NIH NATIONAL INSTITUTE OF PUBLIC HEALTH Est. 1918 r.

NPZ NARODOWY PROGRAM ZDROWIA

HEALTH STATUS OF POLISH POPULATION AND ITS DETERMINANTS 2020

Edited by:
Bogdan Wojtyniak
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National Institute of Public Health
– National Institute of Hygiene

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ISBN 978-83-65870-37-7

eISBN 978-83-65870-38-4

Publication financed by the National Health Programme 2016-2020,
financed by the Health Minister

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FOREWORD

One of the elements of the National Institute of Public Health National Institute of Hygiene (NIPH-NIH) mission is to carry out monitoring the health situation. According to this task Institute prepares reports about health situation of the Polish society, with a long tradition dating back to the 1970s. The scope of data presented in the reports is gradually expanding along with the development of routine information systems collecting health data as well as the wider development of population research in terms of subject matter and representativeness. In addition to the routine data sources used for the analyzes presented in the Reports, the results of population surveys conducted by the NIPH-NIH have been used. These surveys were financed both from national and EU sources and are complementary source of data to those data which is collected by routine systems. Further advantage of these researches is that they can be dedicated to special current health problems. In the present Report, outcomes form NIPH-NIH research together with data from the Statistics Poland made possible to arise and present nutritional status of Poles for the first time. Surveys also allowed to continue following dynamics of changes in health risk factors related to lifestyle.

Reports about health situation in Poland, which had been published by the NIPH-NIH since many years, have enabled indicate strategic directions of health policy, especially that wide scope of the report covers almost the entire area of public health. Special value in this context are international comparisons allowing assessment of the distance of Poland in terms of individual health indicators and disease risk factors, which illustrates distance to the EU average and the most developed countries of the community. This allows to formulate realistic measurable goals in planned strategies aimed at improving the health of the Polish population.

This year is very special because many activities planned in the previous years in the area of health situation of society has been disrupted in the situation of COVID-19 pandemic. The authors of the report took this circumstances into account by preparing a chapter about the initial period of the COVID-19 outbreak in Poland, and presented also preliminary analyzes from this field, which were additionally included in the chapters on hospitalization and sickness absenteeism.

We hope that the presented monography will be excellent contribution for all persons and organizations operating in the field of public health, as well as to all those who strive to improve the health of Polish society.

Grzegorz Juszczyk, MPH, Ph.D

Director General of National Institute of Public Health – NIH

FROM THE EDITORS

The presented picture of the health condition of the population is based on available data at the time of preparing the report, mainly from routine information systems. Most of these systems operate under the Public Statistics Statistical Research Program, approved every year by the Prime Minister. In addition, the report uses data from recognized international databases, including in particular the Eurostat database, as well as OECD and WHO. Important data from other sources are also used in the present report. They include, a survey of a representative random sample of adult Polish population, conducted by the NIPH-NIH in October 2020. Some of the results are presented in the chapter about selected lifestyle-related health risk factors, including changes in the social behaviours associated with the COVID-19 pandemic. A separate chapter has been devoted to the pandemic itself dealing with the initial period of outbreak. As part of the presentation of selected problems related to the health of Polish society, the present Report discusses, for the first time, problems related to the diet and nutritional status of Poles, using data from Statistics Poland as well as own research.

A new valuable issue in the current report is a study on primary health care based on data from electronic documentation of primary care patients. This type of data has been missing so far, as the data from annual reports (MZ-11 statistical forms) collected as part of official statistics, due to their scope and aggregated nature, are of little use for conducting more serious analyses. Another new, interesting data from other sources than public statistics presented in the report are results of the analysis of drug consumption in Poland from the National Health Fund. From the point of view of epidemiological analyses, they constitute an underestimated, but also not easily available source of data for both economic and epidemiological analyses. Finally, the completely new issue in the present Report is the chapter on analysis of big data from laboratory tests in assessing the health of the population. Despite the enormous difficulties related to the organizing data set, the authors of the study achieved a number of interesting results, however as the authors pointed out, the possibility of using this type of data in epidemiological analyses need to be further discussed. The traditional chapters also present new information and broader content. For example, in the chapter on life expectancy and mortality, the problem of mortality from avoidable causes has been significantly exacerbated compared to the previous report. In the chapter on inpatient morbidity, particular more attention was paid to hospitalization due to poisoning, and also were presented preliminary frequency of hospitalizations due to COVID-19. Continuing presentation of the results of the Global Burden of Disease methodology approach to population health problems, the present Report includes also main findings concerning the health of Poles which were presented by the GBD 2019 Study, published in October this year by the Institute for Health Metrics and Evaluation, USA.

In our opinion, a very important chapter in the Report is the one that opens it, discussing the conclusions of the Report in relation to the broadly understood area of health and presenting the need to develop and implement a Health Enhancement Plan.

Looking at the entire report and taking into consideration future and evaluation of the effects of currently implemented National Health Program, which strategic goal is to "extend healthy life, improve health and the related quality of life of the population, and reduce social inequalities in health", current health information systems collect insufficient data related to socio-economic status of population. Also linking data from different systems, especially sources beyond health sector, is currently practically impossible.

Due to the significant limitations in the access to systems collecting data about health situation and risk factors, caused by significant dispersion of data sources and in many cases the lack of the possibility of obtaining information in a socio-demographic cross-section, it seems necessary to implement the countrywide Health and Nutrition Examination Survey following the example of the *National Health and Nutrition Examination Survey* carried out in the USA since the 1960s by the *National Center for Health Statistics (NCHS)* the office of the *Centers for Disease Control and Prevention (CDC)* in Atlanta. Such a survey would be addressed to the entire population, in the full demographic, social and geographical cross-section, combining questionnaire studies, anthropometric and physiological measurements and laboratory analyses. It would allow for a much better monitoring of the health of the population its risk factors.

The presented monography is already the nineteenth in the series started by the National Institute of Hygiene in 1977. The authors and editors are aware that it does not cover all the public health topics. Each chapter disserves to become separate report (detailed studies on the problems of infectious and mental, cancer and occupational diseases are prepared by the relevant institutes of the Ministry of Health). However, we believe that this simple, synthetic analysis showing the dynamics of health problems in the country and their international context should help formulate and implement an appropriate health policy. We hope that the presented

Report will be useful to all persons and organizations being active in the field of public health, as well as to all those who strive to improve the health of Polish society. The authors also invite readers to the website of the NIZP-PZH to download the electronic version (.pdf) of this Report as well as earlier editions and other interesting elaborations about health of the Polish society. We especially recommend visiting portal Knowledge Base on Health Inequalities, and an interactive map on the health of the Polish population presented to the level of poviats (http://bazawiedzy.pzh.gov.pl/atlas) developed within the PL 13 Programme that was co-financed with funds of the Norwegian Financial Mechanism..

ABBREVIATIONS LIST

AIDS – the Acquired Immunodeficiency Syndrome

AOTMiT – the Agency for Health Technology Assessment and Tariffication

ATC – the Anatomical Therapeutic Chemical Classification System

LFS – the Labour Force Survey

BMI – the Body Mass Index

CVDs – cardiovascular diseases

CSIOZ – the Healthcare Information Systems Centre

DALY – Disability Adjusted Life Years

SWH – Social Welfare Home

ECDC – the European Centre for Disease Prevention and Control

EEA – the European Environment Agency

EFSA – the European Food Safety Authority

EHIS – the European Health Interview Survey

EEA – the European Economic Area

ESP2013 – the European Standard Population

GBD – the Global Burden of Disease

SP – Statistics Poland

HBSC – Health Behaviour in School-aged Children

HBV – Hepatitis B Virus

HCV – Hepatitis C Virus

HDI – Human Development Index

HDL – high-density lipoprotein

HIV – Human Immunodeficiency Virus

HLY – Healthy Life Years

ICD-10 – the International Statistical Classification of Diseases and Related Health Problems

IHME – the Institute for Health Metrics and Evaluation

IHR – International Health Regulations

IPiSS – the Institute of Labour and Social Studies

IRTAD – the International Traffic Safety Data and Analysis Group

IŻŻ – the Food and Nutrition Institute

ODTS – the oncological diagnosis and treatment sheet

KGP – the National Police Headquarters

KRN – the National Cancer Register

KRUS – the Agricultural Social Insurance Fund

LDL – low-density lipoprotein

MDR-TB – multi-drug-resistant tuberculosis

MSM – men who have sex with men

NFZ – the National Health Fund

NIZP-PZH – the National Institute of Public Health – National Institute of Hygiene

NSAIDs – non-steroidal anti-inflammatory drugs

NUTS – the Nomenclature of Territorial Units for Statistics

ESR – erythrocyte sedimentation rate

NGHMS – the Nationwide General Hospital Morbidity Study

OECD – the Organisation for Economic Cooperation and Development

OOP – out of pocket expenses

ACS – the Acute Coronary Syndrome

PHEIC – Public Health Emergency of International Concern

GDP – gross domestic product

PM2.5 – atmospheric particulate matter with diameters 2.5 μm or smaller

PM10 – atmospheric particulate matter with diameters up to 10 μm

POBR – the Polish Road Safety Observatory

COPD – chronic obstructive pulmonary disease

PH – primary healthcare

PSP – the State Fire Service

AATC – alcohol addiction treatment centre

PSATC – psychoactive substances addiction treatment centre

PYLL – Potential Years of Life Lost

PYLL75 – Potential Years of Life Lost for the reference age 75

MHC – mental health centre

SCORE – the Systematic Coronary Risk Evaluation

SP – Statistics Poland

EIRS – epidemiological intelligence registration system

TC – total cholesterol

UE – the European Union

UE28 – 28 Member States of the European Union

UV – ultraviolet radiation

WHO – the World Health Organization

WHO HFA DB – the WHO European Health for All Database

WHO HFA MDB the WHO European Health for All Mortality Database

VH – viral hepatitis

YLD – Years of Life with Disability

YLL – Years of Life Lost

ZUS – the Social Insurance Institution

Important facts

SELECTED ASPECTS OF THE SOCIO-DEMOGRAPHIC SITUATION

1. The population of Poland declined in number over the period 2009-2019 and at the end of that year was 38,383,000 people, which constitutes 7.4% of the overall population in 28 countries of the European Union and places our country on the seventh position among EU countries. In 2019, the population growth rate in Poland was negative in urban areas and positive in rural areas.
2. Women made up 51.6% of the overall population as at the end of December 2019. There are more men in younger age groups because more boys than girls are born and that advantage is maintained until they reach the age of 47. Older age groups are characterised by growing preponderance of women. At the age of 65 or more, there are already 154 women for every 100 men, and at the advanced age of 85 or more, there are as many as 260 women for every 100 men.
3. The population of Poland is younger, on average, than the populations of most European Union countries (EU28), however, as follows from the Eurostat's projection, the difference, to Poland's advantage, is going to diminish slowly and, in the middle of this century, both the age median and the percentage of individuals aged 65 or more in Poland are going to be higher than the average ones in EU countries.
4. The number of live births in 2018 and 2019 declined in urban areas and increased slightly in rural areas.
5. The percentage of children born out of wedlock is increasing and, nowadays, every fourth child is born out of wedlock. In the Zachodniopomorskie and Lubuskie Voivodships, the percentage is higher than 40%. In comparison to other European countries, the percentage of illegitimate births in Poland is relatively low; only in five EU countries the percentage of that group of new-borns is lower than in our country.
6. In Poland, one observes a slight downward trend in the frequency of low birth-weight births (5.6% in 2018/2019) and such births occur more rarely than in EU countries on average (6.1% in 2019). In the period 2018-2019, the worst situation was observed in the Zachodniopomorskie, Lubelskie and Dolnośląskie Voivodships.

7. Despite the fact that the percentage of individuals with higher education has increased significantly in Poland recently, it is still lower among men aged 25-64 on Poland than in most EU countries, while the percentage of women is higher than the EU28 average.
8. The continuing elimination of differences in income distribution, which have been lower than the EU average in Poland recently, are a favourable process. The level of the risk of poverty or social exclusion is presently lower than the EU average. One can observe the greatest improvement among children and adolescents under the age of 18, whereas there is no improvement in the case of the oldest population, at the age of 65 or more; still, however, the percentage of individuals at risk of poverty or social exclusion is lower than the EU average. In Poland, the highest risk of poverty, for several years now, has been in the Podlaskie and Warmińsko-mazurskie Voivodships.
9. The overall unemployment rate and the long-term unemployment rate in Poland are one of the lowest in the EU. The worst rates of unemployment are recorded in the Warmińsko-mazurskie, Podkarpackie and Świętokrzyskie Voivodships. It is unfavourable that, in Poland, there are fewer opportunities for part-time jobs than in EU and OECD countries taken together, which is observed especially among women.
10. The housing conditions of Poles are, in some respects, worse from average conditions in EU countries, especially as far as the overcrowding of dwellings is concerned. Poles, however, live in poor-quality dwellings more rarely than the residents of the EU in general.
11. The last Human Development Index (HDI), (2019) places Poland on the 20th position in the European Union and 32th in the world, which means the same position in the EU and a better position, by one place, in the world in comparison with the preceding year.

LIFE EXPECTANCY AND MORTALITY OF THE POPULATION OF POLAND

12. The analysis of data on the life expectancy and mortality of the inhabitants of Poland shows that the improvement in the Polish population's health condition has decelerated in recent years. Due to the health indicators in Poland being continuously inferior in comparison to those for the inhabitants of most European Union countries, this should be considered alarming.
13. In 2019 the life expectancy of men was 74.1 years, and that of women was 7.7 years longer, amounting to 81.8 years. The life expectancy of women in 2016-2019 presented a slow downward trend. The difference in the life expectancy between men and women, resulting from the excess mortality of men in comparison to women, has decreased in recent years. In 2018 men in Poland could expect to live 60.5 healthy (i.e. without disability) life years

(corresponding to 82% of their overall life expectancy), which was less than 2 years before, and the corresponding value for women was 64.3 years (79%). The difference in the healthy life years of women and men in Poland, amounting to 3.8 years, is currently the highest in the EU.

14. The life expectancy of Polish men is much shorter than the average for the European Union – according to Eurostat data, in 2018 it was 4.6 years shorter, while in the case of women the difference was much lower and amounted to 1.9 years. In the last three years no improvement has been observed in this area.
15. Life expectancy is highly influenced by social factors – in 2017 men aged 30 with higher education could expect to live approx. 7.4 years longer than men with secondary education (including basic vocational education), and as many as approx. 11.0 years longer than men with at most lower-secondary education. These unfavourable differences grew in 2017 in comparison to 2014-2016, which was caused by an increase in the life expectancy of men with higher education and a reduction among persons belonging to lower education groups. In the case of women, differences related to the educational level are much less pronounced than among men, but they also increased in 2017. A much greater difference in the life expectancy of men as compared to women with a lower educational level than in the case of people with higher education points to the significant role of factors associated with the socio-economic status in the excess mortality of men as compared to women.
16. The smallest towns with a population below 5,000 are still the least favourable living environments in Poland, with the lowest life expectancy of their inhabitants. On average, individuals living in the largest cities have the longest life expectancy, except for Łódź city whose inhabitants live even shorter than those of small towns. It is worth emphasising that the differences in the life expectancy associated with the place of residence category have not decreased in recent years.
17. The fact of living in urban or rural areas contributes to differences in the life expectancy of the Polish population to a limited extent. Men living in urban areas live generally longer than rural inhabitants (in 2019 1.1 year longer) while the life expectancy of the female inhabitants of urban and rural areas is almost identical.
18. The increase in life expectancy in poviats in the period from 2002-2004 to 2017-2019 was not associated with the deprivation level among men or women, which should be considered a positive phenomenon.

19. Infant mortality in Poland is still higher than the EU average; in 2018 and 2019 as many as 38 children per each 100,000 live births died before reaching the age of 1 year, while in the EU the average number was 35 (2018).
20. The infant mortality rate differs considerably between voivodships. In the entire four-year period of 2016-2019 it was below the national average only in the Mazowieckie and Małopolskie Voivodships. In the Kujawsko-pomorskie, Śląskie, Warmińsko-mazurskie and Zachodniopomorskie Voivodships, the infant mortality rate in the reference years was continuously higher than the national average.
21. Mortality of the inhabitants of Poland in the last ten years has been characterised by a significant slowdown or even deceleration of the decrease in the death rates in the second half of the reference period, for all age groups, both men and women, which is undoubtedly an alarming phenomenon as it refers to the entire population.
22. For years the greatest threat to the lives of Poles has been posed by **cardiovascular diseases (**CVDs), which in 2018 were responsible for 40.5% of all deaths. The force of mortality due to CVDs and their share in the total number of deaths have gradually decreased after 2015. These diseases are the major cause of death of men aged 45-54 and those aged 70 or more, while among women – at the age above 74. Definitely the most common cause of death in the CVDs category is formed by **heart diseases (**59.0% of all deaths attributable to CVDs). Heart diseases are also the most common detailed cause of death in the Polish population. Deaths due to heart diseases are much more frequent in Poland than in more affluent EU countries.
23. **Malignant neoplasms** are the second most common cause of death in Poland (24.5% of all deaths in 2018). In 2016-2018 the age-standardised mortality rate due to malignant neoplasms among women did not show a downward tendency, but their share in all causes of death, among both men and women, dropped slightly. Neoplasms in general constitute a greater health problem for men than for women, and the excess mortality for this cause among men, as compared to women, is higher than in the case of cardiovascular diseases, but they constitute the greatest threat to the life of women aged 30-74 years. In the last 15 years the decrease in the mortality rate due to neoplasms was observed in all voivodships, but its varying course is worth pointing out. Undoubtedly, it would be very beneficial for the health policy to establish the causes of these varying courses of changes in mortality in individual voivodships. The greatest threat to the lives of men is cancer of the trachea, bronchus or lung (greater than for EU inhabitants in total). The mortality rates regarding this cause among men are decreasing, while among women in total they are continuously

growing. It should be emphasised, however, that among women aged 25-64 in the last four years a downward trend was observed. The mortality rate for women in total due to breast cancer has been increasing since 2010 (in 2018/2017 in the Wielkopolskie and Dolnośląskie Voivodships, the mortality rate was over 25% higher than five years before). In general, the situation in Poland with regard to mortality due to malignant neoplasms is unfavourable in comparison to the average situation in the EU, but to a lesser extent than in the case of circulatory diseases.

24. **External causes of death** since 2015 have been the fifth group of mortality causes in Poland (4.9% of all deaths in 2018). They are the fourth cause of death for people aged 5-44; in 2018 they were responsible for 41% of all deaths in this age group. These causes are a greater threat to the lives of men residing in rural areas compared to urban areas. The force of mortality for the external causes of death in total has exhibited a long-term downward trend, which has recently decelerated. Among the external causes, the most important in the last two years were falls, followed by suicides, with traffic accidents ranking third. The order of these causes points to the need to rearrange priorities in the prevention of external death causes.
25. In 2018 in Poland the third most important group of causes of death was formed by **ill-defined and unknown causes**, i.e. those where the cause of death included a description of symptoms, referred to abnormal laboratory test results, was ill-defined or unknown (ICD-10 R00-R99). This was the case of every tenth death. Attention should be drawn to the substantial diversity of the frequency of deaths for these causes between voivodships. Particularly unfavourable results are reported in the Lubelskie and Lubuskie Voivodships, and a dramatic worsening was observed in the Mazowieckie Voivodship. The problem is one of the major arguments for the insufficient quality of the system of determining the causes of death in Poland, which urgently requires fundamental improvement.
26. Poland is among the developed countries where premature deaths of the population are a significant problem. The burden of premature mortality of men is 2.5 times higher than that of women. In the case of women, the dominant cause of potential years of life lost (PYLL75) is cancer, which is responsible for almost 40% of PYLLs. Cardiovascular diseases account for half as many PYLLs. Neoplasms which most frequently cause the premature mortality of women include trachea, bronchus and lung cancer and breast cancer. In the case of men, the greatest burden of premature mortality is related to the following three groups of causes: cardiovascular diseases (22.3%), malignant neoplasms (21.3%) and external causes

(18.6%). Among CVDs, the dominant cause of premature deaths are heart diseases, which are responsible for over four times more potential years of life lost than cerebrovascular diseases. In 2014-2018 the burden of premature mortality decreased, to the greatest extent, for diabetes, diseases of the respiratory system, including in particular pneumonia, chronic liver diseases and overall causes directly related to alcohol consumption.

27. An important element of premature mortality is mortality from avoidable causes which could be effectively treated or prevented. In 2015-2018 the decline in the death rates for these causes decelerated, both in the case of preventable and amenable causes, which may be a sign of the increasing problems of the health care system. Mortality for preventable causes is much higher (85%) than mortality for amenable causes, which exposes the weakness of the current health policy. Preventable mortality due to neoplastic diseases is currently much higher than that due to cardiovascular diseases, both among men and women, which points to an urgent need to intensify preventive measures focusing on neoplasms. The National Oncological Strategy under implementation should direct more attention to this area. Mortality due to preventable alcohol-related diseases is on the rise. The mortality of men due to amenable CVDs is much higher than mortality from neoplastic diseases, whereas the opposite applies to women. Differences between voivodships in the mortality rates for preventable and amenable causes points to the existing high potential for improving the health of the Polish population through public health and clinical medicine.

HOSPITAL MORBIDITY

28. In 2018, some 3,833,000 men and 4,791,000 women were hospitalised in general hospitals in Poland. The total rate of hospitalisation was 2.093 per 10,000 population. Hospital patients were most frequently treated for diseases of the circulatory system (13% of hospitalised patients), all types of neoplasms, injuries or poisoning (10.2% and 8.7% of hospitalised patients, respectively) and diseases of the genitourinary, digestive or respiratory systems (7.4%, 7.2%, 6.3% of hospitalised patients, respectively).

29. In absolute numbers, women were more frequently hospitalised than men (the difference is 861,000), although, the analysis of major causes of diseases shows that, following standardisation of the rates of hospitalisation, men were at a higher risk of hospitalisation for most of the main causes of hospital treatment. The standardised rates of hospitalisation among women were higher only for the following: diseases of the nervous system, hypertensive disease, neoplasms, endocrine disorders, and diseases of the genitourinary system.

30. Men and women from urban areas were treated in hospitals 15% more frequently than inhabitants of rural areas, and this difference increased compared to previously published reports, which may suggest deteriorating access to hospitals for rural residents.. However, there are certain causes of hospitalisation, such as burns, frostbites and pneumonia for which inhabitants of rural areas, both men and women, were hospitalised more frequently. Women from rural areas were hospitalised more frequently than women from urban areas for chronic diseases of the lower respiratory system, injuries and poisoning.
31. From 2003 onwards, many countries recorded a decrease in the rate of hospitalisation. Poland is among the EU Member States with a moderate frequency of hospitalisation in general, with some upward trend (by 30%), although in the last year of the analysis (2018), the rate of hospitalisation slightly decreased.
32. Hospitalisation in Poland is different than in the majority of EU Member States in relation to the high frequency of treatment provided to the youngest (under the age of 5) and the significantly less frequent hospitalisation of the oldest persons (over 75 years of age).
33. In Poland, the total length of hospital stay for all causes is one of the shortest in the EU, however, it is the longest for certain diagnoses, for example, in the case of hospitalisation for treatment of appendicitis and cataract.
34. The current, relatively low, hospital fatality for myocardial infarction in Poland confirms good quality of hospital treatment. The fatality for this cause decreased in the years 1980-2018 by threefold, from 22% to 5.9%. On the other hand, the 30-day fatality for myocardial infarction, published for Poland by OECD, was equal to 4.1%[1] and, following Iceland (2.3%), Norway and Denmark, is the third lowest among the member countries of the Organisation.
35. On the other hand, fatality for cerebral stroke is disturbingly high in Poland. The proportion of hospital deaths due to cerebral haemorrhages has even worsened (28.5% in 2004 and 33.5% in 2018). There was some improvement in fatality rates for ischaemic stroke (14.2% in 2004 and 11.2 in 2018) and unspecified stroke (from 23.7% in 2004 to 14.3% in 2018), although there were certain fluctuations in 2004-2014.
36. The rates for the quality of healthcare established by OECD and based on hospitalisation rates, excluding hospitalisation for diabetes, were higher than for the “old EU” Member States, although these are showing some improvement.

[1] For persons aged 45 or older.

37. In the years 2007-2017, children aged 0-19 were the most frequently hospitalised and the oldest patients (aged 60 or older) were the least frequently hospitalised for poisoning, regardless of their sex and place of residence.
38. In the years 2007-2017, the frequency of hospitalisation for poisoning among men and women showed an upward trend until 2015 and then dropped to the level recorded in 2007. The rates of hospitalisation for men were 50% higher than those for women.
39. In the years 2007-2017, the frequency of hospitalisation for poisoning among the inhabitants of urban areas was markedly higher than among the inhabitants of rural areas.
40. In the group of patients hospitalised in Poland for COVID-19 from March to October, there were slightly more men than women (51% and 49%, respectively), with women admitted to hospitals being a little older (59.6 compared to 55.6 for men).
41. Across nearly all age groups up until the age of 70, there were more hospitalised men. But in the oldest group, there were twice as many women.
42. Inhabitants of rural areas represented only 16.5% of all patients hospitalised for COVID-19.
43. Women were hospitalised for COVID-19 for slightly longer periods of time than men (12.3 days for women and 11.8 days for men) and the inhabitants of urban areas stayed in hospitals for shorter periods than the inhabitants of rural areas (12 and 14 days, respectively).
44. 13% of patients hospitalised for COVID-19 died, with fatality among inhabitants of rural area being higher than of urban area (16.7% and 12.4%, respectively). The fatality among men was higher than among women (14% and 12%, respectively).

INCIDENCE OF MALIGNANT NEOPLASMS IN POLAND

45. The number of cancer cases in Poland is on the rise, as it reached over 164,000 in 2017. The number of cancer cases among men and women is roughly the same (approx. 82,000 for each group).
46. The most frequent malignant neoplasms in men include prostate cancer (19.7%), lung cancer (16.7%), and colorectal cancer (12.3%), while women most frequently suffer from breast cancer (22.5%), colorectal cancer (9.9%) and lung cancer (9.4%).
47. The National Oncological Strategy points to six neoplasms which require special focus, and these include colorectal cancer, melanoma, lung cancer, breast cancer, cervical cancer and prostate cancer.

48. As regards colorectal, breast and cervical cancers, population screening-test programmes were implemented with a view to providing early cancer detection.
49. Neoplasms which are responsive to primary prevention measures (lung cancer, melanoma) require the implementation of educational programmes with an emphasis placed on risk factors. The reduction of smoking among men resulted in a lower incidence of lung cancer. Disseminating knowledge on the need to protect your skin against UV radiation should also effectively reduce the number of melanoma cases.
50. Prostate cancer, the most frequent malignant neoplasm in men, can develop in older patients, which is probably the cause of a sharp rise in the number of cancer cases related to the increased share of older men in general population.
51. A steep rise in the number of cancer cases and convalescents might result in a public health crisis and a burden to the Polish healthcare system. The main challenge for the Polish health care system in the decades to come will be to implement measures aimed at limiting the number of cancer cases and deaths, and finding resources for the treatment of cancer diseases and financing palliative and terminal care for a growing number of cancer patients. The measures should be based on the possibilities provided by evidence-based health policy. The cancer register is a reliable source of information. The development of the National Cancer Register, and support for registering cancer cases is indispensable, in particular in the sphere of finding doctors' approval for cooperating with the register.

MENTAL AND BEHAVIOURAL DISORDERS

52. The total number of patients covered by psychiatric outpatient care is over one million six hundred thousand people. The number of patients treated in the period 2016-2018 remained at a relatively constant level, although there was an increase in the number of patients treated for the first time. There are still tendencies associated with the fact that women are treated more often than men (by over 20%), and in mental health centres – by 50%. Urban inhabitants are treated considerably more often than rural inhabitants. In 2018, in psychiatric outpatient care□, this surplus was as high as 106%, and this difference indicates the unequal satisfaction of the health needs of these two populations.
53. The most common health problems among people treated in psychiatric outpatient care include (and have included for several years) neurosis related to stress and somatoform disorders, as well as mood (affective) disorders.

54. In the years 2011-2018, the number of Polish inhabitants treated in inpatient mental health facilities was rising. In 2018, some 263,000 people were treated for mental disorders. Men were more often treated than women (112% more men) – 941.1 per 100,000 population and 442.4 per 100,000 population, respectively. Urban inhabitants were treated more often than rural inhabitants by 20% (729.2 per 100,000 population and 614.9 per 100,000 population, respectively). This difference was much smaller than in the case of outpatient treatment. However, it has nearly doubled in the last eight years.
55. The most frequent diagnosis among people treated in inpatient mental health facilities was alcohol-related mental disorders – in 2018, 254.3 per 100,000 population, and in patients treated for the first time 109.4 per 100,000 population. An especially large number of inhabitants, just like three years ago, are treated in the Podlaskie, Łódzkie and Świętokrzyskie Voivodships.

INFECTIOUS AND PARASITIC DISEASES

56. The data collected as a part of routine surveillance of infectious diseases and data about causes of deaths indicate that the epidemiological situation of infectious and parasitic diseases in Poland is relatively favourable and stable.
57. The Immunization Programme, implemented for over half a century in Poland, has been gradually changing. In 2017, widespread pneumococcal vaccination was introduced which contributed to a substantial vaccination coverage among children, i.e. over 90%. The clinical effects of the programme can be assessed after several years of vaccination of child cohorts born on the same year.
58. The favourable downward trend in the incidence of rubella and mumps, the diseases most common in small children, continues. Due to the low percentage of laboratory confirmations, rubella is over-diagnosed.
59. Despite the high proportion of people vaccinated over the years, the unfavourable trend in the vaccinations of children and young people continues.
60. The widespread promotion of vaccination in society as the best method of preventing infectious diseases remains an ongoing challenge, especially in view of the intense activity of vaccination opponents.
61. The constant increase in the number of newly detected HIV infections among men who have sex with men as well as syphilis and gonorrhoea in the male population in general, indicates the limited effectiveness of the measures taken to date with regards to that group.

It is necessary to evaluate and intensify measures, as well as to consider the introduction of other interventions with proven effectiveness, such as HIV pre-exposure prevention.

62. Rapid diagnosis and treatment are important elements in the prevention of HIV, HCV and other sexually transmitted diseases. The available data indicate that there are large shortcomings in Poland, especially in terms of diagnostics. A wider access to tests, the promotion of HIV and HCV testing, and the integration of testing (offering a package of tests) for these and other sexually transmitted diseases, remain priority issues.
63. With regard to the diagnosis and treatment of HCV, HIV and other sexually transmitted diseases, it is important to take action to include marginalised populations, such as intravenous drug users, homeless people and illegal migrants, in the medical system. To this end, the diagnostic process must be simplified by using rapid tests and community-based testing by lay providers.
64. Significant differences in recorded incidence rates of sexually transmitted diseases indicate gaps in the system of diagnosis and/or reporting of these diseases in most voivodships. It will be necessary to take action to improve access to diagnostics, as well as to develop acceptable ways of monitoring sexually transmitted infections across Poland.
65. Accurate diagnosis of the epidemiological situation for influenza, and thus planning and performing rational preventive measures in Poland requires a uniform surveillance of influenza in individual voivodships.
66. Considering the enormous economic and social costs of influenza borne every year, efforts should be intensified for a significant increase in the percentage of people vaccinated against this disease.
67. Effective prevention and combatting of infectious diseases require efficient actions aimed at eradicating the limitations in the scope of laboratory diagnostics performed for epidemiological purposes, i.e. for the needs of public health, and not for the purpose of determining therapeutic treatment.
68. Successive implementation of modern molecular methods for the routine surveillance system, e.g. whole genome sequencing, can significantly contribute, especially during epidemiological investigations in outbreaks (including international investigations), to identify the carrier and / or source of infection.
69. The implementation of the comprehensive electronic Epibaza system for epidemiological surveillance, which took place on 1 January 2020, should, in the near future, improve the

collection and transfer of data as part of epidemiological surveillance and support timely, appropriate and effective action to prevent and combat communicable diseases.

70. Increased tourist travel to various parts of the world requires actions to raise public awareness of the health risks connected with such travels and determine methods for the prevention of these threats.

COVID-19 EPIDEMIC IN POLAND IN SPRING AND SUMMER 2020

71. In spring 2020 the COVID-19 epidemic was curbed through the introduction of significant restrictions on social contacts. These restrictions were introduced in Poland at a very early stage of the epidemic and resulting in a low incidence.
72. The low test rate per 100,000 residents paired with the high hospitalisation rate due to COVID-19 indicate that the notification rate may be much lower than the actual incidence, which means that the control measures based on the rapid detection of cases and quarantining individuals who have been in contact with the infected may be of limited impact on the epidemiological situation for COVID-19.
73. In spring 2020, the COVID-19 epidemic (known as the “first wave”) was shaped by infections in the workplace and health care facilities. In the summer season, infections resulting from social contacts, probably also in the context of holiday travel, became more numerous. This significantly limited the possibility of applying well-targeted and timely control measures, leading to a more uncontrolled spread of the epidemic.
74. COVID-19 cases were detected in a large proportion of nursing homes, both among the personnel and the residents. Contrary to expectations, antibodies were undetectable in most recovered patients when they were subjected to serology tests. The period in which the infections occurred is unknown, but it is possible that they occurred several months before the test and the level of antibodies might have dropped below the detectable level, which suggests susceptibility to re-infection.

ACCIDENTS AND ACCIDENTAL POISONINGS AS A THREAT TO HEALTH

75. The mortality rate due to accidents in Poland has been steadily decreasing since 2000. Since 2016, this trend has slowed down. In 2016, a threat to the life of the Polish population due to accidents was 9.8% higher than the average for all EU countries according to Eurostat.
76. The major categories of causes of accidents are falls (crude mortality rate of 11.8 per 100,000 population), followed by transport accidents (9.6), poisonings (3.8) and drownings

(1.6). According to EUROSTAT, in all the aforementioned categories a threat to life in Poland is higher than the average in EU countries.

77. In the last decade, an epidemiological change in the occurrence of accidents can be observed. The share of deaths due to accidents of elderly people is increasing, especially falls, which are also the major cause of hospital treatment due to all accidents in all age groups.

MULTIDIMENSIONAL ANALYSIS OF SICKNESS ABSENCE

78. Many interesting phenomena are observed in the analysis of sickness absence based on data given in sick notes confirming temporary incapacity for work.
79. For many years, the majority of sick notes have been issued to women, their percentage oscillating around 55% of the total number of issued sick notes. This also confirms that sickness is more prevalent among women. In the year 2019, sickness absence in the group of women, confirmed with a sick note, amounted to 139.2 million days. This also translates into the percentage of accumulated sickness absence in that year. In the year 2019, this rate in the group of women was higher than the average accumulated absence among men by more than 7.5 days and amounted to 39.76 days (for men, it was 32.24 days).
80. Absence in the group of women incapable of working during pregnancy is an important element of the analysis of sickness absence. Incapacity for work among pregnant women has a significant impact on overall absence and absence in the population of women. In the year 2019, the percentage of sickness absence due to pregnancy relative to overall absence was 20.0%, and the percentage of sickness absence among pregnant women relative to sickness absence in the group of women was 34.3%. As far as the number of sick notes is concerned, every tenth sick note was issued due to incapacity for work during pregnancy and nearly every fifth woman received a sick note confirming incapacity for work during pregnancy.
81. Sickness absence is most likely to occur in the group of insured aged 30-39 years. In the year 2019, its proportion was 28.6% of absence days, and in the first half of the year 2020 – 27.9%.
82. The following disease entities caused the longest sickness absence among men:
    - nerve root and plexus disorders (G54) – 6.7% of the total number of sick absence days among men;
    - acute upper respiratory infections of multiple and unspecified sites (J06) – 4.5%;

- dorsalgia (M54) – 3.9%.

For years, in the population of women, the longest sickness absence has been due to obstetric care due to other maternal disorders predominantly related to pregnancy (O26) – 26.7% of total sick absence days among women. Other disease entities, in order of prevalence, include:

- acute upper respiratory infections of multiple and unspecified sites (J06) – 3.9%;
- nerve root and plexus disorders (G54) – 3.8%.

83. In February 2020 (before COVID-19 was entered in the Classification), sick notes were most often issued due to acute upper respiratory infections of multiple and unspecified sites (J06). In total, 261.7 thousand sick notes were issued due to this disease entity, of which 115.6 thousand (44.2%) were issued to men and 146.1 thousand (55.8%) to women. The number of sick absence days related to these sick notes was 1,390.9 thousand (the average duration was more than 5 days).

    In March (after the COVID-19 disease entity was entered in the Classification), 401.8 thousand sick notes were issued due to acute upper respiratory infections of multiple and unspecified sites (J06) – 53.5% more than in February. Men received 172.7 thousand sick notes (compared to February, it was 49.4% more) and women – 229.1 thousand of sick notes (i.e. 56.8% more than in February). The number of days of incapacity for work due to acute upper respiratory infections of multiple and unspecified sites (J06) was nearly twice higher than in February. In the case of women, it was 1,667.0 thousand days, an increase compared to February by 119.2%; in the group of men – 1 256.1 thousand days – an increase compared to February by 99.3%.

    In the period March-June 2020, 19.1 thousand sick notes issued due to COVID-19 for a total of 242.6 thousand sick absence days were registered. And the number of sick notes, including those related to quarantine (excluding data on isolation ordered by sanitary services), was 46.3 thousand, accounting for 553.9 thousand sick absence days.

84. The sickness absence is a significant financial challenge. A total of PLN 19.7 billion was spent for this purpose from the social insurance system, of which PLN 12.2 billion was financed from the Social Insurance Fund (sickness allowances) and the remaining amount was financed by employment establishments and the Guaranteed Employee Benefits Fund (FGŚP).

ANALYSES OF LARGE LABORATORY DATA SETS IN POPULATION HEALTH ASSESSMENT

85. The observations presented above are a part of the work carried out under the NIZP-PZH project involving a comprehensive publication on the health situation of the Polish population. The area of laboratory tests has been included in this publication for the first time and on a pilot basis, and serves mainly to explore and test the possibilities of presenting public health phenomena from the perspective of laboratory assays.
86. As can be seen from the examples discussed above, the primary limitation of the use of laboratory tests to assess population phenomena is the uncertainty about the population to which the data refer. The present study utilises the data of the largest diagnostic company in Poland, which ran tests for approximately 16 million representatives of the Polish population throughout merely 5 years. This number is colossal, and so is the analytical potential behind it, but the basic hindrance is the selection of people for the pool of the population which is neither screening nor randomised. Thus, the tested population is strongly biased, with the trends of this bias being unknown and ambiguous. These trends may differ in time (subsequent years) and regionally (depending on the market served by local laboratories). In this situation, deliberations on most of the cases must adopt a narrow perspective and focus on the phenomena occurring in the population *referred to specific tests,* and not in the general population. The most representative results come from the most common tests performed routinely, often without significant clinical indications, such as blood counts. On the other extreme, there are rare tests with very specific indications, such as natriuretic peptides tests. In this case, it can be safely said that the tests were performed in a population of a specific profile (here: suspected heart failure) and apply only to this population.
87. To a large extent, data in the field of laboratory diagnostics can inform about the routine clinical practices and differences between such practices occurring in time and between regions. Such analyses and considerations may be useful from the point of view of managing the healthcare system, shaping the method of financing healthcare services, and monitoring the quality of healthcare services both in the public and private system.
88. The observations presented above are of a preliminary nature, and in the coming months their in-depth and extended versions will be the subject of scientific publications. They substantiate the analytical potential of diagnostic laboratory tests, but also indicate a certain specificity and the need to adapt the analytical apparatus to specific fields and domains.
89. In the context of e-referral plans, there is a possibility of access to analytical data not limited to the set of one single healthcare company. For this purpose, however, a far-reaching effort

should be made to standardise the testing nomenclature, define research methods, and agree on how to present the results in terms of units of measurement (if any) and ranges of reference values. Even within a single company, there were significant problems in this regard, mostly due to the fact that individual laboratories joined the chain at different times and with their own work methodology.

SELECTED LIFESTYLE-RELATED HEALTH RISK FACTORS

90. Smoking tobacco accounted for 2,060 thousand (16.3%) disability-adjusted life years in 2019. In 2020, the estimated share of men and women smoking tobacco was lower than in 2018. However, the share of persons using electronic substitutes has grown significantly. During the COVID-19 pandemic, a vast percentage of persons (both men and women) made a decision on changing their smoking habits. The percentage of persons who decided to make changes which are either favourable or unfavourable from the health-risk perspective was comparable.
91. In 2019, alcohol consumption accounted for 1030 thousand (8.16%) DALY. Alcohol consumption reached a level of 10.6 litres per person (aged 15 or older), and has remained at a similar level for around five years. Over a half of the alcohol was consumed in the form of beer, and over a third in the form of spirits. During the COVID-19 pandemic, a vast percentage of persons (both men and women) made a decision on changing their smoking habits. The changes could slightly impact on the increase in alcohol consumption by men.
92. Excessive body weight (BMI ≥25) accounts for 14.2% of deaths in our country (13.1% of men and 15.3% of women) and for 12.4% of disability-adjusted life years (12.1% and 12.6% respectively). In the spring 2020, 54% of Poles were overweight, more often men (64%) than women (46%). The prevalence of obesity (BMI≥30) was estimated at 10% (12% among men and 8% among women). As regards persons aged 20-44, excessive body weight affects men over twice as often as women (59% versus 29%), and the prevalence of obesity was 9% and 5% respectively. Both for men and women, the values rose in groups aged 45 years or older, which is particularly manifest among women. Disparities in the prevalence of overweight between the inhabitants of urban and rural areas are not significant, but obesity is much more common in women living in rural areas than in women living in urban areas (11% versus 6%). The prevalence of excessive body weight among school-aged children and youth aged 11-16 has risen in recent years (by nearly 2 percentage points between 2014 and 2018 - 16.5% versus 14.8%), which is a trend stronger in boys (by 3.4 p.p.) than in girls (0.4 p.p.).

93. During the COVID-19 pandemic period, between spring and autumn 2020, 28% of Poles aged 20 or older (28% of men 29% of women) reported an increase in their body weight. Men aged 20-44 and women aged 45-64 gained weight most often. Well-educated persons gained weight more often than the representatives of the remaining groups, and, as regards men, the effect was largely caused by the differences in the age structure between the analysed groups. Body weight increase was more often observed among men living in urban areas than among those from rural areas (30% versus 25%), which is also true for women living in rural areas (31% versus 28%). At the same time, 13% of the population (14% of men and 12% of women) reduced their body weight. They were mostly persons aged under 45. Weight loss was most frequently observed in persons with basic vocational education.
94. Low physical activity accounts for 2.3% of deaths and 1.1% of DALY in Poland. Every third Polish national does sports or takes up leisure physical activity in the spring, summer or autumn season. As many as 70% of men and 64% of women admitted not undertaking such activity. For both male and female populations, the percentage of inactive persons increases with each subsequent age group. The physical activity level is strongly correlated to education levels, 89% of Poles with primary or lower secondary education and 56% of persons with tertiary education do not take up physical activity. Only 20% of boys and 15% of girls aged 11-16 maintain the physical activity level recommended by the WHO for proper development and health; in recent years a considerable reduction of physical activity among school-aged children could be observed.
95. During the COVID-19 pandemic, 34% of the residents of our country reduced their physical activity - men more often than women (39% versus 30%). Men aged 45-64 and women aged 20-44 reduced physical activity most often. Low education level was a factor contributing to the reduction of physical activity. At the same time 18% of men and 17% of women increased their physical activity, and the percentage was decreasing from 26% in the 20-44 age group to 6% in the group aged 65 or older. Both for men and women, the level of physical activity was increased most often by persons with basic vocational education.
96. In total, behavioural risk factors account for 35.8% of disability-adjusted life years in Poland (43.0% in men, and 27.1% in women).

DIETARY INTAKE AND NUTRITIONAL STATUS OF THE POLISH POPULATION

97. The analysed data obtained from the household budget surveys show that the significant differences in the diet of the Polish population were observed in 2010-2018. In that period,

the consumption of the majority of food products (cereal products, potatoes, vegetables, meat and meat products, fats, milk and dairy drinks, eggs and sugar) decreased which resulted in the decrease in the energy value of the diet and the intake of more important nutrients such as fibre and vitamin C.

98. Some differences in the diets of the inhabitants of urban and rural areas were observed. The inhabitants of rural areas consumed more bread, potatoes, meat products, milk and dairy drinks, eggs and sugar, which resulted in the higher energy value of their diets and the intake of certain nutrients, as compared to the diets of the inhabitants of urban areas. On the other hand, the consumption of vegetables, fruit and cheese was higher in urban areas, which translated in the higher intake of vitamin C and calcium.
99. Data from the household budget surveys facilitated the findings that in the abovementioned period the Polish population consumed too low quantities of vegetables and fruit, and too much red meat and processed meat, as compared to the recommendations. Moreover, the excessive proportion of energy from fats, including saturated fatty acids, and too little energy from carbohydrates were observed in their diets.
100. Data from the literature discussing the individual food consumption complemented the assessment of the diets of the Polish population, referring to Polish DRVs and recommendations. The results of these studies showed that the diet of some groups of people, especially women, did not cover the energy requirement. The structure of the origin of energy from macronutrients deviated from the recommendations; the amount of energy obtained from fats, especially from saturated fatty acids, was too high, and the amount of energy from carbohydrates was too low, especially in the diet of adults.
101. Deficiencies of certain minerals and vitamins, in particular, calcium, magnesium, potassium, vitamin C and D, and folates were found in the diets of the Polish adult population, and among children and youth – also the deficiency of iron was found. Moreover, the content of sodium in the diet was too high.
102. Data on consumption did not show that the energy value of the diets of the majority of Poles exceeded the recommendations; however, the high prevalence of overweight and obesity was a serious problem, confirmed by the assessment of the nutritional status based on the latest independent studies carried out in the framework of the EU-Menu Project supported by the European Food Safety Authority. Excessive body weight was observed mostly among adults and was more frequent among men than women. However, the scale of this phenomenon was equally disturbing among the population of children. Underweight in adults was not frequent but it related to a significant group of children and youth, or even

infants.

ENVIRONMENTAL RISKS – INEQUALITIES IN EXPOSURE TO PARTICULATE MATTER AMONG THE POLISH POPULATION

103. The mean concentration based on measurement values from air quality monitoring stations might not fully reflect the level of health risk. The application of validated mathematic modelling allows more comprehensive health analyses.

104. The coefficient of population-weighted annual mean concentrations of particulate matter reflect health risk level much better than the commonly applied annual mean concentration. The coefficient of variation in annual mean concentrations may be helpful in the interpretation of risk levels and the assessment of differences between given areas.

105. Europe show significant inequalities in exposure to particulate matter. Poland is one of the countries where these inequalities are considerable.

106. The particulate-matter limit values recommended by the WHO are exceeded in many European countries, especially for PM2.5, where in a third of the countries, including Poland, the entire population is exposed to concentrations not meeting WHO recommendations. There are an estimated 141 million people in Europe who live in areas not meeting WHO recommendations related to PM2.5 and 51 million people for PM10.

107. At present in Poland, the WHO recommended PM2.5 values is exceeded in the entire country. As far as WHO recommendations for PM10 are concerned, exceeded levels are observed in nearly half of Polish poviats. The estimated number of people living in Poland in areas with exceedances PM10 limit values recommended by the WHO, is 24.6 million.

108. The estimated number of premature deaths related to long-term exposure to PM2.5 in Poland, calculated with the use of European models results and statistical data, is close to the values provided in the EEA reports. The share of premature deaths in the total number of deaths in individual poviats ranges from 6% to 18%.

THE MAIN HEALTH ISSUES OF POLES IN THE CONTEXT OF THE LATEST RESULTS OF THE GLOBAL BURDEN OF DISEASE STUDY (GBD) 2019

109. The estimation of the burden of diseases resulting from premature mortality and years of life with disability provides an opportunity to assess the health situation of the country and to identify priorities in terms of the health-related needs of society. The ability to

compare results by location, sex, age and time enables an accurate representation of the currently most burdensome health issues.

110. The results of the GBD studies unequivocally indicate ischemic heart disease as the most important cause of health loss in Poland observed for years. Further places in the ranking are occupied by lung cancer, lower back pain and stroke.

111. The risk factor which, despite its declining importance, has for years been the most responsible for the disability-adjusted life years lost by Poles is tobacco smoking, followed by high BMI levels and hypertension.

THE CONSUMPTION OF DRUGS IN POLAND BASED ON THE NATIONAL HEALTH FUND DATA

112. In 2019, expenditure on reimbursed drugs amounted to PLN 17.31 billion, PLN 12.71 billion of which were public resources and patient payments for reimbursed drugs, foods for special medical purposes and prescribed medical devices sold in pharmacies, and PLN 4.6 billion were public resources on drugs available under drug programmes and chemotherapy.

113. In 2019, the costs of 403.3 million packages of drugs included in the lists of reimbursed drugs announced in notices of the Minister of Health were reimbursed. The most packages of drugs per capita were reimbursed in the Łódzkie Voivodship – 12 packages, and the least in the Podkarpackie Voivodship – 9 packages.

114. The tree groups of drugs with the largest number of packages sold in 2019 by ATC codes include: C09 – Agents acting on the renin-angiotensin system, which comprise in particular drugs used in hypertension, C10 – Lipid modifying agents, i.e. drugs used in the prophylaxis of multiple sclerosis and in the treatment of excessive cholesterol concentration in blood, and A10 – Drugs used in diabetes.

115. C09 – Agents acting on the renin-angiotensin system constitute the drug group, by ATC code, with the largest number of packages reimbursed in 2019 – 61.7 million packages, which accounted for 15.3% of all packages of ready-to-use reimbursed drugs.

116. A10 – Drugs used in diabetes constitute the drug group, by ATC code, with the highest sales value in 2019 – PLN 1.3 billion in total, i.e. 11.6% of public funds and patient payments which were spent in 2019 on ready-to-use reimbursed drugs.

117. C09 – Agents acting on the renin-angiotensin system constitute the drug group, by ATC code, with the highest value of patient payments – PLN 518.4 million in total, which accounted for 17.4% of all patient payments for ready-to-use reimbursed drugs.

118. In relation to 2015, the number of sold packages of ready-to-use reimbursed drugs grew by 4.9% and their sales value by 6.2%.

119. In 2019, the number of people taking C09 drugs grew by 2.4% in relation to 2015, and amounted to 6.9 million patients. The most common substance in that group was *ramiprilum*.

120. Patients treated with *ramiprilum* indicated an average compliance of 62%. For 57% of them, compliance was below 80%, and for 27% below 40%.

121. In 2019, the number of people taking C10 drugs grew by 14% in relation to 2015, and amounted to 5.4 million patients. The most common substance in that group was *atorvastatinum*.

122. In 2019, the number of people taking A10 drugs grew by 21% in relation to 2015, and amounted to 2.8 million patients. The most common substance in that group was *metformini hydrochloridum*.

123. Based on the National Health Fund data, it is estimated that approximately 554,100 Poles aged 65 or more can be at risk of chronic polypharmacy, and 380,000 can be at risk of long-term polypharmacy.

124. The occurrence of interactions between drugs is indicated as an adverse consequence of polypharmacy, while the combination of non-steroidal anti-inflammatory drugs with other drugs is considered one of the most common interactions. The probable combination of such drugs with drugs used in hypertension occurred in nearly 1.6 million people.

EXPENDITURE ON HEALTHCARE AND INFRASTRUCTURE OF THE HEALTHCARE SYSTEM IN POLAND

125. Although there is an increase in nominal expenditure on healthcare the expenditure in Poland is much lower than in other countries. In Poland in 2018 the expenditure on healthcare as a percentage of GDP was 6.3%, while the average for OECD countries was 8.8%. Considering the state of the epidemic since March 2020 the level of funding for healthcare is likely to change in the coming years. Comparing the currently available data for Q2 2020 to the same period in 2019 GDP decreased by 8.4%. As a result of the dynamic epidemiological situation, at this stage it is not possible to predict exactly what change in health expenditure will occur in the coming years. and the actions currently being taken at the central level will have a significant impact on shaping the future situation. However,

based on the available data, it can be assumed that both health expenditure and GDP will be significantly reduced.

126. Public expenditure is the main source of healthcare financing in most European countries. Public expenditure also dominates in Poland, and in 2017 it accounted for around 70% of total expenditure, 59% of which came from the National Health Fund budget.

127. Private expenditure in 2017 in Poland accounted for 30% of total expenditure. Direct payments by households are prevalent. In particular, the costs of diagnostic tests, the purchase of medicinal products and medical devices are financed directly.

128. Expenditure on preventive measures should increase, especially in the context of the problem of the ageing of society. In 2016, it accounted for 3% of all spending, while expenditure on medical services accounted for 60%.

129. The number of doctors and nurses qualified for the profession has been growing steadily for years, but there is still the shortage of medical personnel. In 2018 the number of doctors totalled 149.134, of whom 89.532 worked directly with patients, and 42.282 were dentists. In the professional group of nursing personnel 295.464 persons had qualifications and licences to practise the profession. Ensuring an adequate number of medical personnel and, in particular balancing the shortage of doctors and nurses constitutes a significant challenge in the healthcare system.

130. The ageing of society also affects medical professions, which with limited resources translates into a problem of generation replacement. According to estimates 45% of doctors and 33% of nurses are in the age group of 55 or more. If the current proportion of people under 35 is maintained it will not be possible to ensure the replacement of generations of medical professionals in the near future.

131. Considering the rapid ageing of the Polish population there is also a growing demand to ensure access to publicly financed long-term care services. Currently, the long-term care system in Poland is dispersed and does not provide comprehensive care to patients.

132. Significant disproportions in infrastructure at the voivodship level are noticeable. For years the largest hospital and bed infrastructure has been located in the Mazowieckie and Śląskie Voivodships. In order to reduce the inequalities between regions Health Needs Maps were introduced as a mechanism for monitoring and forecasting the health needs of the Polish population.

PRIMARY HEALTHCARE IN POLAND- ITS ROLE IN THE SYSTEM AND THE AVAILABLE INFORMATION TOOL

133. Nearly 3% of patients aged 19-24, 2.0% aged 25-44, 1.5% aged 45-64 and 1.4% of children up to the age of 6 listed as active patients of PH facilities in 2018 were not registered in the given PH facility. Women prevailed in every age group.

134. Every third patient registered with a PH physician was between the age of 25 and 44, every fourth was between the age of 45 and 64, and every fifth was over 65. School children and adolescents up to the age of 18 accounted for 30% of patients registered with a PH physician, and only 8% were between 19 and 24 years old.

135. In every age group of 18 years of age or more, women prevailed among those using PH physician services, reaching the highest rate in the oldest group of patients over 80 years of age (68.5%). The greatest differences in this respect were visible in the age categories of 19-24 years (they oscillated around 12 p.p.) and over 80 years of age (about 8 p.p. compared to patients aged 65-79).

136. In 2018, almost one in four patients receiving healthcare services in PH facilities was aged 65 or more. The percentage of medical consultations in this group of patients was 34.3% and the average number of consultations per year was 6.7. The percentage of nursing appointments/consultations in this group of patients was 43.9% and the average number of appointments/consultations per year was 4.8.

137. Altogether, 71.9% of patients listed as active patients of PH facilities in 2017-2018 were provided with medical care in the same facility, and their appointments represented 82.3% of all medical consultations. The highest number of patients continuous registered as active was from towns (82.0%) and rural areas (81.2%), while in cities (over 100,000 inhabitants) this percentage was only 68.7%. The largest share in the total number of medical consultations provided in PH facilities was represented by appointments of continuous registered patients from towns below 100,000 inhabitants (87.7%), and the lowest by those from rural areas (79.6%).

138. In 2018, 84% of medical consultations provided were marked with the ICD-10 code which was assumed as the main reason for the patient's appointment. The remaining 16% of cases did not have such an annotation in the patient's medical records. The percentage of medical consultations without such an annotation increased by approx. 3 p.p. from 2013.

139. More than 27% of children up to the age of 6 registered with a PH physician did not receive any PH medical consultation in 2018.

140. In 2019 the breastfeeding indicator for infants up to 6 months of age was 47.6% (median 50%).

141. The most common chronic diseases in the group of patients aged 0-18 years were chronic bronchitis and asthma (8.1%), congenital malformations of the circulatory system (5.5%) and musculoskeletal and connective tissue diseases (2.2%). Among patients over 18 years of age, the hypertensive disease was the most common (28.3%), followed by musculoskeletal and connective tissue diseases (19.7%), diabetes (5.8%), thyroid gland diseases (4.7%) and ischemic heart disease (4.3%).

142. In 2019, the most frequent new diagnosis in the group of patients over 18 years of age (according to the National Health Fund data) were cardiovascular diseases (2.8% of patients). The second most common diagnosis was musculoskeletal system and connective tissue diseases (2.3%), followed by hypertension (1.7%) and chronic digestive system diseases (1.3%).

143. In general, in 2018, 32.5% of patients listed as active patients of PH facilities were affected by multiple morbidity and were provided with 50.2% of all medical consultations. Inhabitants of cities (over 100,000 people), used the services of a PH physician to a greater extent than the examined PH population in general (34.2% of patients, 51.3% of consultations, respectively). The lowest number of such patients was in towns (28.2%), and the least medical consultations were provided to patients with multiple morbidities in rural areas (46.2%) and towns (45.6%).

144. The multiple morbidity of patients is strongly linked to age. Almost 80% of patients in the oldest age group (80+) were treated for several chronic diseases. A significant increase is observed in the incidence of multiple morbidity in patients aged above 44 (it ranged around 24 p.p. compared to patients aged 25 to 44 years old).

145. The mortality rate of patients registered for PH as at 31.12.2019 was 1.1% and was similar to the average value (median), which was 1.2%.

146. A relatively low activity of PH physicians in terms of referring patients to diagnostic tests, analytical tests, specialist consultations, rehabilitation and hospital treatment is observed. Considering the years 2014 to 2018, it should be noted that there was a slight variation in the availability of PH patients for this type of treatment. According to the data for 2018:

- On average in a year, every 20th patient aged over 18 and 5.6% of patients over 65 received a referral for at least one basic laboratory test (i.e. blood count, ESR, blood glucose test, or general urine test).

- The referral for at least one imaging examination was issued for only 7.6% of all medical consultations. Patients from cities were referred for such examinations more often (3.0% more often than in towns).
- Referrals for laboratory tests were issued for 17.9% of PH medical consultations, with almost twice as many patients from cities with more than 100,000 inhabitants (19.2% of appointments) than from towns (10.9% of appointments).
- The referral for laboratory tests was received by 40.6% of patients listed as active PH patients and 46.0% of patients with a chronic disease. This most frequently concerned patients with obesity (62.0% of patients, 53.4% of appointments), with a diagnosed thyroid gland disease (62.0% of patients, 55.8% of appointments) or with diseases of the urinary system (55.5% of patients, 48.6% of appointments). Only every third appointment of a patient with hypertension resulted in such referrals, although 46.2% of patients received them.
- The average number of referrals for laboratory tests ranged from 1.0 to 1.4 per year depending on the group of diseases and was the highest among patients with diagnosed cancer and thyroid gland diseases. In 2018, patients with any chronic disease received on average 1.8 referrals for analytical tests (0.4 more than the total number of PH patients).
- Overall, 1.7% of patients listed as active PH patients received referrals for hospital treatment.
- In total, only 0.38% of active patients were referred for rehabilitation procedures.

147. According to data from 2019 (the National Health Fund), 0.8% of patients aged 65 to 79 years, 0.7% of patients over 80 years of age (0.7%) and 0.3% of patients aged 45 to 65 years (0.3%) received DiLO cards (a card of oncological diagnosis and treatment).

148. The percentage of patients referred for specialist consultations in 2018 was 16.2% in 2014 and in 2018 decreased to 10.2%. Meanwhile, the percentage of medical consultations in 2018 that ended in the issuance of at least one referral for specialist consultation was 3.4% (a decrease of 1.2 p.p. compared to 2013). One in four patients from towns with up to 100,000 inhabitants and only one in twelve patients from cities received a referral for a specialist consultation in 2018.

149. In 2018, referrals for a specialist consultation were issued to patients over 18 years of age mainly due to the diagnosis of hypertension (19.1%), musculoskeletal and connective tissue diseases (6.7%), diabetes (2.7%), thyroid gland disease (2.1%) and ischemic heart

disease (1.9%). The total proportion of selected diseases in the referrals for specialist consultations was 36.2%. In younger age groups, i.e. patients under 18 years of age, the total share of selected main diseases was 1.5%, mainly attributable to chronic bronchitis /asthma (0.8%), musculoskeletal system disorders (0.2%), obesity (0.1%) and congenital malformations of the circulatory system (0.11%).

150. The involvement of PH practitioners in the implementation of disease prevention activity is insufficient. In 2018:

- On average, in 2018, 29% of patients with diagnosed diabetes had HbA1c concentration determined in the last 12 months, mostly in towns with less than 100,000 inhabitants (47%), the least in rural areas (11%).
- On average, 47% of patients with a diagnosed coronary artery disease had a lipid profile performed in 2018, more often in towns with less than 100,000 inhabitants (63%), and less often in rural areas – only 15% of patients.
- The percentage of children between 1 and 4 weeks of age under analysis as at 31.12.2019 who had a routine health check amounted to 87.0%; adolescents' routine health checks were irregular – only every second patient aged 19 (51.2%) and every second five-year-old (53.6%) took part in preventive health examinations. In the remaining patient groups, this rate was slightly higher, ranging from 60.4% in the 4-year-olds group to 68.7% in the 7-year-olds group.

151. There is a small share of patients in risk groups who were vaccinated against influenza. Between 1 August 2017 and 31 March 2018, referrals for influenza vaccinations were issued to:

- On average 6.3% of patients with ischemic heart disease
- On average 4.5% of patients with diabetes
- On average 6.4% of patients with chronic obstructive pulmonary disease
- On average, 4.4% of patients with stroke or transient ischemic attack (TIA).

152. According to the data from the National Health Fund, the average number of antibiotics prescribed by PH physicians per year per registered patient in 2019 was on average 0.38 package and was close to the average size (median), which was 0.37 package. On average, during less than every second PH medical consultation in 2019, which diagnosed an upper respiratory tract infection, antibiotic therapy was prescribed (41.6%). The median for the above-mentioned index was 42.6%.

153. There is a great diversity of PH centres in terms of human resources. As at 31.12.2019:

- The average number of nurses employed in PH facilities was 4.9, which is much more than the average value (median) of 3.0. The standard deviation is 6.7 and the values are from 1 (min) to 141 (max).
- The average number of midwives employed in PH centres was 1.4, i.e. more than the average value (median) of 1.0. The standard deviation is 1.1 and the values are from 1 (min) to 22 (max).
- On average, there were 1,198 patients per 1 nurse employed in a PH facility, and this is close to the average (median) value of 1,253. The standard deviation is as high as 1,571 and the values range from 175 (min) to 7,407 (max).

154. There was an increase in the proportion of patient appointments to renew prescriptions (from 16.7% in 2013 to 24.1% in 2018), while other administrative appointments (from 1.7% in 2013 to 1.0% in 2018) and other appointments marked with the code “ICD-10.Z” decreased (from 17.6% in 2013 to 12.4 in 2018) in the total number of PH medical consultations. This means that more than one third of PH medical consultations are administrative in nature.

A systemic diagnosis and the Health Enhancement Plan – redefining the disease prevention and treatment system in Poland

Conclusions from the Report

Grzegorz Juszczyk, Stefan Bogusławski, Bogdan Wojtyniak

As a biennial series presented by the National Institute of Public Health – National Institute of Hygiene, this publication provides a unique snapshot of the overall health of the Polish population. This book contains a comprehensive overview of the available data and expert insights describing the vital socio-demographic and epidemiological determinants of the overall health of this country's society.

What can be inferred from the data for 2020?

The most important observation is the noticeable (in recent years) **break in the long-term trend of public health improvement**, calculated as a decrease in the rate of deaths from preventable causes (which could be avoided through prevention or treatment) and healthy life years lost among men. The favourable trend for both indicators observed until 2016, has not only slowed down in recent years, but even reversed. This is one of the main reasons for the fact that **life expectancy in Poland, especially among men, still remains below the EU average**.

The data cited and discussed in this publication should be seen in the context of the social and demographic projections for Poland for the next decade. There is no doubt that the situation in this area will only deteriorate in the coming years. We will be witnessing **fast population ageing**, a **number of negative lifestyle-related trends,** and **unfavourable phenomena in the natural environment, including climate change**. As a result, we should expect the adverse trends, especially in circulatory diseases, cancer, metabolic disorders (particular diabetes), neurological and mental disorders, as well as various types of allergies, to continue and **even grow at a faster rate.** These trends will overlap with the **increasingly frequent outbreaks of epidemics and pandemics of infectious diseases**, which is so tragically illustrated by the current COVID-19 crisis. It should be emphasised that Poland still has significant levels of **health inequalities**, which cause a lot of concern among experts and are visible in numerous branches of medicine.

If no measurable changes are introduced in the implementation of public health tasks and the operation of the whole healthcare system, the indicated unfavourable trends will only aggravate, **leading to a shorter life expectancy** in our country.

These phenomena develop against the backdrop of **rapidly growing expectations** among people functioning in a digitised information society and **hard-to-predict changes in their attitudes**, including an odd combination of easy access to reliable sources of knowledge and a remarkable susceptibility to false medical information. Another critical trend is the **development of IT-based technologies** – medical, information and communication (telemedicine, telecare, databases, artificial intelligence (AI), social networks, new personalised medical devices, etc.).

The changes which have been witnessed for a number of years in the Polish healthcare system, and perhaps even particularly in the field of public health, have failed to keep up with the rapid evolution of public health needs expressed in objective (morbidity, incidence, mortality, fatality) and subjective (communicated public expectations) parameters.

The resources of the Polish healthcare system, their organisation, management methods, level and structure of financing, as well as the motivations of healthcare professionals are insufficient to provide an acceptable level of care to meet not only the current, but, worse still, growing health needs of our society. The data published in this book should serve as a warning which shows the adverse trends in Poland.

The COVID-19 pandemic has exposed different, new and unforeseen threats to public health, but has also aggravated the already-existing tensions and problems in the Polish healthcare system, leading to its further weakening.

We are facing a challenge, which has never been so urgent as today, to effect a rapid reform of the healthcare system and public health in Poland. We need to develop and implement a **Health Enhancement Plan**.

1. The strongest point should be firm, well-prepared, long-term and adequately-funded **measures in the area of public health**. Their purpose should be to reduce morbidity in lifestyle related and infectious diseases and to improve the effectiveness of primary and secondary prevention. As indicated by analyses, such actions are the essential in reducing the preventable mortality rate. Health education in public schooling, already planned under the National Oncology Strategy, as well as the coordinated health policy programmes

implemented by local government units, **are not only a supplement, but a foundation for a healthcare system that ensures early diagnosis and appropriate treatment**.

2. The actions taken must, most importantly, lead to **reducing the inequalities in health**. In a democratic, highly-developed country such a level of inequalities as observed in Poland cannot be accepted. These inequalities also involve access to public health activities, which are often local initiatives rather than nationwide programmes. Removing the inequalities provides an opportunity for a fast and long-term extension of life expectancy in Poland.
3. Public health reform must **be based on effective public administration**, including sanitary and epidemiological surveillance institutions and local government units cooperating with them. This clearly **requires more funding**. Another question is whether this funding should be based on state budget or health insurance contributions. In our view, the tasks of the sanitary inspection and local government initiatives in the field of public health should be financed under the Public Health Fund, integrating the currently dispersed sources, such as state budget subsidies, funds from the National Health Fund, resources from licences to sell liquor, local government's own resources and competition funds. A transparent and predictable financing mechanism will facilitate the development of human resources, methods of influencing health behaviour and evaluation of the obtained results.
4. There is a clear need for a regular **increase in financing of the healthcare system every year**, planned in a way that improves the health efficiency of its operation. It seems that the funds guaranteed by the so-called "Act 6.0" are now insufficient. Increasing the health insurance contribution should definitely be considered. The state of public health has a measurable effect on the Polish economy, so health insurance contribution should be regarded as an investment.
5. The purpose of increased financing should be, primarily:
   a. to introduce **patient care coordination**, under the publicly funded system and between it and the system financed by non-public funds;
   b. **to substantially increase the role of outpatient care**, particularly **primary healthcare**, involving changing the financing paradigm of healthcare services by increasing the share of outpatient care in the breakdown of expenditures of the public payer and motivating active health supervision over the population under the care of primary health care units.
   c. to significantly and rapidly increase the effectiveness of healthcare, including the work of medical professionals, **by introducing new medical and IT technologies**.

It must be done in a way that addresses the ethical, technical and cost-related challenges of the process.

d. **to facilitate access to healthcare among socially and economically disadvantaged groups** and people at risk of severe diseases (rare, congenital, etc.);
e. **to develop user-friendly reporting systems, data analysis systems and information technologies** to effectively use data for treating individual patients and management of the individual system elements and the whole system, formulate a health policy, plan, monitor and evaluate the programmes aimed at improving public health.

6. It is necessary to maintain the financial and organisational efforts aimed at **increasing the number of employed medical professionals**. The intensive education of new generations of physicians, nurses, paramedics, diagnosticians, pharmacists, physiotherapists, public health programme graduates, and medical assistants is the crucial precondition of success for the whole project. This success cannot be achieved without **boosting the morale of medical professionals** in Poland, which is not only shaped by wages, although they are of key importance.

Examples from other countries, especially the Netherlands, demonstrate that the preparation of expert-developed plans, their eventual implementation and experience-based adjustment, is a highly effective method of reforming healthcare systems. The studies carried out by NIZP-PZH are a diagnosis of the state of health of Polish society. This diagnosis demonstrates that the application of immediate “treatment” is vital. Considering the painful experience of the COVID-19 pandemic for our society at large, we may conclude with the statement that the Health Enhancement Plan will be like oxygen for systemic changes before a ventilator is needed.

1. SELECTED ASPECTS OF THE SOCIO-DEMOGRAPHIC SITUATION

Bożena Moskalewicz, Paweł Goryński, Jakub Stokwiszewski, Aneta Trochonowicz, Bogdan Wojtyniak

The number of the population of Poland decreased steadily from 1996 to 2007, then increased slowly for four years and, after 2011, once again declined. In 2019 the population was 38,388,000. The balance of international migration was negative for many years until 2014, whereas recently, in 2018-2019, it was positive and amounted to 3,600 and 6,200 respectively. In addition, the population growth rate (the difference between the number of births and the number of deaths) has been negative since 2012 in urban areas, and in 2015 and 2019 was negative as well in rural areas (Fig. 1.1). For the country as a whole, negative population growth was recorded between 2013 and 2019 inclusive. From among all 28 European Union countries, 16 recorded negative population growth in 2019 and the EU as a whole recorded one as well, and in 9 countries the population declined[2]. As the Eurostat data shows, the inhabitants of Poland presently constitute 7.4% of the overall EU population, which places our country on the eighth position in terms of population size.

[2] https://ec.europa.eu/eurostat/web/regions/data/database

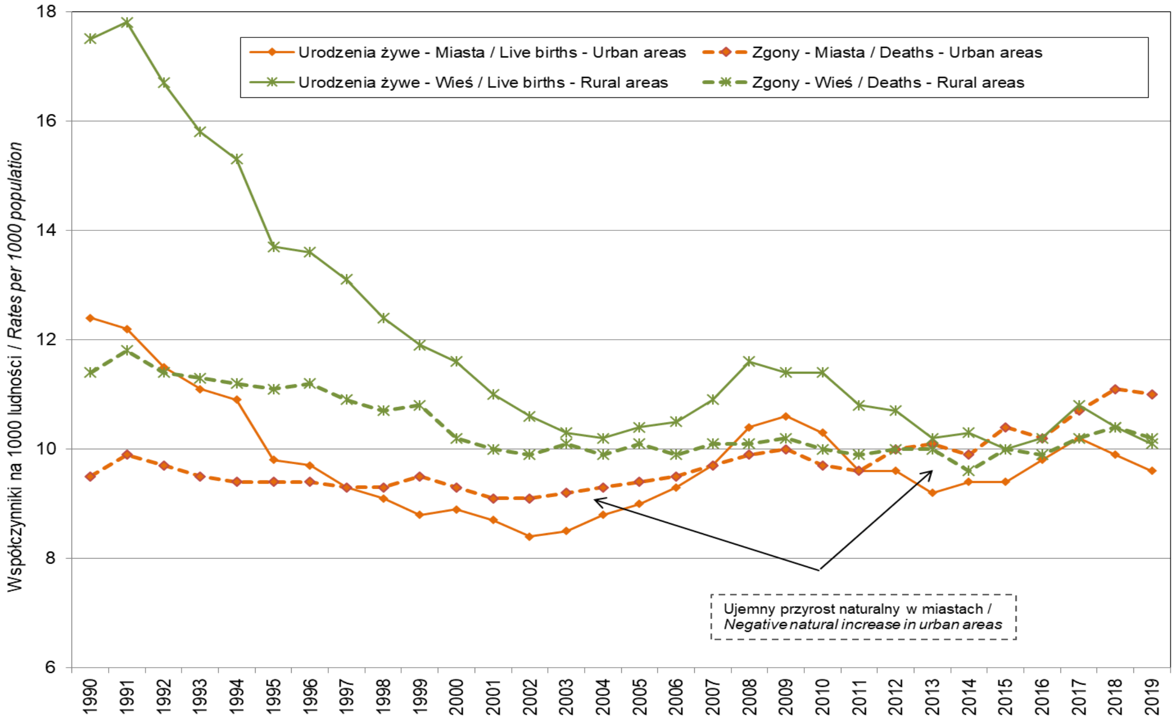


Fig. 1.1. Vital statistics of the Polish population in urban and rural areas, 1990-2019 (SP data)

Women make up more than half of the population (51.6%) and there are 107 women for every 100 men (Tab. 1.1). The preponderance of women over men occurs no earlier than at the age of 50-54 and increases very rapidly in older age groups. At the age of 65 or more, there are already 154 women for every 100 men, and at the advanced age of 85 or more, there are as many as 260 women for every 100 men (they make up 72.3% of the overall population of that age in Poland). In age groups below 48, as one observes, men continue to outnumber women (most newborns are boys – 51.4% in 2019), however, their predominance has been decreasing gradually due to higher rates of premature mortality in comparison with women.

Table 1.1. Population of Poland by sex, place of residence and selected age groups, 2009-2019 (as at 31 December), (SP data)

Year	Total	Men	Women	Urban areas	Rural areas	Women per 100 men	Population (%)		
	In thousand						below 20	65 or more	urban areas
2009	38,167	18,429	19,739	23,278	14,889	107	21.8	13.5	61.0
2010	38,530	18,653	19,877	23,429	15,101	107	21.5	13.5	60.8
2011	38,538	18,655	19,884	23,386	15,153	107	21.1	13.8	60.7
2012	38,533	18,649	19,884	23,336	15,197	107	20.8	14.2	60.6
2013	38,496	18,630	19,866	23,258	15,238	107	20.5	14.7	60.4
2014	38,479	18,620	19,859	23,216	15,262	107	20.3	15.3	60.3
2015	38,437	18,598	19,839	23,166	15,271	107	20.1	15.8	60.3
2016	38,433	18,593	19,840	23,129	15,304	107	20.0	16.4	60.2
2017	38,434	18,593	19,840	23,109	15,324	107	20.0	17.0	60.1
2018	38,411	18,582	19,829	23,067	15,344	107	20.0	17.5	60.1
2019	38,383	18,567	19,816	23,033	15,350	107	20.0	18.1	60.0

The percentage of children and adolescents at the age below 20 has been declining slowly, yet systematically, since the second half of the 80s, and in 2019 the group constituted 20.0% of the overall population, whereas children aged 0-14 made up 15.3%. At the same time the percentage of individuals aged 65 or more has been gradually increasing and in 2019 they made up 18.1% of the overall population in Poland (Tab. 1.1). The percentage of the elderly, at the age of 65 or more, is higher among inhabitants of urban areas than among those living in rural areas; in 2019 the percentages were 19.9% and 15.5%, respectively. The median age of the inhabitants of urban areas was 42.5 and the median age of the inhabitants of rural areas was lower by three years: 39.5.

The population of Poland is, on average, younger than the populations of most European Union countries (EU28). According to the data of the Statistical Office of the European Union, the Eurostat, as at 1 January 2019, the median age of the inhabitants in the entire European Union was 43.3, as compared to the median age of the population in Poland being 41.0, whereas the percentage of people at the age of 65 or more was 20.0% and 17.7% respectively (according to those indices, only the populations of Cyprus, Ireland, Luxembourg and Slovakia are younger than the population of Poland, and taking into consideration the median age, also the populations of Sweden and the United Kingdom are slightly younger). As follows from projections made by the Eurostat, the difference, which puts Poland at an advantage, is going to decrease gradually and, in the middle of this century, both the median age and the percentage of individuals aged 65 or more are going to be higher than average rates for EU28 countries (Tab. 1.2). It is worth noting that the percentage of the oldest individuals in Poland, namely aged 80 or more, is going to increase most rapidly between 2030 and 2040, while the percentage of the group at the age of 65 or more is going to increase significantly already between 2020-2030, which means that the very near increase in the percentage of older people will be observed, in the first place, among individuals at the age below 80. The changes occurring in the population age structure and the problem of population ageing are reflected in key demographic and social indicators. One of them is the so-called potential support ratio, which is the number of active-age people per one elderly person. As shown in Fig. 1.2, in the following decades, we are going to observe a dramatic decline in the potential support ratio both in Poland and in the whole of Europe, however, in Poland that change is going to be more intense and presumably more noticeable. The ongoing changes in the age structure and population ageing in Poland are well illustrated by the changes already visible in the age pyramid of the Polish population and considerable population growth in the oldest age groups (Fig. 1.3.).

Table 1.2. The projected median age and the percentage of persons aged 65 years or more and 80 years or more in Poland and selected countries, 2020-2050 (Eurostat projections, EUROPOP2019)

Country	2019	2020	2030	2040	2050
	Median age				
UE28/ EU28	43.7	43.9	46.1	47.7	48.2
Austria/ AT	43.4	43.4	44.9	46.6	47.4
The Czech Republic/ CZ	42.6	42.9	45.6	47.4	46.6
Ireland/ IE	37.7	38.0	40.5	42.2	43.7
Germany/ DE	46.0	45.9	46.1	47.2	47.2
Poland/ PL	**41.0**	**41.3**	**45.5**	**49.1**	**50.9**
Hungary/ HU	43.0	43.3	45.6	47.0	47.8
	Percentage aged 65+				
UE28/ EU28	20.3	20.6	24.2	27.6	29.5
Austria/ AT	18.8	19.0	23.0	26.4	27.7
The Czech Republic/ CZ	19.6	19.9	22.0	24.8	28.2
Ireland/ IE	14.1	14.4	17.6	21.0	24.7
Germany/ DE	21.5	21.8	25.4	27.9	28.0
Poland/ PL	**19.3**	**19.9**	**21.6**	**24.3**	**27.7**
Hungary/ HU	17.7	18.2	22.7	25.3	30.1
	Percentage aged 80+				
UE28/ EU28	5.8	5.9	7.2	9.2	11.3
Austria/ AT	5.0	5.3	6.7	8.2	11.1
The Czech Republic/ CZ	4.1	4.1	6.4	8.0	8.6
Ireland/ IE	3.3	3.4	4.8	6.4	8.0
Germany/ DE	6.5	6.8	7.3	9.1	11.9
Poland/ PL	**4.4**	**4.5**	**5.8**	**7.8**	**8.5**
Hungary/ HU	4.4	4.4	5.7	9.2	9.7

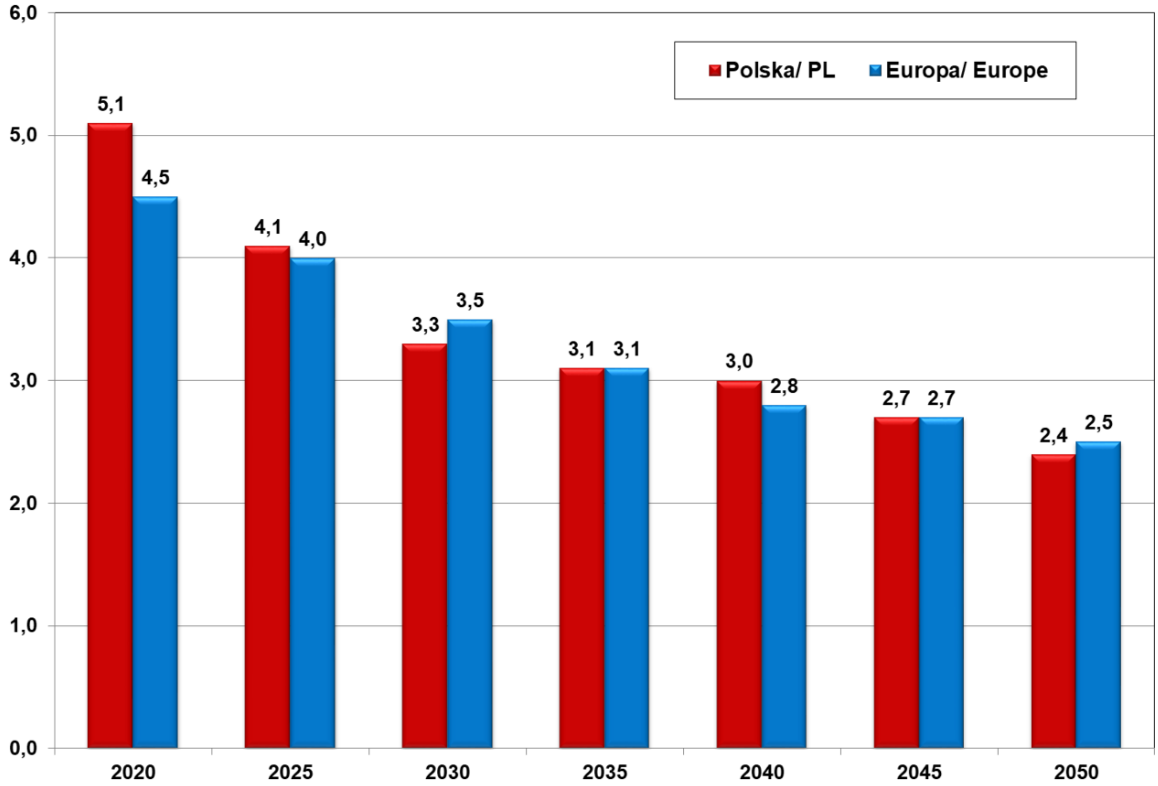


Fig.1.2. The potential support ratio (the ratio of the population aged 25-69 per population 70+) in Poland and Europe in 2020 and projected in 2020-2050 (UN, World Population Prospects: The 2019 Revision)

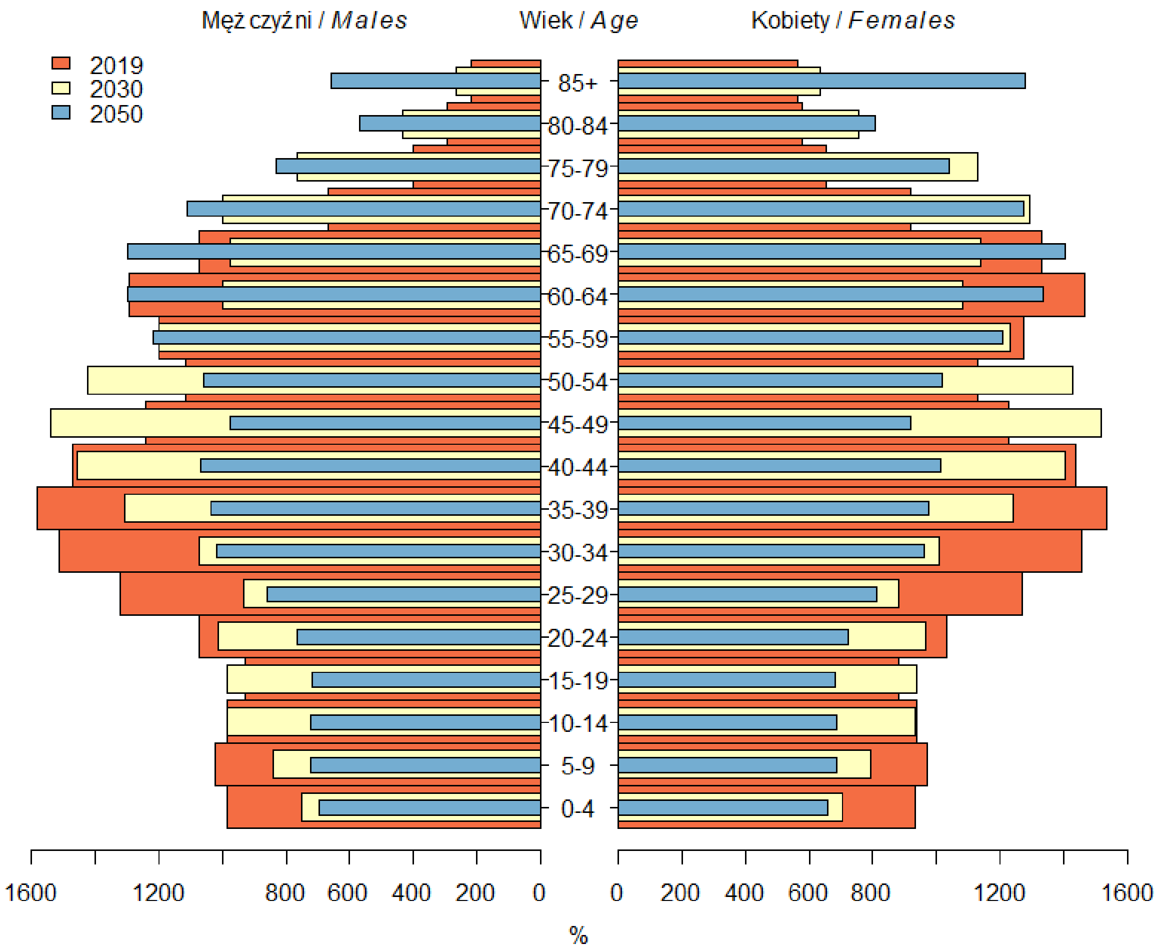


Fig. 1.3. The population of Poland by sex and age in 2019 and projected in 2030 and 2050 (Eurostat projections, EUROPOP2019)

If we compare the voivodships, the highest percentage of individuals at the age of 65 or more has been recorded, for many years now, in the Łódzkie and Świętokrzyskie Voivodships, while the lowest percentage has been recorded in the Warmińsko-Mazurskie Voivodship. The situation is different for the inhabitants of rural areas, in the case of which relatively the highest number of the elderly population lives in the Podlaskie Voivodship (18.4%), and the lowest number lives in the Pomorskie Voivodship (12.1%) (Fig. 1.4). The differentiation in the percentages of the elderly population throughout the voivodships is greater in rural areas than in urban areas. According to a projection prepared by the Statistics Poland, it is predicted that, in the Świętokrzyskie, Opolskie and Łódzkie Voivodships, already one fourth of the population is going to be at the age of 65 or more in 2030, whereas the highest increase in the percentage of the elderly population in relation to 2017, by 7.7 basis point, is expected to be observed in the Opolskie and Warmińsko-Mazurskie Voivodships[3].

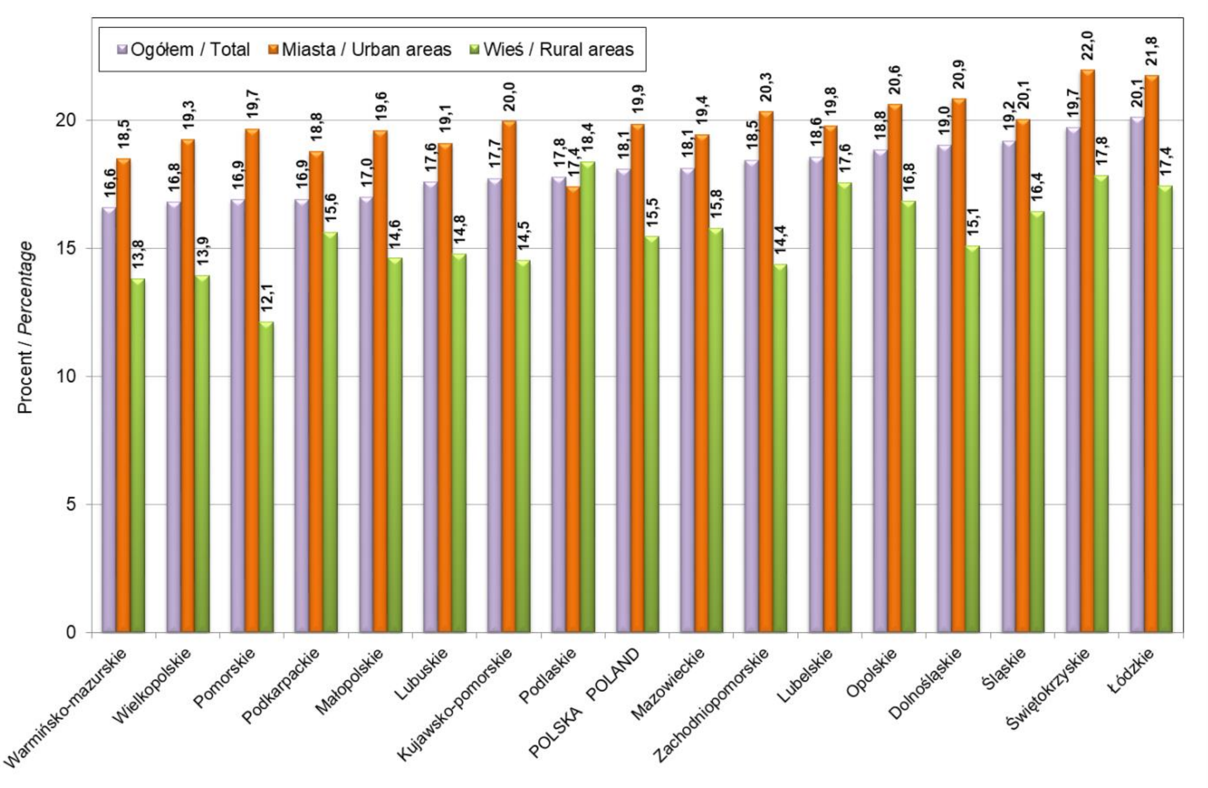


Fig. 1.4. The percentage of the population aged 65 years or more in urban and rural areas in Poland by voivodship, 2019 (SP data)

After 2000, there has been a downward trend as regards the percentage of the elderly population in urban areas, which amounted to 60% in 2019. According to the projection of the Statistics Poland, the percentage is going to decline slowly, yet systematically. The most urbanised voivodship is the Śląskie Voivodship, where 76.6% of the population lived in urban areas in 2019, while half as high percentage of the population living in urban areas was recorded in the Podkarpackie Voivodship – 41.4%.

The number of live births in 2018 and 2019 decreased both in terms of absolute values and with reference to the overall population (Tab. 1.3). A drop in the birth rate is observed mainly in urban areas. All data included in Tab. 1.3 is based on the definitions of live birth and foetal death which have been effective in Poland since 1 July 1994 and which are consistent

[3] http://demografia.stat.gov.pl/bazademografia/Prognoza.aspx

with the recommendations of the World Health Organisation. According to those definitions, the so-called birth of a newborn unable to live and with signs of life should be classified as live birth, while the so-called birth of a newborn unable to live and without signs of life should be classified as the so-called still birth.

Table 1.3. Births in Poland, selected years 2009-2019 (SP data)

Year	Live births			Still births	
	number (in thousand)	per 1000 population	illegitimate as percentage of live births	number	percentage of all births
2009	417.6	11.0	20.2	1,748	0.42
2010	413.3	10.7	20.6	1,730	0.42
2011	388.4	10.1	21.2	1,653	0.42
2012	386.3	10.0	22.3	1,601	0.41
2013	369.6	9.6	23.4	1,386	0.37
2014	375.2	9.7	24.2	1,341	0.36
2015	369.3	9.6	24.6	1,075	0.29
2016	382.3	9.9	25.0	1,147	0.30
2017	402.0	10.5	24.1	1,101	0.27
2018	388.2	10.1	26.4	1,277	0.33
2019	375.0	9.8	25.4	1,238	0.33

Source: SP data

Every fourth child born in Poland is born out of wedlock. It is worth noting that the percentage of such births in 2019 was lower than a year before and, similarly, in 2017 was lower than in the preceding year (Tab. 1.3). One observes considerable differences in the percentage among voivodships as well as its fluctuations over time. In 2017 and 2019, the percentage of illegitimate births was definitely the highest in the Zachodniopomorskie and Lubuskie Voivodships. On the other hand, a three times lower rate of illegitimate births was recorded in the Podkarpackie and Małopolskie Voivodships (Fig. 1.5a). As we already pointed out in the 2018 Report, the percentage of illegitimate births is, on the whole, higher in urban areas than in rural areas, and only in the Zachodniopomorskie, Warmińsko-Mazurskie and Lubuskie Voivodships the situation is reversed.

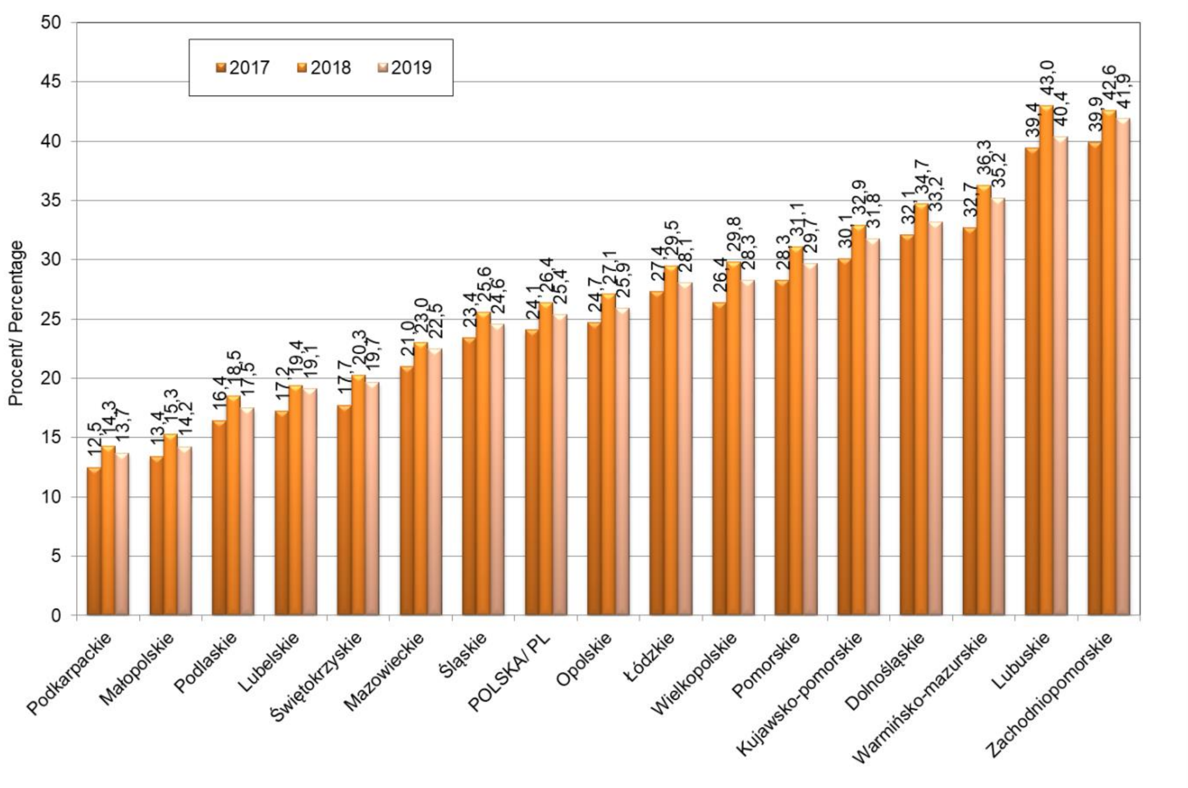


Fig. 1.5a. Illegitimate births as a percentage of total live births by voivodship 2017, 2018 and 2019 (SP data)

As follows from the Eurostat data, the percentage of illegitimate births in Poland is low in comparison to the 28 EU countries, since only Greece, Croatia and Lithuania have a lower percentage of such births than our country (Fig. 1.5b). In ten of the countries illegitimate births constitute more than half of all births. In all EU countries taken together, on average, 42% of children are born out of wedlock.

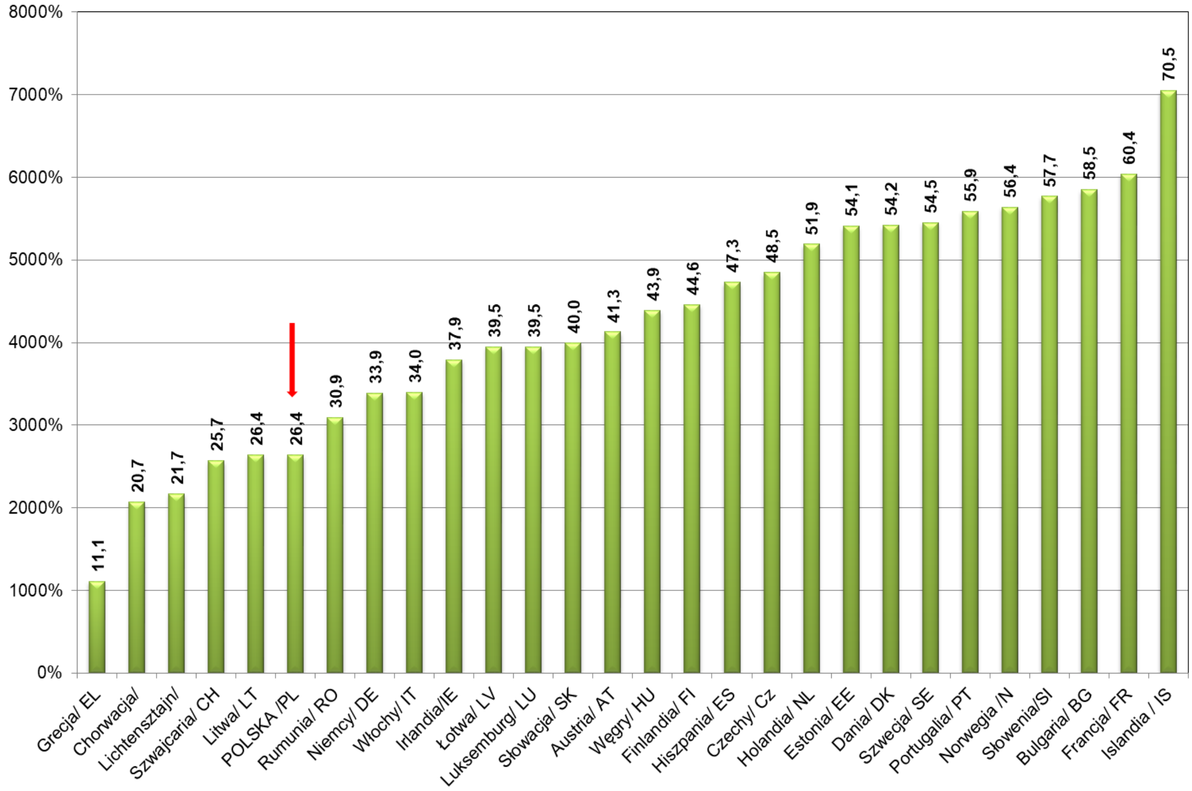


Fig. 1.5b. Illegitimate births as a percentage of total live births in EU countries, 2019 (Eurostat database)

In 2019, 5.6% of live births were the so-called low-birth-weight births, namely the births of infants whose weight upon delivery was below 2500 g (Tab. 1.4). After 2014, one observes a slight downward trend in the frequency of such births. Low birth-weight infants are born more rarely in Poland than in the European Union on average (according to the WHO's estimates, in 2018 the percentage for EU28 was 6.1%, WHO HFA DB).

Table 1.4. Live born infants by birth weight, selected years 2009-2019 (SP data)

Year	Live births				
	total	below 2500 g		2500g or more	
		number	percentage[1]	number	percentage[1]
2009	417,589	24,449	5.9	393,134	94.1
2010	413,300	23,506	5.7	389,794	94.3
2011	388,416	21,793	5.6	366,617	94.4
2012	386,257	21,835	5.7	364,419	94.3
2013	369,576	22,019	6.0	347,553	94.0
2014	375,160	22,211	5.9	352,940	94.1

2015	369,308	21,351	5.8	346,611	94.2
2016	382,257	22,314	5.8	359,929	94.2
2017	401,982	23,062	5.7	378,877	94.3
2018	388,178	21,451	5.5	366,686	94.5
2019	374,954	21,174	5.6	353,724	94.3

1 – Only infants with known birth weight are included in the calculation
Source: SP data

The difference in the percentages of low birth-weight infants in the voivodships of Poland has been growing slightly recently. In the period between 2014 and 2019, the least favourable situation was observed in the Śląskie and Zachodniopomorskie Voivodships, while the best situation was in the Podlaskie Voivodship, in which it has been improving systematically (Fig. 1.6). In most voivodships the percentage of low birth-weight births is declining, and only in three of them: the Lubuskie, Kujawsko-Pomorskie and Wielkopolskie Voivodship, it remains the same.

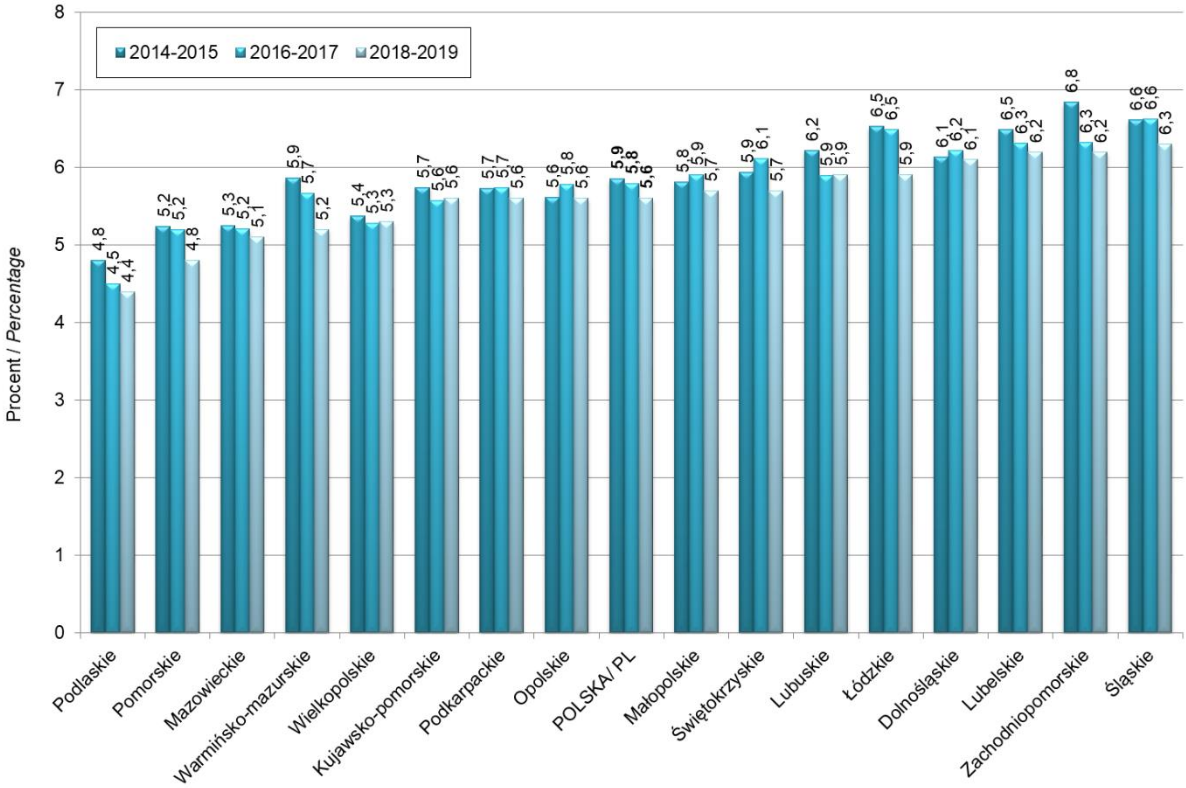
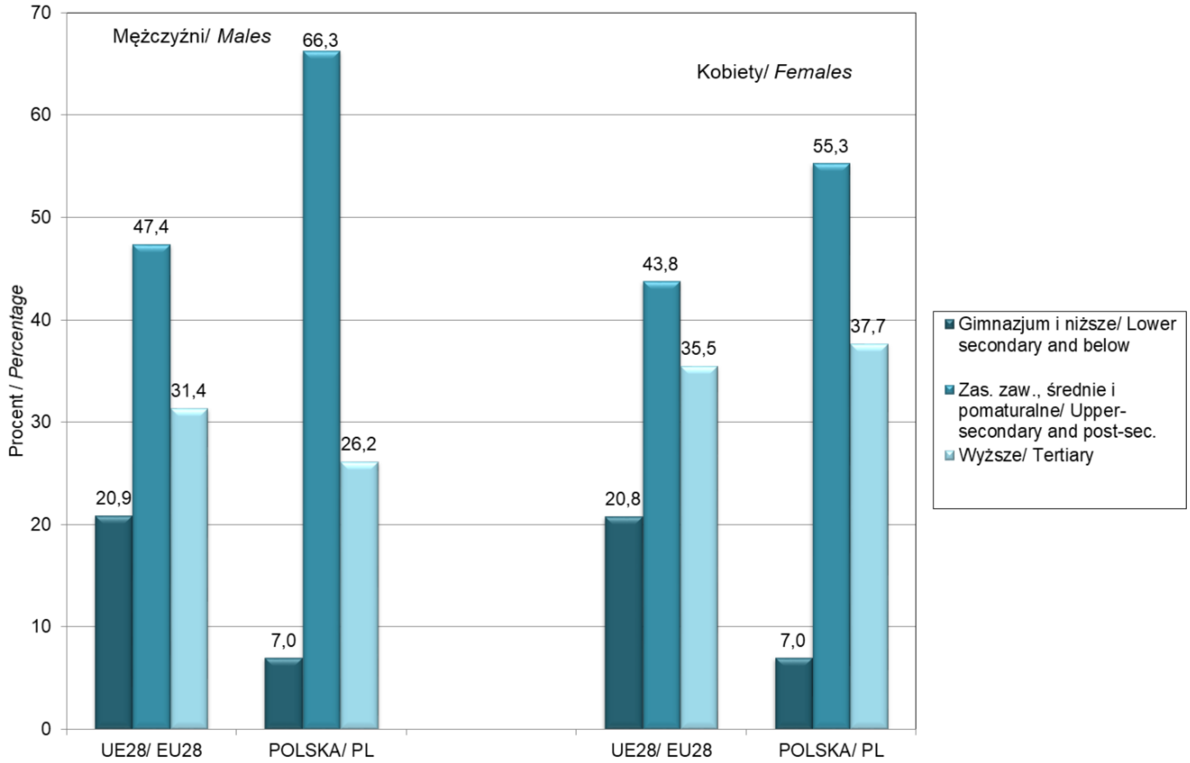


Fig. 1.6. The percentage of low birth-weight (below 2500 g) live births by voivodship, 2014-2015, 2016-2017 and 2018-2019 (SP data)

The socioeconomic status has been acknowledged to have an enormous influence on one's health. The socioeconomic structure of the population of Poland, in comparison to the other European Union countries, is less advantageous, although there are some exceptions. The most important determinant of social status is the level of education.

Despite the fact that the percentage of individuals with higher education has increased significantly in Poland recently, it is still lower among men in Poland than in most EU countries, while the percentage of women is higher from the average percentage for EU28 (Fig. 1.7). In addition, the Eurostat data shows that, in Poland, the percentage of individuals aged 18-24 who graduated at least from a lower secondary school and do not continue to study, in comparison to the overall number of individuals at the same age, is one of the lowest among EU countries and in 2019 amounted to 5.5%, whereas the average for EU28 countries was 11.0%[4].

[4] http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=edat_lfse_15&lang=en



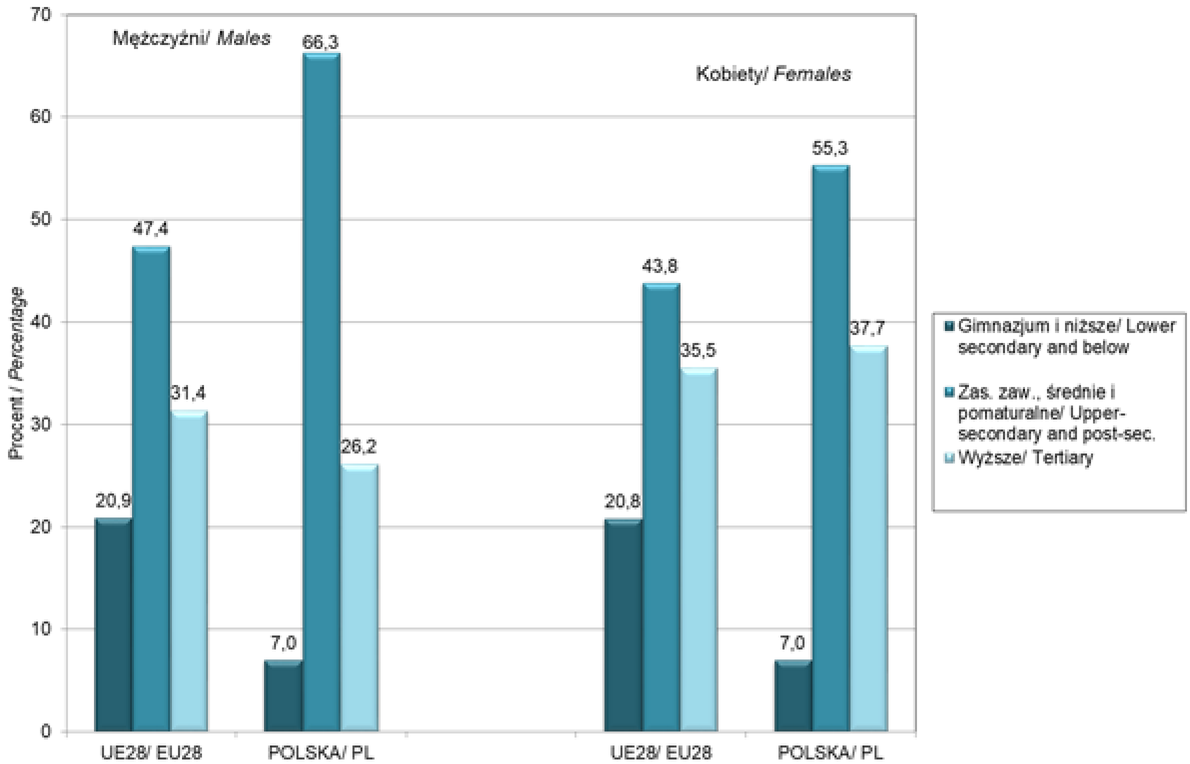


Fig. 1.7. Men and women of age 25-64 years (%) by educational attainment level in EU countries, 2019 (Eurostat database, EU-LFS)

Even though the economic situation in Poland has been improving and the growth rate of the Gross Domestic Product (GDP) is higher than the EU average (4.1% vs. 1.7% in 2019) and higher than in a significant majority of EU countries (only 4 countries recorded greater growth), the GDP per capita (in PPS) is still one of the lowest in the EU: in 2019 it was 24% lower than the average GDP for EU28 as a whole[5]. A worse situation is observed in Bulgaria, Greece, Croatia, Romania and Latvia.

The continuing elimination of inequality in income distribution in our country is to be considered a desired trend. It is illustrated by the income quintile share ratio – in so far as the income of the 20% of the population with the highest income in 2017 was 4.6 times higher than the income of the 20% with the lowest income, the EU28 average being 5.1, in 2019 this ratio decreased to 4.4 in Poland, whereas the average ratio for EU countries retained its value 5.1 (according to the Eurostat data[6]). Similar changes in income distribution among the population of Poland in comparison to other EU countries are also illustrated by the Gini coefficient. In 2019 it amounted to 29.9 for Poland (the EU average being 30.3), and in 2015 it amounted to 30.6, whereas the EU28 average was 31.0[7]. The issue of income inequality is an important one as it may negatively impact the society's health, especially in the case of the less affluent one[8].

From the point of view of public health, one should consider significant the reduction of economic poverty, estimated based on the expenses of households in our country in 2019. Persons at the risk of poverty are, according to the definition adopted by EU countries, those living in households the disposable income of which is below the poverty threshold of 60% of the median equivalised income after social transfers. Persons at the risk of social exclusion are those living in severely materially deprived households (unable to meet at least 4 out of 9 recognised needs for financial reasons) or those living in households characterised by very low work intensity. The data of the Eurostat shows that, in Poland, the ratio is presently lower than the EU28 average (Fig. 1.8a) and that in 17 EU countries the risk of poverty or social exclusion is more common than in Poland. The greatest improvement is observed among children and

[5] http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&language=en&pcode=tec00114&plugin=1

[6] http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=ilc_di11&lang=en

[7] http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=ilc_di12&lang=en

[8] Wilkinson R. and Pickett K. Income inequality and population health: a review and explanation of the evidence. *Social Science & Medicine* 2006; 62:1768-84. Babones SJ. Income inequality and population health: Correlation and causality. *Social Science & Medicine* 66 (2008) 1614-1626

adolescents under the age of 18 (the situation is worse in 21 EU countries), while there is no improvement as for the elderly at the age of 65 or more. However, the ratio is lower than the EU average in that group.

The risk of poverty and social exclusion among children is strongly related to the education of parents, both in Poland and the European Union as a whole. In Poland, the year 2019 brought a significant improvement in that respect, however, the differences are still considerable (Fig. 1.8b). It is worth noting that, whereas in Poland in 2016 children of parents below higher education level were more exposed to the risk of poverty or social exclusion in comparison to the EU on average, in 2017, 2018 and 2019 they were not.

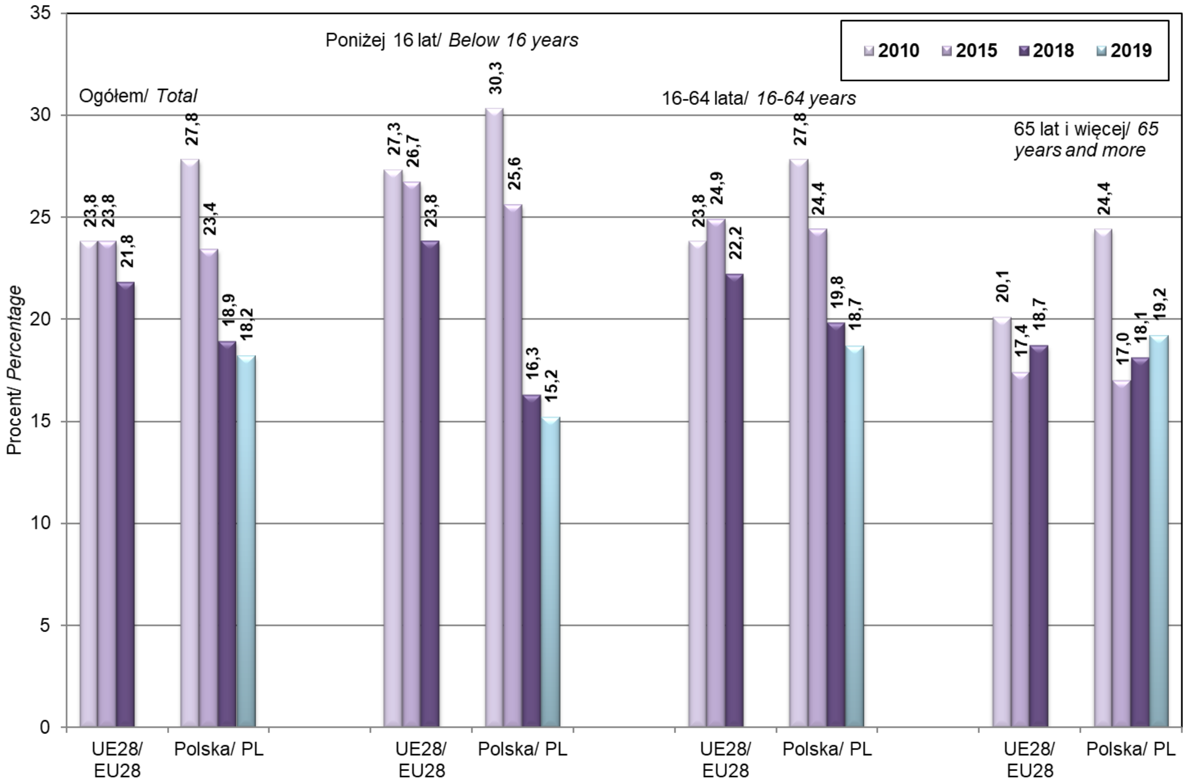


Fig. 1.8a. Population at risk of poverty or social exclusion in total and by age groups in Poland and the average for EU28 countries, 2010-2019 (Eurostat database, EU-SILC survey)

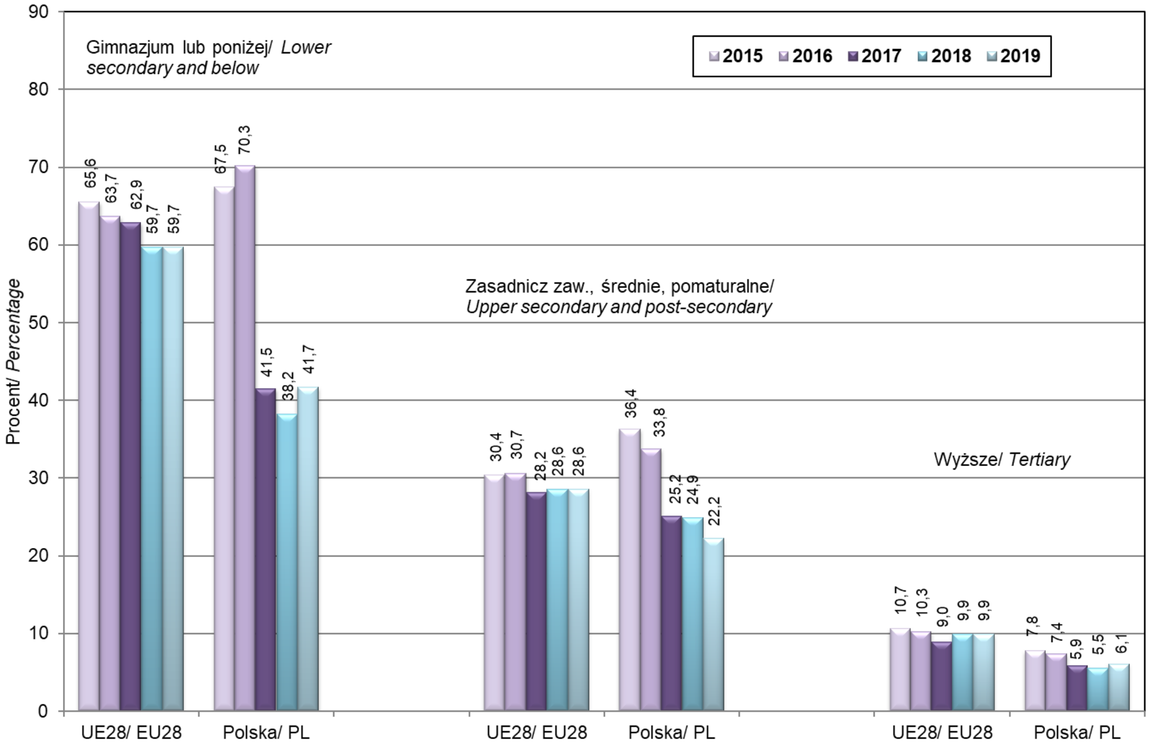


Fig. 1.8b. People below 18 years of age at risk of poverty or social exclusion by parents educational attainment level in Poland and EU28, 2015-2019 (Eurostat database, EU-SILC survey)

One observes a strong differentiation in terms of poverty throughout the voivodships. The extent (rate) of poverty is the percentage of individuals livings in households in which the level of expenses (including the value of commodities obtained free of charge and natural consumption) was below the poverty line. Figure 1.9 presents three at-risk-of-poverty indicators in the Voivodships in 2019 estimated by the Statistics Poland based on a survey of household budgets[9]. Those indicators are based on different poverty lines. In its estimates of the extent of objective poverty, the Statistics Poland takes the following poverty lines into consideration: (a) a relative poverty line – 50% of average expenses of all households, (b) the so-called statutory poverty line – the amount which, under a legally binding social assistance act, qualifies one to apply for financial benefits from the social welfare system, (c) an extreme poverty line – the minimum level of existence calculated by the Institute of Labour and Social Studies (IPiSS). The minimum level of existence covers only those needs the meeting of which may not be postponed, and consumption below that level leads to biological wasting of the body. A starting

[9] Zasięg ubóstwa ekonomicznego w Polsce w 2019 r. (na podstawie wyników badania budżetów gospodarstw domowych). Informacje sygnalne. (The extent of economic poverty in Poland in 2019 (based on a survey of household budgets. Advance releases.) Warsaw 2020. SP

point for determining the extreme poverty lines is the minimum level calculated for a one-person working household, which is multiplied by the number of "equivalent persons". In 2019 the extreme poverty rate was 4.2%, whereas in 2018 it amounted to 5.4%. In figure 1.9 the Voivodships are ordered as per the mean rank for the three rates. In connection with a change in the NUTS classification, the data for 2019 encompass the Masovian region (i.e. the Mazowieckie Voivodship, without the capital region). It can be acknowledged that, taking into consideration the risk of material poverty, the best situation is observed in the Pomorskie and Opolskie Voivodships, and the worst one – in the Podlaskie, Małopolskie and Warmińsko-Mazurskie Voivodships. It is worth noting that, without the capital city region, the risk of poverty in the Mazowieckie Voivodship is higher from the national average.

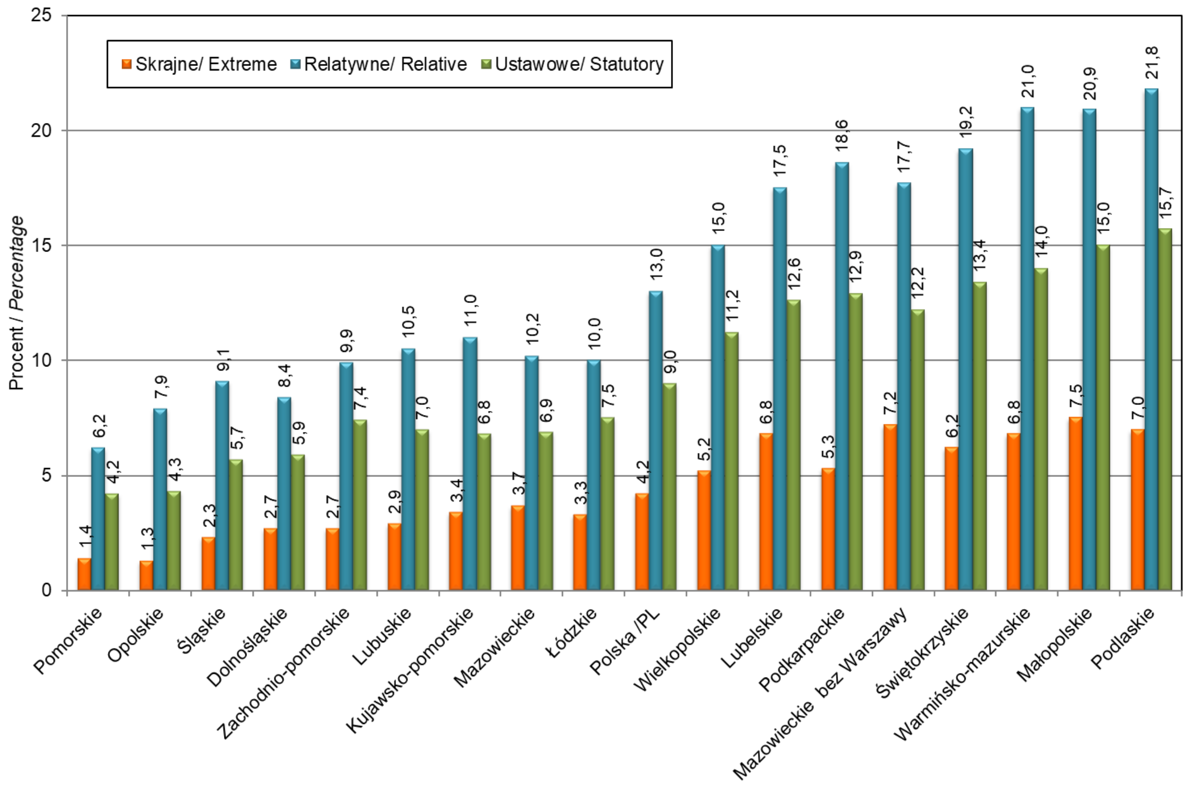


Fig. 1.9. Persons in households by three poverty thresholds by voivodship, Poland, 2019 (SP estimates based on the household budget survey)

Between 2017 and 2019, a certain decrease in the extent of extreme poverty in Poland on the whole and in most voivodships occurred. Figure 1.10 depicts changes in the extent of extreme poverty in the respective voivodships in that period. What is astonishing is the one-year increase in poverty rates in 2018 in the Podkarpackie and Lubuskie Voivodships, as well as in the Małopolskie and Świętokrzyskie Voivodships. Not taking the temporary "fling" into consideration, one should take heed of the systematic improvement in the Opolskie and Pomorskie Voivodships, and in the Warmińsko-Mazurskie Voivodship in 2019. A clear increase of poverty can be observed in the Mazowieckie Voivodship except for Warsaw.

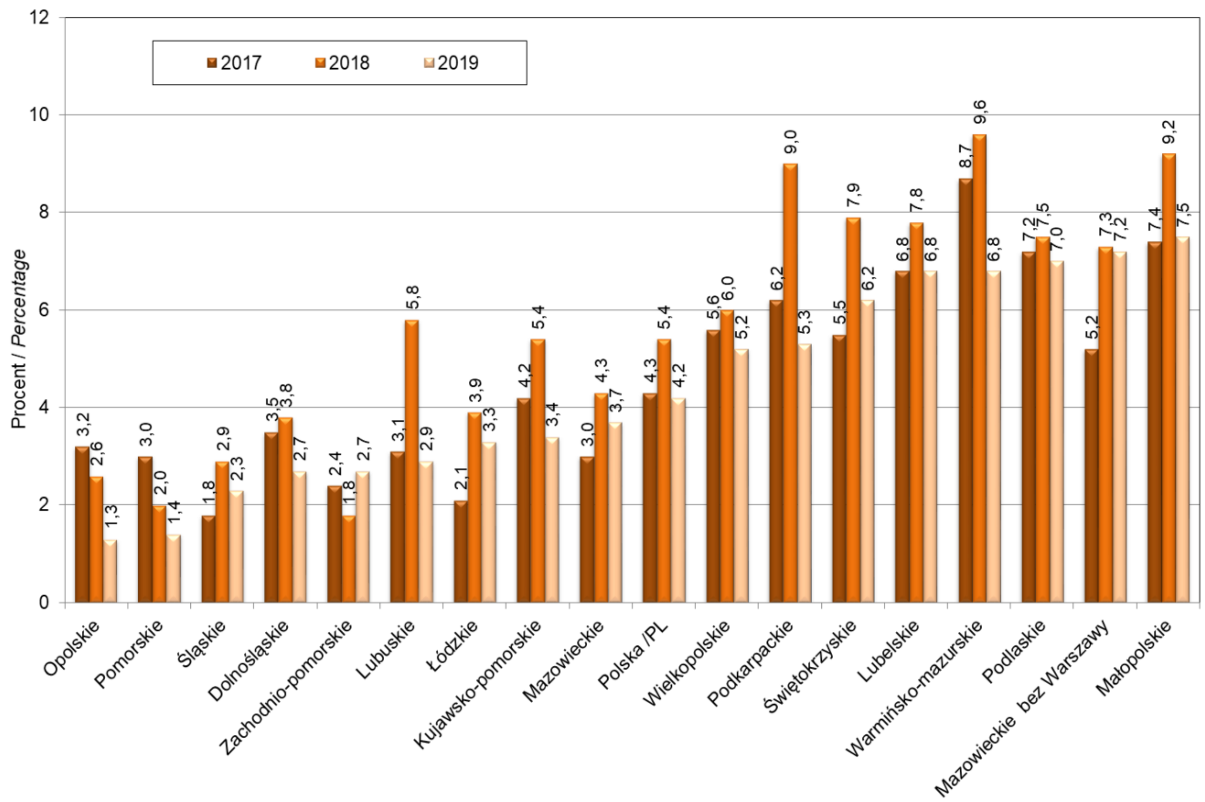


Fig. 1.10. Persons in households at risk of extreme poverty by voivodship, Poland, 2017-2019 (SP estimates based on the household budget survey)

In addition, one can clearly observe a continuing improvement in the unemployment rate in Poland in comparison to the previous years, which is not only lower than the EU average, but is one of the lowest in the EU. As follows from a LFS survey (Labour Force Survey) conducted in those countries in 2019, the unemployment rate in Poland, among the population aged 15-74, was 3.3%, whereas the EU28 average was 6.3% (Fig. 1.11). Further, it is a favourable fact that, in Poland, the long-term unemployment rate, namely the rate of unemployment lasting over 12 months, was merely 0.7% in relation to the active population, whereas the EU28 average was 2.5%. It was lower only in the Czech Republic and Germany.

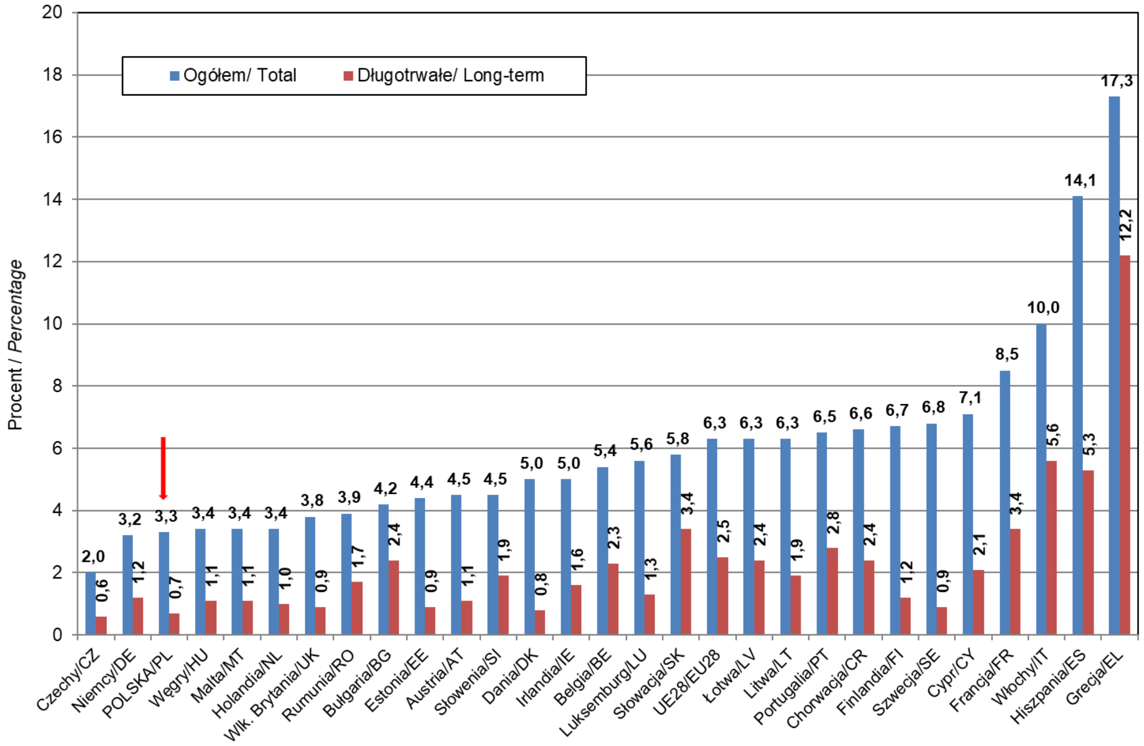


Fig. 1.11. The unemployment and long-term unemployment rate among persons 15-74 years old in EU countries, 2019 (Eurostat database, Labour Force Survey)

The risk of unemployment on the whole and of long-term unemployment differs significantly throughout the respective voivodships. Because of the low credibility of the estimates of long-term unemployment rate in the voivodships based on the LFS survey, a comparison based on the registered unemployment rate was made. In 2019, the best situation as regards the overall unemployment rate and the long-term unemployment rate was observed in the Wielkopolskie Voivodship, whereas the highest rate of total unemployment risk was recorded in the Warmińsko-Mazurskie Voivodship and of long-term unemployment – in the Podkarpackie Voivodship (Fig. 1.12). The results of the LFS survey show that the lowest overall unemployment rate was in the Śląskie and Wielkopolskie Voivodships, and the highest – in the Lubelskie and Podkarpackie Voivodships[10]. It is worth noting that, probably due to the COVID-19 pandemic, in the period from April to September 2020, both the unemployment expressed in absolute values and the unemployment rate started to increase systematically in

[10] https://ec.europa.eu/eurostat/web/regions/data/database

comparison to 2019 (the unemployment rate was higher – from 0.2 in April to 1.0 in September)[11].

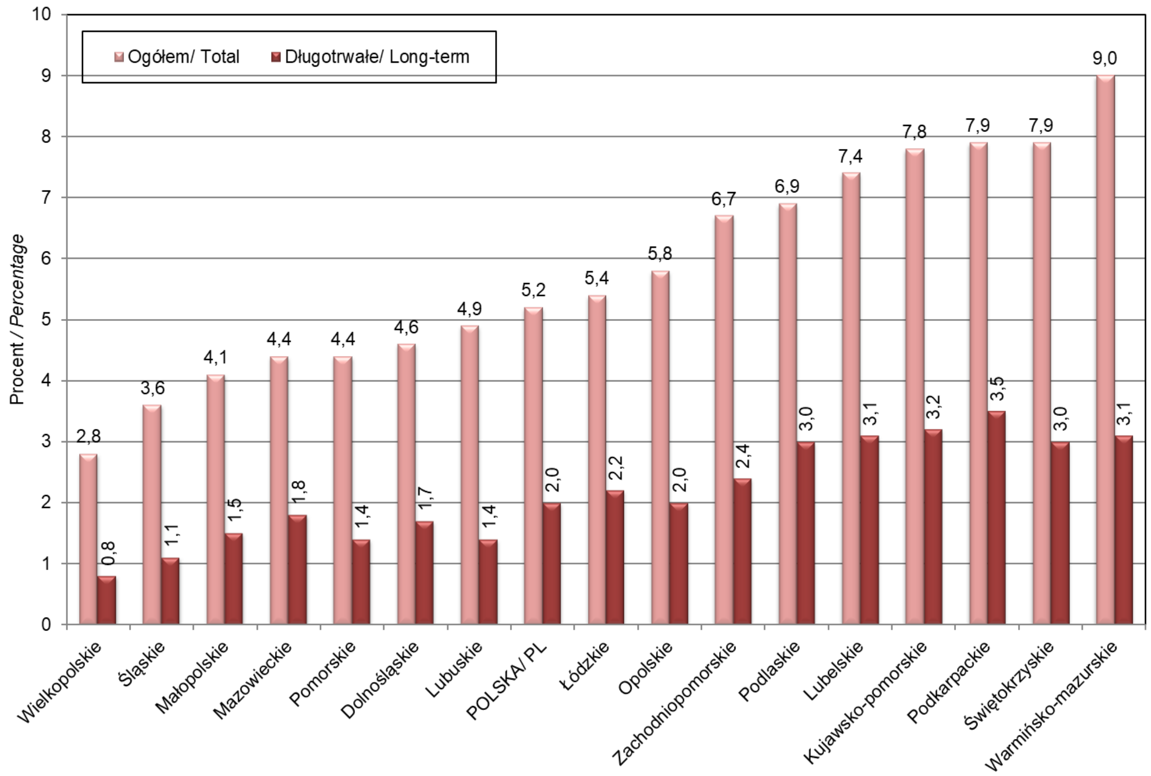


Fig. 1.12. The registered overall unemployment rate and the long-term unemployment rate by voivodship, 2019 (SP data)

An important aspect of employment socially and as regards public health is the ability to work part-time, which allows one to better fulfil their family duties, some of which are related to health, such as the care of children or older persons. For many years, the situation in Poland in that respect has differed, to Poland's disadvantage, from the average one in OECD and EU countries – employees, men and, especially, women are much more rarely employed part-time. In 2019, in Poland, the percentage of such employees in relation to the overall number of the employed aged 20-64 was 3.3% for men, in comparison to 7.8% in EU28, and 9.1% and 30.7% for women respectively[12]. The situation is to be thought of as unfavourable, especially that it does not seem the result of voluntary choices.

[11] Source: The statistical bulletins of Statistics Poland for 2020.
[12] https://ec.europa.eu/eurostat/web/regions/data/database

The housing conditions of Poles are, in some respects, worse than those in EU countries. That is particularly apparent in the overcrowding of dwellings. According to the definition used by the Eurostat, it is assumed that an individual lives in an overcrowded dwelling if that dwelling does not meet one of the following criteria: (a) has at least one room, (b) each married couple has at least one room, (c) each single person aged 18 or more has at least one room, (d) two same-sex children aged 12-17 have at least one room, (e) each of the children aged 12-17 who belongs to none of the above categories has at least one room, (f) each two children below the age of 12 have their own room. As can be seen in Fig 1.13, under the definition, 39.2% of the population in Poland lives in overcrowded dwellings, in comparison to the EU average of merely 15.5%. Presently, a worse situation can be observed only in four other countries. The data does not include one-person households. Overcrowding depends very much on income both in Poland and other EU countries. The persons at the risk of poverty, namely those who live in households the disposable income of which is lower than the 60% of the median equivalised income, much more frequently live in overcrowded dwellings. One should note that the difference in Poland and Central and Eastern European countries is smaller from the average one for EU countries (Fig. 1.13).

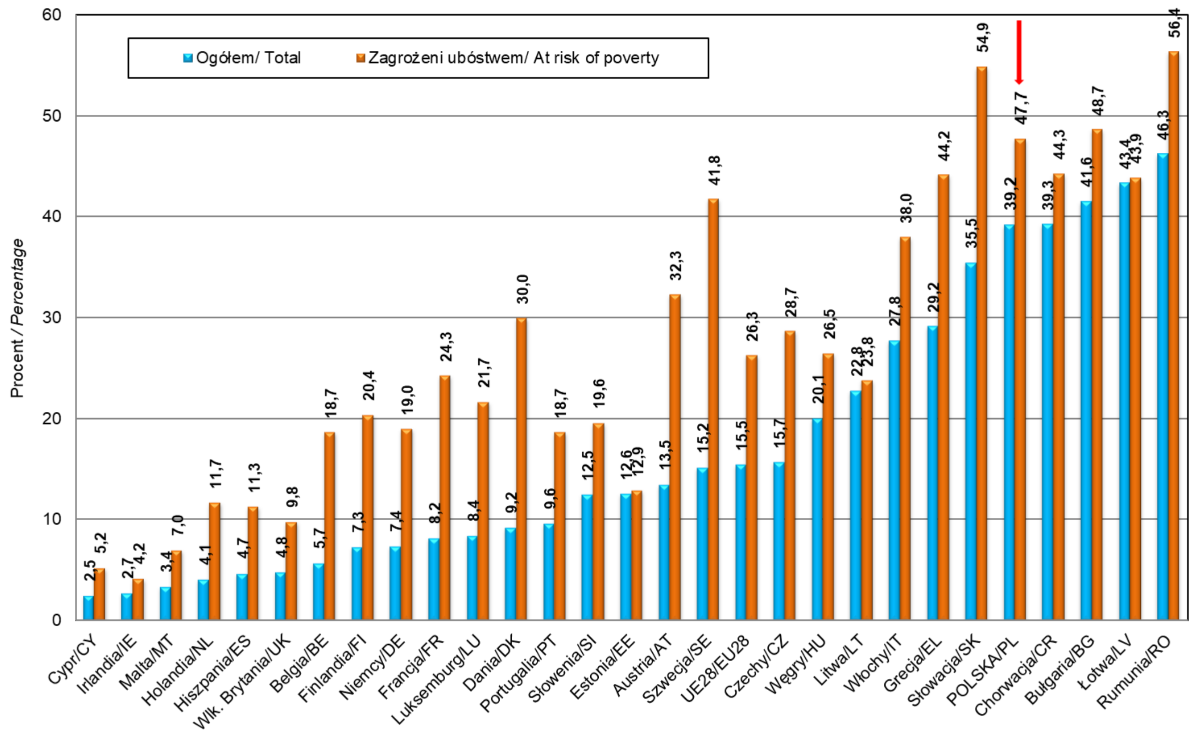


Fig. 1.13. The overcrowding rate among the overall population and the population at risk of poverty in EU28 countries, 2019 (Eurostat database, EU-SILC survey)

However, if one is to assess housing conditions taking into consideration the quality of dwellings and the existence of any signs of their poor quality such as a leaking roof, damp walls, floors or foundations, rot in window frames or floor, the conditions in Poland are better than the average conditions in EU28 countries (Fig. 1.14). The individuals at risk of poverty live in poor conditions more often than the general population, yet in that group the conditions are presently better in Poland than in EU28 on average, and furthermore, the unfavourable difference for individuals at risk of poverty is smaller in Poland than in EU countries.

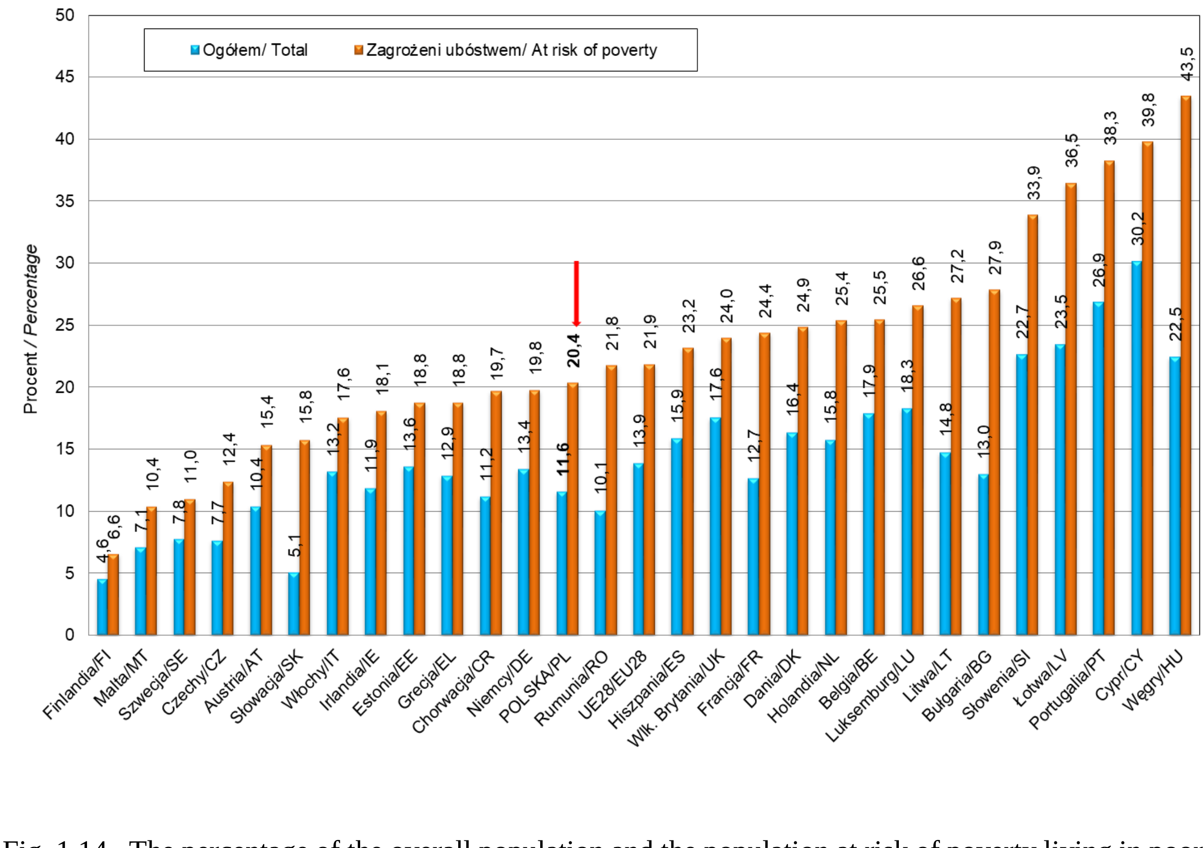


Fig. 1.14. The percentage of the overall population and the population at risk of poverty living in poor-quality dwellings in EU28 countries, 2019 (Eurostat database, EU-SILC survey)

It should be emphasised that, apart from the greater problem of overcrowded dwellings in Poland in comparison to the EU, the situation in the other analysed areas is better in Poland than in EU countries on average.

One of the summary measures of the overall social situation of countries is the synthetic Human Development Index (HDI), put forward by the United Nations for the purpose of making comparisons internationally. It is a measure of average achievement in three key dimensions of life. The dimensions are: health (assessed based on average life expectancy), education (based on the average number of years of education for individuals at the age of 25 or more, and the expected number of years of education for children starting school) and wealth, i.e. income (more specifically, its logarithm) per capita, taking purchasing power parity into consideration (the Gross National Income). The construction of the measure specifies target values in each of the dimensions. According to the recent data of the United Nations for 2019[13], Poland comes 20th in the European Union and 32th in the world.

The above description of the socioeconomic situation of the society in our country allows us to state that the activities aimed at improving it and reducing the discrepancies that, in some areas, separate the Polish society from the societies of more developed EU countries should also contribute to favourable, long-term changes in the Polish population's health, which is consistent with the concept of new public health.

SUMMARY

1. The population of Poland declined in number over the period 2009-2019 and at the end of that year was 38,383,000 people, which constitutes 7.4% of the overall population in 28 countries of the European Union and places our country on the seventh position among EU countries. In 2019, the population growth rate in Poland was negative in urban areas and positive in rural areas.
2. Women made up 51.6% of the overall population as at the end of December 2019. There are more men in younger age groups because more boys than girls are born and that advantage is maintained until they reach the age of 47. Older age groups are characterised by growing preponderance of women. At the age of 65 or more, there are already 154 women for every 100 men, and at the advanced age of 85 or more, there are as many as 260 women for every 100 men.
3. The population of Poland is younger, on average, than the populations of most European Union countries (EU28), however, as follows from the Eurostat's projection, the difference,

[13] http://hdr.undp.org/en/content/2019-human-development-index-ranking

to Poland’s advantage, is going to diminish slowly and, in the middle of this century, both the age median and the percentage of individuals aged 65 or more in Poland are going to be higher than the average ones in EU countries.

4. The number of live births in 2018 and 2019 declined in urban areas and increased slightly in rural areas.
5. The percentage of children born out of wedlock is increasing and, nowadays, every fourth child is born out of wedlock. In the Zachodniopomorskie and Lubuskie Voivodships, the percentage is higher than 40%. In comparison to other European countries, the percentage of illegitimate births in Poland is relatively low; only in five EU countries the percentage of that group of newborns is lower than in our country.
6. In Poland, one observes a slight downward trend in the frequency of low birth-weight births (5.6% in 2018/2019) and such births occur more rarely than in EU countries on average (6.1% in 2019). In the period 2018-2019, the worst situation was observed in the Zachodniopomorskie, Lubelskie and Dolnośląskie Voivodships.
7. Despite the fact that the percentage of individuals with higher education has increased significantly in Poland recently, it is still lower among men aged 25-64 on Poland than in most EU countries, while the percentage of women is higher than the EU28 average.
8. The continuing elimination of differences in income distribution, which have been lower than the EU average in Poland recently, are a favourable process. The level of the risk of poverty or social exclusion is presently lower than the EU average. One can observe the greatest improvement among children and adolescents under the age of 18, whereas there is no improvement in the case of the oldest population, at the age of 65 or more; still, however, the percentage of individuals at risk of poverty or social exclusion is lower than the EU average. In Poland, the highest risk of poverty, for several years now, has been in the Podlaskie and Warmińsko-Mazurskie Voivodships.
9. The overall unemployment rate and the long-term unemployment rate in Poland are one of the lowest in the EU. The worst rates of unemployment are recorded in the Warmińsko-Mazurskie, Podkarpackie and Świętokrzyskie Voivodships. It is unfavourable that, in Poland, there are fewer opportunities for part-time jobs than in EU and OECD countries taken together, which is observed especially among women.
10. The housing conditions of Poles are, in some respects, worse from average conditions in EU countries, especially as far as the overcrowding of dwellings is concerned. Poles, however, live in poor-quality dwellings more rarely than the residents of the EU in general.

11. The last Human Development Index (HDI), (2019) places Poland on the 20th position in the European Union and 32th in the world, which means the same position in the EU and a better position, by one place, in the world in comparison with the preceding year.

2. LIFE EXPECTANCY AND MORTALITY OF THE POPULATION OF POLAND

Bogdan Wojtyniak, Jakub Stokwiszewski, Paweł Goryński, Aneta Trochonowicz, Tomasz Zdrojewski, Daniel Rabczenko

The analysis of mortality of the population of Poland presented below is largely based on individual data from the death register of Polish inhabitants maintained by Statistics Poland. The register, with some necessary restrictions, is made available to the National Institute of Public Health – National Institute of Hygiene in order to conduct the statutory analyses of the health status of the inhabitants of Poland. The majority of the presented results are authors' own calculations based on the data from the mentioned database as well as the WHO mortality register[14]. Use was also made of indicators published by Statistics Poland and those available in international databases, mainly Eurostat[15], which was in each case clearly marked in the text.

The direct method was used to standardise the mortality rate by age. Generally, as a standard age structure, the new European structure was used, the same for men and women, developed by Eurostat[16], as well as the age structure of the Polish population dated 2018, which was in each case clearly marked in the text. Due to the adoption of the European age structure by Eurostat, the currently presented age-standardised death rates should not be compared with those presented in the previous Reports, as they were calculated with the WHO European age structure as a standard, and these structures differ from each other.

In the case of authors' own calculations of life expectancy, the classic Chiang[17] method was used, while the decomposition of life expectancy by death cause and age was conducted with Ariaga's method[18]. The analysis of time trends in the death rates and life expectancy in Poland, and average trends for the European Union, was performed with jointpoint models and the Jointpoint Regression Program (Version 4.8.0.1 April 22, 2020; National Cancer Institute, USA). The analysis took into consideration the relative rate of changes, which enabled a better

[14] https://www.who.int/healthinfo/statistics/mortality_rawdata/en/
[15] https://ec.europa.eu/eurostat/data/database
[16] Eurostat. Revision of the European Standard Population - Report of Eurostat's task force. 2013 11/07/2013. Report No.: 1977-0375. European Union 2013
[17] Chiang C. L. "The Life Table and its Applications", Robert E. Krieger Publishing Company, Inc., Malabar, Florida, 1984
[18] Chiang C. L. "The Life Table and its Applications", Robert E. Krieger Publishing Company, Inc., Malabar, Florida, 1984

comparison of the situation in Poland with other countries, as well as comparisons between sexes.

2.1. Time changes and life expectancy diversity among the inhabitants of Poland

In accordance with the latest data from Statistics Poland, in 2019 the average life expectancy of men was 74.07 years, while for women it was 7.68 years longer and amounted to 81.75 years. The analysis of long-term trends has revealed a worrying situation in recent years (Fig. 2.1). After a clear slowdown in the life expectancy of men between 2002-2008, in the subsequent years 2008-2014 the growth rate in the life expectancy of men increased to the level observed in 1991-2002; however, in 2014-2019 there was another significant deceleration of the growth rate in the life expectancy of men. In the case of women, the slowdown in the annual growth rate after 2002 was lower compared with men, and until 2016 it remained at a similar level, while in 2016-2019 there was a slight downward trend in the life expectancy of women. Nonetheless, a slight increase in the life expectancy of women in 2019 could point to the slowdown of this negative process if not for the increase in mortality in Poland during the COVID-19 pandemic that takes away such hopes.

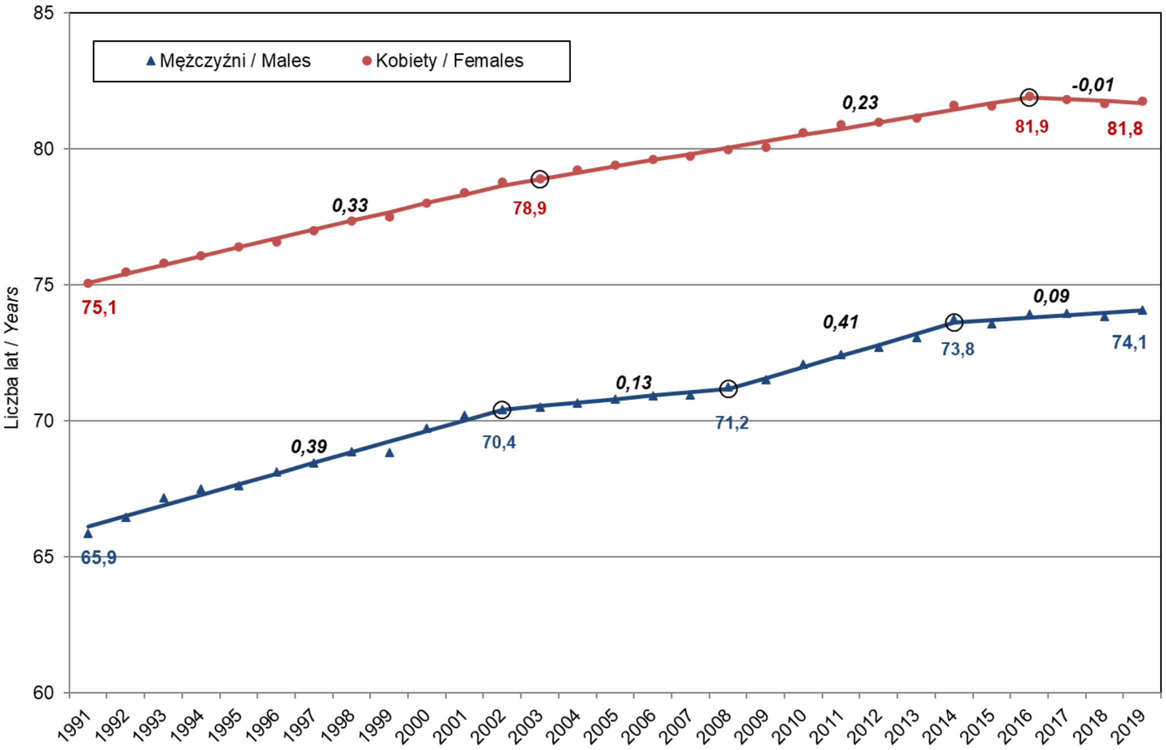


Fig. 2.1. Life expectancy at birth in Poland in 1991-2019 – its trends and annual average change (SP data and authors' own calculations)

The slowdown in the life expectancy growth occurs in both young and old age. To estimate the life expectancy in the younger age group, we calculated the temporary life expectancy of men and women within the 0-75 age range ($e_{0\text{-}75}$). The calculated value represents the life expectancy of a newborn for the period up to the age of 75, taking into account the force of mortality as applied in the year of the study. In theory, if there were no premature deaths, i.e. at an age below 75, the temporary life expectancy would amount to 75 years. For individuals aged 75, the life expectancy calculated by Statistics Poland for people of this age was used (e_{75}). Fig. 2.2a and 2.2b present values of both parameters for men and women in 2010-2018. Both for men and women, the parameters in 2014-2018 increased to a considerably lower degree than in 2010-2014.

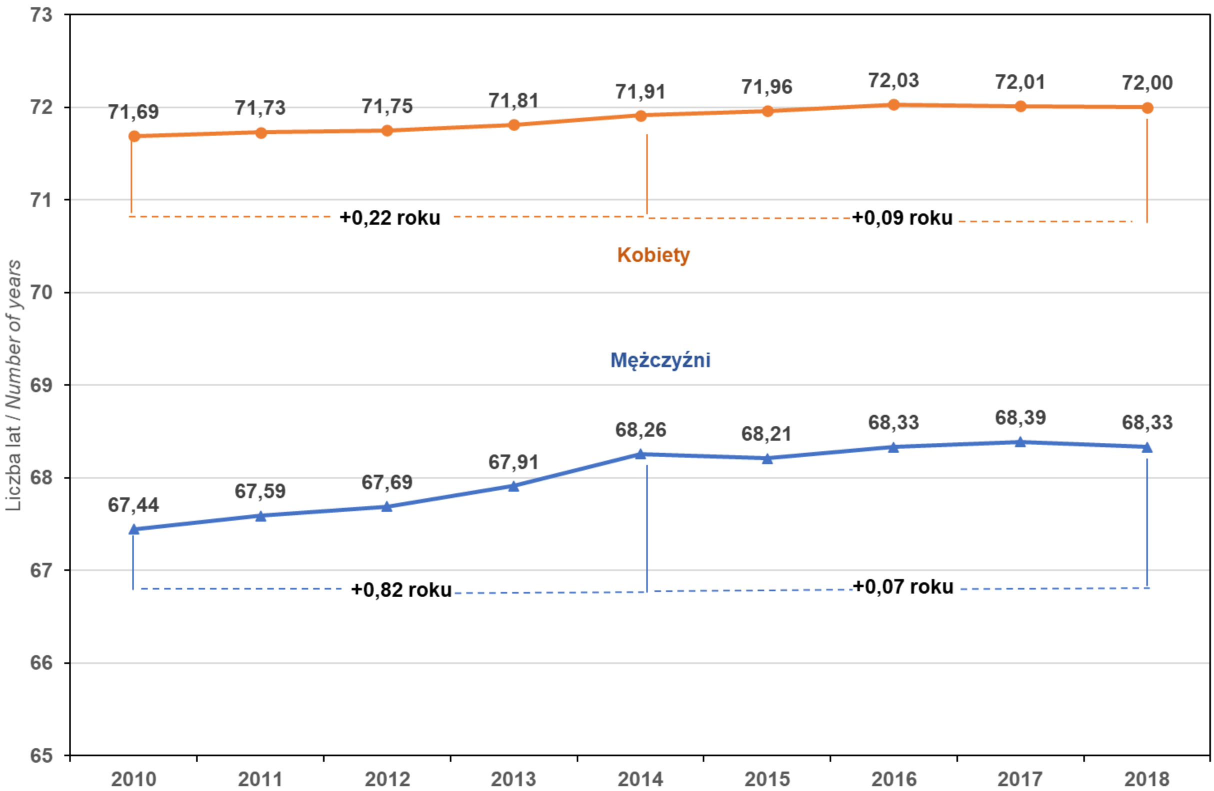


Fig. 2.2a. Partial life expectancy $e_{0\text{-}75}$ of men and women in 2010–2018 (authors' own calculations)

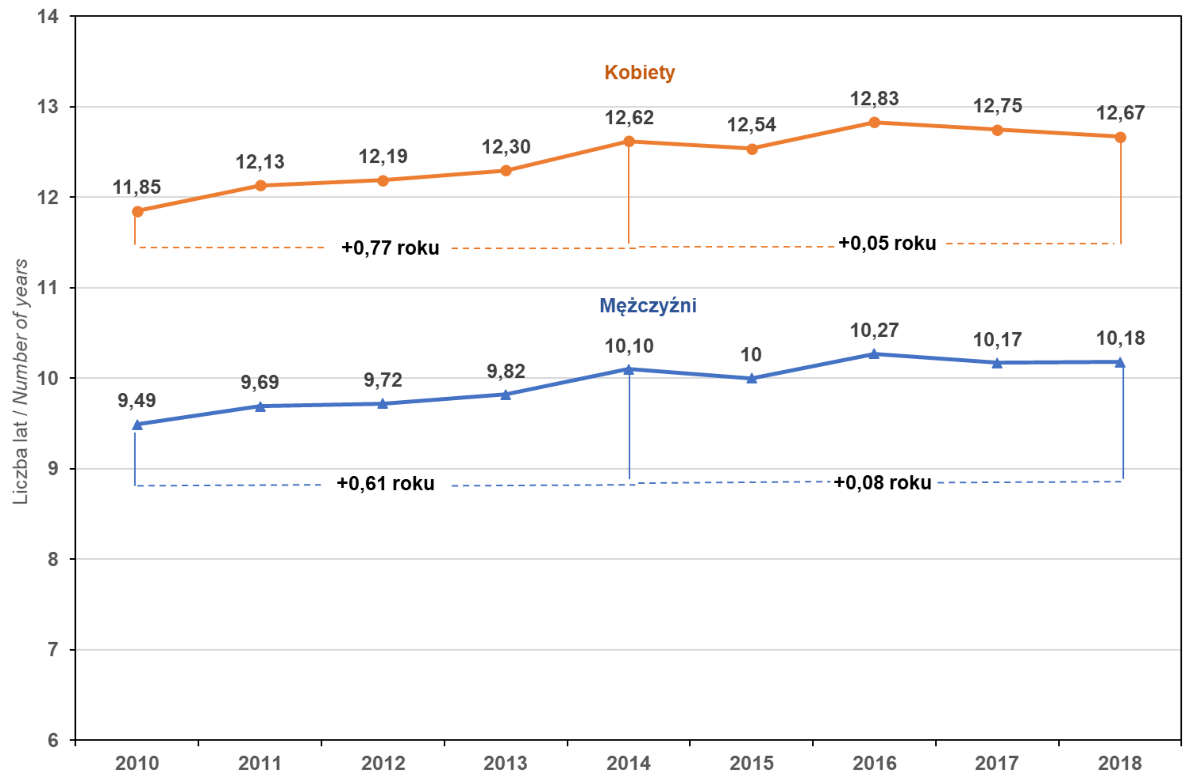


Fig. 2.2b. Life expectancy at the age of 75 in 2010–2018 (SP data)

For many years there has been an unfavourable trend in Poland of the excess mortality of men compared with women. As a consequence, they live much shorter, regardless of their age (Fig. 2.3). Boys born in 2019 could expect that they would live on average 7.2 years shorter than girls, and men aged 45 could expect to live 6.1 years shorter than women of the same age. After 2007 the difference between the life expectancy of women and men has slowly decreased, with a short exception of 2015 and 2016. It should be pointed out that, in the last two years of the analysed period, the unfavourable tendency of the increasing disparity between the life expectancy of men and women aged 75 was reversed.

According to our estimations, while at the beginning of the transformation period in 1991, two-thirds of the difference in the life expectancy of men and women resulted from a higher mortality rate for men of working age (25-64 years), in 2016 this was still more than a half (53%), and in 2019 even more (54.4%).

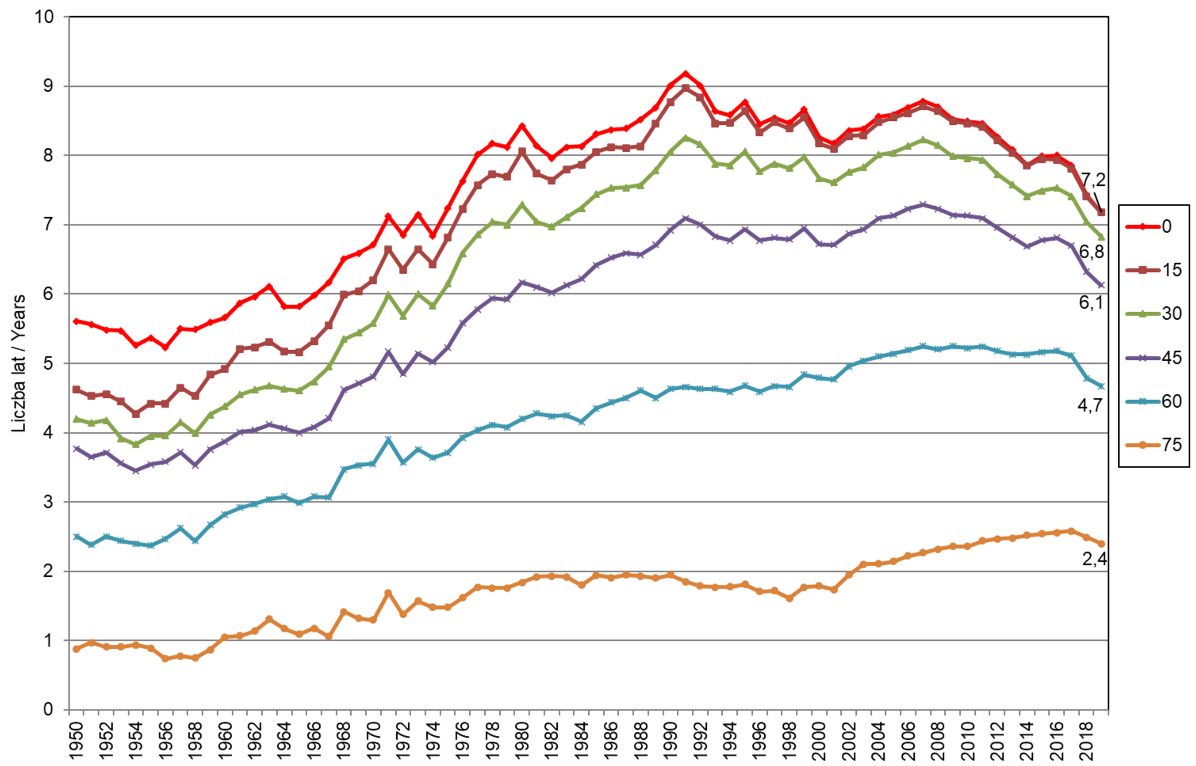


Fig. 2.3. Differences in the life expectancy of men and women in Poland by age in 1950–2019 (based on SP data)

The life expectancy of Polish inhabitants varies in terms of rural and urban areas, and this diversity is quite stable and permanent, though not very high. The most unfavourable health situation concerns the inhabitants of the smallest towns with a population below 5,000, where the average life expectancy is the shortest. The longest life expectancy is observed among the inhabitants of the largest cities with more than 500,000 inhabitants. The life expectancy differences depending on the place of residence so determined are greater for men than for women (Fig. 2.4a and 2.4b). The most considerable differences occurred between 2008-2009, decreasing up to 2012-2013 for men and up to 2013-2014 for women, whereas in the subsequent years the differences again increased. Currently, men in the smallest towns live on average 2.8 years shorter than those who live in the largest cities, whereas for women the difference is 1.6 years. The deceleration of the growth in the life expectancy of women, occurring in recent years, has affected to the least extent the inhabitants of the largest cities with a population over 500,000. It is worth noting that the life expectancy of women living in small towns with a population below 10,000 grew in the last five years. A considerable improvement in the situation, and a higher than average increase in life expectancy of the inhabitants of small towns in the period of 2008/2009 – 2010/2011, was discussed in the previous Report.

While the overall situation of the inhabitants of the largest cities is generally the most favourable, the situation of the inhabitants of Łódź is still highly unfavourable, as their life expectancy in 2017-2019 was 72.3 years for men and 80.4 years for women, i.e. even shorter than in the case of the inhabitants of small towns.

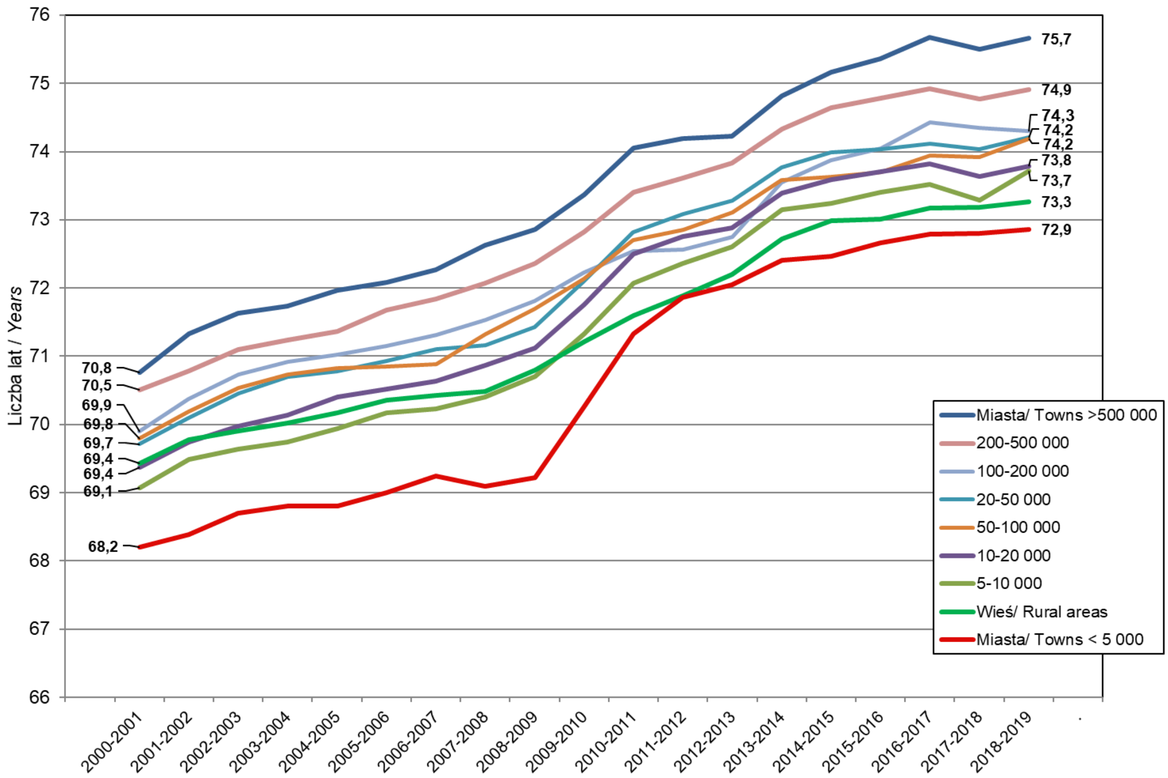


Fig. 2.4a. Life expectancy of men at birth in Poland, in rural area and urban areas by population, 2000-2019 – 2-year moving averages (authors' own calculations)

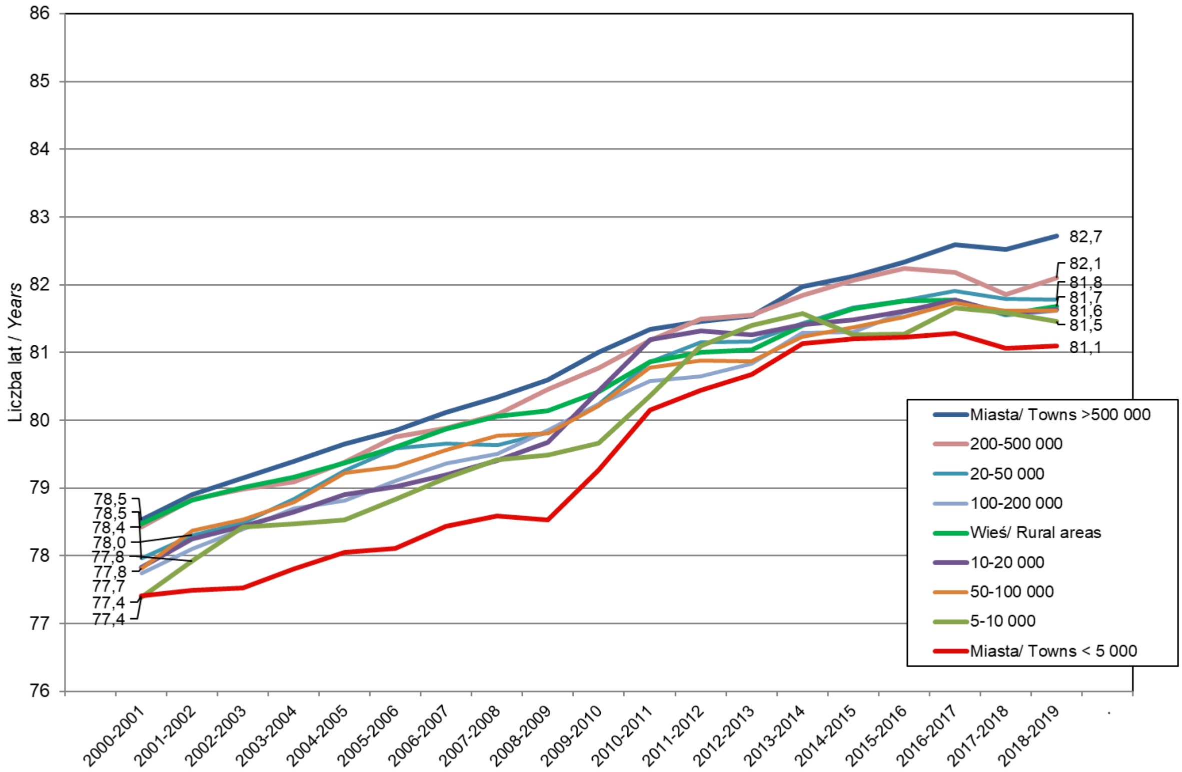


Fig. 2.4b. life expectancy of women at birth in Poland, in rural area and urban areas by population, 2000-2019 – 2-year moving averages (authors' own calculations)

There are some evident and relatively permanent differences in the life expectancy between voivodships. The most striking one is the shortest life expectancy of men in the Łódzkie Voivodship, which is a tendency that has been observed for years (Fig. 2.5a). However, attention should be paid to the fact that in the last three years under analysis (2016-2019), the life expectancy of men in the Łódzkie Voivodship grew by 0.5 year, which is a higher increase than in the remaining voivodships. In consequence, the difference between the inhabitants of the Podkarpackie Voivodship, whose average life expectancy is the longest, has been reduced. However, in the case of women, the inhabitants of the Łódzkie Voivodship do not differ significantly when compared with women residing in other voivodships – a similar life expectancy of women can be observed in the Śląskie Voivodship, and in 2019 it was even shorter, while women in the Podkarpackie Voivodship live approximately 2.2-2.3 years longer (Fig. 2.5b).

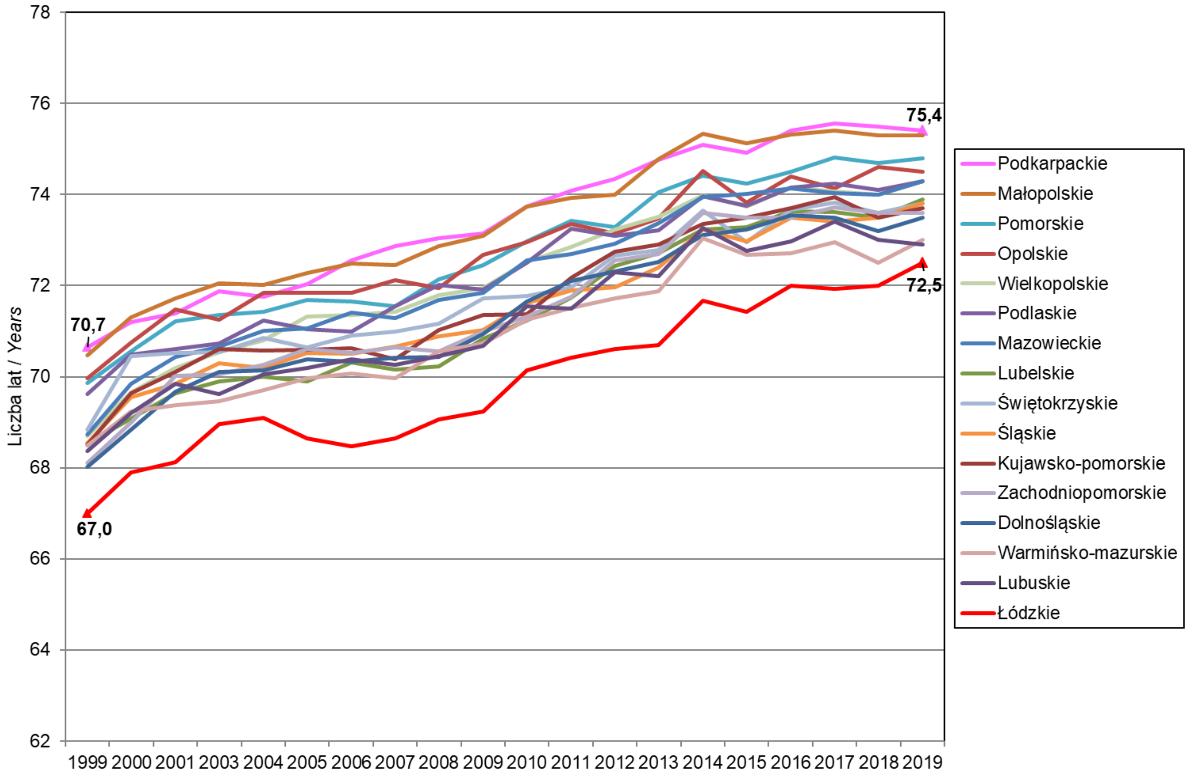


Fig. 2.5a. Life expectancy of men at birth by voivodship, 1999-2019 (SP data)

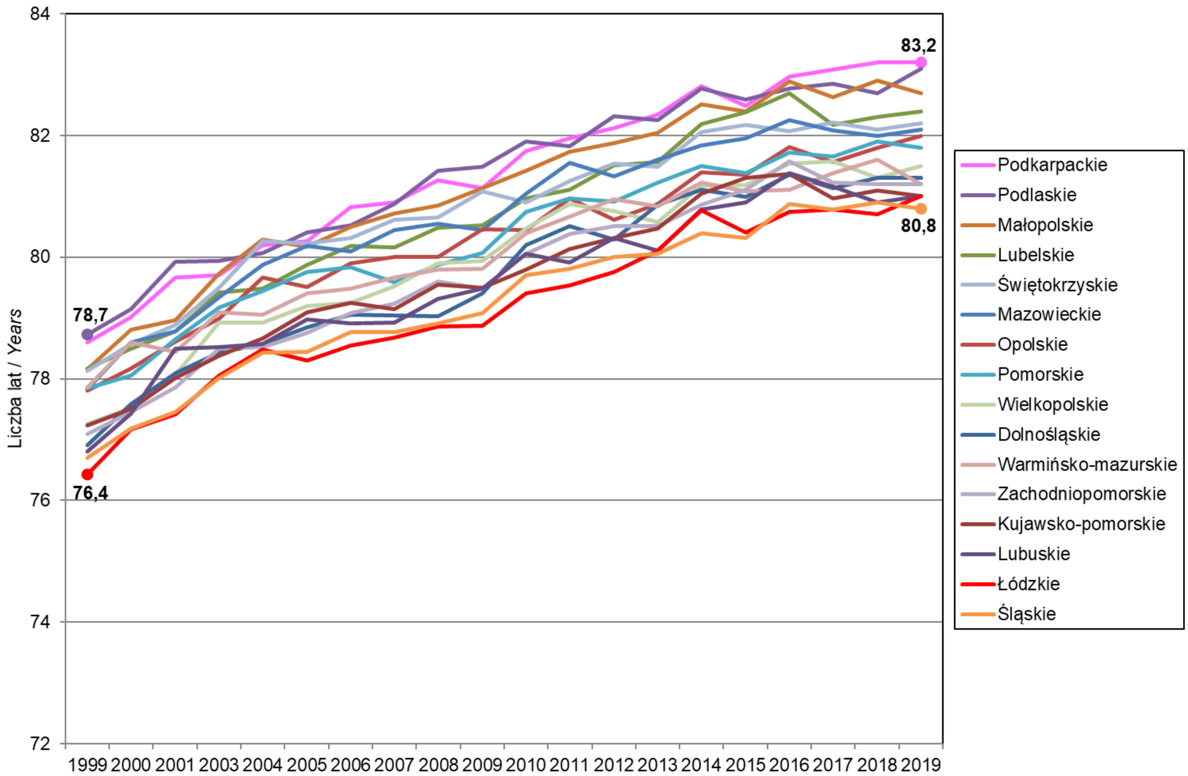


Fig. 2.5b. Life expectancy of women at birth by voivodship, 1999-2019 (SP data)

A slightly downward trend in the life expectancy of women in the whole Poland, in 2016-2019, was a product of uneven changes in the respective voivodships. However, it should be emphasised that a year-on-year reduction in the life expectancy of women was not observed in any voivodship in the period under analysis.

In 2019 men living in urban areas lived longer than men living in rural areas by 1.1 year on average. This regularity occurred in all voivodships except for Śląskie, where men in rural areas lived 0.7 years longer than man in urban areas. In the Lubelskie, Mazowiecie, Świętokrzyskie and Podlaskie Voivodships, the difference in favour of urban inhabitants was greater than 2 years (Fig. 2.6). It is worth pointing out that men in the Podkarpackie and Małopolskie Voivodships lived longer than men from other voivodships, both in the case of urban and rural areas. For women, the differences in the life expectancy between the inhabitants of urban and rural areas were much less pronounced compared with men, both in the respective voivodships and in the whole country. In 2019 women living in urban areas lived on average 0.1 year shorter than the female inhabitants of rural areas. However, in 11 voivodships, female urban inhabitants lived longer than rural inhabitants (the biggest difference of 1.3 years was recorded in the Zachodniopomorskie Voivodship), while the reverse trend was observed in only four voivodships (in the Śląskie and Łódzkie Voivodships, female rural inhabitants lived 1.0 year longer).

Generally, it can be stated that living in urban or rural areas has a relatively small impact on the life expectancy of the Polish population, especially when it comes to women.

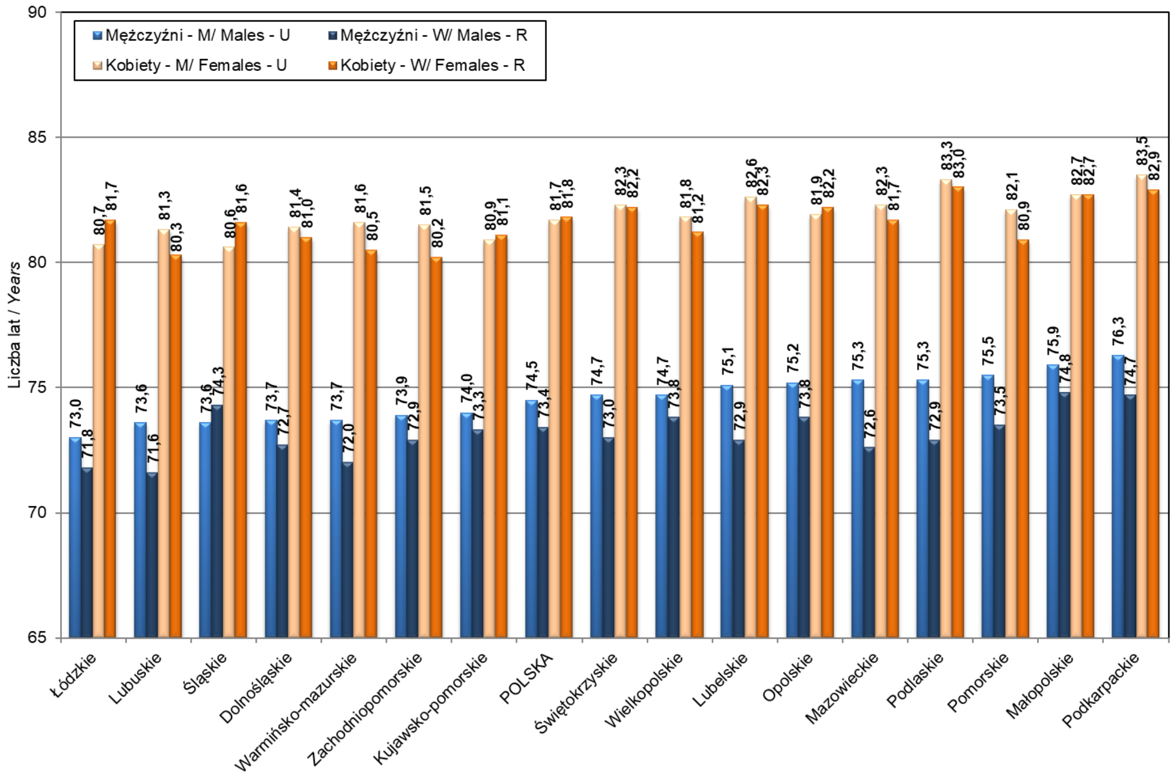


Fig. 2.6. Life expectancy of men and women at birth in urban (U) and rural (R) areas in Poland, by voivodship, 2019 (SP data)

For obvious reasons, the differences in the life expectancy of poviat inhabitants are much more pronounced than those of voivodship inhabitants. It can be stated that the majority of the poviats where men live the longest are situated in the south and central-western Poland, whereas women live the longest in the poviats located in the eastern regions of the country (Fig. 2.7a and 2.7b).

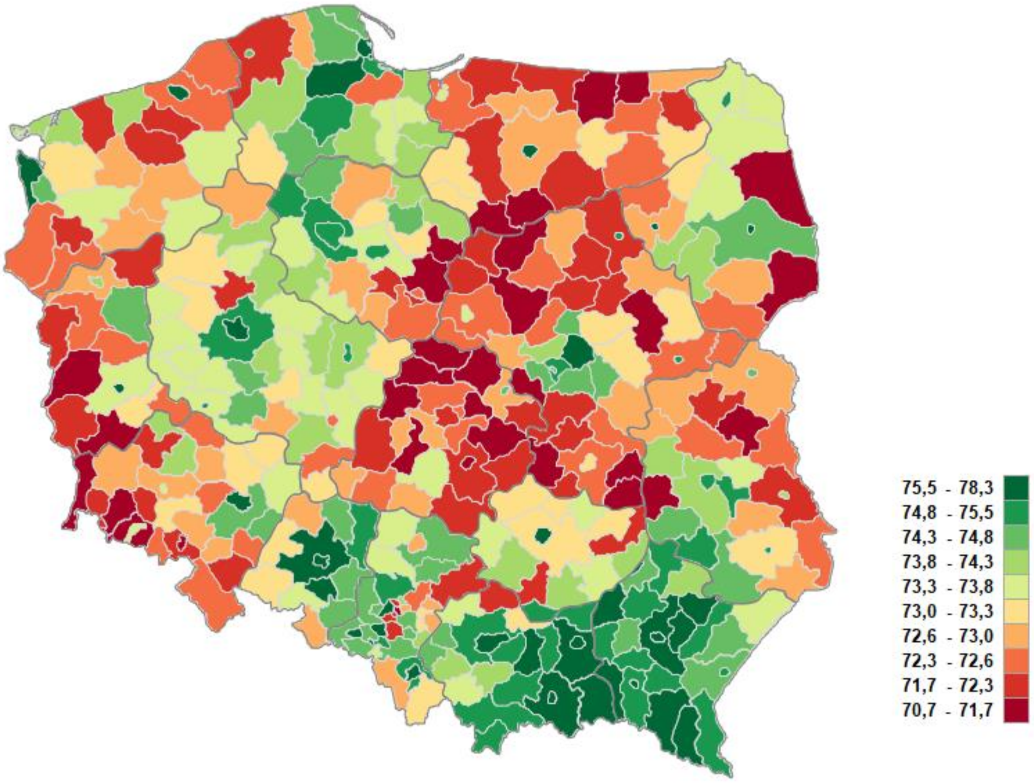


Fig. 2.7a. Life expectancy of men by poviat in 2017-2019 (authors' own calculations based on SP data)

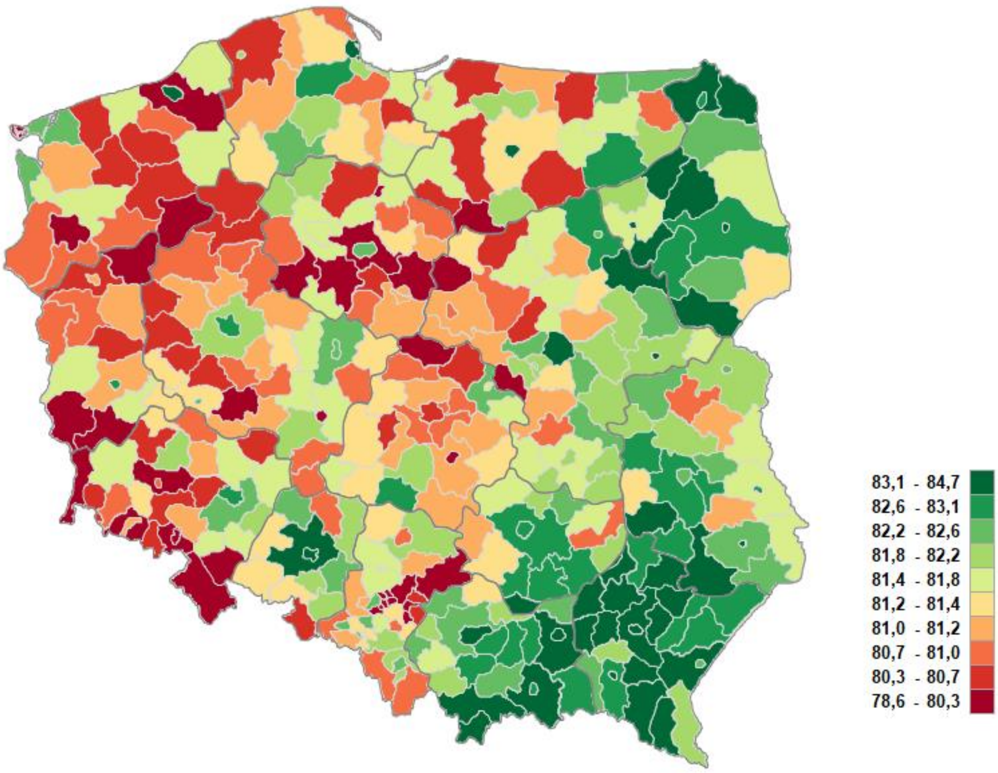


Fig. 2.7b. Life expectancy of women by poviat in 2017-2019 (authors' own calculations based on SP data)

In the three-year period of 2017-2019, the longest life expectancy was observed for the inhabitants of Sopot – 78.3 years, and the shortest was recorded among the inhabitants of the Kutno Poviat – 70.7 years, so the difference was approx. 7.6 years (Tab. 2.1a). In the case of women, the difference was slightly less pronounced; the longest life expectancy was again observed among the inhabitants of Sopot – 84.7 years, and the shortest was recorded in Chorzów – 78.6 years, with the difference of approx. 6.1 years (Tab. 2.1b). These differences refer to poviats with extreme values, whereas the difference between the first and the tenth decile, i.e. the threshold for 10% of the poviats with the shortest life expectancy and 10% of the poviats with the longest life expectancy, is 3.7 years (71.75 vs. 75.45) for men and 2.88 years (80.32 vs. 83.20) for women. Therefore, it can be stated that these differences are not very high.

Tab. 2.1a. Twenty five poviats with the longest and the shortest life expectancy of men in 2017-2019

TERYT	Poviats with the longest life expectancy	Life expectancy	TERYT	Poviats with the shortest life expectancy	Life expectancy
2264	m. Sopot	78.3	1002	Kutno	70.7
1863	m. Rzeszów	78.0	2005	Hajnówka	70.8
1661	m. Opole	77.4	2811	Nidzica	70.8
1263	m. Tarnów	77.1	1413	Mława	70.9
1861	m. Krosno	77.0	2819	Węgorzewo	70.9
2262	m. Gdynia	76.9	0408	Lipno	71.0
1261	m. Kraków	76.8	1062	m. Piotrków Trybunalski	71.0
2061	m. Białystok	76.6	2463	m. Chorzów	71.2
1465	m. st. Warszawa	76.5	0265	m. Wałbrzych	71.2
1201	Bochnia	76.4	0212	Lwówek	71.2
3261	m. Koszalin	76.3	1423	Przysucha	71.2
1817	Sanok	76.3	0613	Parczew	71.2
3064	m. Poznań	76.2	0412	Rypin	71.2
2062	m. Łomża	76.2	1021	Brzeziny	71.3
1821	Leszno	76.2	1016	Tomaszów Mazowiecki	71.3
1609	Opole	76.1	2808	Kętrzyn	71.3
2204	Gdańsk	76.1	1420	Płońsko	71.3
1262	m. Nowy Sącz	76.0	1011	Poddębice	71.4
1816	Rzeszów	75.9	1409	Lipsko	71.4
1805	Jasło	75.9	1003	Łask	71.4
1811	Mielec	75.8	1438	Żyrardów	71.5
1605	Krapkowice	75.8	0810	Żagań	71.5
2862	m. Olsztyn	75.8	0206	Jelenia Góra	71.5
1864	m. Tarnobrzeg	75.8	1005	Łowicz	71.5
2478	m. Zabrze	75.8	2803	Działdowo	71.5

* m. – cities/towns with poviat rights

Source: authors' own calculations based on SP data

Tab. 2.1b. Twenty five poviats with the longest and the shortest life expectancy of women in 2017-2019

TERYT	Poviats with the longest life expectancy	Life expectancy	TERYT	Poviats with the shortest life expectancy	Life expectancy
2264	m. Sopot	84.7	2463	m. Chorzów	78.6
1863	m. Rzeszów	84.3	0806	Strzelce-Drezdenko	79.4
1821	Leszno	84.3	2471	m. Piekary Śląskie	79.4
2062	m. Łomża	84.2	3217	Wałcz	79.4
1811	Mielec	84.1	0206	Jelenia Góra	79.5
2004	Grajewo	84.1	2472	m. Ruda Śląska	79.5
2061	m. Białystok	84.1	0408	Lipno	79.6
1812	Nisko	84.0	3263	m. Świnoujście	79.6
1806	Kolbuszowa	83.8	2803	Działdowo	79.7
1803	Dębica	83.8	0209	Legnica	79.7
1861	m. Krosno	83.8	2476	m. Świętochłowice	79.7
1864	m. Tarnobrzeg	83.7	1438	Żyrardów	79.7
2862	m. Olsztyn	83.7	0810	Żagań	79.7
1211	Nowy Targ	83.6	3212	Pyrzyce	79.8
1808	Leżajsk	83.6	1002	Kutno	79.8
1813	Przemyśl	83.6	0265	m. Wałbrzych	79.8
0664	m. Zamość	83.6	1062	m. Piotrków Trybunalski	79.9
2012	Suwałki	83.5	0221	Wałbrzych	79.9
1216	Tarnów	83.5	2401	Będzin	80.0
1609	Opole	83.5	0462	m. Grudziądz	80.0
2010	Siemiatycze	83.5	0419	Żnin	80.0
1810	Łańcut	83.4	2470	m. Mysłowice	80.1
1817	Sanok	83.4	3061	m. Kalisz	80.1
2262	m. Gdynia	83.4	0224	Ząbkowice Śląskie	80.2
1210	Nowy Sącz	83.4	2416	Zawiercie	80.2

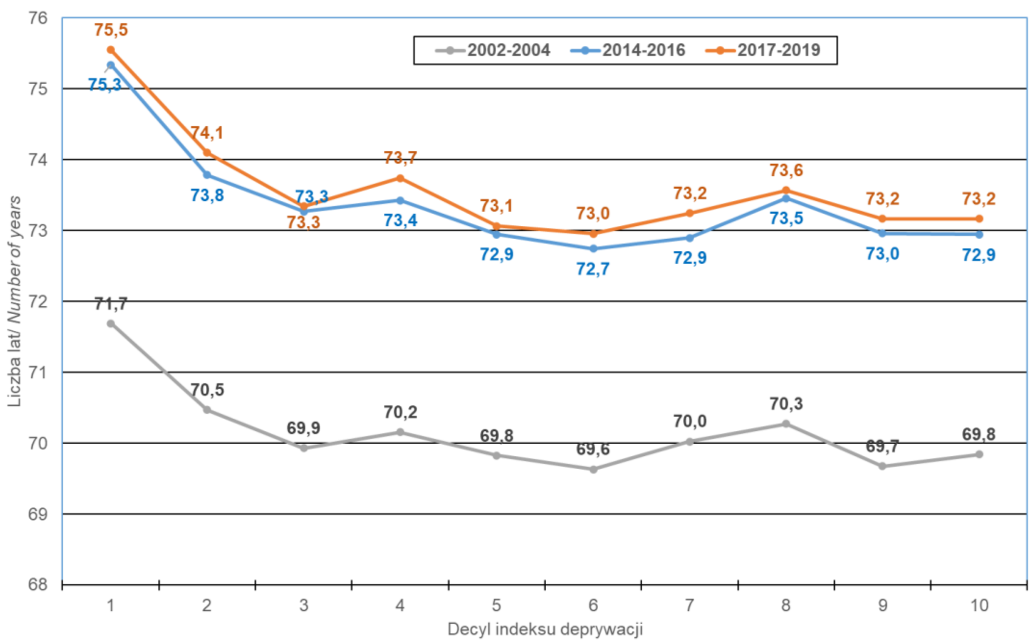
* m. – cities/towns with poviat rights

Source: authors' own calculations based on SP data

Differences in the life expectancy between the respective poviats occur in every voivodship, but their extent is varied. The highest differences in the life expectancy of men is found to occur in the Pomorskie Voivodship – approx. 6.1 years (the life expectancy in Sopot

– 78.3 years and in the Słupsk Poviat – 72.2 years), and it is the lowest in the Łódzkie Voivodship – 3.7 years. In the case of women, these differences are much less pronounced. The greatest difference in the life expectancy of women is observed in the Warmińsko-Mazurskie Voivodship – approx. 4.1 years (the life expectancy in Olsztyn – 83.7 years and in the Działdowo Poviat – approx. 79.7 years), and the lowest difference is found in the Małopolskie and Świętokrzyskie Voivodships – approx. 2.3 years.

As for the assessment of social inequalities in the health of the Polish population, an important question is whether, and to what extent, the variation in the health status among poviat inhabitants results from differences in their socio-economic situation. The relationship between life expectancy, including its changes in recent years, and the deprivation index in poviats is presented in Fig. 2.8a and 2.8b. The average life expectancy of women in poviats depended to a very limited extent on the value of the deprivation index[19]. In the poviats with the highest deprivation (the tenth decile), the average life expectancy of women in 2017-2019 was only 0.4 years shorter than in the poviats with the lowest deprivation. However, in the case of men, the difference was higher, amounting to 2.3 years, while the general negative correspondence between life expectancy and the deprivation level was observed within deciles 1-3. The increase in the life expectancy in poviats between 2002-2004 and 2017-2019 was not associated with the deprivation level, either among men or among women.



[19] The deprivation index was described in the previous 2018 Report.

2.8a. Life expectancy of men in 2002-2004, 2014-2016 and 2017-2019 by decile of the deprivation index (2013) in poviats (authors' own calculations)

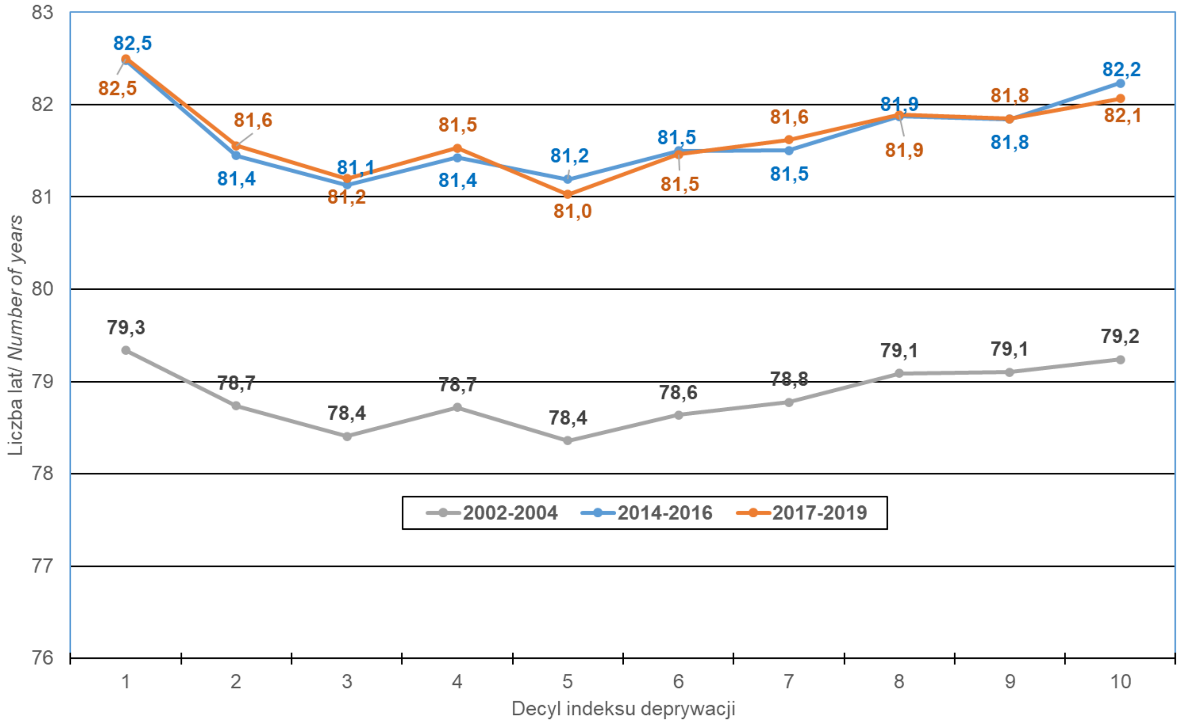


Fig. 2.8b. Life expectancy of women in 2002-2004, 2014-2016 and 2017-2019 by decile of the deprivation index (2013) in poviats (authors' own calculations)

A factor strongly differentiating the life expectancy of Poles is the level of their education. According to Eurostat's estimations, in 2017 (the most recent available data) men aged 30 with tertiary education could expect that they would live approx. 7.4 years longer than men with secondary education (including basic vocational education), and approx. 11.0 years longer than men with at most lower-secondary education. These unfavourable differences intensified in 2017 in comparison to 2014-2016, which was caused by an increase in the life expectancy of men with higher education and a decline in other education groups (Fig. 2.9a). In the case of women, the differences related to the educational level are considerably less pronounced compared to men, but they also increased in 2017 (Fig. 2.6b). It should be borne in mind that Eurostat amended the previous life expectancy estimation by education for 2014-2016, thus the values provided differ slightly from those presented in the previous Report. We have not managed to establish the reason for that amendment.

It is worth noting that the life expectancy of women with tertiary education is higher than that of men with the same educational level by 2.9 years, while in the case of individuals with at most lower-secondary education, the difference between the life expectancy of men and women is 10.5 years. This points to the significant role played by factors associated with the socio-economic status in the excess mortality of men as compared to women.

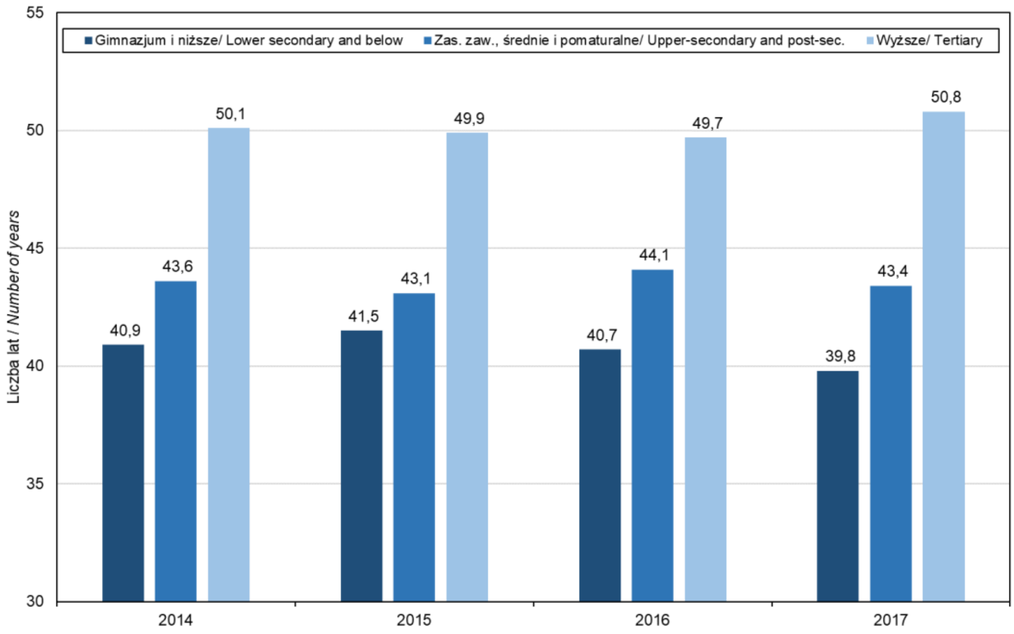


Fig. 2.9a. Life expectancy of men aged 30 by educational attainment level in Poland in 2014-2017 (Eurostat database)

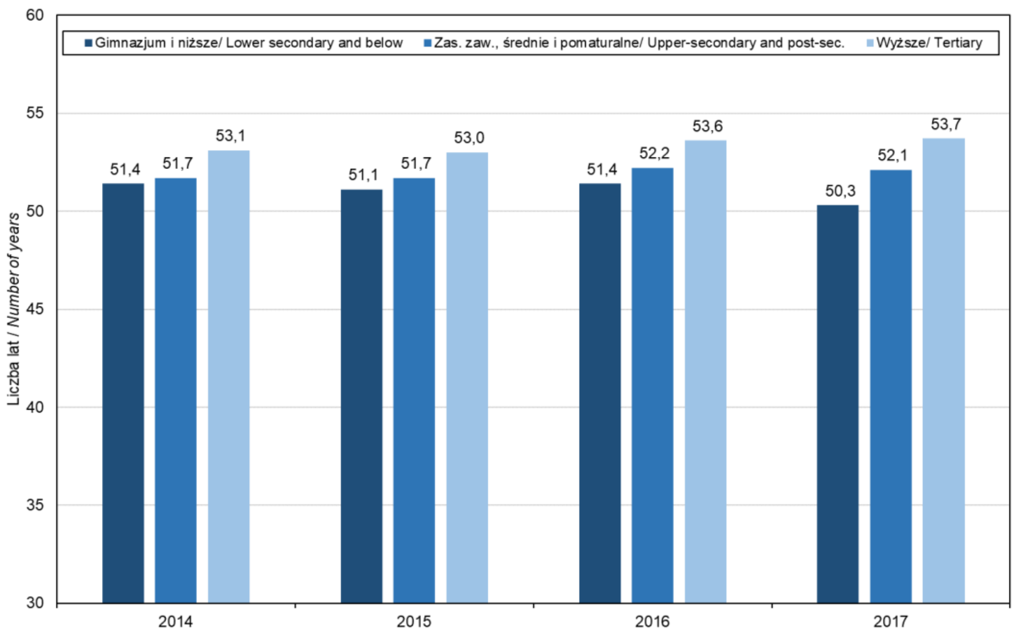


Fig. 2.9b. Life expectancy of women aged 30 by educational attainment level in Poland in 2014-2017 (Eurostat database)

2.2. Life expectancy of Polish inhabitants compared with inhabitants in other European Union countries

According to Eurostat's estimates, currently (in 2018) the life expectancy of men in Poland is approx. 4.6 years shorter than the average life expectancy of EU inhabitants, with the difference in comparison to Sweden amounting to 7.2 years, and to Italy, where life expectancy is the longest in the EU, to 7.5 years (Fig. 2.10a). The shortest average life expectancy among the EU countries is observed in Latvia (70.1 years) and Lithuania (70.9 years).

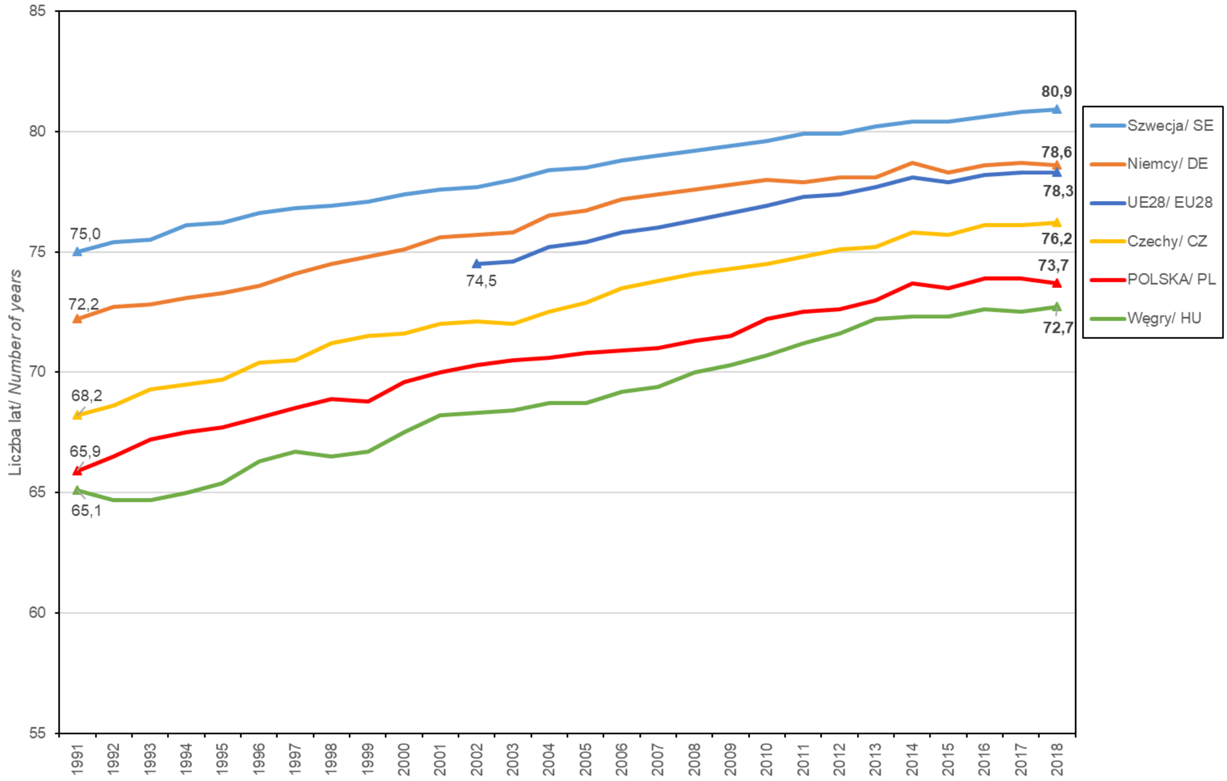


Fig. 2.10a. Life expectancy of men in Poland and in selected EU countries, 1991-2018 (Eurostat database)

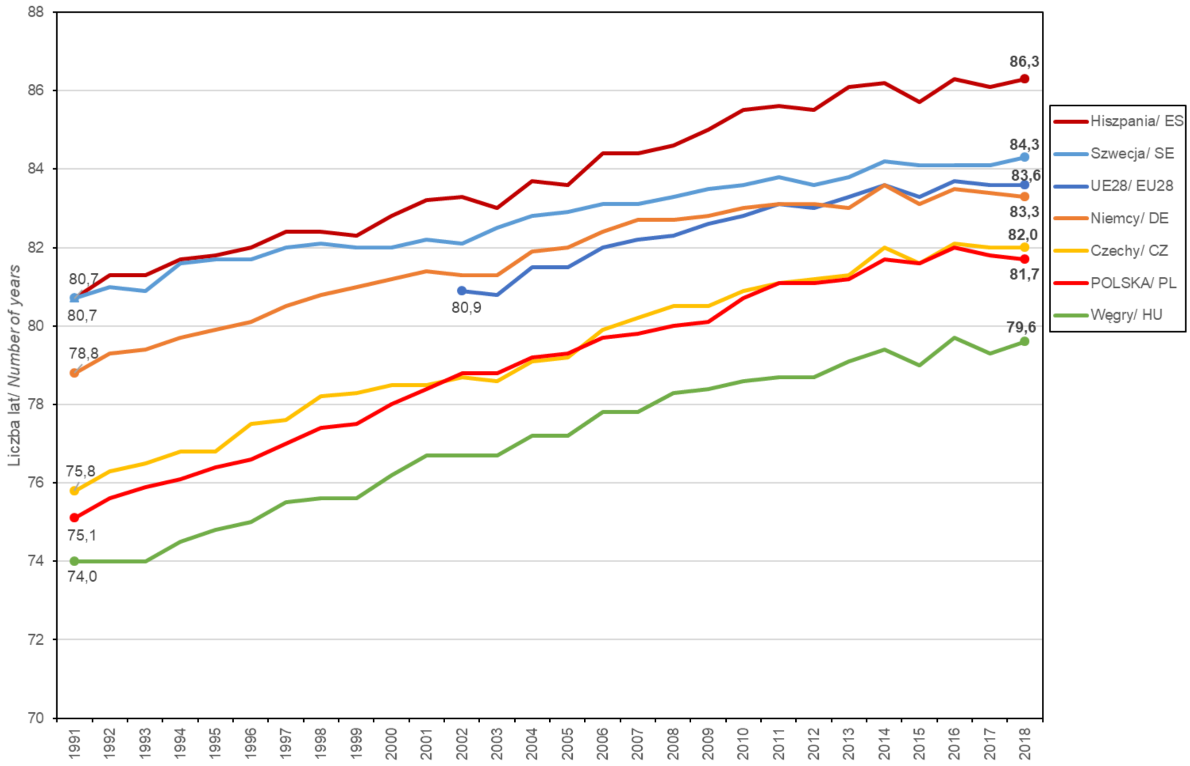


Fig. 2.10b. Life expectancy of women in Poland and in selected EU countries, 1991-2018 (Eurostat database)

In the case of women, the differences are less pronounced, with the current (2018) average life expectancy of Polish women being by approx. 1.9 years shorter than the average life expectancy of women in the EU, and by approx. 4.6 years shorter than that of women in Spain who live the longest (Fig. 2.10b). The shortest average life expectancy among women in the EU countries is recorded in Bulgaria (78.6 years) and Romania (79.2 years).

It should be pointed out that the life expectancy calculation method applied by Eurostat is slightly different from that applied by Statistics Poland, and thus the estimations provided by these two institutions are likely to exhibit some differences. However, these are usually within the range of 0.1-0.2 year.

As mentioned above, the educational level is a factor strongly differentiating the life expectancy of the population. Such a situation occurs not only in our country but, as we can see in Fig. 2.11a and 2.11b, it is particularly evident among men in Central and Eastern Europe, and it results from the clearly shorter life expectancy of people with low educational attainment. The Polish men aged 30 with at most lower-secondary education can expect to have a shorter average life expectancy than their peers with the same educational level in Finland, Greece, Norway, Portugal, Sweden, and Italy, while the differences in the life expectancy of men with higher education are within the range of 1.4-3.0 years. In the case of women, these differences are much less pronounced, but they also reflect the described pattern. However, the differentiation of the life expectancy of women associated with their educational level does not indicate a considerable extent of the problem in Central and Eastern European countries.

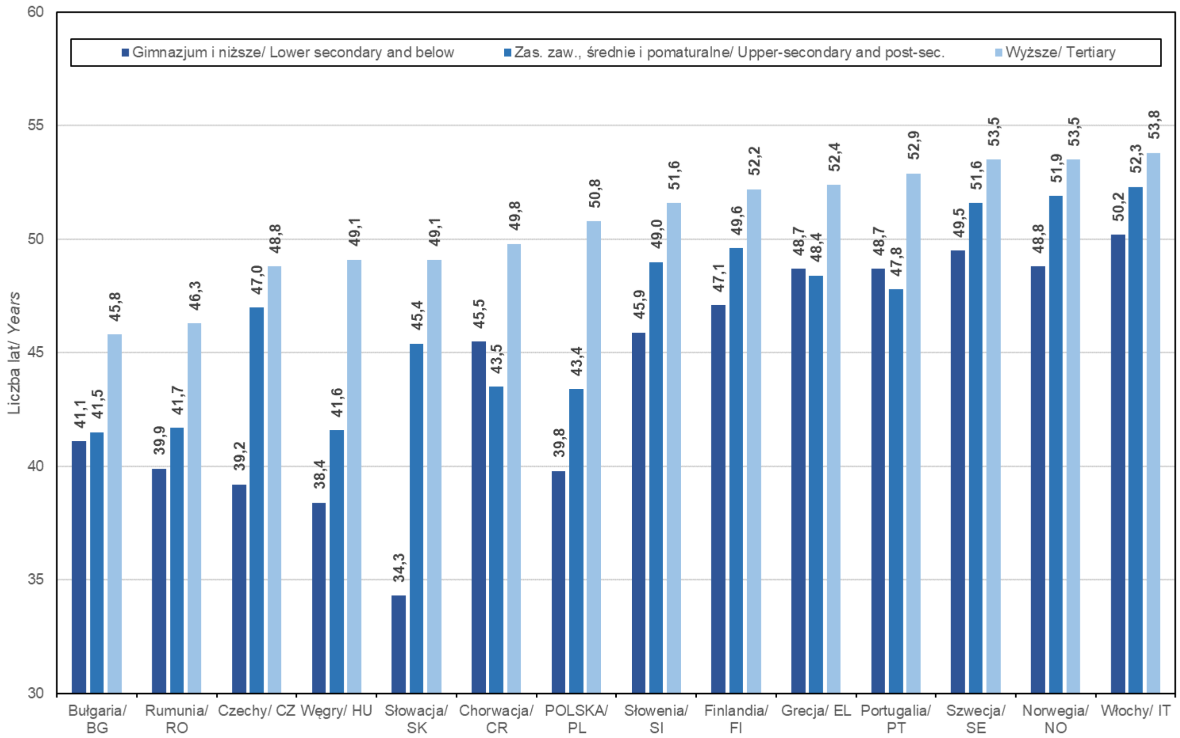


Fig. 2.11a. Life expectancy of men aged 30 by educational attainment level in selected European countries, 2017 (Eurostat database)

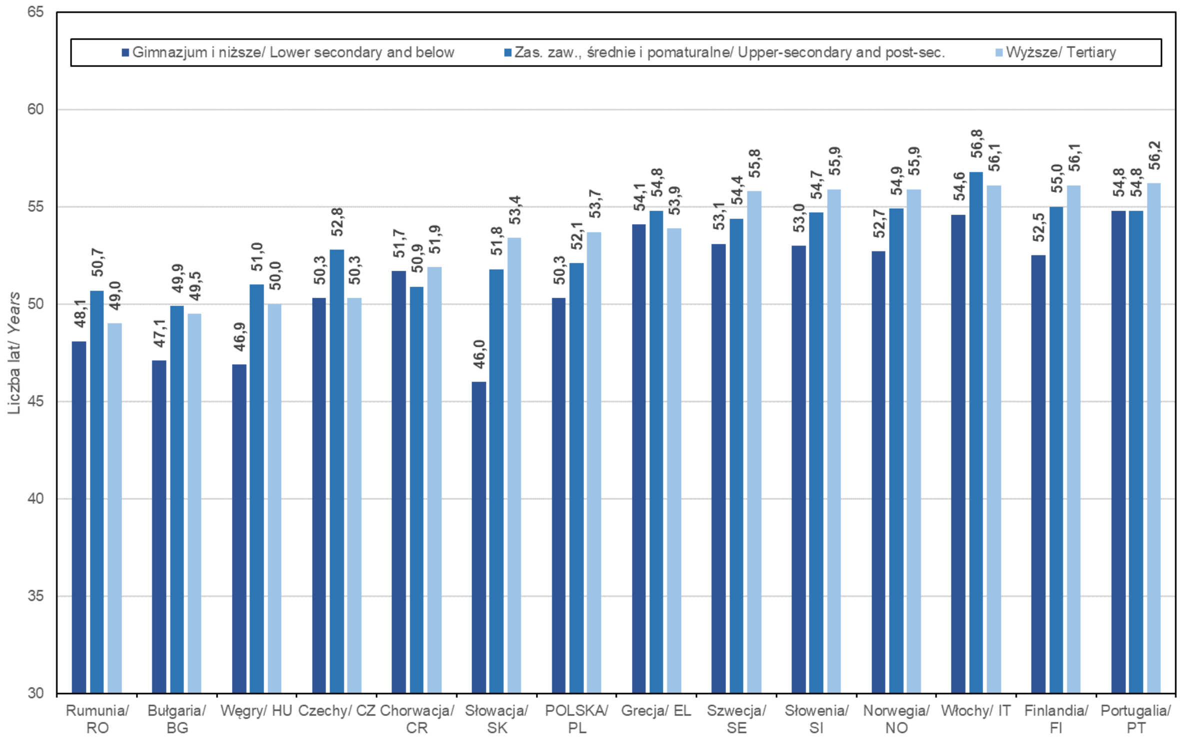


Fig. 2.11b. Life expectancy of women aged 30 by educational attainment level in selected European countries, 2017 (Eurostat database)

Life expectancy is one of the basic and most common simple statistical measures used for the general assessment of the health status of the population. However, it has some limitations as it does not reflect the exact health condition which people experience throughout their lives. For this reason, a more complex measure is used, i.e. **the Health Expectancy or Healthy Life Years** (HLY), calculated by dividing one's life into the period lived in a healthy condition and that lived in poor health. There are various measures for poor health, most often consisting of prolonged disability resulting from one's health condition, the presence of specific chronic diseases, and a poor assessment of one's own health condition. The estimated healthy life years for the EU countries, as provided by Eurostat, are based on the so-called Global Activity Limitation Index. The question regarding limited abilities is asked in the European Union Statistics on Income and Living Conditions (EU-SILC), which has been conducted in Poland since 2005 by Statistics Poland on a random sample of the Polish population. However, it should be emphasised that the content of the question was modified, which makes it impossible to assess the change in the indicator across the entire period. Since 2009 the question has been as follows: “Did you experience a limited ability to perform usual activities due to health problems lasting 6 months or more?”. It is, therefore, possible to assess the healthy life years of Poles as compared to the average for EU countries in 2009-2018.

The general health situation of the Polish population is less unfavourable compared with all EU inhabitants if one takes into account, in calculating the life expectancy, the fact that only part of one's life is lived in good health. In accordance with the current Eurostat estimates, the life expectancy in good health of Polish women (64.3 years, 78.7% of the total life expectancy) is 0.5 years longer than the average in EU countries. Polish men live in good health on average 60.5 years (82.1% of total life expectancy), i.e. 2.9 years shorter than the average value for EU countries (Fig. 2.12a). Within nine-year period of 2009-2018, the life expectancy in good health increased for men by 2.2 years, and in the last two years of that period, i.e. in 2016-2018, it declined by 0.8 year, i.e. to a greater extent that the average for EU countries. In the case of women, the life expectancy decrease in 2017 was, to a great extent, set-off by the increase in 2018. The total healthy life years for women in the period of 2009-2018 grew by 1.8 years, i.e. less than in the case of men. The difference in the healthy life years of men and women in Poland, corresponding to 3.8 years, is currently the highest among EU countries.

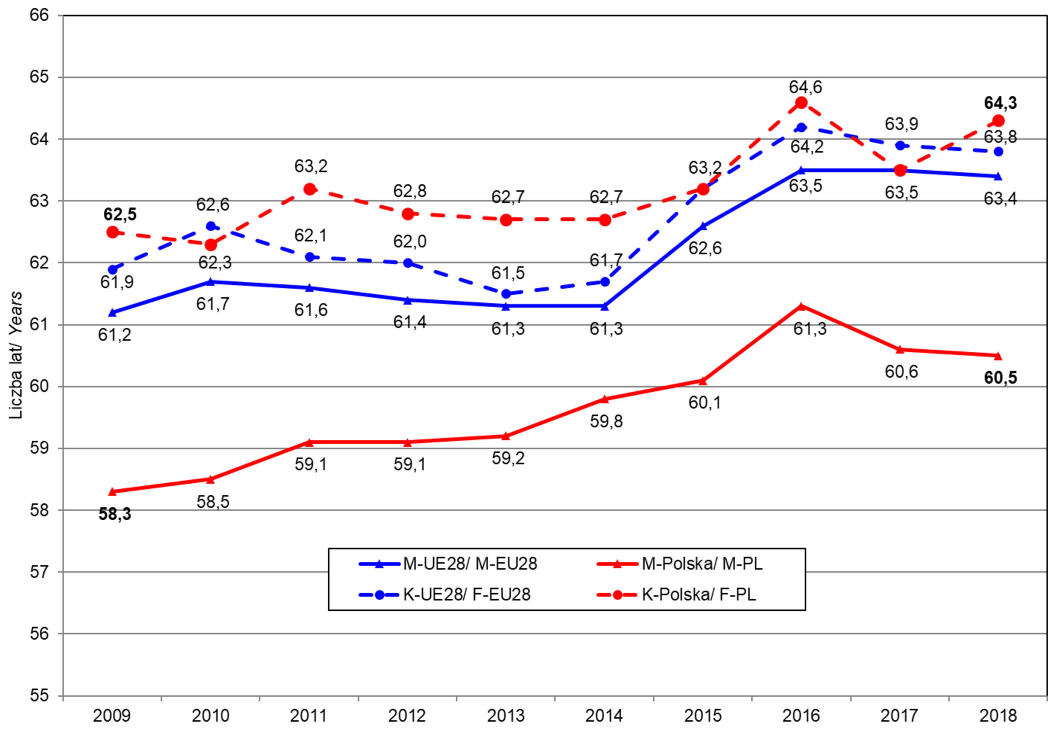


Fig. 2.12a. Healthy life years (without disability) of men (M) and women (W) at birth in Poland and the average for EU countries in 2009-2018 (Eurostat database)

The healthy life years of elderly people aged 65, both men and women, in Poland is growing, although the growth rate is non-systematic, and in the years 2016-2018 it even decelerated (Fig. 2.12b). For both sexes in Poland, the value is lower than the EU average by 1.7 and 1.2 years for men and women, respectively. It is worth pointing out that the percentage of years lived in health by elderly people, in comparison to the total life expectancy, was more or less constant in 2009-2014, both for Poland and the EU countries; however, in the subsequent years 2014-2018 it started to increase at a lower rate in Poland than in EU countries in total (Fig. 2.13c).

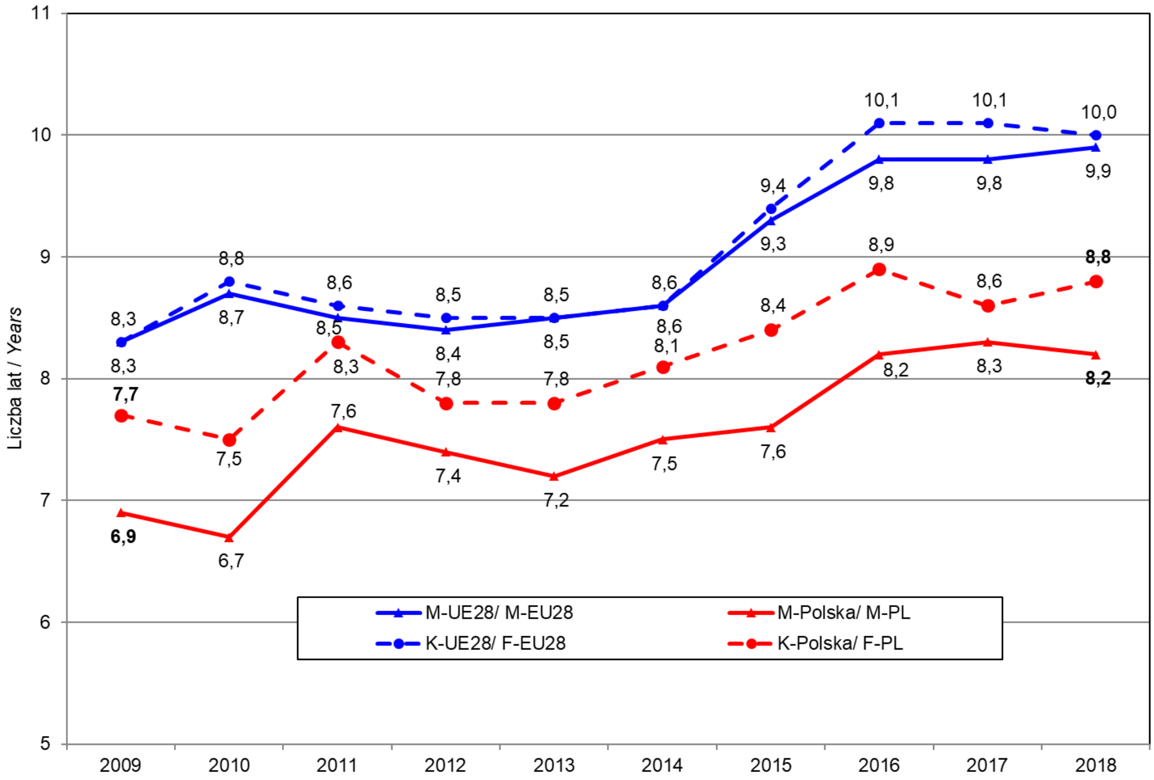


Fig. 2.12b. Healthy life years (without disability) of men (M) and women (W) aged 65 in Poland and the average for EU countries in 2009-2018 (Eurostat database)

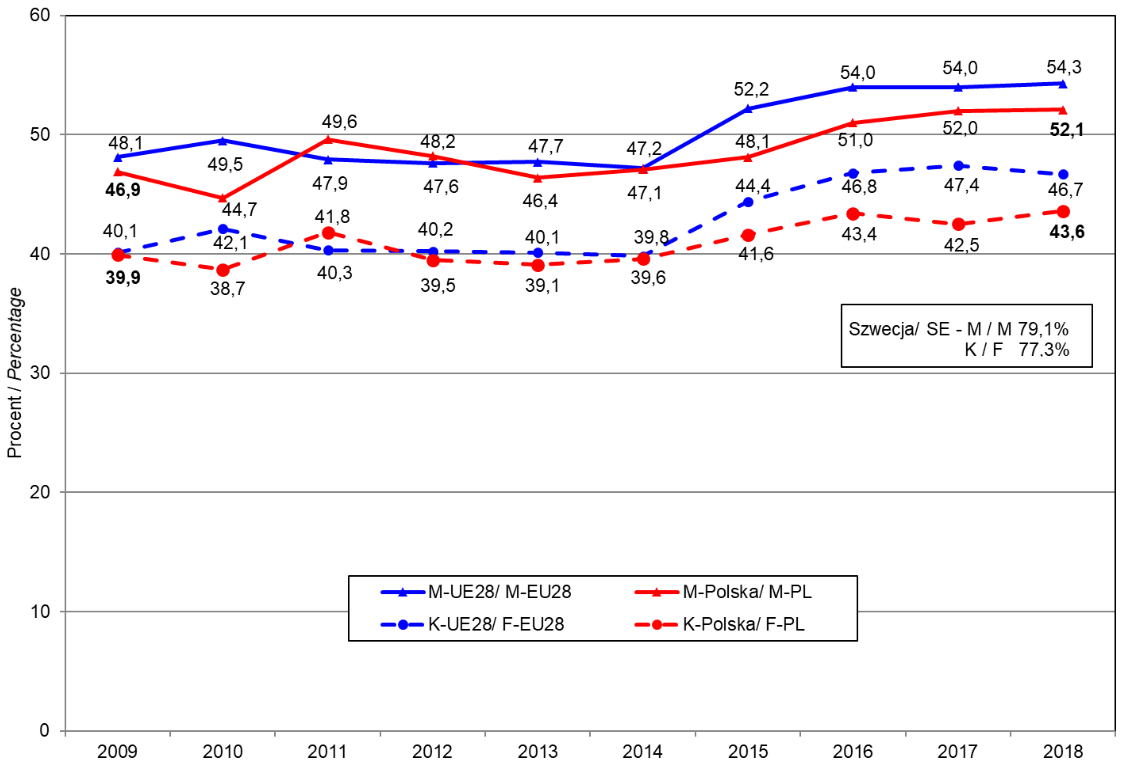


Fig. 2.12c. Average healthy life years (without disability) of men (M) and women (W) aged 65, as a percentage of the total life expectancy, in Poland and the average for EU countries in 2009-2018 (Eurostat database)

2.3. Mortality due to all causes in Poland and the European Union

The total mortality rate in Poland has been decreasing since 1991, but in the recent years, i.e. after 2014, the growth rate has decelerated. For men, the change in the previous decrease rate is not yet statistically significant, while in the case of women, it has reached the level of statistical significance. The situation is similar as in Germany (in recent years, the relative decrease ratio of the death rate is the same in both countries, i.e. -0.3% per year), and previously as in the Czech Republic and Hungary (Fig. 2.13a, 2.13b). In 2017, the mortality rate of men in Poland was considerably higher than in most EU countries, e.g. by 49% higher than in Sweden, and by 32% higher than in Germany. In the case of women, the excess mortality is much lower, with corresponding values amounting to 18% and 12%.

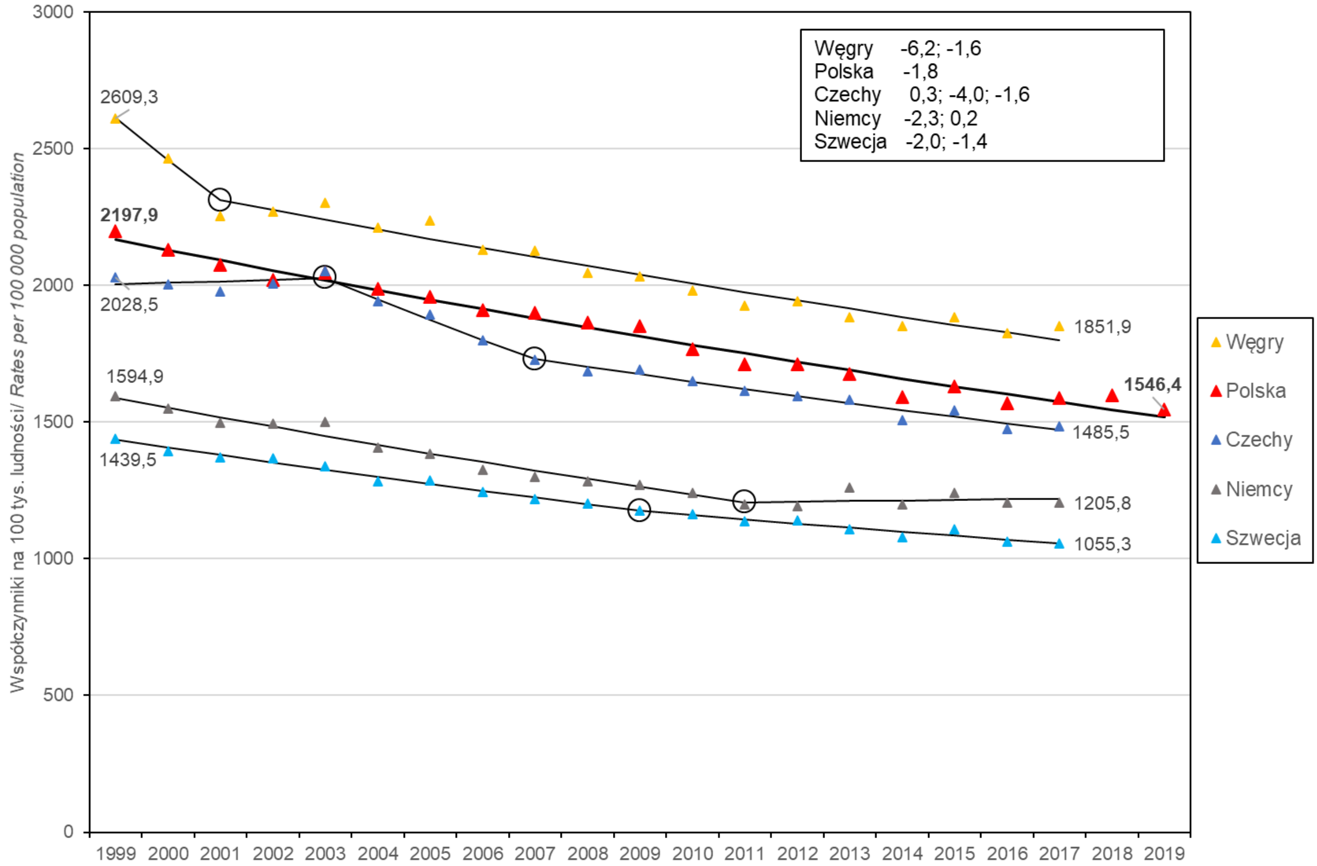


Fig. 2.13a. Standardised total death rates of men in Poland and selected EU countries in 1999-2019 – their trends and annual average decrease rate (authors' own calculations based on SP and WHO databases)

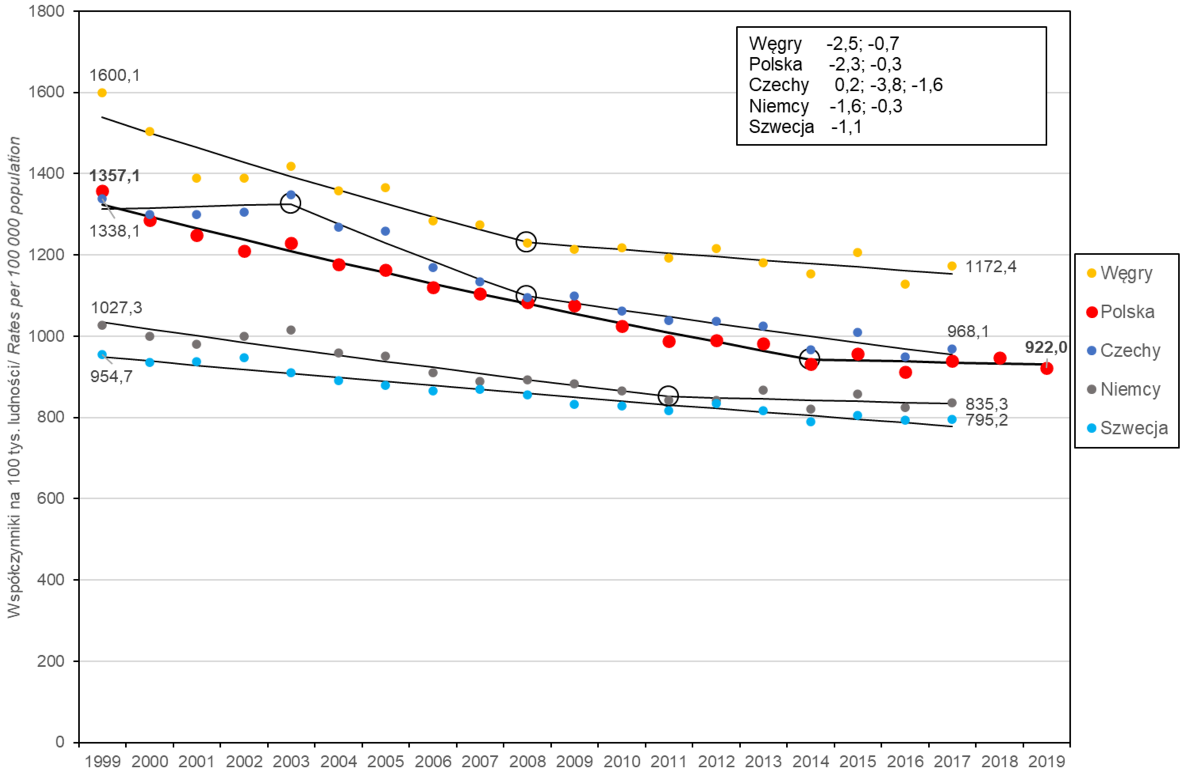


Fig. 2.13b. Standardised total death rates of women in Poland and selected EU countries in 1999-2019 – their trends and annual average decrease rate (authors' own calculations based on SP and WHO databases)

2.4. Mortality by sex and age

The mortality rate of the population of Poland in the last decade has been characterised by a significant slowdown, and even a deceleration of the death rate decrease in the second half of the period in all age groups, both among men and women (Tab. 2.2a and 2.2b).

Tab. 2.2a. Death rates of men by age in 2009-2019 (per 100,000 men of a given age group)

Age	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
0[1]	604	539	514	501	493	451	438	442	440	417	389
1-4	22	21	22	23	20	17	19	18	18	17	17
5-14	18	16	15	14	14	11	12	12	11	12	11
15-19	72	66	64	65	66	57	55	49	48	49	49
20-34	128	122	123	118	114	113	113	112	114	116	120
35-44	320	298	294	278	264	252	246	243	242	256	248
45-54	869	821	796	785	732	677	683	665	647	639	618
55-64	1,856	1,764	1,731	1,743	1,707	1,609	1,648	1,619	1,615	1,627	1,600
65-74	3,839	3,692	3,539	3,480	3,396	3,216	3,262	3,174	3,168	3,265	3,226
>75	9,821	9,494	9,272	9,405	9,370	9,008	9,376	9,052	9,415	9,539	9,210

[1] rates per 100,000 live births

Tab. 2.2b. Death rates of women by age in 2009-2019 (per 100,000 women of a given age group)

Age	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
0[1]	508	454	429	424	416	392	359	352	356	350	364
1-4	21	19	18	14	17	17	15	13	14	14	13
5-14	14	11	11	11	11	11	10	8	9	10	9
15-19	25	21	25	23	24	23	21	20	22	23	21
20-34	34	29	30	30	29	30	28	30	30	32	30
35-44	103	96	95	89	85	83	82	82	83	81	80
45-54	325	306	296	294	275	267	257	248	242	235	233
55-64	735	702	699	710	711	671	685	665	661	688	668
65-74	1,698	1,670	1,615	1,615	1,579	1,493	1,505	1,464	1,510	1,526	1,525

>75	7,527	7,297	7,099	7,206	7,272	6,962	7,345	7,047	7,436	7,615	7,456

[1] rates per 100,000 live births

In all age groups, men die more often than women. The highest excess mortality of men compared with women is recorded in the age group of 20-34 years; the mortality rate in this group in 2019 was almost four times higher than that of women, and also in the age group of 35-44 years, in which the mortality rate of men was three times higher. If the effect of differences in the age structure is eliminated in both sex groups, the total male mortality rate in 2019 was 68% higher than the female rate. In the EU countries, the average excess mortality of men in relation to women is lower; in 2016 it amounted to approx. 53% (in the United Kingdom or the Netherlands, it has recently amounted to 37%, in Iceland and Cyprus to only 20%, and in Estonia, Latvia and Lithuania it has exceeded 80%).

The mortality rate of men of working age, i.e. 25-64 years in Poland, has been decreasing since 1991, with a deceleration of the death rate in 2002-2007 and a significant slowdown after 2014 (the relative decline rate decreased from -3.3% in annual terms to -0.7% in annual terms). The mortality rate in Poland is still significantly higher than in most EU countries. For instance, in 2017 it was by 165% higher than in Sweden, by 165%, by 81% than in Germany, and by 41% than in the Czech Republic (Fig. 2.14a). In the case of Polish women, there was also a considerable slowdown of the death rate decrease in 2002-2007, and in 2017 there was a significant change in the trend from downward (-2.2% in annual terms) to upward (+3.6% in annual terms) (Fig. 2.14b). While the excess mortality of Polish women as compared to other EU countries is considerably lower than that of men, it is still evident – the corresponding values are 59%, 29% and 20%.

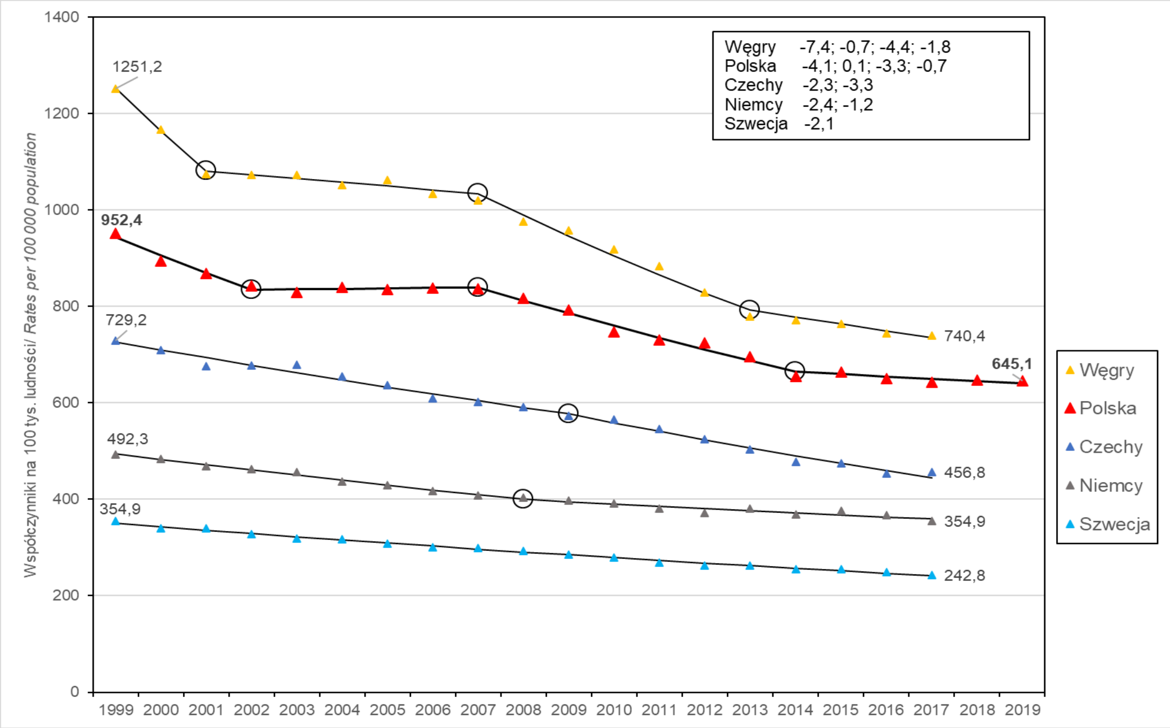


Fig. 2.14a. Age-standardised total death rates of men aged 25-64 in Poland and in selected EU countries, in 1999-2019 – their trends and annual average relative decrease rate (authors' own calculations based on SP and WHO databases)

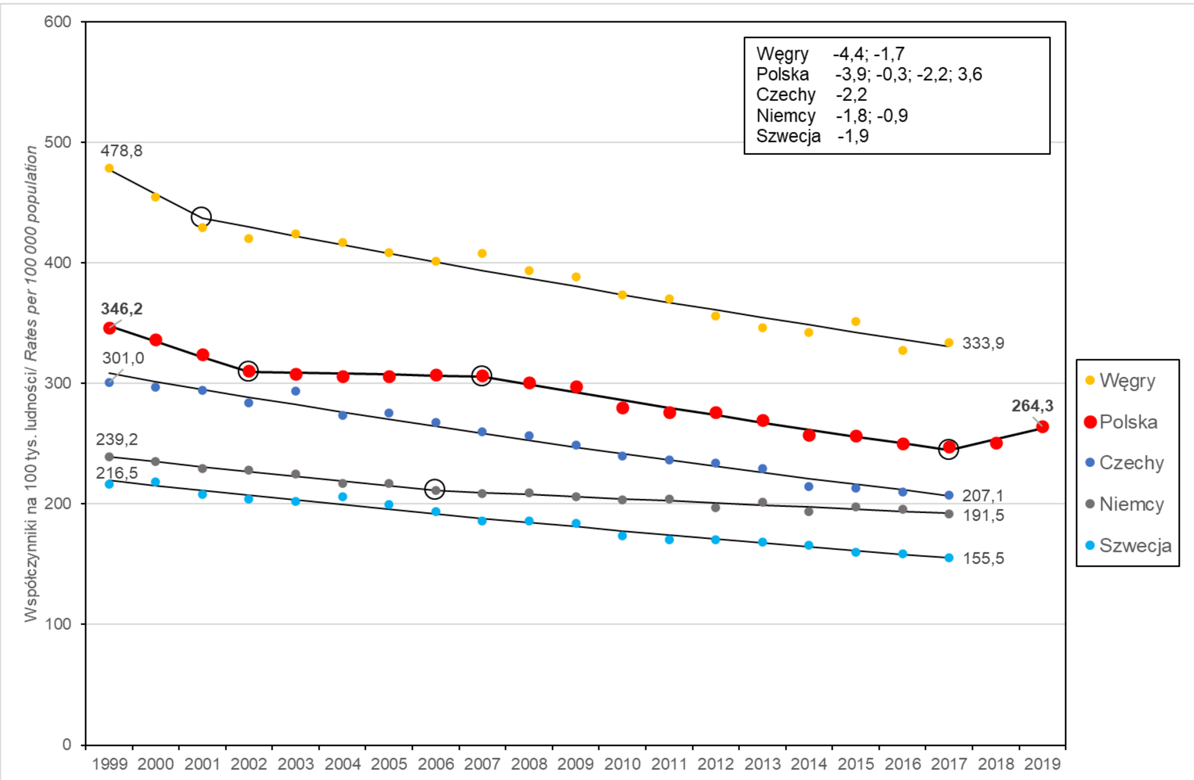


Fig. 2.14b. Age-standardised total death rates of women aged 25-64 in Poland and in selected EU countries, in 1999-2019 – their trends and annual average relative decrease rate (authors' own calculations based on SP and WHO databases)

2.5. Mortality by causes

The major causes of death in Poland are diseases of the circulatory system, which in the clinical nomenclature are also referred to as cardiovascular diseases (CVDs) (in the publication, the names are used interchangeably), and malignant neoplasms (Fig. 2.15). In 2018 these two groups of diseases were responsible for 65.0% of all deaths in total, including 40.5% of deaths in the case of CVDs and 24.5% of deaths in case of malignant neoplasms. The sad fact worth emphasising is that the third most common cause of death in Poland, both for men and women, are not specific diseases but a category including "pathological symptoms and features" and above all "ill-defined or unknown causes of death". Such a "diagnosis" was stated in every tenth death report as the underlying cause of death. Unfortunately, the frequency of these causes has risen significantly in recent years.

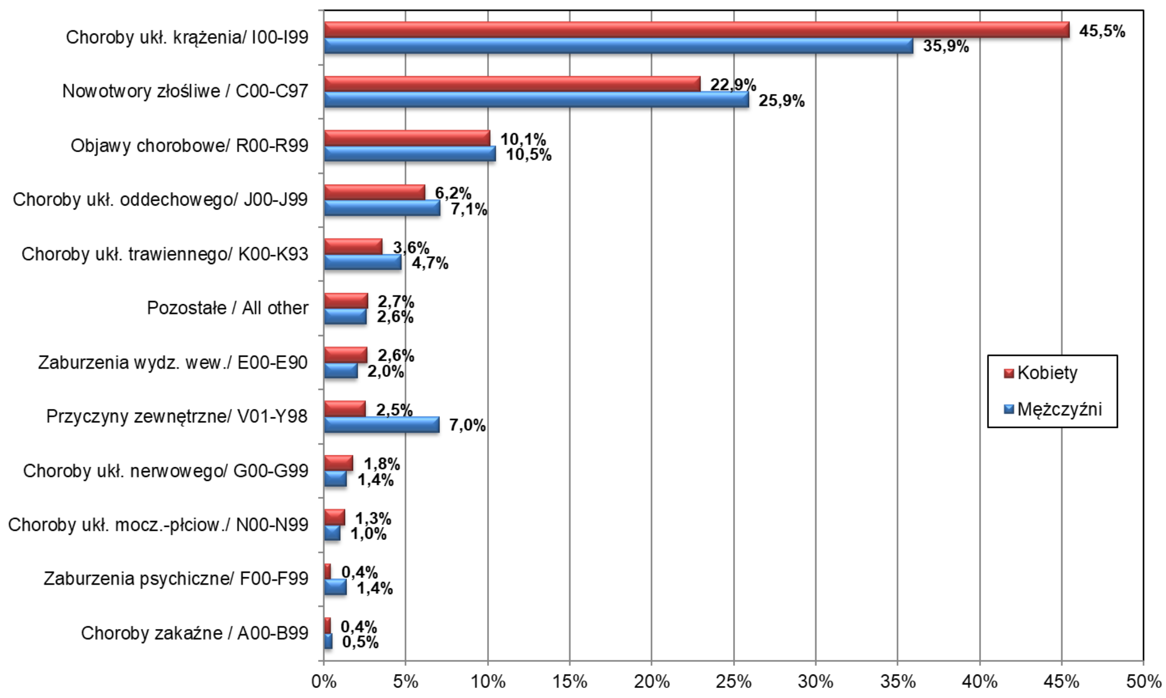


Fig. 2.15. Proportion of deaths from main causes in total deaths in Poland by sex, 2018 (SP data)

In order to define the leading mortality causes of the inhabitants of Poland, taking into consideration more detailed causes of death, we used the grouping list prepared by the WHO which is applied in England, Wales and Australia[20]. We made a modification in the list due to

[20] Becker R, Silvi J, Ma Fat D, L'Hours A & Laurenti R 2006. A method for deriving leading causes of death. Bulletin of the World Health Organization 84:297–304

differences between voivodships in determining cardiovascular diseases as the causes of death, and the “heart disease” category was added which is also present in the original grouping. Heart disease is the most common cause of death in the Polish population in total and of people aged more than 45 (Tab. 2.3). The second position of atherosclerosis results from its being frequently reported as the cause of death in the oldest age groups characterised by a high number of deaths. However, it must be borne in mind that generalised and unspecified atherosclerosis (I70.9) is considered a “garbage code”. It is very alarming that the most common cause of death of young Poles aged 25-44 and second most frequent among every younge people aged 15-24 is suicide. Still, a very high position, the second in the 45-74 age group, is the malignant neoplasm of the trachea, bronchus and lung, which in the vast majority of cases could be prevented. The fact which speaks to the disadvantage of Poland’s death statistics is that far too often, in more than 10% of cases, the “unknown, unspecified” is provided as the cause of death for people in the working-age population aged 25-64.

The share of particular broad disease groups as the cause of death in the age groups is presented in Fig. 2.16a and 2.16b. The lives of younger people, men aged 5-44 and women aged 10-29, are threatened mostly by external factors, such as accidents (transport accidents, falls, poisoning, drowning), suicides and crime. In the subsequent age-groups, the biggest risk for men comes from cardiovascular diseases and, to a lesser extent, malignant neoplasms. The lives of women under 75 are most threatened by malignant neoplasms in general, which in the oldest age are superseded by cardiovascular diseases.

Table 2.3. Ten leading causes of death in Poland by age in 2018

Rank	Total	1-14	15-24	25-44	45-64	65-74	75 *years* +
1	I00-I09, I11, I13, I20-I51 N=99011 (24%)	Q00-Q99 N=129 (19%)	V01-V89 N=427 (22%)	X60-X84 N=1486 (10%)	I00-I09, I11, I13, I20-I51 N=14824 (18%)	I00-I09, I11, I13, I20-I51 N=19341 (22%)	I00-I09, I11, I13, I20-I51 N=63400 (28%)
2	I70 N=33418 (8%)	J10-J18 N=60 (9%)	X60-X84 N=337 (18%)	I00-I09, I11, I13, I20-I51 N=1383 (9%)	C33, C34 N=7321 (9%)	C33, C34 N=9686 (11%)	I70 N=29340 (13%)
3	I60-I69 N=29951 (7%)	V01-V89 N=54 (8%)	Y10-Y34 N=122 (6%)	K70-K76 N=1265 (8%)	K70-K76 N=4346 (5%)	I60-I69 N=6014 (7%)	I60-I69 N=19542 (9%)
4	C33, C34 N=23722 (6%)	C71 N=46 (7%)	J10-J18 N=73 (4%)	V01-V89 N=864 (6%)	I60-I69 N=3896 (5%)	C18-C21 N=3741 (4%)	J10-J18 N=12329 (5%)
5	J10-J18 N=17999 (4%)	C81-C96 N=36 (5%)	W65-W74 N=61 (3%)	Y10-Y34 N=590 (4%)	C18-C21 N=2679 (3%)	I70 N=3189 (4%)	C33, C34 N=6573 (3%)
6	C18-C21 N=12434 (3%)	Y10-Y34 N=24 (3%)	X40-X49 N=58 (3%)	F10-F19 N=494 (3%)	J10-J18 N=2239 (3%)	J10-J18 N=2799 (3%)	C18-C21 N=5807 (3%)
7	E10-E14 N=9017 (2%)	X60-X84 N=21 (3%)	I00-I09, I11, I13, I20-I51 N=50 (3%)	I60-I69 N=476 (3%)	C50 N=2079 (3%)	E10-E14 N=2173 (2%)	E10-E14 N=5199 (2%)
8	K70-K76 N=8051 (2%)	W65-W74 N=20 (3%)	C81-C96 N=49 (3%)	J10-J18 N=452 (3%)	F10-F19 N=1825 (2%)	J40-J47 N=2072 (2%)	D00-D48 N=4414 (2%)
9	D00-D48 N=7890 (2%)	A39, A87, G00-G03 N=13 (2%)	W00-W19 N=49 (3%)	X40-X49 N=433 (3%)	X60-X84 N=1760 (2%)	D00-D48 N=2056 (2%)	J40-J47 N=3818 (2%)
10	J40-J47 N=6993 (2%)	G40, G41 N=11 (2%)	Q00-Q99 N=37 (2%)	W00-W19 N=336 (2%)	E10-E14 N=1481 (2%)	C81-C96 N=2021 (2%)	C61 N=3340 (1%)
R00-R99	N=42633 (10%)	N=14 (2%)	N=160 (8%)	N=2227 (15%)	N=9467 (12%)	N=6191 (7%)	N=24532 (11%)

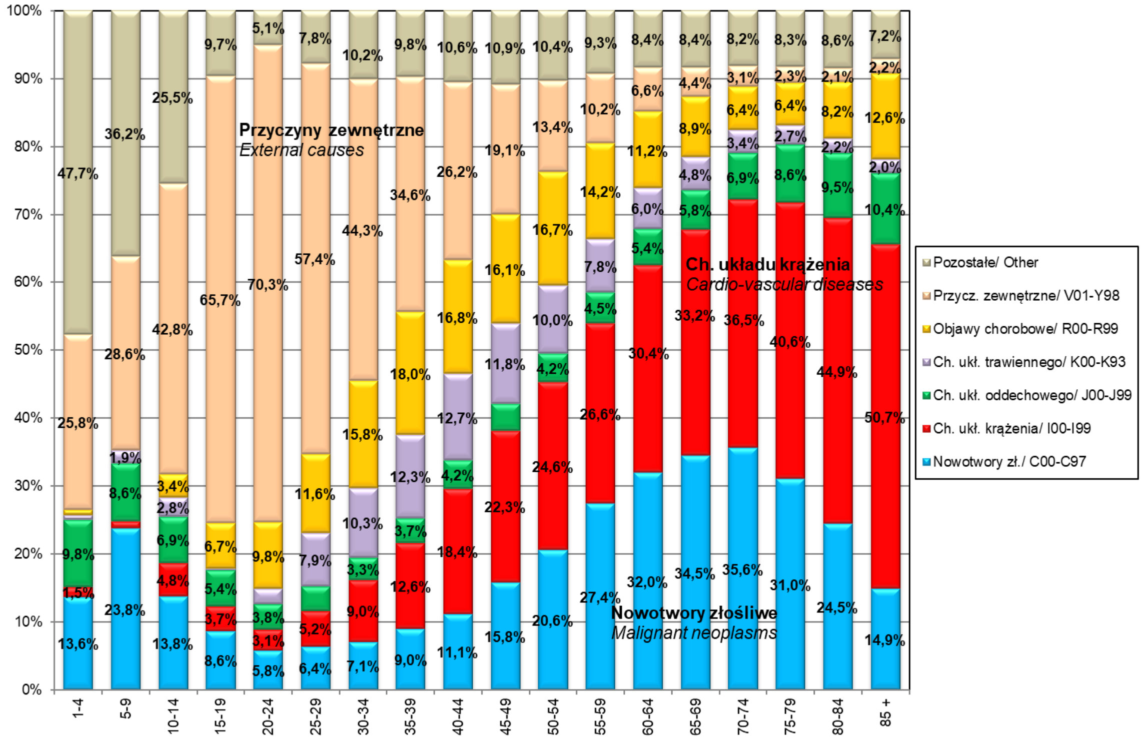


Fig. 2.16a. The proportion of death from the main groups of the causes in men by 5-year age groups in 2018 (based on SP data)

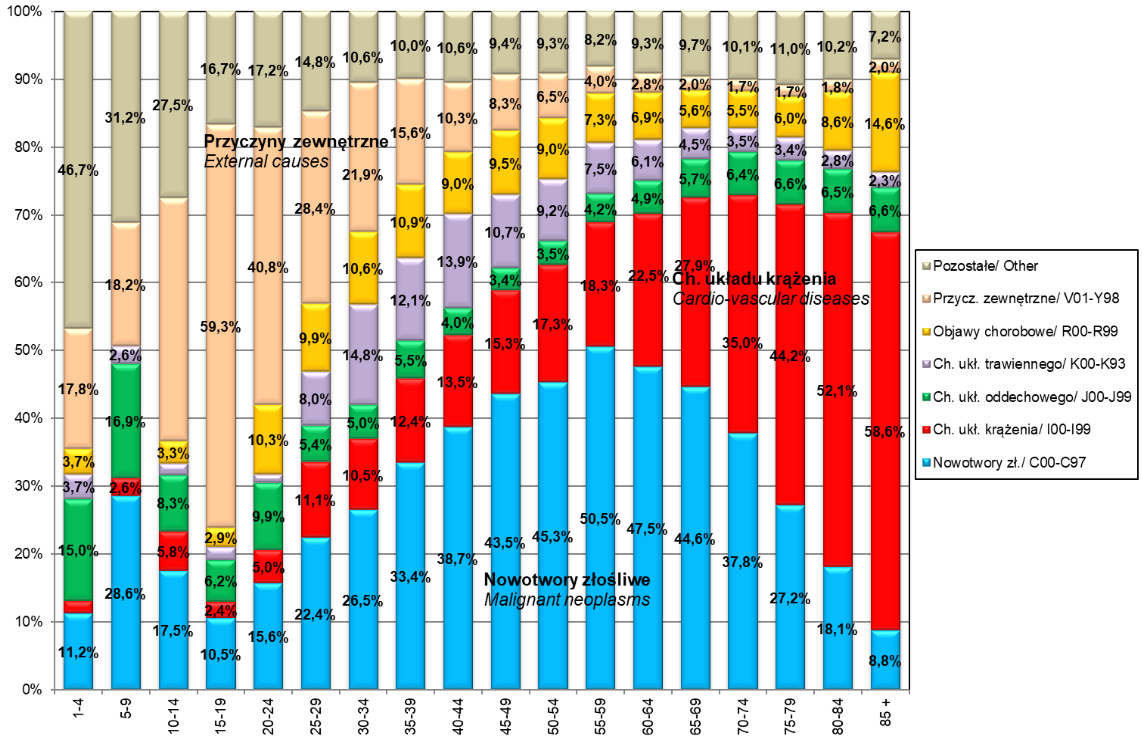


Fig. 2.16b. The proportion of death from the main groups of the causes in women by 5-year age groups in 2018 (based on SP data)

If we assume that death before the age of 75 is premature[21], it brings the potential years of life lost (PYLL), which results from the difference between the age at death and the age of 75. For instance, a man who died in 2018 at the age of 20 lost 55 potential years of life, while a woman who died at the age of 65 lost 10 such years. For this reason, deaths at a younger age are of greater importance than in older age. Taking this fact into consideration, it is possible to calculate the degree to which the respective causes of death contribute to the potential years of life lost by the inhabitants of Poland. The PYLL indicator is among the basic measures of premature mortality burden. Based on OECD data, Poland belongs to the group of developed countries which evidently have a problem with the premature mortality of the population[22].

In 2018, as a result of deaths before the age of 75, men in Poland lost 863,811 (10,029.3 per 100,000 population) potential years of life, and women 801,741 years (4,043.2 per 100,000 population). Fig. 2.17 presents the percentage of deaths caused by particular diseases or their groups and external factors in the total number of potential lost years of life in 2018, for both men and women. In the case of women, the dominant cause of prematurely lost years of life are malignant neoplasms which are responsible for nearly 40% of PYLL. The significance of cardiovascular diseases is smaller by half. The neoplasms which are the most common cause of the premature mortality of women include mostly the malignant neoplasm of the trachea, bronchus and lung, as well as breast cancer. It should be noted that cirrhosis and chronic liver diseases are responsible for almost identical potential years of life lost as cerebrovascular diseases, while neoplasms of the colon, rectum and anus cause a greater loss of potential years of life among women than cervical cancer.

In the case of men, the greater burden of premature mortality is related to cardiovascular diseases (22.3%) than to malignant neoplasms (21.3%), which in turn are followed by external causes (18.6%). Among CVDs, the dominant cause of premature deaths of men are heart diseases which are responsible for over four times more potential years of life lost than cerebrovascular diseases. It should be mentioned that heart diseases are only slightly less responsible for premature deaths among men than all external factors. In the latter group, suicides are the cause of greater burden of the premature mortality of men than transport accidents.

In order to emphasise the growing significance of the health consequences of alcohol consumption, the analysis also includes lost years of life due to diseases and health incidents

[21] The adopted threshold is a matter of convention; the same is used in calculations in the USA and England, while OECD and Eurostat assume 70 years.
[22] https://data.oecd.org/healthstat/potential-years-of-life-lost.htm (19.06.2020)

associated directly with alcohol consumption. The classification used by OECD and Eurostat was used to determine those causes[23].

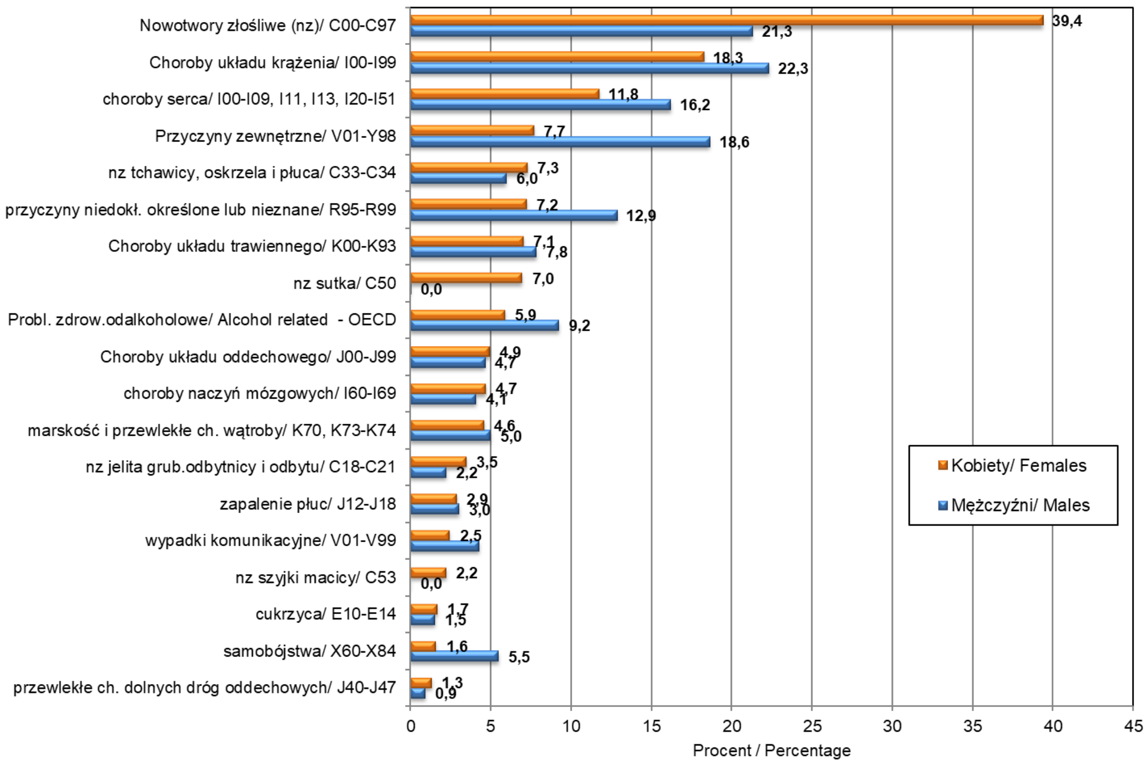


Fig. 2.17. Potential years of life lost (PYLL-75) of men and women for main causes of death in Poland in 2018 (authors' own calculations)

After eliminating the impact of differences in the age structure in subsequent years, and between men and women (the national age structure in 2018 was used as the basis), it can be stated that the burden of premature mortality of men is 2.5 times higher than that of women (Tab. 2.4a and 2.4b). The burden of premature mortality (PYLL) in 2014-2018 was at a relatively stable level.

While assessing changes in the potential years of life lost for specific causes, in 2014-2018, attention should be drawn to their considerable increase due to diabetes, respiratory system diseases, including in particular pneumonia, chronic liver diseases and all causes in general directly associated with alcohol consumption, and in 2014-2017 for unspecified causes. In 2014-2017 the potential years of life lost indicators dropped significantly for cardiovascular

[23] OECD, EUROSTAT, Avoidable mortality: OECD/Eurostat lists of preventable and treatable causes of death (November 2019 version)), November 2019 http://www.oecd.org/health/health-systems/Avoidable-mortality-2019-Joint-OECD-Eurostat-List-preventable-treatable-causes-of-death.pdf

diseases, in particular for heart diseases (although in 2018 they unfortunately grew) and, in the whole 2014-2018 period, for suicides.

Table 2.4a. Age-standardised rates of potential years of life lost (PYLL-75) of men by main causes of death in Poland in years 2014-2018 (per 100,000 population) (authors' own calculations)

Causes of death (ICD-10)	2014	2015	2016	2017	2018
Total	10,095.8	10,189.7	9,995.1	9,908.0	10,022.5
of which:					
Certain infectious and parasitic diseases (A00-B99)	81.2	90.1	85.2	74.0	72.2
Malignant neoplasms (C00-C97)	2,434.7	2,421.6	2,312.5	2,229.0	2,183.8
Malignant neoplasm of stomach (C16)	151.6	151.8	145.1	130.8	127.3
Malignant neoplasm of colon, rectum and anus (C18-C21)	246.0	244.4	236.5	240.4	230.1
Malignant neoplasm of trachea, bronchus and lung (C33-C34)	728.8	726.6	696.2	641.8	618.4
Malignant neoplasm of prostate (C61)	93.0	89.4	92.0	92.1	92.5
Diabetes (E10-E14)	123.2	140.9	143.7	151.6	154.3
Diseases of the circulatory system (I00-I99)	2,738.3	2,819.3	2,470.4	2,207.3	2,280.4
heart diseases (I00-I09, I11, I13, I20-I51)	2,092.6	2,188.9	1,827.9	1,568.3	1,652.3
acute myocardial infarction (I21-I22)	416.0	415.5	361.7	331.7	318.7
cerebrovascular diseases (I60-I69)	466.8	439.9	423.8	427.1	415.5
Diseases of the respiratory system (J00-J99)	372.8	415.3	428.0	418.8	470.4
pneumonia (J12-J18)	230.8	251.3	252.3	246.5	302.6
chronic lower respiratory diseases (J40-J47)	97.3	104.1	95.4	99.7	97.0
Diseases of the digestive system (K00-K93)	643.6	653.1	706.6	729.5	776.3
chronic diseases of liver (K70, K73, K74)	378.7	403.4	444.1	451.9	493.1
Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified (R00-R99)	921.0	997.5	1,176.6	1,374.3	1,279.8
External causes of morbidity and mortality (V01-Y98)	2,003.8	1,823.9	1,736.1	1,718.2	1,811.6
transport accidents (V01-V99)	439.7	408.7	426.3	393.9	413.7
falls (W00-W19)	184.3	157.1	156.2	159.7	157.9
intentional self-harm (X60-X84)	707.7	643.3	553.6	541.2	531.8
Alcohol related	752.3	786.0	825.6	872.2	912.3
Avoidable	6,747.3	6,671.1	6,543.5	6,535.0	6,653.6
Preventable	4,777.5	4,679.9	4,587.3	4,548.6	4,640.0
Amenable	1,969.8	1,991.1	1,956.2	1,986.4	2,013.6

Table 2.4b. Age-standardised rates of potential years of life lost (PYLL-75) of women for main causes of death in Poland in years 2014-2018 (per 100,000 population) (authors' own calculations)

Causes of death	2014	2015	2016	2017	2018
Total	4,140.1	4,077.4	3,991.1	4,011.0	4,034.6
of which:					
Certain infectious and parasitic diseases (A00-B99)	34.2	33.1	30.6	26.2	24.4
Malignant neoplasms (C00-C97)	1,684.4	1,646.9	1,583.3	1,589.1	1,574.4

malignant neoplasm of colon, rectum and anus (C18-C21)	138.7	138.4	141.1	136.5	139.3
malignant neoplasm of trachea, bronchus and lung (C33-C34)	313.5	306.6	294.8	293.6	286.5
malignant neoplasm of breast (C50)	295.0	285.3	286.0	289.6	281.4
malignant neoplasm of cervix uteri (C53)	100.3	95.4	89.1	96.2	90.3
Diabetes (E10-E14)	56.4	62.5	61.6	60.9	65.5
Diseases of the circulatory system (I00-I99)	873.4	877.0	768.8	707.3	720.4
heart diseases (I00-I09, I11, I13, I20-I51)	598.6	618.0	514.6	446.3	464.1
acute myocardial infarction (I21-I22)	100.5	97.5	86.9	80.4	79.8
cerebrovascular diseases (I60-I69)	217.0	199.1	181.4	188.8	185.8
Diseases of the respiratory system (J00-J99)	156.7	185.4	173.0	182.2	198.9
pneumonia (J12-J18)	93.0	104.4	90.4	97.2	116.9
chronic lower respiratory diseases (J40-J47)	42.2	52.0	46.0	51.1	51.1
Diseases of the digestive system (K00-K93)	236.6	232.1	257.6	272.7	287.1
chronic diseases of liver (K70, K73, K74)	136.2	136.7	153.3	173.3	187.6
Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified (R00-R99)	200.4	221.1	271.9	299.1	293.5
External causes of morbidity and mortality (V01-Y98)	362.1	320.8	314.9	304.0	320.2
transport accidents (V01-V99)	108.5	98.8	106.4	97.6	103.0
falls (W00-W19)	31.4	22.4	26.4	23.6	20.4
intentional self-harm (X60-X84)	96.1	87.8	72.7	71.1	66.7
Alcohol related	183.3	183.7	203.3	225.5	242.0
Avoidable	2,672.9	2,604.7	2,580.1	2,606.9	2,628.9
Preventable	1,399.7	1,348.1	1,335.9	1,358.6	1,372.7
Amenable	1,273.2	1,256.6	1,244.2	1,248.3	1,256.2

Below is a detailed description of mortality for the most frequent causes of death in Poland. Differences between men and women, between the inhabitants of urban and rural areas, and between voivodships are presented. Furthermore, the authors present differences in mortality from selected diseases between the Polish population and the inhabitants of selected European Union countries. For a better comparison of the force of mortality in various years and in different populations, e.g. of men and women, of the inhabitants of urban and rural areas, and of the inhabitants of various voivodships, the rates were age-standardised. Furthermore, crude death rates in Poland in 2017 and 2018 were presented, demonstrating the actual mortality of inhabitants due to a specific group of diseases in the given year.

2.6. Mortality due to cardiovascular diseases

The mortality from cardiovascular diseases (CVDs) and their proportion in total deaths has gradually decreased after 2015 (Tab. 2.5a and 2.5b). However, these diseases are still responsible for the biggest risk of death in the Polish population. In 2018, 167,942 people in Poland, i.e. 437 per 100,000 population, died due to these diseases.

Table 2.5a. Mortality of men by main groups of causes in 2009-2018 (authors' own calculations based on SP data)

Causes of death (ICD-10)	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Age-standardised death rates per 100,000 men										
Malignant neoplasms (C00-C97)	448.4	432.0	422.8	422.8	410.2	405.1	426.5	414.3	400.6	398.8
Diseases of the circulatory system (I00-I99)	855.1	808.8	765.4	780.7	756.1	703.1	723.9	656.3	636.4	624.1
Diseases of the respiratory system (J00-J99)	126.0	116.0	115.9	113.2	122.5	106.4	119.9	111.6	122.1	125.3
Diseases of the digestive system (K00-K93)	73.5	69.6	69.0	67.9	66.2	60.6	57.3	61.6	62.4	64.2
Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified (R00-R99)	116.0	113.5	108.8	101.1	106.4	118.2	105.1	117.8	150.4	163.2
External causes (V01-Y98)	112.6	109.6	108.7	107.3	101.3	96.2	87.5	84.6	83.9	87.6
Percentage in deaths of men in total										
Malignant neoplasms (C00-C97)	25.7	25.9	26.0	26.1	25.9	26.9	27.3	27.3	26.3	25.9
Diseases of the circulatory system (I00-I99)	41.0	40.8	40.0	41.2	40.9	40.3	40.8	38.2	36.5	35.9
Diseases of the respiratory system (J00-J99)	6.0	5.7	6.0	5.8	6.5	5.9	6.6	6.4	6.9	7.1
Diseases of the digestive system (K00-K93)	4.7	4.7	4.8	4.7	4.6	4.5	4.2	4.6	4.6	4.7

Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified (R00-R99)	6.5	6.7	6.6	6.2	6.6	7.6	7.0	8.2	10.1	10.5
External causes (V01-Y98)	9.1	9.1	9.2	8.9	8.4	8.3	7.2	7.1	6.9	7.0

Table 2.5b. Mortality of women by main groups of causes in 2009-2018 (authors' own calculations based on SP data)

Causes of death (ICD-10)	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Age-standardised death rates per 100,000 women										
Malignant neoplasms (C00-C97)	230.1	224.6	220.2	223.6	219.1	220.9	227.5	223.1	221.3	222.5
Diseases of the circulatory system (I00-I99)	575.5	540.5	510.7	516.4	505.6	468.9	487.3	441.6	434.1	425.9
Diseases of the respiratory system (J00-J99)	50.7	45.4	45.4	45.9	52.4	45.2	54.9	49.0	57.6	58.4
Diseases of the digestive system (K00-K93)	40.8	38.6	38.2	37.5	37.9	34.1	31.2	33.0	34.4	34.3
Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified (R00-R99)	68.0	68.0	63.4	56.4	60.8	67.0	58.1	62.7	80.6	93.8
External causes (V01-Y98)	31.3	29.4	28.9	29.2	28.1	26.4	25.0	24.1	24.1	24.6
Percentage in deaths of women in total										
Malignant neoplasms (C00-C97)	22.6	22.8	22.9	23.0	22.6	23.7	23.6	24.1	23.1	22.9

Diseases of the circulatory system (I00-I99)	52.1	51.8	51.1	51.7	51.1	50.3	51.0	48.8	46.7	45.5
Diseases of the respiratory system (J00-J99)	4.7	4.4	4.6	4.6	5.3	4.8	5.7	5.4	6.1	6.2
Diseases of the digestive system (K00-K93)	3.9	3.9	4.0	3.9	3.9	3.7	3.3	3.6	3.6	3.6
Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified (R00-R99)	5.9	6.3	6.2	5.6	6.1	7.2	6.1	7.0	8.7	10.1
External causes (V01-Y98)	3.1	3.0	3.1	3.1	2.9	2.9	2.6	2.6	2.5	2.5

Women die more often than men due to CVDs (in 2018 crude death rates for both groups were 460 and 413 per 100,000, respectively); however, this difference results from the older average age of women. If the disparity in the age structure of both sexes is eliminated, it turns out that these diseases pose a much greater threat to men's life – the standardised death rate in 2018 for men was 46.5% higher than for women (Tab. 2.6 and 2.7).

Table 2.6. Crude death rates by sex and cause of death in 2017 and 2018 (per 100,000 population)

Causes of death (ICD-10)	Total		Men		Women	
	2017	2018	2017	2018	2017	2018
Total of which:	1,048.5	1,078.3	1,117.2	1,149.7	984.1	1,011.4
Certain infectious and parasitic diseases (A00-B99)	5.0	4.8	5.6	5.5	4.4	4.0
tuberculosis (A15-A19)	1.3	1.4	2.1	2.2	0.5	0.5
Malignant neoplasms (C00-C97)	259.3	263.9	293.5	297.9	227.3	232.1
Malignant neoplasm of stomach (C16)	12.8	12.8	17.0	17.0	9.0	8.8
Malignant neoplasm of colon, rectum and anus (C18-C21)	31.9	32.4	37.1	37.6	27.1	27.5
Malignant neoplasm of trachea, bronchus and lung (C33-C34)	60.8	61.8	83.5	84.1	39.5	40.8
Malignant neoplasm of breast (C50)	17.5	18.1	0.4	0.4	33.6	34.8

Malignant neoplasm of cervix uteri (C53)	4.2	4.1	-	-	8.1	8.0
Malignant neoplasm of prostate (C61)	14.0	14.5	28.9	30.0	-	-
Malignant neoplasm of bladder (C67)	10.3	10.3	16.4	16.5	4.5	4.5
Diabetes (E10-E14)	22.9	23.5	21.0	21.8	24.6	25.0
Mental and behavioural disorders (F00-F99)	9.7	9.8	15.3	15.8	4.4	4.2
Diseases of the nervous system (G00-G99)	16.8	17.0	15.6	15.9	18.0	18.0
Diseases of the circulatory system (I00-I99)	434.8	437.2	408.1	413.0	459.9	459.9
heart diseases (I00-I09, I11, I13, I20-I51)	253.4	257.8	255.6	262.5	251.4	253.3
acute myocardial infarction (I21-I22)	32.3	31.3	39.6	38.5	25.6	24.6
cerebrovascular diseases (I60-I69)	79.7	78.0	73.4	71.6	85.6	83.9
Diseases of the respiratory system (J00-J99)	68.5	71.7	77.0	81.7	60.5	62.4
pneumonia (J12-J18)	41.6	46.6	43.9	50.8	39.4	42.6
chronic lower respiratory diseases (J40-J47)	19.1	18.2	24.3	22.8	14.3	13.9
Diseases of the digestive system (K00-K93)	43.5	45.1	51.7	54.5	35.8	36.2
chronic diseases of liver (K70, K73, K74)	18.0	19.4	25.5	27.8	10.9	11.5
Diseases of the genitourinary system (N00-N99)	10.2	12.1	9.7	11.3	10.8	12.8
Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified (R00-R99)	99.0	111.0	113.2	120.1	85.8	102.4
External causes (V01-Y98)	50.1	52.3	76.8	80.7	25.1	25.7
transport accidents (V01-V99)	9.0	9.6	14.1	15.1	4.3	4.4
falls (W00-W19)	11.9	11.8	13.5	13.3	10.5	10.5
intentional self-harm (X60-X84)	11.7	11.6	20.9	20.8	3.0	2.9
Alcohol related	29.6	31.3	46.9	49.7	13.4	14.2
Avoidable*	331.6	343.5	448.8	465.2	216.7	224.2
Preventable*	208.8	215.6	303.8	313.8	115.7	119.4
Amenable*	122.8	127.9	145.0	151.4	101.0	104.8

* Population below the age of 75

Table 2.7. Standardised death rates by sex and causes of death in 2017 and 2018 (per 100,000 population) (authors' own calculations based on SP data)

Causes of death (ICD-10)	Total		Men		Women	
	2017	2018	2017	2018	2017	2018
Total of which:	1,207.4	1,218.8	1,587.3	1,599.3	939.2	947.7
Certain infectious and parasitic diseases (A00-B99)	5.6	5.3	7.3	7.0	4.2	3.8
tuberculosis (A15-A19)	1.3	1.4	2.3	2.4	0.5	0.5
Malignant neoplasms (C00-C97)	289.6	290.0	400.6	398.8	221.3	222.5
Malignant neoplasm of stomach (C16)	14.4	14.1	23.2	22.8	8.7	8.5
Malignant neoplasm of colon, rectum and anus (C18-C21)	36.6	36.4	52.9	52.8	26.4	26.3
Malignant neoplasm of trachea, bronchus and lung (C33-C34)	66.1	66.0	108.3	107.1	38.3	38.7
Malignant neoplasm of breast (C50)	19.6	19.9	0.6	0.6	32.7	33.3
Malignant neoplasm of cervix uteri (C53)	4.5	4.4	-	-	7.9	7.7
Malignant neoplasm of prostate (C61)	16.6	16.9	46.8	47.4	-	-
Malignant neoplasm of bladder (C67)	12.0	11.7	25.1	24.5	4.4	4.3
Diabetes (E10-E14)	26.8	26.9	30.2	30.7	23.7	23.6

Mental and behavioural disorders (F00-F99)	9.9	10.0	16.3	16.8	4.2	3.9
Diseases of the nervous system (G00-G99)	19.4	19.3	21.9	21.9	17.5	17.2
Diseases of the circulatory system (I00-I99)	518.9	510.0	636.4	624.1	434.1	425.9
heart diseases (I00-I09, I11, I13, I20-I51)	299.5	297.9	386.9	384.8	238.0	235.4
acute myocardial infarction (I21-I22)	36.8	35.1	53.9	51.7	24.5	23.2
cerebrovascular diseases (I60-I69)	94.5	90.5	111.5	105.9	81.6	78.5
Diseases of the respiratory system (J00-J99)	80.9	82.9	122.1	125.3	57.6	58.4
pneumonia (J12-J18)	49.6	54.3	71.4	79.5	37.2	39.6
chronic lower respiratory diseases (J40-J47)	22.4	20.8	38.1	34.5	13.8	13.3
Diseases of the digestive system (K00-K93)	47.3	48.1	62.4	64.2	34.4	34.3
chronic diseases of liver (K70, K73, K74)	18.1	19.3	26.7	28.6	10.5	11.1
Diseases of the genitourinary system (N00-N99)	12.2	14.1	15.5	17.7	10.3	12.0
Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified (R00-R99)	112.4	125.0	150.4	163.2	80.6	93.8
External causes of morbidity and mortality (V01-Y98)	52.0	54.0	83.9	87.6	24.1	24.6
transport accidents (V01-V99)	9.1	9.6	14.4	15.6	4.3	4.4
falls (W00-W19)	13.8	13.4	18.7	18.0	9.8	9.6
intentional self-harm (X60-X84)	11.4	11.4	20.8	21.0	3.0	2.9
Alcohol related	29.4	30.9	48.1	50.5	12.9	13.5
Avoidable*	347.2	350.5	502.8	507.9	214.4	215.3
Preventable*	216.4	218.6	335.8	339.3	113.5	114.1
Amenable*	130.8	131.8	167.0	168.5	100.8	101.2

* Population below the age of 75

While analysing the mortality of the Polish population due to cardiovascular diseases it should be borne in mind that the comparative analysis of mortality by more detailed CVD subgroups is still limited, both in regional and international terms. On the one hand, there are significant differences between voivodships in assigning and coding the causes of death for many diseases. On the other hand, there is the phenomenon of attributing as the causes of death the diagnosis/codes defined by WHO experts as garbage codes[24]. In 2018, 41.4% of all deaths due to CVDs were assigned codes included in that list, which is some improvement in comparison to the situation in 2016, when the percentage was at the level of 46.7%. Differences between voivodships are extremely high, as the percentage of deaths for these causes ranges from 11% in the Pomorskie Voivodship to 56% in the Łódzkie Voivodship. Because of such problems in the presented analysis, among CVDS the following were distinguished: heart

[24] *WHO methods and data sources for country-level causes of death 2000-2012*, Global Health Estimates Technical Paper WHO/HIS/HSI/GHE/2014.7, WHO, Geneva, May 2014
Na co umarł pacjent – czyli, co jest wpisywane na kartach zgonów (What was the cause of death, i.e. what is entered in death reports) http://stat.gov.pl/obszary-tematyczne/ludnosc/statystyka-przyczyn-zgonow/na-co-umarl-pacjent-czyli-co-jest-wpisywane-na-kartach-zgonow-,1,1.html

diseases in general (ICD-10 I00–I09, I11, I13 and I20–I51), including myocardial infarction (I21-I22) and cerebrovascular diseases (I60-I69).

The most common cause of death among cardiovascular diseases are **heart diseases** (in 2018, 99,000 deaths, including myocardial infarction – 12,000, which accounted for 59.0% and 7.2% of all deaths from cardiovascular diseases, respectively). The second group are **cerebrovascular diseases** (30,000 deaths, 17.3% of the whole CVDs group). For all these causes, age-standardised death rates decreased in 2018 in comparison to the previous year (for heart diseases by 14% and for cerebrovascular diseases by 7%) (Tab. 2.7). As a result of a change in the population age structure, the crude death rates due to heart diseases, and hence the actual magnitude of the problem, have remained high (Tab. 2.6).

The inhabitants of rural areas are at a higher risk of death from CVDs than the inhabitants of urban areas, which can be clearly noticed after the age-standardisation of mortality rates (the inhabitants of urban areas are on average older than the inhabitants of rural areas) – the mortality of the rural population is 20.5% higher (Tab. 2.8 and 2.9). However, an exception is myocardial infarction among men that causes death slightly more often among urban than rural inhabitants. The excess mortality of the rural population as compared to the urban population is similar for heart diseases (16.2%) and for cerebrovascular diseases (18.4%).

Table 2.8. Crude death rates by sex, place of residence and cause of death in 2018 (per 100,000 population)

Causes of death (ICD-10)	Total		Men		Women	
	Urban areas	Rural areas	Urban areas	Rural areas	Urban areas	Rural areas
Total of which:	1,105.3	1,037.5	1,182.7	1,102.3	1,035.7	973.0
Certain infectious and parasitic diseases (A00-B99)	5.5	3.7	6.4	4.3	4.7	3.1
tuberculosis (A15-A19)	1.4	1.3	2.4	2.0	0.5	0.6
Malignant neoplasms (C00-C97)	285.6	231.3	316.7	271.0	257.5	191.9
Malignant neoplasm of stomach (C16)	13.4	11.8	17.9	15.6	9.3	8.0
Malignant neoplasm of colon, rectum and anus (C18-C21)	35.2	28.2	40.7	33.1	30.1	23.3
Malignant neoplasm of trachea, bronchus and lung (C33-C34)	66.0	55.3	86.5	80.7	47.6	30.0
Malignant neoplasm of breast (C50)	21.1	13.8	0.4	0.4	39.6	27.1
Malignant neoplasm of cervix uteri (C53)	4.8	3.2	-	-	9.1	6.3
Malignant neoplasm of prostate (C61)	15.6	12.8	32.9	25.8	-	-
Malignant neoplasm of bladder (C67)	11.6	8.5	18.4	13.8	5.4	3.1
Diabetes (E10-E14)	23.8	23.0	23.4	19.6	24.2	26.4
Mental and behavioural disorders (F00-F99)	9.8	9.7	15.6	16.0	4.6	3.5
Diseases of the nervous system (G00-G99)	19.0	13.9	17.6	13.6	20.3	14.3
Diseases of the circulatory system (I00-I99)	432.3	444.5	418.1	405.7	445.2	483.1

heart diseases (I00-I09, I11, I13, I20-I51)	258.7	256.4	268.9	253.4	249.4	259.4
acute myocardial infarction (I21-I22)	33.4	28.3	41.9	33.7	25.7	22.8
cerebrovascular diseases (I60-I69)	77.9	78.2	72.5	70.4	82.7	85.9
Diseases of the respiratory system (J00-J99)	75.6	65.9	85.0	77.0	67.2	54.9
pneumonia (J12-J18)	50.4	40.8	55.7	43.8	45.6	37.9
chronic lower respiratory diseases (J40-J47)	17.8	18.8	20.5	26.1	15.4	11.5
Diseases of the digestive system (K00-K93)	49.5	38.4	59.4	47.6	40.5	29.3
chronic diseases of liver (K70, K73, K74)	21.9	15.7	30.9	23.4	13.7	8.0
Diseases of the genitourinary system (N00-N99)	13.2	10.4	12.5	9.6	13.8	11.2
Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified (R00-R99)	111.5	110.2	122.5	116.8	101.7	103.6
External causes of morbidity and mortality (V01-Y98)	48.1	58.8	72.9	91.9	25.7	25.8
transport accidents (V01-V99)	7.5	12.6	11.6	20.1	3.9	5.2
falls (W00-W19)	12.2	11.4	13.9	12.4	10.6	10.4
intentional self-harm (X60-X84)	9.6	14.6	17.3	25.9	2.6	3.3
Alcohol related	33.4	28.3	52.0	46.4	16.6	10.2
Avoidable*	356.5	324.2	471.7	456.1	248.0	187.0
Preventable*	220.4	208.5	313.5	314.3	132.8	98.5
Amenable*	136.1	115.7	158.2	141.8	115.2	88.5

Population below the age of 75

Table 2.9. Age-standardised death rates by sex, place of residence and cause of death in 2018 (per 100,000 population)

Causes of death (ICD-10)	Total		Men		Women	
	Urban areas	Rural areas	Urban areas	Rural areas	Urban areas	Rural areas
Total of which:	1,178.5	1,289.3	1,539.9	1,704.6	929.7	976.9
Certain infectious and parasitic diseases (A00-B99)	5.8	4.4	7.7	6.1	4.2	3.1
tuberculosis (A15-A19)	1.4	1.5	2.4	2.5	0.5	0.6
Malignant neoplasms (C00-C97)	294.2	282.3	398.4	398.9	232.0	204.5
Malignant neoplasm of stomach (C16)	13.8	14.6	22.5	23.3	8.4	8.5
Malignant neoplasm of colon, rectum and anus (C18-C21)	37.1	35.3	53.7	51.1	27.2	24.7
Malignant neoplasm of trachea, bronchus and lung (C33-C34)	65.9	66.2	103.4	113.5	42.0	32.3
Malignant neoplasm of breast (C50)	21.8	16.5	0.6	0.6	35.9	28.6
Malignant neoplasm of cervix uteri (C53)	4.8	3.7	-	-	8.3	6.7
Malignant neoplasm of prostate (C61)	17.0	16.8	47.9	46.5	-	-
Malignant neoplasm of bladder (C67)	12.3	10.7	25.4	23.0	4.9	3.3
Diabetes (E10-E14)	25.5	29.4	30.6	30.8	21.7	27.2
Mental and behavioural disorders (F00-F99)	9.7	10.5	16.1	17.9	4.1	3.5
Diseases of the nervous system (G00-G99)	20.5	17.2	23.0	20.1	18.5	14.9
Diseases of the circulatory system (I00-I99)	474.8	572.2	583.8	696.4	397.3	475.5
heart diseases (I00-I09, I11, I13, I20-I51)	281.5	327.1	365.7	418.8	222.9	257.4
acute myocardial infarction (I21-I22)	35.2	34.9	52.7	50.0	23.2	23.4
cerebrovascular diseases (I60-I69)	85.0	100.6	99.3	117.7	74.2	86.2
Diseases of the respiratory system (J00-J99)	82.3	84.2	120.6	134.0	60.3	55.0

pneumonia (J12-J18)	55.5	52.2	81.0	77.2	40.8	37.2
chronic lower respiratory diseases (J40-J47)	19.0	24.2	28.2	45.8	13.9	12.1
Diseases of the digestive system (K00-K93)	50.2	44.5	66.5	60.9	36.8	30.0
chronic diseases of liver (K70, K73, K74)	21.0	16.5	31.1	24.9	12.6	8.4
Diseases of the genitourinary system (N00-N99)	14.5	13.4	18.0	17.0	12.4	11.3
Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified (R00-R99)	119.1	135.3	155.0	178.4	90.4	99.2
External causes of morbidity and mortality (V01-Y98)	48.6	62.9	78.0	102.0	23.8	25.9
transport accidents (V01-V99)	7.5	12.8	11.9	21.0	3.7	5.3
falls (W00-W19)	13.2	13.9	18.1	17.8	9.4	10.1
intentional self-harm (X60-X84)	9.3	14.8	17.1	26.8	2.6	3.4
Alcohol related	31.9	29.4	51.7	48.9	15.3	10.6
Avoidable*	340.7	367.8	489.0	539.7	220.0	206.0
Preventable*	210.0	233.7	323.0	366.2	117.3	107.8
Amenable*	130.7	134.1	166.0	173.5	102.7	98.2

* Population below the age of 75

There is a substantial difference between voivodships in relation the mortality from **cardiovascular diseases in general** (Fig. 2.18a). In 2017-2018 the mortality rate due to CVDs was the lowest in the Mazowieckie Voivodship, where in the last five years of the analysed period there was the highest decrease in the death rate for these causes. The highest mortality recorded five years before and recently concerned the Świętokrzyskie Voivodship, and excess mortality in relation to the whole country increased from 10.3% to 16.5%. During the last five years of the analysed period (from 2012-2013 to 2017-2018) the mortality due to CVDs decreased in Poland by 16.6%, of which to the greatest extent in the Mazowieckie Voivodship (by 27.0%), and to the lowest extent in the Podlaskie and Pomorskie Voivodships (a decrease of 4.2% and 5.0%, respectively). The voivodship differences in the mortality rates due to CVDs decreased in the last five years.

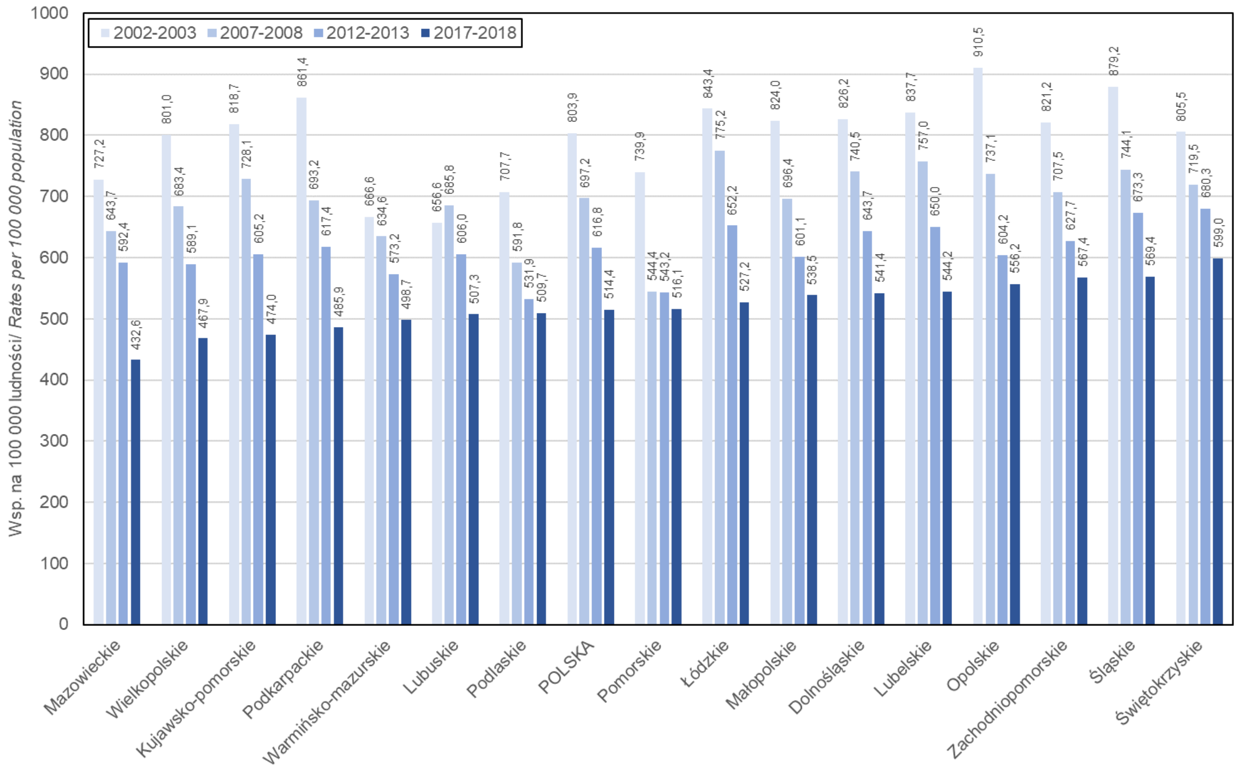


Fig. 2.18a. Age-standardised annual death rates due to diseases of the circulatory system in general (I00-I99) in the total population, by voivodship, in 2002-2003, 2007-2008, 2012-2013 and 2017-2018

For many years mortality due to CVDs of the working-age population aged 25-64 has been the lowest in the Podlaskie Voivodship, and in the last five years it was over 30% lower than the overall value for Poland (Fig. 2.18b). Like in the total population, in the group aged 25-64 the highest reduction in the death rate in the last five years occurred in the Mazowieckie Voivodship. Among the voivodships with a relatively high mortality rate in this group are those located in the western part of the country, i.e. the Zachodniopomorskie, Lubuskie and Dolnośląskie Voivodships, as well as the Śląskie Voivodship.

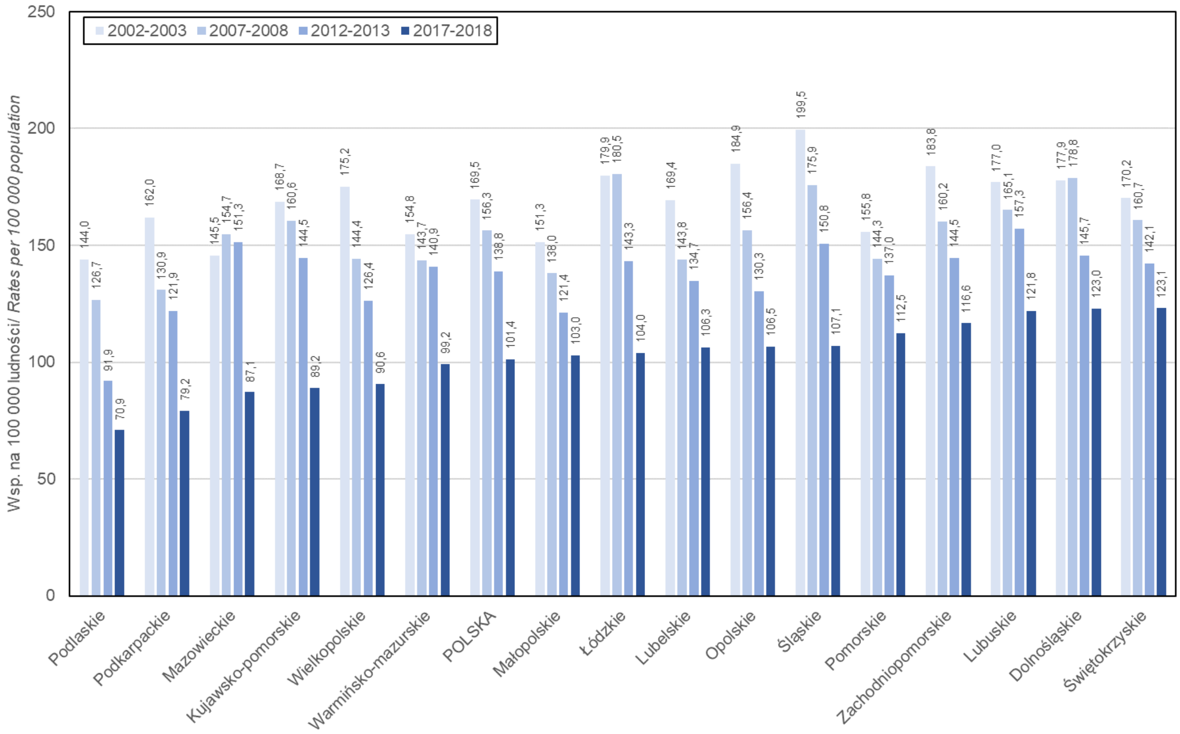


Fig. 2.18b. Age-standardised annual death rates due to diseases of the circulatory system in general (I00-I99) in people aged 25-64, by voivodship, in 2002-2003, 2007-2008, 2012-2013 and 2017-2018

In all voivodships, the inhabitants of rural areas face higher mortality from cardiovascular diseases than the urban population, and in all voivodships mortality among the inhabitants of rural areas is higher than the average for Poland (Fig. 2.19). Mortality among the inhabitants of rural areas in the highest in the Zachodniopomorskie Voivodship, and among those of urban areas in the Śląskie Voivodship. In the Mazowieckie Voivodship, the mortality rate is the lowest both in urban and rural areas, but the difference in these rates is the highest among all voivodships.

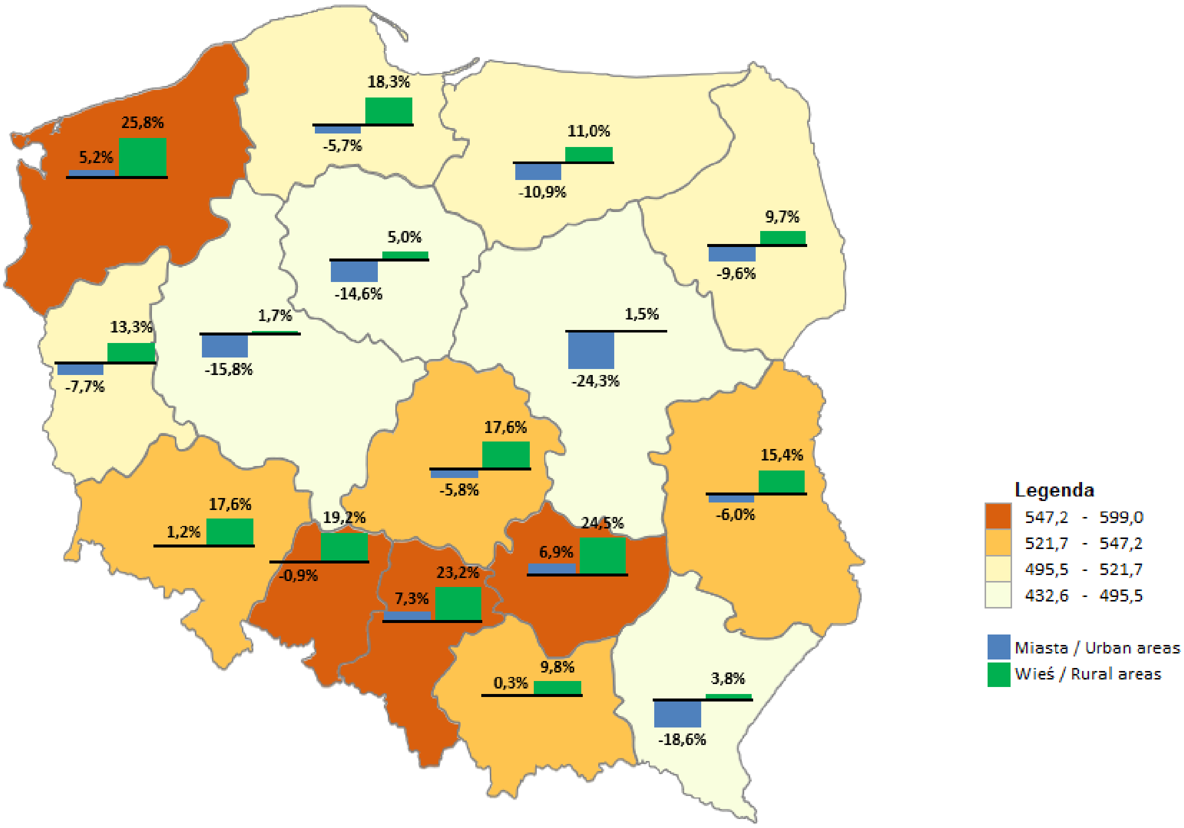


Fig. 2.19. Relative difference (%) in age-standardised death rates due to diseases of the circulatory system in general (I00-I99) in the inhabitants of urban and rural areas, in relation to the death rate in the whole Poland, by voivodship, in 2017-2018

Heart diseases (HDs) (I00–I09, I11, I13, I20–I51) in the last years of the analysed period (2017-2018) pose the highest risk for the inhabitants of the Pomorskie and Podlaskie Voivodships, where the mortality rate was higher than the average for Poland by 28% and 23%, respectively (Fig. 2.20a). As pointed out in previous reports, the assessment of the rate and changes occurring in recent years in the mortality rate from heart diseases of the inhabitants of respective voivodships may be partially disrupted by changes in assigning atherosclerosis as the cause of death. The highest decrease in mortality due to heart diseases in the last five years was observed in the Mazowieckie Voivodship, and due to the fact the drop in the total mortality rate from cardiovascular diseases in the Mazowieckie Voivodship was the sharpest, it can be suspected that it reflected the actual situation for heart diseases. The extent of voivodship differences in the mortality rate from heart diseases was not reduced in the last five years.

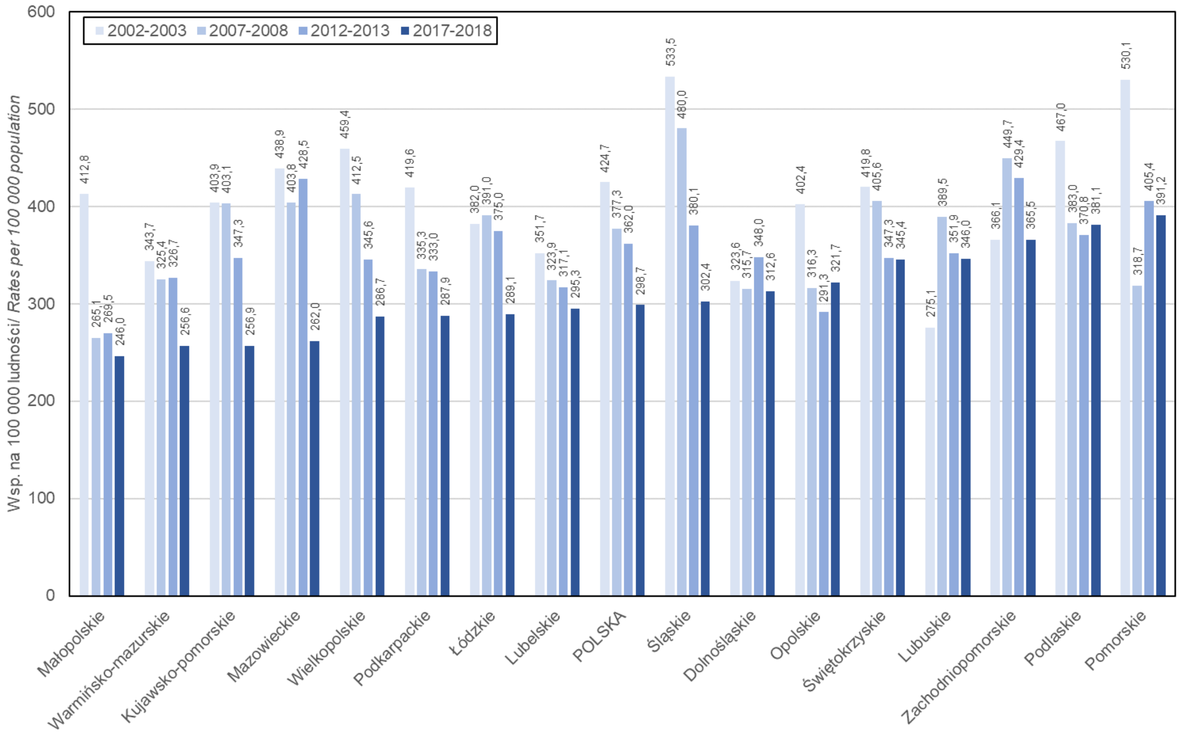


Fig. 2.20a. Age-standardised annual death rates due to heart diseases (I00–I09, I11, I13, I20–I51) in the total population, by voivodship, in 2002-2003, 2007-2008, 2012-2013 and 2017-2018

For several years, mortality from heart diseases among the people of working age (25-64 years) has been at the lowest level in the Podlaskie Voivodship, and currently the level is lower than the general value for Poland by 32.1% (Fig. 2.20b). The sharpest decline in the mortality rate in the last five years (of 51%) was observed in the Kujawsko-Pomorskie Voivodship, and the least pronounced in the Świętokrzyskie Voivodship (of 9.5%), where the mortality rate is currently the highest. Voivodship differences in the mortality rate of young people from heart diseases is still increasing.

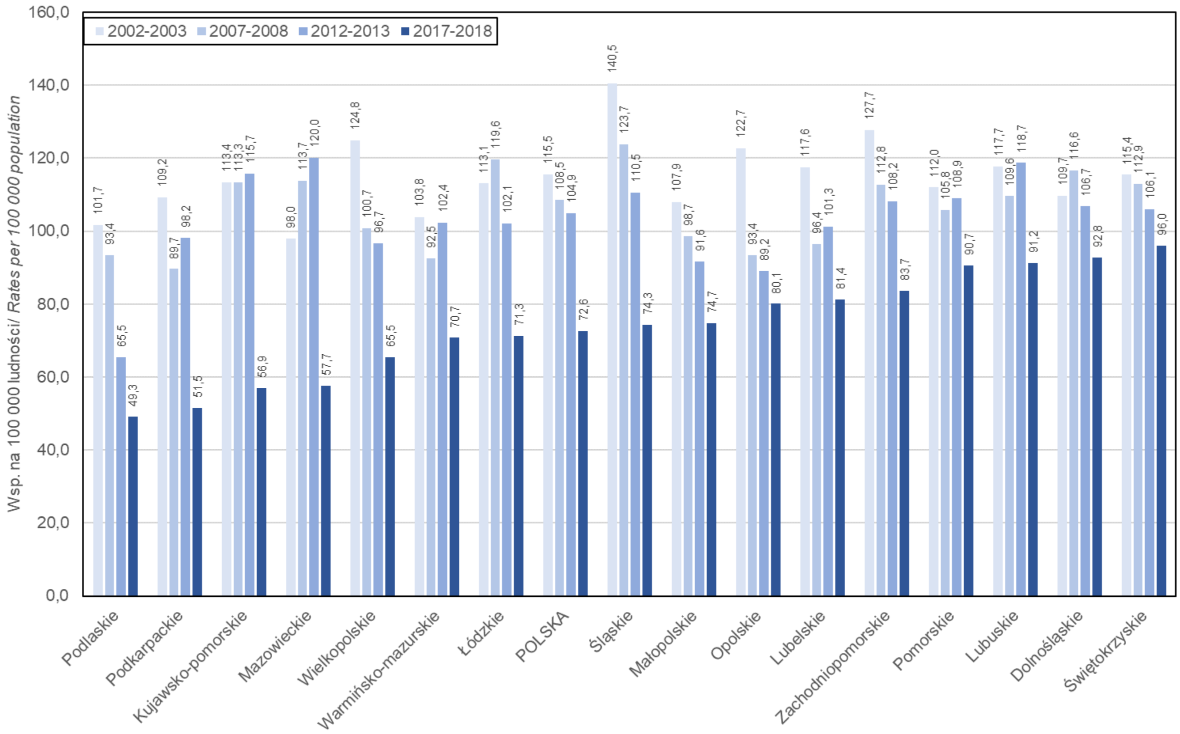


Fig. 2.20b. Age-standardised annual death rates due to heart diseases (I00–I09, I11, I13, I20–I51) in people aged 25-64, by voivodship, in 2002-2003, 2007-2008, 2012-2013 and 2017-2018

Heart diseases in all voivodships pose a higher risk to the inhabitants of rural areas than to those of urban areas. In the Pomorskie Voivodship, the mortality rate both in rural and urban areas is the highest in Poland and exceeds the average for Poland by 55.9% and 22.5%, respectively (Fig. 2.21). The difference in the mortality rates between the inhabitants of urban and rural areas in the Pomorskie Voivodship is the highest in the country.

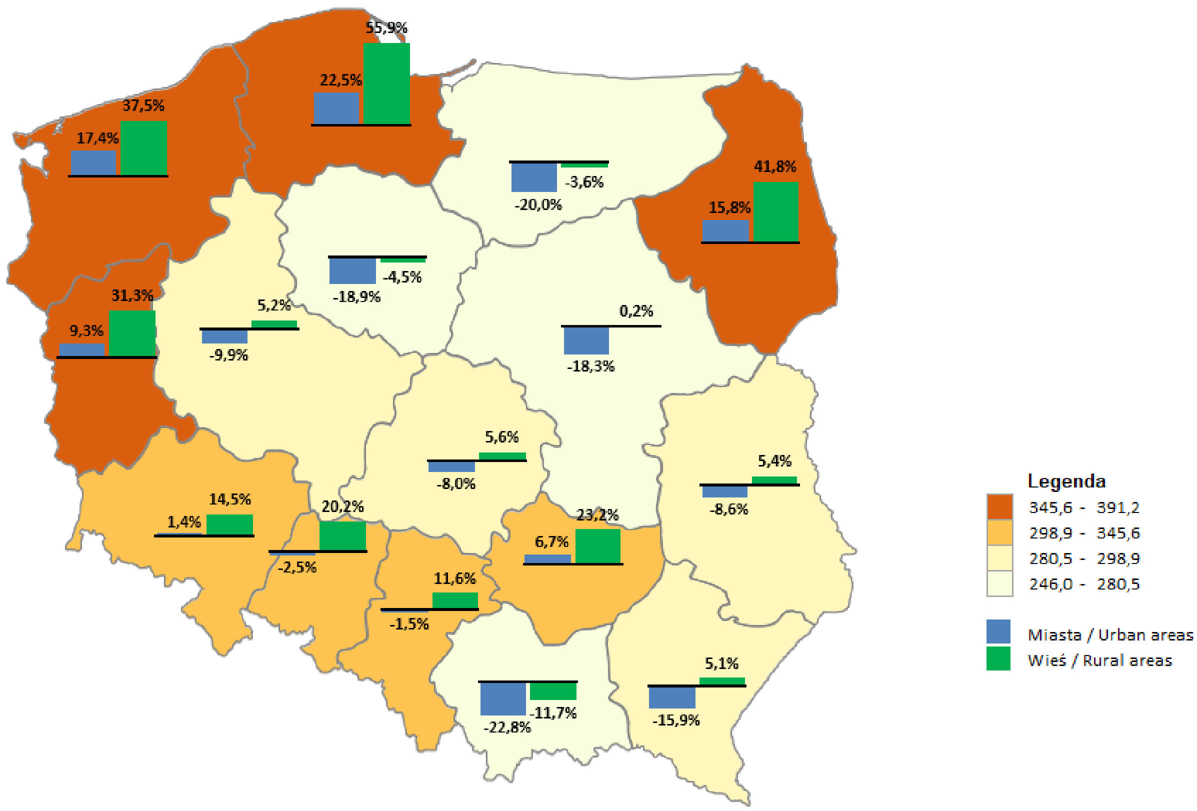


Fig. 2.21. Relative difference (%) in age-standardised death rates due to heart diseases (I00–I09, I11, I13, I20–I51) in the inhabitants of urban and rural areas, in relation to the death rate in the whole Poland, by voivodship, in 2017-2018

In the Lubuskie and Śląskie Voivodships, the mortality from **cerebrovascular diseases** (I60-I69) has been a large problem for years, both in the case of the mortality of all inhabitants and people of working age, and five years before also in the Łódzkie Voivodship, where in the recent years a considerable improvement of the situation has been observed (Fig. 2.22a and 2.22b). The mortality rate of all inhabitants of these two voivodships is currently higher than the national average by 19% and 13%, respectively, and of people aged 25-64 by approx. 19% and 16%, respectively. In all voivodships, mortality due to this group of diseases decreased in the last five years of the analysed period (in national terms, the mortality rate of the whole population and the premature mortality rate decreased by approx. 20% and 22%, respectively). The greatest improvement in the last five years was recorded in the Świętokrzyskie and Lubelskie Voivodships, where the total mortality rate decreased by a third. The mortality rate in the 25-64 age group in the last five years dropped to the greatest extent in the Lubelskie Voivodship – by 34%. In the Łódzkie Voivodship, despite the second sharpest decrease in the mortality rate, its level is still among the highest in the country. Considerations regarding the impact of local tendencies and changes in assigning atherosclerosis as the main cause of death on the reliable assessment of its diversity, and on chances in the mortality rate in voivodships, also apply to cerebrovascular diseases.

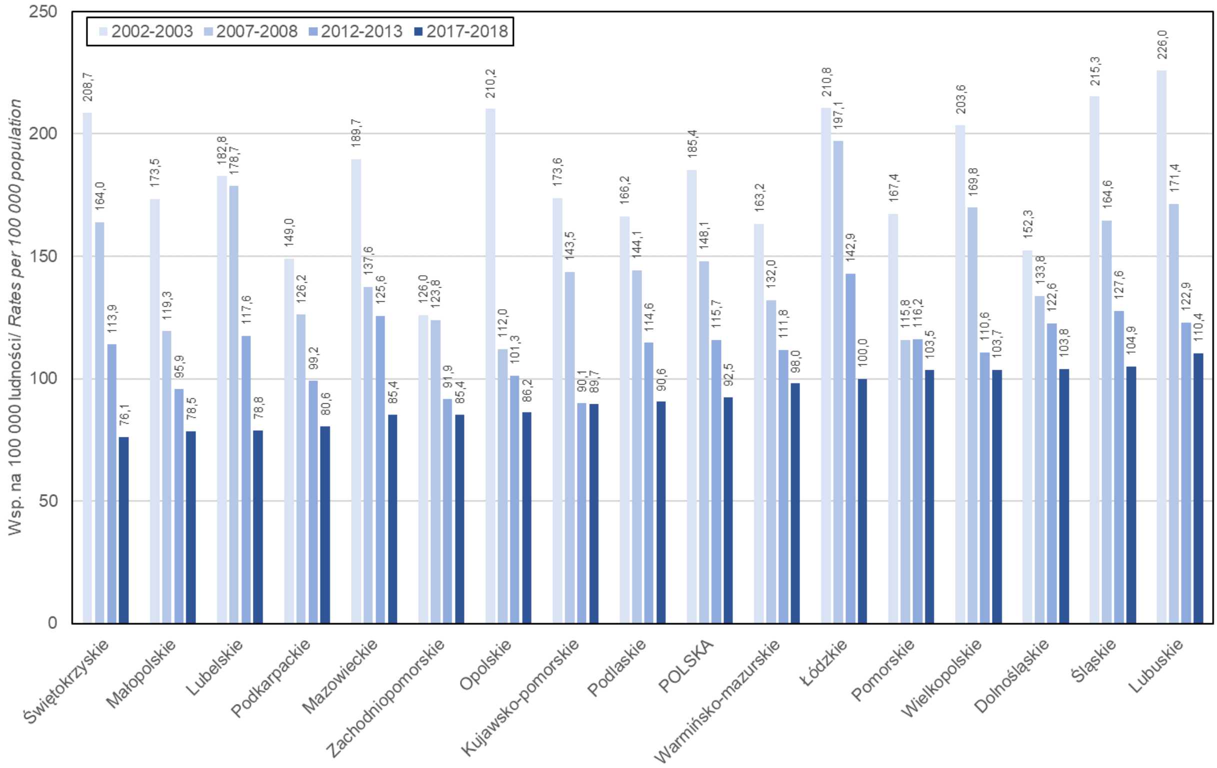


Fig. 2.22a. Age-standardised annual death rates due to cerebrovascular diseases (I60-I69) in the total population, by voivodship, in 2002-2003, 2007-2008, 2012-2013 and 2017-2018

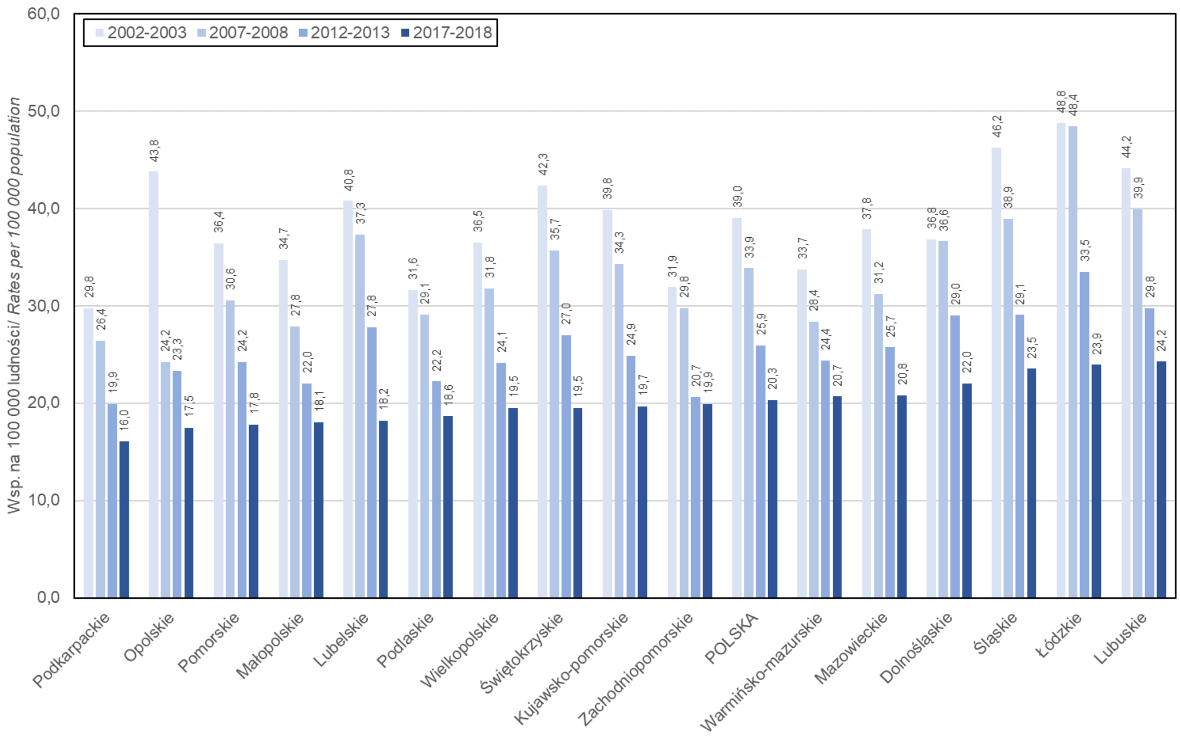


Fig. 2.22b. Agee-standardised annual death rates due to cerebrovascular diseases (I60-I69) in people aged 25-64, by voivodship, in 2002-2003, 2007-2008, 2012-2013 and 2017-2018

Cerebrovascular diseases in all voivodships pose a higher risk for the inhabitants of rural areas than for those of urban areas (Fig. 2.23). In rural areas, the highest mortality rate is recorded in the Lubuskie Voivodship, and in urban areas in the Śląskie Voivodship. The lowest mortality rate in rural areas is recorded in the Świętokrzyskie Voivodship, and in urban areas in the Lubelskie Voivodship. In the Łódzkie and Śląskie Voivodships, the mortality rate both in rural and urban areas is among the highest in the country, and in the Opolskie and Podkarpackie Voivodships among the lowest in the country. The highest relative difference between mortality rates due to cerebrovascular diseases in urban and rural areas is observed in the Lubuskie and Mazowieckie Voivodships; in the former case, the mortality rate in both urban and rural areas is higher than Poland's total, and in the latter case, the mortality rate in urban areas is much below the national average, while in rural areas it is above the national average.

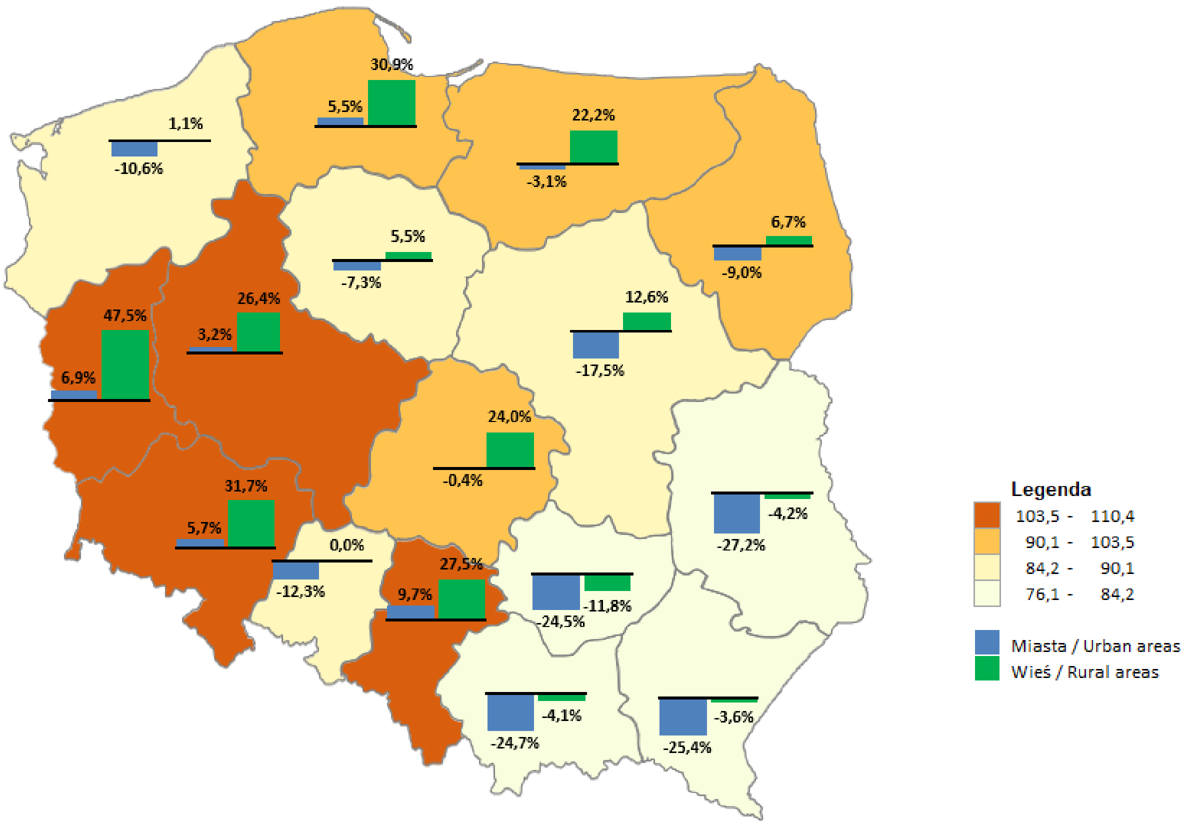


Fig. 2.23. Relative difference (%) in age-standardised death rates due to cerebrovascular diseases (I60-I69) in the inhabitants of urban and rural areas, in relation to the death rate in the whole Poland, by voivodship, in 2017-2018

For many years some unusual differences between voivodships have been observed in the mortality from **atherosclerosis** (I70) as the cause. In over 80%, it is reported as generalised and unspecified atherosclerosis, i.e. according to the WHO, it belongs to the so-called garbage categories. The standardised death rate with atherosclerosis provided as the cause in 2017-2018 ranged from 6.4 per 100,000 population in the Pomorskie Voivodship to 195.7 per 100,000 population in the Małopolskie Voivodship (Fig. 2.24). With the general decrease in the mortality rate due to atherosclerosis in the last five years (of 16.2%), attention should be paid to its growth in four voivodships, with a surprising over twofold increase in the Mazowieckie Voivodship. The highest progress, when it comes to eliminating the coding of atherosclerosis as the cause of death, in the last five years of the analysed period was made in the Lubuskie, Podkarpackie, Wielkopolskie, Opolskie and Kujawsko-pomorskie Voivodships. It cannot be ruled out that a relatively small improvement in the mortality rate due to cerebrovascular diseases in these voivodships was caused by the limited reporting of atherosclerosis as the cause of death.

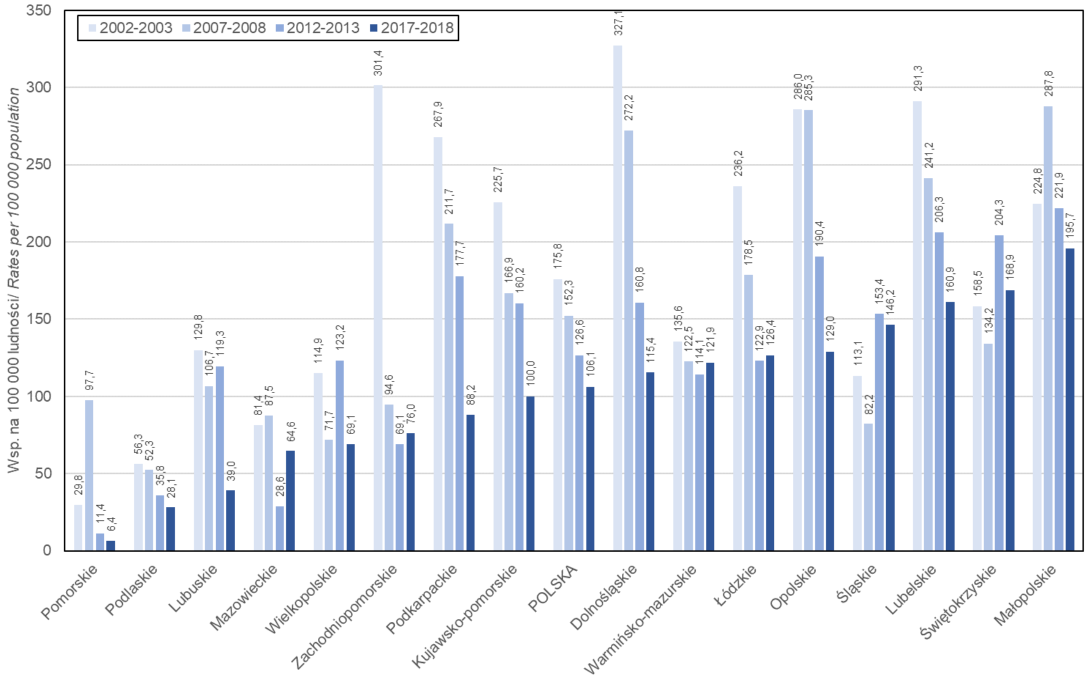


Fig. 2.24. Age-standardised annual death rates due to atherosclerosis (I70) in the total population, by voivodship, 2002-2003, 2007-2008, 2012-2013 and 2017-2018

To recapitulate, on the basis of the voivodship differences in the mortality rate due to cardiovascular diseases, we should reiterate our observations from previous years, which are still up-to-date and to be remembered when interpreting the observed differences. Part of the differences between voivodships, both in the case of deaths from heart diseases and cerebrovascular diseases, may result from the local tendencies to assign generalised atherosclerosis as the main cause of death and the approach of trained physicians coding death reports. The problem concerns in particular the Małopolskie Voivodship and undoubtedly requires urgent action in order to ensure a better comparability of data on the causes of death in the Polish population collected in various parts of the country.

2.7. Mortality due to malignant neoplasms

Malignant neoplasms are the second most frequent cause of death in Poland; while in 2016-2018 the age-standardised mortality rate due to these diseases does not show a decreasing tendency, their share in the total causes of death decreases slightly among both men and women (Tab. 2.5a and 2.5b) (it is worth recalling that among women aged 30-74, malignant neoplasms constitute the major threat to life, Fig. 2.16b). In 2018, 101,386 people in Poland (including 55,361 men and 46,025 women) died from malignant neoplasms, i.e. 263.9 per 100,000 population.

Malignant neoplasms pose a much greater threat to the lives of men than to the lives of women. In 2018 the standardised death rate for men was 79.2% higher than the death rate for women (Tab. 2.2). Thus, the excess mortality of men in relation to women is greater in the case of malignant neoplasms than in the case of cardiovascular diseases. In 2017-2018, among men, the number of deaths due to malignant neoplasms exceeded the number of deaths due to heart diseases. Among women, the number of deaths due to cancer was lower than the number of deaths due to heart diseases.

Among malignant neoplasms, the greatest risk of death in the Polish population is caused by trachea, bronchus and lung cancer (C33-C34). In 2018 as many as 23,722 people died from this cancer (23.4% of all deaths caused by malignant neoplasms). Other cancer types occurred much less frequently. In 2018 there were 12,434 deaths due to the malignant neoplasm of colon, rectosigmoid junction, rectum and anus (ICD10 C18-C21) (12.3% of all deaths from neoplasms); 4,900 people died from the malignant neoplasm of stomach (C16) (4.8%); 6,970 women (and 75 men) died from the malignant neoplasm of breast (C50) (6.9% of all deaths from neoplasms and 15.0% of the deaths from neoplasms among women); 1,593 women died from the malignant neoplasm of cervix uteri (C53) (1.6% of all deaths from neoplasms and 3.5% of the deaths from neoplasms among women); and 5,574 men died from the malignant neoplasms of prostate (5.5% of all deaths from neoplasms and 10.1% of the deaths from neoplasms among men). In 2018 the standardised death rates due to malignant neoplasms for men were in general slightly lower than in 2017, but the mortality rate due to the malignant neoplasm of prostate increased. The mortality rate of women in 2018 was slightly higher than a year before, which was influenced by the rise in the mortality rate due to the malignant neoplasm of the breast, and due to trachea, bronchus and lung cancer (Tab. 2.7). Trends in the mortality rate changes due to neoplastic diseases in the Polish population, as compared to average trends for all EU countries, will be discussed in the subsequent section.

Malignant neoplasms in general pose the same threat to the lives of men living in rural and urban areas, but due to differences in the age structure, the crude death rate is higher in urban areas. A clear difference in the threat to life faced by men in rural and urban areas is observed for the malignant neoplasm of the lung, which is a more common cause of death in rural areas (Tab. 2.8 and 2.9). In the case of women, the mortality rate in rural areas is lower than in urban areas, both in the case of malignant neoplasms in general and for the specific cancer types, except for the malignant neoplasm of the stomach.

Malignant neoplasms in general currently pose the highest risk of death in the Wielkopolskie Voivodship. High mortality rates, both currently and five years before, are also observed in the Kujawsko-pomorskie, Dolnośląskie and Pomorskie Voivodships (Fig. 2.25a). The lowest risk of death due to cancer is observed in the Podkarpackie Voivodship. In the last five years the death rate for the total population dropped in almost all voivodships, the most in the Warmińsko-mazurskie and Opolskie Voivodships – by 8.4% and 8.2%, respectively. The average decrease in the rate in Poland amounted to 2.0%. In the last 15 years the mortality rate has occurred in all voivodships; however, what is worth drawing attention to is its varying dynamics. In five voivodships, including the Podkarpackie and Wielkopolskie, Voivodships, a decrease in the mortality rate occurred between 2007-2008 and 2012-2013, in the Lubelskie Voivodship between 2002-2003 and 2007-2008, and in most voivodships the death rates were decreasing fairly steadily throughout the period. Undoubtedly, the health policy could benefit from the reasons for such prominent differences in the mortality rate change dynamics. Differences between voivodships in the mortality rates due to malignant neoplasms are decreasing.

In the case of people aged 25-64, in the last five years there was a nationwide gradual decrease in mortality rates in all voivodships, at a rate of 12.4%, and in the period of 15 years – at a rate of 27.2% (Fig. 2.25b). The sharpest decrease in the last five years took place in the Warmińsko-Mazurskie Voivodship (of 19.1%), the Zachodniopomorskie Voivodship (of 17.5%) and the Opolskie Voivodship (of 17.3%). In these three voivodships and in the Pomorskie Voivodship, the sharpest decline in the mortality rate has been observed in the last 15 years – of over 30%.

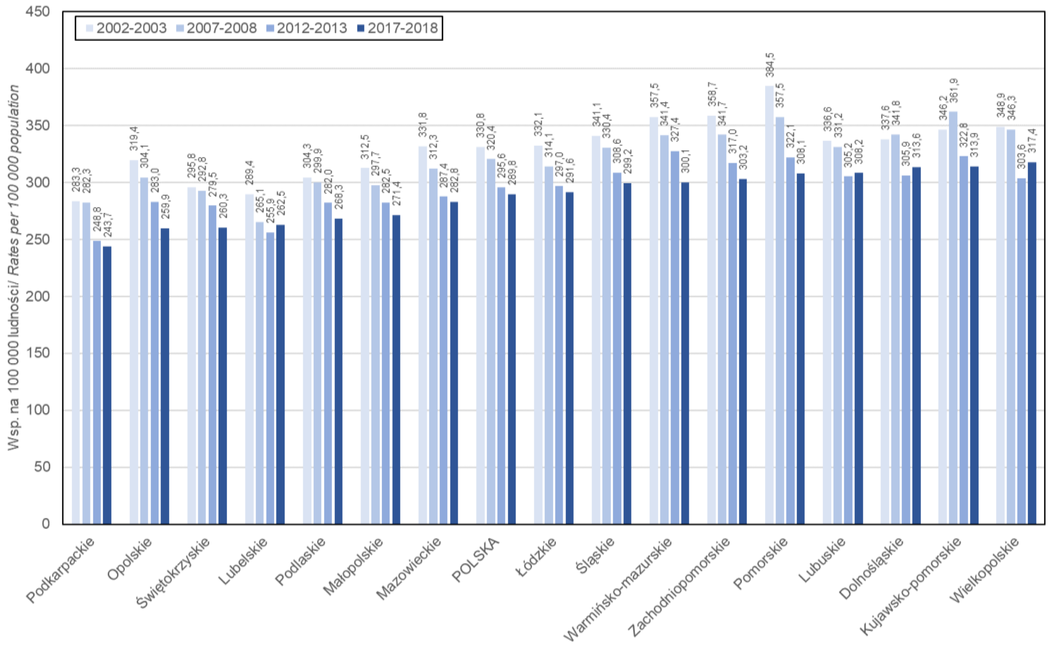


Fig. 2.25a. Age-standardised annual death rates due to malignant neoplasms in general (C00-C97) in the total population, by voivodship, in 2002-2003, 2007-2008, 2012-2013 and 2017-2018

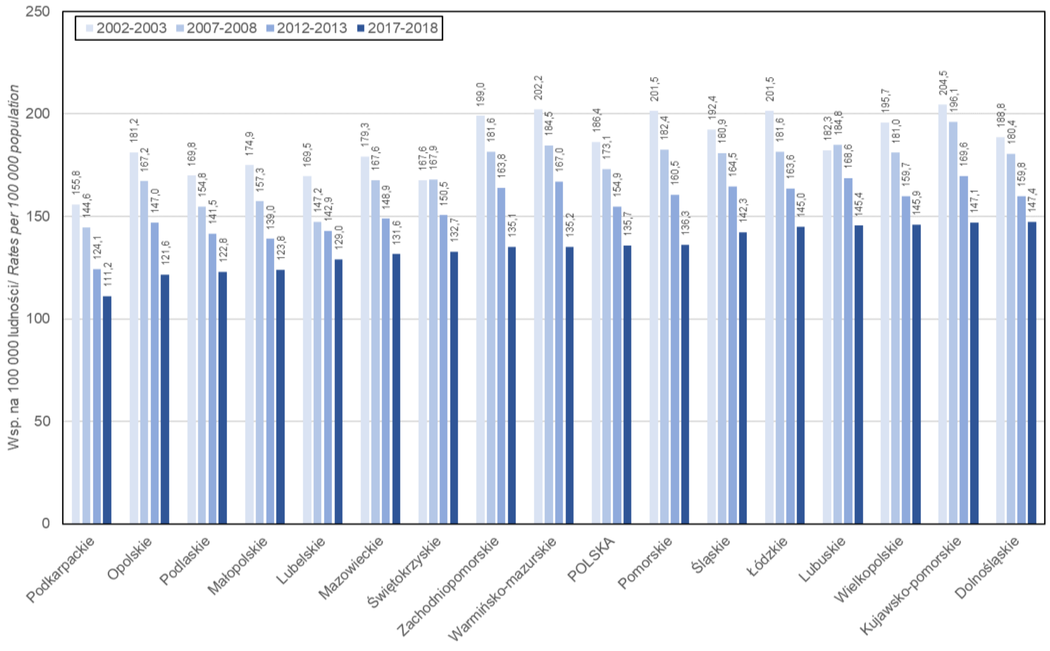


Fig. 2.25b. Age-standardised annual death rates due to malignant neoplasms in general (C00-C97) in population aged 25-64, by voivodship, in 2002-2003, 2007-2008, 2012-2013 and 2017-2018

In four voivodships, malignant neoplasms present a higher risk of death for the inhabitants of rural areas than for those of urban areas, whereas in eleven voivodships the situation is opposite and the mortality rate is higher in urban areas (Fig. 2.26). The life of the rural population is the most threatened due to neoplasms in the Dolnośląskie Voivodship, and of the urban population – in the Wielkopolskie Voivodship. The largest difference in the mortality rate due to malignant neoplasms between urban and rural areas is found in the Dolnośląskie and Warmińsko-Mazurskie Voivodships to the disadvantage of the inhabitants of rural areas, and in the Podlaskie Voivodship to the disadvantage of the inhabitants of urban areas.

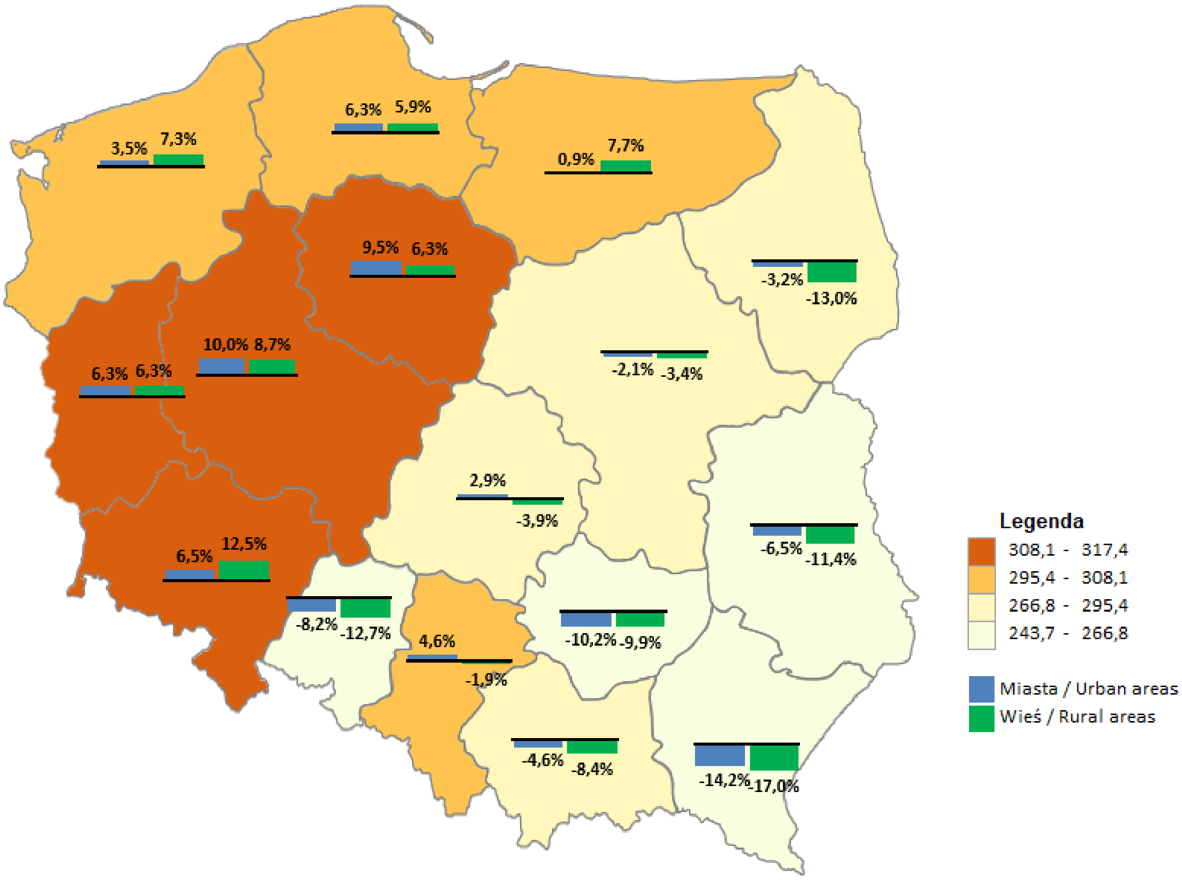


Fig. 2.26 Relative difference (%) in standardised death rates due to malignant neoplasms in general (C00-C97) in the inhabitants of urban and rural areas, in relation to the death rate in the whole Poland, by voivodship, in 2017-2018

The greatest risk of death due to **the malignant neoplasm of the trachea, bronchus and lung** in the last years of the analysed period, i.e. 2017-2018, occurred in the Kujawsko-Pomorskie, Lubuskie and Zachodniopomorskie Voivodships, both in the case of the total population and among persons aged 25-64, although five years before the highest mortality rate was recorded in the Warmińsko-mazurskie Voivodship (Fig. 2.27a and 2.27b). In contrast, the lowest threat to life due to the malignant neoplasm of the lung is currently recorded in the Podkarpackie, Opolskie and Małopolskie Voivodships. In the last five years, the force of mortality due to lung cancer, both in the total population and among people aged 25-64, decreased to the lowest extent in the Warmińsko-mazurskie and Opolskie Voivodships. While for younger people, the improvement was observed in all voivodships, in the case of the general population, the mortality rate increased or did not decrease, while in the Wielkopolskie Voivodship it even grew by 9.3%.

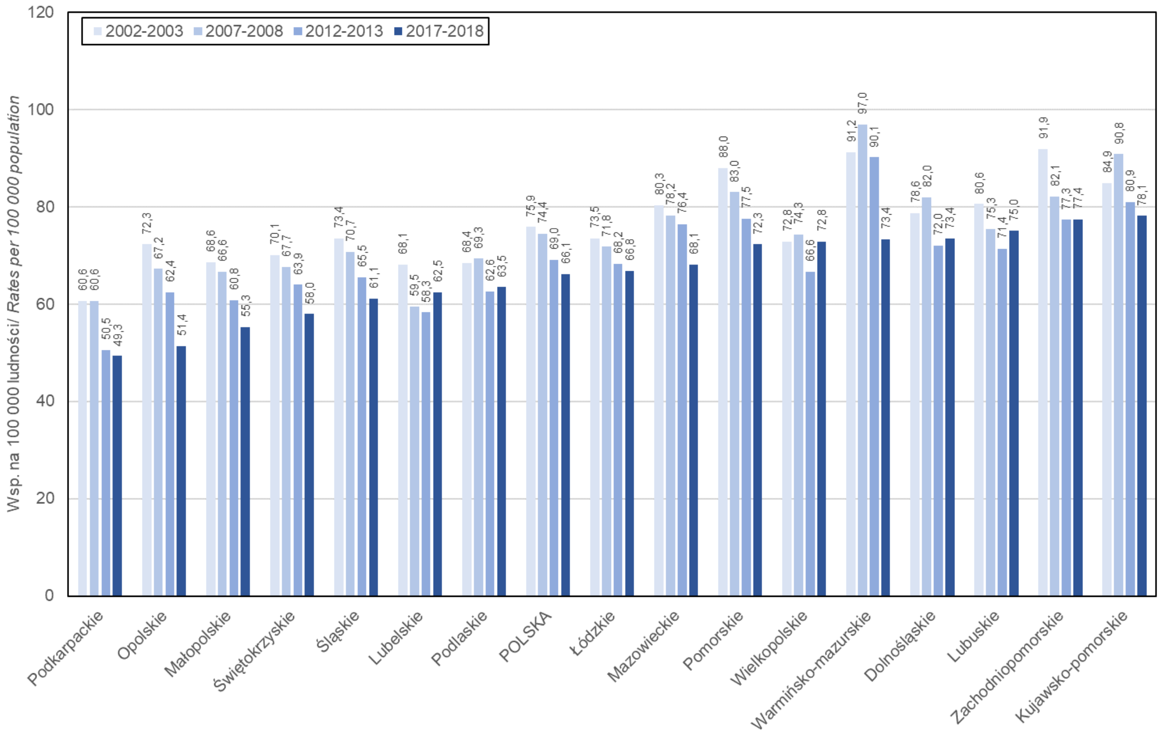


Fig. 2.27a. Age-standardised annual death rates due to trachea, bronchus and lung cancer (C33-C34) in the total population, by voivodship, in 2002-2003, 2007-2008, 2012-2013 and 2017-2018

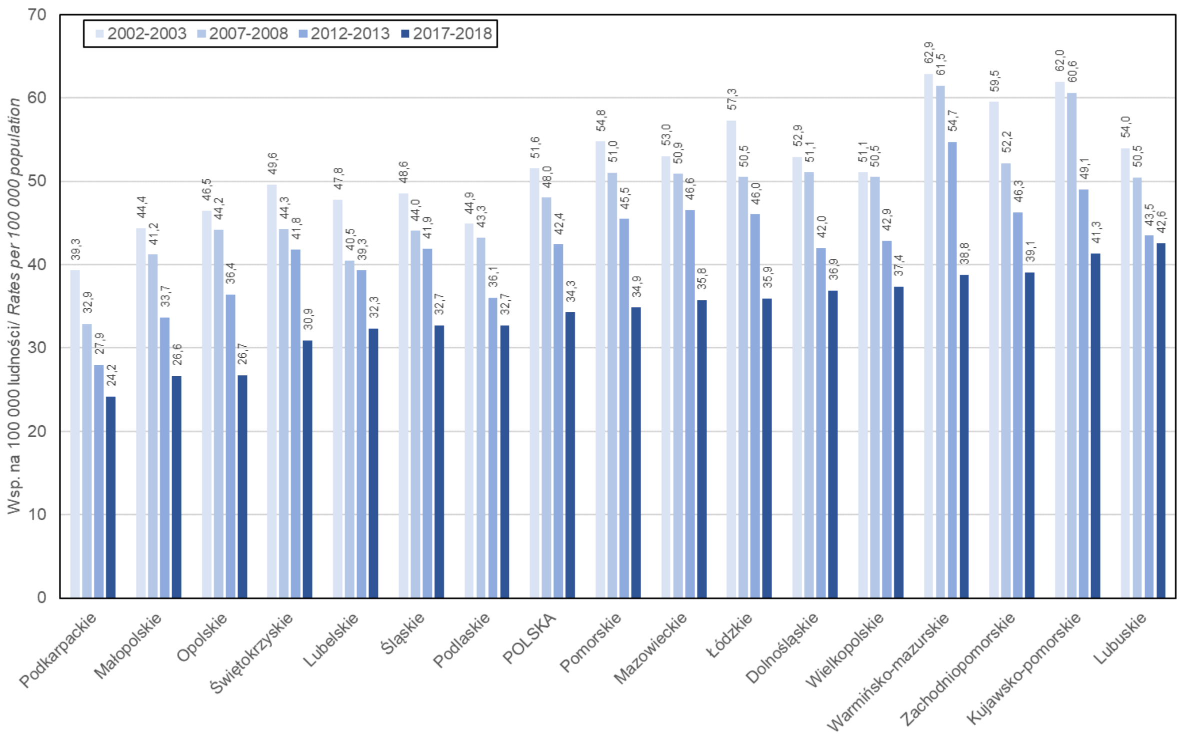


Fig. 2.27b. Age-standardised annual death rates from trachea, bronchus and lung cancer (C33-C34) in people aged 25-64, by voivodship, in 2002-2003, 2007-2008, 2012-2013 and 2017-2018

Malignant neoplasms of the trachea, bronchus and lung in nine voivodships pose a greater risk to life in rural areas than in urban areas, and in five voivodships the opposite situation applies, with a greater risk to the life of the urban population (in two voivodships, the mortality rates in urban and rural areas are very similar). In rural areas, the highest mortality rate is observed in the Zachodniopomorskie and Warmińsko-Mazurskie Voivodships, while in urban areas in the Kujawsko-pomorskie Voivodship (Fig. 2.28). The highest relative difference due to malignant neoplasms of the lung in urban and rural areas, to the disadvantage of the rural population, is found in the Warmińsko-mazurskie Voivodship, while in the Podlaskie and Śląskie Voivodships it is the highest to the disadvantage of the urban population.

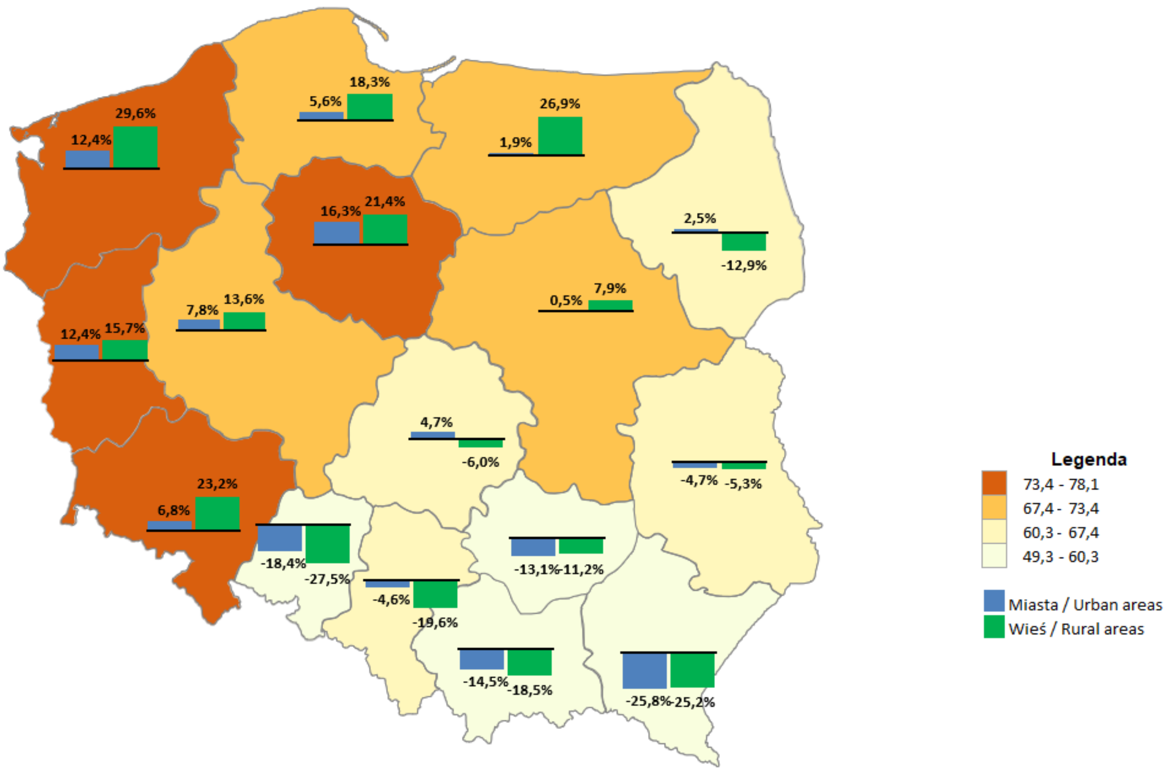


Fig. 2.28. Relative difference (%) in standardised death rates due to trachea, bronchus and lung cancer (C33-C34) in the inhabitants of urban and rural areas, in relation to the death rate in the whole Poland, by voivodship, in 2017-2018

The threat to life caused by **the malignant neoplasm of colon, rectosigmoid junction, rectum and anus** (C18-C21) in the Polish population in total in 2000s was at a relatively stable level, with certain changes occurring in respective voivodships. In the last five years, the mortality rate decreased to the greatest extent in the Warmińsko-mazurskie Voivodship (by 15.3%), in which the mortality rate five years before was the highest, and now is within the national average, and in the Świętokrzyskie Voivodship (by 12.5%), where the rate is currently the lowest. (Fig. 2.29a). The lowest threat to life due to the said neoplasms is currently found in the Świętokrzyskie and Podkarpackie Voivodships. For many years the greatest threat related to this neoplasm has been posed to the lives of the inhabitants of the Wielkopolskie Voivodship, where the downward tendency of the death rate in the last five-year period was, unfortunately, reversed. Overall, an increase in the death rate due to these neoplasms in the last five years occurred in eight voivodships, with the highest one being recorded in the Lubelskie Voivodship (13.4%). In eight voivodships, the current mortality rates are higher than in 2002-2003, with the greatest difference being observed in the Lubelskie Voivodship (+12.8%). In the case of people aged 25-64, in 2000s there has been a weak downward tendency of the mortality rate in national terms, but in none of the voivodship a constant decrease in the death rate has observed (Fig. 2.29b). In six voivodships, there was an increase in the death rate in the last five years, in the Podkarpackie Voivodship as high as 14%. In two voivodships – Świętokrzyskie and Lubelskie – the current mortality rate of persons aged 25-64 is higher than in 2002-2003.

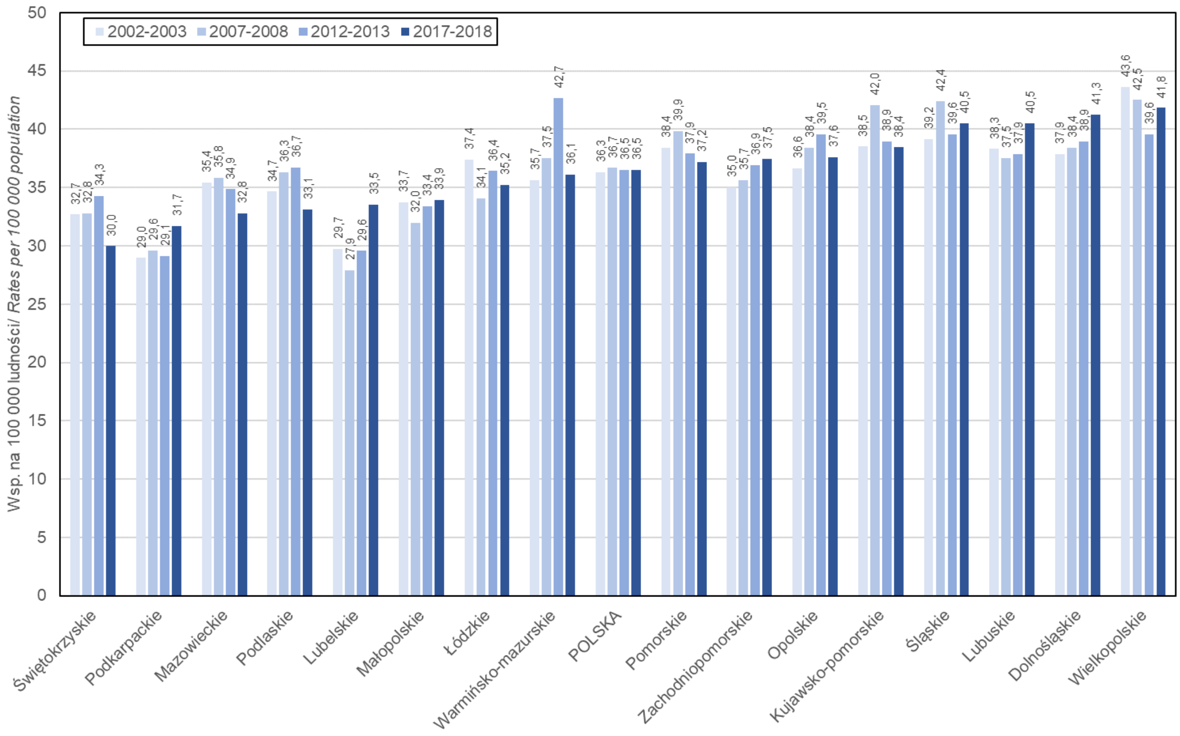


Fig. 2.29a. Age-standardised annual death rates due to the colorectal cancer (C18-C21) in the total population, by voivodship, in 2002-2003, 2007-2008, 2012-2013 and 2017-2018

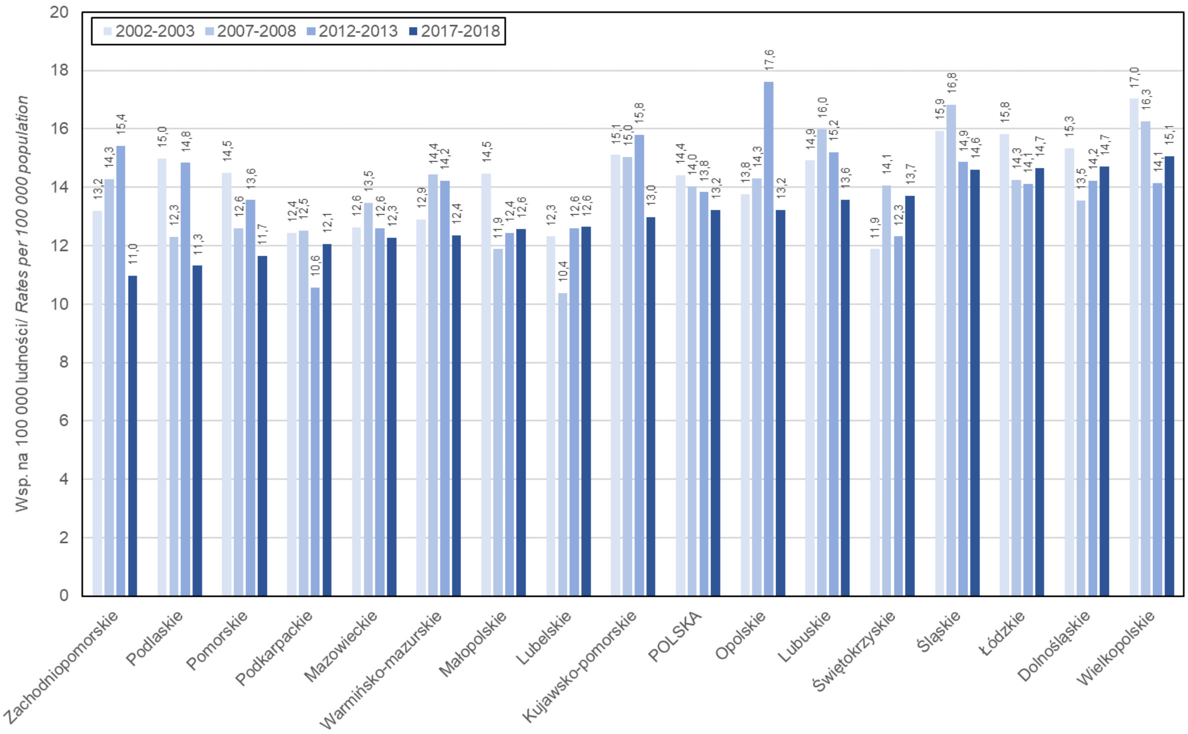


Fig. 2.29b. Age-standardised death rates due to the colorectal cancer (C18-C21) in people aged 25-64, by voivodship, in 2002-2003, 2007-2008, 2012-2013 and 2017-2018

Colorectal cancer in most voivodships pose a greater risk to life in urban areas than in rural areas, and only in five voivodships the opposite situation applies, with a higher risk to the lives of the inhabitants of rural areas. The highest mortality rate in urban areas is found in the Lubuskie and Wielkopolskie Voivodships, and as far as rural areas are concerned, it is evidently the highest in the Dolnośląskie, Wielkopolskie and Śląskie Voivodships (Fig. 2.30). In contrast, the lowest mortality rate in rural areas in observed in the Świętokrzyskie Voivodship, and in urban areas in the Mazowieckie Voivodship. The highest relative difference between mortality rates from colorectal cancer between urban and rural areas, to the disadvantage of the urban population, is found in the Lubelskie and Świętokrzyskie Voivodships, while in the Pomorskie and Dolnośląskie Voivodships the difference is the greatest to the disadvantage of the rural population, but the differences in this case are much less pronounced than in the voivodships where the difference is unfavourable to the urban population.

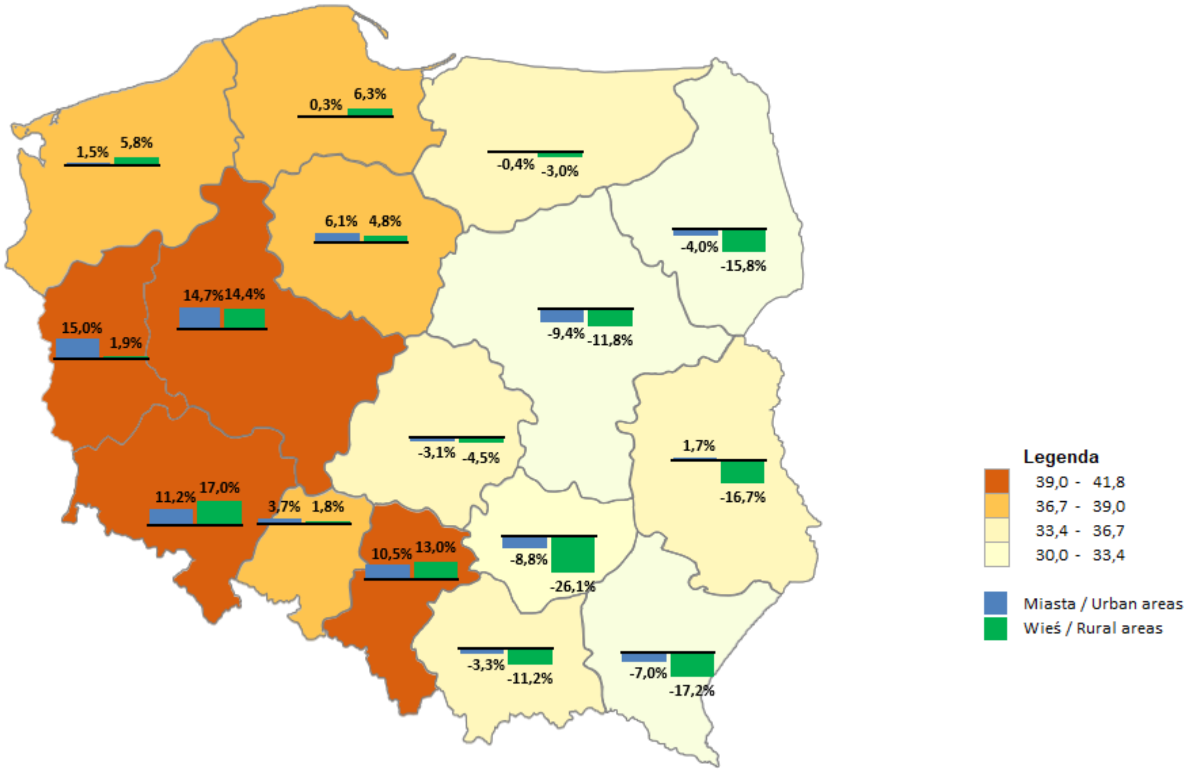


Fig. 2.30. Relative difference (%) in standardised death rates due to colorectal cancer (C18-C21) in the inhabitants of urban and rural areas, in relation to the death rate in the whole Poland, by voivodship, in 2017-2018

The risk of death of women in total due to **the malignant neoplasm of the breast** ("breast cancer") in 2017-2018, both in Poland and in most voivodships, was higher than five years before. The standardised death rate was 10% higher, and in the Wielkopolskie and Dolnośląskie Voivodships as many as 28% higher (Fig. 2.31a). It should be mentioned that, both in national terms and in eleven voivodships, the mortality rate in 2017-2018 was higher than fifteen years earlier, with the surplus exceeding 20% in the Lubuskie, Łódzkie and Dolnośląskie Voivodships.

In the case of women aged 25-64, the situation is more favourable than for all women in total, and the death rates due to breast cancer in the last five years decreased both in national terms and in eleven voivodships, with the highest decline observed in the Małopolskie Voivodship (20%) and in the Podkarpackie Voivodship (19%) (Fig. 2.31b). The difference in the mortality rate in the voivodships where the situation was the least and the most favourable, i.e. in the Łódzkie and the Podkarpackie Voivodships, was approx. 62%.

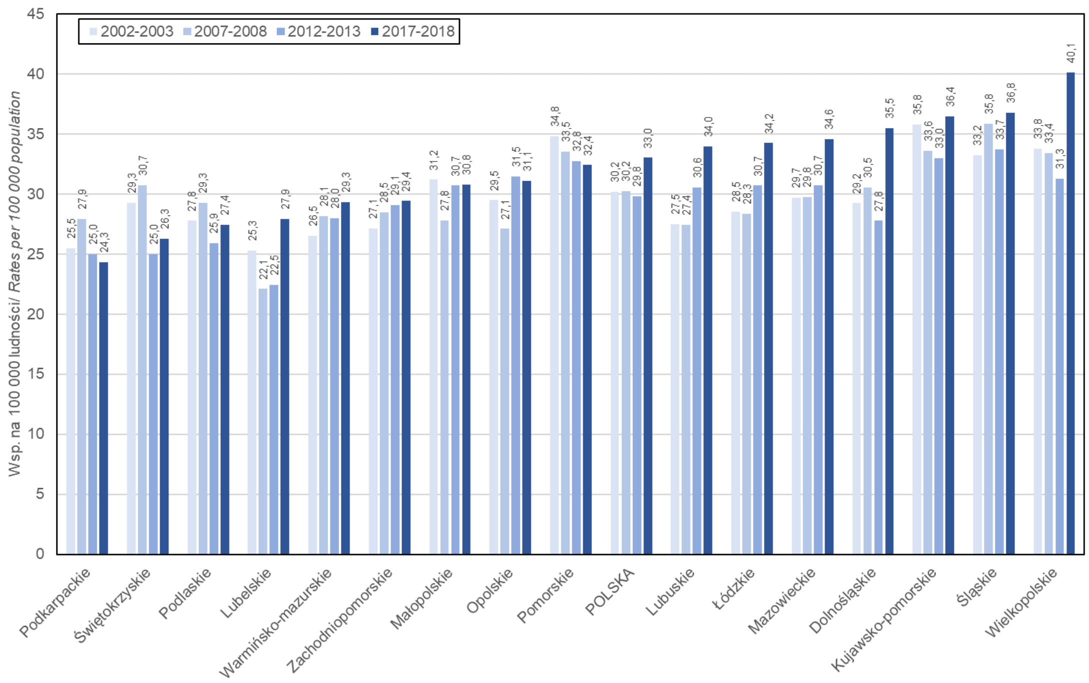


Fig. 2.31a. Age-standardised annual death rates due to breast cancer (C50) in women in total, by voivodship, in 2002-2003, 2007-2008, 2012-2013 and 2017-2018

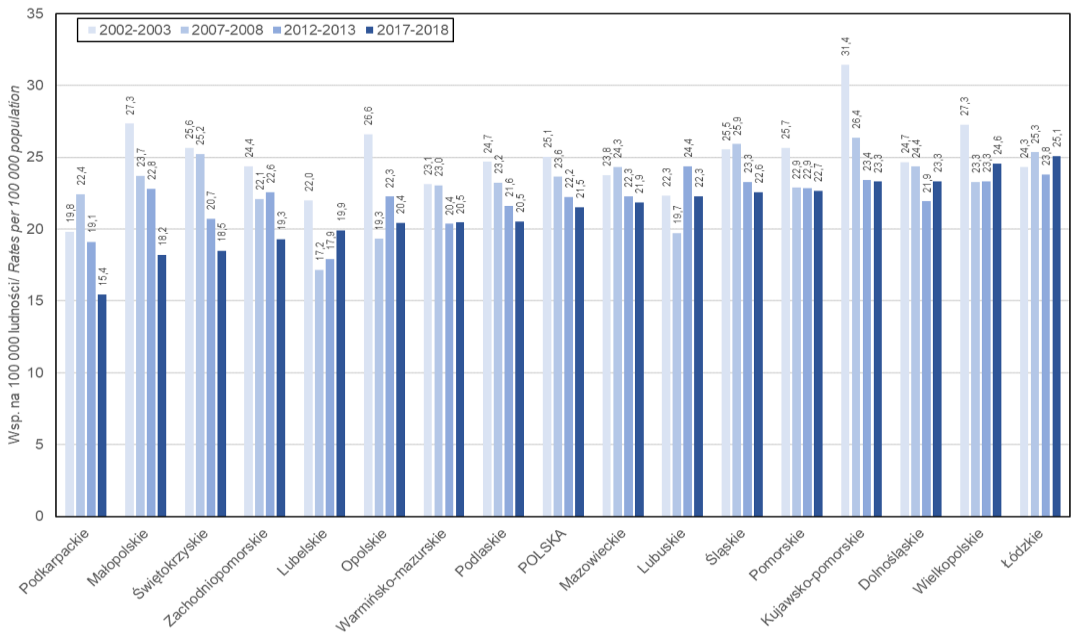


Fig. 2.31b. Age-standardised annual death rates due to breast cancer (C50) in women aged 25-64, by voivodship, in 2002-2003, 2007-2008, 2012-2013 and 2017-2018

In all voivodships, except for Dolnośląskie and Zachodniopomorskie Voivodships, breast cancer poses a higher risk of death to women residing in urban areas compared to rural areas. In the Wielkopolskie Voivodship, the mortality rate in both urban and rural areas in 2017-

2018 was the highest in the country, and this is one of two voivodships (followed by Dolnośląskie) where the mortality rate in rural areas is higher than the national average (Fig. 2.32). The high mortality rate of women residing in urban areas is also observed in the Kujawsko-Pomorskie and Śląskie Voivodships. The highest relative difference in the mortality rates due to breast cancer between urban and rural areas is found in the Łódzkie, Mazowieckie and Podlaskie Voivodships.

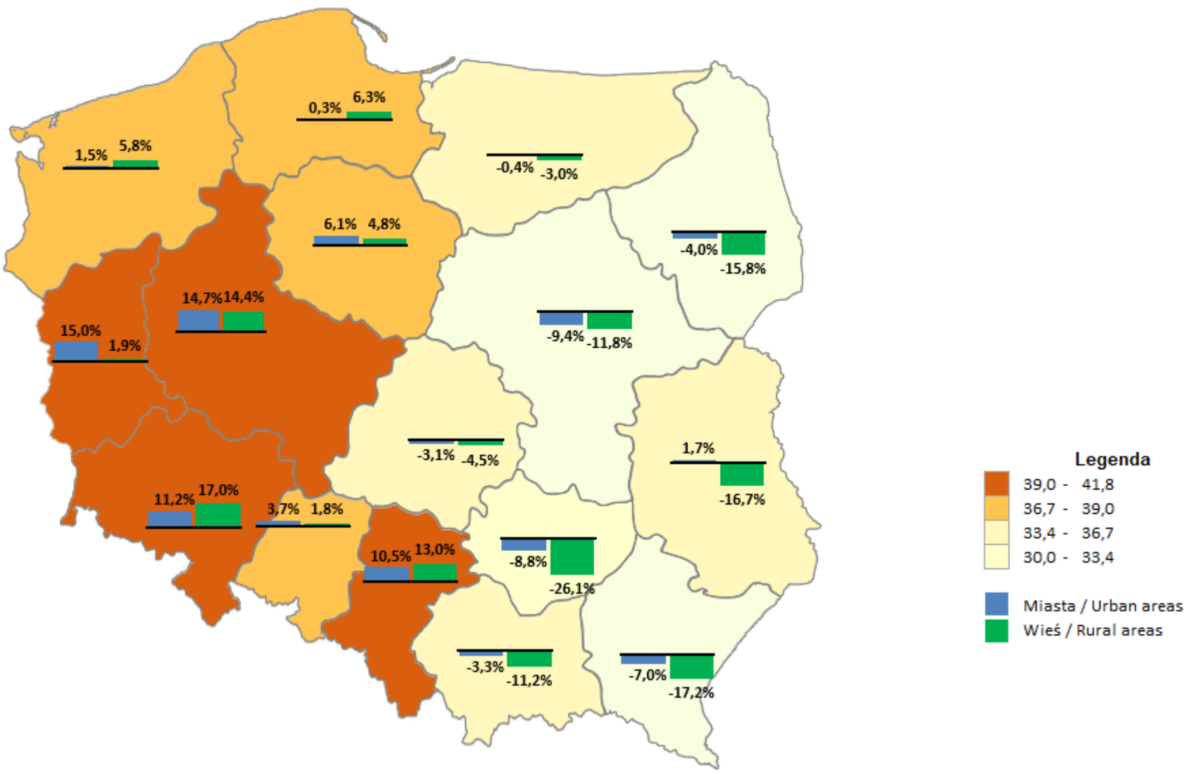


Fig. 2.32. Relative difference (%) in standardised death rates due to breast cancer (C50) in the female inhabitants of urban and rural areas, in relation to the death rate in the whole Poland, by voivodship, in 2017-2018

The threat of women' lives due to **cancer of cervix uteri** has decreased in Poland quite steadily but at a slow pace. However, it can be stated that the dynamics of changes in the mortality rate of women due to this disease is more favourable than in breast cancer. The current mortality rate of all women in Poland is 9.0% lower than five years before, and 22% lower than 10 years before, and in the case of women aged 25-64, it is 19% and 32% lower, respectively (Fig. 2.33a and 2.33b). It should be noted that the rise in the death rate due to cervix uteri cancer was observed in the last five years, both among all women and women aged 25-64, in the Wielkopolskie Voivodship. In the case of young women, this is the only voivodship where a rise in the mortality rate is recorded. It can be noticed that the overall number of deaths among women due to this cancer have for years been the major problem in the Lubuskie Voivodship.

Although the situation is systematically improving, its rate only slightly exceeds that for the whole country. However, in the case of young women, the improvement is more prominent.

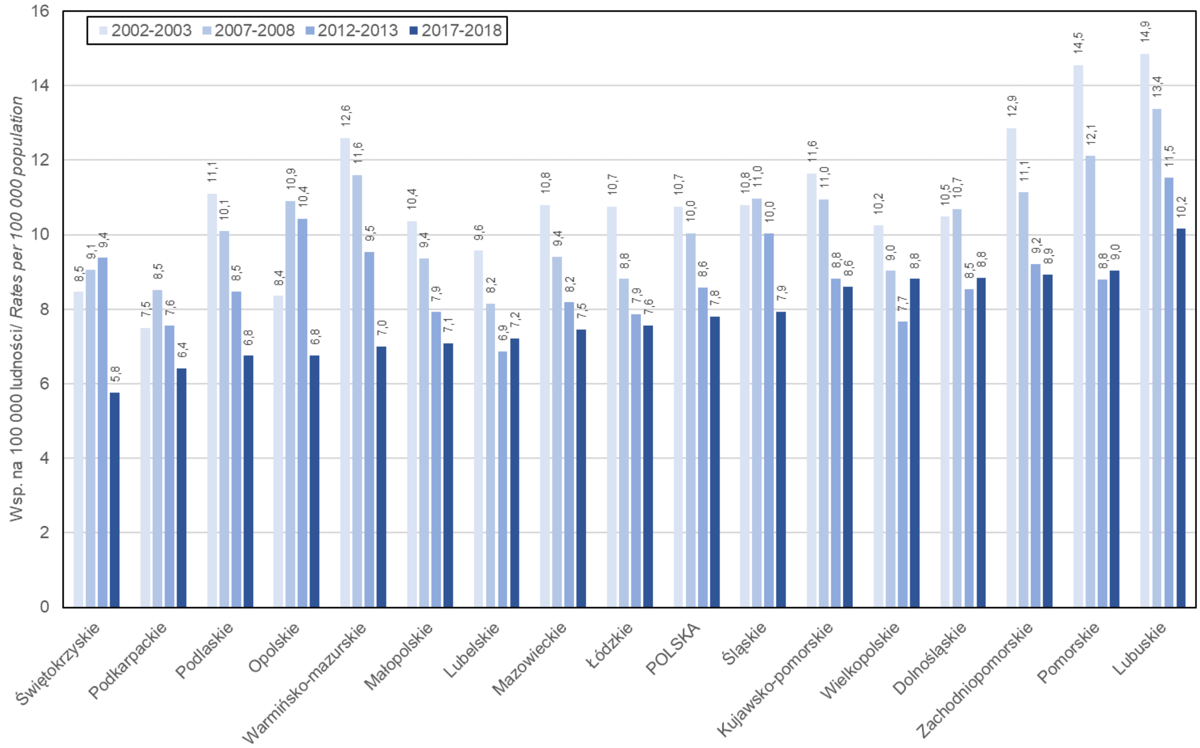


Fig. 2.33a. Age-standardised annual death rates due to cancer of cervix uteri (C53) in women in total, by voivodship, in 2002-2003, 2007-2008, 2012-2013 and 2017-2018

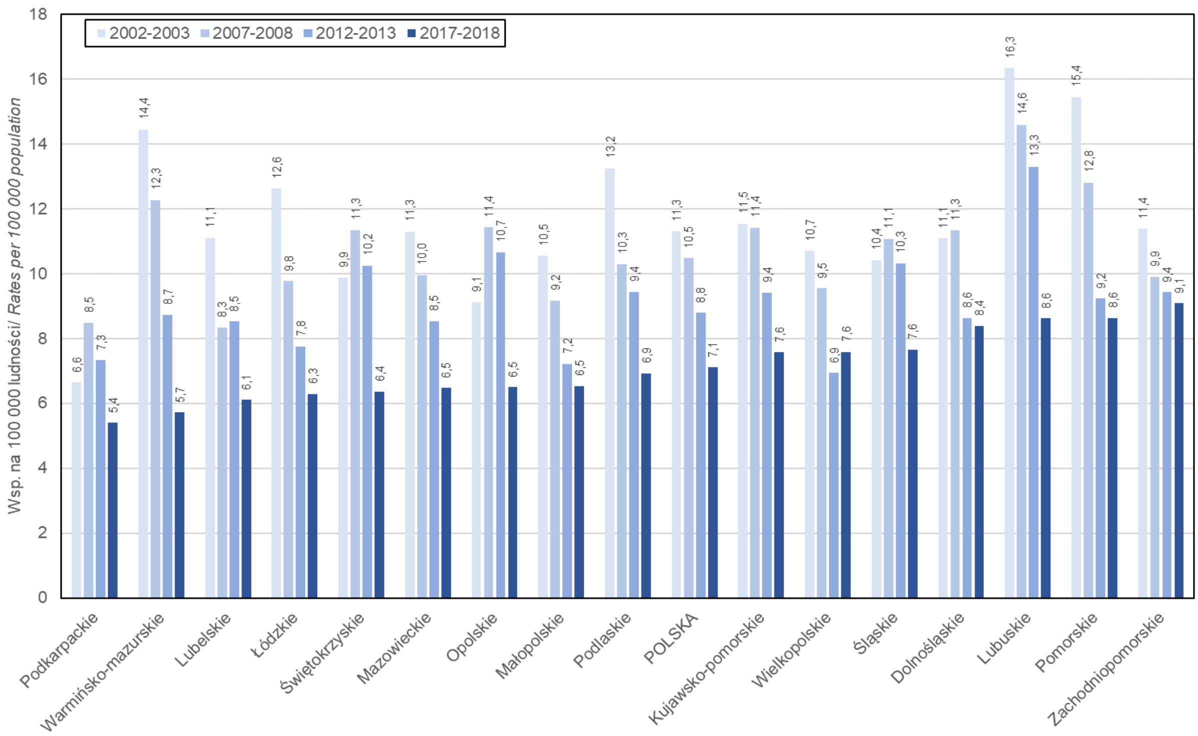


Fig. 2.33b. Age-standardised annual death rates due to cancer of cervix uteri (C53) in women aged 25-64, by voivodship, in 2002-2003, 2007-2008, 2012-2013 and 2017-2018

Malignant neoplasms of the cervix uteri pose a greater risk to women in urban areas than to those rural areas, and in five voivodships the mortality rates in rural areas are slightly higher than those in urban areas (Fig. 2.34). Both in the case of female inhabitants of urban and rural areas, the highest mortality rate is recorded in the Lubuskie Voivodship. A high mortality rate in urban areas is also observed in the Pomorskie Voivodship, but the situation in rural areas in that voivodship is considerably better. In contrast, a relatively high mortality rate of women in rural areas is observed in the Wielkopolskie and Kujawsko-pomorskie Voivodships. The highest relative difference in the mortality rates due to cervical cancer between urban and rural areas is recorded in the Małopolskie, Podlaskie and Pomorskie Voivodships.

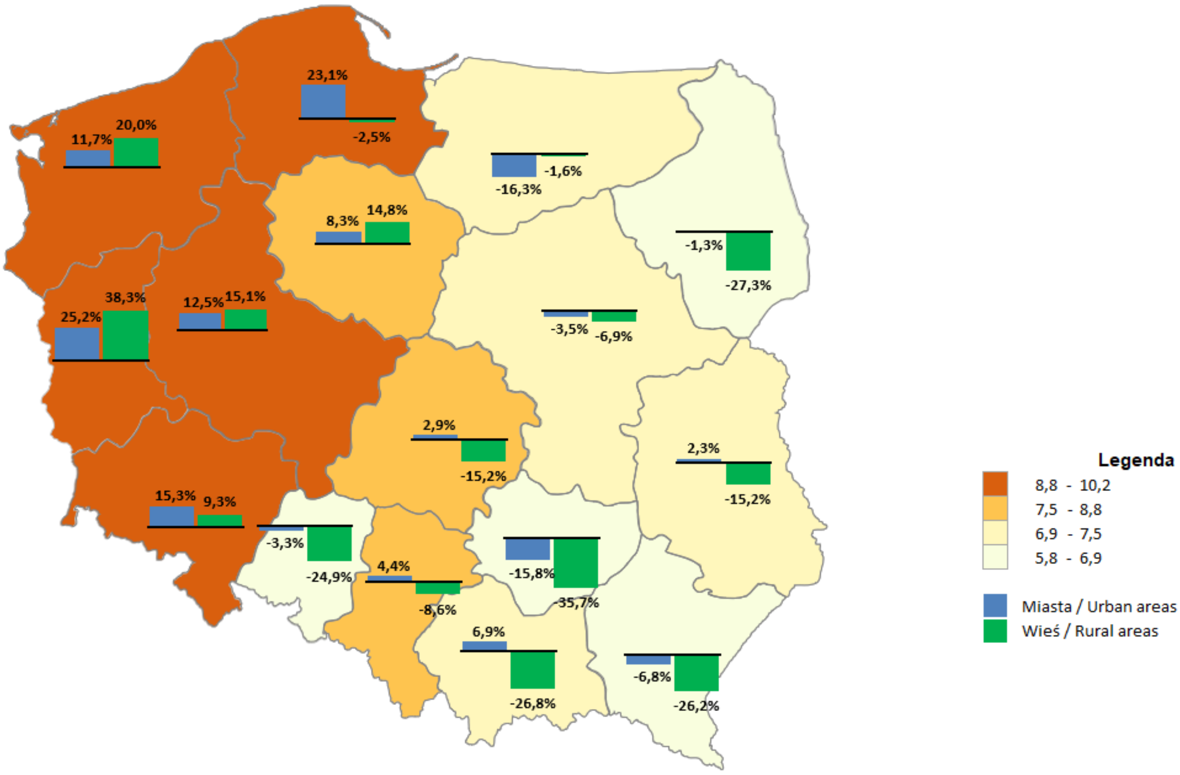


Fig. 2.34. Relative difference (%) in standardised death rates due to cancer of cervix uteri (C53) in the female inhabitants of urban and rural areas, in relation to the death rate in the whole Poland, by voivodship, in 2017-2018

As the deaths of men from **malignant neoplasms of the prostate** concerned men below the age of 65 only in 10% of all cases (2018), the mortality rate due to this type of cancer by voivodship was presented only for men in total (Fig. 2.35). The death rate in the last years of the analysed period, i.e. 2017-2018, was at a higher level than five years before, both in national terms (by 13.9%) and in all voivodships. The highest increase (of 34.3%) in that rate occurred in the Warmińsko-mazurskie Voivodship where the mortality rate is currently the highest, and in the Dolnośląskie Voivodship (of 21.4%), while in the Mazowieckie and Łódzkie Voivodships the death rates grew by approx. 19%. The current mortality rate in Poland in total is also higher than 10 and 15 years before, which applies to most voivodships. A relatively lowest threat to men's lives due to prostate cancer in 2017-2018, like 10 years before, was observed in the Opolskie Voivodship.

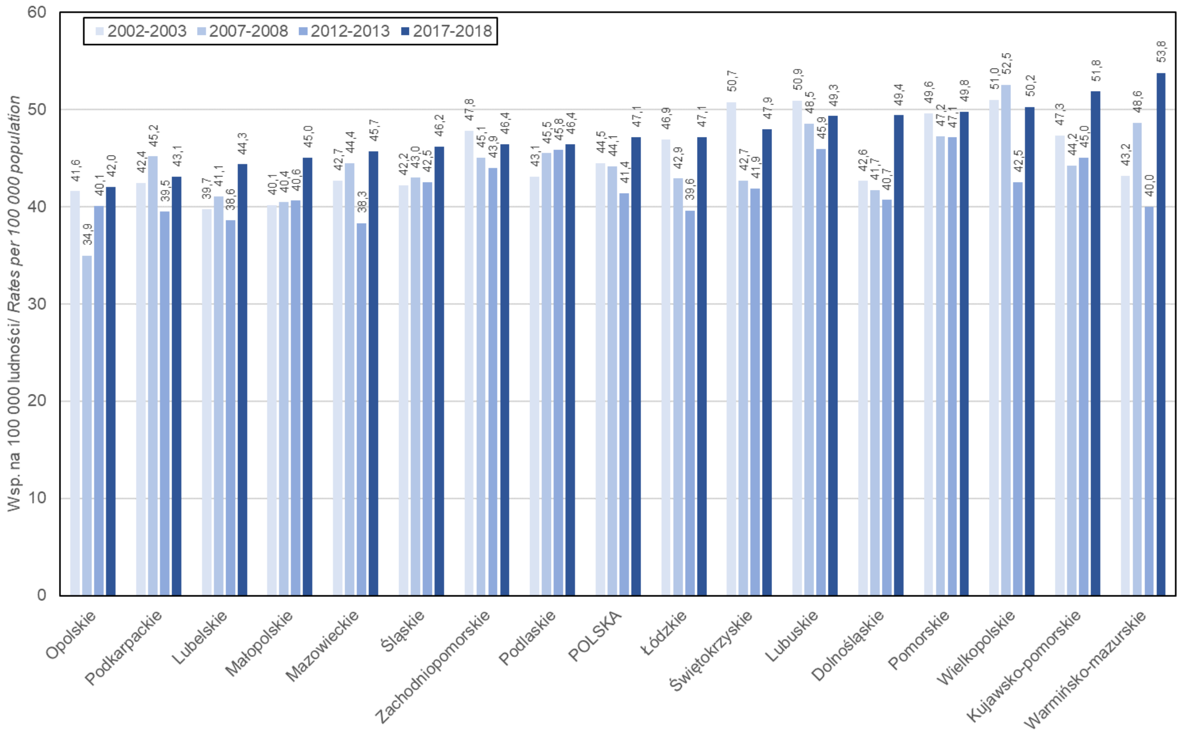


Fig. 2.35. Age-standardised annual death rates due to cancer of prostate (C61) in men in total, by voivodship, in 2002-2003, 2007-2008, 2012-20113 and 2017-2018

Mortality rates due to prostate cancer among men in urban and rural areas did not differ significantly in most voivodships (Fig. 2.36). The greatest differences in the mortality rates of the inhabitants of urban and rural areas, to the disadvantage of the latter, are observed in the Podlaskie and Warmińsko-mazurskie Voivodships, and slightly lower in the Podkarpackie and Lubelskie Voivodships. A higher mortality rate in urban areas compared to rural areas is particularly noticeable in the Zachodniopomorskie and Wielkopolskie Voivodships.

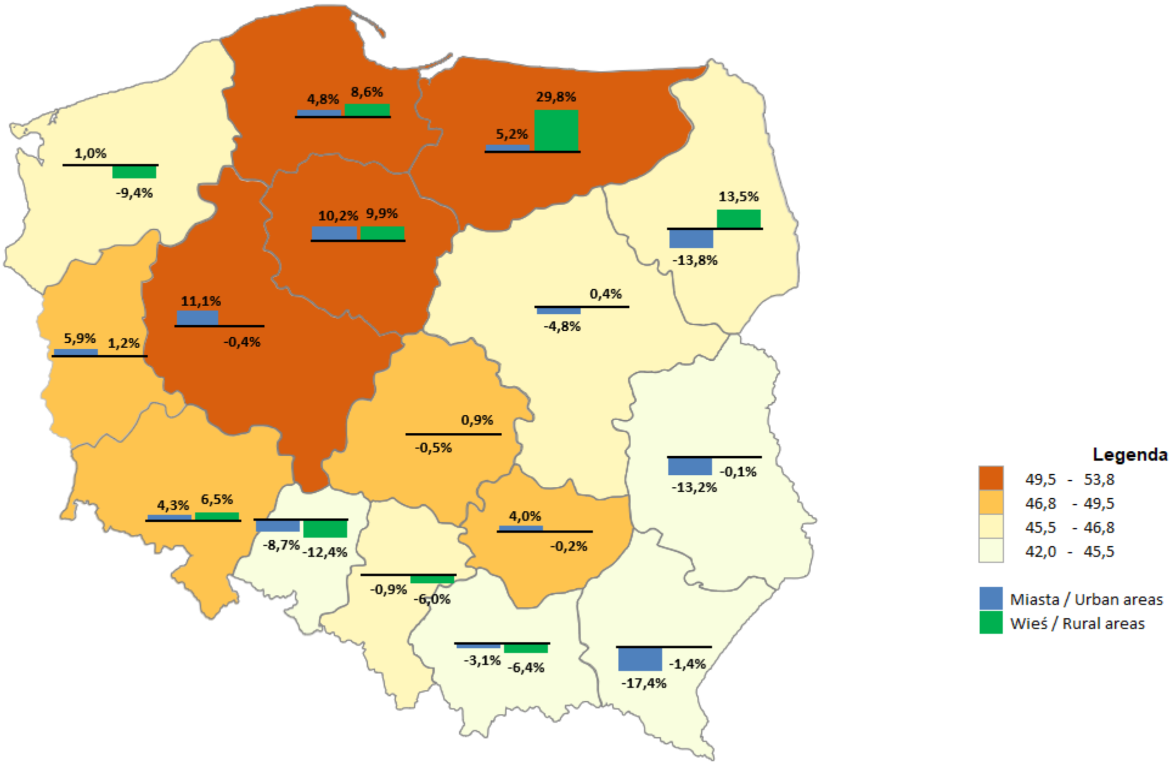


Fig. 2.36. Relative difference (%) in standardised death rates due to cancer of prostate (C61) among men living in urban and rural areas, in relation to the death rate in the whole Poland, by voivodship, in 2017-2018

2.8. Mortality due to external causes

External causes of death are the fifth group of death causes in the whole population. However, they are the fourth cause of death among men and the biggest threat to life among people aged 5-44; they were responsible for 41% of deaths in this age group in 2018 (Fig. 2.16a and 2.16b). In 2018 as many as 20,106 people (including 15,004 men and 5,102 women), i.e. 52.3 per 100,000 population (80.7 in the case of men and 25.7 in the case of women), died due to external causes (Tab. 2.6). The importance of this group as the cause of death of men and women is declining. Downward trends in both the mortality rate and the share in total deaths have been observed for a number of years, but in recent years they have slowed down (Tab. 2.5a and 2.5b).

External causes of death are a much greater threat to the lives of men than to the lives of women. In 2018 the standardised death rate for men was 3.6 times higher than that for women (Tab. 2.7). These causes pose a larger risk of death for men in rural areas compared to urban areas (by 31%), while for the female inhabitants of rural areas, the risk is currently only slightly higher (by 8%) than for those living in urban areas (Tab. 2.9).

Among the external causes of death, the most prevalent in 2018 (and a year before) were **falls**, which in 2018 were responsible for the death of 4,549 people (including 2,465 men and 2,084 women), i.e. for 23% of all deaths due to external causes. It is worth noting that among women only 6% of deaths for this cause concerned women aged below 65, and in the case of men as many as 43%. Falls pose a similar threat to life for the inhabitants of urban and rural areas. The second most common external cause of death is **suicide**, as a result of which in 2018 as any as 4,441 people lost their lives (including 3,870 men and 571 women). Suicides are a considerably greater threat to the lives of men residing in rural areas compared to urban areas, and in the last year under analysis they also posed a higher threat (31%) to the lives of women residing in rural areas compared to urban areas. It should be pointed out that two years before, in 2015-2016, the number of deaths due to suicides exceeded the number of deaths from falls. **Traffic accidents** are the third external cause of death in Poland. In 2018 they were responsible for the death of 3,672 people (including 2,806 men and 866 women). These causes are a greater risk of death for the rural population than for the urban one – for men by 76% and for women by 43% (Tab. 2.9).

The variation in the mortality rates due **external causes** between voivodships is substantial and does not decrease. However, in 2017-2018 the mortality rate in all voivodships, except for the total population of the Opolskie Voivodship, was lower than five years earlier, in national terms, in the total population by 17% and among people aged 25-64 by 20% (Fig. 2.37a and 2.37b). In the Mazowieckie Voivodship, both in the case of the total population and people aged 25-64, the rates decreased by 27%, which was the sharpest drop. A considerable threat to life due to external causes has continued to apply in the Łódzkie and Warmińsko-mazurskie Voivodships, both for the total population and people aged 25-64. In contrast, a relatively favourable situation can be observed in the Podkarpackie, Wielkopolskie and Małopolskie Voivodships.

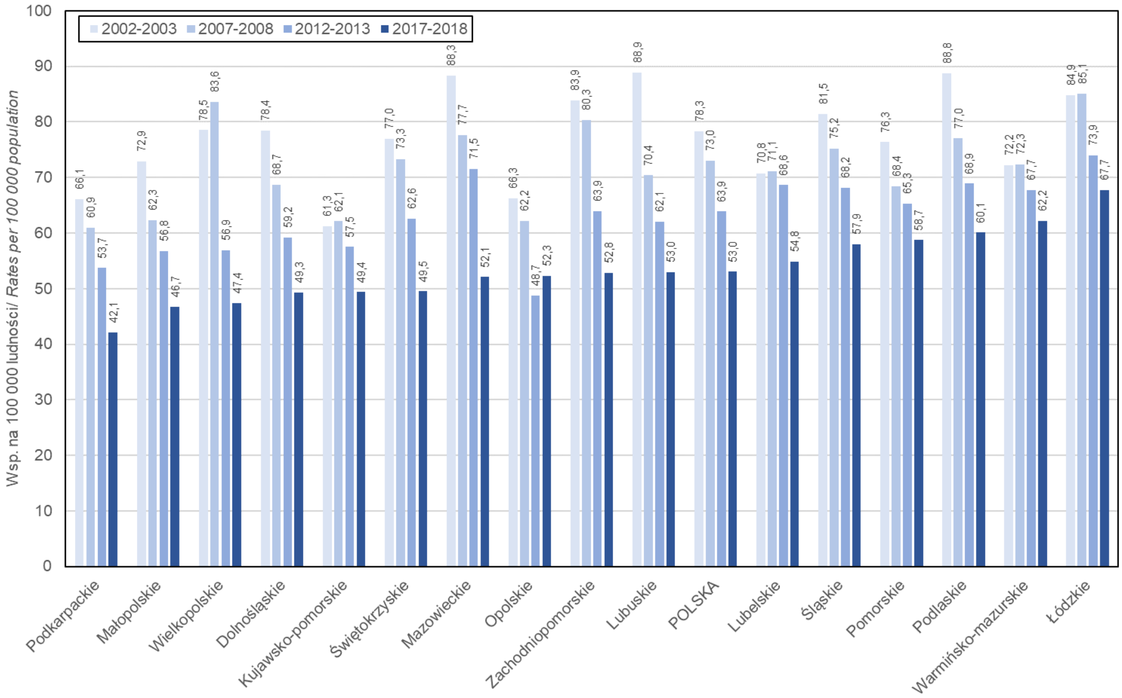


Fig. 2.37a. Age-standardised annual death rates due to external causes (V00-Y98) in the total population, by voivodship, in 2002-2003, 2007-2008, 2012-2013 and 2017-2018

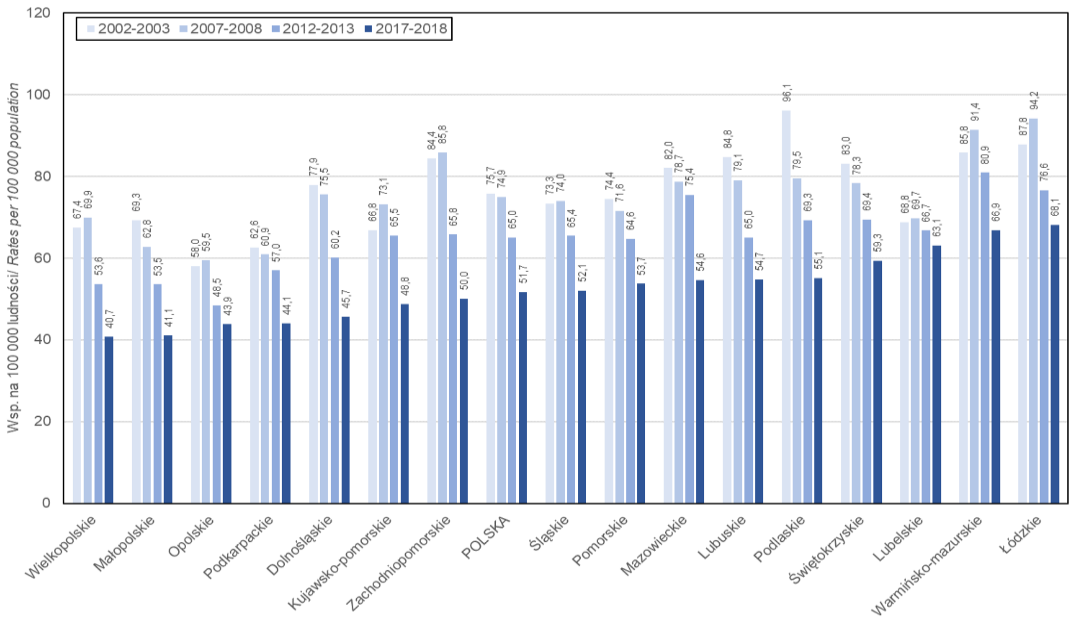


Fig. 2.37b. Age-standardised annual death rates due to external causes (V00-Y98) in people aged 25-64, by voivodship, in 2002-2003, 2007-2008, 2012-2013 and 2017-2018

The death rate due to **suicides** in 2017-2018 was lower in the whole country than five years before by 29.6% in the total population and by 27.6% among people aged 25-64 (a slight increase was recorded only in the Opolskie Voivodship) (Fig. 2.38a and 2.38b). An improvement was observed in all voivodships except for the Warmińsko-mazurskie Voivodship where the mortality rate grew by 46.8% for the total population and by 42.9% for people aged 25-64. In the Świętokrzyskie Voivodship, the improvement was only slight. The largest relative decrease in the death rate in the last five years – in the total population, reaching as many as 62%, and among people aged 25-64 approx. 64% – occurred in the Kujawsko-pomorskie Voivodship. The rise in the death rate in the Warmińsko-mazurskie Voivodship and the drop in the death rate in the Kujawsko-pomorskie Voivodship, can be partially an artefact resulting from a substantial change in the frequency of deaths the cause of which were "events of undetermined intent" (Y10-Y34) (the data quality issue is further discussed below). Their number among all inhabitants of the Warmińsko-mazurskie Voivodship decreased from 587 in 2012-2018 to 208 in 2017-2018, whereas in the Kujawsko-pomorskie Voivodship it grew from 63 in 2012-2013 to 421 in 2017-2018. A quantity leap occurred in 2016, when 196 deaths for this cause were recorded, while a year before there were only 10. In recent years the relatively best situation, and hence the lowest threat to life due to suicides, both for the total population and for people aged 25-64, has occurred in the Śląskie and Opolskie Voivodships. A variation in the mortality rates between voivodships due to suicides is not decreasing.

However, it should be pointed out that the analysis of the threat to life due to suicides in Poland, and in particular the comparative analysis of the death rate for this cause, is significantly hindered because of the previously mentioned questionable quality of death statistics, which also refers to deaths resulting from suicides. The problem of the underestimation of these events, arising from "concealed suicides" which are described and coded in the death report as "events of undetermined intent" (ICD-10, Y10-Y34), is very crucial from the perspective of public health and epidemiology, and has been discussed in the literature on the subject. It is assumed that a model indicator for assessing the reliability of suicide death statistics is the death rate for events of undetermined intent (U10-Y34) below 2/100,000 and a quotient of this specific death rate and the death rate for suicides below 0.20[25]. Unfortunately, in Poland both these parameters in 2018 amounted to 5.5/100,000 and 0.48, respectively, which is far more than the limits. There are also vast differences in these parameters between voivodships, probably indicating considerable disparities in data reliability. For instance, in the Małopolskie Voivodship these parameters were 0.5 and 0.04, respectively; in the Podlaskie Voivodship 0.6 and 0.05, respectively; in the Pomorskie Voivodship 0.5 and 0.04, respectively; in the Kujawsko-Pomorskie Voivodship 12.5 and 1.56, respectively; in the Łódzkie Voivodship

[25] P. Värnik, M. Sisask, A. Värnik, E. et al.: Validity of suicide statistics in Europe in relation to undetermined deaths: developing the 2-20 benchmark Inj Prev . 2012 Oct;18(5):321-5. doi: 10.1136/injuryprev-2011-040070. Epub 2011 Dec 10

12.5 and 0.90, respectively; in the Mazowieckie Voivodship 11.4 and 0.91, respectively; in the Opolskie Voivodship 6.2 and 0.92, respectively; and in the Śląskie Voivodship 8.6 and 1.31 respectively.

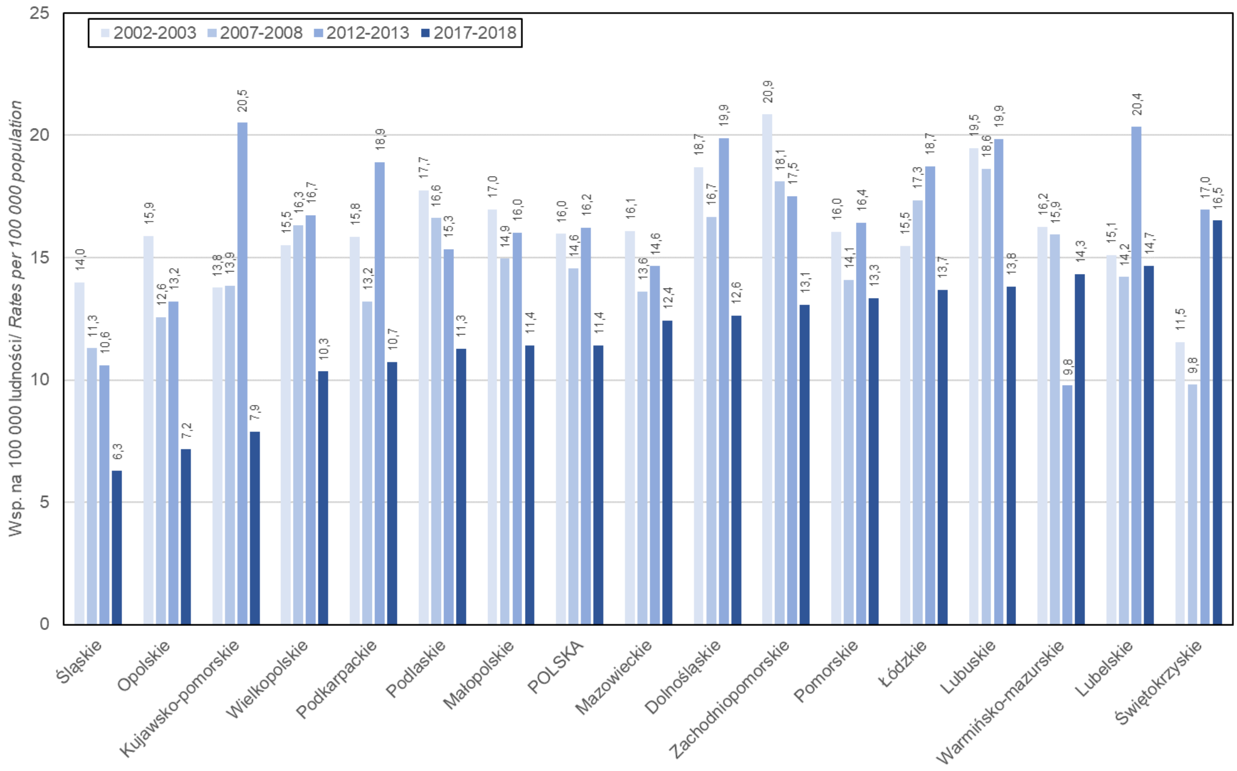


Fig. 2.38a. Age-standardised annual death rates due to intentional self-harm (X60-X84) in the total population, by voivodship, in 2002-2003, 2007-2008, 2012-2013 and 2017-2018

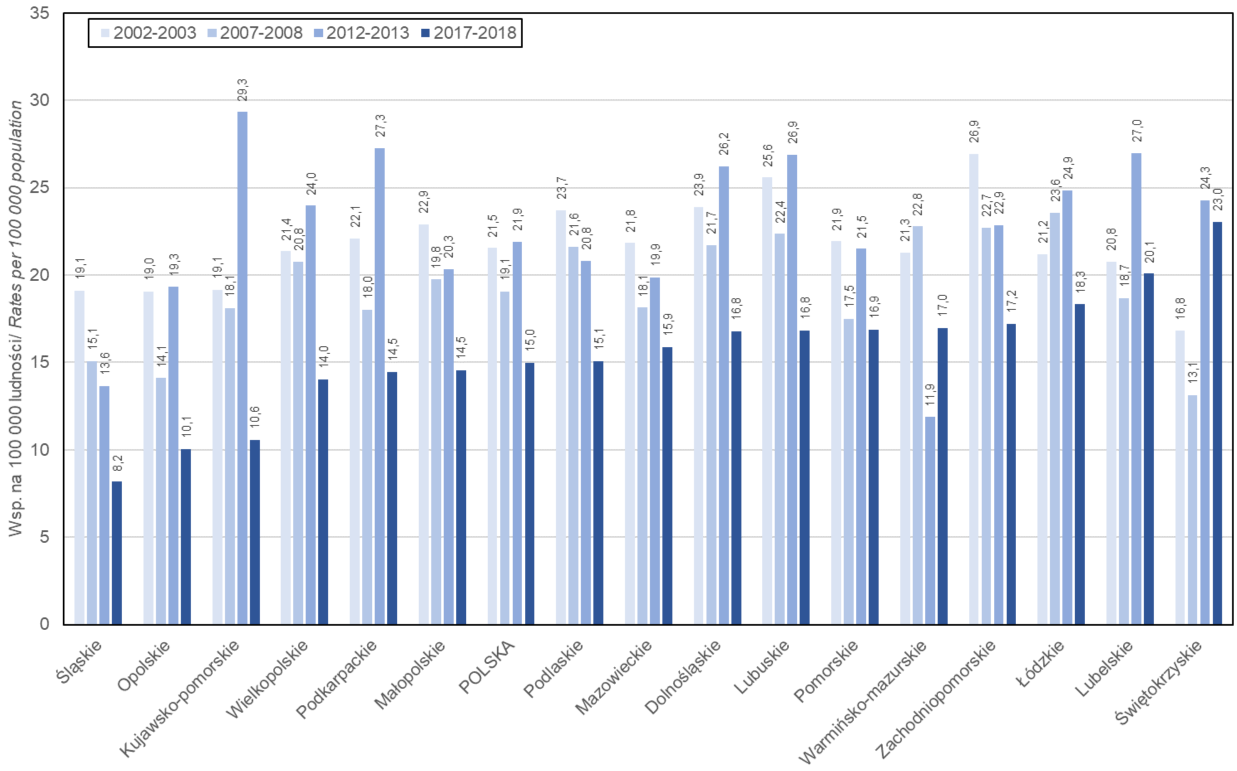


Fig. 2.38b. Age-standardised annual death rates due to intentional self-harm (X60-X84) in people aged 25-64, by voivodship, in 2002-2003, 2007-2008, 2012-2013 and 2017-2018

In all voivodships, the mortality rate due to suicides is much higher among the inhabitants of rural areas compared to urban areas. The highest relative difference in the mortality rates between rural and urban areas is recorded in the Mazowieckie Voivodship, followed by the Lubelskie and Podlaskie Voivodships (Fig. 2.39). The highest threat to life due to suicides among the inhabitants of rural areas is currently observed in the Świętokrzyskie Voivodship, followed by the Mazowieckie and Lubelskie Voivodships, and as far as the inhabitants of urban areas are concerned, in the Świętokrzyskie and Lubuskie Voivodships.

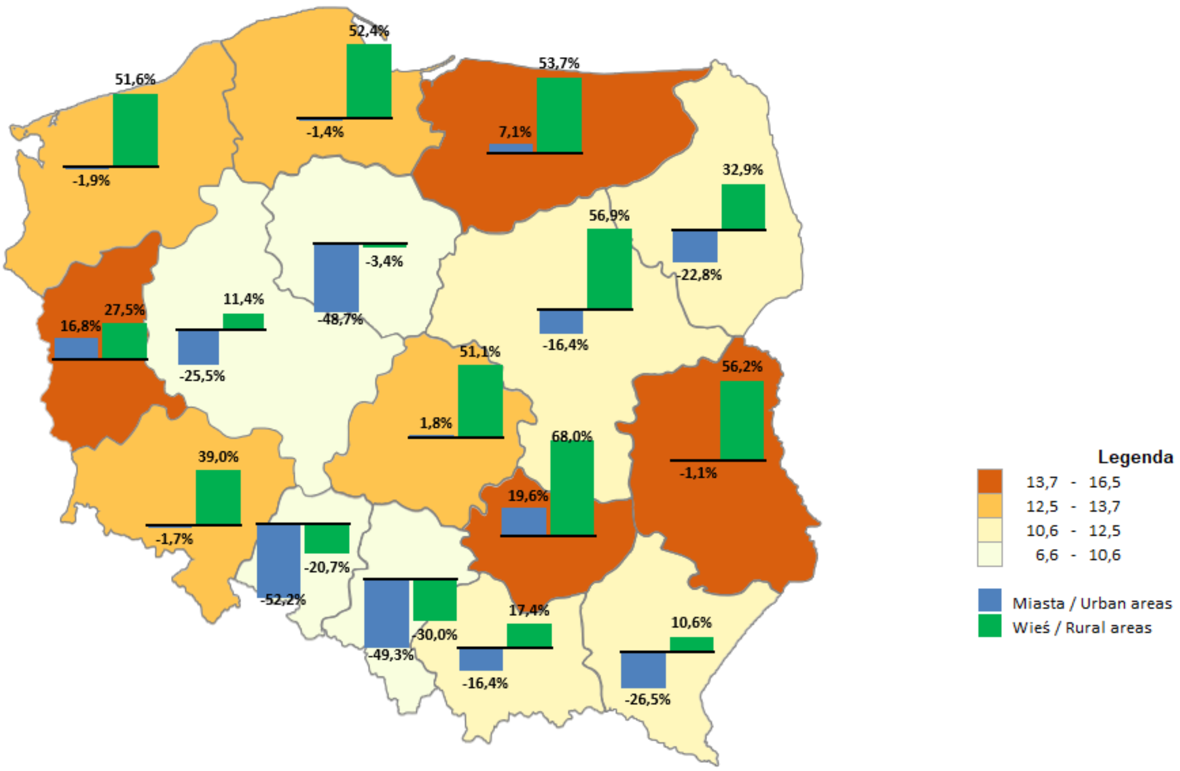


Fig. 2.39. Relative difference (%) in age-standardised death rates due to intentional self-harm (X60-X84) in the inhabitants of urban and rural areas, in relation to the death rate in the whole Poland, by voivodship, in 2017-2018

The lost of life from **traffic accidents** has been systematically decreasing in Poland. The death rate of the total population in Poland in 2017-2018 was 11.8% lower than five years before, which corresponds to a lower decrease than in the previous five-year period (2007-2008 – 2012-2013), which amounted to 33.6%. A similar situation is observed among people aged 25-64, whose mortality in the last five years decreased by 13.0%, and in the previous five-year period by 32.8% (Fig. 2.40a and 2.40b). The systematic improvement of the situation can be observed in almost all voivodships, and the mortality rate in the last period of 2017-2018 was higher than five years before only in the Dolnośląskie Voivodship, both for the total population (by 33.8%) and for people aged 25-64 (by as many as 50.6%). A slightly lower increase in the mortality rate was observed in the Świętokrzyskie Voivodship, where the corresponding growth values amounted to 11.1% and 25.7%, respectively.

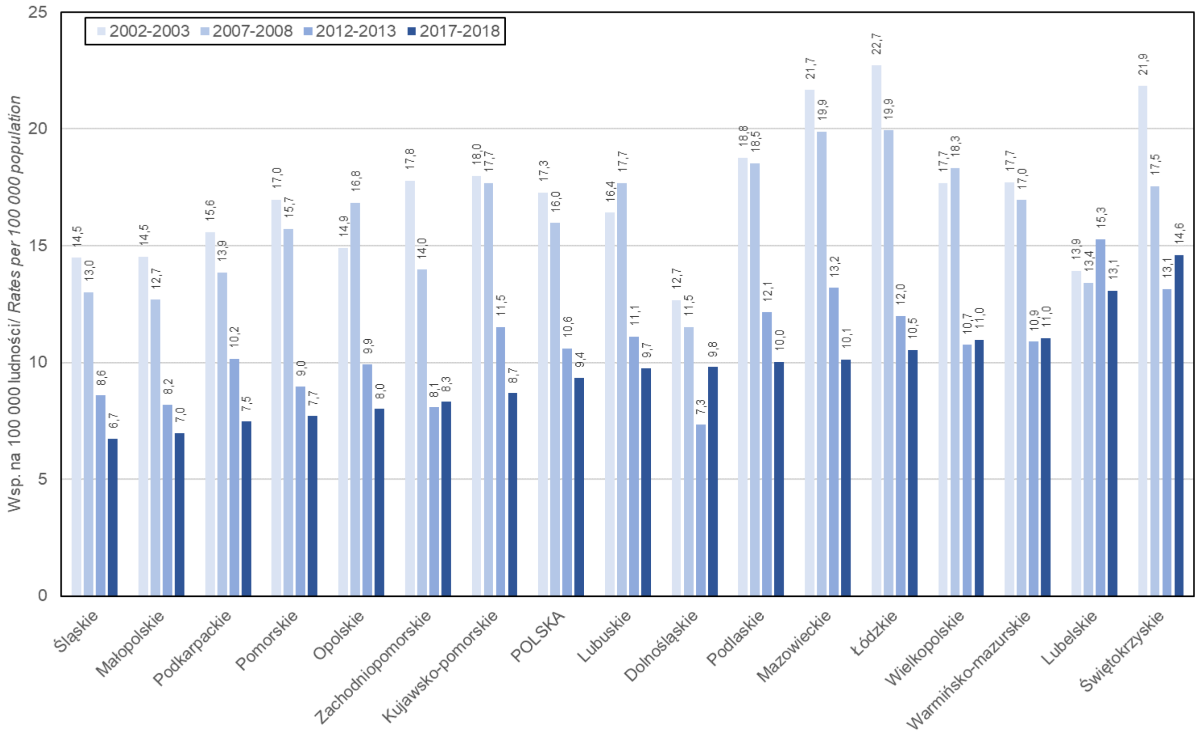


Fig. 2.40a. Age-standardised annual death rates due to transport accidents (V00-V99) in the total population, by voivodship, in 2002-2003, 2007-2008, 2012-2013 and 2017-2018

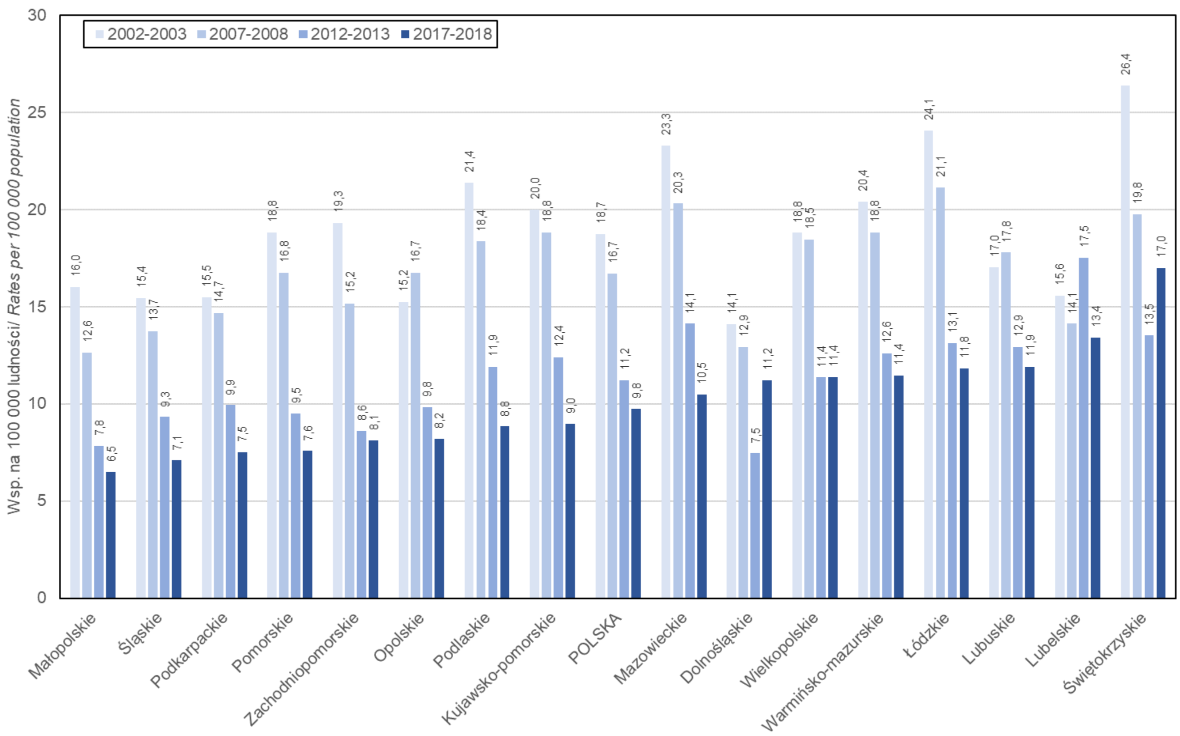


Fig. 2.40b. Age-standardised annual death rates due to transport accidents (V00-V99) in people aged 25-64, by voivodship, in 2002-2003, 2007-2008, 2012-2013 and 2017-2018

In all voivodships, the mortality rate from traffic accidents is noticeably higher for the rural population than for the urban population (Fig. 2.41). The highest relative difference in the mortality rates between rural and urban areas is found in the Mazowieckie and Łódzkie Voivodships, where the rates for the inhabitants of rural areas, but not for those residing in urban areas, are among the highest in the country. In the Świętokrzyskie and Lubelskie Voivodships, the mortality rates are among the highest both in the case of rural and urban inhabitants.

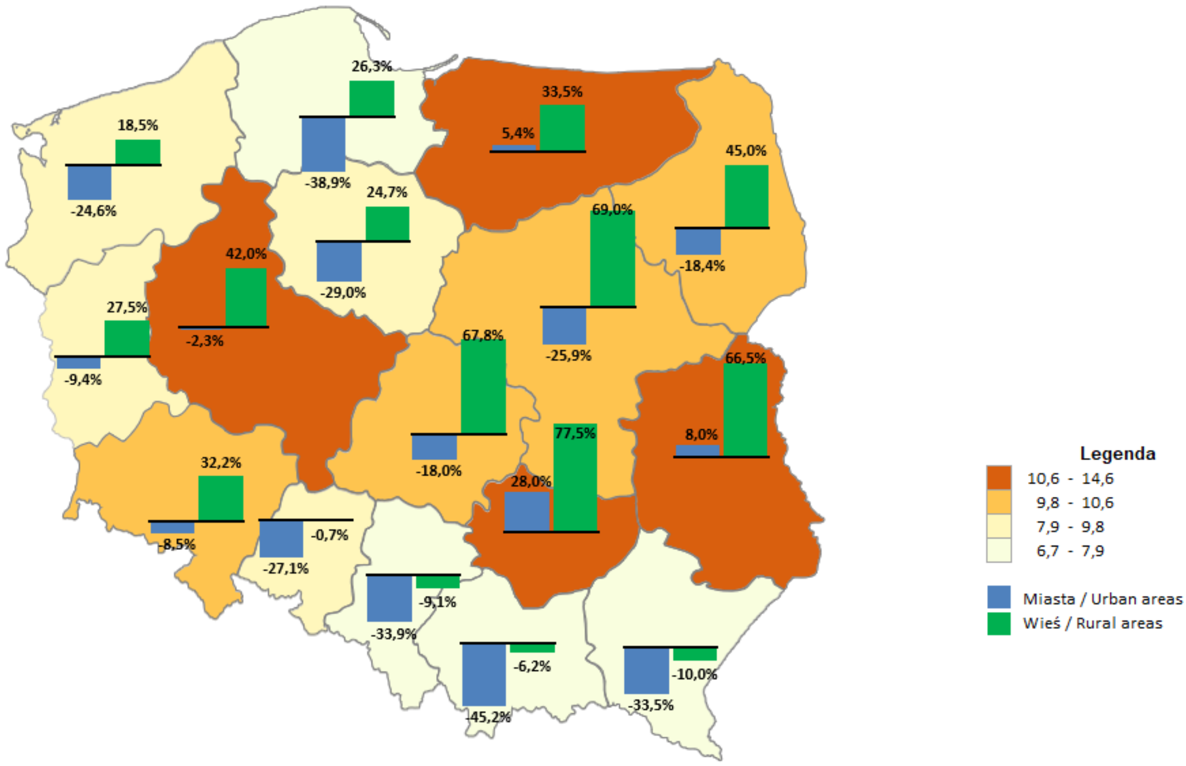


Fig. 2.41. Relative difference (%) in age-standardised death rates due to transport accidents (V00-V99) in the inhabitants of urban and rural areas, in relation to the death rate in the whole Poland, by voivodship, in 2017-2018

2.9. Mortality due to respiratory system diseases

Mortality from respiratory system diseases has shown an upward trend in recent years (Tab. 2.5a and 2.5b). In 2018 these diseases caused 27,561 deaths (including 15,186 deaths of men and 12,375 deaths of women), i.e. 72 of each 100,000 people died due to these diseases (82 men and 62 women, Tab. 2.4).

Respiratory system diseases are a much greater threat to men than to women, and after eliminating differences in the age structure, the force of mortality due to these diseases is 2.1 times higher among men than among women (Tab. 2.7). At the age above 65, respiratory diseases are a much greater risk for life than external causes, both for men and women (Fig. 2.16a and 2.16b).

Among respiratory system diseases, the most important causes of death are pneumonia, which caused 17,889 deaths in 2018 (including 9,441 deaths of men and 8,448 deaths of women) and chronic lower respiratory diseases, which caused 6,993 deaths (4,237 deaths of men and 2,756 deaths of women).

Respiratory system diseases in general are a greater threat (in 2018 by 11%) to the lives of men in rural areas than in urban areas, while the mortality rate for the female inhabitants of rural areas is 9% lower than for women living in urban areas (Tab. 2.8 and 2.9). Mortality due to pneumonia is higher in the urban population, both among men and women, while chronic lower respiratory diseases are a much greater threat to the lives of men living in rural areas compared to urban areas (the excess mortality for men in rural areas is 62%). The mortality rate among women in urban areas is currently 15% higher than in rural areas.

The threat to life of the inhabitants of Poland caused by **respiratory system diseases in general**, in national terms, was characterised by an increase in the mortality rate in the last five years, in all voivodships except for the Świętokrzyskie and Lubelskie where the mortality rate is currently the lowest (Fig. 2.42a and 2.42b). Among people aged 25-64, the rates are currently lower than five years earlier in four voivodships, but their decrease is lower. On the other hand, it is alarming to observe a high increase in the death rate in the total population of the Dolnośląskie, Małopolskie and Zachodniopomorskie Voivodships, while the rise in the last one was particularly pronounced among people aged 25-64.

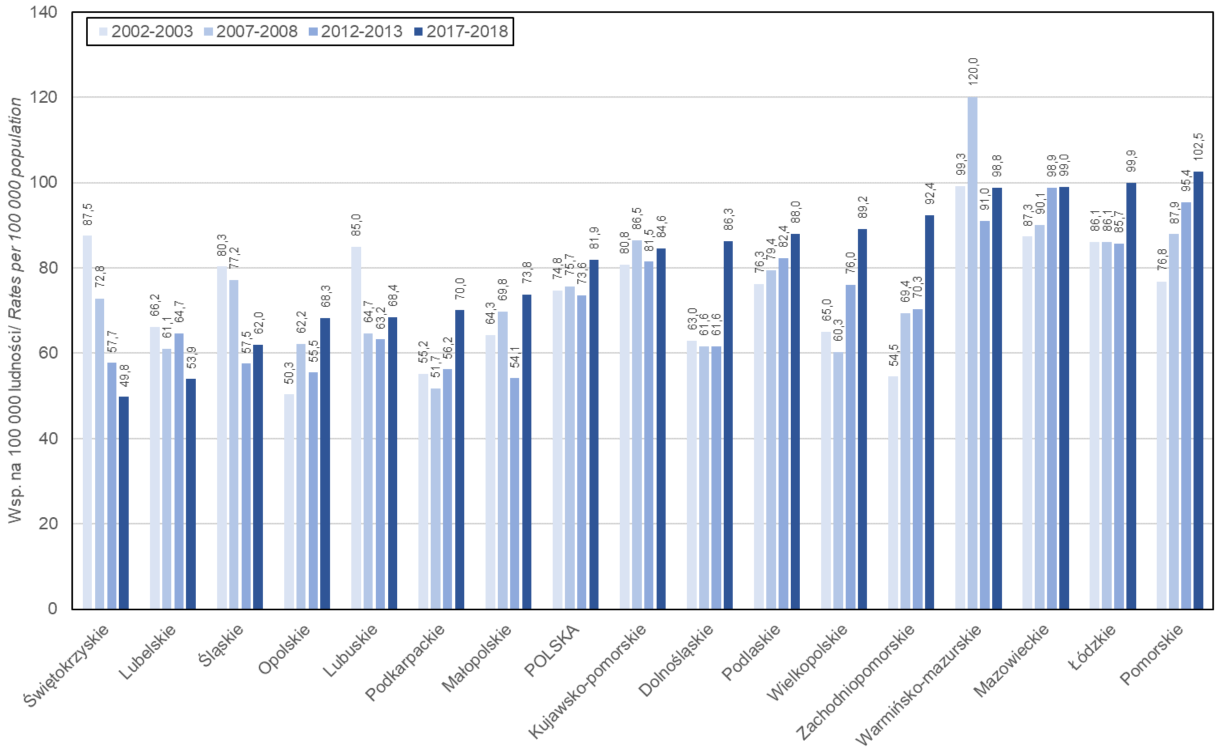


Fig. 2.42a. Age-standardised annual death rates due to diseases of the respiratory system in general (J00-J99) in the total population, by voivodship, in 2002-2003, 2007-2008, 2012-2013 and 2017-2018

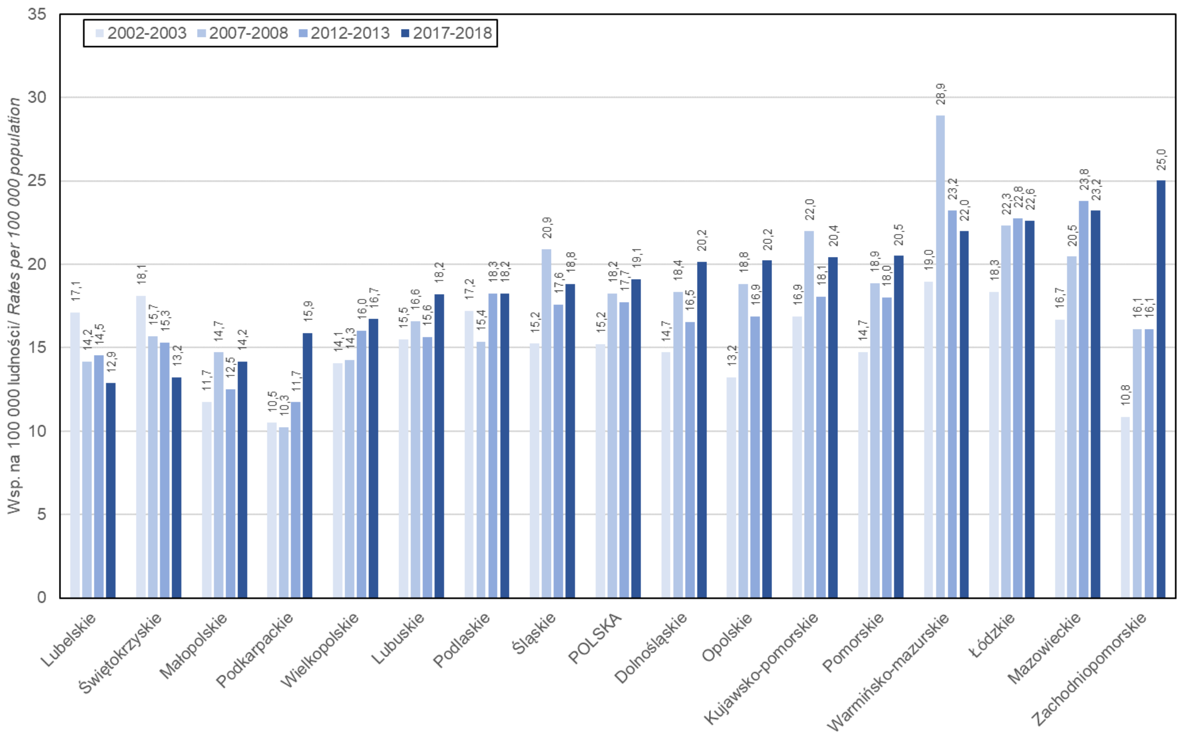


Fig. 2.42b. Age-standardised annual death rates due to diseases of the respiratory system in general (J00-J99) in people aged 25-64, by voivodship, in 2002-2003, 2007-2008, 2012-2013 and 2017-2018

Differences between voivodships in the mortality caused by **pneumonia** is high, almost twofold, and there was also a high variation of changes in the mortality rates in the last five years in respective voivodships (Fig. 2.43a and 2.43b). Death rates in 2017-2018 were higher than five years before in all voivodships, both for the total population and for people aged 25-64. Attention should be drawn to high increase in the mortality rates of the total population in the Dolnośląskie and Małopolskie Voivodships (88% in each case), the Opolskie voivodship (48%) and the Zachodniopomorskie Voivodship (46%). In the first and the last voivodships, the increase in the mortality rate among persons aged 25-64 was also the highest.

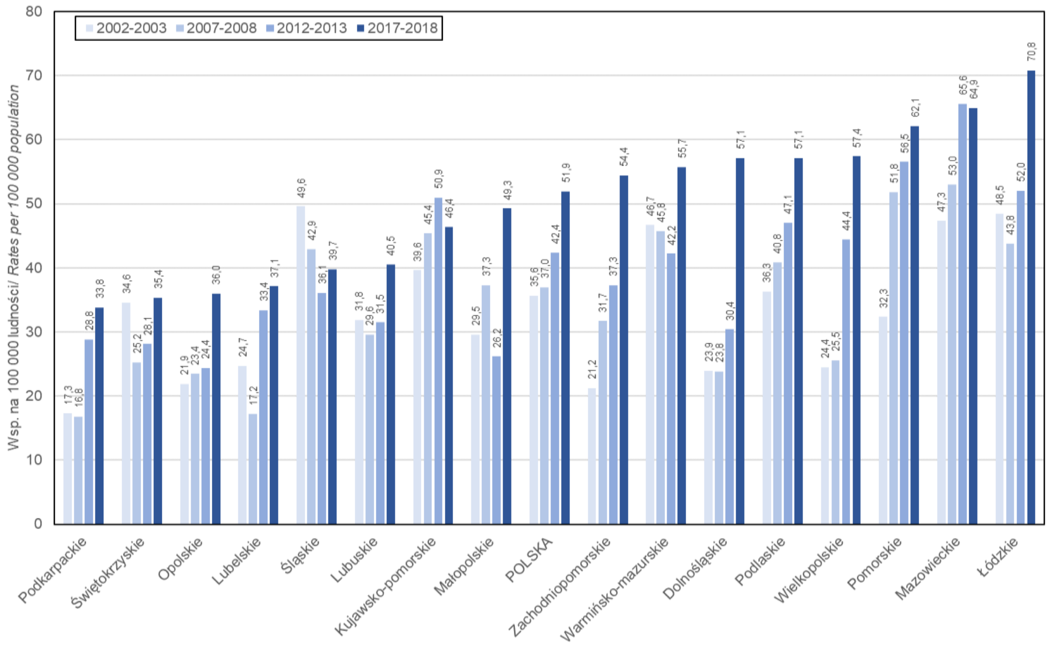


Fig. 2.43a. Age-standardised annual death rates due to pneumonia (J12-J18) in the total population, by voivodship, in 2002-2003, 2007-2008, 2012-2013 and 2017-2018

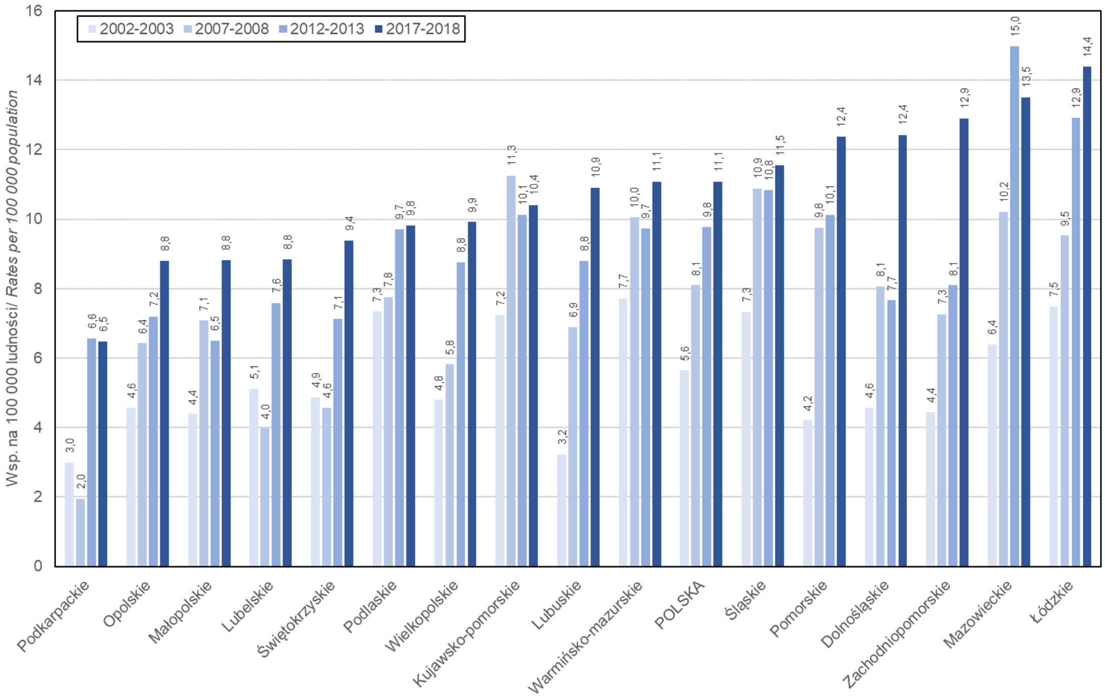


Fig. 2.43b. Age-standardised annual death rates due to pneumonia (J12-J18) in people aged 25-64, by voivodship, in 2002-2003, 2007-2008, 2012-2013 and 2017-2018

Despite the higher mortality rate due to pneumonia, in national terms, in urban areas than in rural areas, in most voivodships the mortality rate of the inhabitants of rural areas was higher than that in urban areas (Fig. 2.44). The highest relative difference in the mortality rates, to the disadvantage of the urban population, is found in the Łódzkie Voivodship, where the mortality rate of the inhabitants of urban areas is the highest in the whole country, whereas the most unfavourable rate among the rural population was recorded in the Śląskie Voivodship.

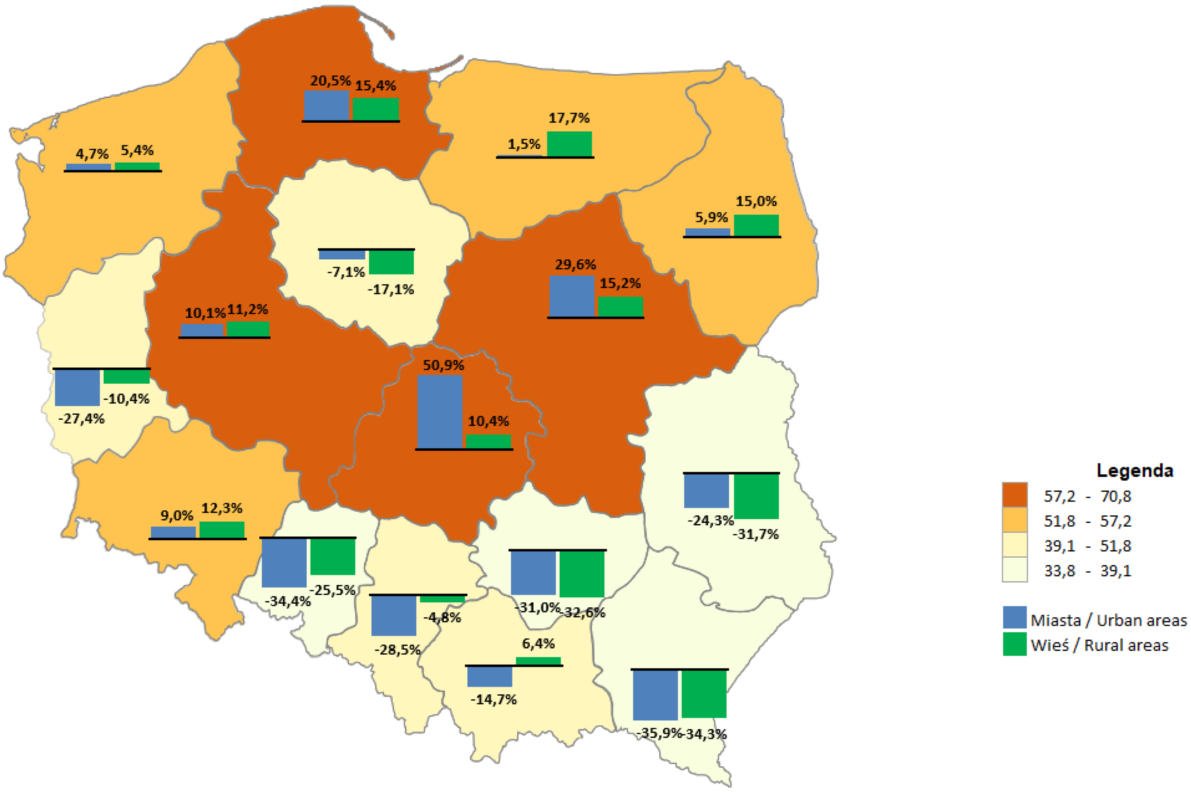


Fig. 2.44. Relative difference (%) in age-standardised death rates due to pneumonia (J12-J18) in the inhabitants of urban and rural areas, in relation to the death rate in the whole Poland, by voivodship, in 2017-2018

The threat to life among the inhabitants of Poland caused by **chronic lower respiratory diseases** has been gradually decreasing for ten years, which applies to practically all voivodships, though to a varying degree (Fig. 2.45). In the last five years the mortality rate dropped to the greatest extent in the Lubelskie Voivodship (by 49%), the Opolskie Voivodship (by 48%) and the Świętokrzyskie Voivodship (by 44%), and the mortality rates in these voivodships are now the lowest in the countru. In the whole 2000s period, the threat to life caused by this group of diseases was the highest in the Warmińsko-mazurskie Voivodship although the lowering of the mortality rate in this Voivodship has been regular and substantial.

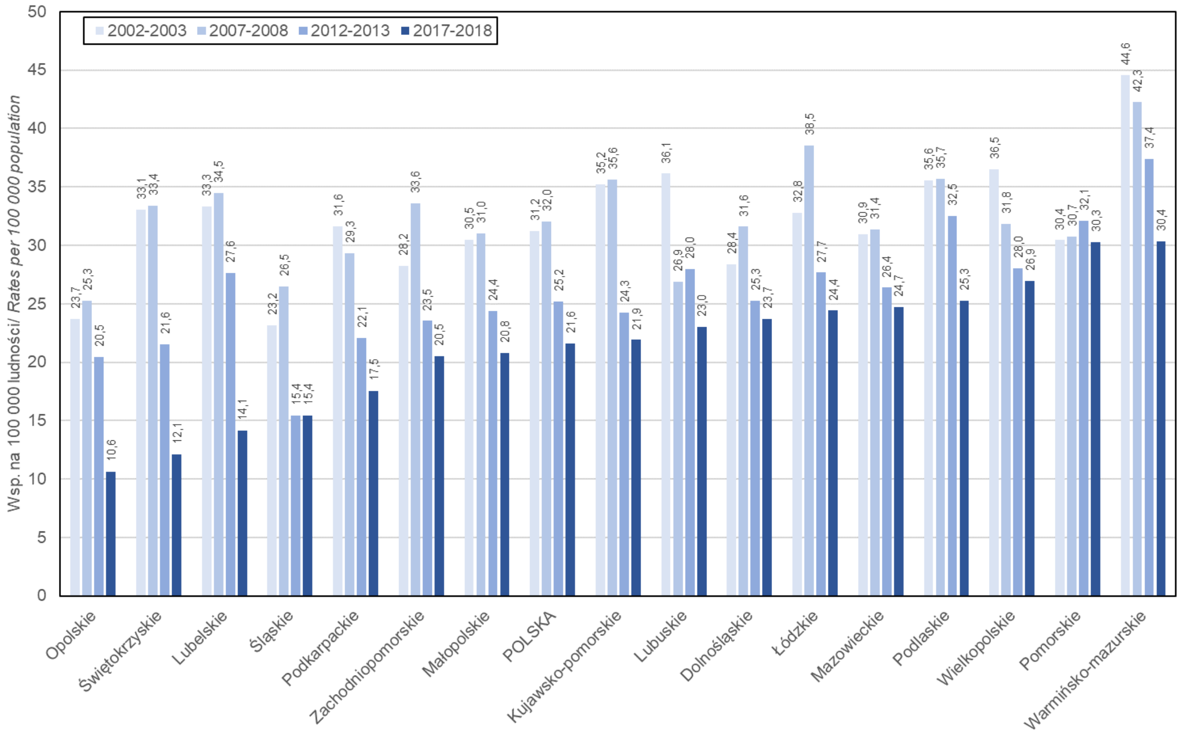


Fig. 2.45. Age-standardised annual death rates due to chronic lower respiratory diseases (J40-J47) in the total population, by voivodship, in 2002-2003, 2007-2008, 2012-2013 and 2017-2018

The mortality rate of the inhabitants of rural areas due to chronic lower respiratory diseases is higher than in the urban population in all voivodships except for the Śląskie Voivodship (Fig. 2.46). The highest relative difference in the mortality rates between rural and urban areas is found in the Warmińsko-mazurskie Voivodship, with the highest mortality rate among the inhabitants of rural areas, and in the Zachodniopomorskie Voivodship. A considerable difference in mortality is also observed between rural and urban areas in the Pomorskie Voivodship, where the mortality rate in urban areas is the highest in the country, but the mortality rate in rural areas is also relatively high, superseded only by that in the Warmińsko-mazurskie Voivodship. In the Opolskie Voivodship, the mortality from chronic lower respiratory diseases is among the lowest in the country, both in the urban and the rural population.

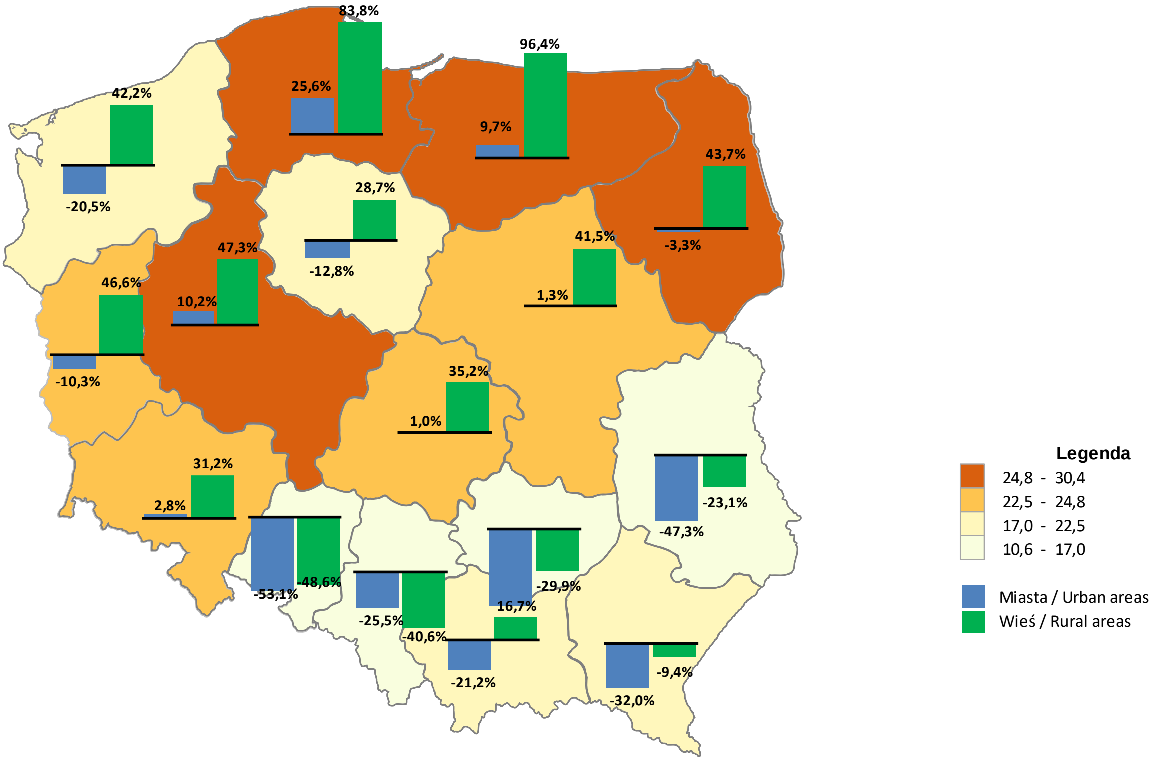


Fig. 2.46. Relative difference (%) in age-standardised death rates due to chronic lower respiratory diseases (J40-J47) in the inhabitants of urban and rural areas, in relation to the death rate in the whole Poland, by voivodship, in 2017-2018

2.10. Mortality due to diseases of the digestive system

The mortality of the total population in Poland from the digestive system diseases has increased after 2015, which is particularly prominent among men (Tab. 2.5a and 2.5b). In 2018 digestive diseases caused 17,309 deaths (including 10,134 deaths of men and 7,175 deaths of women), i.e. 45 persons died per 100,000 population for this cause (55 in the case of men and 36 in the case of women, Tab. 2.4). Although the total mortality rate due to diseases of the digestive system is lower than in the case of diseases of the respiratory system, the former are a more frequent cause of death in Poland among people aged 25-64 (Fig. 2.16a and 2.16b).

The mortality rate due to diseases of the digestive system is much higher among men than among women, and after eliminating differences in the age structure, the mortality from these diseases is more than 80% higher among men than among women (Tab. 2.7).

Among diseases of the digestive system, chronic liver diseases (K70, K73 and K74) (basically, cirrhosis and alcoholic liver disease) are the most important cause of death, and they caused 7,457 deaths in 2018 (including 5,170 deaths of men and 2,287 deaths of women) (43% of all deaths due to diseases of the digestive system).

Mortality from diseases of the digestive system in general is higher in the urban population than in the inhabitants of rural areas, both in the case of men and women (Tab. 2.8 and 2.9). An even greater difference, to the disadvantage of the urban population, occurs in the case of chronic liver diseases. The mortality rate due to these diseases is 25% higher for men in urban than in rural areas, and in the case of women this difference is as high as 50%.

The threat to life from **diseases of the digestive system in general,** for both the total population and people aged 25-64, was the highest, both in 2017-2018 and in the previous years, in the Łódzkie and Śląskie Voivodships (Fig. 2.47a and 2.47b). On the other hand, the most favourable situation in the total population is currently found in the Lubelskie and Świętokrzyskie Voivodship, and among people aged 25-64 a slightly lower mortality rate is recorded in three other voivodships. The mortality rate in two best-ranking voivodships is almost by half lower than in the Śląskie and Łódzkie Voivodships. This increases the differences in the mortality rates between voivodships due to diseases of the digestive system.

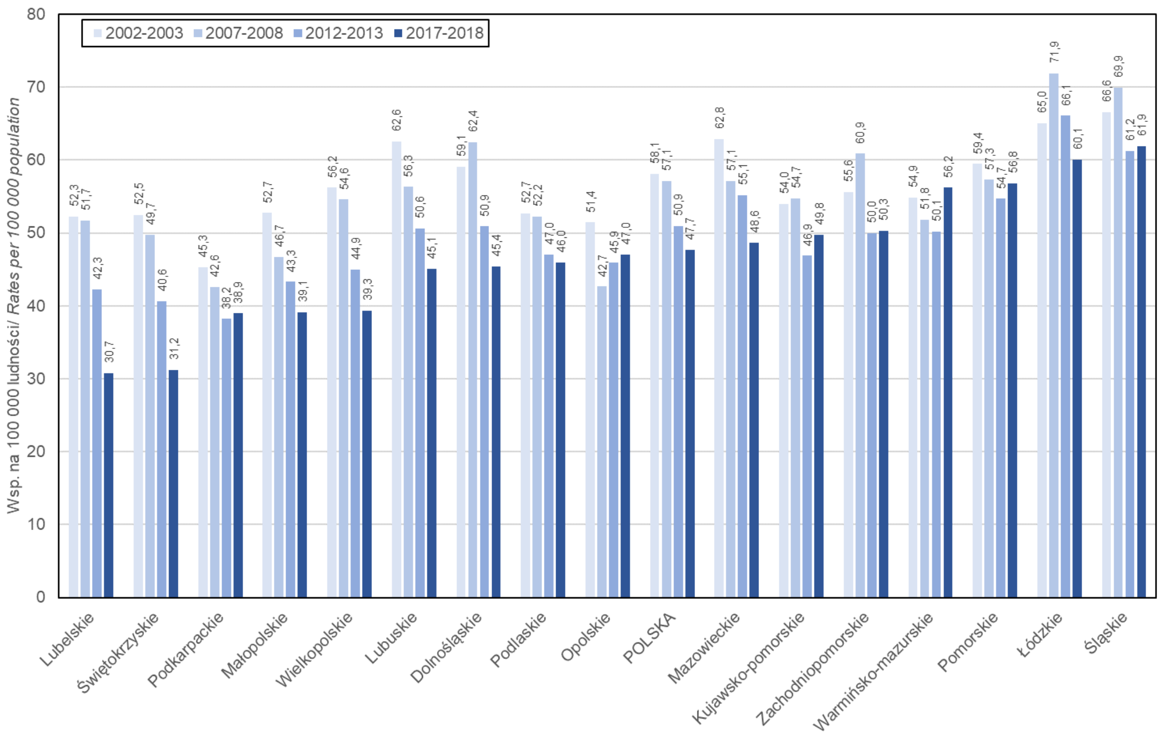


Fig. 2.47a. Age-standardised annual death rates due to diseases of the digestive system in general (K00-K93) in the total population, by voivodship, in 2002-2003, 2007-2008, 2012-2013 and 2017-2018

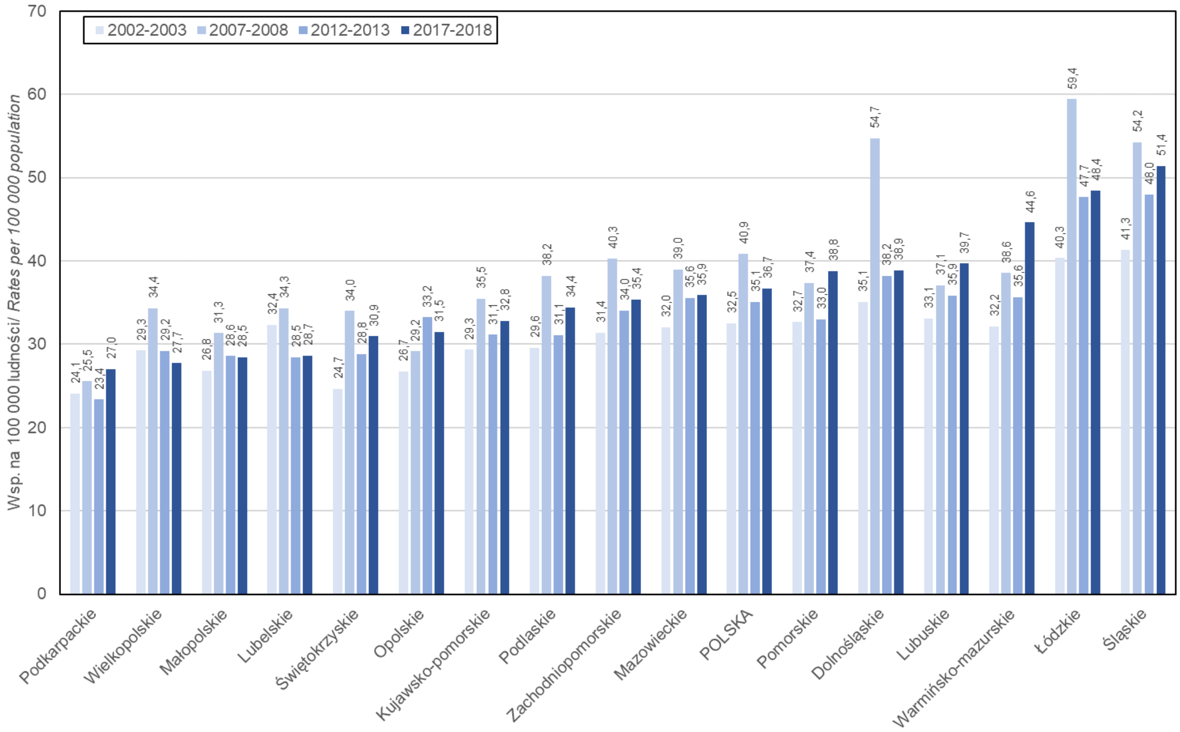


Fig. 2.47b. Age-standardised annual death rates due to diseases of the digestive system in general (K00-K93) in people aged 25-64, by voivodship, in 2002-2003, 2007-2008, 2012-2013 and 2017-2018

There is a large variation between voivodships in mortality from **chronic liver diseases**. During the whole 2000s period mortality was the highest in the Śląskie Voivodship, and up to the 2012-2013 period also in the Łódzkie Voivodship, both for the total population and people of working age (25-64 years) (Fig. 2.48a and 2.48b). In the Śląskie Voivodship, mortality is approx. 50% higher than the national average. In all voivodships except for the Łódzkie and Opolskie, the mortality rate in 2017-2018 was higher than five years before, and its greatest increase (of over 40%) was observed for both the total population and people aged 25-64 in the Warmińsko-mazurskie Voivodship.

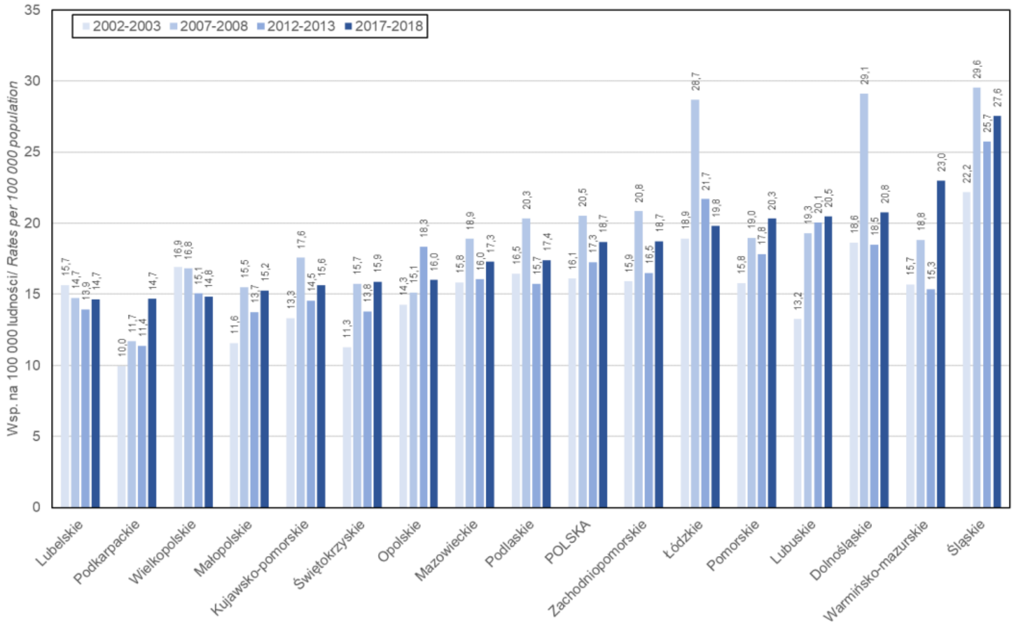


Fig. 2.48a. Age-standardised annual death rates due to chronic liver disease and cirrhosis (K70, K73-K74) in the total population, by voivodship, in 2002-2003, 2007-2008, 2012-2013 and 2017-2018

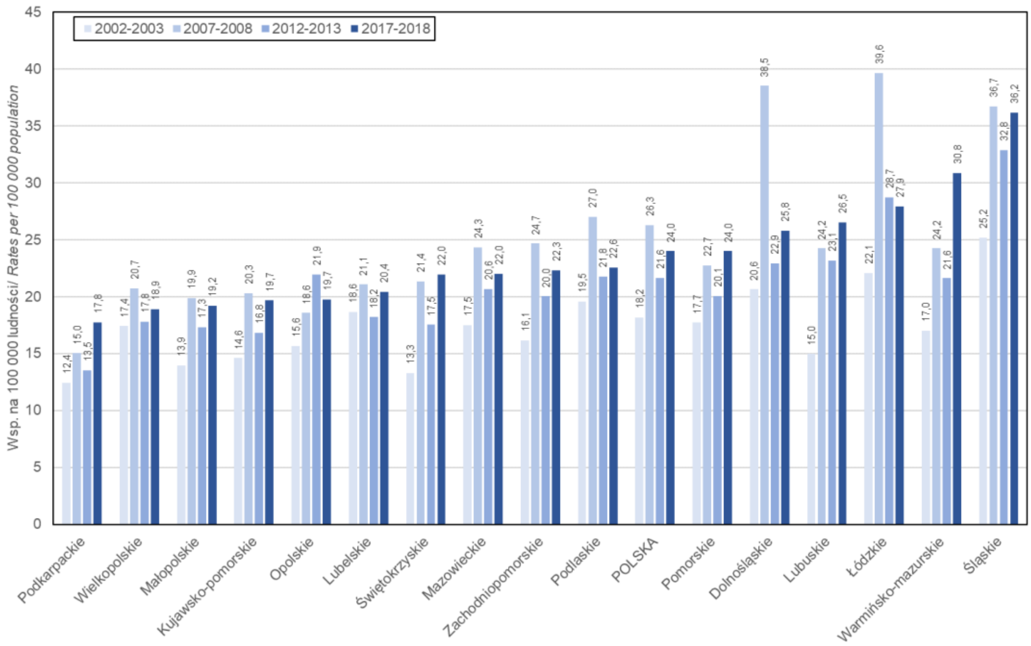


Fig. 2.48b. Age-standardised annual death rates due to chronic liver disease and cirrhosis (K70, K73-K74) in people aged 25-64, by voivodship, in 2002-2003, 2007-2008, 2012-2013 and 2017-2018

In all voivodships, the mortality rate due to chronic liver diseases and cirrhosis is higher in the urban population than in rural areas. The only exception is the Podlaskie Voivodship. The highest relative difference in mortality rates in urban and rural areas is found in the Śląskie

Voivodship (the highest mortality rate in both urban and rural areas) and the Kujawsko-pomorskie Voivodship (the lowest mortality rate in rural areas in the whole country) (Fig. 2.49).

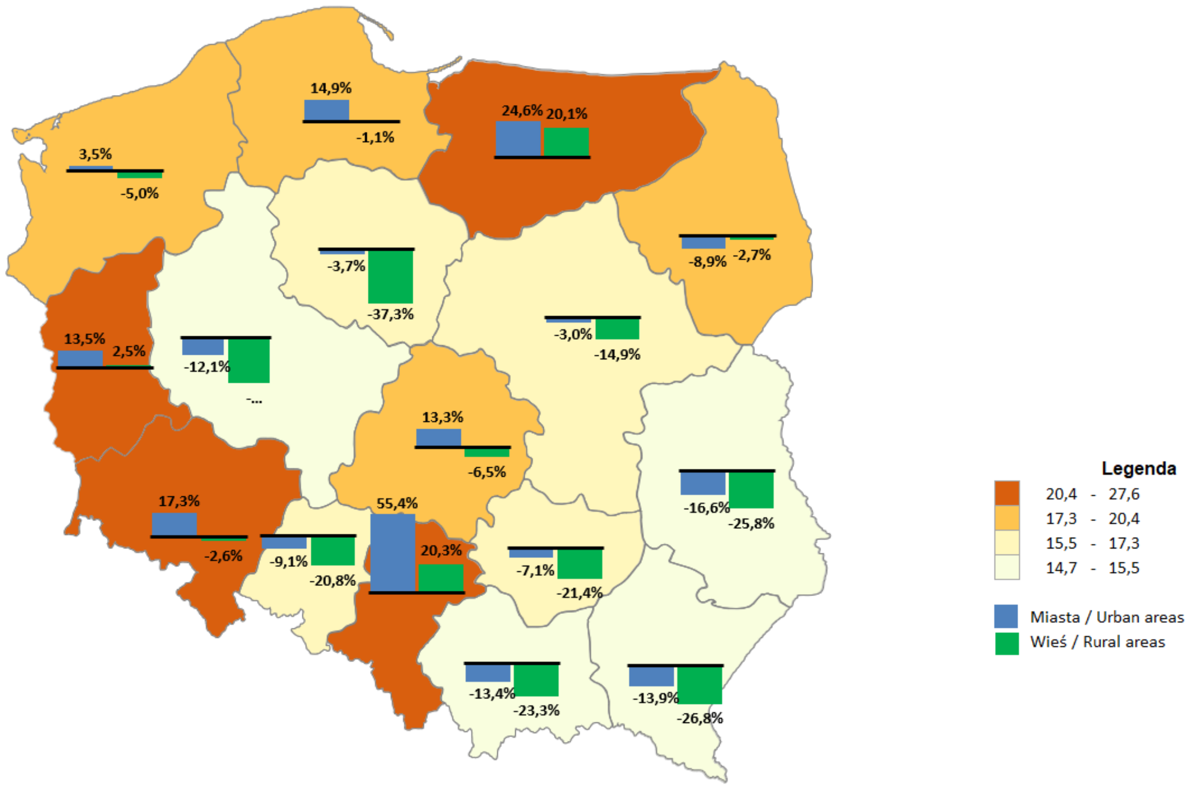


Fig. 2.49. Relative difference (%) in age-standardised death rates due to chronic liver disease and cirrhosis (K70, K73-K74) in the inhabitants of urban and rural areas, in relation to the death rate in the whole Poland, by voivodship, in 2017-2018

2.11 Mortality due to symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified

When discussing mortality from respective causes, it is worth paying attention to the group of symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified, i.e. where the cause of death includes a description of symptoms, but is not directly specified or is said as even unknown (ICD-10 R00-R99). In 2018 in Poland that group of causes was rated third in terms of significance, and was found not only in the oldest population but also in all age groups (Tab. 2.3, Fig. 2.16a and 2.16b). The mortality rate due to symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified, has increased after 2015 (Table 2.5a and 2.5b). In 2018 that category was used in the case of death of 42,633 people (including 22,327 deaths of men and 20,306 deaths of women) (111 per 100,000 population). These causes are more often observed in the case of deaths of men compared to women, and are more frequent in rural areas compared to urban areas (Tab. 2.6-2.9).

For years we have pointed to the alarming situation of the voivodship differences in terms of deaths due to indirectly specified or unknown causes. Both the mortality rate and its changes occurring over time vary to a considerable extent between voivodships (Fig. 2.50a and 2.50b). First, differences in the rates recorded in the voivodships with extreme values are six-fold for the total population and ten-fold for people aged 25-64. Second, the rate changes occurring over time are subject to high fluctuations which are difficult to explain. For instance, in the Mazowieckie Voivodship in the last five-year period the rate showed a four-fold increase, although in the previous years there was a clear downward trend. A similar situation was observed in the Warmińsko-mazurskie Voivodship. On the other hand, it should also be noted that, in the entire 2000s period, the highest mortality rates with so described death causes among people aged 25-64 was recorded in the Łódzkie Voivodship. As many as 20% of men within this age range had this cause reported as their cause of death. The same applies to recent values observed in the Podlaskie Voivodship. This leads to a valid question which causes of death decreased for this reason. On the other hand, such a varying death rate change in certain voivodships may undoubtedly impact on the death rates change for specific causes.

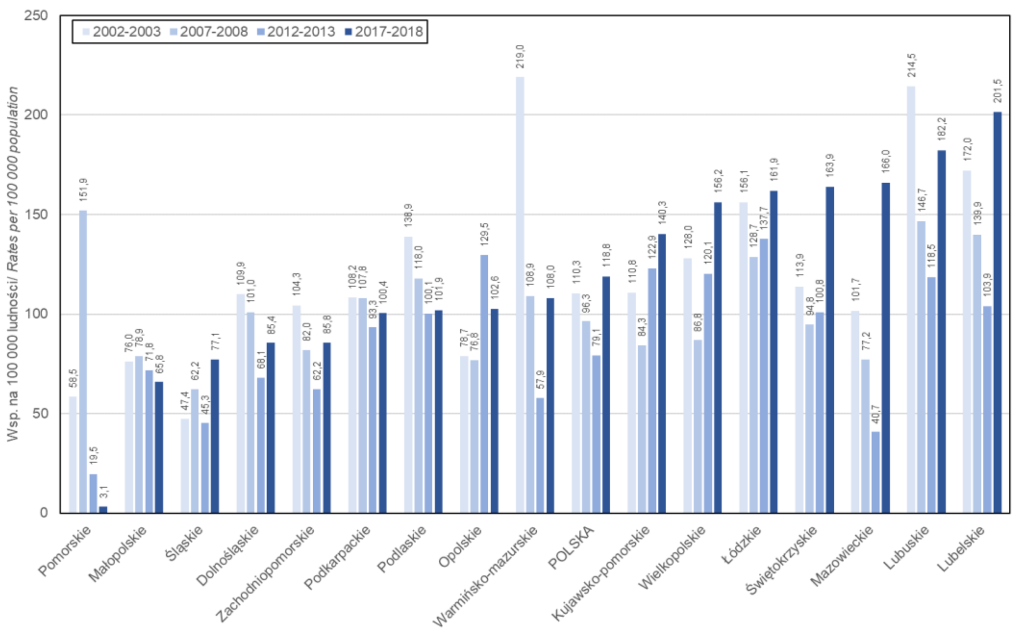


Fig. 2.50a. Age-standardised annual death rates due to symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified (R00-R99) in the total population, by voivodship, in 2002-2003, 2007-2008, 2012-2013 and 2017-2018

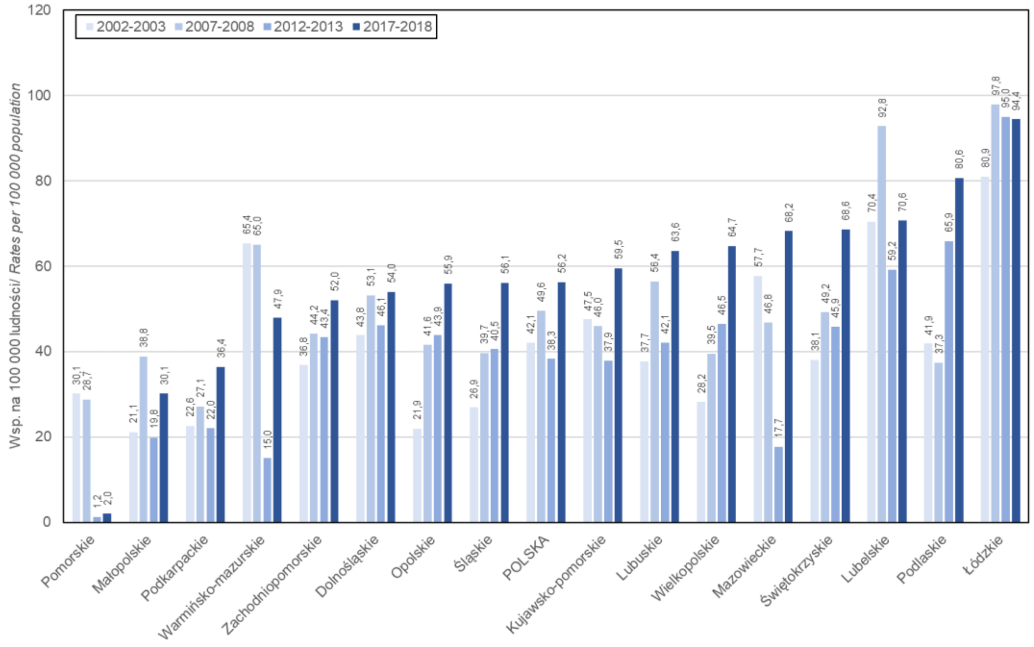


Fig. 2.50b. Age-standardised annual death rates due symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified (R00-R99) in people aged 25-64, by voivodship, in 2002-2003, 2007-2008, 2012-2013 and 2017-2018

2.12 Mortality due to preventable and amenable causes

The term *avoidable mortality* is based on the concept that premature deaths due to certain health causes/events should be rare, and ideally should not occur provided that there are timely and effective medical or public health measures. Mortality due to these causes includes deaths from preventable causes (the so-called preventable causes of death), and deaths from causes that are amenable to medical intervention and can be effectively treated (the so-called amenable causes of death). We are going to discuss the issue of mortality of the Polish population from these two groups of causes. Avoidable death rates do not constitute a precise, clear-cut measure of the healthcare system operation, but they act as population health indicators which form a good starting point for assessing the system operation, and for comparisons of the functioning of public health and healthcare activities, which should lead to limiting premature deaths due to preventable and amenable causes.

A cause of death can be prevented if, within the meaning of the health determinants applicable in the period when the death occurred, all or most of the causes (subject to age restrictions) could be avoided with generally understood public health interventions. **A cause of death is amenable to medical intervention** if, with the medical knowledge and technology available in the period when the death occurred, all or most of the deaths for that cause could be avoided with good-quality healthcare. The identified groups of diseases were created in line with the afore-mentioned list agreed upon between Eurostat and the OECD, published in November 2019[26]. Contrary to the previous versions, in the current version of the list the age threshold was established in a uniform manner at 75 years for all avoidable causes of death. The established principles also included the following three major principles described by their authors: “For those causes of death that can be both largely prevented and also treated once they have occurred, these causes of death were attributed to the preventable category on the rationale that if these diseases are prevented, there would be no need for treatment. Causes of death should generally not be fractioned as being partly preventable and amenable given the lack of evidence to do this accurately and systematically, except when there is no strong evidence of predominance, in which case a 50%-50% allocation was used. Any double-counting of the same causes of death between the two lists was avoided, so that the two lists can be used together to provide a broad assessment of the relative importance of prevention and health-care interventions in reducing avoidable deaths”. The 50-50 allocation was used for the malignant neoplasms of the cervix uteri, diabetes and most selected cardiovascular diseases (CVDs) which could be avoided, including the hypertensive disease, ischaemic heart disease and cerebrovascular diseases. All the principles make the new lists differ slightly from the previous ones.

As emphasised by the authors, both the lists of causes of death and age restrictions reflect the current health expectations, technology and medical knowledge, as well as the heath policy development, so they may be subject to future changes.

The most important specific categories of **preventable deaths** include deaths caused by diseases which could be prevented through vaccination, HIV/AIDS, lung cancer, chronic obstructive pulmonary disease, diseases connected with alcohol consumption and other psychoactive substances, as well as accidents, injuries and suicides.

In 2018, 76,973 people died from preventable causes, including 55,446 men and 21,527 women (216 per 100,000 population). The causes in this group pose a much greater threat to men than to women, and if the differences in the age structure are eliminated, mortality due to these diseases is 3.0 times higher among men than among women (Tab. 2.7). Deaths belonging to this group comprise 18.6% of all deaths, of which 26% of all deaths in men and 11% of all deaths in women, and they account for 41%, 44% and 34% of the deaths of persons aged below 75, respectively.

[26] OECD, EUROSTAT, Avoidable mortality: OECD/Eurostat lists of preventable and treatable causes of death (November 2019 version), November 2019. Retrieved on 24 April 2020 from http://www.oecd.org/health/health-systems/Avoidable-mortality-2019-Joint-OECD-Eurostat-List-preventable-treatable-causes-of-death.pdf

The standardised death rates as regards preventable causes for men are 13.4% higher in rural areas than in urban areas, and in the case of women, they are 8.8% higher in urban areas (Tab. 2.9).

Mortality of the inhabitants of Poland due to preventable causes had been decreasing gradually, but at a variable rate, until 2015 (Fig. 2.51). The relative mortality decrease rate for preventable diseases was slower than for the diseases which could be effectively treated – in the former case, in 2007-2015 it was 2.9% per year, and in the latter case, in 2008-2015 – 3.8%. In 2015-2018 the decrease rate of the mortality rates changed significantly, slowing down completely in the case of both the groups of the causes of death. The situation may indicate a certain inefficiency of the healthcare system in Poland both in the area of public health and medical interventions, and it clearly needs further investigation.

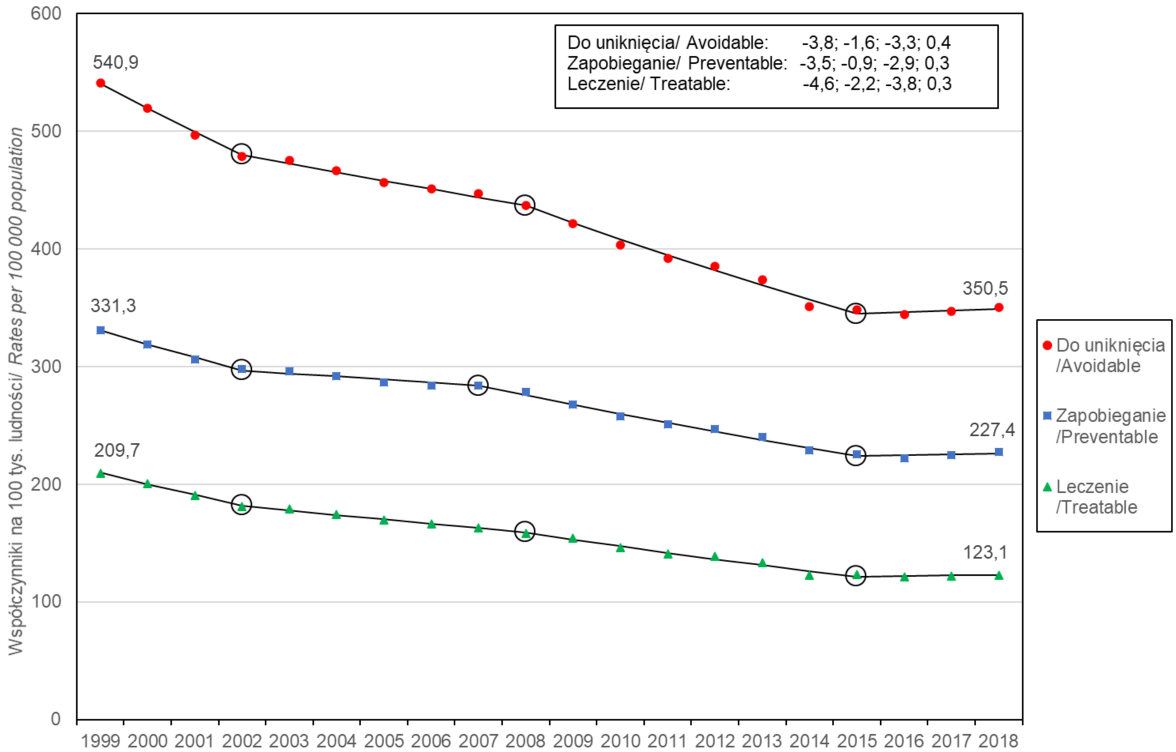


Fig. 2.51. Age-standardised mortality rates for people below the age of 75 due to avoidable, preventable and amenable causes of death – their trends and annual average relative change rates, 1999–2018 (authors' own calculations based on the WHO mortality database and SP data)

Mortality from preventable causes decreased in 2017-2018, in comparison with 2012-2013, in all voivodships, on average by 7.9% – the most in the Mazowieckie and Świętokrzyskie Voivodships, by approx. 13%, and the least in the Pomorskie Voivodship, by 1.5%, and in the Warmińsko-mazurskie Voivodship, by 2.7%, where the mortality rate is the highest in the country (Fig. 2.52). The share of deaths from preventable causes in the total number of deaths among people below the age of 75 is the highest in the Pomorskie Voivodship, amounting to 49.3%. On the other hand, the most favourable situation has for years occurred in the Podkarpackie Voivodship, where the mortality rate has recently been 22% lower than the national average, and 34% lower than in the Warmińsko-Mazurskie Voivodship. The lowest share of deaths from these causes in the total number of deaths among people below the age of 75 is found in the Świętokrzyskie and Lubelskie Voivodships, amounting to 36% in each case, while in the Podkarpackie Voivodship it is around 39%. Differences between voivodships in the mortality rates due to preventable causes in 2000s did not decrease.

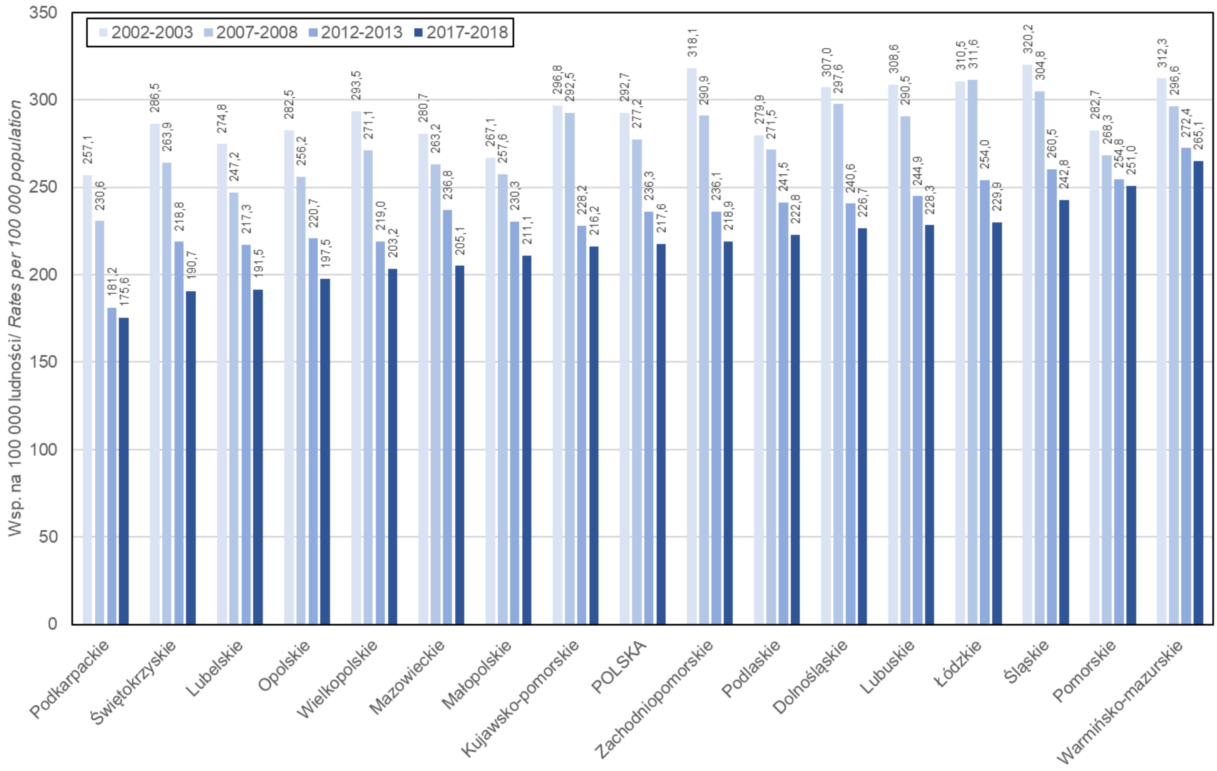


Fig. 2.52. Age-standardised annual death rates due to preventable causes of death in the total population, by voivodship, in 2002-2003, 2007-2008, 2012-2013 and 2017-2018

In almost all voivodships, the mortality from preventable causes is higher in the rural population than in the urban population, the only exception being the Śląskie Voivodship where the mortality of urban inhabitants is one of the highest in the country. The greatest relative difference in the mortality rates in urban and rural areas is found in the Warmińsko-mazurskie, Mazowieckie and Zachodniopomorskie Voivodships (Fig. 2.53). In the first voivodship mentioned, the mortality rate in rural areas is the highest in the country. The Podkarpackie, Świętokrzyskie and Lubelskie Voivodships are the voivodships where the threat to life from preventable causes, in both urban and rural inhabitants, is the lowest in the country, whereas the voivodship with the highest mortality of the inhabitants of both urban and rural areas is the Pomorskie Voivodship.

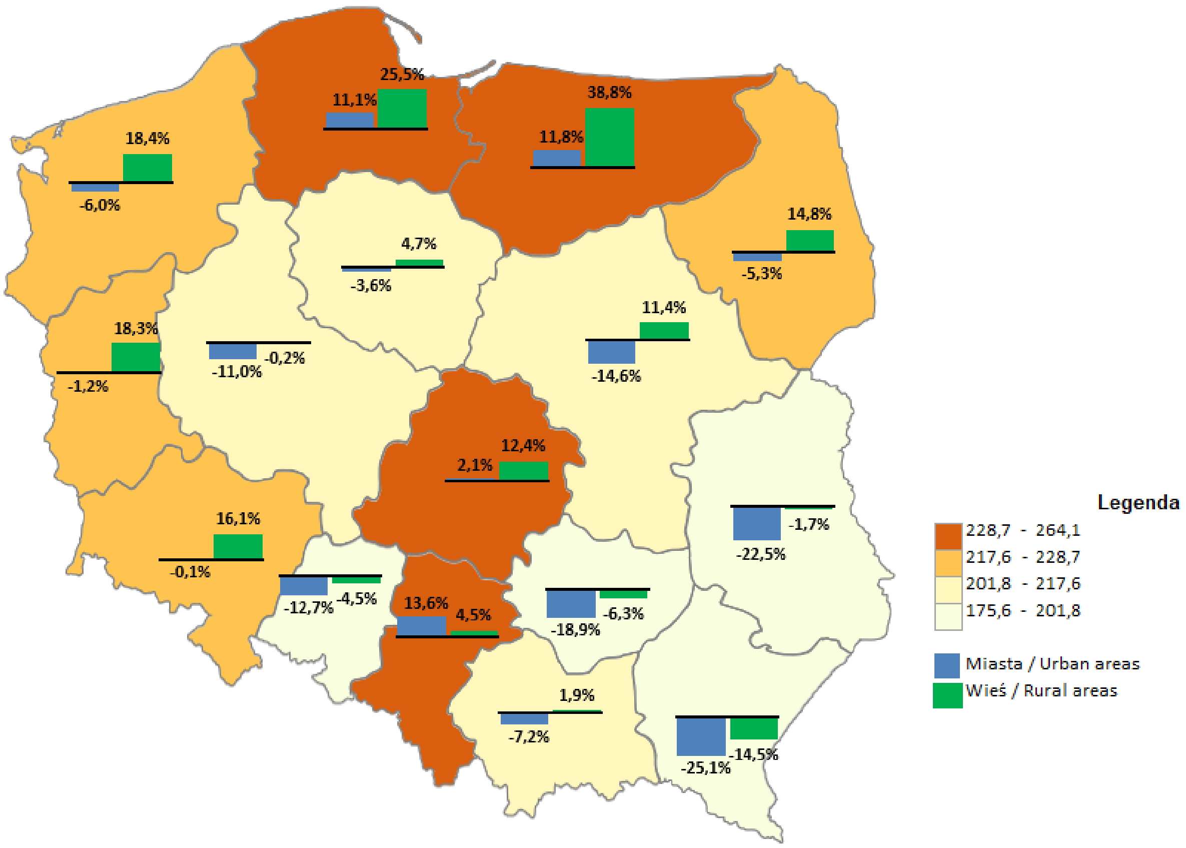


Fig. 2.53. Relative difference (%) in age-standardised death rates due to preventable causes of death in the inhabitants of urban and rural areas, in relation to the death rate in the whole Poland, by voivodship, in 2017-2018

Fig. 2.54 presents a noteworthy phenomenon, i.e. the dynamics of the standardised mortality rates due to preventable cardiovascular diseases and malignant neoplasms in 1999-2018. It reveals their trends and the average relative annual change rates (%) in time segments determined by the significant change in that rate. It is worth considering the following facts. Avoidable mortality due to malignant neoplasms is currently much higher than from CVDs, both among men and women. In the case of women, the death rates due to neoplasms were characterised with a slow but significant upward trend (0.9% in annual terms), while the death rates due to CVDs, after a gradual fall in 1999-2016 (5.7% in annual terms), has remained at a similar level. In the case of men, mortality from CVDs had been decreasing at a faster rate than from neoplasms until 2015, but in 2015-2018 the decrease decelerated, while the downward mortality trend due to neoplasms continued.

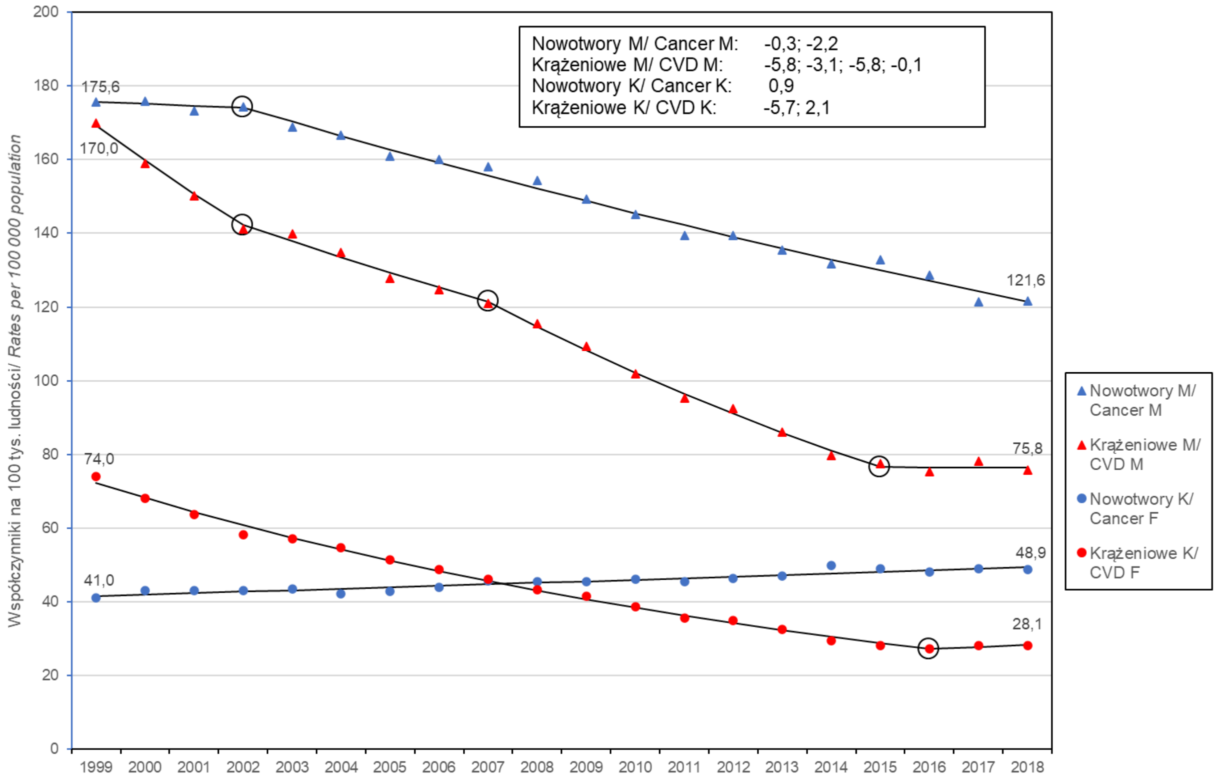


Fig. 2.54. Age-standardised mortality rates of men (M) and women (F) below the age of 75 due to preventable CVDs and cancer – their trends and annual average rates, 1999–2018 (authors' own calculations based on the WHO mortality database and SP data)

The specific categories of **amenable causes of death** include among others malignant neoplasms of the breast, colon, rectum and anus, Hodgkin's disease, non-malignant neoplasms, acute and chronic rheumatic heart diseases, pneumonia and acute lower respiratory infections, asthma, gastric and duodenal ulcers, diseases of appendix and hernias.

In 2018 as many as 45,642 people, including 26,753 men and 18,889 women (128 per 100,000 population), died from amenable causes. The causes included in this category pose a much greater threat to life for men than for women, and after eliminating differences in the age structure, the mortality due to these diseases is 1.66 times higher among men than among women (Tab. 2.7). Deaths belonging to this group comprise 11.0% of all deaths, including 13% of all deaths of men and 9% of all deaths of women, and they account for 24%, 21% and 30% of the deaths of people below the age of 75, respectively.

Standardised death rates for causes that could be effectively treated are similar for the urban and rural populations (Tab. 2.9).

In 2017-2018 death rates in all voivodships, except for the Pomorskie Voivodship, were lower than five years before, on average by 8.4%. The greatest improvement was observed in the Świętokrzyskie and Mazowieckie Voivodships, where the rates dropped by approx. 15%.

The Pomorskie Voivodship recorded the same mortality rate as the Śląskie Voivodship, where mortality due to amenable causes is the highest in the country (Fig. 2.55). Also in the Pomorskie Voivodship, the share of deaths from amenable causes among persons aged below 75 in the total number of deaths is among the highest in the country, and in 2018 it amounted to 29%. A slightly higher rate was recorded only in the Małopolskie Voivodship – 31%. On the other hand, a favourable situation can be observed in the Podkarpackie and Lubelskie Voivodships, where the mortality rate is recently lower than the national average by 19% and 18%, respectively.

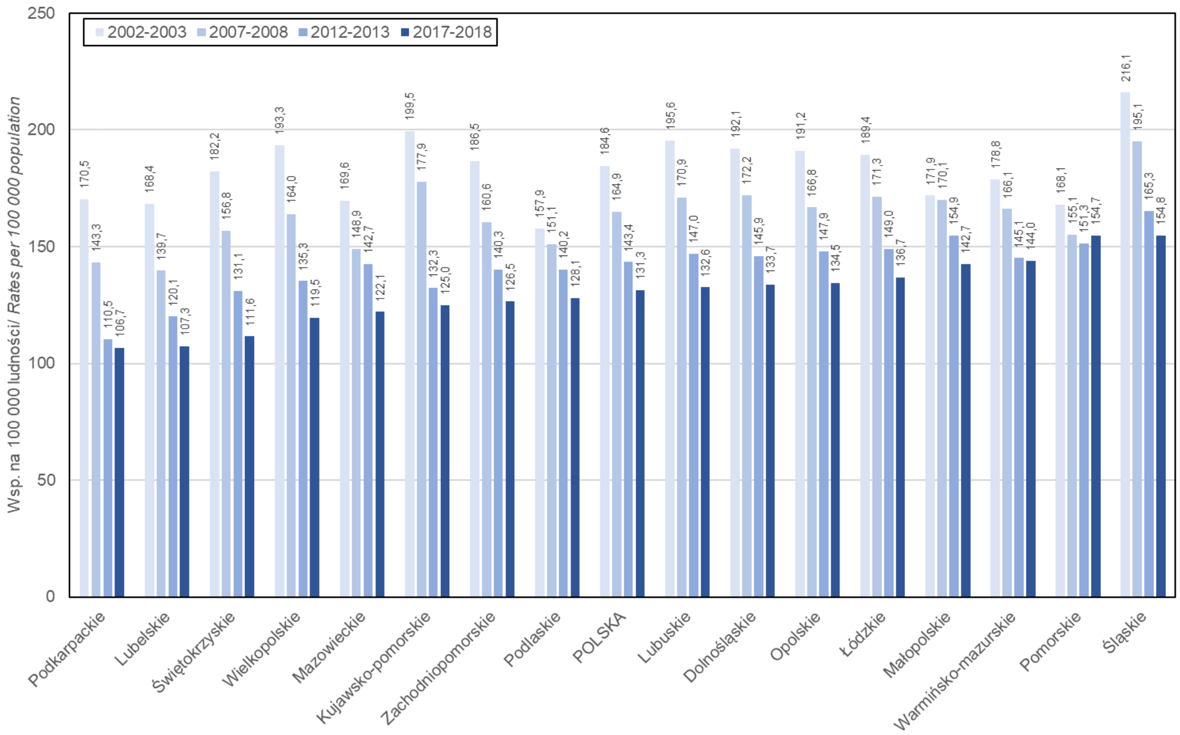


Fig. 2.55. Age-standardised annual rates of amenable mortality in the total population, by voivodship, in 2002-2003, 2007-2008, 2012-2013 and 2017-2018

The mortality rate from amenable causes is quite similar for the total rural and urban populations. In all voivodships except for the Łódzkie and Śląskie Voivodships, it is higher for the inhabitants of rural areas compared to urban areas. The greatest absolute difference in the mortality rates in rural and urban areas is found in the Warmińsko-mazurskie Voivodship (Fig. 2.56). The voivodships in which the mortality due to amenable causes is among the lowest in the country, for both the inhabitants of urban and rural areas, are the Podkarpackie and Lubelskie Voivodships, while the greatest risk to the lives of the urban population is in the Śląskie and Pomorskie Voivodships, and among the rural population in the Warmińsko-mazurskie and Pomorskie Voivodships.

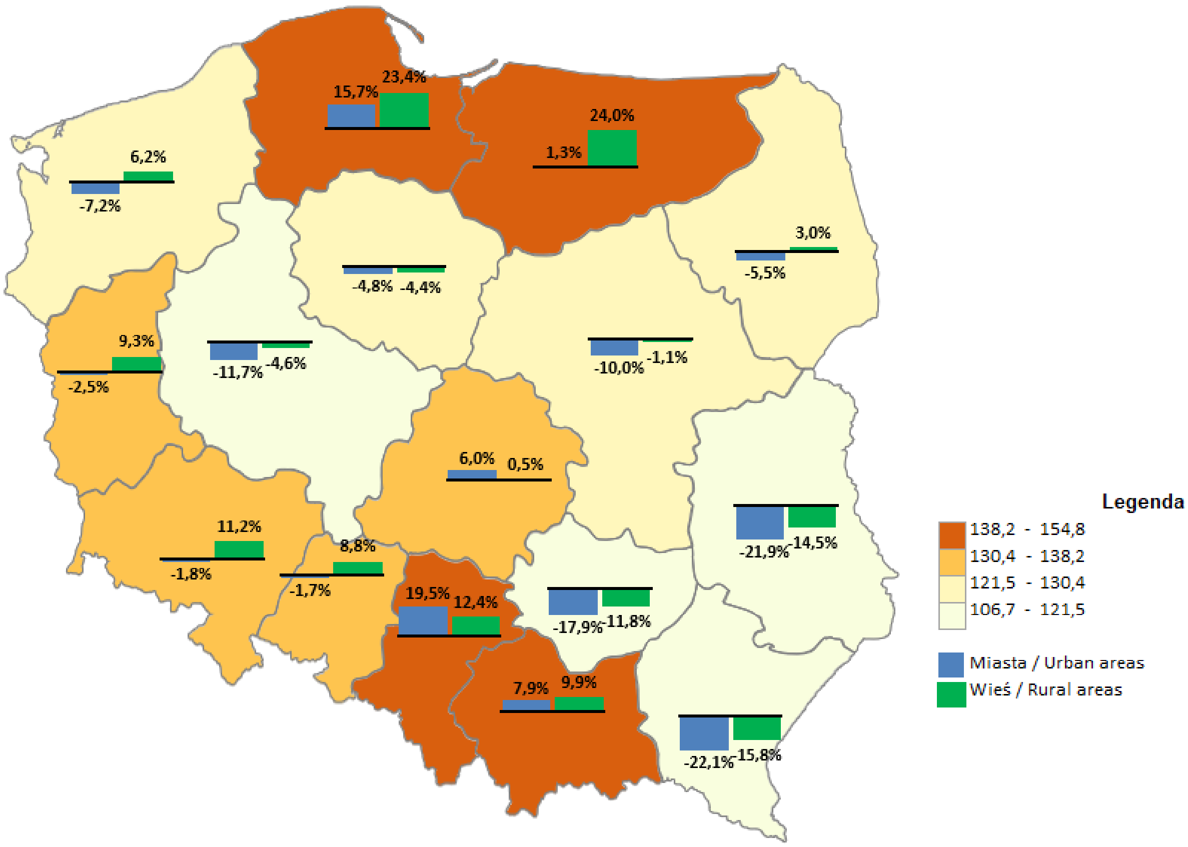


Fig. 2.56. Relative difference (%) in age-standardised death rates for amenable causes in the inhabitants of urban and rural areas, in relation to the death rate in the whole Poland, by voivodship, in 2017-2018

A very interesting phenomenon is presented in Fig. 2.57, i.e. the standardised death rates for amenable causes due to CVDs and cancer in 1999-2018. The trends and the annual average relative change rates (%) are presented in time segments determined by a significant change in this rate. The following facts are worth noting. The mortality of men due to amenable CVDs is much higher than their mortality due to cancer, while with regard to the mortality of women, the situation is the opposite. In addition, the mortality of women due to CVDs is significantly lower than that of men, while in the case of deaths due to cancer, the relationship is the opposite. Among both men and women, there is a slow but significant downward trend in cancer deaths, for women -0.6% per year and for men, only since 2009, -1.0% per year. In contrast, the death rates due to CVDs, after a systematic rapid decline until the middle of the previous decade (5.8% per year), have remained more or less constant over the last period.

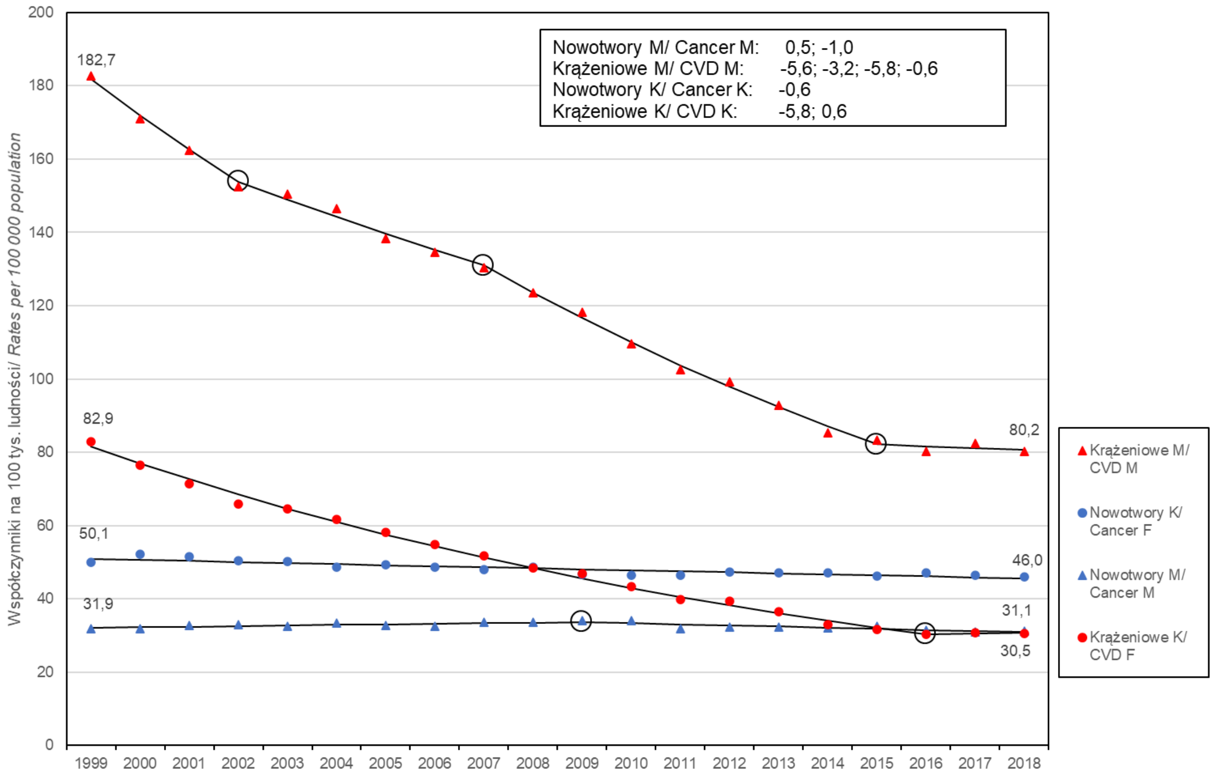


Fig. 2.57. Age-standardised mortality rates of men (M) and women (F) below the age of 75 due to amenable CVDs and cancer – their trends and annual average relative change rates, 1999–2018 (authors' own calculations based on the WHO mortality database and SP data)

The level and dynamics of death rates due to amenable diseases in Poland, as compared to selected EU countries, is discussed later on in this chapter.

2.12. Infant mortality

Infant mortality, i.e. mortality of children under the age of 1 year, has been decreasing in Poland for many years. In 2010-2019, for every 100,000 live births, on average 13 fewer infants died in comparison to the previous year. However, it should be noted that in the last years, i.e. 2018-2019, the infant mortality rate (IMR), after its previous stabilisation at the level of 4.0 deaths per 1,000 live births, dropped to 3.8/1,000 live births. In 2019 as many as 1,412 children under the age of 1 year died in Poland (Tab. 2.10). More than a half (53.4%) of all infant deaths happened in the first week of life, which is the same as two years before, while the age of 389 children who died ranged between the fifth week and below the age of 1 year (27.5% of the total).

Table 2.10. Infant deaths by age, 2010-2019

Year	Total	Age in completed days				
		0-27				28-365
		total	0-6		7-27	
			total	0		
	number	percentage				
2009	2,327	72.0	54.4	35.3	17.6	28.0
2010	2,057	70.7	52.8	33.0	17.8	29.3
2011	1,836	68.5	51.4	31.0	17.2	31.5
2012	1,791	71.2	51.3	33.4	20.0	28.8
2013	1,684	69.1	50.2	30.8	18.9	30.9
2014	1,583	68.5	49.3	29.9	19.1	31.5
2015	1,476	72.3	51.6	29.1	20.7	27.7
2016	1,522	71.9	52.2	28.3	19.7	28.1
2017	1,604	70.8	53.4	31.0	17.5	29.2
2018	1,494	71.5	53.7	32.7	17.8	28.5
2019	1,412	72.5	53.4	31.6	19.1	27.5
per 1,000 live births						
2009	5.6	4.0	3.0	2.0	1.0	1.6
2010	5.0	3.5	2.6	1.6	0.9	1.5
2011	4.7	3.2	2.4	1.5	0.8	1.5
2012	4.6	3.3	2.4	1.5	0.9	1.3
2013	4.6	3.1	2.3	1.4	0.9	1.4
2014	4.2	2.9	2.1	1.3	0.8	1.3
2015	4.0	2.9	2.1	1.2	0.8	1.1
2016	4.0	2.9	2.1	1.1	0.8	1.1
2017	4.0	2.8	2.1	1.2	0.7	1.2
2018	3.8	2.8	2.1	1.3	0.7	1.1
2019	3.8	2.7	2.0	1.2	0.7	1.0

Source: based on SP data

Low birth weight (LBW) is one of the main risk factors of infant mortality. In this group of neonates, which in 2019 comprised only 5.6% of all live births, there were as many as 69.8% infant deaths, and the mortality rate of infants who weighed less than 2500 g at birth was 39 times greater than the mortality rate of infants who weighted more (Tab. 2.11).

Table 2.11. Infant deaths by birth weight, 2010-2019

Year	Below 2500 g		2500 g or more	
	percentage of deaths[1]	IMR per 1,000 live births	percentage of deaths[1]	IMR per 1,000 live births
2009	67.6	64.4	32.4	1.9
2010	66.0	57.8	34.0	1.8
2011	67.6	56.9	32.2	1.6
2012	66.1	54.2	33.9	1.7

2013	66.4	50.8	33.4	1.6
2014	66.7	47.5	33.2	1.5
2015	68.8	47.6	31.2	1.3
2016	68.4	46.6	31.6	1.3
2017	67.0	46.6	33.0	1.4
2018	70.8	49.2	29.2	1.2
2019	69.8	46.3	30.2	1.2

[1] Percentages may not add up to 100 due to lack of information on birth weight
Source: based on SP data

Slightly more than half of all infant deaths in 2018 (51.4%) was caused by diseases with an onset in the perinatal period, primarily disorders related to short gestation and low body weight at birth, which account for approx. 52% of all deaths in this group of causes (Tab. 2.12). Attention should be drawn to a significant reduction in 2018, as compared to 2017, in the number of deaths due to respiratory and cardiovascular disorders, thanks to which the overall infant mortality rate also decreased.

Table 2.12. Infant deaths by cause, 2017 and 2018 (SP data)

Causes of death (ICD-10)	2017			2018		
	Number	Percentage	per 1,000 live births	Number	Percentage	per 1,000 live births
Total	1604	100.0	4.0	1494	100.0	3.8
of which:						
Certain infectious and parasitic diseases (A00-B99)	8	0.5	0.0	6	0.4	0.0
sepsis (A40-A41)	1	0.1	0.0	0	-	-
Pneumonia (J12-J18)	39	2.4	0.1	47	3.1	0.1
Certain conditions originating in the perinatal period (P00-P96)	858	53.5	2.1	768	51.4	2.0
disorders related to short gestation and low birth weight (P07)	428	26.7	1.1	397	26.6	1.0
birth trauma (P10-P15)	7	0.4	0.0	0	-	-
respiratory and cardiovascular disorders (P20-P29)	212	13.2	0.5	66	4.4	0.2
bacterial sepsis of newborn (P36)	24	1.5	0.1	20	1.3	0.1
Congenital malformations, deformations and chromosomal abnormalities (Q00-Q99)	598	37.3	1.5	567	38.0	1.5

malformations of the nervous system (Q00-Q07)	49	3.1	0.1	28	1.9	0.1
malformations of the circulatory system (Q20-Q28)	247	15.4	0.6	242	16.2	0.6
sudden infant death syndrome (R95)	6	0.4	0.0	31	2.1	0.1
Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified of mortality (R96-R99)	8	0.5	0.0	10	0.7	0.0
External causes of morbidity and mortality (V01-Y98)	22	1.4	0.1	22	1.5	0.1

Among the second most common cause of death, i.e. congenital malformations, deformations and chromosomal abnormalities, which account for 38.0% of all infant deaths in total, the dominating cause are circulatory system malformations responsible for 43% of all deaths in this group.

In 2018 there was a considerable increase in the infant mortality rate due to the sudden infant death syndrome.

The infant mortality rate varies considerably in the respective voivodships. In 2019 the infant mortality rate ranged from 28 deaths per 10,000 live births in the Świętokrzyskie Voivodship and 49 deaths per 10,000 live births in the Kujawsko-pomorskie Voivodship (Fig. 2.58). It should be noted that there were large fluctuations of the IMR in individual voivodships in 2016-2019. Only in the Mazowieckie and Małopolskie Voivodships, they were below the national level in that four-year period. In contrast, in the Kujawsko-Pomorskie, Śląskie, Warmińsko-mazurskie and Zachodniopomorskie Voivodships, the IMR in 2016-2019 was higher than the national level.

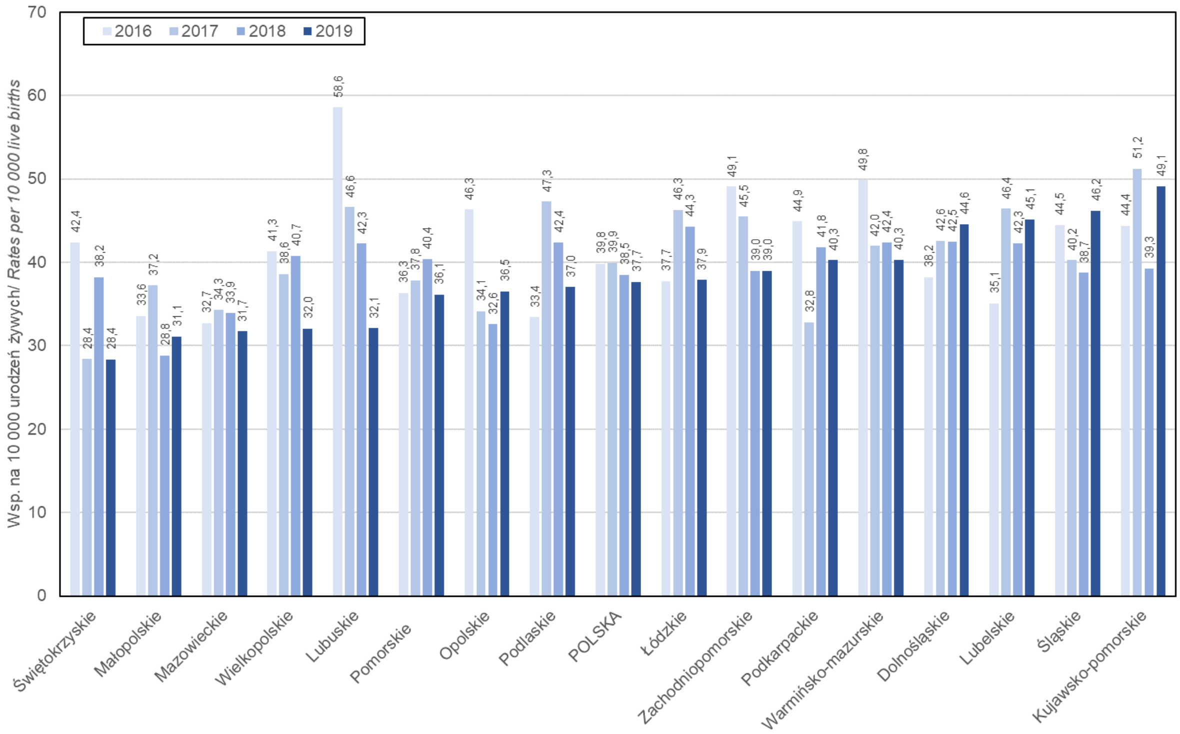


Fig. 2.58. Infant mortality rates by voivodship in 2016, 2017, 2018 and 2019 (SP data)

2.13. Mortality in Poland compared with the situation in the European Union

Due to the prolonged updating of the WHO HFA MDB and the simultaneous switch to the European standard population developed by Eurostat in the comparative analyses of mortality in Poland, we referred to mortality in selected EU countries, for which we calculated the age-standardised rates using the above-mentioned WHO mortality database including data on the number of deaths by detailed age group and cause of death[27]. Due to the large problem of the premature deaths of people of working age (25-64 years) in Poland (in 2018 as many as 68,100 men and 28,300 women died in this age group, corresponding to 31.9% of all deaths of men and 14.1% of all deaths of women, respectively), the comparative analysis was performed for the total population and for this age group, starting with the presentation of the mortality of infants below the age of 1 year. The analysis of the time trends of death rates in Poland, and the average rates for the European Union, was carried out using the jointpoint models and the Jointpoint Regression Program, (*Version 4.8.0.1 April 22, 2020; National Cancer Institute, USA*).

[27] https://www.who.int/healthinfo/statistics/mortality_rawdata/en/

Although **the infant mortality rate** in our country has been gradually decreasing for years, the average rate of that decrease in 2015-2019 (1.6% per year) was significantly slower than in 2000-2015 (4.6%) (Fig. 2.59). The infant mortality rate in Poland is still higher than the EU average (3.5 per 1,000 live births in 2018), but the average decline rate of the infant death rate in Poland in the whole 2000-2019 period (3.9% per year) was higher than in the EU in 2000-2018 (2.9% per year). Our infant mortality rate in 2018 was equal to the average for all EU countries in 2012.

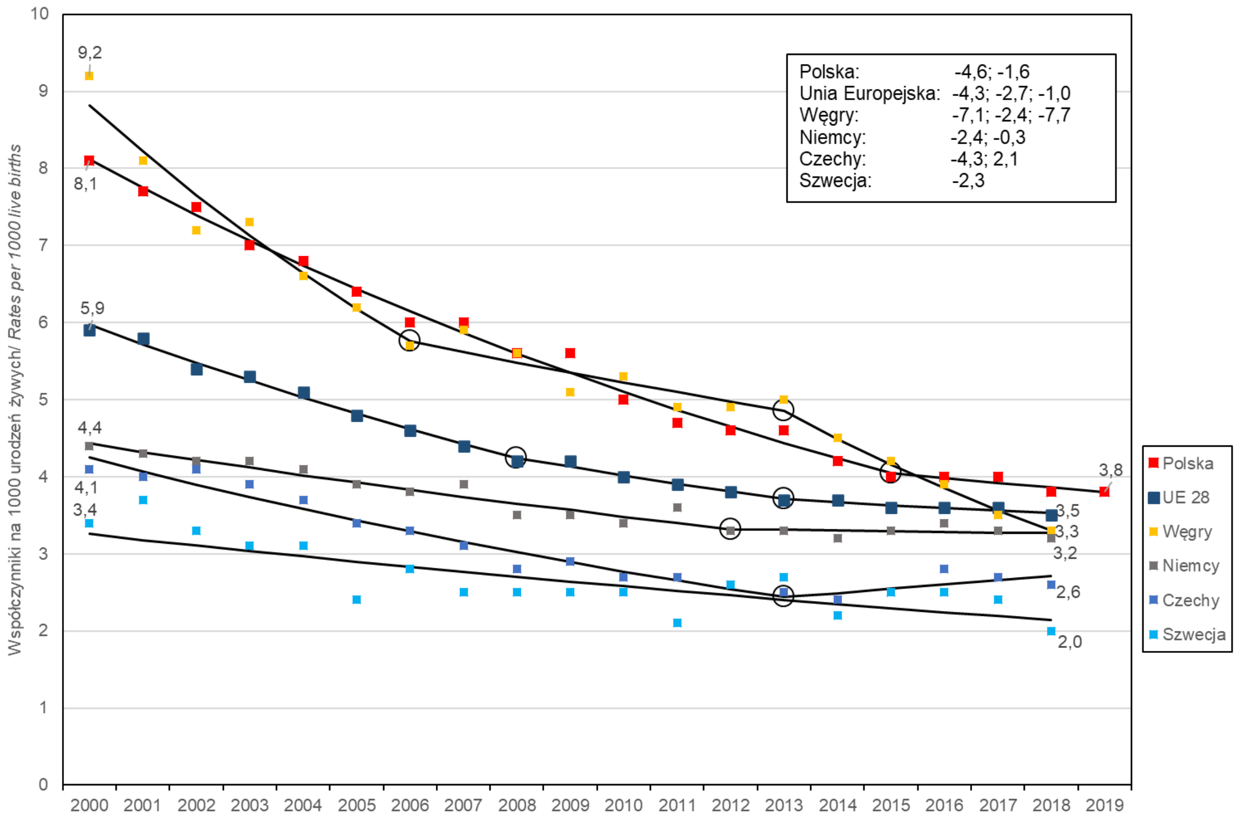


Fig. 2.59. Infant mortality rates in Poland and in selected EU countries, rates per 1,000 live births – their trends and annual average relative change rates, 2000-2018 (authors' own calculations based on the Eurostat database and SP data)

Due to the lack of estimates of the infant mortality rate according to age for the EU28, either in the WHO or Eurostat databases, in recent years the situation in Poland has been compared to selected EU countries. As two years before, it should be noted that the rate of early neonatal mortality, i.e. in the first week of the child's life, is higher in Poland not only than in Finland, Sweden and Slovenia, but also than in the Czech Republic, Slovakia and Hungary (Fig. 2.60).

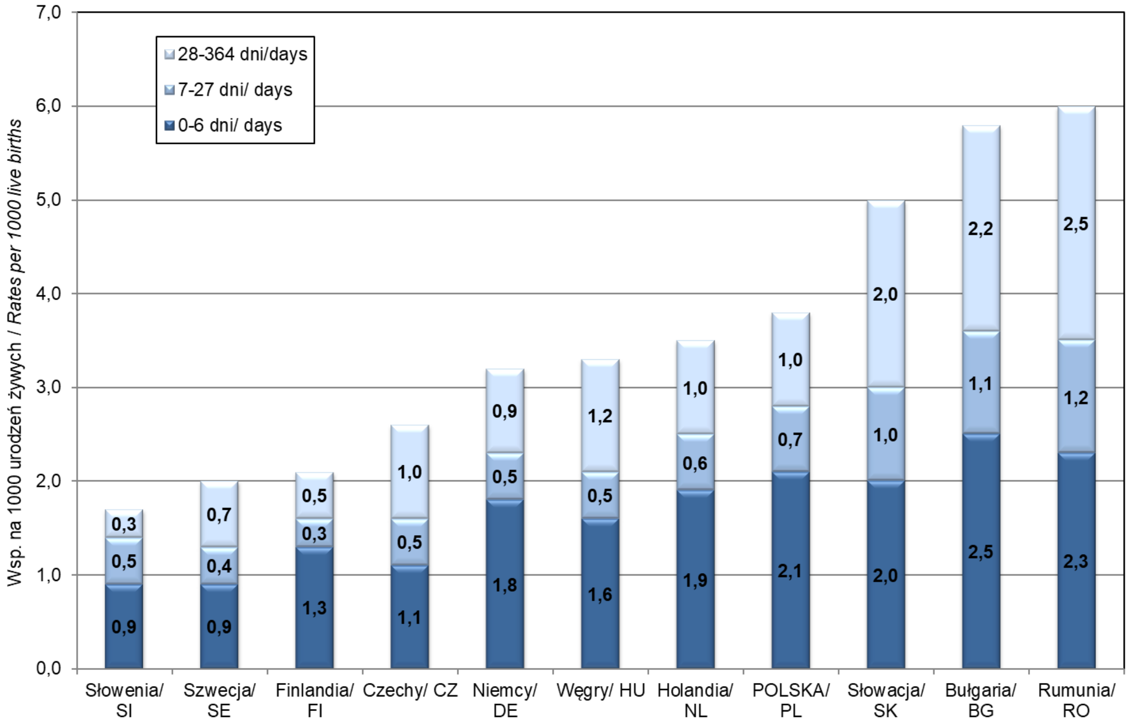


Fig. 2.60. Infant mortality rates by age in Poland and in selected EU countries, 2018 (Eurostat database)

The following section of the Report presents the level and dynamics of changes in the age-standardised mortality rates for major causes of death in Poland, in comparison to the situation in the Czech Republic, Germany, Sweden and Hungary, in 1999-2018, i.e. within the period when the ICD-10 Classification of Diseases and Related Health Problems was used.

The threat to life among the inhabitants of Poland due to **cardiovascular diseases** in general decreased in 1999-2018 at a steady rate (the relative drop rate for men – 2.8% per year, and for women – 3.0% per year), which is slightly slower than in the Czech Republic but faster than in recent years in Germany or Hungary (Fig. 2.61a and 2.61b). The mortality rate due to these diseases in 2018 in Poland was higher than in Sweden in 2017 by **71%** for men and **66%** for women, and was at a similar level to the death rate recorded in the Czech Republic. The standardised death rate in Poland in 2018 was higher than the average for EU28 countries in 2016, which was 442.9 per 100,000 for men and 301.7 per 100,000 for women, i.e. 40.9% and 41.2% higher, respectively.

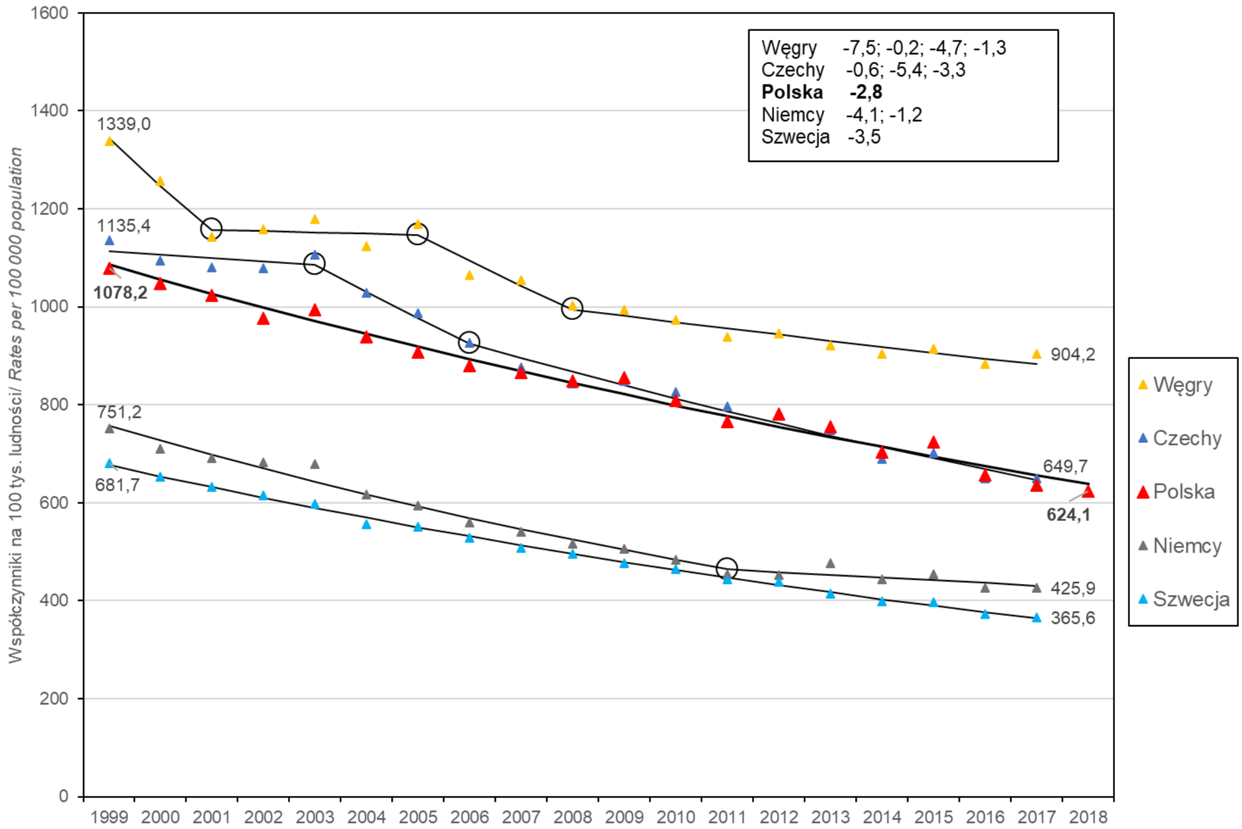


Fig. 2.61a. Age-standardised mortality rates due to diseases of the circulatory system of men in Poland, the Czech Republic, Germany, Sweden and Hungary – their trends and annual average relative change rates, 1999–2018 (authors' own calculations based on the WHO mortality database and SP data)

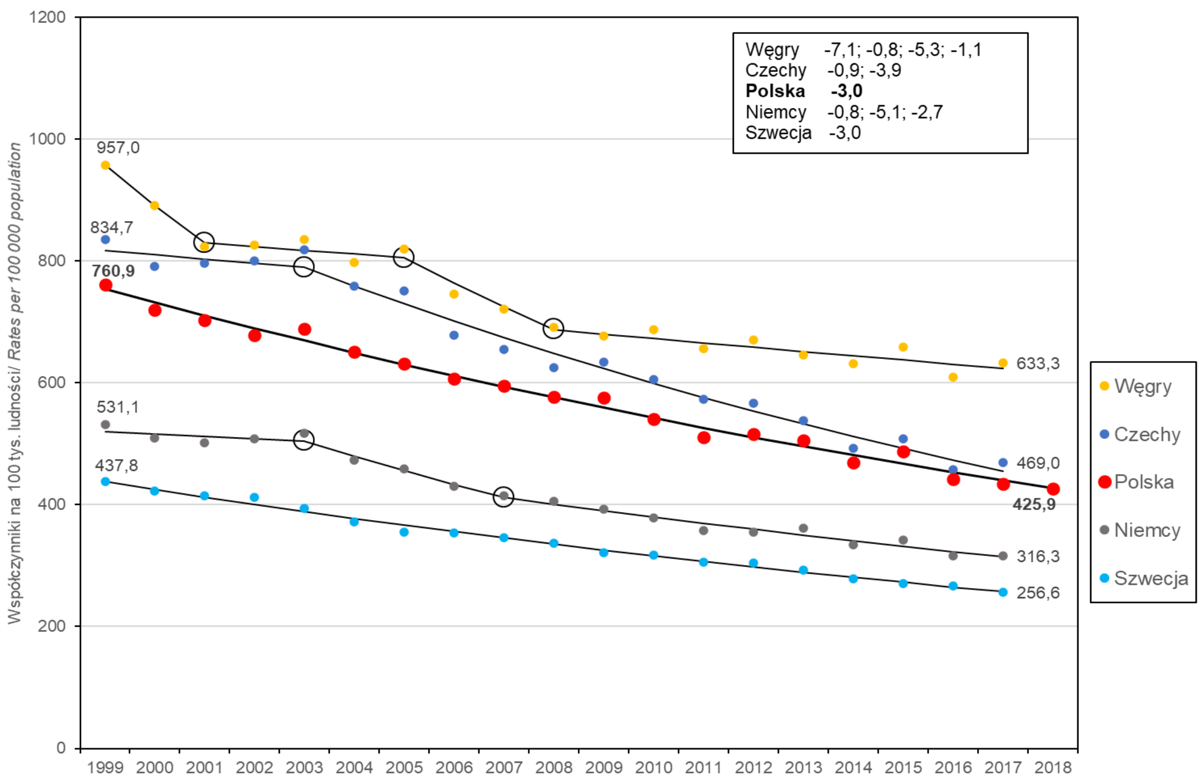


Fig. 2.61b. Age-standardised mortality rates due to diseases of the circulatory system of women in Poland, the Czech Republic, Germany, Sweden and Hungary – their trends and annual average relative change rates, 1999–2018 (authors' own calculations based on the WHO mortality database and SP data)

An evident acceleration after 2015 in the case of men, and after 2014 in the case of women, as regards the downward trend of the death rates due to CVDs among people aged 25-64, has let Poland make up for the unfavourable differences in comparison to other EU countries, which are, nonetheless, still substantial (Fig. 2.62a and 2.62b). The mortality rate in 2018 in Poland was higher than in Sweden in 2017 by as many as **177%** in the case of men and **102%** in the case of women, and it exceeded the mortality rate in the Czech Republic. It can be considered alarming, however, that in 2018 the rates for men and women remained at the same level as in 2017.

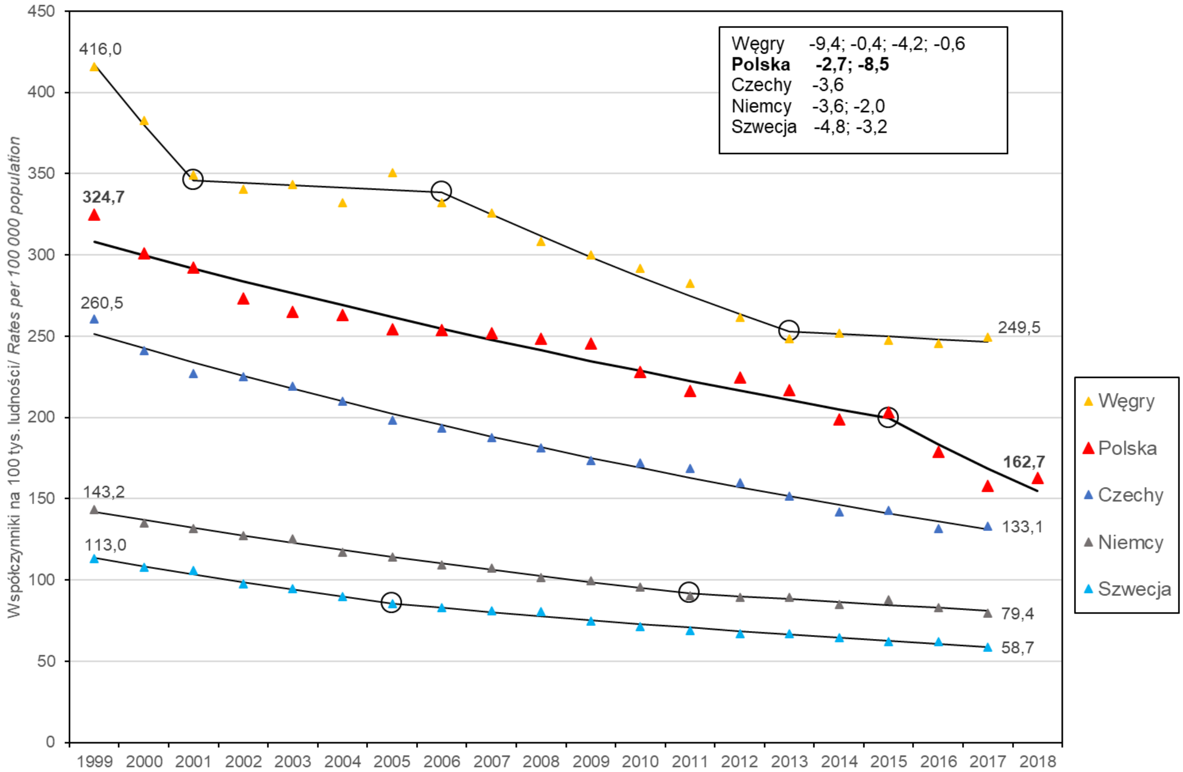


Fig. 2.62a. age-standardised mortality rates due to diseases of the circulatory system of men aged 25-64 in Poland, the Czech Republic, Germany, Sweden and Hungary – their trends and annual average relative change rates, 1999–2018 (authors' own calculations based on the WHO mortality database and SP data)

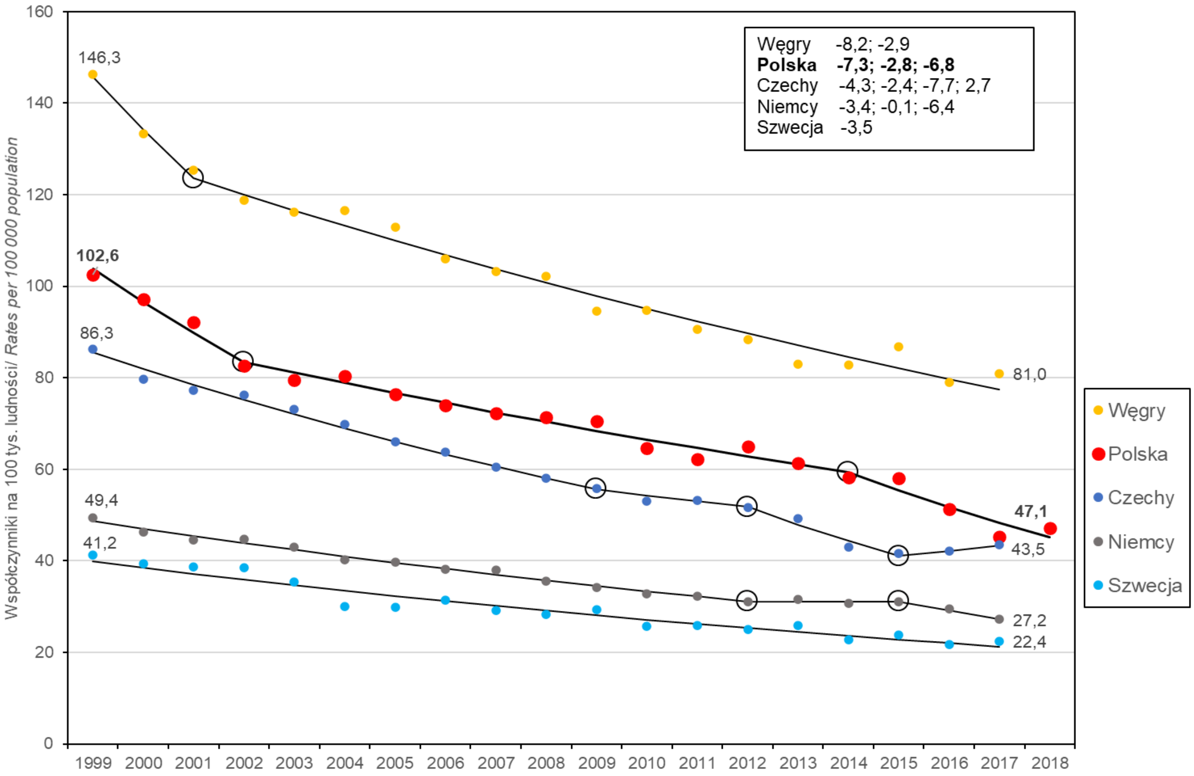


Fig. 2.62b. Age-standardised mortality rates due to diseases of the circulatory system of women aged 25-64 in Poland, the Czech Republic, Germany, Sweden and Hungary – their trends and annual average relative change rates, 1999–2018 (authors' own calculations based on the WHO mortality database and SP data)

In terms of **heart diseases**, only the mortality among men and women aged 25-64 was analysed. The situation in Poland is similar to the total deaths from CVDs in this age group, i.e. in the case of men, it is definitely disadvantageous as compared to EU countries, including those selected for the analysis, and slightly less unfavourable in the case of women (Fig. 2.63a and 2.63b). In recent years this unfavourable situation has improved.

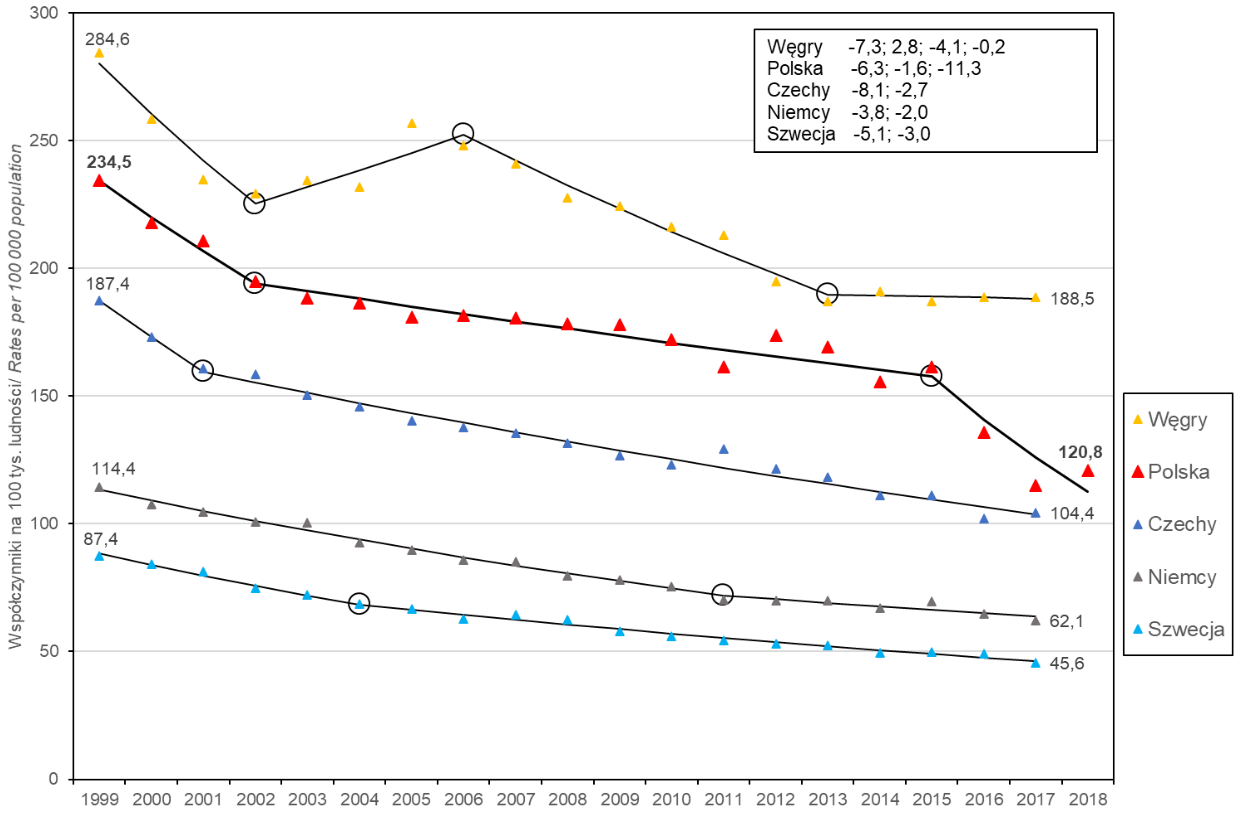


Fig. 2.63a. Age-standardised mortality rates due to heart diseases of men aged 25-64 in Poland, the Czech Republic, Germany, Sweden and Hungary – their trends and annual average relative change rates, 1999–2018 (authors' own calculations based on the WHO mortality database and SP data)

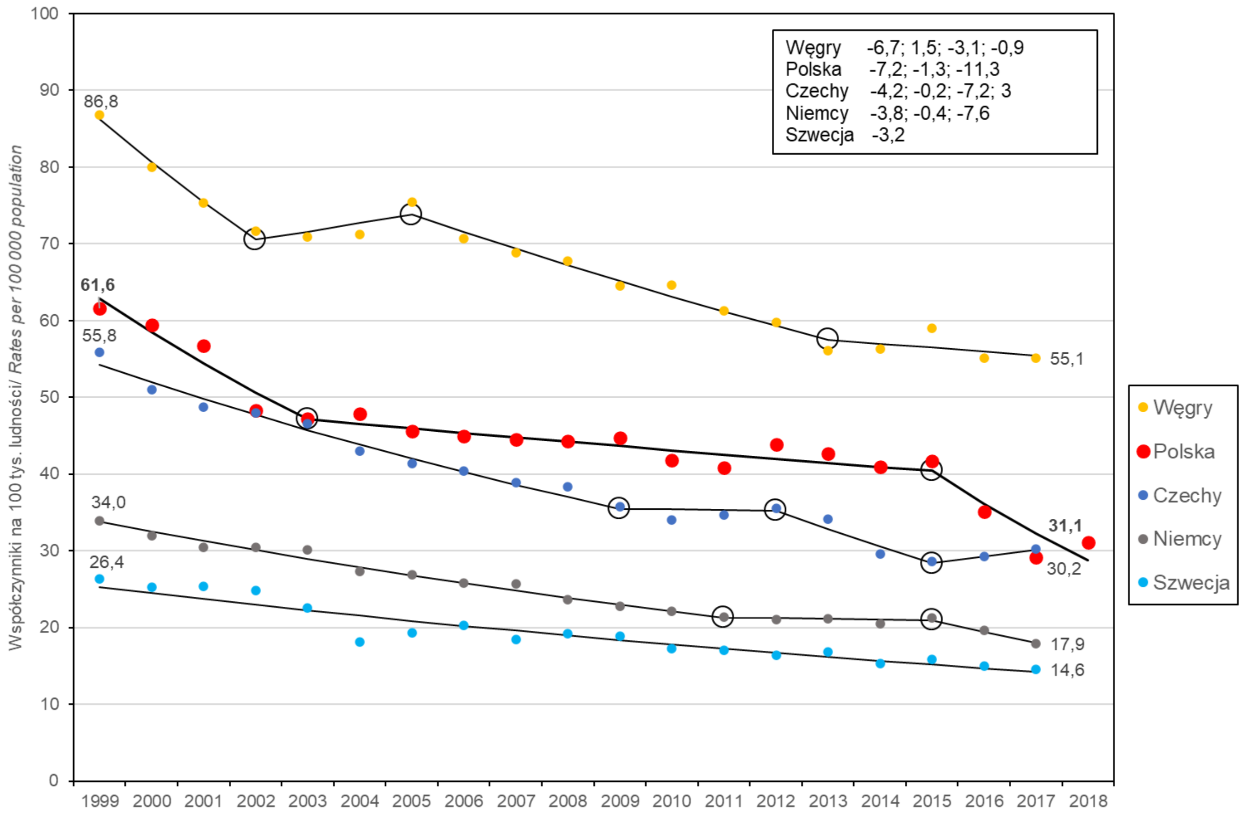


Fig. 2.63b. Age-standardised mortality rates due to heart diseases of women aged 25-64 in Poland, the Czech Republic, Germany, Sweden and Hungary – their trends and annual average relative change rates, 1999–2018 (authors' own calculations based on the WHO mortality database and SP data)

When considering mortality due to **cerebrovascular diseases** of all men and women in Poland, attention should be drawn to the deceleration of the downward trend of the death rates in recent years, both for the entire population (Fig. 2.64a and 2.64b) and among people aged 25-64 (Fig. 2.65a and 2.65b). Furthermore, it should be pointed out that while the mortality of all persons in Poland was at a similar level as in the Czech Republic, in the case of the younger population the death rates are substantially higher. The standardised death rate in Poland in 2018 was higher than the EU28 average in 2016, which was 90.3 per 100,000 for men and 72.8 per 100,000 for women, i.e. 17.3% and 7.8% higher, respectively.

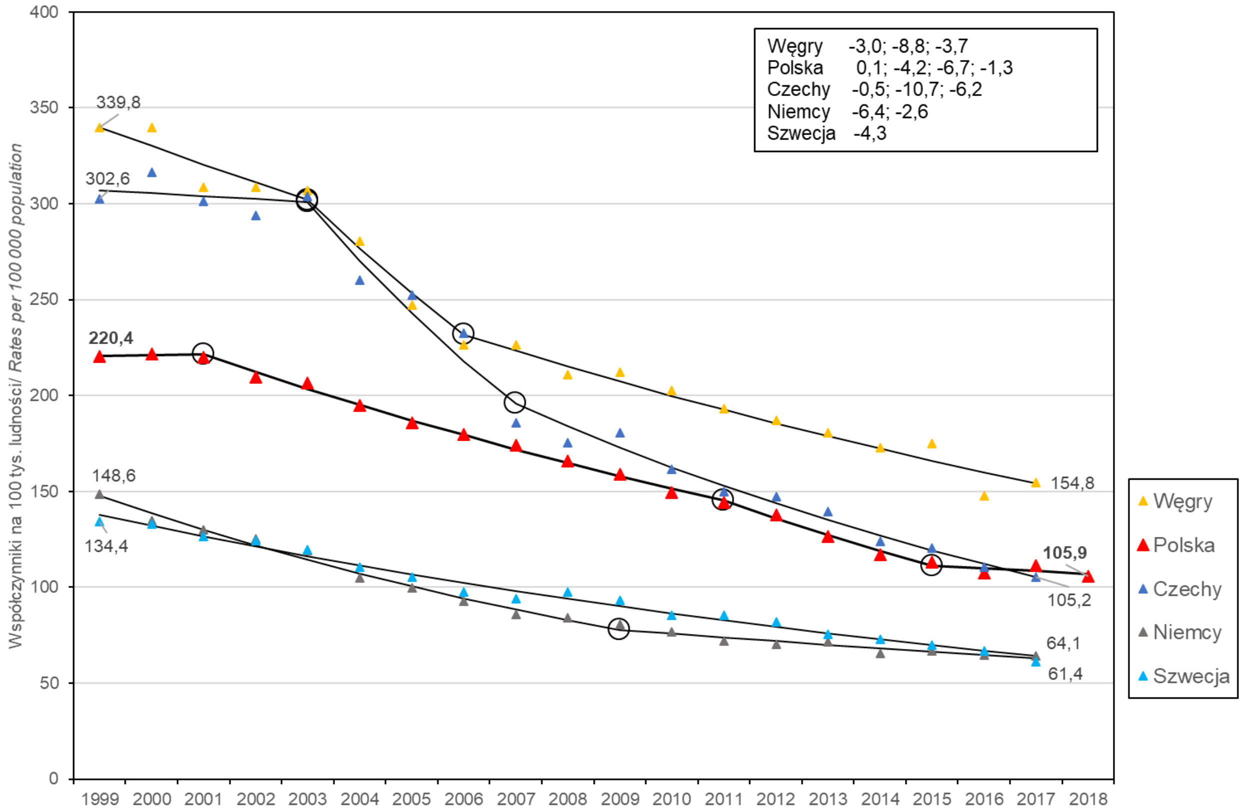


Fig. 2.64a. Age-standardised mortality rates due to cerebrovascular diseases of men in Poland, the Czech Republic, Germany, Sweden and Hungary – their trends and annual average relative change rates, 1999–2018 (authors' own calculations based on the WHO mortality database and SP data)

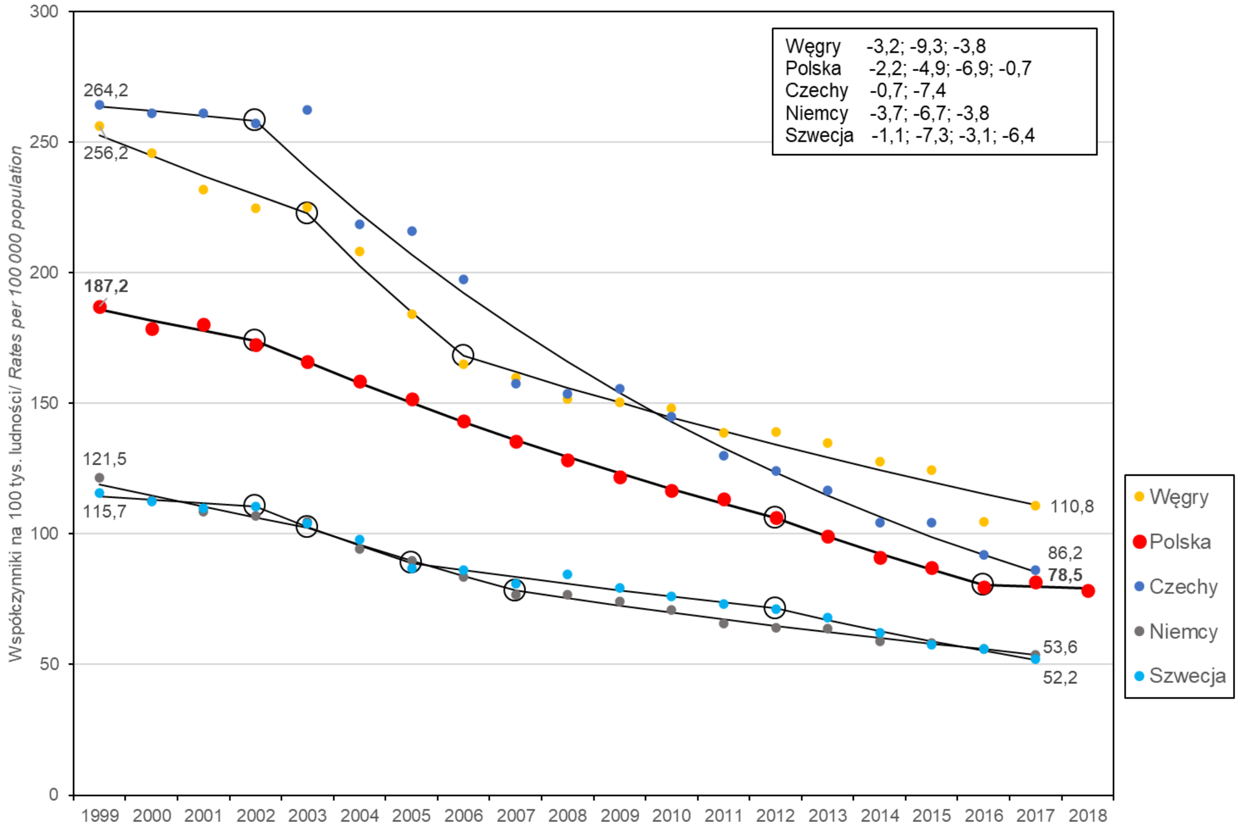


Fig. 2.64b. Age-standardised mortality rates due to cerebrovascular diseases of women in Poland, the Czech Republic, Germany, Sweden and Hungary – their trends and annual average relative change rates, 1999–2018 (authors' own calculations based on the WHO mortality database and SP data)

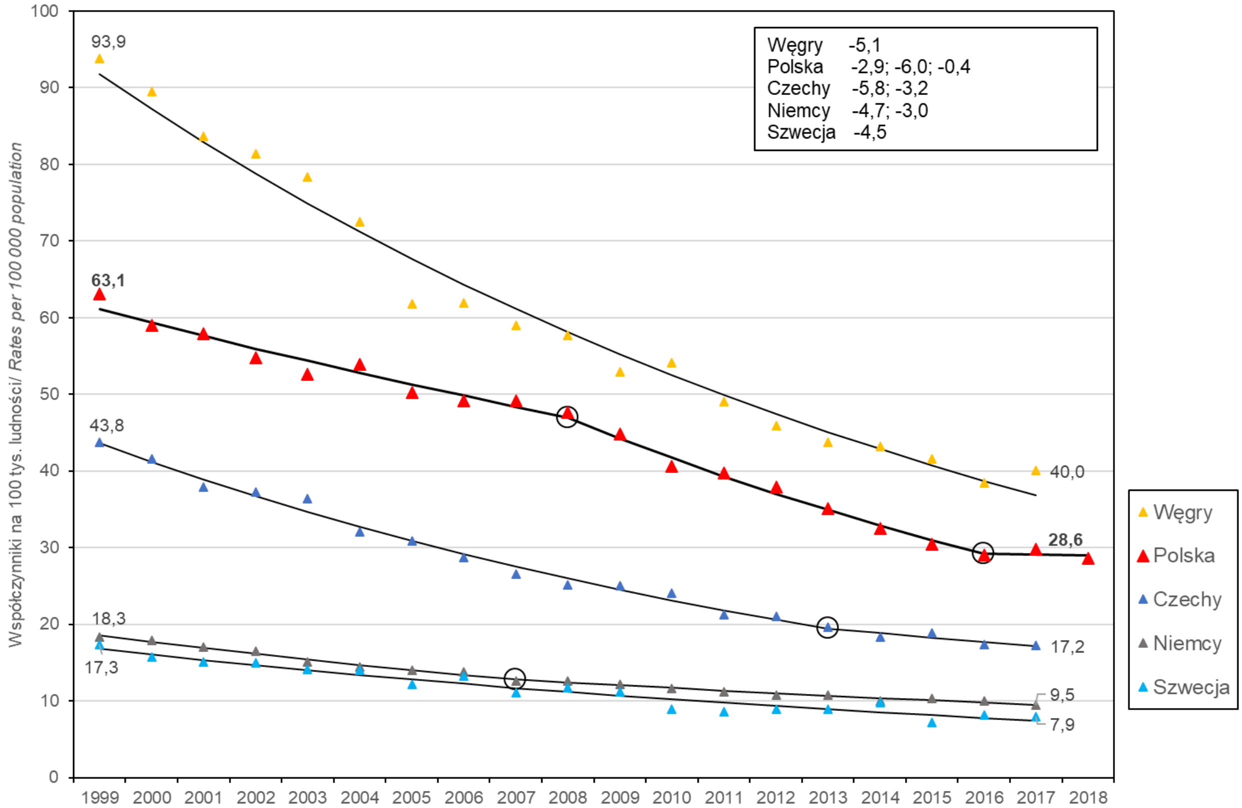


Fig. 2.65a. Age-standardised mortality rates due to cerebrovascular diseases of men aged 25-64 in Poland, the Czech Republic, Germany, Sweden and Hungary – their trends and annual average relative change rates, 1999–2018 (authors' own calculations based on the WHO mortality database and SP data)

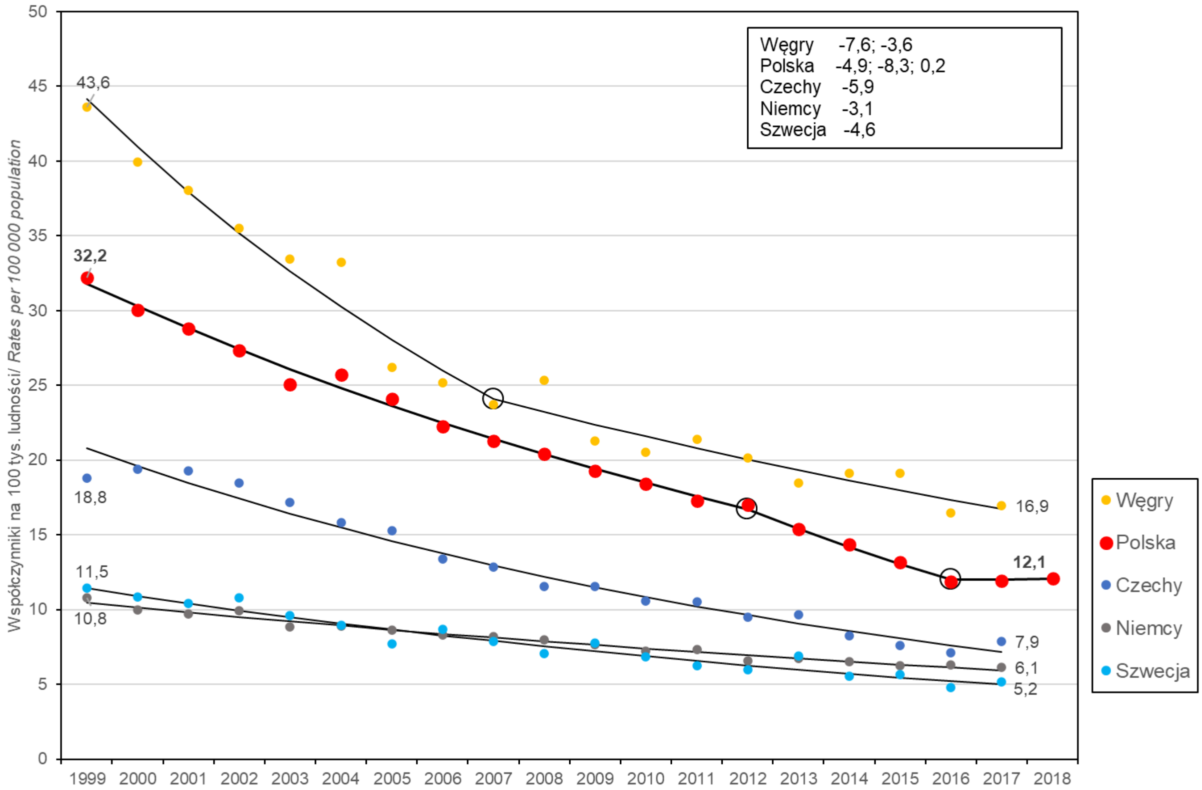


Fig. 2.65b. Age-standardised mortality rates due to cerebrovascular diseases of women aged 25-64 in Poland, the Czech Republic, Germany, Sweden and Hungary – their trends and annual average relative change rates, 1999–2018 (authors' own calculations based on the WHO mortality database and SP data)

In 2002-2018 the mortality of Polish men due to **malignant neoplasms in general** showed a substantial downward trend whose relative rate was similar to that in Sweden and slightly higher than those in Germany and Hungary (Fig. 2.66a). However, the rate was slower than in the Czech Republic, where the mortality rate has been decreasing at a faster rate than in other analysed countries. With regard to the mortality of Polish women, the downward trend of the rates in 2007-2011 unfortunately decelerated, and currently a slight upward trend is observed (Fig. 2.66b). As in Sweden and Germany a slow downward trend is continuing, and in the Czech Republic it is much faster, the differences to the disadvantage of Polish women are increasing. As far as the Polish population aged 35-64 is concerned, the death rates are subject to a steady downward trends, which for men has accelerated after 2004 to achieve a faster rate than in Germany, but is much slower than in the Czech Republic, as a result of which the excess mortality of Polish men, in comparison to men in the Czech Republic, is increasing (Fig. 2.67a). The lowering of the mortality rate of Polish women began as late as after 2006, and the decline rate of the death rates is slower than among men, and also slower than in the

Czech Republic and Sweden, but faster than in Germany (Fig. 2.67b). The standardised death rate in Poland in 2018 was higher than the EU28 average in 2016, which amounted to 343.0 per 100,000 for men and to 200.3 per 100,000 for women, i.e. 28.2% and 13.9% higher, respectively.

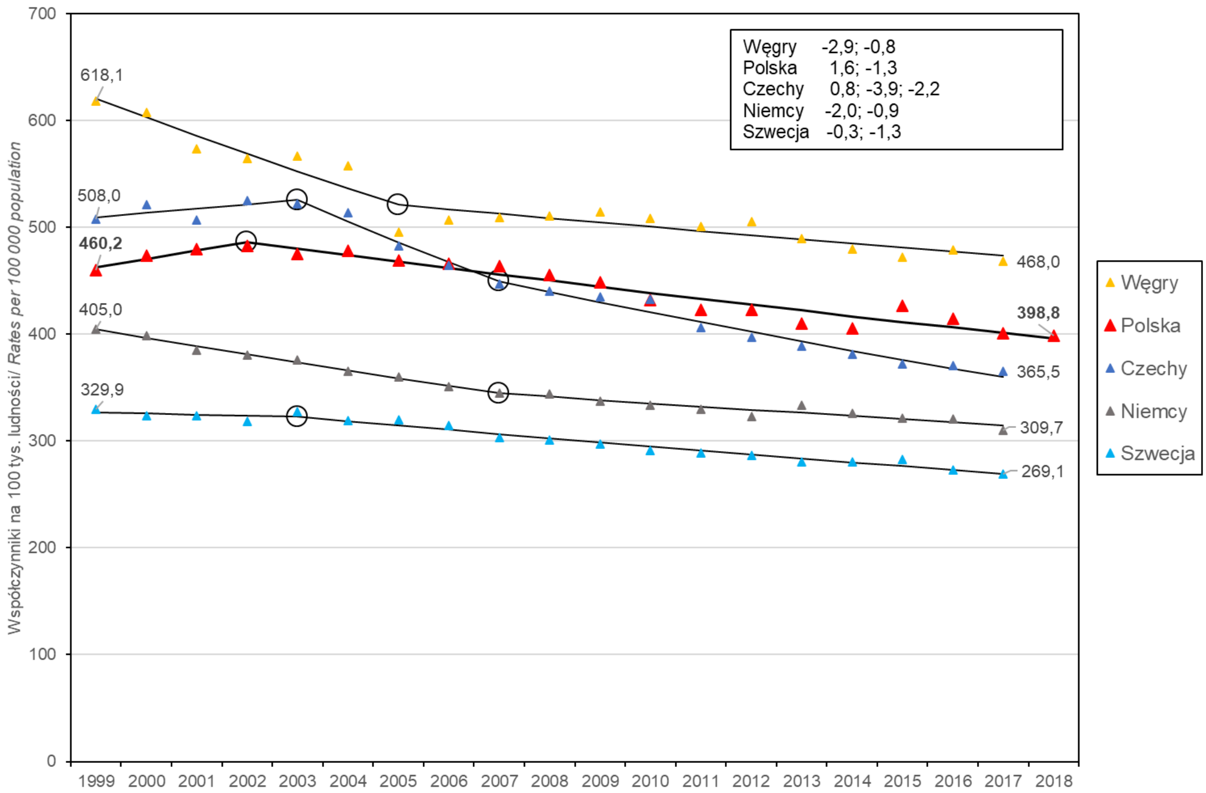


Fig. 2.66a. Age-standardised mortality rates due to malignant neoplasms of men in Poland, the Czech Republic, Germany, Sweden and Hungary – their trends and annual average relative change rates, 1999–2018 (authors' own calculations based on the WHO mortality database and SP data)

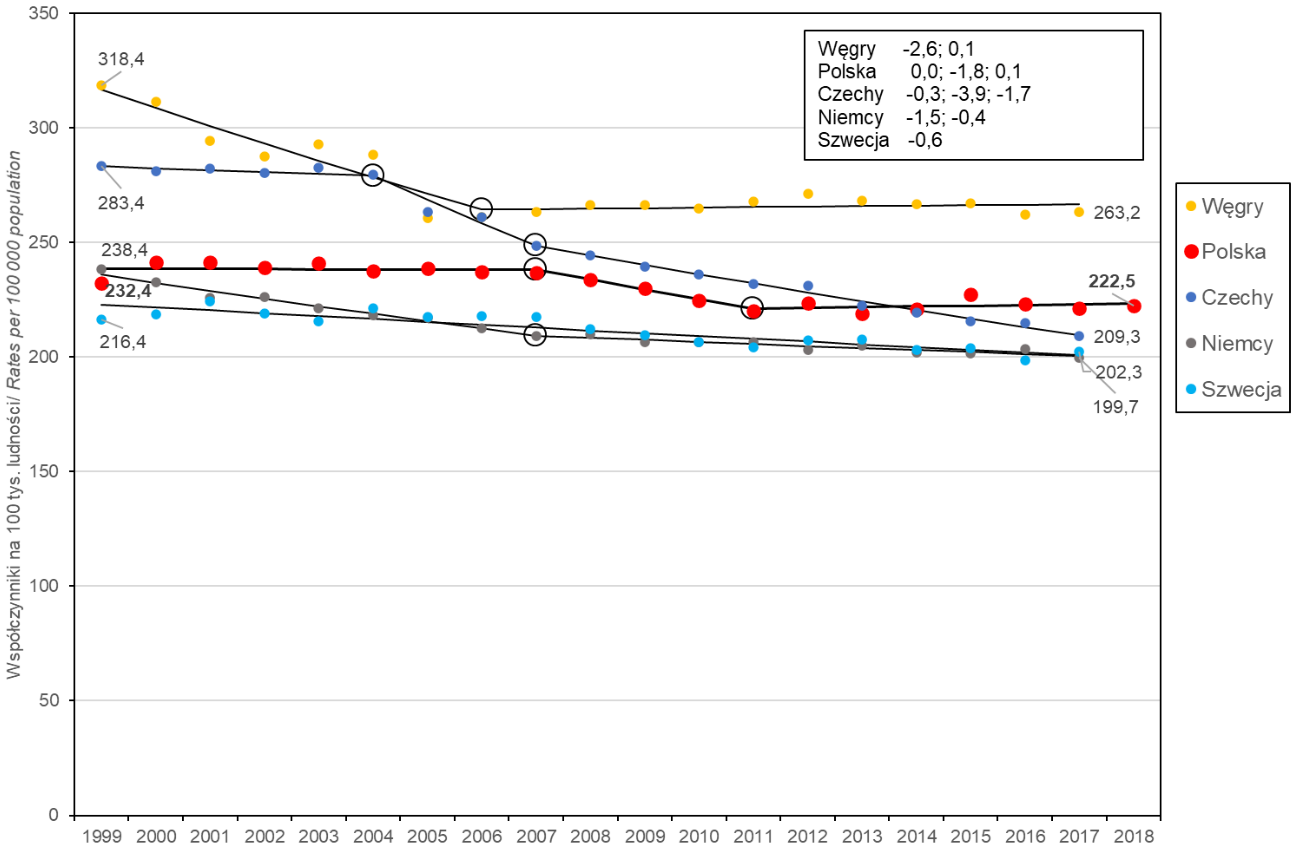


Fig. 2.66b. Age-standardised mortality rates from malignant neoplasms of women in Poland, the Czech Republic, Germany, Sweden and Hungary – their trends and annual average relative change rates, 1999–2018 (authors' own calculations based on the WHO mortality database and SP data)

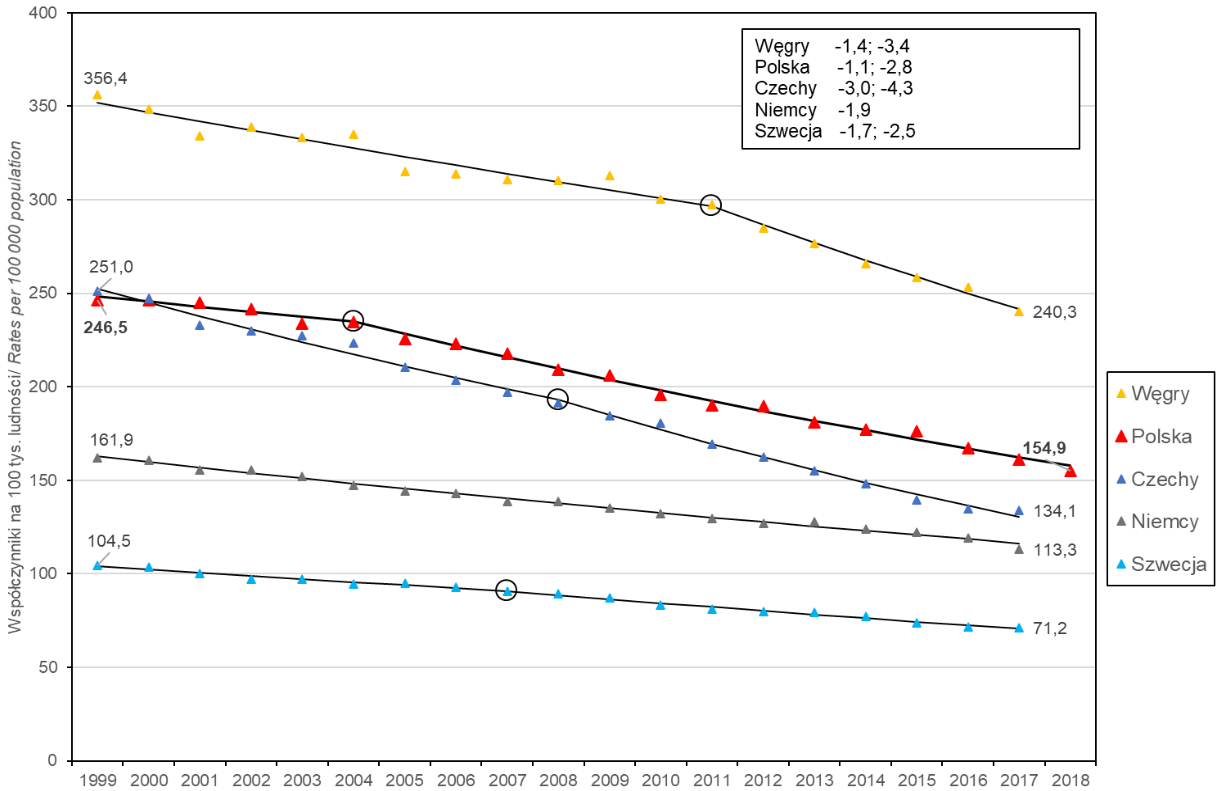


Fig. 2.67a. Age-standardised mortality rates due to malignant neoplasms of men aged 25-64 in Poland, the Czech Republic, Germany, Sweden and Hungary – their trends and annual average relative chage rates, 1999–2018 (authors' own calculations based on the WHO mortality database and SP data)

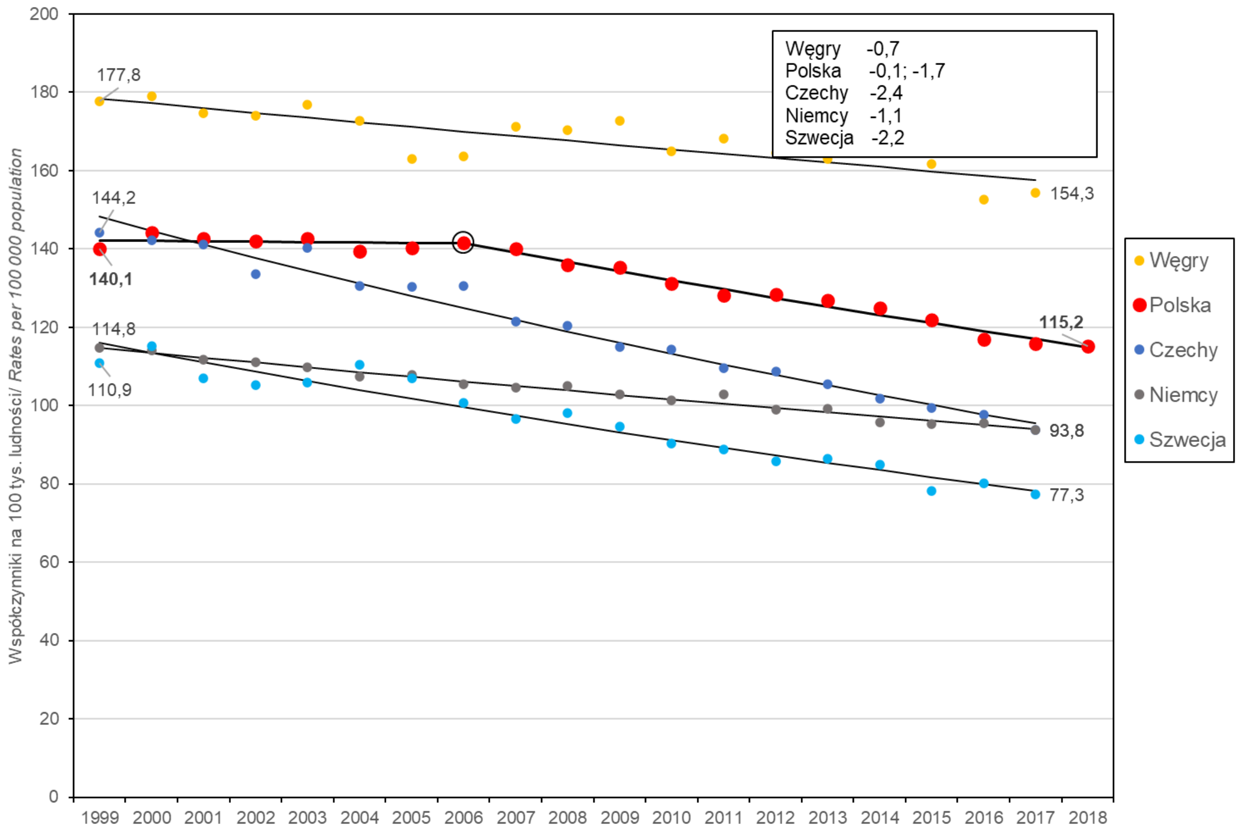


Fig. 2.67b. Age-standardised mortality rates due to malignant neoplasms of women aged 25-64 in Poland, the Czech Republic, Germany, Sweden and Hungary – their trends and annual average relative change rates, 1999–2018 (authors' own calculations based on the WHO mortality database and SP data)

The rate and trends of mortality due to **malignant neoplasms of the colon, rectosigmoid junction, rectum and anus** (ICD-10 C18-C21) for Polish men in total are characterised with a slow upward trend, with a visible deceleration of the growth of death rates in the last three years, but the change has not yet reached the level of statistical significance (Fig. 2.68a). In the case of younger men aged 25-64 and women in total, as well as younger women, the mortality rates are subject to a slow downward trend (Fig. 2.68b, 2.69a and 2.69b). However, it should be stated that with a higher mortality rate of younger men in Poland than in Sweden and Germany, the difference is increasing, as the downward trend in these countries is stronger. The standardised death rate in Poland in 2018 was higher than the EU28 average in 2016, which was 41.2 per 100,000 for men and 23.1 per 100,000 for women, i.e. 28.2% and 13.9% higher, respectively.

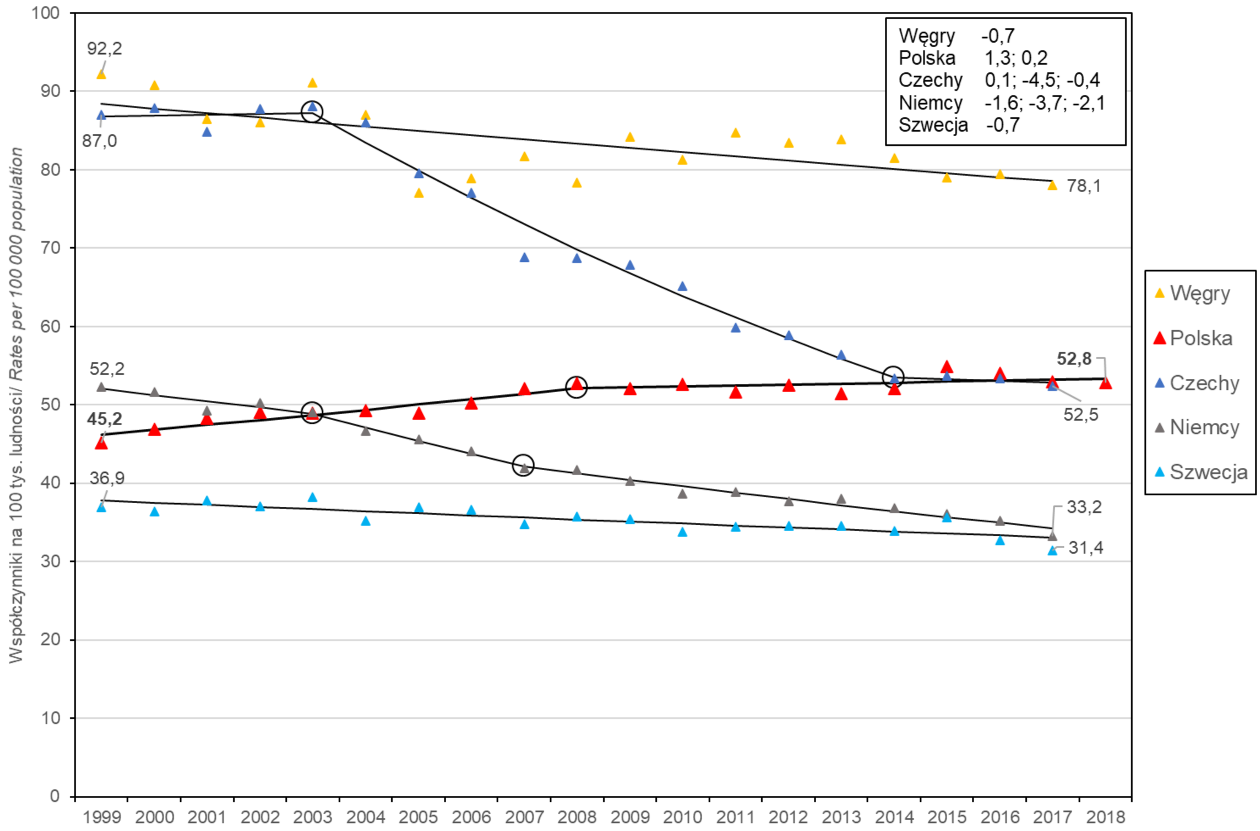


Fig. 2.68a. Age-standardised mortality rates due to colorectal cancer of men in Poland, the Czech Republic, Germany, Sweden and Hungary – their trends and annual average relative change rates, 1999–2018 (authors' own calculations based on the WHO mortality database and SP data)

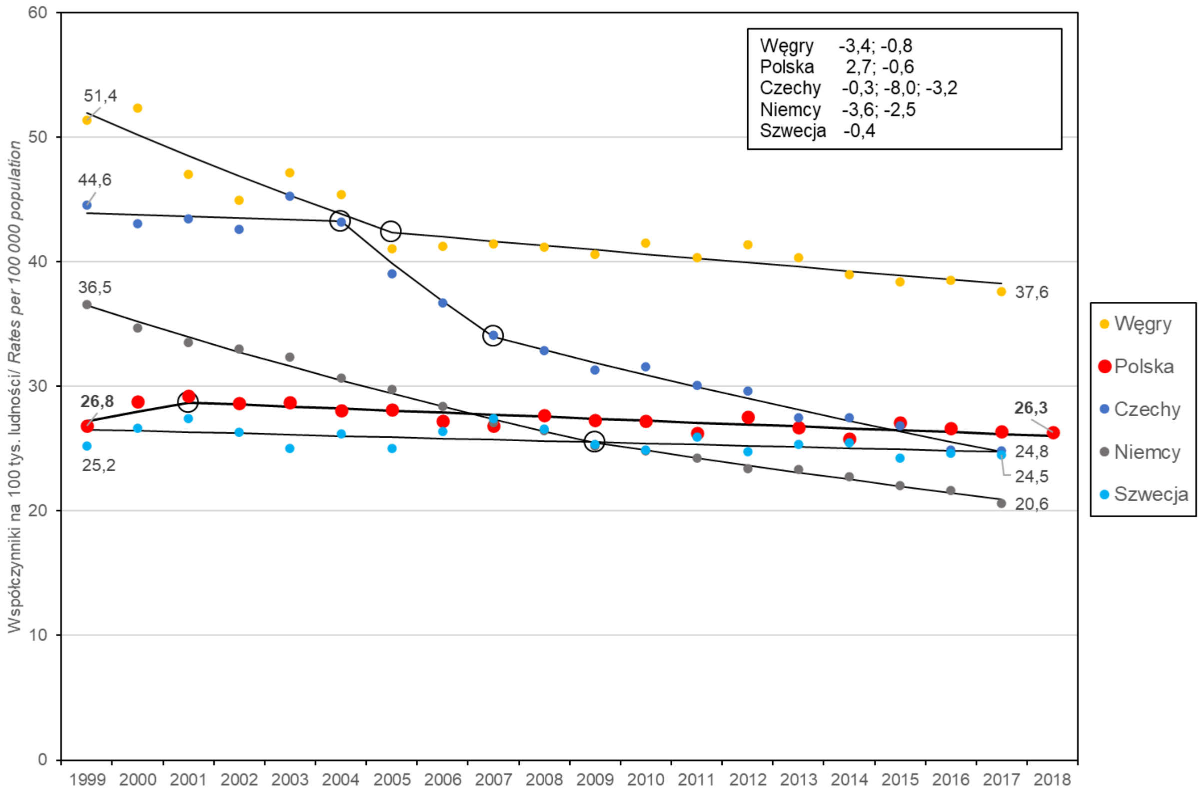


Fig. 2.68b. Age-standardised mortality rates due to colorectal cancer of women in Poland, the Czech Republic, Germany, Sweden and Hungary – their trends and annual average relative change rates, 1999–2018 (authors' own calculations based on the WHO mortality database and SP data)

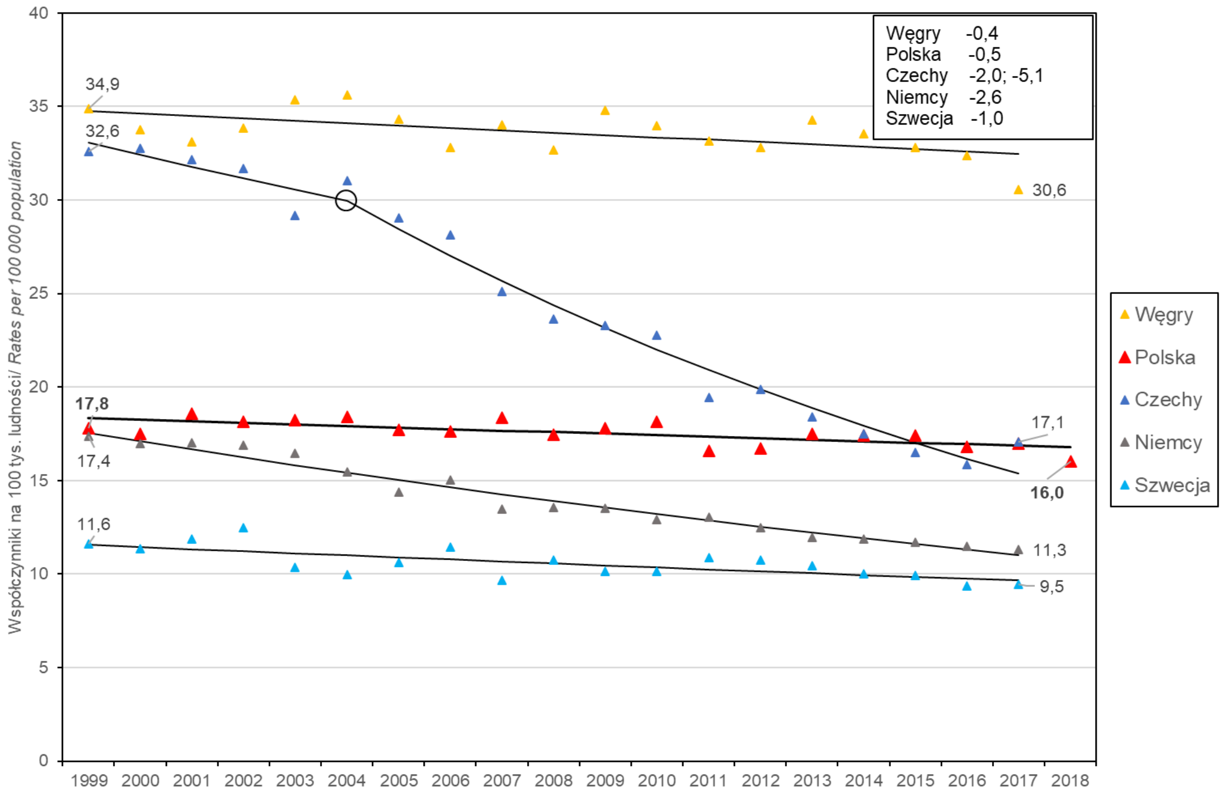


Fig. 2.69a. Age-standardised mortality rates due to colorectal cancer of men aged 25-64 in Poland, the Czech Republic, Germany, Sweden and Hungary – their trends and annual average relative change rates, 1999–2018 (authors' own calculations based on the WHO mortality database and SP data)

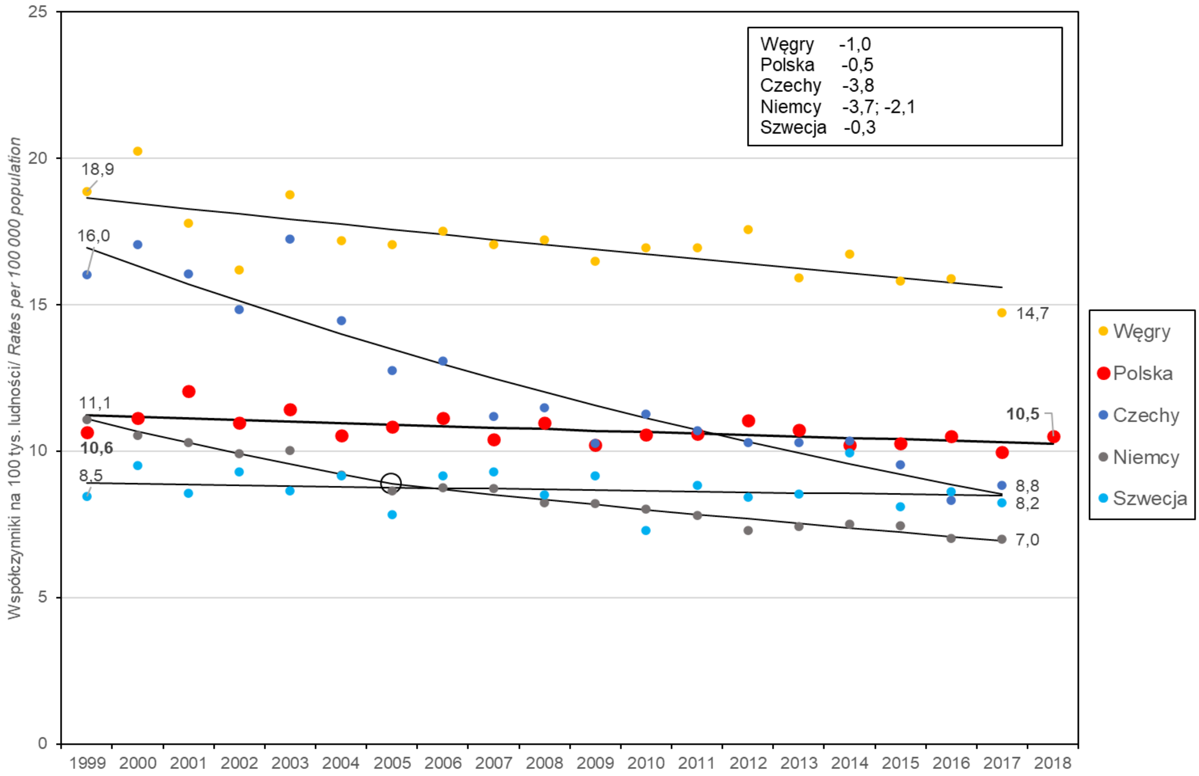


Fig. 2.69b. Age-standardised mortality rates due to colorectal cancer of women aged 25-64 in Poland, the Czech Republic, Germany, Sweden and Hungary – their trends and annual average relative change rates, 1999–2018 (authors' own calculations based on the WHO mortality database and SP data)

The mortality rates due to **malignant neoplasms of the trachea, bronchus and lung**, both for men in total and for men aged 25-64, saw a downward trend which accelerated after 2007, and in the subpopulation of younger men, it additionally accelerated after 2015, with the decrease being substantially faster than in Germany and Hungary (Fig. 2.70a and 2.71a). In turn, in the case of women in total, the upward trend has been growing at a faster rate than in the compared countries, with the mortality rate being higher than in the Czech Republic, Germany and Sweden (2.70b). Among women aged 25-64, after 2014 the mortality rates improved significantly, with their decrease rate being faster than in Germany, but still slightly slower than in the Czech Republic and Sweden (Fig. 2.71b). The standardised death rate in Poland in 2018 was higher than the EU28 average in 2016, which amounted to 83.6 per 100,000 for men and to 31.7 per 100,000 for women, i.e. 28.1% and 22.1% higher, respectively.

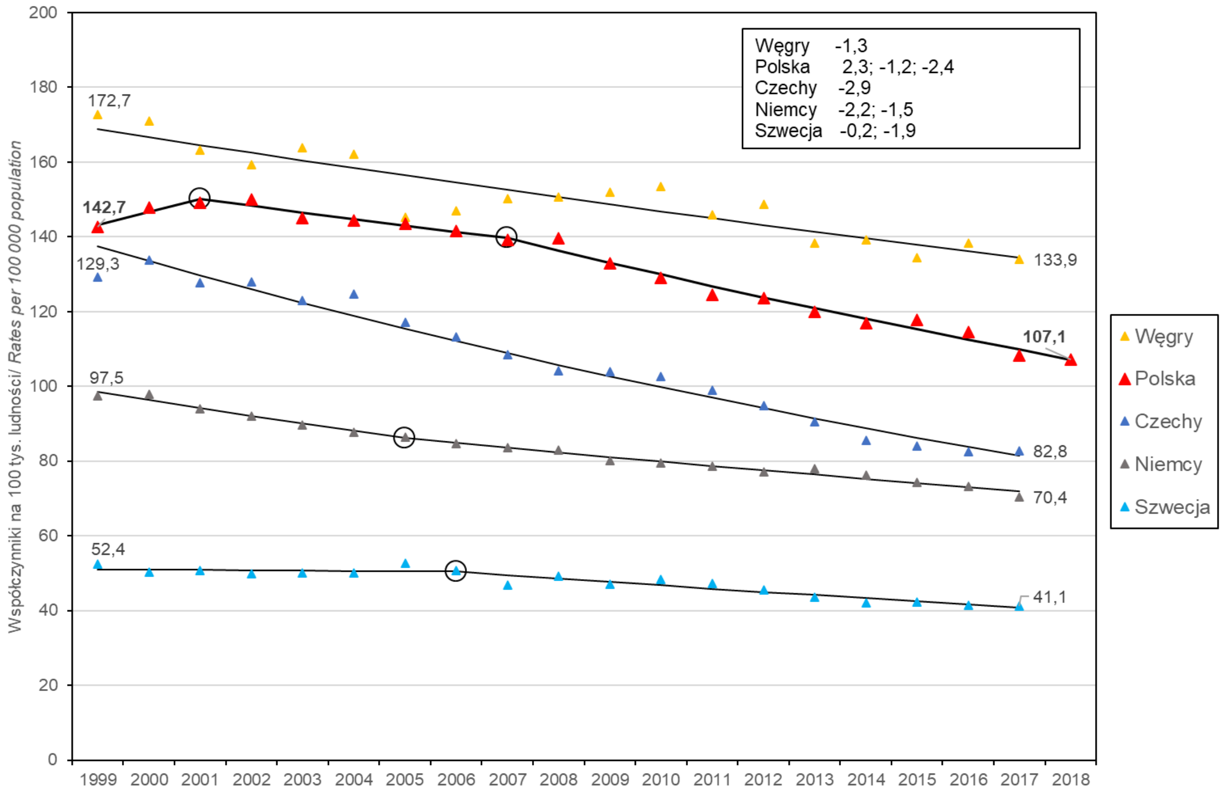


Fig. 2.70a. Age-standardised mortality rates due to trachea, bronchus and lung cancer of men in Poland, the Czech Republic, Germany, Sweden and Hungary – their trends and annual average relative change rates, 1999–2018 (authors' own calculations based on the WHO mortality database and SP data)

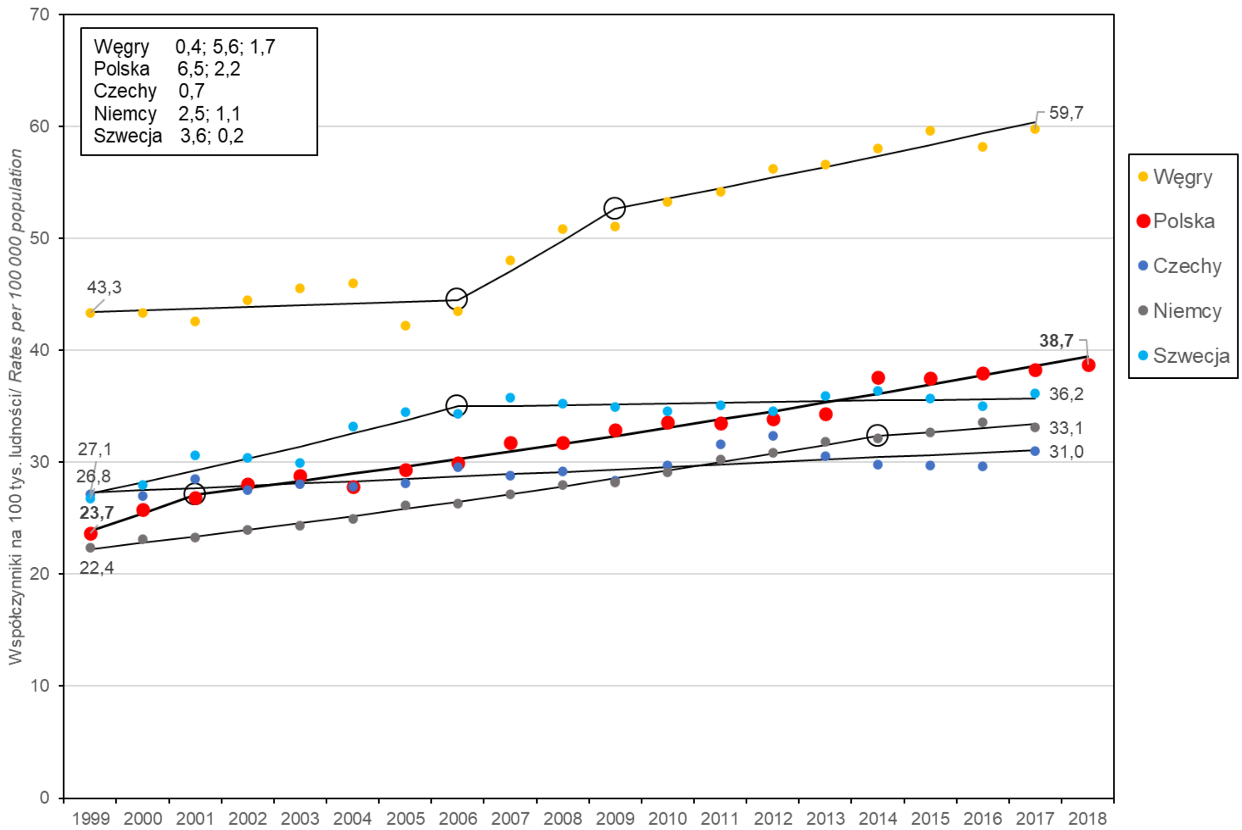


Fig. 2.70b. Age-standardised mortality rates due to trachea, bronchus and lung cancer of women in Poland, the Czech Republic, Germany, Sweden and Hungary – their trends and annual average relative change rates, 1999–2018 (authors' own calculations based on the WHO mortality database and SP data)

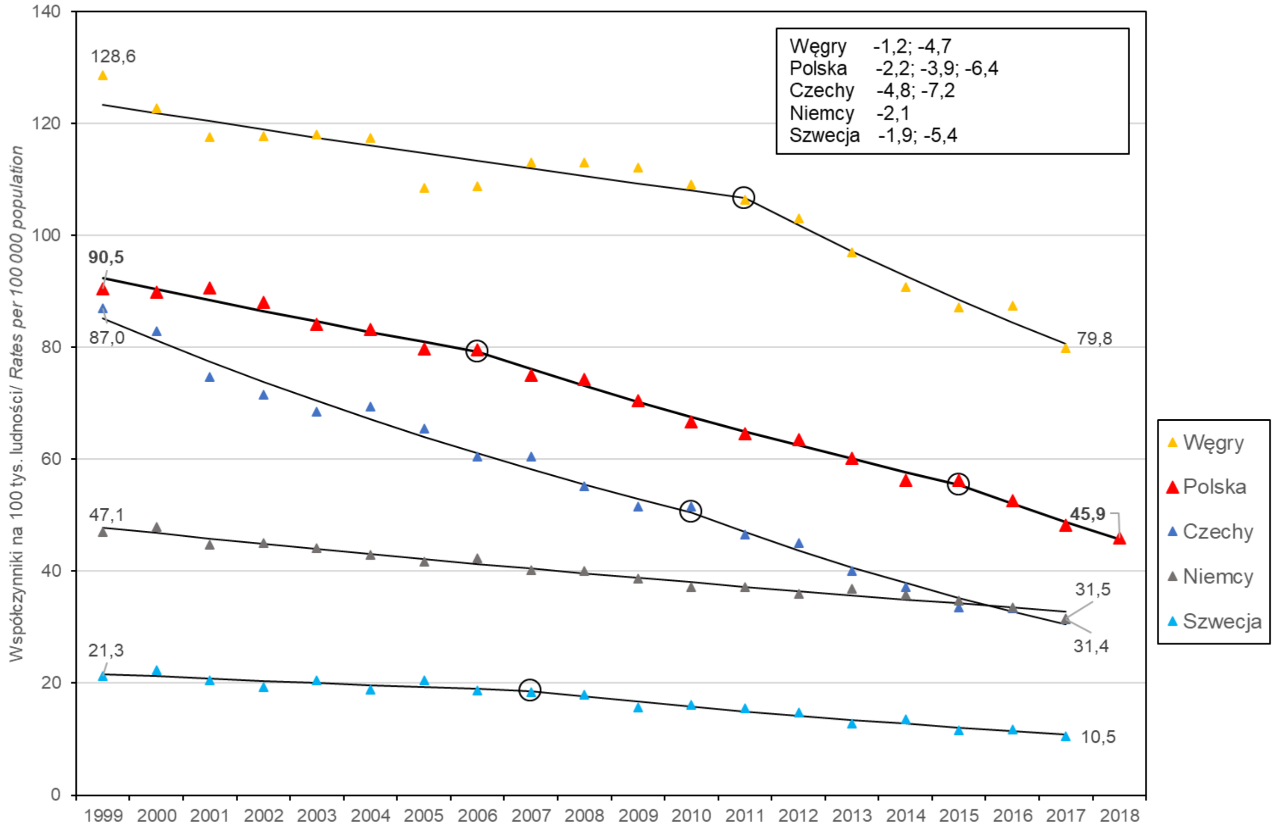


Fig. 2.71a. Age-standardised mortality rates due to trachea, bronchus and lung cancer of men aged 25-64 in Poland, the Czech Republic, Germany, Sweden and Hungary – their trends and annual average relative change rates, 1999–2018 (authors' own calculations based on the WHO mortality database and SP data)

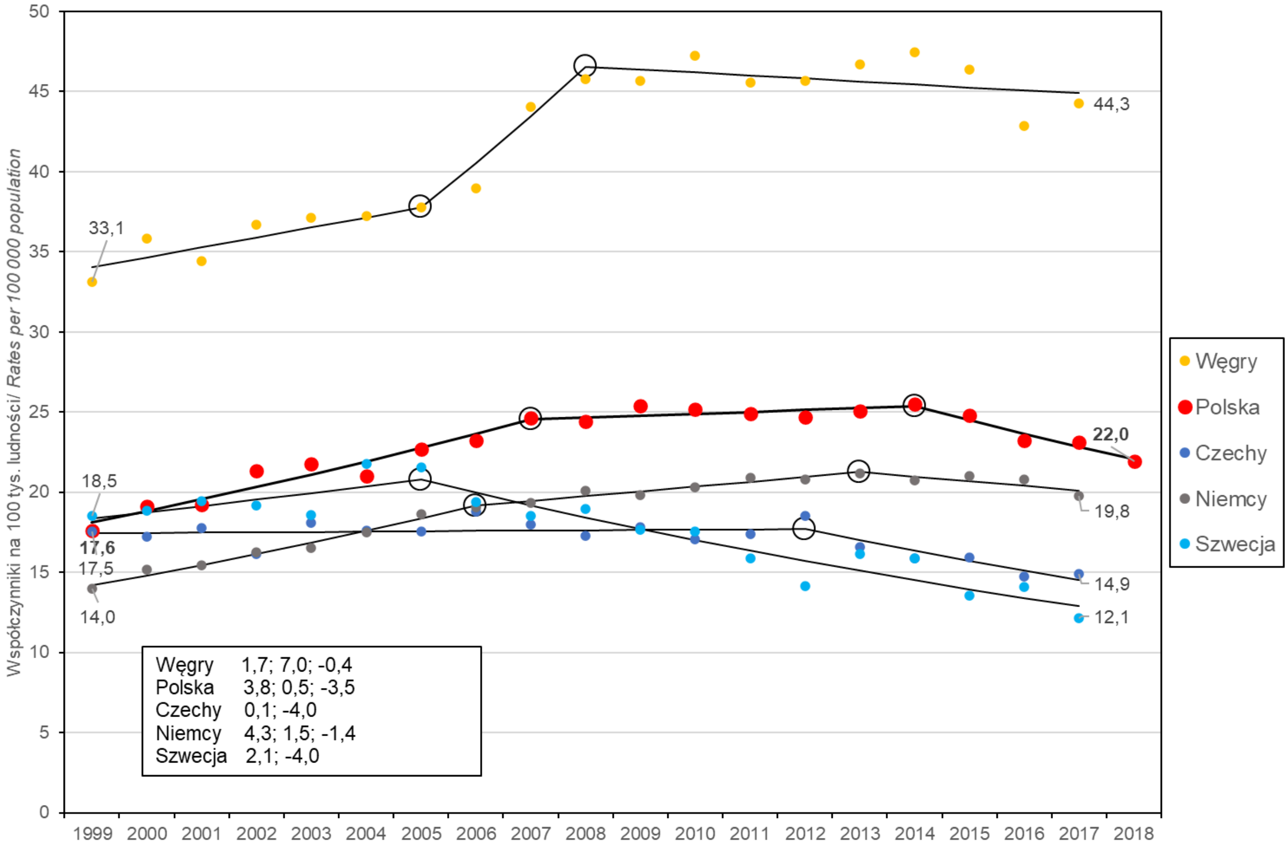


Fig. 2.71b. Age-standardised mortality rates due to trachea, bronchus and lung cancer of women aged 25-64 in Poland, the Czech Republic, Germany, Sweden and Hungary – their trends and annual average relative change rates, 1999–2018 (authors' own calculations based on the WHO mortality database and SP data)

Since 2010 the total mortality of women due to **breast cancer** in Poland has been increasing, in contrast to the remaining four countries where has continued to decrease, though in Germany and Hungary at a very slow rate (Fig. 2.72a). In the latter two countries, the mortality rate is higher than in Poland. The standardised death rate in Poland in 2018 was 26.6% higher than in Sweden in 2017, and was a little lower than the EU28 average in 2016, which was 32.9/100,000. After 1999 the mortality rate of women aged 25-64 has shown a slow downward trend, which is slower than in the other four countries, and so the excess mortality rate of Polish women, in relation to Czech, German and Swedish women, is increasing (Fig. 2.72b).

In contrast, the mortality of women from **cancer of cervix uteri** shows a clear downward trend, whose relative rate is the same as in the Czech Republic, and higher than in Germany and Sweden, but the difference in the levels to the disadvantage of Polish women is significant (Fig. 2.73a). The standardised death rate in Poland in 2018 was as many as 2.7 times higher than in Sweden in 2017, and more than 2 times higher than the EU28 average in 2016, which was 3.8/100,000. The mortality rate of women aged 25-64 is decreasing at a much faster rate than in the remaining analysed countries, but it is still much higher than in these countries, except Hungary (from 2014) (Fig. 2.73b). The increase recorded in recent years in mortality from this cancer among young women in Germany is worth noting.

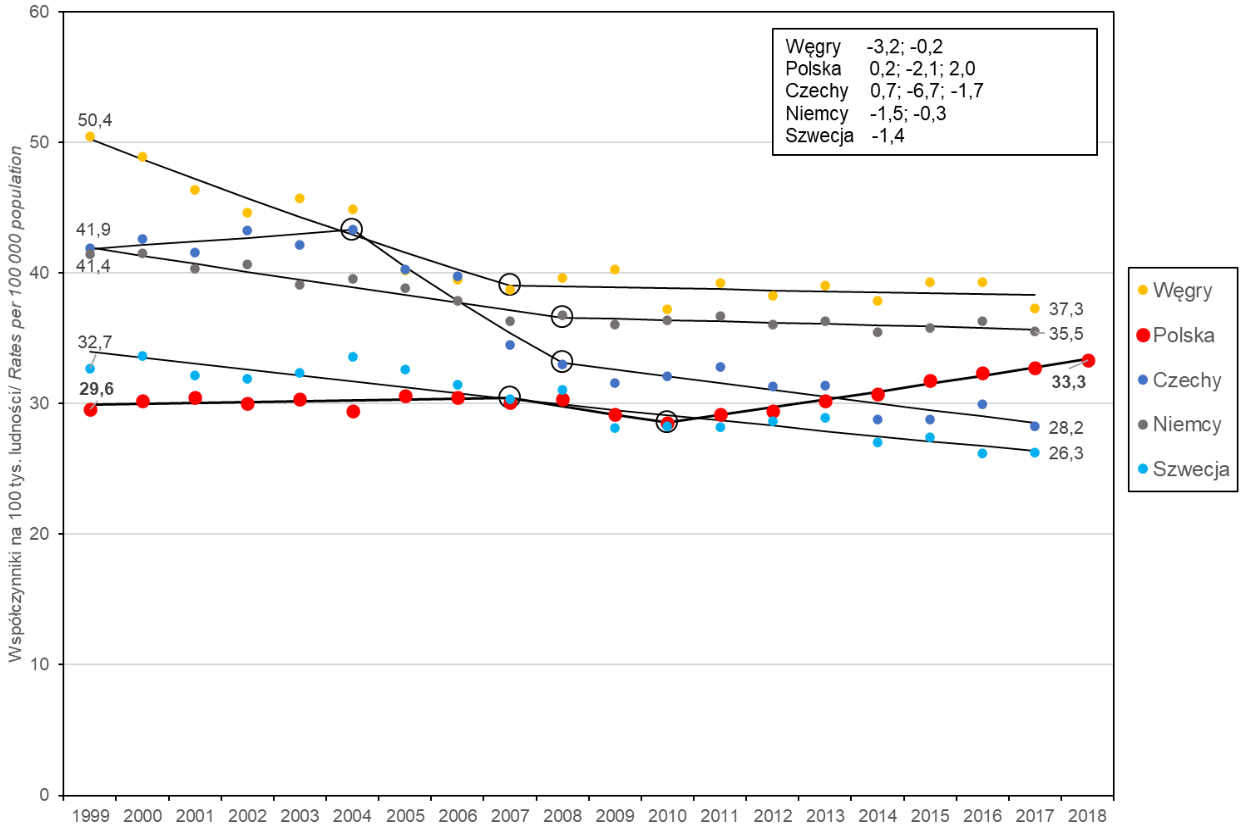


Fig. 2.72a. Age-standardised mortality rates due to breast cancer of women in Poland, the Czech Republic, Germany, Sweden and Hungary – their trends and annual average relative change rates, 1999–2018 (authors' own calculations based on the WHO mortality database and SP data)

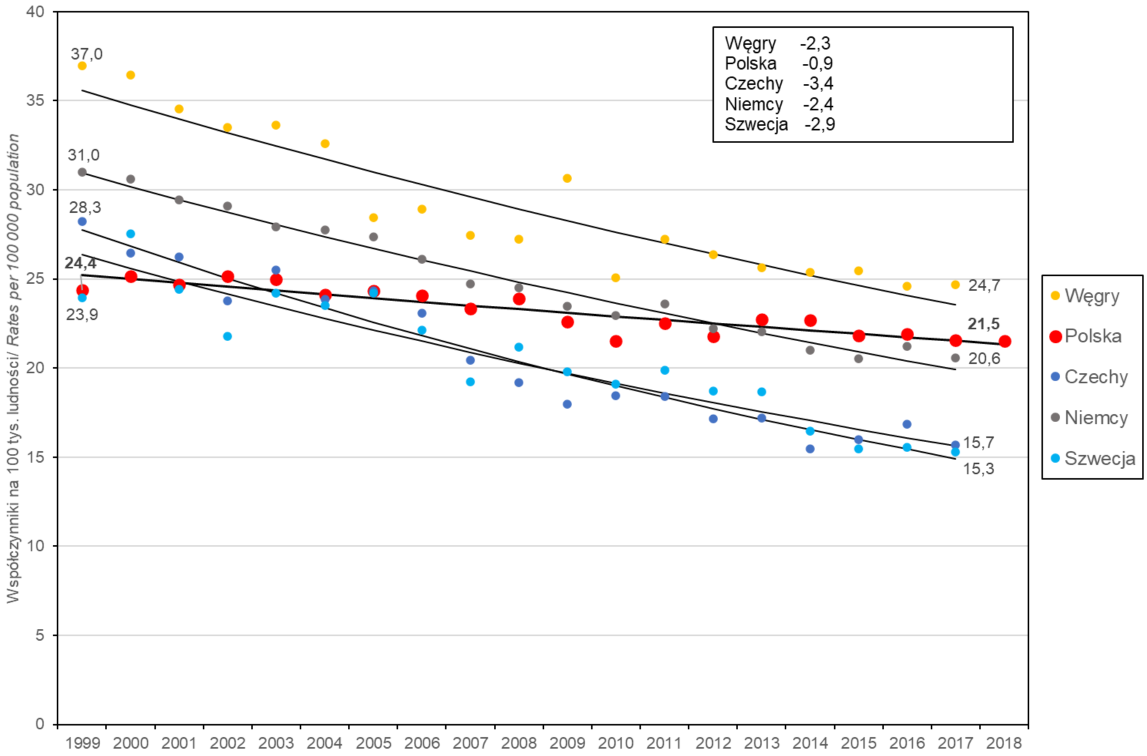


Fig. 2.72b. Age-standardised mortality rates due to breast cancer of women aged 25-64 in Poland, the Czech Republic, Germany, Sweden and Hungary – their trends and annual average relative change rates, 1999–2018 (authors' own calculations based on the WHO mortality database and SP data)

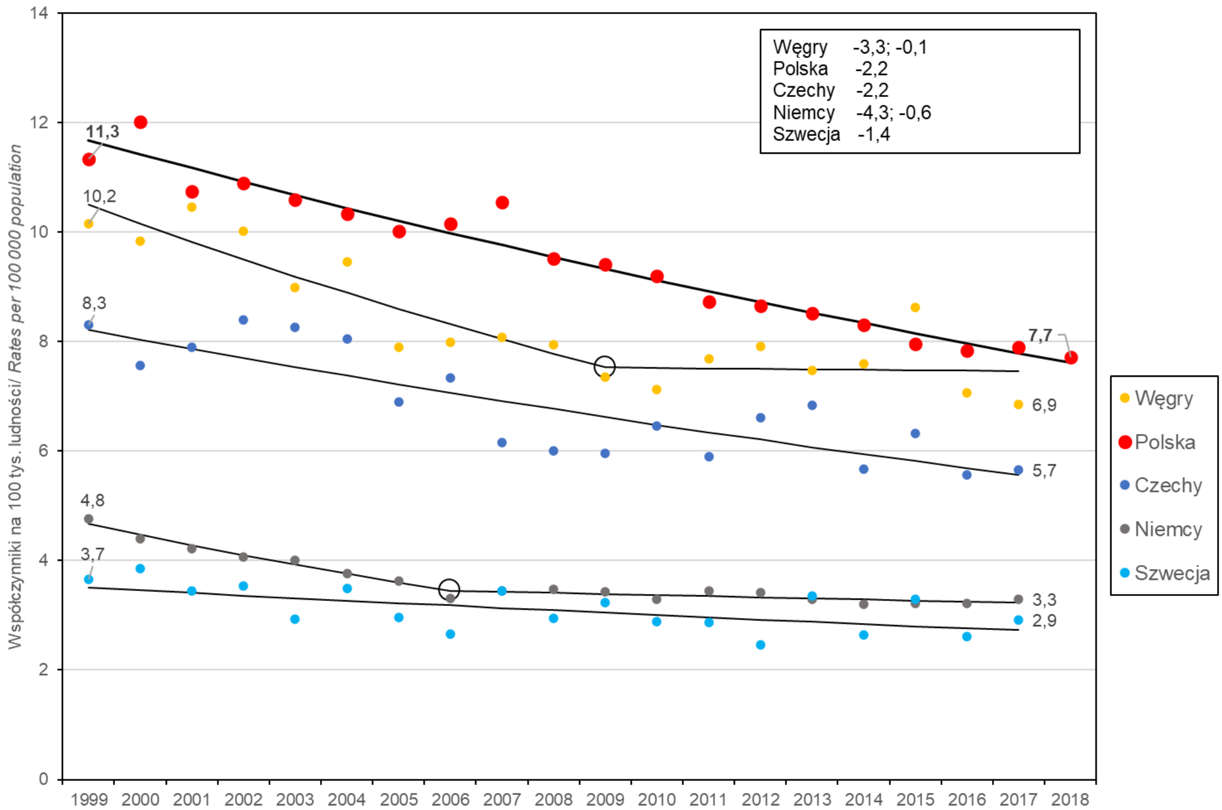


Fig. 2.73a. Age-standardised mortality rates due to cancer of cervix uteri of women in Poland, the Czech Republic, Germany, Sweden and Hungary – their trends and annual average relative change rates, 1999–2018 (authors' own calculations based on the WHO mortality database and SP data)

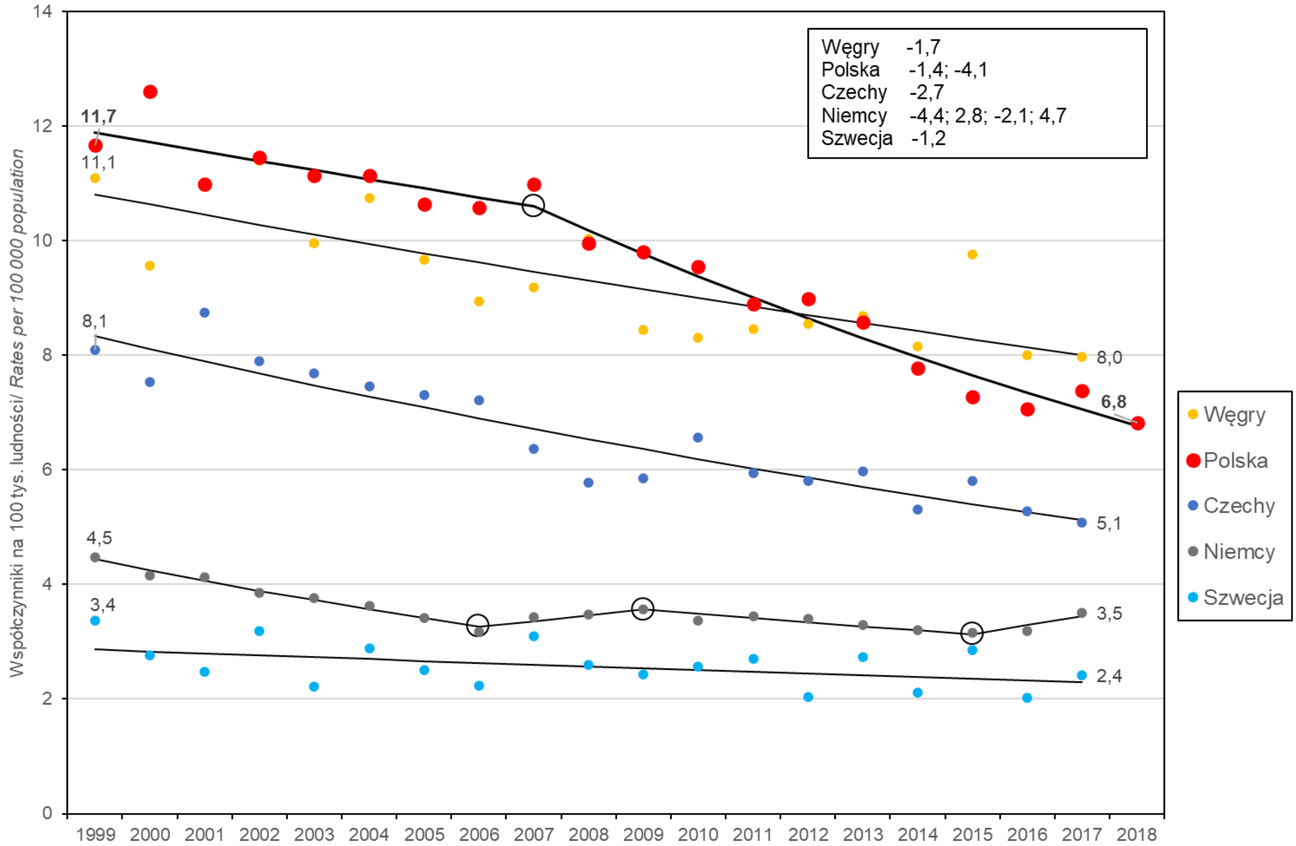


Fig. 2.73b. Age-standardised mortality rates due to cancer of cervix uteri of women aged 25-64 in Poland, the Czech Republic, Germany, Sweden and Hungary – their trends and annual average relative change rates, 1999–2018 (authors' own calculations based on the WHO mortality database and SP data)

The mortality rate in Poland of men in total due to **prostate cancer** after 2013 has demonstrated an upward trend, with a downward trend of the death rates in the remaining countries under analysis. It is worth noting here that the mortality rate in Sweden is higher than in Poland (Fig. 2.74). The standardised death rate of men in Poland in 2018 was higher than the EU average in 2016, which amounted to 37.7 per 100,000, by 25.7%.

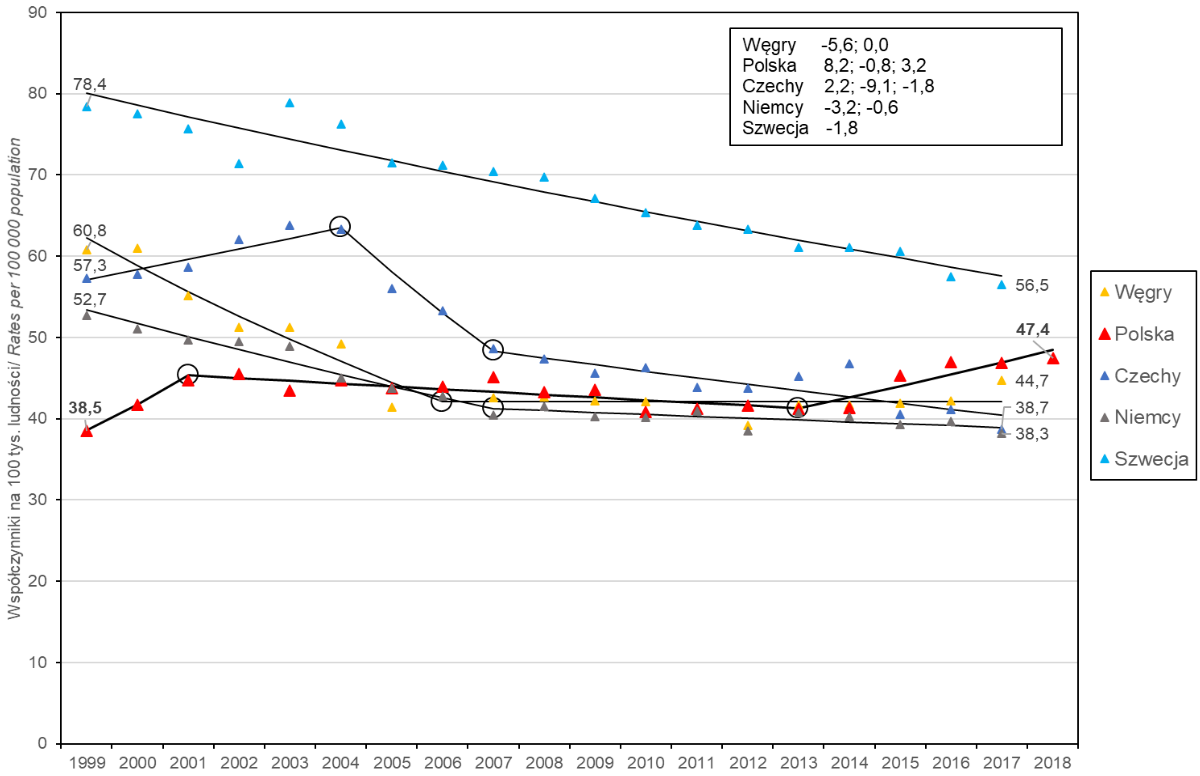


Fig. 2.74. Age-standardised mortality rates of men due to prostate cancer in Poland, the Czech Republic, Germany, Sweden and Hungary – their trends and annual average relative change rates, 1999–2018 (authors' own calculations based on the WHO mortality database and SP data)

The total mortality of men and women in Poland due to **respiratory system diseases** is subject to considerable annual fluctuations, but in general, in the case of men, a slow downward trend is observed, while for women an upward trend has been recorded after 2011 (Fig. 2.75a and 2.75b). The mortality rate of men aged 25-64 is characterised with variable tendencies similar to those observed in Hungary, and in the recent period it has seen an upward tendency (2.76a). The mortality rate of women aged 25-64, since 2002, has been subject to an upward trend similar to the one observed in Germany (Fig. 2.76b). The standardised death rate of men in Poland in 2018 was higher than the EU28 average in 2016, which equalled 108.1, by 15.9%, while the death rate of Polish women was lower than the EU28 average, amounting to 62.0 per 100,000, by 5.8%.

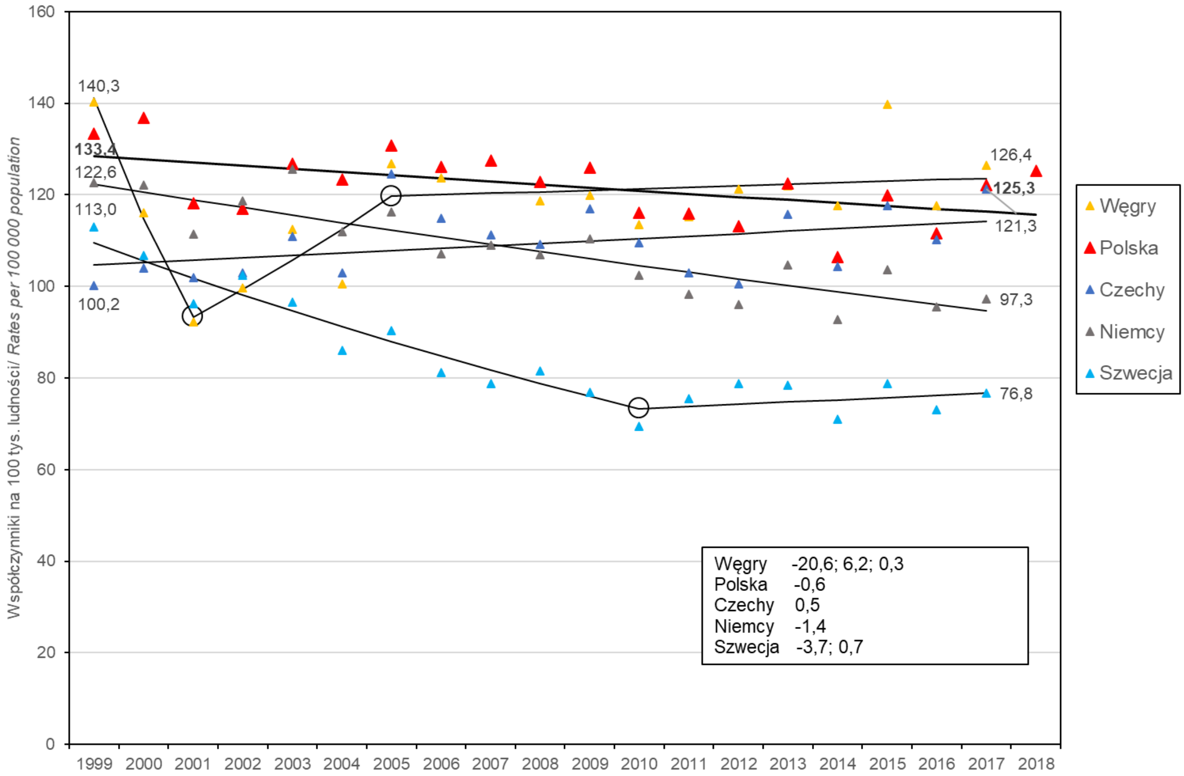


Fig. 2.75a. Age-standardised mortality rates due to diseases of the respiratory system of men in Poland, the Czech Republic, Germany, Sweden and Hungary – their trends and annual average relative change rates, 1999–2018 (authors' own calculations based on the WHO mortality database and SP data)

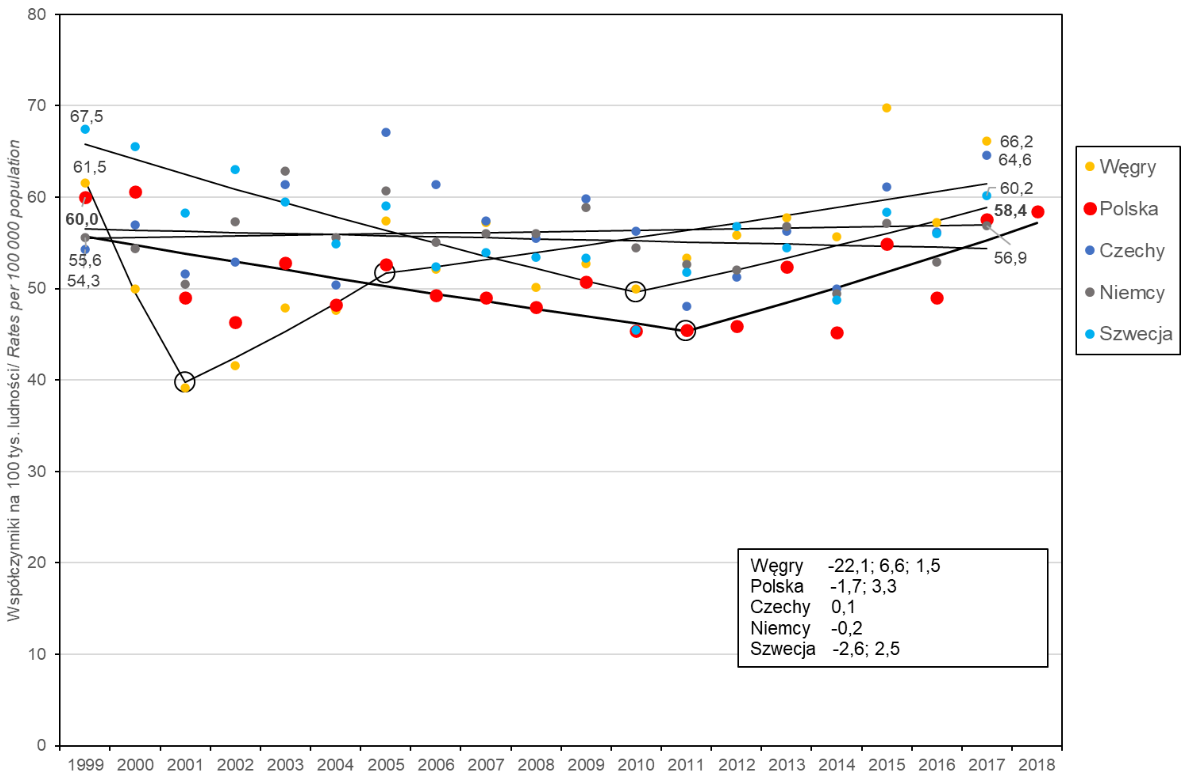


Fig. 2.75b. Age-standardised mortality rates due to diseases of the respiratory system of women in Poland, the Czech Republic, Germany, Sweden and Hungary – their trends and annual average relative change rates, 1999–2018 (authors' own calculations based on the WHO mortality database and SP data)

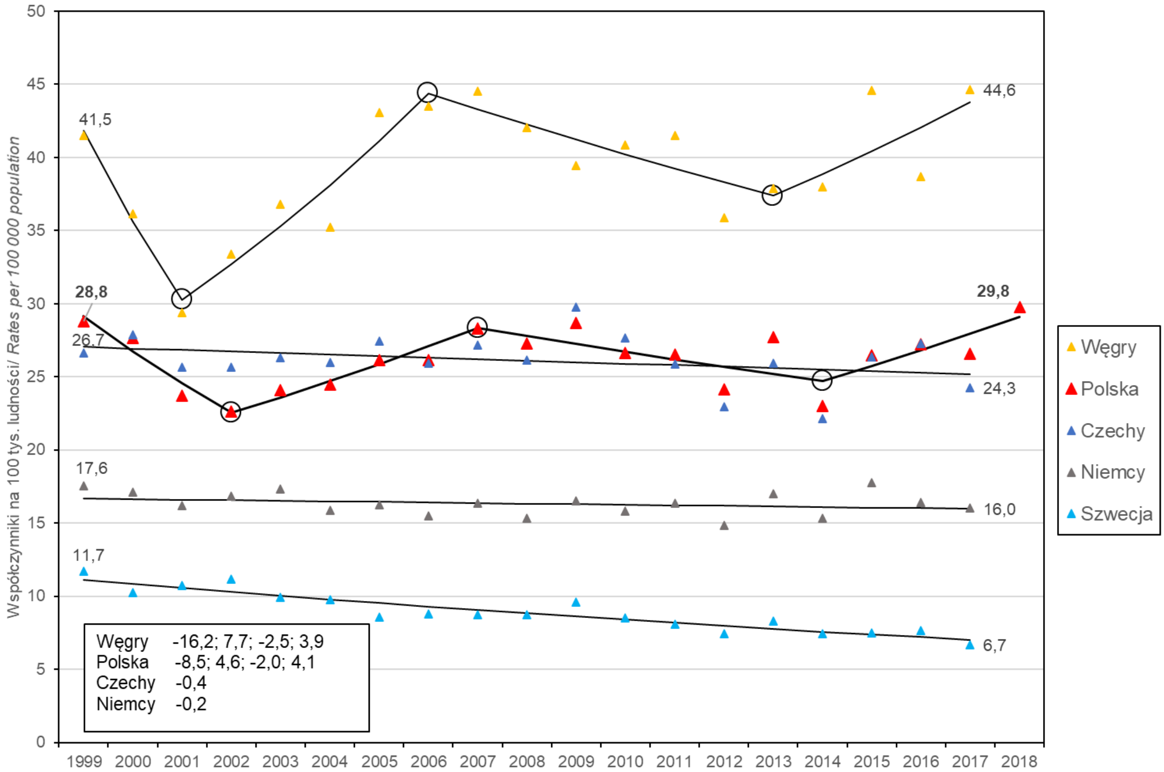


Fig. 2.76a. Age-standardised mortality rates due to diseases of the respiratory system of men aged 25-64 in Poland, the Czech Republic, Germany, Sweden and Hungary – their trends and annual average relative change rates, 1999–2018 (authors' own calculations based on the WHO mortality database and SP data)

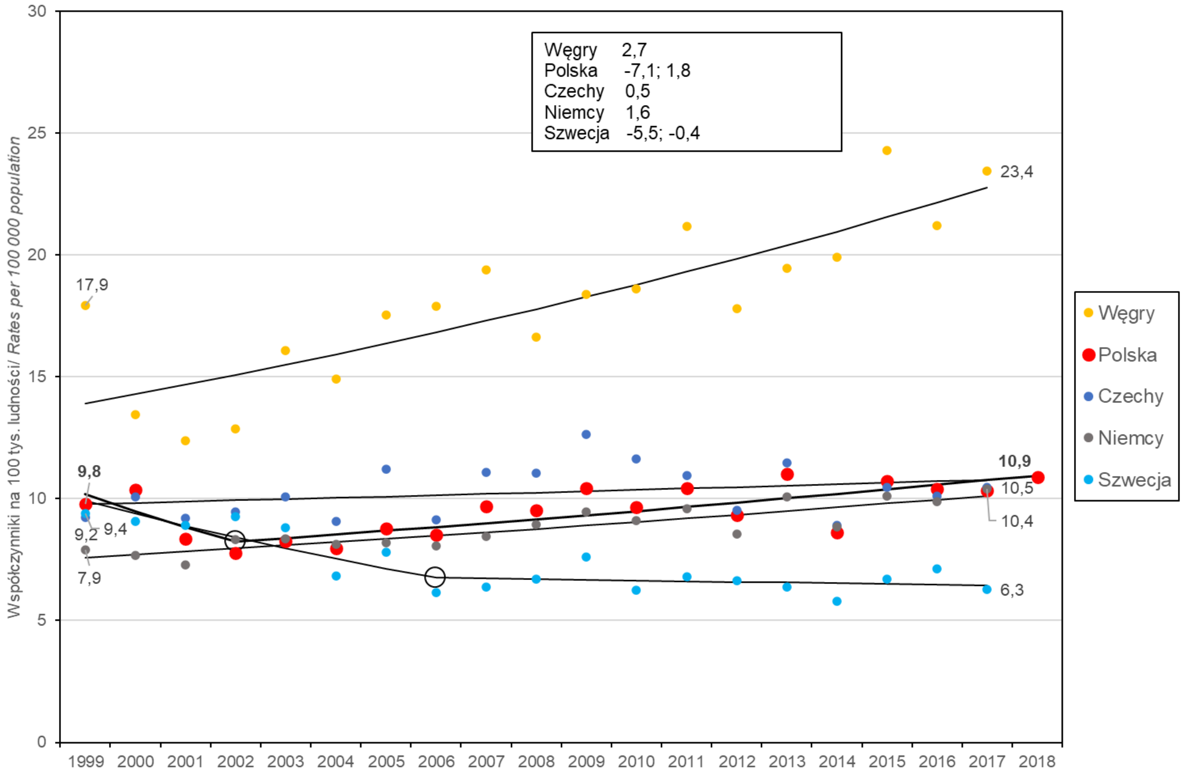


Fig. 2.76b. Age-standardised mortality rates due to diseases of the respiratory system of women aged 25-64 in Poland, the Czech Republic, Germany, Sweden and Hungary – their trends and annual average relative change rates, 1999–2018 (authors' own calculations based on the WHO mortality database and SP data)

In recent years the mortality due to **diseases of the digestive system** in Poland, for both men and women in total and those aged 25-64, has shown an upward trend of the death rates after 2015 (among men aged 25-64, it started a year earlier) (Fig. 2.77a, 2.77b, 2.78a, 2.78b). A similar rise in the mortality rates of men in total occurred in Germany, and among younger men in the Czech Republic. However, an upward trend in the mortality rate of Polish women was not accompanied by a similar tendency in the analysed countries, which may point to some specific circumstances in Poland. The mortality rate due to these diseases in 2018 in Poland was higher than in Sweden in 2017 by **91%** for men in total, and by **46%** for women in total, being similar to the death rate in the Czech Republic. The standardised death rate in Poland in 2018 was higher than the EU28 average in 2016, which amounted to 54.6 per 100,00 for men and 33.3 per 100,000 for women, i.e. 17.6% and 3.0% higher, respectively.

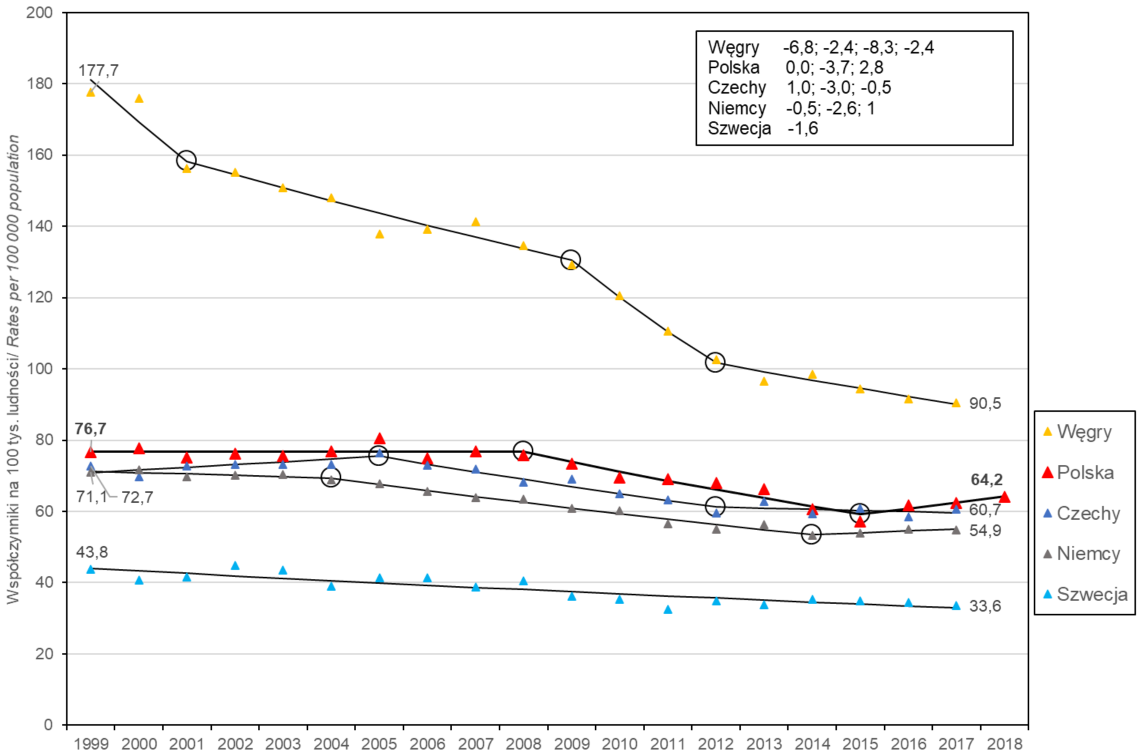


Fig. 2.77a. Age-standardised mortality rates due to diseases of the digestive system of men in Poland, the Czech Republic, Germany, Sweden and Hungary – their trends and annual average relative change rates, 1999–2018 (authors' own calculations based on the WHO mortality database and SP data)

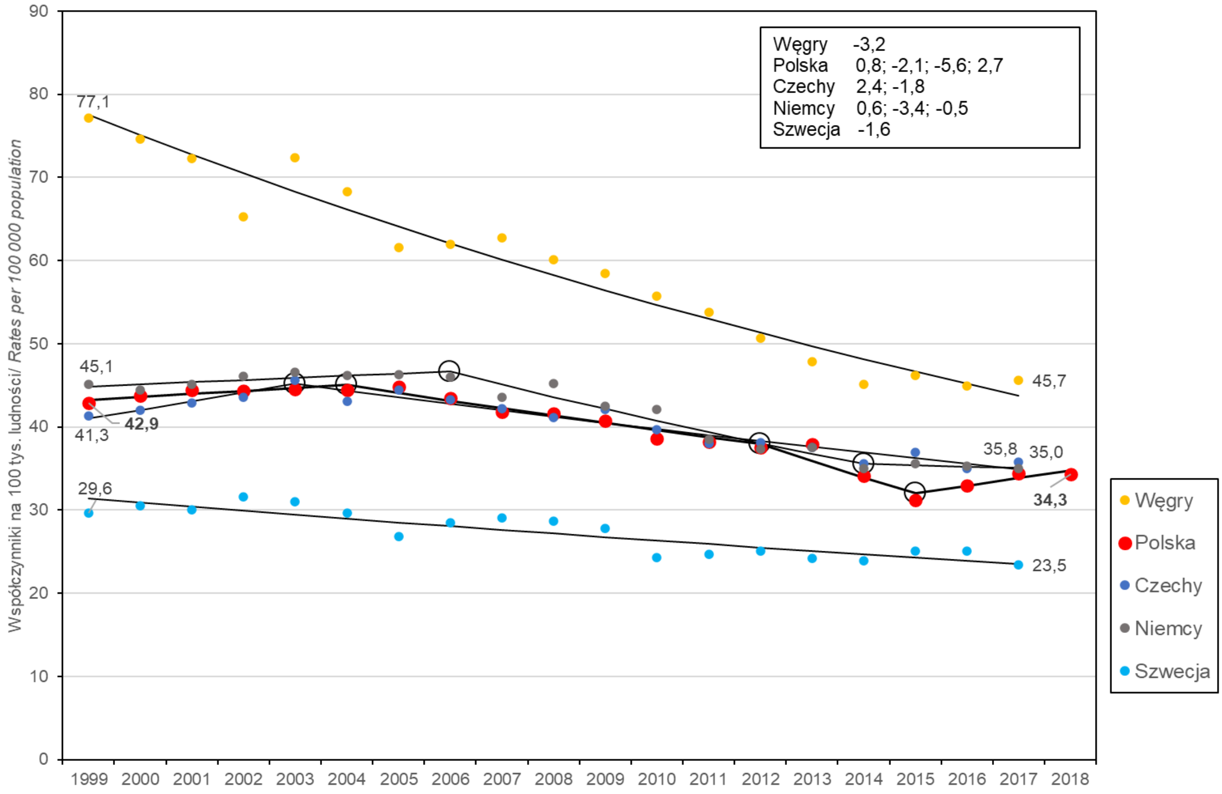


Fig. 2.77b. Age-standardised mortality rates due to diseases of the digestive system of women in Poland, the Czech Republic, Germany, Sweden and Hungary – their trends and annual average relative change rates, 1999–2018 (authors' own calculations based on the WHO mortality database and SP data)

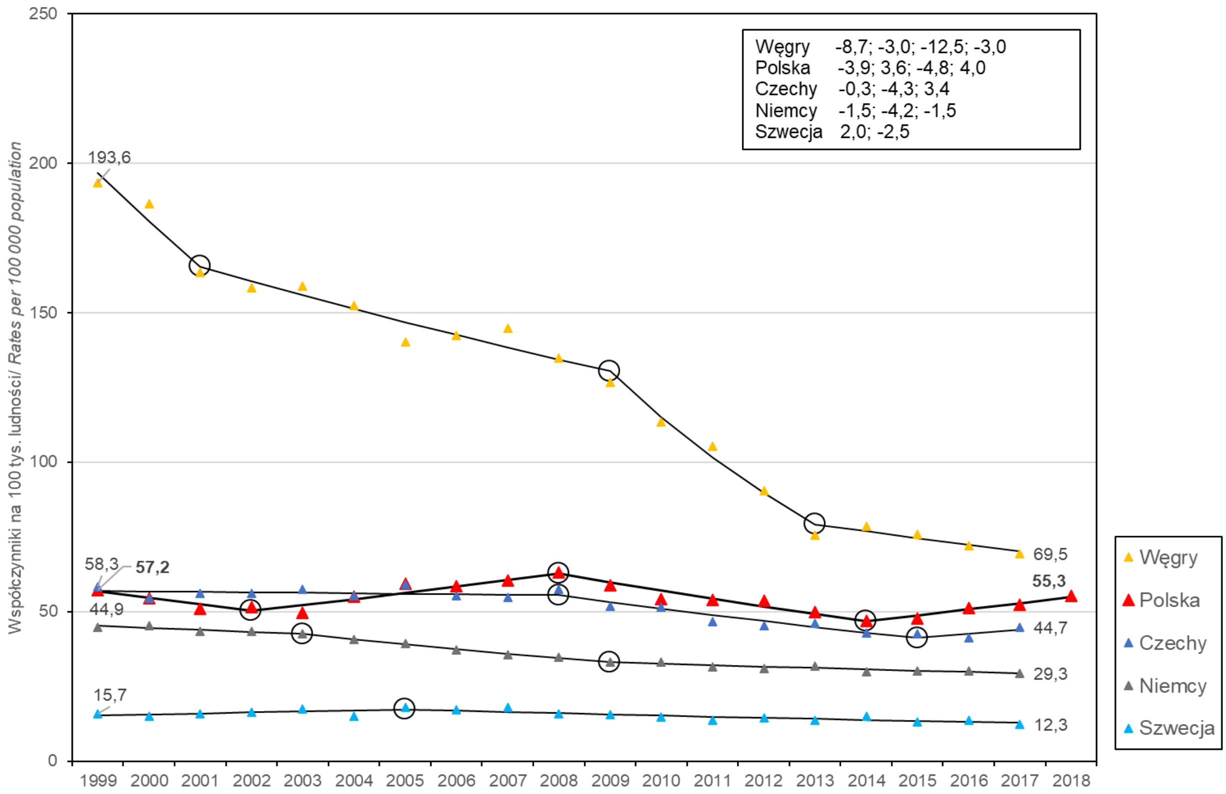


Fig. 2.78a. Age-standardised mortality rates due to diseases of the digestive system of men aged 25-64 in Poland, the Czech Republic, Germany, Sweden and Hungary – their trends and annual average relative change rates, 1999–2018 (authors' own calculations based on the WHO mortality database and SP data)

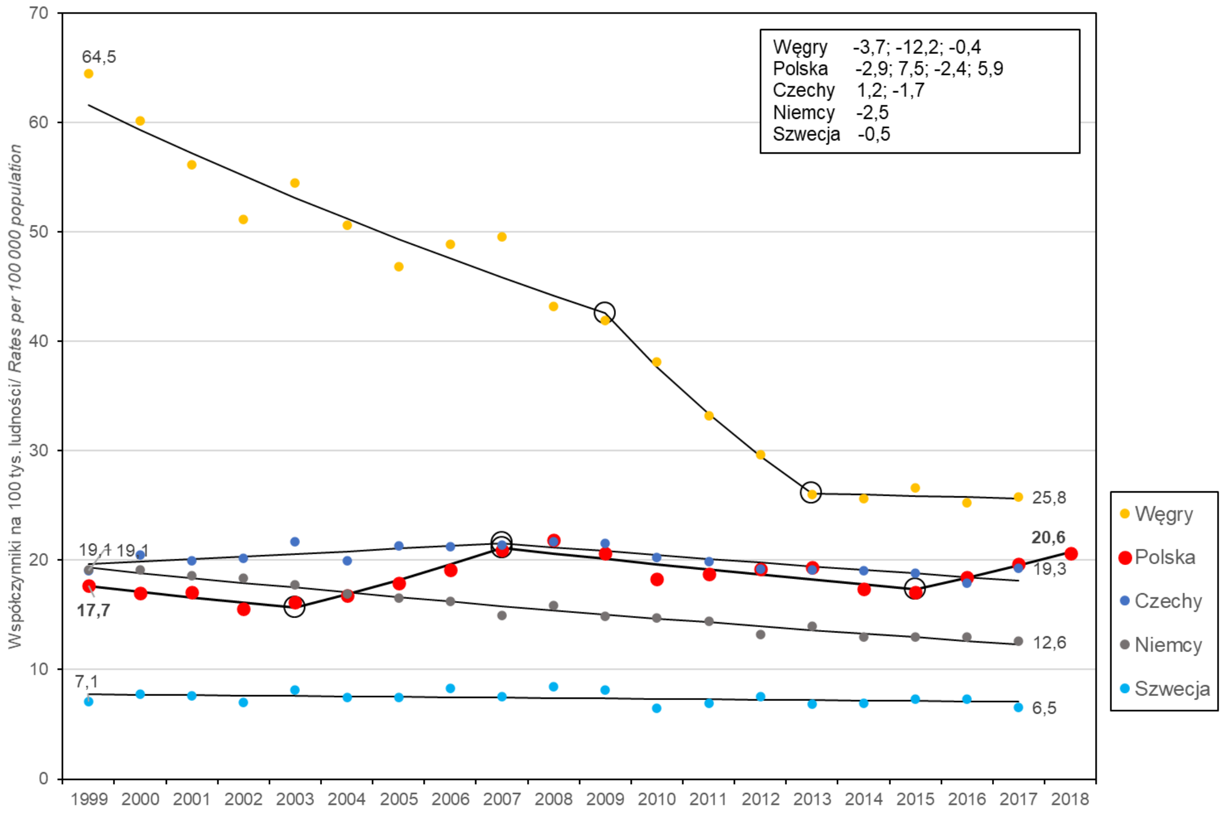


Fig. 2.78b. Age-standardised mortality rates due to diseases of the digestive system of women aged 25-64 in Poland, the Czech Republic, Germany, Sweden and Hungary – their trends and annual average relative change rates, 1999–2018 (authors' own calculations based on the WHO mortality database and SP data)

Following the period of a fast-paced decrease in 2012-2016 in the mortality rate for **external causes**, both among men in total and those aged 25-64 years, the trend has been recently found to decelerate (Fig. 2.79a and 2.80a). In 2018 the standardised death rate among men in Poland was 27.3% higher than the average for EU countries in 2016 (68.8 per 100,000), and 45.0% higher than the rate for Germany in 2017. The death rate of working-age men in Poland was as many as 2.4 times higher than in Germany. After 1999 the mortality rate of women in total from external causes has been characterised with a continuing downward trend which, as is evident in the death rates in the last three year, is subject to a deceleration which has not yet reached the level of statistical significance (Fig. 2.79b). However, in the case of women aged 25-64, the relative decrease in the death rate after 2008 has been substantially faster than in other analysed countries, but the mortality rate is still higher than in Germany and lower than in the remaining three countries (Fig. 2.80b).

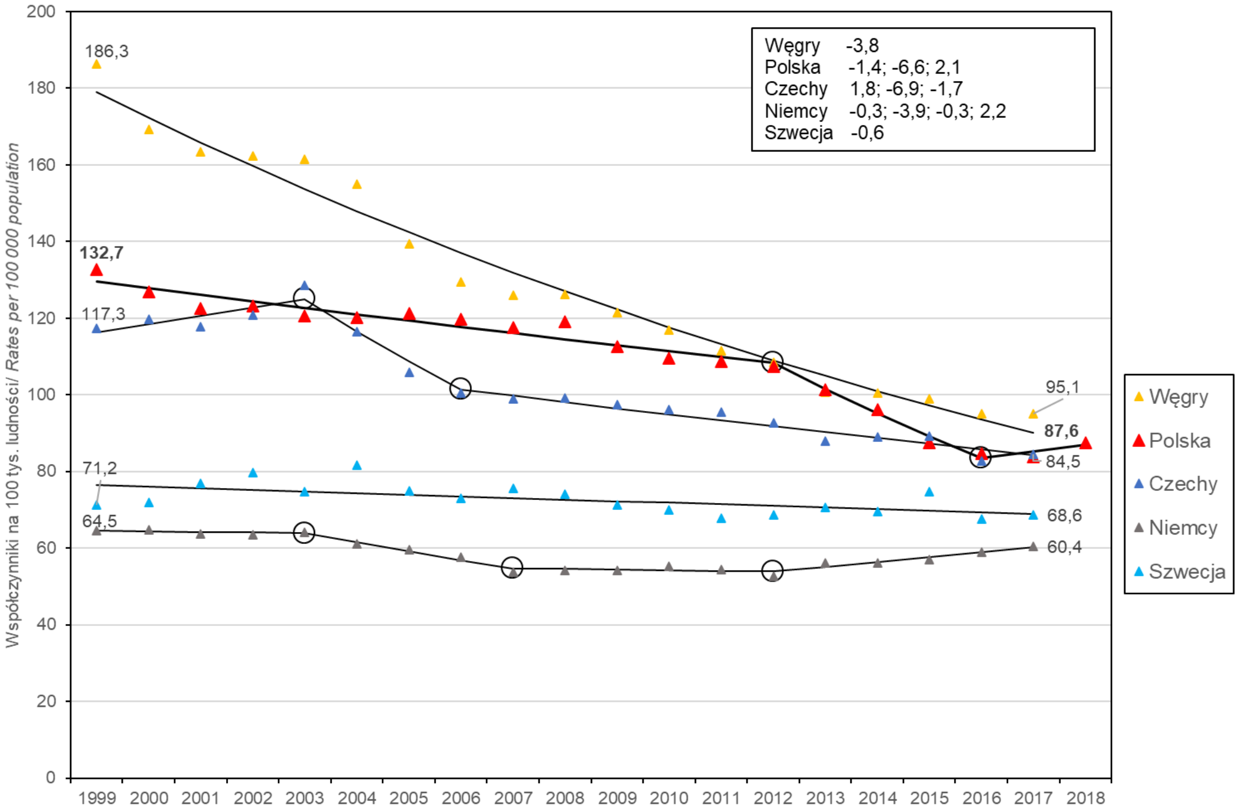


Fig. 2.79a. Age-standardised mortality rates from external causes of men in Poland, the Czech Republic, Germany, Sweden and Hungary – their trends and annual average relative change rates, 1999–2018 (authors' own calculations based on the WHO mortality database and SP data)

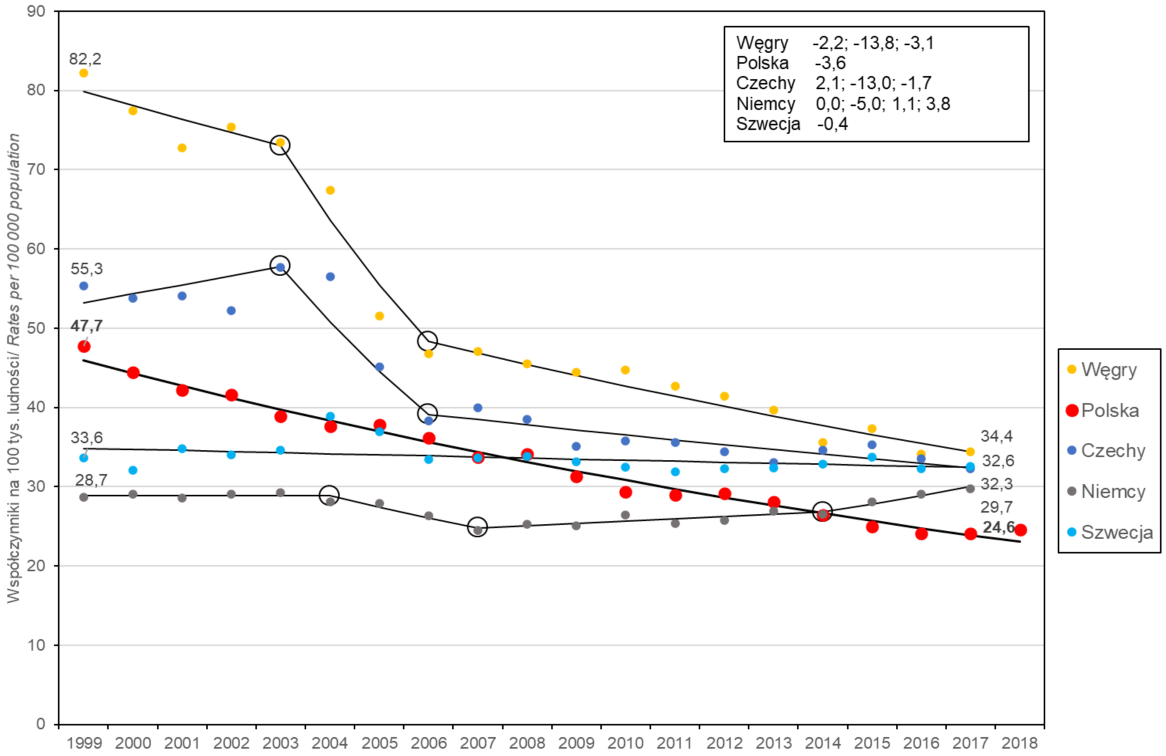


Fig. 2.79b. Age-standardised mortality rates from external causes of women in Poland, the Czech Republic, Germany, Sweden and Hungary – their trends and annual average relative change rates, 1999–2018 (authors' own calculations based on the WHO mortality database and SP data)

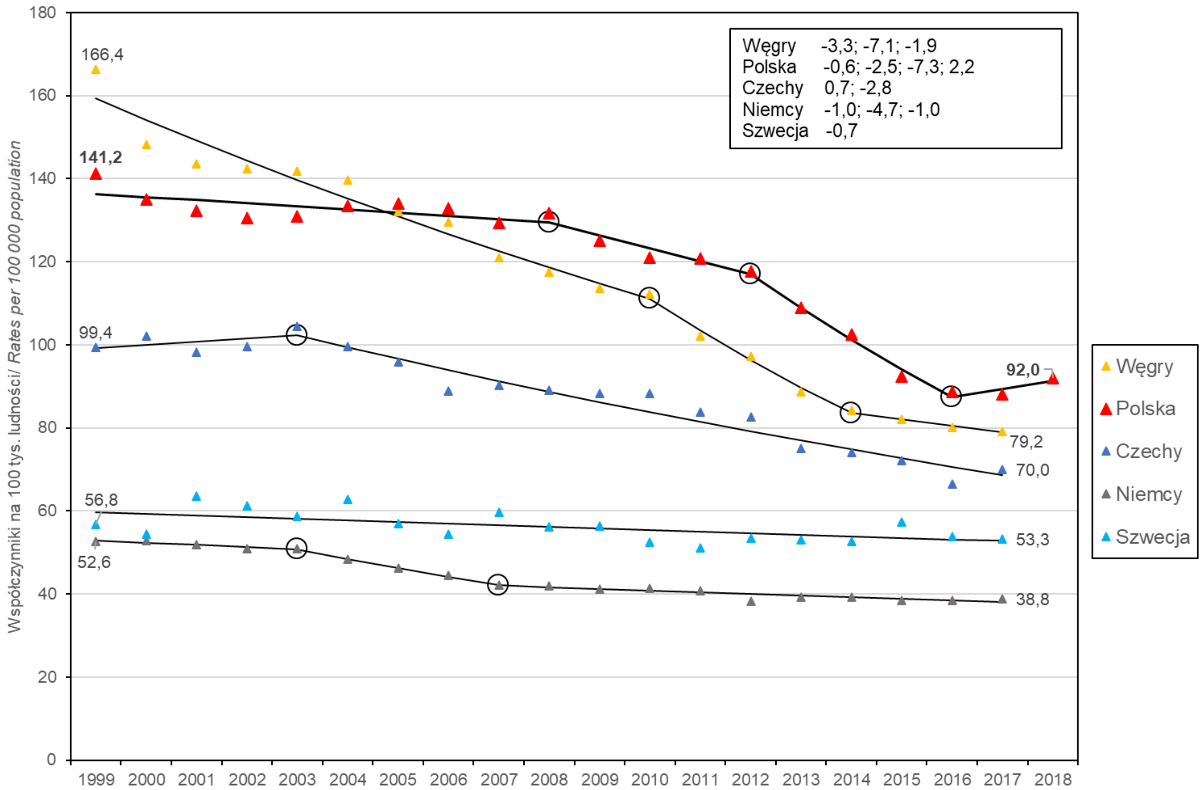


Fig. 2.80a. Age-standardised mortality rates from external causes of men aged 25-64 in Poland, the Czech Republic, Germany, Sweden and Hungary – their trends and annual average relative change rates, 1999–2018 (authors' own calculations based on the WHO mortality database and SP data)

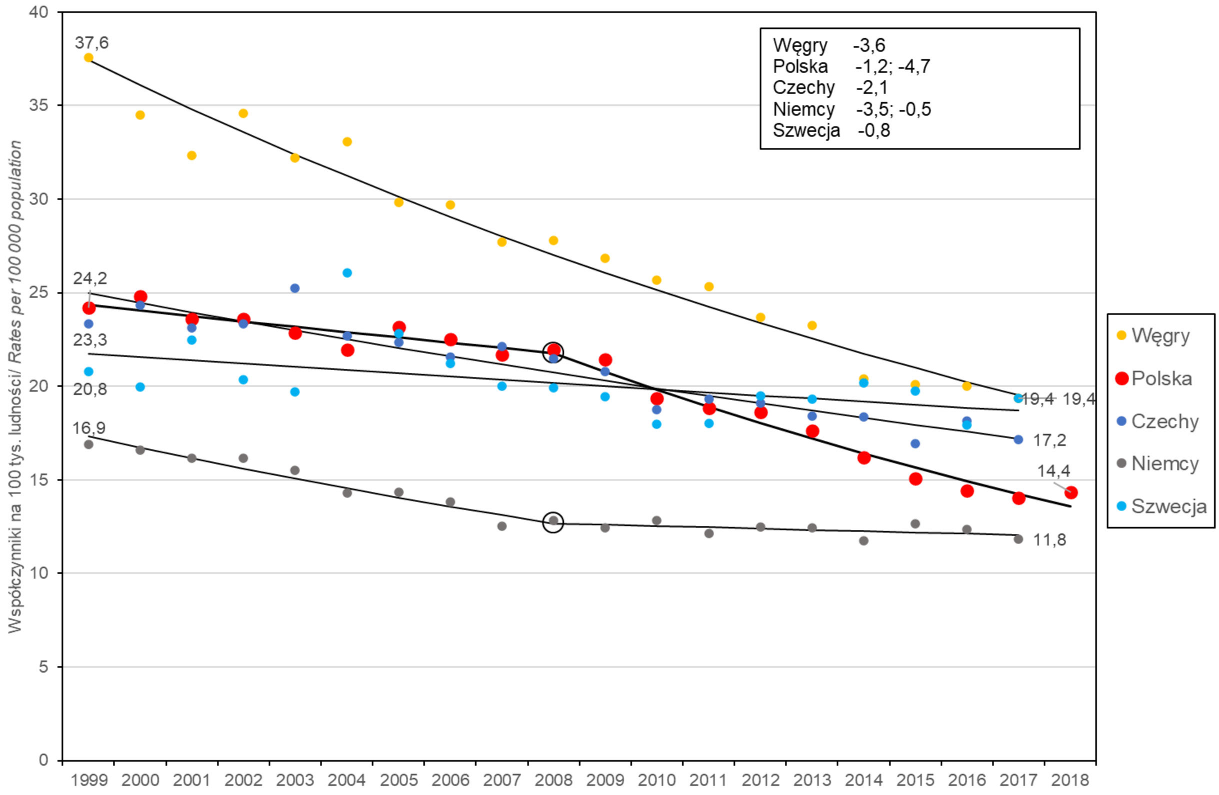


Fig. 2.80b. Age-standardised mortality rates from external causes of women aged 25-64 in Poland, the Czech Republic, Germany, Sweden and Hungary – their trends and annual average relative change rates, 1999–2018 (authors' own calculations based on the WHO mortality database and SP data)

Mortality due to **transport accidents** in Poland is much higher than the EU average. The standardised death rate in Poland in 2018 was higher than the EU28 average in 2016, which amounted to 9.0 per 100,000 for men and to 2.5 per 100,000 for women, i.e. by 73% and 76%, respectively. As compared to Sweden, the mortality rate in 2018 in Poland among men was as many as 3.4 times (4.55 per 100,000) higher than in Sweden in 2017, and in the case of women by approx. 3.5 times higher (1.24/100,000).

The mortality rate due to **suicides** among men, both in total and those aged 25-64, has presented a downward trend since 2013, but in 2018 the death rates were at a similar level as a year before (Fig. 2.81a and 2.82a). The mortality level in Poland is similar to the one in the Czech Republic, but higher than in Sweden and Germany. It is 18% higher than the mortality rate for men in total in the EU, which in 2016 was 17.8 per 100,000. The mortality rates of Polish women, both in total and those aged 25-64, are characterised with a multiannual downward trend, but it should be pointed out that the death rates in the last three years have pointed to a possible deceleration of the favourable tendency (Fig. 2.81b and 2.82b). The death rates due to suicides among Polish women are lower than in most EU countries.

However, it is worth emphasising that previous comments on the reliability of the suicide death rate data also refer to international comparisons. The death rate for the events of an undetermined intent in Poland is substantially higher than in the compared countries, except for Sweden in the case of women, and also than in the whole EU28, which may contribute to reducing differences in the mortality rates to the benefit of Poland's data.

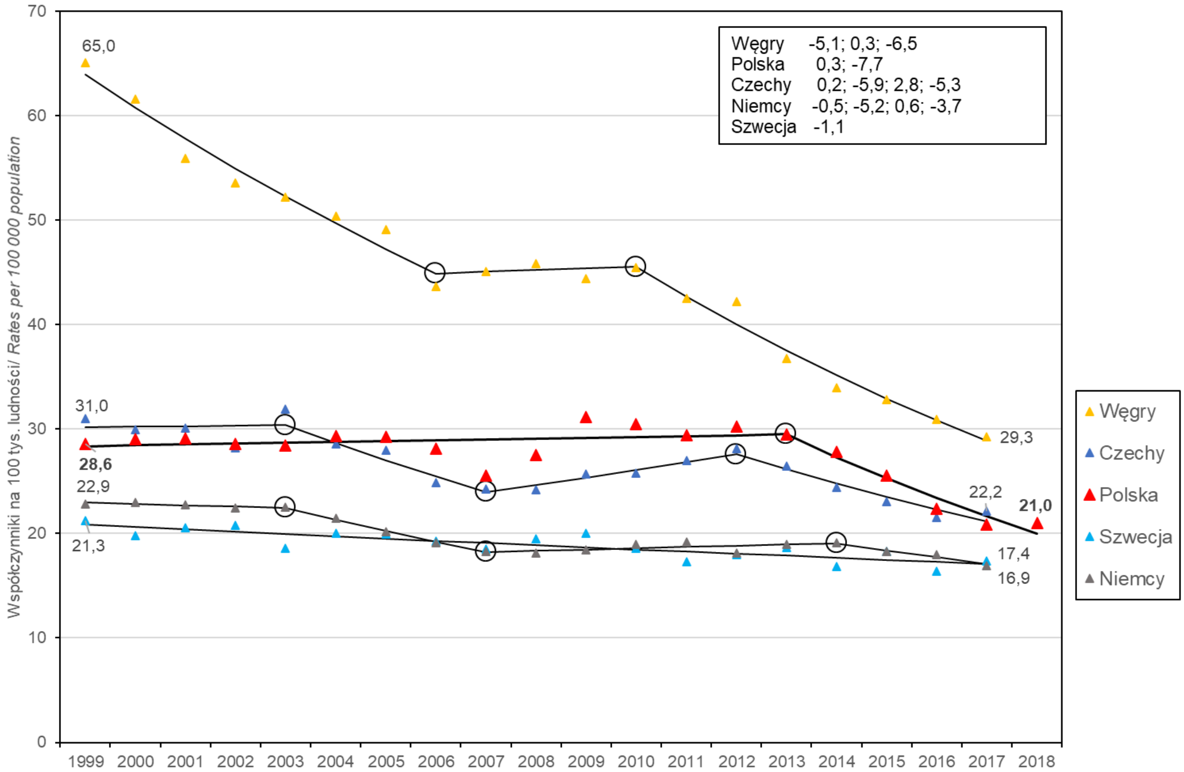


Fig. 2.81a. Age-standardised mortality rates from suicide of men in Poland, the Czech Republic, Germany, Sweden and Hungary – their trends and annual average relative change rates, 1999–2018 (authors' own calculations based on the WHO mortality database and SP data)

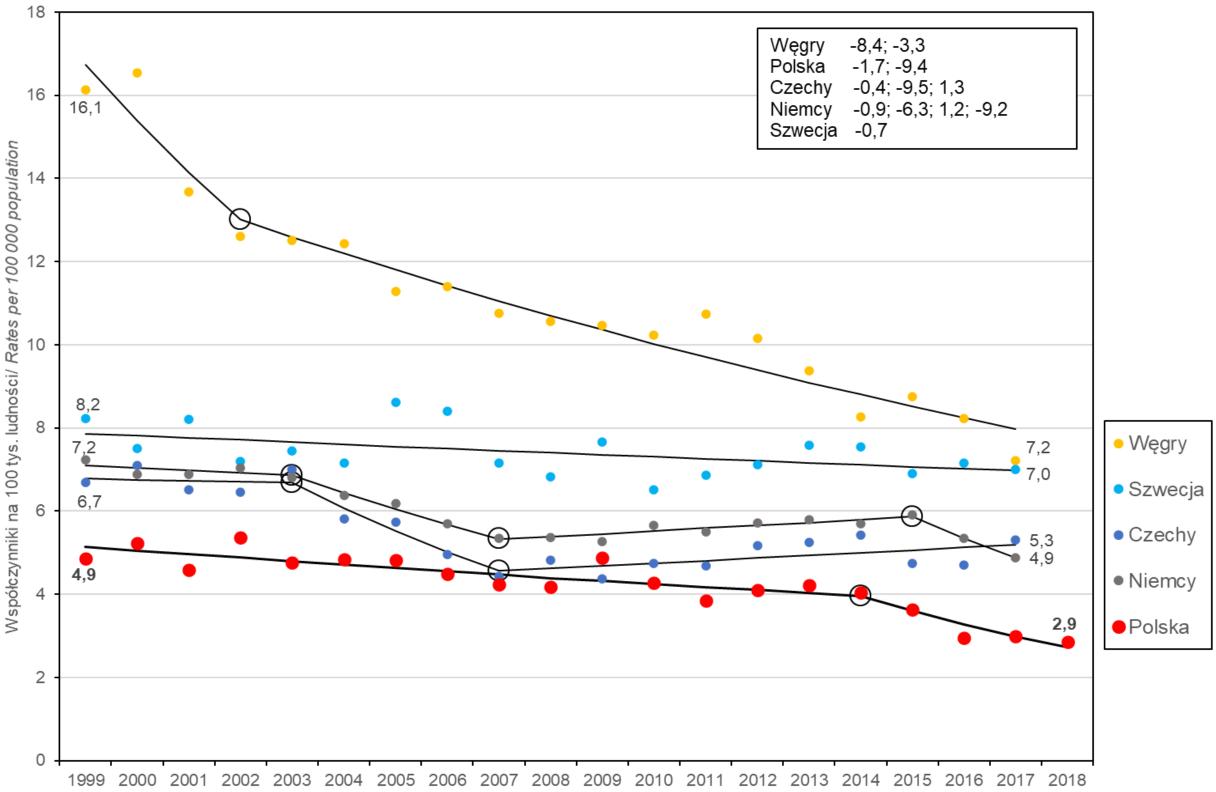


Fig. 2.81b. Age-standardised mortality rates from suicide of women in Poland, the Czech Republic, Germany, Sweden and Hungary – their trends and annual average relative change rates, 1999–2018 (authors' own calculations based on the WHO mortality database and SP data)

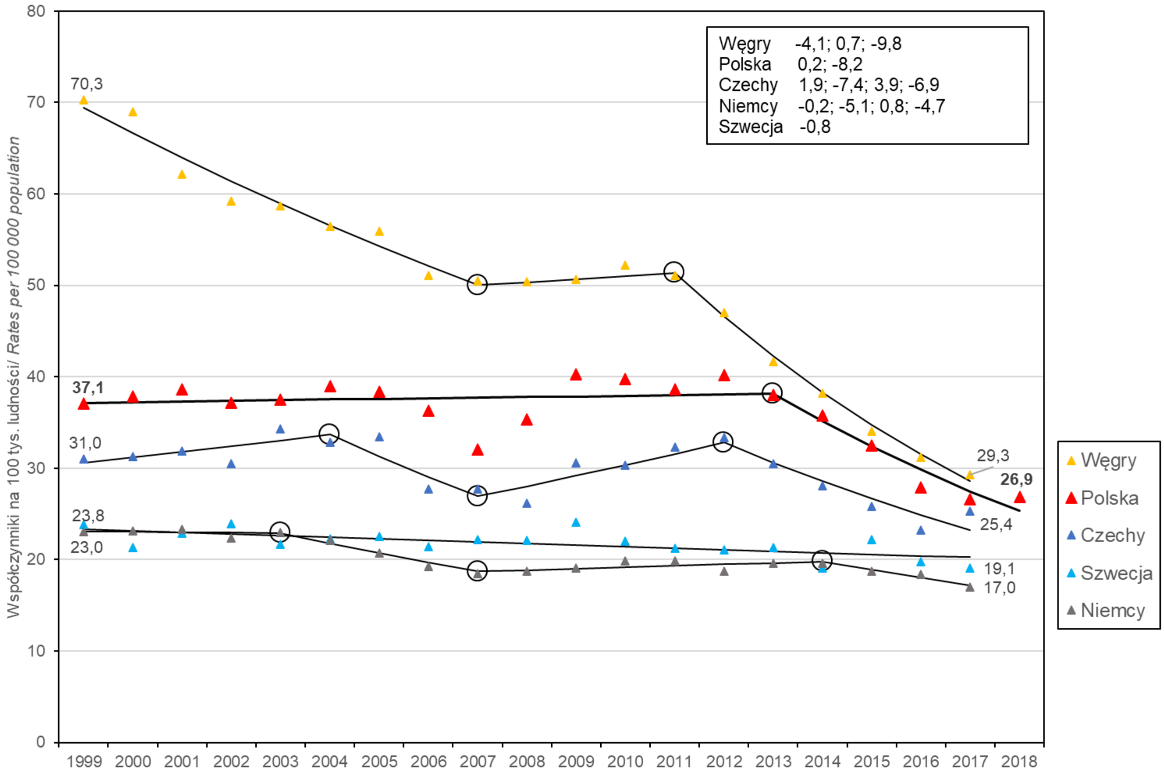


Fig. 2.82a. Age-standardised mortality rates from suicide of men aged 25-64 in Poland, the Czech Republic, Germany, Sweden and Hungary – their trends and annual average relative change rates, 1999–2018 (authors' own calculations based on the WHO mortality database and SP data)

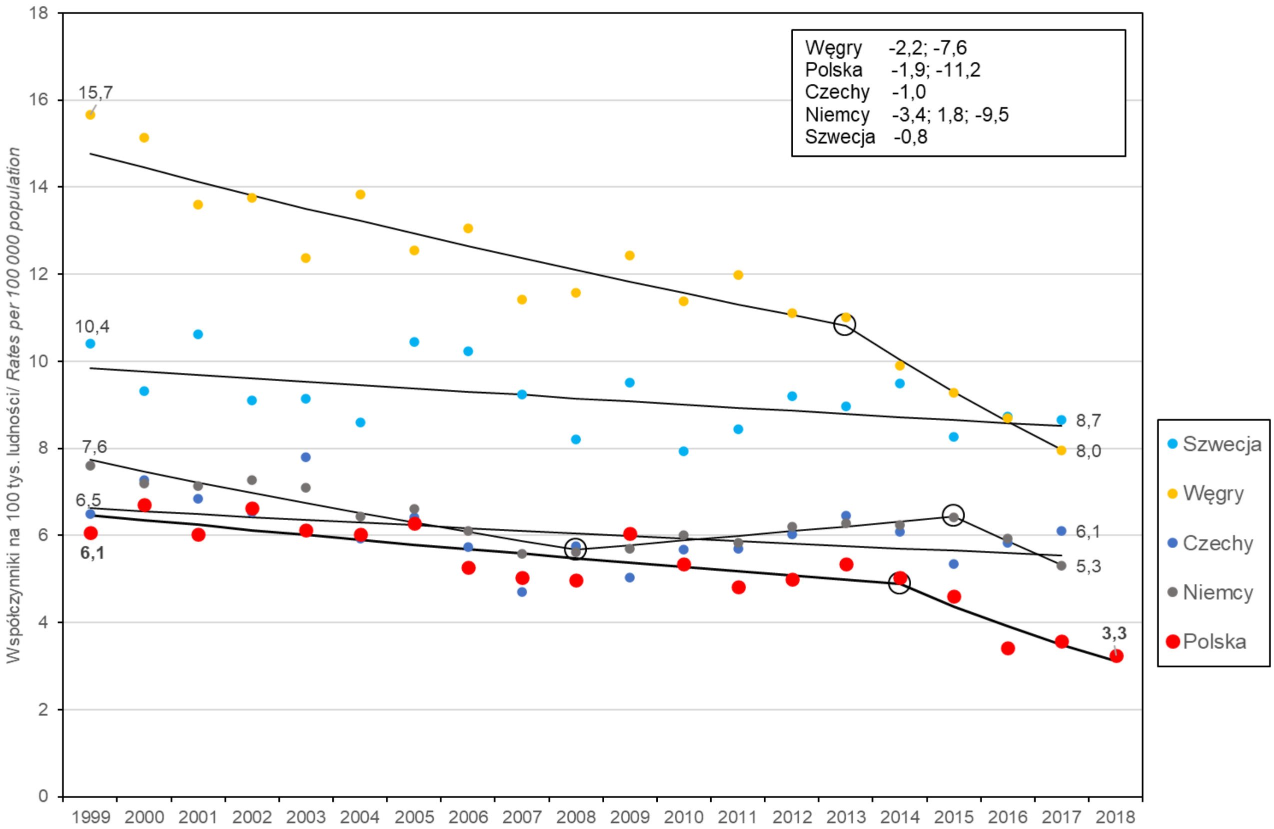


Fig. 2.82b. Age-standardised mortality rates from suicide of women aged 25-64 in Poland, the Czech Republic, Germany, Sweden and Hungary – their trends and annual average relative change rate, 1999–2018 (authors' own calculations based on the WHO mortality database and SP data)

We would like to complete the comparison of the levels and dynamics of mortality rates in Poland and in selected EU countries by referring to avoidable deaths. As deaths from diseases of the respiratory system, due to the adopted allocations to the group of avoidable and amenable causes, are characterised with a similar level and trends, below there are death rates of men due to avoidable CVDs (Fig. 2.83). The mortality rate in Poland is clearly lower than in Hungary where there is a deceleration of the decrease in death similar to Poland, at the same level as in the Czech Republic where the decrease rate has not slowed down, and over twice as high as in Sweden and 68% higher than in Germany. The deceleration of the decrease rate in these two countries was recorded previously, starting with 2011, which may point to slightly other causes than in Poland or Hungary.

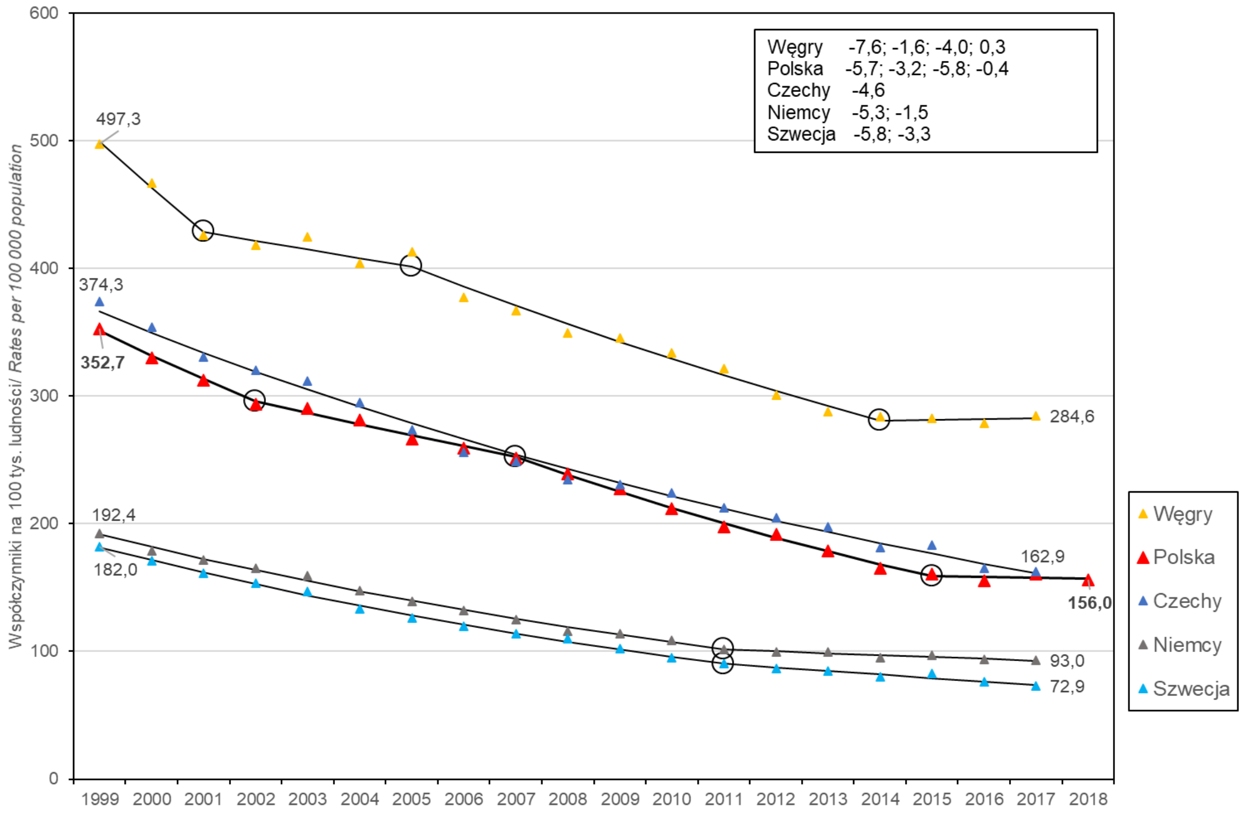


Fig. 2.83. Age-standardised mortality rates of men from avoidable cardiovascular diseases in Poland, the Czech Republic, Germany, Sweden and Hungary – their trends and annual average relative change rate, 1999–2018 (authors' own calculations based on the WHO mortality database and SP data)

In the case of deaths from preventable neoplastic diseases among men, in the analysed countries a downward trend of the death rates is observed, without a deceleration in recent years, and in Germany it has even accelerated after a slowdown in 2007-2015, while in Poland it is slower than in the Czech Republic (Fig. 2.84a). The mortality rate in Poland is considerably higher than in the Czech Republic, Germany and Sweden. In comparison to Sweden, the excess rate is over 2.5 times higher. As far as the mortality rate of women is concerned, an upward trend of the avoidable mortality rate due to neoplasms in Poland is similar to that observed in Germany, while in Sweden and the Czech Republic the rates show a significant but slow downward trend, which results in an increase in the excess mortality to the disadvantage of Polish women (Fig. 2.84b). It is undoubtedly worth verifying which preventive measures in these countries are more effective than in Poland.

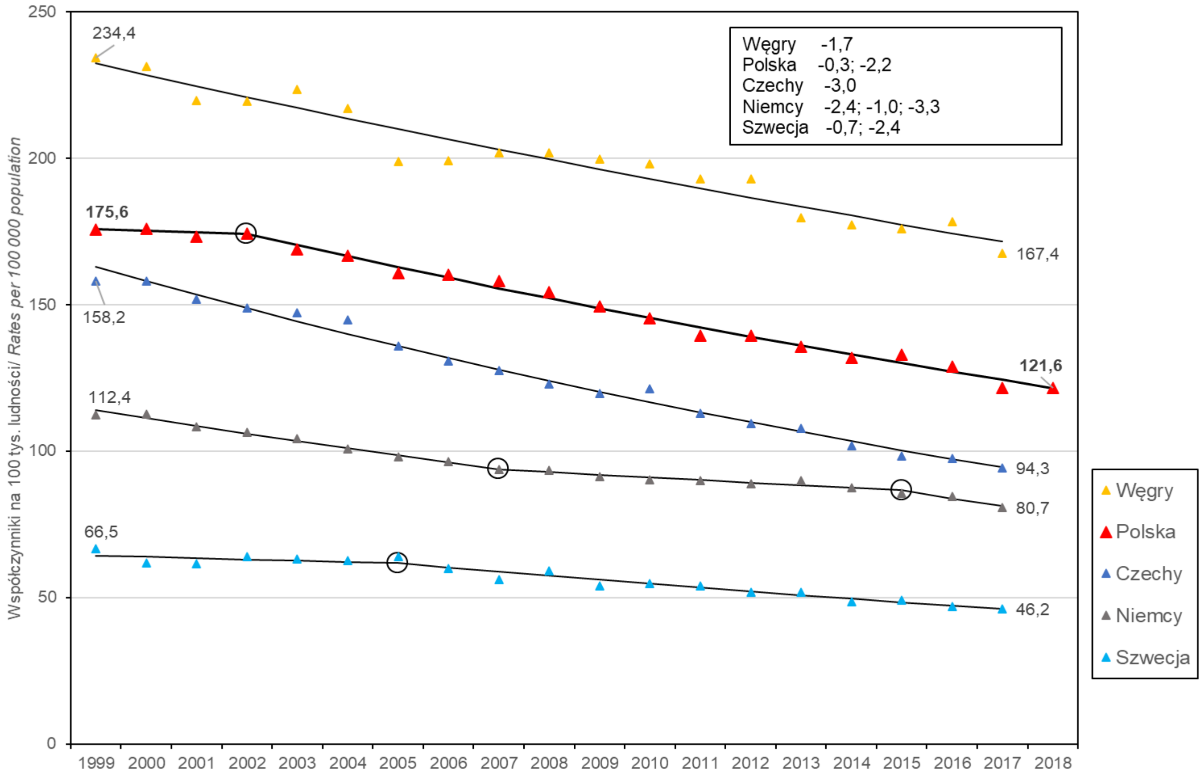


Fig. 2.84a. Age-standardised mortality rates of men below the age of 75 from preventable cancer in Poland, the Czech Republic, Germany, Sweden and Hungary – their trends and annual average relative change rates, 1999–2018 (authors' own calculations based on the WHO mortality database and SP data)

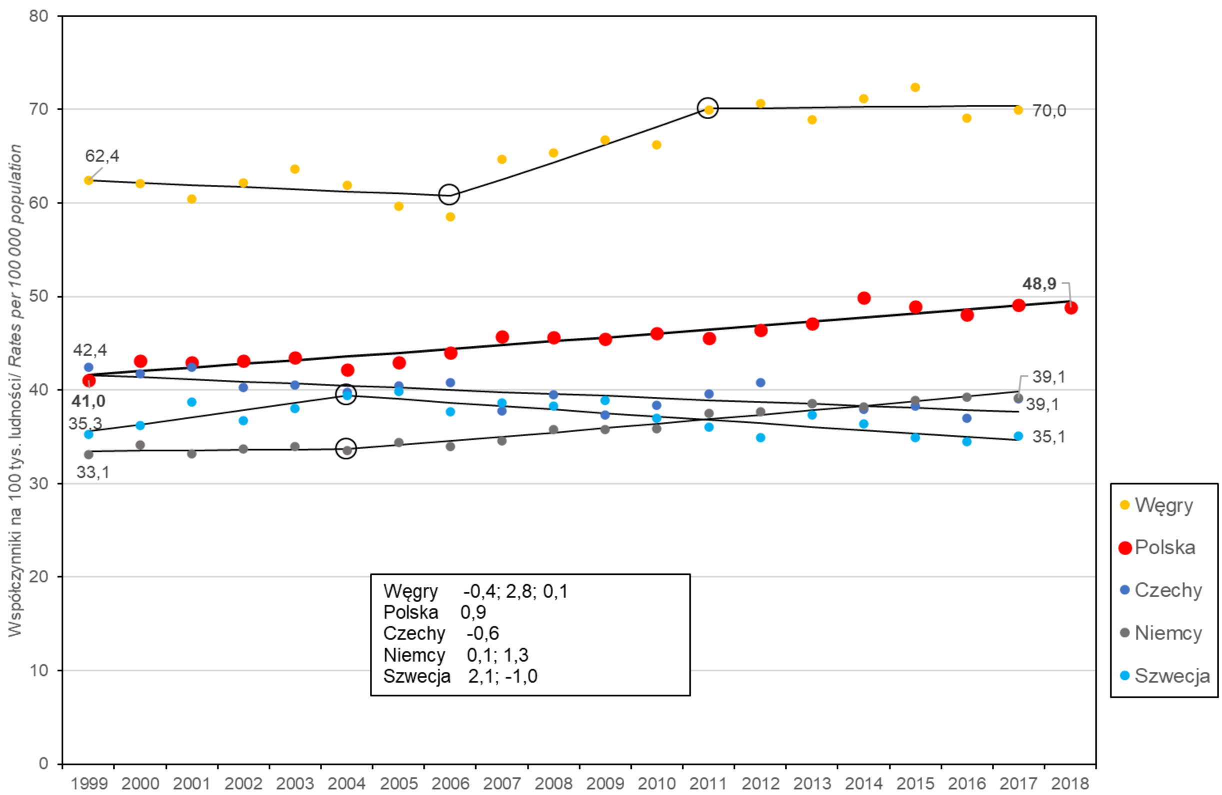


Fig. 2.84b. Age-standardised mortality rates of women below the age of 75 from preventable cancer in Poland, the Czech Republic, Germany, Sweden and Hungary – their trends and annual average relative change rates, 1999–2018 (authors' own calculations based on the WHO mortality database and SP data)

In the case of deaths due to amenable neoplastic diseases among men, in the analysed countries there is a downward trend of the death rates, without a slowdown in recent years. Attention should be drawn to the fast-paced decrease in the Czech Republic, where the mortality rate is currently slightly lower than in Poland, while in early 2000s it was approx. 60% higher (Fig. 2.85a). Moreover, the downward trend in Poland is slower than in Germany and Sweden, where the mortality rate is lower, which causes an increase in the excess mortality of Polish men as compared to the inhabitants of these countries. The mortality rate due to amenable neoplastic diseases among Polish women is higher than in the Czech Republic, Germany and Sweden, and as the decrease is slower in Poland, the excess mortality of Polish women in comparison to the inhabitants of these countries is growing (Fig. 2.85b).

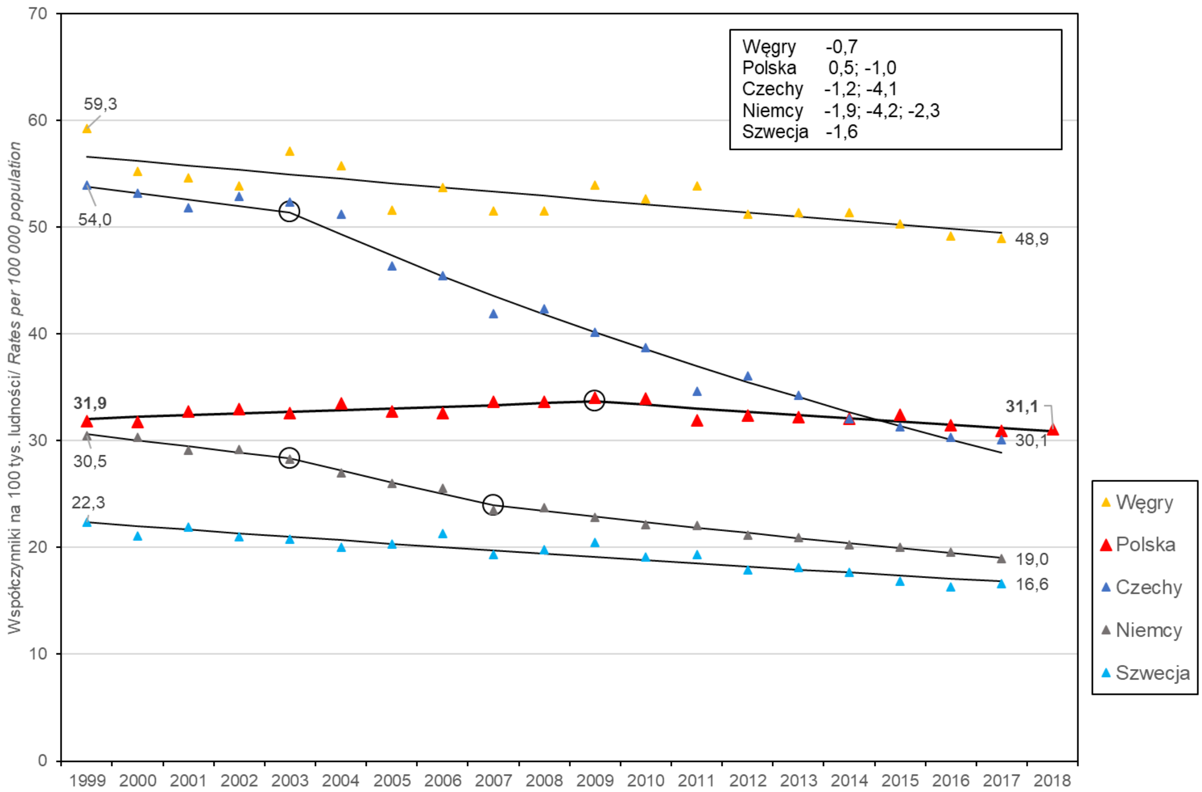


Fig. 2.85a. Age-standardised mortality rates of men below the age of 75 from amenable cancer in Poland, the Czech Republic, Germany, Sweden and Hungary – their trends and annual average relative change rates, 1999–2018 (authors' own calculations based on the WHO mortality database and SP data)

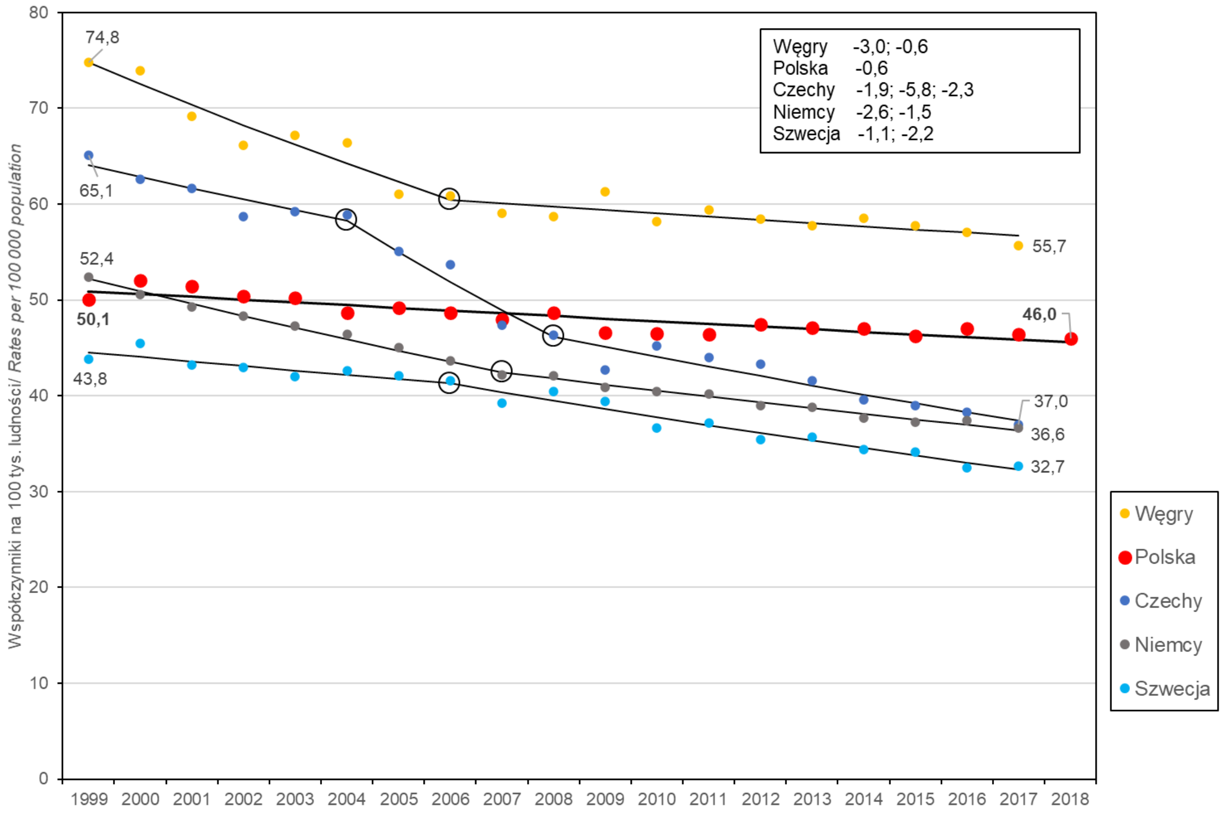


Fig. 2.85b. Age-standardised mortality rates of women below the age of 75 from amenable cancer in Poland, the Czech Republic, Germany, Sweden and Hungary – their trends and annual average relative change rates, 1999–2018 (authors' own calculations based on the WHO mortality database and SP data)

Finally, there is a need to consider mortality due to preventable alcohol-related health problems, which are also included in the afore-mentioned OECD and Eurostat list. The mortality of men in Poland for these causes was characterised by a pronounced increase in the rates in 2014-2018 and a higher level than in the Czech Republic, Germany and Sweden, with an almost four-fold surplus as compared to Sweden (Fig. 2.86). Taking into consideration the fact that the included causes of death are almost entirely a result of alcohol consumption, and also that the list does not include the causes which may be related to alcohol consumption to a varying extent, but are unknown in the specific cases of deaths, the problem is much broader and requires urgent measures to be taken.

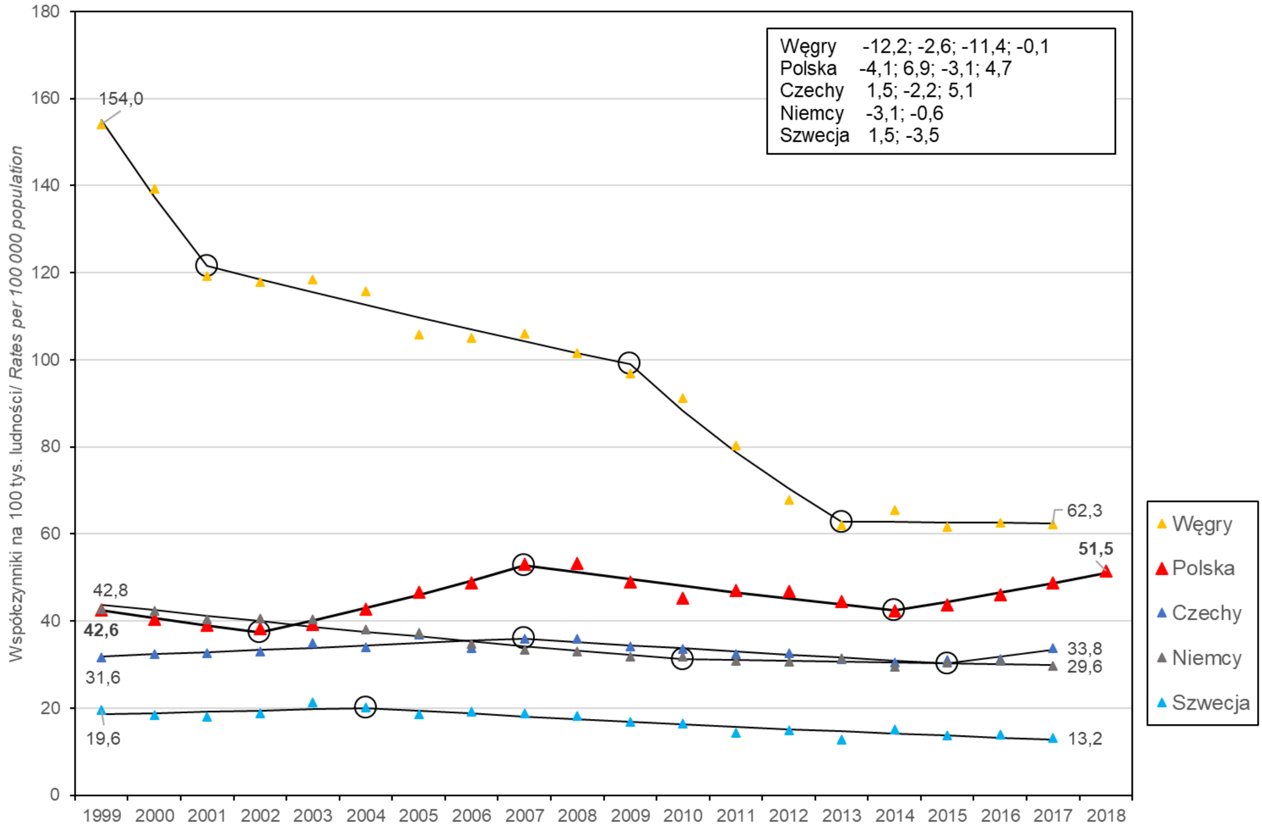


Fig. 2.86. Age-standardised mortality rates of men below the age of 75 from preventable alcohol-related causes of death in Poland, the Czech Republic, Germany, Sweden and Hungary – their trends and annual average relative change rates, 1999–2018 (authors' own calculations based on the WHO mortality database and SP data)

SUMMARY:

1. The analysis of data on the life expectancy and mortality of the inhabitants of Poland shows that the improvement in the Polish population's health condition has decelerated in recent years. Due to the health indicators in Poland being continuously inferior in comparison to those for the inhabitants of most European Union countries, this should be considered alarming.
2. In 2019 the life expectancy of men was 74.1 years, and that of women was 7.7 years longer, amounting to 81.8 years. The life expectancy of women in 2016-2019 presented a slow downward trend. The difference in the life expectancy between men and women, resulting from the excess mortality of men in comparison to women, has decreased in recent years. In 2018 men in Poland could expect to live 60.5 healthy (i.e. without disability) life years (corresponding to 82% of their overall life expectancy), which was less than 2 years before, and the corresponding value for women was 64.3 years (79%). The difference in the healthy

life years of women and men in Poland, amounting to 3.8 years, is currently the highest in the EU.

3. The life expectancy of Polish men is much shorter than the average for the European Union – according to Eurostat data, in 2018 it was 4.6 years shorter, while in the case of women the difference was much lower and amounted to 1.9 years. In the last three years no improvement has been observed in this area.
4. Life expectancy is highly influenced by social factors – in 2017 men aged 30 with higher education could expect to live approx. 7.4 years longer than men with secondary education (including basic vocational education), and as many as approx. 11.0 years longer than men with at most lower-secondary education. These unfavourable differences grew in 2017 in comparison to 2014-2016, which was caused by an increase in the life expectancy of men with higher education and a reduction among persons belonging to lower education groups. In the case of women, differences related to the educational level are much less pronounced than among men, but they also increased in 2017. A much greater difference in the life expectancy of men as compared to women with a lower educational level than in the case of people with higher education points to the significant role of factors associated with the socio-economic status in the excess mortality of men as compared to women.
5. The smallest towns with a population below 5,000 are still the least favourable living environments in Poland, with the lowest life expectancy of their inhabitants. On average, individuals living in the largest cities have the longest life expectancy, except for Łódź whose inhabitants live even shorter than those of small towns. It is worth emphasising that the differences in the life expectancy associated with the place of residence category have not decreased in recent years.
6. The fact of living in urban or rural areas contributes to differences in the life expectancy of the Polish population to a limited extent. Men living in urban areas live generally longer than rural inhabitants (in 2019 1.1 year longer) while the life expectancy of the female inhabitants of urban and rural areas is almost identical.
7. The increase in life expectancy in poviats in the period from 2002-2004 to 2017-2019 was not associated with the deprivation level among men or women, which should be considered a positive phenomenon.
8. Infant mortality in Poland is still higher than the EU average; in 2018 and 2019 as many as 38 children per each 100,000 live births died before reaching the age of 1 year, while in the EU the average number was 35 (2018).

9. The infant mortality rate differs considerably between voivodships. In the entire four-year period of 2016-2019 it was below the national average only in the Mazowieckie and Małopolskie Voivodships. In the Kujawsko-pomorskie, Śląskie, Warmińsko-mazurskie and Zachodniopomorskie Voivodships, the infant mortality rate in the reference years was continuously higher than the national average.
10. Mortality of the inhabitants of Poland in the last ten years has been characterised by a significant slowdown or even deceleration of the decrease in the death rates in the second half of the reference period, for all age groups, both men and women, which is undoubtedly an alarming phenomenon as it refers to the entire population.
11. For years the greatest threat to the lives of Poles has been posed by **cardiovascular diseases (**CVDs), which in 2018 were responsible for 40.5% of all deaths. The force of mortality due to CVDs and their share in the total number of deaths have gradually decreased after 2015. These diseases are the major cause of death of men aged 45-54 and those aged 70 or more, while among women – at the age above 74. Definitely the most common cause of death in the CVDs category is formed by **heart diseases (**59.0% of all deaths attributable to CVDs). Heart diseases are also the most common detailed cause of death in the Polish population. Deaths due to heart diseases are much more frequent in Poland than in more affluent EU countries.
12. **Malignant neoplasms** are the second most common cause of death in Poland (24.5% of all deaths in 2018). In 2016-2018 the age-standardised mortality rate due to malignant neoplasms among women did not show a downward tendency, but their share in all causes of death, among both men and women, dropped slightly. Neoplasms in general constitute a greater health problem for men than for women, and the excess mortality for this cause among men, as compared to women, is higher than in the case of cardiovascular diseases, but they constitute the greatest threat to the life of women aged 30-74 years. In the last 15 years the decrease in the mortality rate due to neoplasms was observed in all voivodships, but its varying course is worth pointing out. Undoubtedly, it would be very beneficial for the health policy to establish the causes of these varying courses of changes in mortality in individual voivodships. The greatest threat to the lives of men is cancer of the trachea, bronchus or lung (greater than for EU inhabitants in total). The mortality rates regarding this cause among men are decreasing, while among women in total they are continuously growing. It should be emphasised, however, that among women aged 25-64 in the last four years a downward trend was observed. The mortality rate for women in total due to breast

cancer has been increasing since 2010 (in 2018/2017 in the Wielkopolskie and Dolnośląskie Voivodships, the mortality rate was over 25% higher than five years before). In general, the situation in Poland with regard to mortality due to malignant neoplasms is unfavourable in comparison to the average situation in the EU, but to a lesser extent than in the case of circulatory diseases.

13. **External causes of death** since 2015 have been the fifth group of mortality causes in Poland (4.9% of all deaths in 2018). They are the fourth cause of death for people aged 5-44; in 2018 they were responsible for 41% of all deaths in this age group. These causes are a greater threat to the lives of men residing in rural areas compared to urban areas. The force of mortality for the external causes of death in total has exhibited a long-term downward trend, which has recently decelerated. Among the external causes, the most important in the last two years were falls, followed by suicides, with traffic accidents ranking third. The order of these causes points to the need to rearrange priorities in the prevention of external death causes.
14. In 2018 in Poland the third most important group of causes of death was formed by **ill-defined and unknown causes**, i.e. those where the cause of death included a description of symptoms, referred to abnormal laboratory test results, was ill-defined or unknown (ICD-10 R00-R99). This was the case of every tenth death. Attention should be drawn to the substantial diversity of the frequency of deaths for these causes between voivodships. Particularly unfavourable results are reported in the Lubelskie and Lubuskie Voivodships, and a dramatic worsening was observed in the Mazowieckie Voivodship. The problem is one of the major arguments for the insufficient quality of the system of determining the causes of death in Poland, which urgently requires fundamental improvement.
15. Poland is among the developed countries where premature deaths of the population are a major problem. The burden of premature mortality of men is 2.5 times higher than that of women. In the case of women, the dominant cause of potential years of life lost (PYLL75) is cancer, which is responsible for almost 40% of PYLLs. Cardiovascular diseases account for half as many PYLLs. Neoplasms which most frequently cause the premature mortality of women include trachea, bronchus and lung cancer and breast cancer. In the case of men, the greatest burden of premature mortality is related to the following three groups of causes: cardiovascular diseases (22.3%), malignant neoplasms (21.3%) and external causes (18.6%). Among CVDs, the dominant cause of premature deaths are heart diseases, which are responsible for over four times more potential years of life lost than cerebrovascular diseases. In 2014-2018 the burden of premature mortality decreased, to the greatest extent,

for diabetes, diseases of the respiratory system, including in particular pneumonia, chronic liver diseases and overall causes directly related to alcohol consumption.

16. An important element of premature mortality is mortality from avoidable causes which could be effectively treated or prevented. In 2015-2018 the decline in the death rates for these causes decelerated, both in the case of preventable and amenable causes, which may be a sign of the intensification of healthcare system issues. Mortality for preventable causes is much higher (85%) than mortality for amenable causes, which exposes the weakness of the applied health policy. Preventable mortality due to neoplastic diseases is currently much higher than that due to cardiovascular diseases, both among men and women, which points to an urgent need to intensify preventive measures focusing on neoplasms. The National Oncological Strategy under implementation should direct more attention to this area. Preventable mortality due to neoplastic diseases is currently much higher than that due to cardiovascular diseases, both among men and women, which points to an urgent need to intensify preventive measures focusing on neoplasms. Mortality due to preventable alcohol-related diseases is on the rise. The mortality of men due to amenable CVDs is much higher than mortality from neoplastic diseases, whereas the opposite applies to women. Differences between voivodships in the mortality rates for preventable and amenable causes points to the existing high potential for improving the health of the Polish population through public health and clinical medicine.

3. HOSPITAL MORBIDITY

Paweł Goryński, Wojciech Seroka, Paweł Radomski, Bożena Moskalewicz, Bogdan Wojtyniak

Information on causes and frequency of hospitalisation is, regardless of its administrative relevance, one of the more important aspects of analysing and assessing a population's health. Such data has certain limitations, as hospitalisation is determined on the severity of disease, the possibility of diagnosing and ensuring proper out-of-hospital treatment, selection of admissions related to availability of hospital beds, and socio-economic factors. In contrast, an undeniable advantage of the information on hospitalisation is the precision and accuracy of hospital diagnosis, which is superior to the diagnostic correctness in other routine systems of assessing a population's health.

The data concerning hospitalisation of the population of Poland are collected as part of the Nationwide General Hospital Morbidity Study carried out according to the programme of statistical surveys for the purpose of official statistics, and the data are processed and analysed by the National Institute of Public Health – National Institute of Hygiene. The basic document in this system is statistical form Mz/Szp-11. Until 1999, the study had covered a random sample of 10% of all patients who were treated, discharged from, or died in any public or non-public hospital, excluding patients treated in psychiatric hospitals or wards, who were covered by a separate study. Since 2000, the hospitalisation morbidity study has been conducted in a comprehensive form and has covered all patients treated in hospitals. This modification is particularly important from the point of view of the monitoring of population health.

In the year 2018, the information on hospitalisation of the population of Poland encompassed 8,625,568 cases, including childbirths. There were no data from 4.1% of hospitals which should have sent the data according to the Statistical Survey Program of Official Statistics (PBSSP).

The hospitalised cases also include patients who were hospitalised on multiple occasions. NIPH-NIH has estimated that this applies to 10% of all patients admitted to hospitals.

The data on hospitalisation in other European Union Member States are retrieved from the OECD[28] and EUROSTAT[29] databases to which the data from Poland are transferred by NIPH-NIH.

3.1. Hospitalisation by cause

Table 3.1 shows the crude and standardised rates of hospitalisation in Poland for 2018. As noted above, in general, 8,625,568 persons were hospitalised in Poland (some of them on multiple occasions), therefore, the rate of hospitalisation is 20,931 persons per 100,000 population. The total number of hospitalised persons included 3,833,653 men and 4,791,915 women, which means there were over 20% more women than men.

Circulatory system diseases (13% of hospitalised patients), all types of neoplasms or injuries and poisoning (10.2% and 8.7%, respectively), and diseases of the genitourinary, digestive or respiratory systems (7.4%, 7.2%, and 6.3%, respectively) were the most common causes for hospitalisation. Diseases of the musculoskeletal system, ill-defined causes and eye diseases constituted the subsequent three categories of causes for hospitalisation, having the respective prevalence of 5.6%, 4.8%, and 4.4%. A large group of patients (10%) was hospitalised for the so-called "factors influencing health and to contact with health services" (Z00-Z99). These factors include medical examinations and observations, but nearly half of this group are infants (code ICD-10 - Z38). It should be noted that the structure of causes of hospitalisation was only slightly changed as compared to the data presented in the previous report (data for 2016).

The comparison of the standardised rates of hospitalisation among men and women (Table 3.1, Fig. 3.1) shows that, in total, women were 5.0% less frequently hospitalised than men[30]. As noted above, the comparison of the absolute number of men and women staying in hospitals shows that women were 20% more frequently than men admitted to general hospitals all over the country, but this is mostly due to hospitalisation for pregnancy, childbirth and puerperium. Figure 3.1 shows that men were more frequently than women admitted to hospitals for various causes[31]. The largest difference, over twofold, relates to myocardial infarction, ischaemic heart disease and atherosclerosis. More than one and a half times difference was

[28] https://stats.oecd.org/
[29] https://ec.europa.eu/eurostat/data/database
[30] Standardised rates.
[31] For the comparable age structure (standardised rates).

found for burns and frostbites, liver diseases, renal failure, injuries and the entire spectrum of diseases of the circulatory system. Men were less frequently than women hospitalised for diseases of the nervous system (women are 5% more frequently hospitalised), hypertensive disease, endocrine disorders, and genitourinary system diseases (women are 48% more frequently hospitalised). The ICD-10 codes of the group "symptoms, signs and abnormal clinical and laboratory findings" (R00-R98) are more often used for women than for men (by 8%).

Tabela. 3.1. Współczynniki rzeczywiste i standaryzowane hospitalizacji wg. płci i przyczyn w Polsce w 2018 r., (na 100 tys. ludności, dane NIZP-PZH)

Table. 3.1. Crude and standardised hospitalization rates in Poland in 2018 by sex and cause (per 100,000 population, NIPH-NIH data)

Rozpoznania/*Diagnoses*	Rzeczywiste/*Crude*			Standaryzowane/*Standardised*		
	Ogółem/ *Total*	Mężczyźni/ *Males*	Kobiety/ *Females*	Ogółem/ *Total*	Mężczyźni/ *Males*	Kobiety/ *Females*
Wszystkie rozpoznania/ All diagnoses, A00-Z99	20931.5	19554.2	22222.4	19028.0	18695.4	19671.6
Choroby zakaźne/ Infectious diseases, A00-B99	476.2	511.2	443.4	565.5	602.9	530.5
Nowotwory/ Neoplasms, C00-D48	2233.3	2078.4	2378.3	1792.0	1750.3	1910.4
Nowotwory złośliwe/ Malignant neoplasms, C00-C97	1404.0	1374.3	1431.8	1098.4	1146.5	1100.2
Zaburzenia wydziel., wewn./ Endocrine disorders, E00-E90	656.1	539.2	765.6	634.6	545.3	723.4
Cukrzyca/ Diabetes, E10-E14	187.0	204.1	171.1	156.7	185.1	130.6
Choroby układu nerwowego/ Diseases of the nervous system, G00-H95	1957.4	1739.6	2161.4	1661.2	1615.7	1703.7
Choroby układu krążenia/ Diseases of the circulatory system, I00-I99	2825.8	3093.9	2574.6	2017.7	2571.4	1580.3
Choroba nadciśnieniowa /Hypertensive disease, I10-I15	179.6	151.8	205.7	144.0	137.3	144.9
Choroba niedokrwienna serca/ Ischaemic heart disease, I20-I25	640.4	812.3	479.3	461.7	664.8	298.5
Zawał serca/ Myocardial infarction, I21-I22	193.9	253.4	138.2	138.9	209.0	81.8
Zespół sercowo płucny/ Pulmonary heart disease, I26-I51	1201.1	1286.7	1120.9	826.2	1068.8	639.2
Choroby naczyń mózgowych/ Cerebrovascular diseases, I60-I69	352.0	357.4	347.0	242.4	292.7	202.6

Miażdżyca/ Atherosclerosis, I70	176.5	208.1	146.9	116.3	166.2	77.4
Choroby układu oddechowego/ Diseases of the respiratory system, J00-J99	1372.7	1582.0	1176.6	1457.7	1710.6	1237.1
Zapalenie płuc/ Pneumonia, J12-J18	315.1	363.4	269.9	351.2	416.5	297.3
Przew. ch. dolnych dróg oddech./ Chronic lower respiratory diseases, J40-J47	241.3	255.9	227.6	205.2	237.3	182.5
Choroby układu trawiennego/ Diseases of the digestive system, K00-K93	1575.0	1677.8	1478.6	1411.2	1568.5	1277.1
Choroby wątroby/ Diseases of liver, K70-K77	136.3	168.8	105.9	117.3	150.2	86.8
Chor. układu mocz.-płciowego/ Diseases of the genitourinary system, N00-N99	1620.4	1105.9	2102.6	1464.6	1036.4	1913.6
Niewydolność nerek/ Renal failure, N17-N19	200.2	221.6	180.2	145.8	189.8	112.9
Ciąża, poród, połóg O00-O99 bez O80 i O84/ Pregnancy, childbirth and puerperium, O00-O99 excl. O80 and O84	1118.8	0.0	2167.4	1093.6	0.0	2223.3
Objawy niedokładnie rozpoznane/ Ill-defined symptoms and signs, R00-R99	1042.5	981.6	1099.6	1003.8	972.4	1053.6
Urazy i zatrucia/ Injuries and poisoning, S00-T14	1878.3	2260.8	1519.8	1894.9	2316.8	1452.3
Urazy/ Injuries, S00-T14	1502.7	1806.6	1217.9	1507.3	1853.1	1142.7
Oparzenia, odmrożenia/ Burns, frostbites, T20-T35	32.2	42.9	22.2	37.8	48.0	27.6
Zatrucia/ Poisoning, T36-T65	92.9	110.1	76.7	103.4	116.3	91.1

Dane: Zakład Centrum Monitorowania i Analiz Stanu Zdrowia Ludności, Narodowego Instytutu Zdrowia Publicznego - Państwowego Zakładu Higieny (NIZP-PZH)/Data: NIPH-NIH

Tables 3.2 and 3.3 show the standardised and crude rates of hospitalisation among inhabitants of urban and rural areas. After the differences concerning the heterogenous age structure are eliminated, men living in urban areas were nearly 15% more frequently hospitalised than inhabitants of rural areas.

Tabela. 3.2. Współczynniki rzeczywiste i standaryzowane hospitalizacji w Polsce wg płci i przyczyn w 2018 r. - miasto (na 100 tys. ludności, dane NIZP-PZH)

Table. 3.2. Crude and standardised hospitalization rates in Poland in 2018 by sex and cause – urban population (per 100,000 population, NIHP-NIH data)

Rozpoznania/*Diagnoses*	Rzeczywiste/*Crude*			Standaryzowane/*Standardised*		
	Ogółem/ *Total*	Mężczyźni/ *Males*	Kobiety/ *Females*	Ogółem/ *Total*	Mężczyźni/ *Males*	Kobiety/ *Females*
Wszystkie rozpoznania/ All diagnoses, A00-Z99	22060.8	20658.8	23324	19604.6	19256.5	20246.1
Choroby zakaźne/ Infectious diseases, A00-B99	481.5	527.3	440.2	572.1	614.8	533.3
Nowotwory/ Neoplasms, C00-D48	2485.1	2298.8	2653.1	1892.6	1833.3	2024.8
Nowotwory złośliwe/ Malignant neoplasms, C00-C97	1568.7	1515.6	1616.5	1156.3	1192.8	1169.3
Zaburzenia wydziel., wewn./ Endocrine disorders, E00-E90	701.2	580.4	810.1	684.3	587.8	778.9
Cukrzyca/Diabetes, E10-E14	192	215.5	170.8	157.7	191.3	128.8
Choroby układu nerwowego/ Diseases of the nervous system, G00-H95	2179.1	1938.5	2396	1776.8	1738.9	1811.3
Choroby układu krążenia/ Diseases of the circulatory system, I00-I99	2940.9	3263.6	2650.2	1984.3	2565.3	1546.4
Choroba nadciśnieniowa/ Hypertensive disease, I10-I15	186.4	155.9	213.9	143.1	137.9	142.4
Choroba niedokrwienna serca/ Ischaemic heart disease, I20-I25	685.7	883	507.8	461.2	681.5	293.7
Zawał serca/ Myocardial infarction, I21-I22	206.7	274.3	145.8	139.3	214.8	80.9
Zespół sercowo płucny/ Pulmonary heart disease, I26-I51	1223.5	1334.4	1123.5	796.4	1044.9	613.4
Choroby naczyń mózgowych/ Cerebrovascular diseases, I60-I69	365	368.9	361.5	236.8	283.8	201.8
Miażdżyca/Atherosclerosis, I70	187.7	219.5	159	115.5	163.5	79.6
Choroby układu oddechowego/ Disease of the respiratory system, J00-J99	1401.2	1610.8	1212.4	1486.4	1726.6	1275.9
Zapalenie płuc/ Pneumonia, J12-J18	314.6	364.9	269.3	349.6	411.6	298.6

Przew. ch. dolnych dróg oddech./ Chronic lower respiratory diseases, J40-J47	243.2	245.1	241.4	202.5	222.7	187.6
Choroby układu trawiennego/ Diseases of the digestive system, K00-K93	1647.8	1761	1545.7	1441.5	1608.8	1304.4
Choroby wątroby/ Diseases of liver, K70-K77	147.7	179.6	119	122.5	155.7	93.5
Chor. układu mocz.-płciowego/ Diseases of the genitourinary system, N00-N99	1688.8	1181.8	2145.7	1495	1077.5	1915.8
Niewydolność nerek/ Renal failure, N17-N19	208.4	234.4	185	144.1	190.6	110.1
Ciąża, poród, połóg O00-O99 bez O80 i O84/ Pregnancy, childbirth and puerperium, O00-O99 excl. O80 and O84	1098.5	-	2088.3	1094.9	-	2200.6
Objawy niedokładnie rozpoznane/ Ill-defined symptoms and signs, R00-R99	1091.8	1037	1141.2	1047.4	1014.7	1097.8
Urazy i zatrucia/ Injuries and poisoning, S00-T14	1897	2244.8	1583.5	1943.2	2340.8	1533.5
Urazy/ Injuries, S00-T14	1509.3	1785.8	1260.3	1537.7	1866.4	1196.9
Oparzenia, odmrożenia/ Burns, frostbites, T20-T35	30.3	40.1	21.4	36.4	45.7	27.4
Zatrucia/ Poisoning, T36-T65	106.3	127.8	87	122.4	137	109.1

Dane: Zakład Monitorowania i Analiz Stanu Zdrowia Ludności, Narodowego Instytutu Zdrowia Publicznego-Państwowego Zakładu Higieny (NIZP-PZH)/Data: NIPH-NIH

Similarly, women living in urban areas were by 15% more frequently treated in hospitals than women living in rural areas. On the one hand, this may result from the fact that inhabitants of rural areas have a limited access to hospital treatment, and on the other, from different epidemiological situation. At the same time, it should be noted that the difference concerning place of residence (urban vs rural areas), recorded in 2010, 2014 and 2016, was smaller than now, and this may prove that availability of hospitals for inhabitants of rural areas decreased.

Tabela. 3.3. Współczynniki rzeczywiste i standaryzowane hospitalizacji w Polsce wg płci i przyczyn w 2018 r. - wieś (na 100 tys. ludności, dane NIZP-PZH)

Table 3.3. Crude and standardised hospitalization rates in Poland in 2018 by sex and cause – rural population (per 100,000 population, NIHP-NIH data)

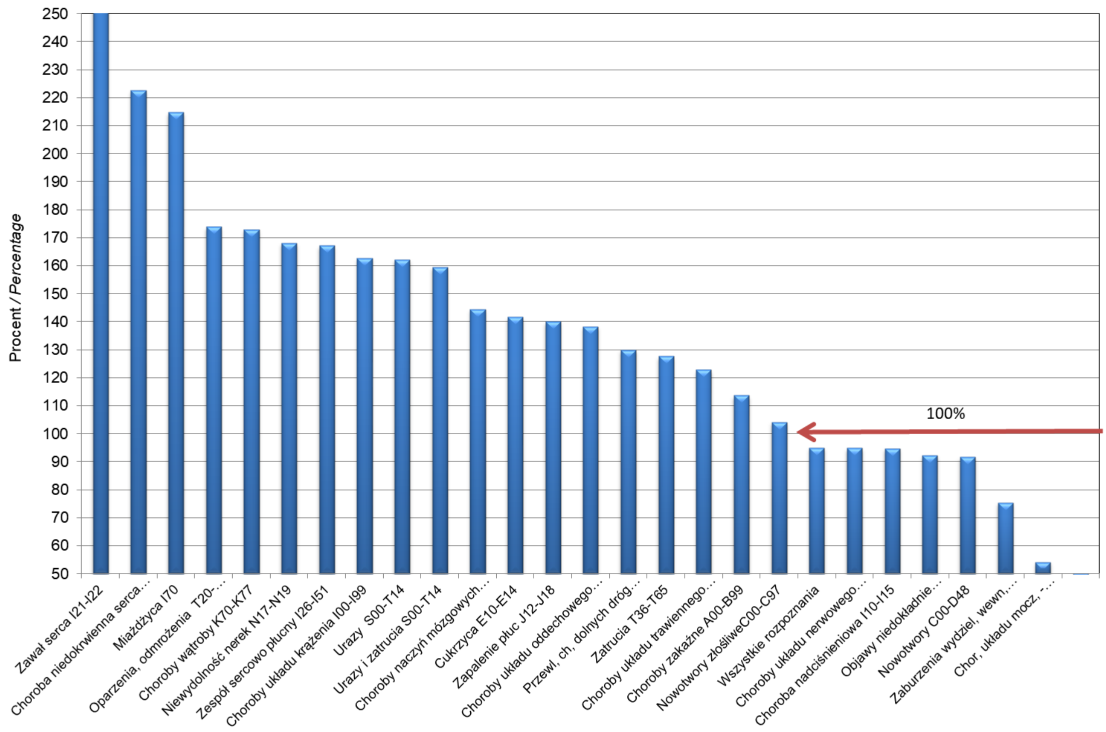
Rozpoznania/*Diagnoses*	Rzeczywiste/*Crude*			Standaryzowane/*Standardised*		
	Ogółem/ *Total*	Mężczyźni/ *Males*	Kobiety/ *Females*	Ogółem/ *Total*	Mężczyźni/ *Males*	Kobiety/ *Females*
Wszystkie rozpoznania/ All diagnoses, A00-Z99	19229	17970.8	20479.9	18186.9	17890.1	18804
Choroby zakaźne/ Infectious diseases, A00-B99	468.3	488.1	448.5	556.8	586.6	527.8
Nowotwory/Neoplasms, C00-D48	1853.5	1762.6	1943.8	1622.1	1611.6	1708.3
Nowotwory złośliwe/ Malignant neoplasms, C00-C97	1155.8	1171.9	1139.8	997.9	1066.6	975.3
Zaburzenia wydziel., wewn./ Endocrine disorders, E00-E90	588	480.1	695.2	569.7	489.2	651.5
Cukrzyca/ Diabetes, E10-E14	179.6	187.7	171.5	157.5	177.4	136.8
Choroby układu nerwowego/ Diseases of the nervous system, G00-H95	1623	1454.6	1790.4	1474.9	1422.4	1526.8
Choroby układu krążenia/ Diseases of the circulatory system, I00-I99	2652.2	2850.6	2454.9	2082.7	2587.7	1649.4
Choroba nadciśnieniowa/ Hypertensive disease, I10-I15	169.4	146	192.8	146.4	137.3	150.5
Choroba niedokrwienna serca/ Ischaemic heart disease, I20-I25	572.2	710.9	434.2	462.6	636.3	308.1
Zawał serca/Myocardial infarction, I21-I22	174.6	223.4	126.1	138.5	200.4	83.6
Zespół sercowo płucny/ Pulmonary heart disease, I26-I51	1167.3	1218.3	1116.6	882.7	1112.2	691.5
Choroby naczyń mózgowych/ Cerebrovascular diseases, I60-I69	332.4	340.8	324.1	252.7	307.7	204.9
Miażdżyca/Atherosclerosis, I70	159.7	191.8	127.7	117.6	170.8	72.7
Choroby układu oddechowego/ Disease of the respiratory system, J00-J99	1329.7	1540.7	1120	1423.8	1700.7	1181.9
Zapalenie płuc/ Pneumonia, J12-J18	315.9	361.4	270.7	355.2	426	296.2
Przew. ch. dolnych dróg oddech./ Chronic lower respiratory diseases, J40-J47	238.4	271.4	205.7	212.6	265.2	175.2

Choroby układu trawiennego/ Diseases of the digestive system, K00-K93	1465.2	1558.6	1372.4	1367	1510.5	1237.4
Choroby wątroby/ Diseases of liver, K70-K77	119.1	153.2	85.1	108.7	141.6	75.3
Chor. układu mocz.-płciowego/ Diseases of the genitourinary system, N00-N99	1517.3	997.1	2034.5	1420.2	977.1	1912.9
Niewydolność nerek/ Renal failure, N17-N19	187.9	203.2	172.6	148.9	188.8	118
Ciąża, poród, połóg O00-O99 bez O80 i O84/ Pregnancy, childbirth and puerperium, O00-O99 excl. O80 and O84	1149.5	0	2292.4	1087	0	2247.5
Objawy niedokładnie rozpoznane/ Ill-defined symptoms and signs, R00-R99	968.2	902.3	1033.7	944.6	915.1	992.9
Urazy i zatrucia/ Injuries and poisoning, S00-T14	1850.2	2283.9	1419	1839.3	2294.9	1345.3
Urazy/ Injuries, S00-T14	1492.7	1836.5	1150.9	1474.2	1843.6	1071.8
Oparzenia, odmrożenia/ Burns, frostbites, T20-T35	35.1	46.9	23.4	39.9	51.4	28.2
Zatrucia/ Poisoning, T36-T65	72.6	84.9	60.5	78.8	89.5	67.8

Dane: Zakład Monitorowania i Analiz Stanu Zdrowia Ludności, Narodowego Instytutu Zdrowia Publicznego-Państwowego Zakładu Higieny (NIZP-PZH)/Data: NIPH-NIH

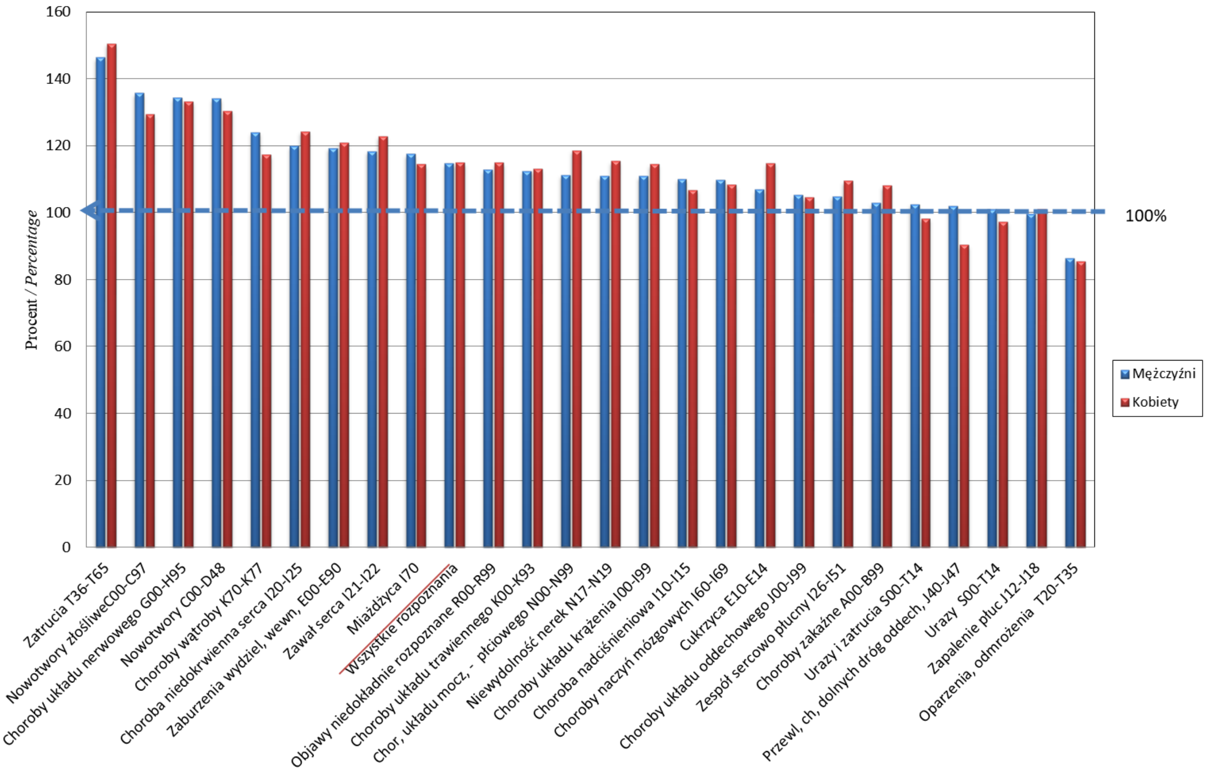
Fig. 3.2 is a detailed comparison of the rates of hospitalisation corresponding to men and women from urban and rural areas, broken down by groups of diagnoses. As noted above, in general, the rates of hospitalisation among men and women from urban areas were higher (by 15%). The particularly high difference corresponds to poisoning by drugs and other substances, including alcohol, especially among women (higher by 46% and 50%, respectively, among men and women from urban areas). The significant difference in the frequency of hospitalisation among inhabitants of urban and rural areas was also recorded in relation to neoplasms (35% and 29% among men and women) and diseases of the nervous system (34% and 33%). Smaller differences correspond to diseases of liver (by 24% among men and by 17% among women).

Inhabitants of rural areas, both men and women, are more frequently hospitalised for burns (14%) compared to inhabitants of urban areas. The remaining differences pointing to the more frequent hospitalisation of inhabitants are insignificant and correspond only to women: injuries are 2.8% more frequent, chronic, and lower respiratory diseases are 9.7% more frequent. In general, it can be said that the number of diagnoses for which the rates of hospitalisation of inhabitants from rural areas were higher than the rates of hospitalisation of inhabitants from urban areas has been decreasing year by year (data from the previously published reports on the health of the population of Poland). This could suggest that the health of inhabitants of rural areas has been improving, or it may result from the decreased availability of hospital treatment for inhabitants of rural areas.



Ryc. 3.1. Standaryzowane współczynniki hospitalizacji mężczyzn w porównaniu do kobiet w 2018 r, kobiety = 100 (dane NIZP-PZH)

Fig. *3.1. Standardised hospitalization rates for males compared to females, female = 100, Poland 2017 (NIPH-NIH data)*



Ryc. 3.2. Standaryzowane współczynniki hospitalizacji mężczyzn i kobiet z miast w porównaniu do współczynnika dla mieszkańców wsi. Polska 2018 r, wieś =100 (dane NIZP-PZH)

Fig. *3.2. Standardised hospitalization rates for men and women living in urban areas compared to those living in rural areas. Poland 2018, rural areas =100 (NIPH - NIH data)*

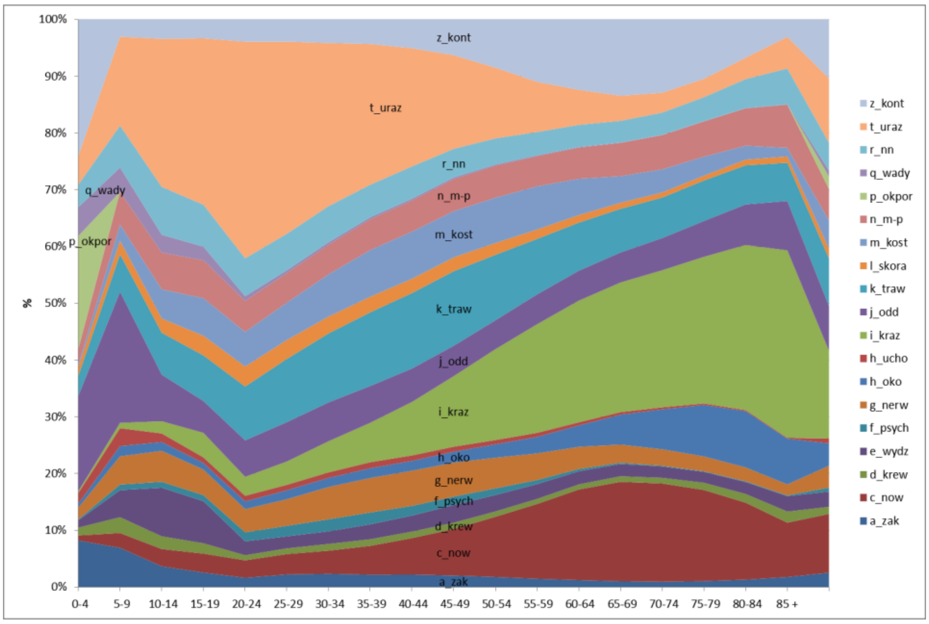
It may be concluded that the greatest differences in hospitalisation of inhabitants from urban and rural areas correspond to poisoning (T35-T65) because far more men and women from urban areas are hospitalised for this cause. The differences in the opposite direction are significantly smaller and include more frequent hospital stays due to chronic lower respiratory diseases and childbirths among women from rural areas.

3.2. Structure of causes of hospitalisation in Poland by age

The causes of hospitalisation recorded in 2018 were analysed across 5-year age groups, separately for men and women, to broaden the information concerning the structure of hospitalisation. As Fig. 3.3 shows, diseases of the respiratory system were the most frequent cause of hospitalisation among boys under 10 years of age.

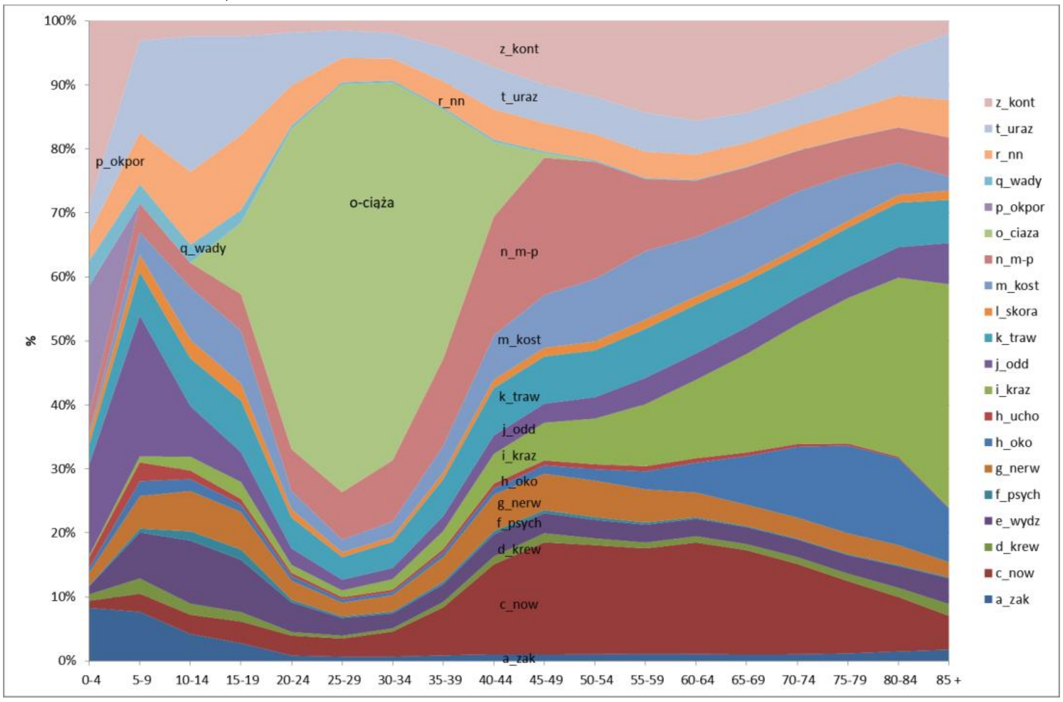
It should be noted that high frequency of hospitalisation among children under 5 years of age, due to factors influencing contact with health services, is dependent on live births coded under this category of causes (ICD-10: Z38). Infectious diseases form a relatively large group of causes of hospitalisation in this age group. It is worth noting that, in quantitative terms and in contrast to any other age group, infectious diseases are the most problematic in the group of the youngest patients. The most prevailing causes of hospitalisation in the group of hospitalised boys over the age of 10 include injuries, poisoning and diseases of the digestive system. This situation is observed among men up to 45 years of age, when diseases of the circulatory system become the prevailing causes of hospitalisation. From the age of 50, apart from diseases of the circulatory system, neoplasms become more frequent cause of hospitalisation and account for most hospitalisations in the group of 65-69-year-olds. However, in terms of hospitalisation frequency, neoplasms still come second to diseases of the circulatory system which are an increasingly common cause of hospitalisation among men all the way up to the oldest age group. The prevalence of diseases of the respiratory system is increasing as the cause of hospitalisation of men in older age groups.

It is important to note the decreasing rate of hospitalisation for neoplasms over the age of 70. The relatively high proportion of eye diseases over the age of 70 corresponds to intraocular lens implantation due to senile cataract.



Ryc. 3.3. Struktura przyczyn hospitalizacji w Polsce w 2018 r. wg wieku leczonych – mężczyźni (dane NIZP-PZH)

Fig. *3.3. Structure of the causes of hospitalization in Poland in 2018 by patient's age* - *males (NIPH-NIH data)*



Ryc. 3.4. Struktura przyczyn hospitalizacji w Polsce w 2018 r. wg wieku leczonych – kobiety (dane NIZP-PZH)

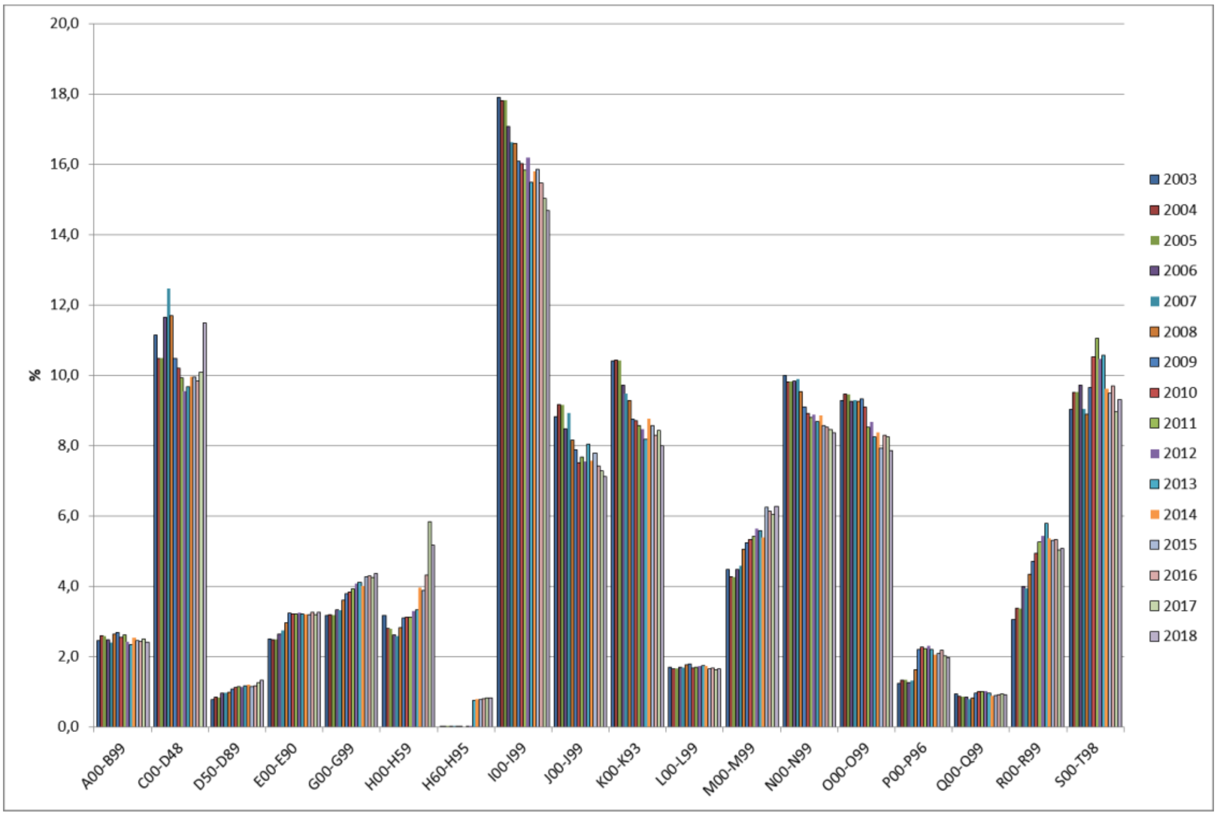
Fig. 3.4. *Structure of the causes of hospitalization in Poland in 2018 by patient's age* - *females (NIPH-NIH data)*

The structure of hospitalisation among women is slightly different (Fig. 3.4). Like in the group of boys from the same age group, diseases of the respiratory system and infectious diseases are the predominant causes of hospitalisation for girls under the age of 10. In contrast to boys, injuries and poisoning are the most common causes of hospitalisation only among girls between the ages of 10 and 14. Events corresponding to pregnancy, childbirth and puerperium are predominant starting from the ages of 15-19 and until the age of 39. Moreover, diseases of the genitourinary system are far more commonly observed among women than men. Starting from the age of 60 up until oldest age groups, diseases of the circulatory system are the predominant cause of hospitalisation among women. The proportion of neoplasms, the more frequent prevalence of which is observed among women at a younger age compared to men, is decreasing gradually but more significantly than among men. Infectious diseases are a significant cause of hospitalisation for both sexes only in the youngest age groups, but in older age groups their share among causes of hospitalisation is higher among men. A significant percentage of other ill-defined symptoms and signs (R00-R99) is observed among both men and women, and especially among children and adolescents.

3.3. Changes in the structure of causes of hospitalisation in the years 2003-2018

The changes in the percentage structure of causes of hospitalisation in the years 2003-2018 are illustrated in Fig. 3.5. As the figure shows, considering their share in all hospital stays, diseases of the circulatory system (I00-I99), neoplasms (C00-D48), injuries and poisoning (S00-T98), diseases of the genitourinary system (N00-N99) and hospital stays corresponding to pregnancy and childbirth (O00-O99) were the predominant.

Considering the changes in the percentage share of individual causes, it may be stated that in the years 2003-2018, the share of the following diseases was constantly decreasing: diseases of the circulatory system (from 18% to 15%), diseases of the genitourinary and digestive systems (from 10% to 8%) and causes corresponding to childbirth (from 9% to 8%). Following an initial decrease, the share of neoplasms among the causes of hospitalisation has been increasing in the recent years. This was particularly noticeable in 2018. The undeniable increase in this proportion corresponds also to diseases of the musculoskeletal and nervous systems. Unfortunately, the share of ill-defined symptoms and signs is increasing, thus limiting our knowledge on hospitalisation. However, there has been some improvement over the last four years. A volatile situation is observed in terms of injuries and poisoning, although there has been some decrease recently. On the other hand, as far as infectious diseases, skin diseases and developmental anomalies are concerned, the situation is stable. The trends concerning these temporal changes in the structure of causes of hospitalisation, as presented here, may constitute the basis for decisions concerning transformations of the system to satisfy the health needs in the domain of hospitalisation and to define the demand for experts in various fields of medicine.



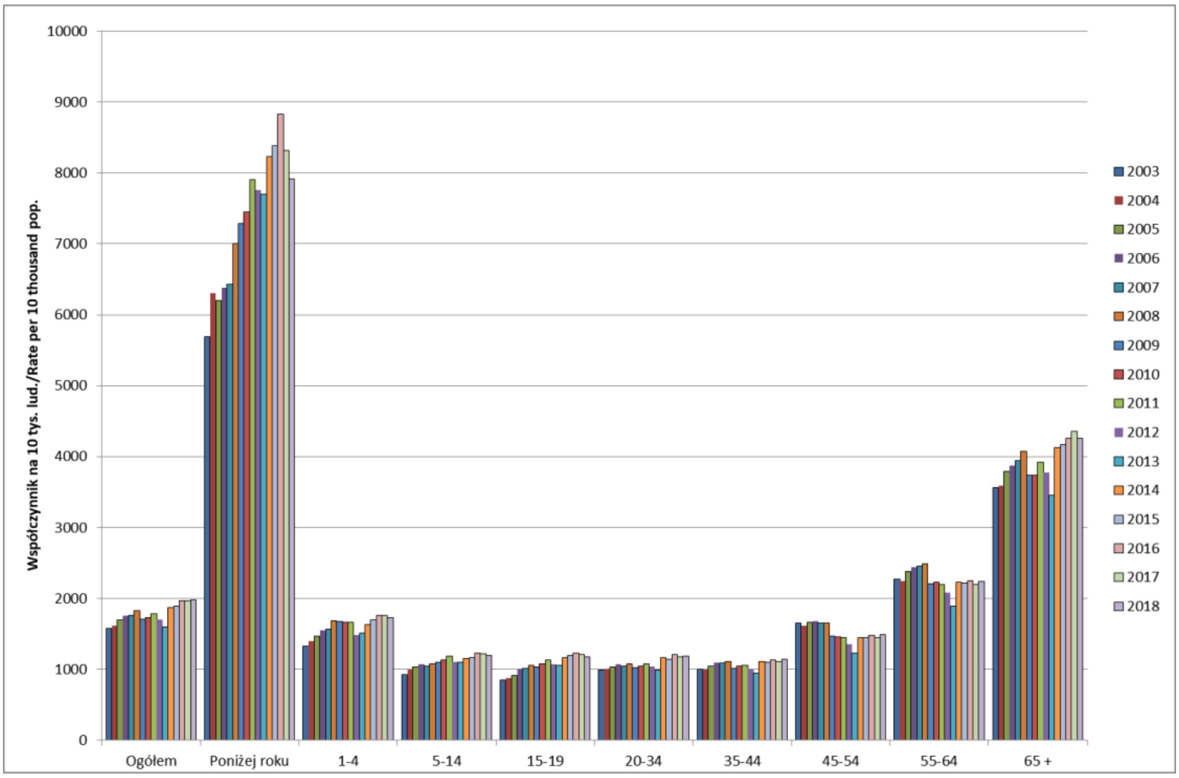
Ryc. 3.5 Struktura procentowa przyczyn hospitalizacji w Polsce w latach 2006-2018 (dane NIZP-PZH)
Fig. 3.5. *Structure of causes of hospitalization in Poland in the years 2006-2018 in percentages (NIPH – NIH data)*

3.4. Changes in hospitalisation in time and by age of treated patients

The changes in the structure of rates of hospitalisation[32] in the years 2006-2018, in total and by age, are illustrated in Fig. 3.6.

As Fig. 3.6 shows, children under a year and adults over the age of 65 were the most frequently hospitalised.

In general, in the years 2003-2018, the rates of hospitalisation increased by 25%, but the increase was not clearly noticeable until 2013. The general, upward trend in the rates of hospitalisations is noticeable nearly in all age groups, except for two subgroups, namely 45-54-year-olds and 55-64-year-olds. However, in recent years, a certain increase in these rates has also been noticeable. A serious drop in the frequency of hospital treatment in Poland occurred in 2014 and was noticeable across all age groups.



Ryc. 3.6. Hospitalizacja w Polsce w latach 2003-2018 ogółem wg wieku (dane NIZP-PZH)
Fig. *3.6. Overall hospitalization in Poland in the years 2003-2018 by age (NIPH – NIH data)*

In recent years, there has been a constant increase in the hospitalisation of infants (except for the year 2014) and stable hospitalisation rates across older age groups.

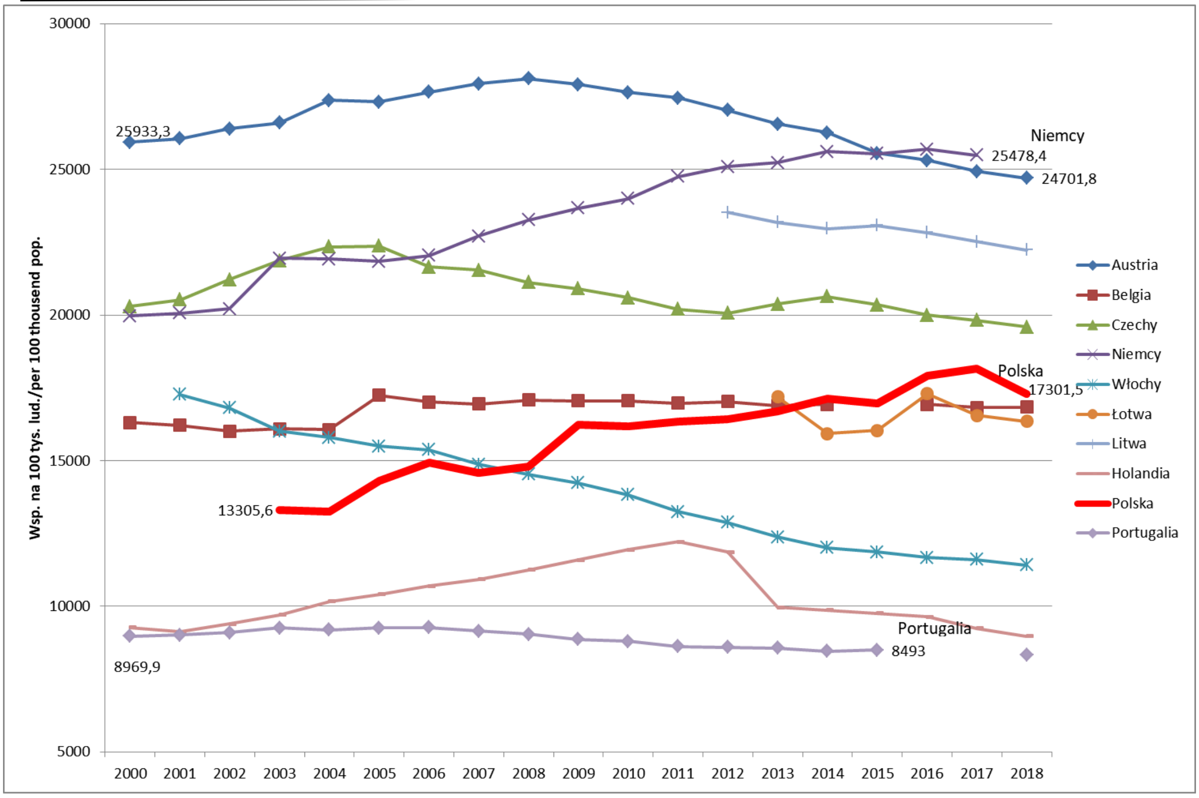
[32] It should be noted that hospitalisation rates by cause, calculated in relation to the total number of patients treated in hospitals in Poland, are discussed in the previous chapter. This chapter discusses the rates of hospitalisation by age group (numbers of people from individual age groups are the denominators).

3.5. International comparisons of hospitalisation

The total frequency of hospital treatment of the inhabitants of Poland in the years 2003–2018 (Fig. 3.7) was gradually increasing and over the entire analysed period (2003-2018) increased by nearly 30%[33].

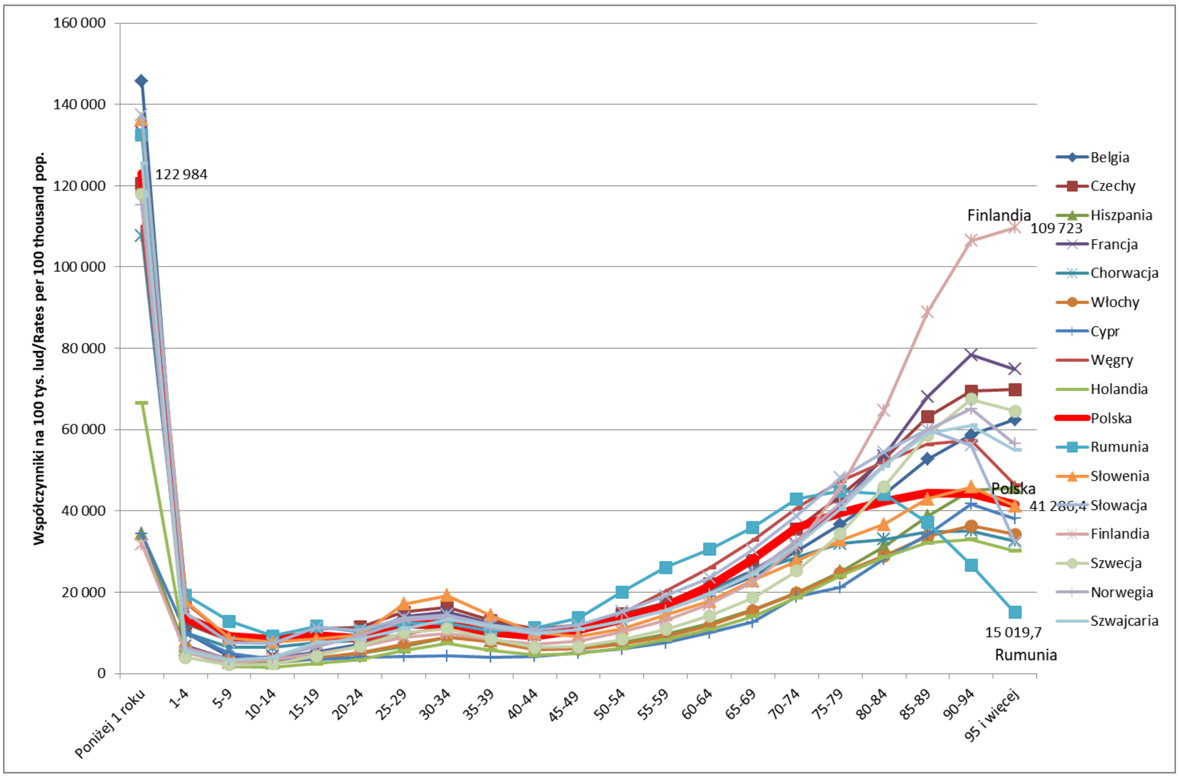
Recent data show that now (the most recent data available are from 2018), we are on the level of the EU average in terms of the frequency of hospitalisation of population. As Fig. 3.7 shows, the difference between extreme hospitalisation rates across EU Member States is more than 200%: the inhabitants of Germany and Austria are the most frequently hospitalised (approx. 2,500 per 10,000 population), while the inhabitants of Portugal are the least frequently hospitalised (849 per 10,000 inhabitants). From among the countries selected for the comparisons, Latvia and Belgium (in 2018) hospitalised their inhabitants as frequently as Poland, while the inhabitants of the Netherlands and Portugal were hospitalised less frequently. The Czech Republic and Lithuania hospitalised their inhabitants more frequently. Such remarkable differences in the frequency of hospital treatment result probably from the actual medical needs and different organisation of healthcare systems compared to our country, including different, mutual relations among services provided within the primary, specialty and stationary healthcare systems. What can also be of some significance are the differences in the completeness of the collected data.

[33] Note: the OECD data for Poland are slightly different from the NIPH-NIH data because OECD calculates the rates applying its own methodology for grouping hospitals and population as rate denominators.



Ryc. 3.7. Współczynniki hospitalizacji ludności dla ogółu przyczyn dla Polski i wybranych krajów UE w latach 2003 - 2018, współczynniki na 100 tys. ludności, (dane OECD)
Fig. 3.7. Overall hospitalization rates for Poland and selected other EU Member States in 2003-2018, (data of OECD)

The comparison of age structures for patients hospitalised in various countries is interesting and illustrated in Fig. 3.8. As it was previously noted based on Polish data (NIPH-NIH), in general, the groups most frequently treated in hospitals are the youngest and the oldest patients, namely, infants and children up to 4 years of age and adults over the age of 75. Based on the comparison between Poland and other EU Member States, it may be concluded that the trends concerning changes in the frequency of hospitalisation with age are similar. However, certain “excess” in hospitalisation of the youngest group, and less frequent hospitalisation of the oldest patients, compared to many other countries, is observed in Poland, Belgium, Slovakia and Romania. What is noticeable is the high frequency of hospitalisation of the oldest men, over the age of 80, observed in Finland (nearly 3 times more frequent than in Poland), France and the Czech Republic, and, by contrast, low frequency of hospitalisation of the oldest patients observed in Romania (nearly 3 times less frequent than in Poland).



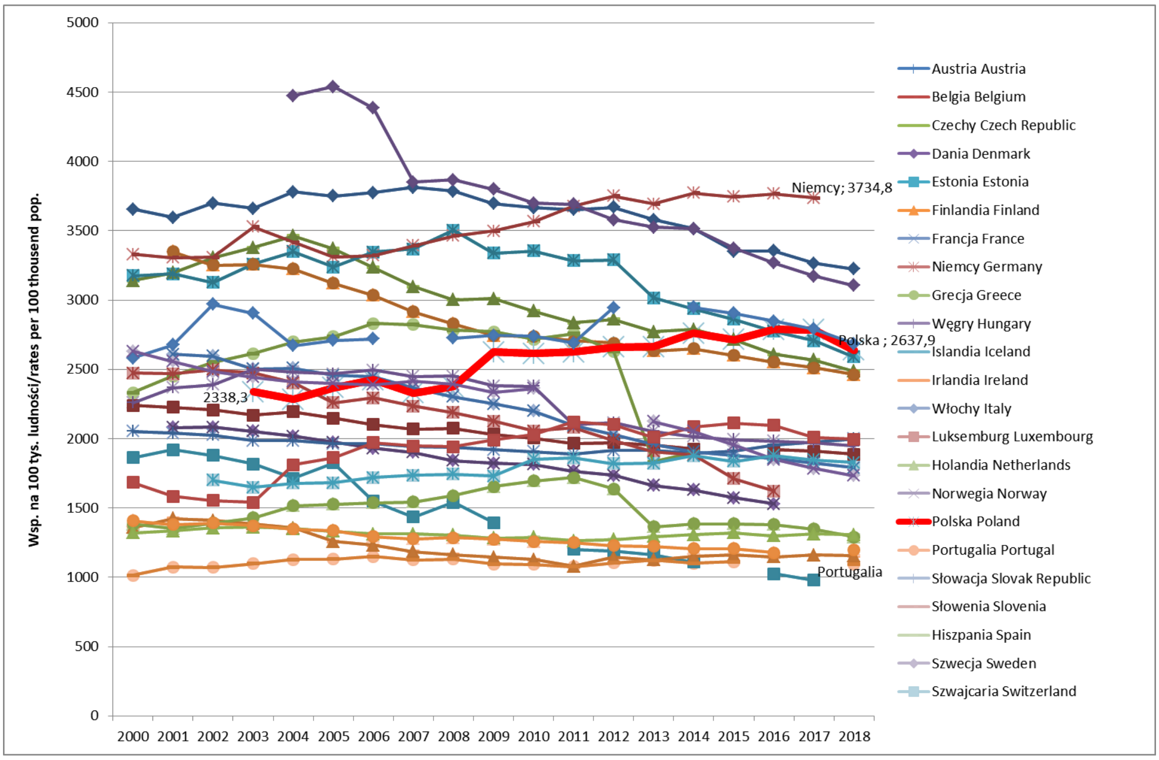
Ryc. 3.8. Hospitalizacja ogółem w Polsce i innych krajach UE wg wieku, 2018 r. (współczynniki na 100 tys. ludności, dane Eurostat)

Fig. 3.8. Overall hospitalization rates in Poland and other EU Member States by age, 2018 (Eurostat data)

3.6. Hospitalisation in Poland and other EU Member States by the selected causes

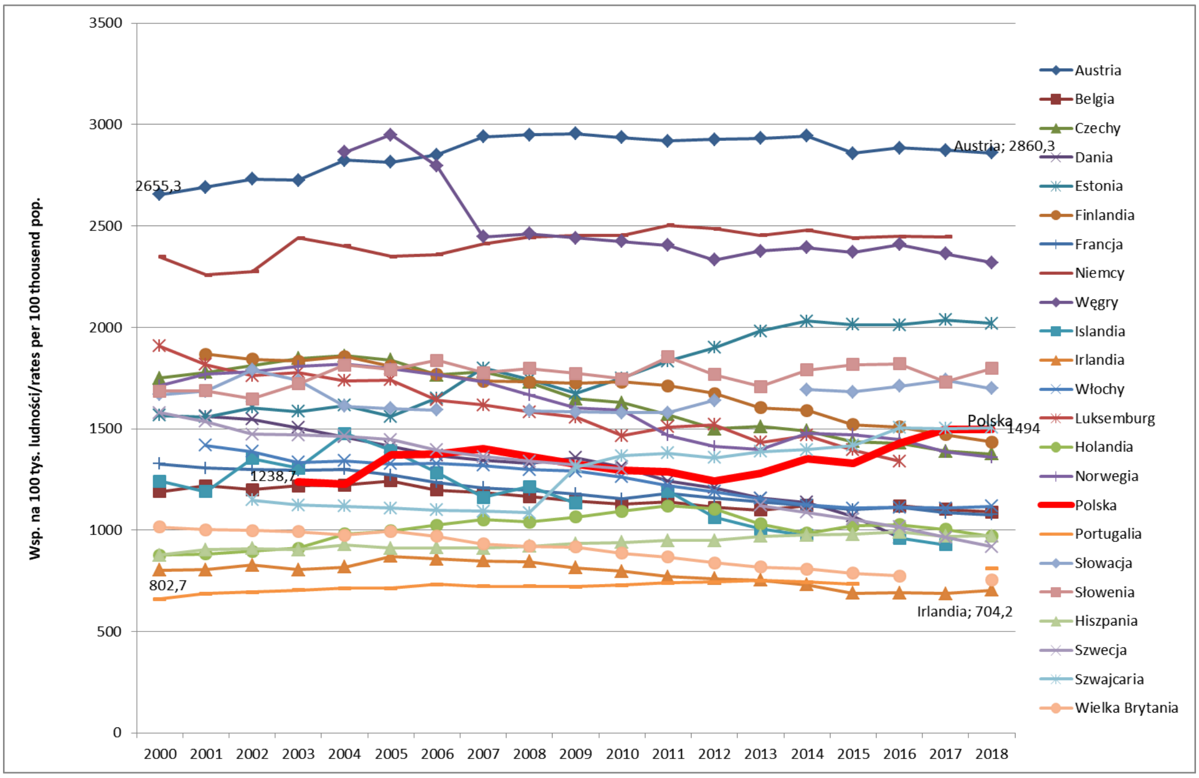
The total rates of hospitalisation by age and trends, concerning the selected causes in the years 2003-2018, are presented to compare hospitalisation in Poland and in other EU Member States. The data applied in the analyses are retrieved from databases of Eurostat and OECD to which NIPH-NIH transfers its information on hospital treatment in Poland.

The trends in hospitalisation for diseases of the circulatory system (Fig. 3.9) varied in the countries included in the comparison. In Poland, from the year 2003 to 2018, the rates of hospitalisation increased by 12% (from 2,338 to 2,638). And in Germany, in the same period of time, hospitalisation for diseases of the circulatory system increased by 5% but hospitalisation in this country is the most frequent among all EU Member States (30% more frequent than in Poland). There are countries where hospitalisation for diseases of the circulatory system significantly decreased, and they include Italy (decrease by 40% in the same period of time) and Finland (decrease by 36%). Portugal is the country of the lowest frequency of hospitalisation for diseases of the circulatory system (2.5 times less frequently than in Poland).



Ryc. 3.9. Zmiany trendów hospitalizacji z powodu chorób układu krążenia ogółem w Polsce i w innych krajach UE, mężczyźni i kobiety razem, współczynniki na 100 tys. ludności (dane OECD)

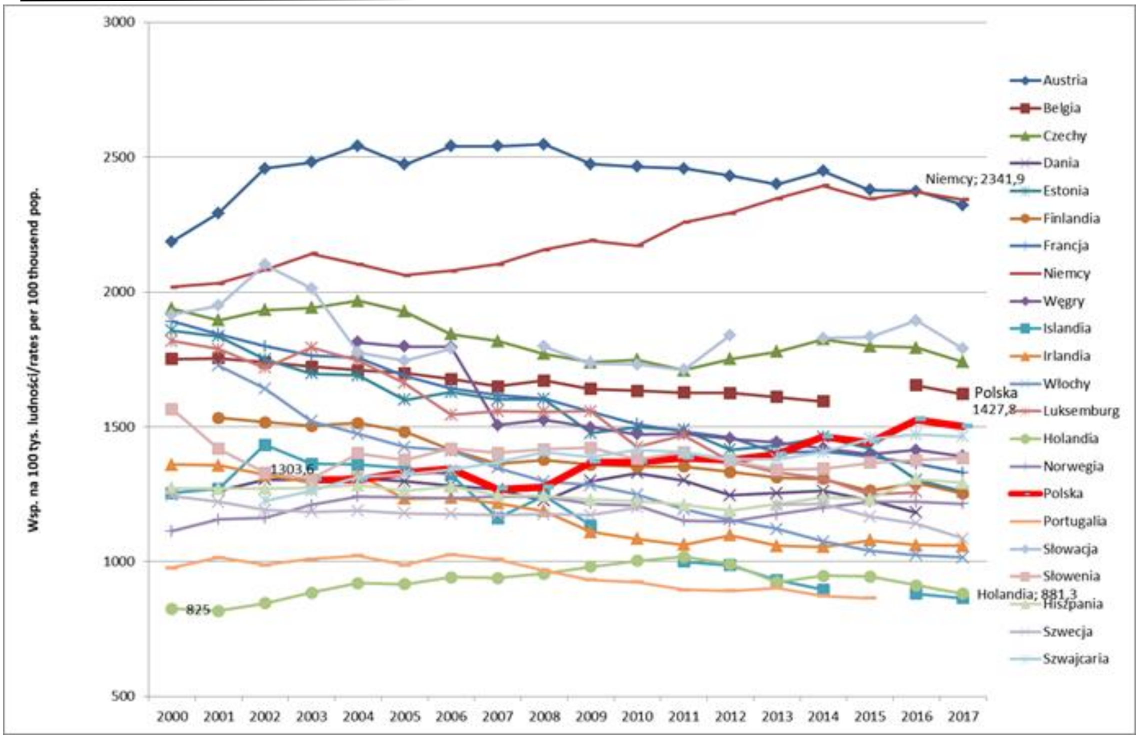
Fig. 3.9. Time trends in hospitalization rates for cardiovascular diseases in Poland and other EU Member States, both sexes, 2000-2018 (OECD data)



Ryc. 3.10. Zmiany trendów hospitalizacji z powodu nowotworów ogółem w Polsce i innych krajach UE mężczyźni i kobiety razem, współczynniki na 100 tys. ludności (dane OECD data)

Fig. 3.10. Time trends in hospitalization rates for malignant neoplasms in Poland and other EU Member States, both sexes, 2000-2018 (OECD data)

The trends in hospitalisation for all types of neoplasms are very different in individual countries. The stable and constantly high, in quantitative terms, situation concerning hospitalisation in recent years is noticeable in Austria. This is a EU Member State where the population continues to be the most frequently hospitalised for neoplasms. Polish data show a slow decrease in the frequency of hospitalisation for this cause until 2012, and a slow increase is observed in the following years. As the figure shows, Poland is among the countries which hospitalise their populations for neoplasms less frequently. The frequency of hospitalisation in 2018 was two times lower than in Austria. The inhabitants of Ireland are the least frequently hospitalised for neoplasms, and in comparison to Austria, where the patients suffering from neoplasms are the most frequently hospitalised, the difference in 2018 was fourfold.

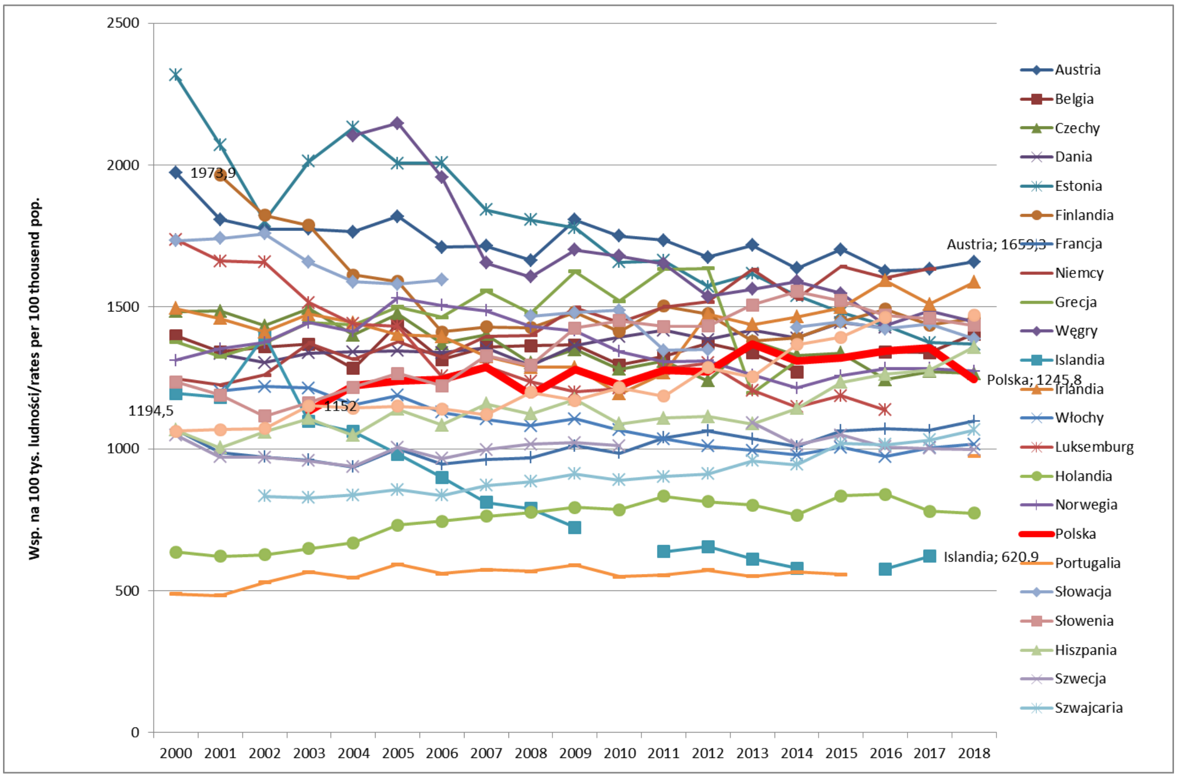


Ryc. 3.11. Zmiany trendów hospitalizacji z powodu chorób układu trawiennego ogółem w Polsce i innych krajach UE mężczyźni i kobiety razem, współczynniki na 100 tys. ludności (dane OECD)

Fig. 3.11. Time trends in hospitalization rates for diseases of the digestive system in Poland and other EU Member States, both sexes, 2000-2018 (OECD data)

Diseases of the digestive system, injuries, poisoning and diseases of the respiratory system are among major causes of hospitalisation, and at the same time, some of the most common causes of deaths, especially among women (Fig. 3.11). It should be noted that the rates of hospitalisation in Poland for this group of causes show a slight upward trend in the years 2003-2018 (9%) and occupy the middle ground among all EU Member States.

As the figure shows, Germans and Austrians are the most frequently hospitalised for this cause (more frequently than in Poland by 60%). The inhabitants of the Netherlands, Iceland and Portugal are the least frequently hospitalised for this cause (less frequently than in Poland by 60%).

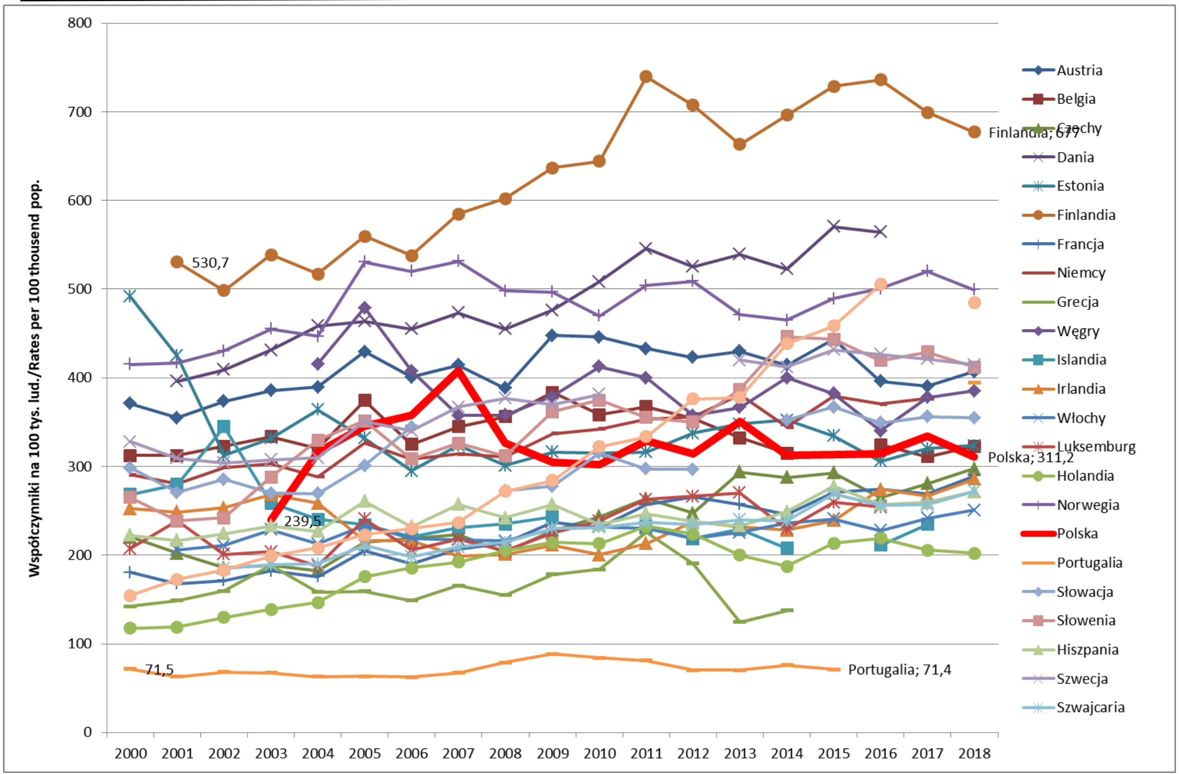


Ryc. 3.12. Zmiany trendów hospitalizacji z powodu chorób układu oddechowego w Polsce i innych krajach UE mężczyźni i kobiety razem, współczynniki na 100 tys. ludności (dane OECD)

Fig. 3.12. Time trends in hospitalization rates for diseases of the respiratory system in Poland and other EU Member States, both sexes, 2000-2018 (OECD data)

As previously noted, diseases of the respiratory and digestive systems are frequent causes of hospital stays.

The minimum increase in the frequency of hospitalisation for diseases of the respiratory system was observed in Poland in the years 2003-2018. In total, the increase in the frequency of hospitalisation in the years 2003-2018 was only 9% (Fig. 3.12). Germans and Austrians are 60% more frequently hospitalised for diseases of the respiratory system, and the inhabitants of the Netherlands, Iceland and Portugal are hospitalised for this cause two times less frequently than Polish inhabitants.



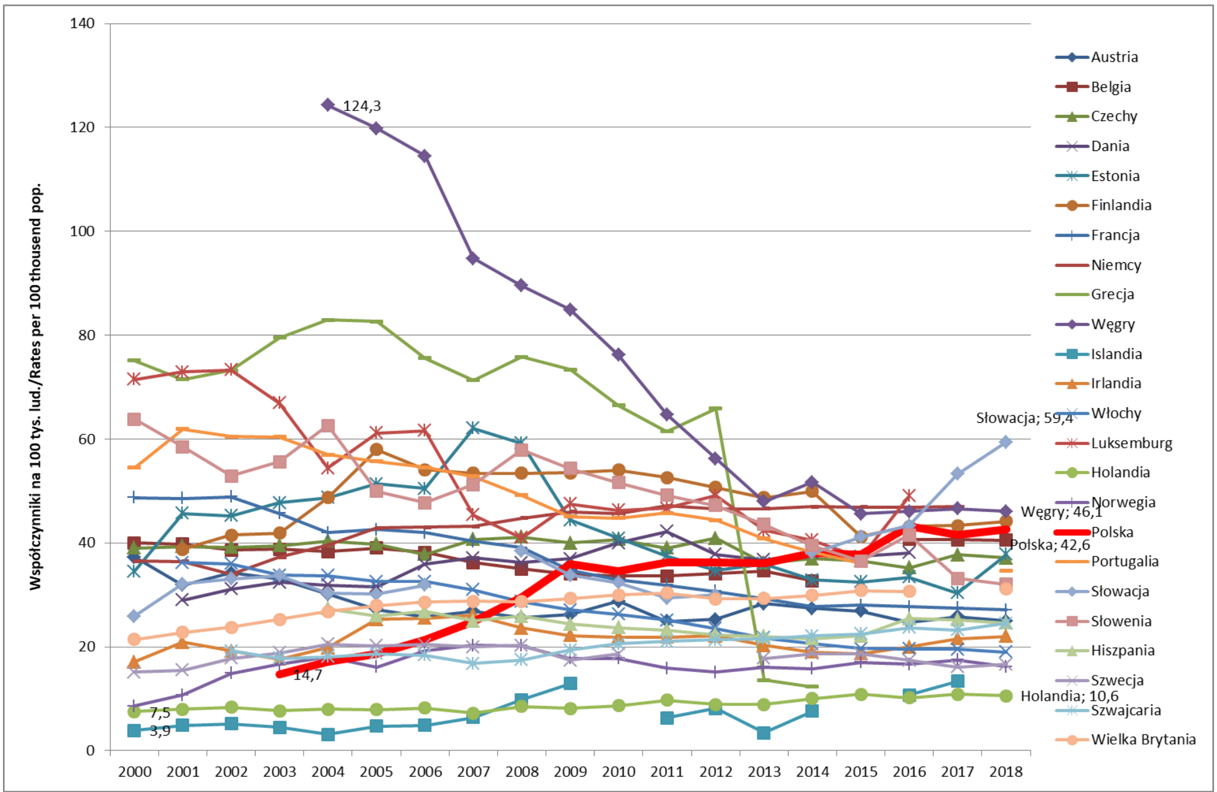
Ryc. 3.13. Zmiany trendów hospitalizacji z powodu zapalenia płuc ogółem w Polsce i innych krajach UE mężczyźni i kobiety razem, współczynniki na 100 tys. ludności (dane OECD)

Fig. 3.13. Time trends in hospitalization rates for pneumonia in Poland and other EU Member States, both sexes, 2000-2018 (OECD data)

The variability of the rates of hospitalisation for pneumonia (Fig. 3.13) across all age groups and for both sexes in Poland is below the average for other countries. A significant increase was observed from 2003 until 2018, and from 2008 until 2015. The trend was stable and in recent years, the rates of hospitalisation have been on the level of 3 hospitalised cases per 1,000 population. In Finland, the number of hospital-treated pneumonia cases had been significantly increasing starting from the year 2000, and in 2018 hospitalisation for pneumonia in that country was two times higher than in Poland. On the other hand, in Portugal, where the situation corresponding to hospitalisation for pneumonia is stable, the hospitalisation is four times less frequent than in Poland.

The rates of hospitalisation for alcoholic liver disease in Poland and other European countries are illustrated below (Fig. 3.14). For many years, the lowest frequency of hospitalisation for alcoholic liver disease was recorded in the Netherlands and Iceland. Hungarians were the most frequently hospitalised for this cause, but since 2003, the situation has improved threefold and nowadays, hospitalisation for this cause is on the level recorded in

Poland and Germany, which are the countries where the people suffering from alcoholic liver disease are most frequently treated in hospital. It should be noted that the number of patients treated for alcoholic liver disease correlates with the litres of alcohol drank by one inhabitant of a given country.



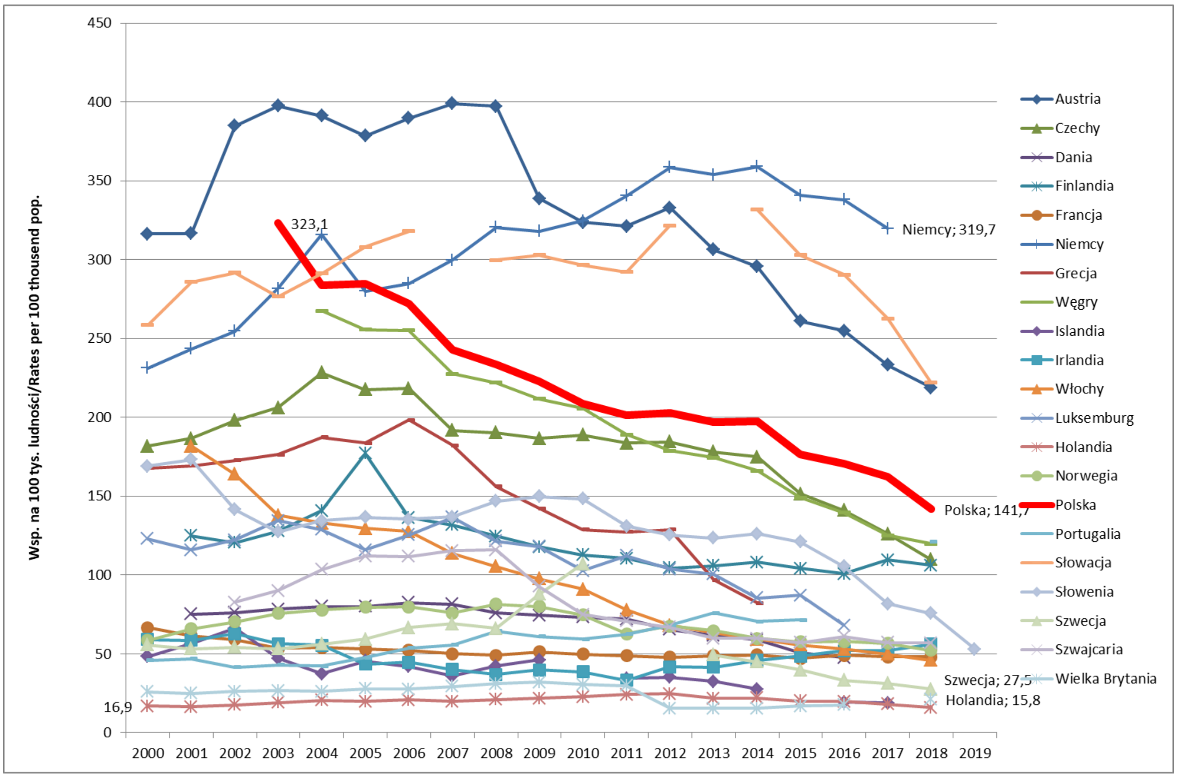
Ryc. 3.14. Zmiany trendów hospitalizacji z powodu alkoholowej choroby wątroby ogółem w Polsce i innych krajach UE mężczyźni i kobiety razem, współczynniki na 100 tys. ludności (dane OECD)

Fig. 3.14. Time trends in hospitalization rates for alcoholic liver disease in Poland and other EU Member States, both sexes, 2000-2018 (OECD data)

3.7. Hospitalisation in Poland for causes recognised by OECD as indicative of the quality of healthcare systems

OECD experts believe that there are some disease entities which are too frequently subject to hospitalisation in certain countries, and these mainly chronic diseases can usually be treated in specialty and primary healthcare facilities, with hospitalisation being used when the disease exacerbates. The disease entities recognised by OECD and classified as excessively hospitalised are hypertensive disease, asthma and diabetes.

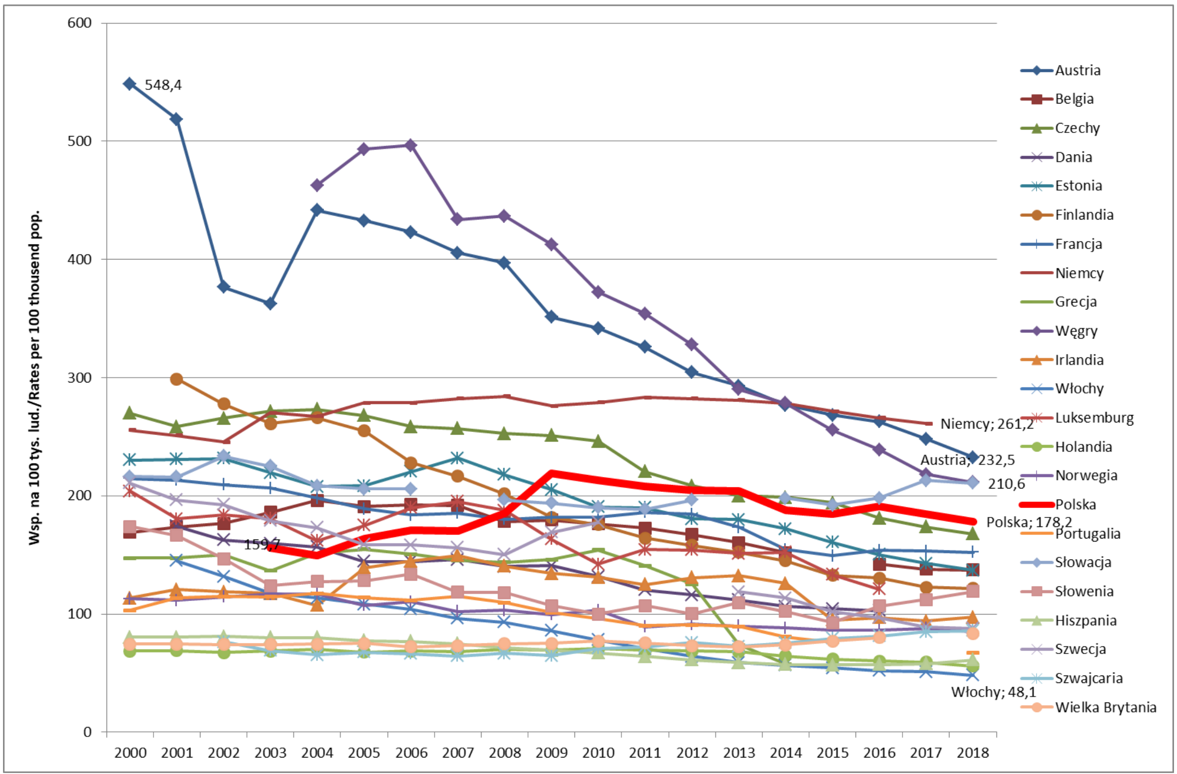
In Poland, the excessive hospitalisation for arterial hypertension is confirmed by the trends in hospitalisation from recent years (Fig. 3.15). A clear downward trend concerning the hospital treatment of hypertension was slightly stopped in 2010, but after 2015 such hospitalisation has continued to drop, which is recognised by OECD as something positive. Poland, Austria, Slovakia and Germany are still the countries characterised by the most frequent hospitalisation for arterial hypertension. In Sweden, the Netherlands and Italy, on the other hand, the rates of hospitalisation for arterial hypertension have been over ten times lower for many years now.



Ryc. 3.15. Zmiany trendów hospitalizacji z powodu choroby nadciśnieniowej ogółem w Polsce i innych krajach UE mężczyźni i kobiety razem, współczynniki na 100 tys. ludności (dane OECD)

Fig. 3.15. Time trends in hospitalization rates for hypertension in Poland and other EU Member States, both sexes, 2000-2018 (OECD data)

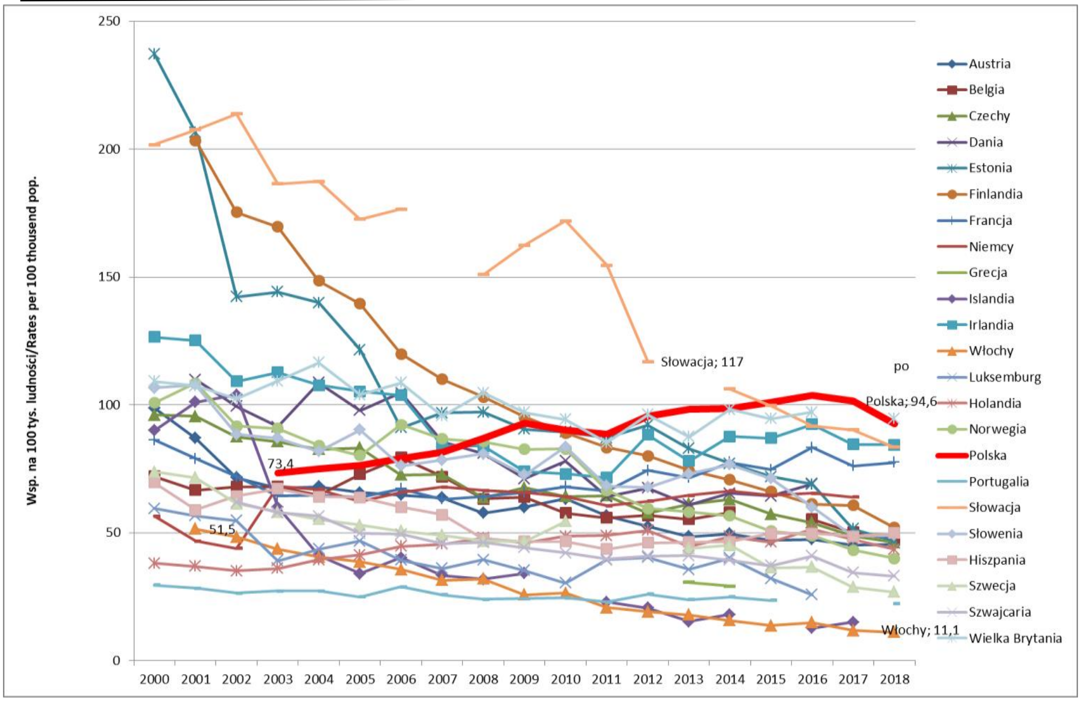
Diabetologists claim that the system of care for patients suffering from diabetes should ensure the continuity of outpatient treatment of this chronic disease. As Fig. 3.16 shows, Poland, Germany, Austria and Slovakia are the countries where diabetes is the most frequently hospitalised. The rate of hospitalisation in Poland is 178 per 100,000, but in 2018, this rate was lower than in Germany by nearly 50% and 3 times higher than in Italy.



Ryc. 3.16. Zmiany trendów hospitalizacji z powodu cukrzycy ogółem w Polsce i innych krajach UE mężczyźni i kobiety razem, współczynniki na 100 tys. ludności (dane OECD)

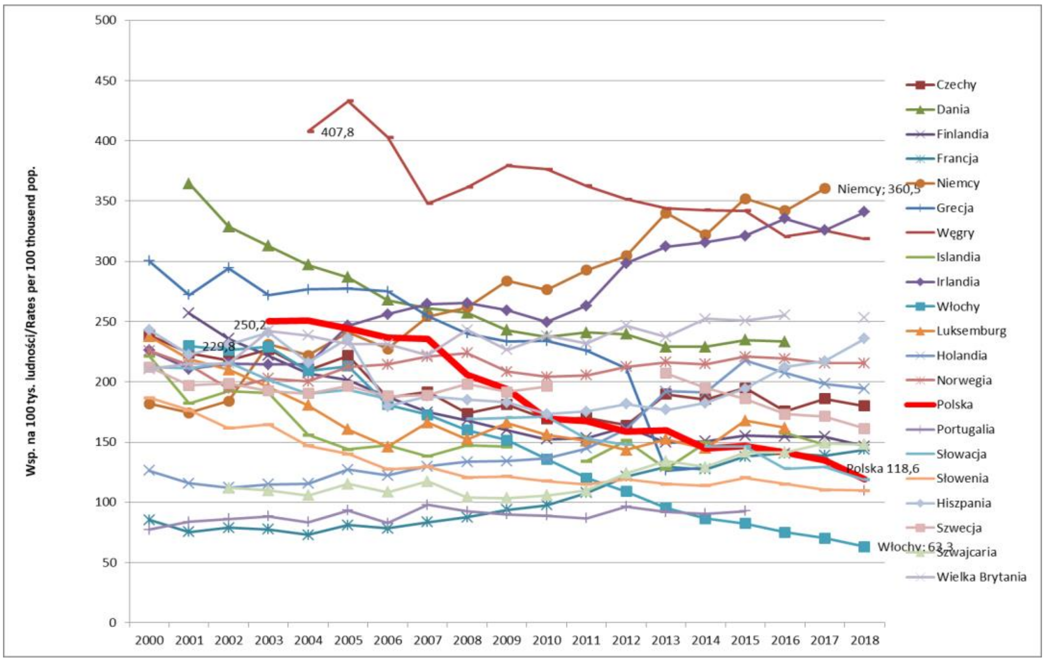
Fig. 3.16. Time trends in hospitalization rates for diabetes in Poland and other EU Member States, both sexes, 2000-2018 (OECD data)

Asthma is also one of the diseases which should be treated on an outpatient basis more frequently than it is now. Fig. 3.17 shows that, in the years 2003-2015, the frequency of hospitalisation for this cause increased in Poland by 30%. At present, we are one of the countries with the highest frequency of hospitalisation for asthma. The frequency of hospitalisation for this cause is higher in Slovakia and Latvia. Italy is the country where the rate of hospitalisation for asthma is the lowest. What is important to note is how the situation changed in Finland, where the rates of hospitalisation decreased in the years 2000-2018 from 208 to 54, i.e. fourfold.



Ryc. 3.17. Zmiany trendów hospitalizacji z powodu astmy ogółem w Polsce i innych krajach UE mężczyźni i kobiety razem, współczynniki na 100 tys. ludności (OECD)

Fig. 3.17. Time trends in hospitalization rates for asthma in Poland and other EU Member States, both sexes, 2000-2018 (OECD data)



Ryc. 3.18. Zmiany trendów hospitalizacji z powodu POChP ogółem w Polsce i innych krajach UE mężczyźni i kobiety razem, współczynniki na 100 tys. ludności (dane OECD)

Fig. 3.18. Time trends of COPD rates in Poland and other EU Member States, both sexes, 2000-2018 (OECD data)

Fig. 3.18 shows the trends in hospitalisation for COPD in the years 2000-2018. As the figure shows, the frequency of hospitalisation in Poland and many other compared countries started to decrease. The highest decreases were recorded in Italy (over threefold decrease), in Poland (twofold) and Finland (nearly twofold decrease). The continuously high frequency of hospitalisation for COPD was observed in Germany, Ireland and Hungary, where the rates were over 2 to 3 times higher than in Poland.

The final question is what causes such significant differences in the frequency of hospitalisation in various countries. These differences refer to the evolution of trends - the upward or downward trends, or relative stability – and rates of hospitalisation, and, therefore, the trajectory of the curves. There are some countries where, year by year, some unexpected fluctuations in the values of these rates are observed, which might suggest errors in data or structural changes in the healthcare system, but sometimes the values return to their previous levels. Perhaps these differences are the result of deficiencies in the data collection systems in individual countries. The unexpected deviations from the stable trends and data deficiencies in certain years are observed especially in smaller countries. Compared to other countries, the data on hospitalisation in Poland are quite stable.

In general, experts in healthcare organisation call for the limitation of hospital treatment whenever possible, and for relying on outpatient care provided within either specialty or primary healthcare facilities. At the same time, with the modern, advanced medical techniques hospital stays can now be significantly shortened. This is possible due to the implementation of modern surgical procedures and provision of the further care and rehabilitation in out-of-hospital facilities.

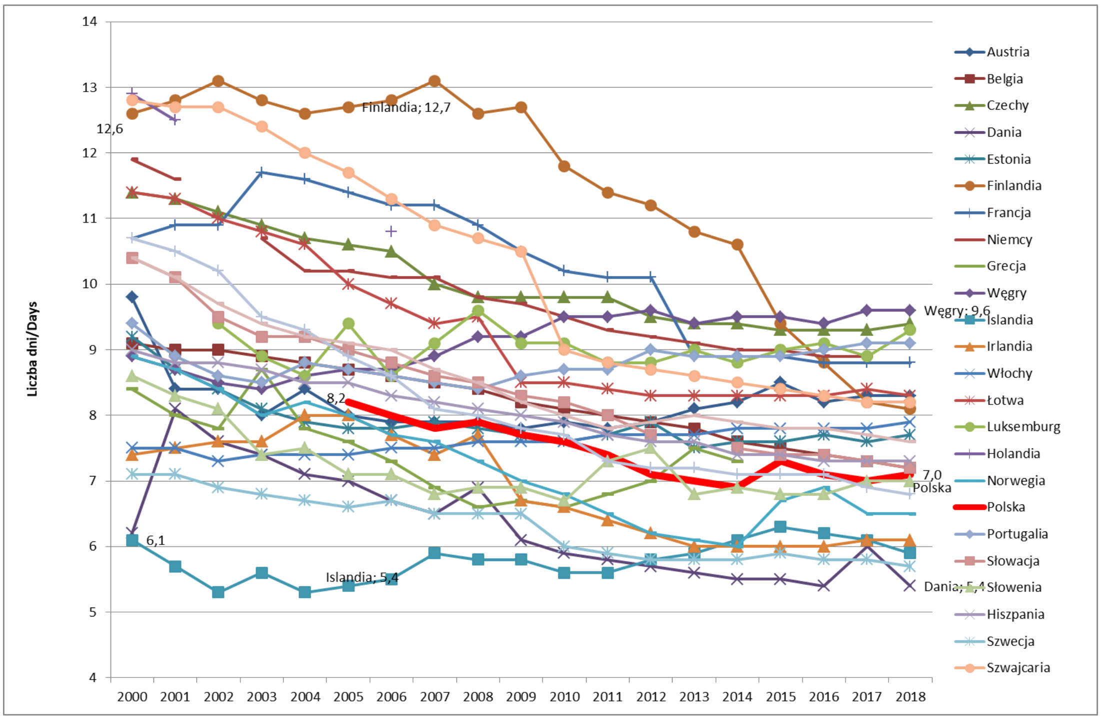
The different approaches, and the evolution of the role of hospital treatment within healthcare system, may be the answer to the observed differences in trends in hospitalisation in certain countries. In their databases, the OECD and Eurostat try to document the reasons for any recorded irregularities and deficiencies in the data collected.

3.8. Length of hospitalisation

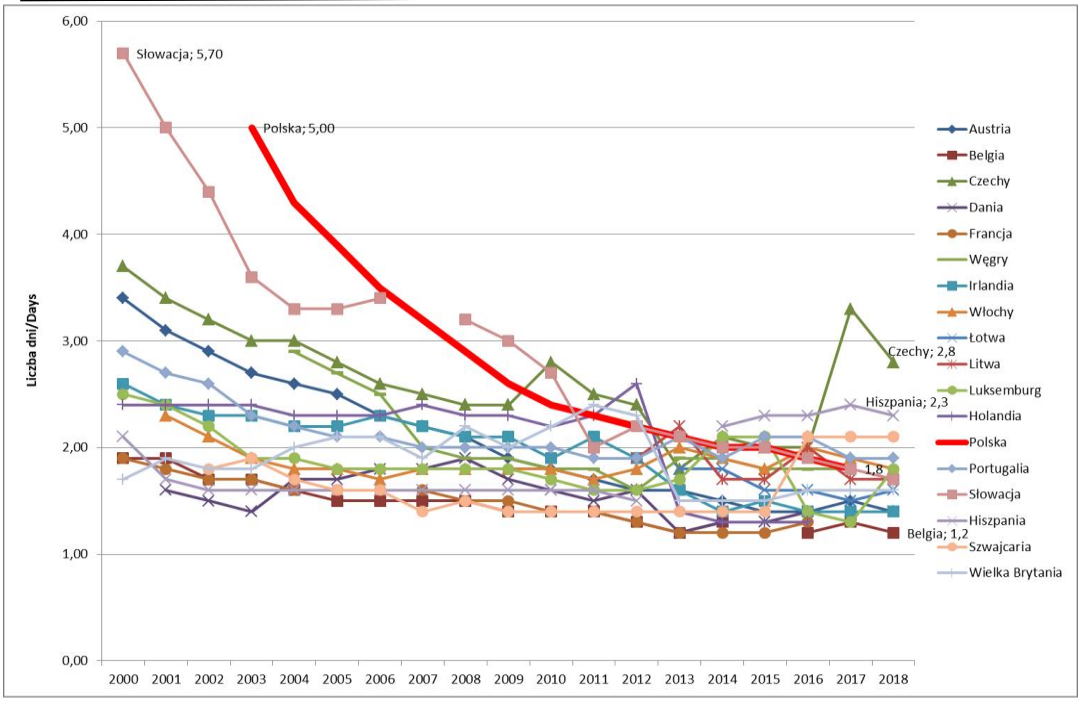
Depending on the country, hospital treatment generates from 40-50% of the healthcare costs, and the significant part of the costs is accounted for by the hospital stay, namely, the so-called "hotel costs". Therefore, healthcare administrators try to lower the frequency of hospitalisation and to shorten the length of hospital stays. Exposure to in-hospital infections, the likelihood of which increases with the length of hospital stay, is another argument in favour of the shortening of hospital stays.

Considering the fact that certain diagnoses are increasingly treated under one-day procedures carried out in specialist hospitals or ambulatory facilities, the average length of hospital stays shortens[34]. As Fig. 3.16 shows, the length of hospital stay in Poland in the years 2005-2018 was shortened by 1 day (15%) and now Poland is among the countries characterised by the relatively short hospital stay for all causes (7 days), but this is still 2.5 days longer (22%) than in Sweden. On the other hand, the length of hospitalisation in Poland is 2.6 days (37%) shorter than in Hungary.

[34] OECD applies its own division of hospitals, differentiating between acute hospitals and all other types of hospitals. This chapter analyses the length of hospital stay for all types of hospitals.

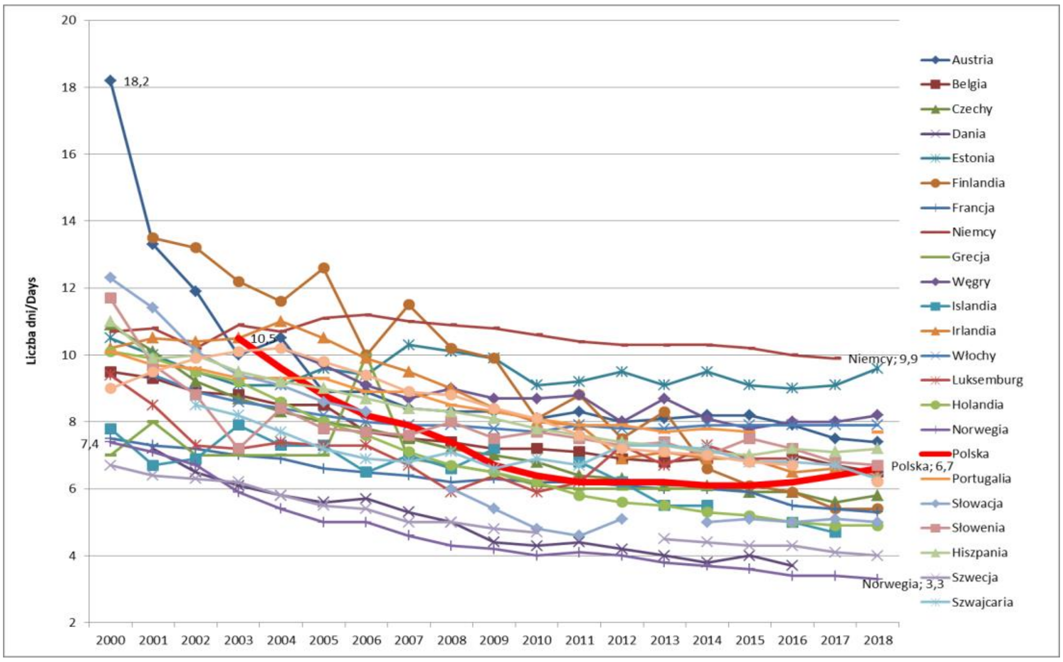


Ryc. 3.19. Długość pobytu w szpitalu wszystkie przyczyny w Polsce i innych krajach UE (dane OECD)
Fig. 3.20. Length of stay in hospital for all causes in Poland and other EU Member States by age, 2000-2018 (OECD data)



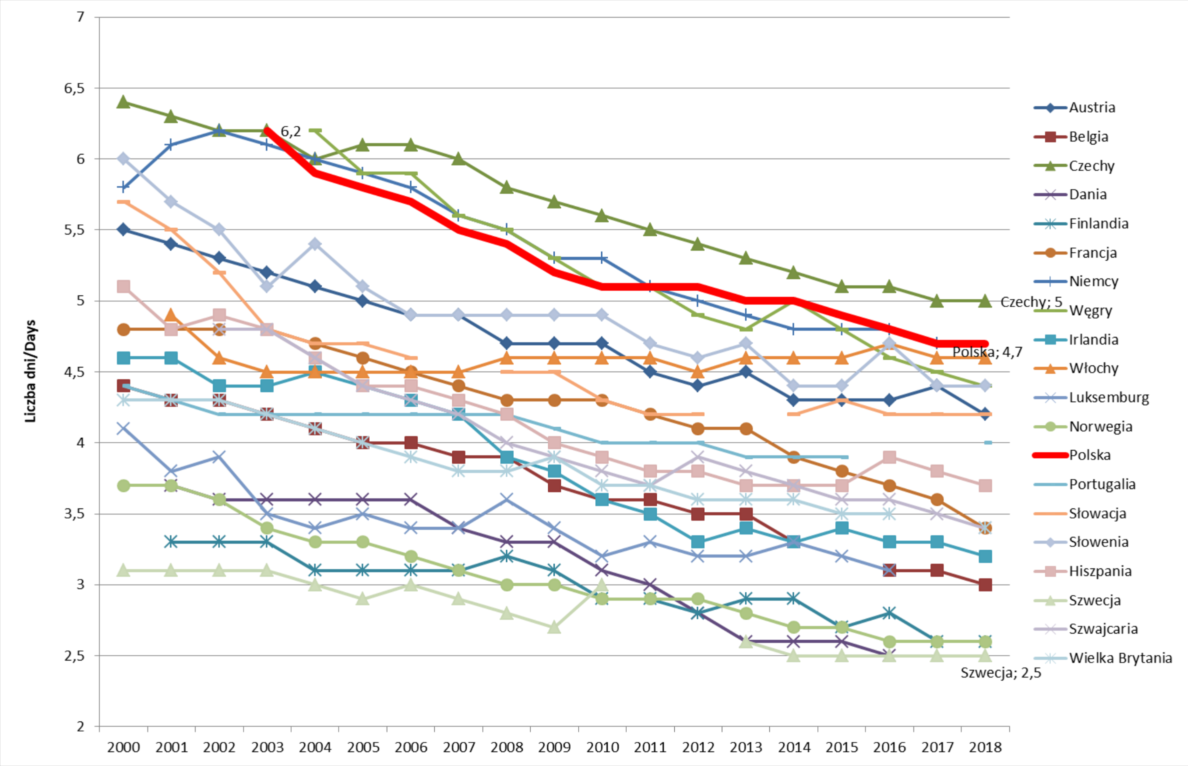
Ryc. 3.20. Długość pobytu w szpitalu z powodu leczenia zaćmy w Polsce i innych krajach UE (dane OECD)

Fig. 3.21. Length of stay in hospital because of cataract treatment in Poland and other EU Member States, 2000-2018 (OECD data)



Ryc. 3.21. Długość pobytu w szpitalu z powodu leczenia zawału serca w Polsce i innych krajach UE (dane OECD)

Fig. 3.21. Length of stay in hospital because of myocardial infarction treatment in Poland and other EU Member States, 2000-2018 (OECD data)



Ryc. 3.22. Długość pobytu w szpitalu z powodu leczenia wyrostka robaczkowego w Polsce i innych krajach UE (dane OECD)

Fig. 3.22. Length of stay in hospital because of appendicitis treatment in Poland and other EU Member States, 2000-2018 (OECD data)

In Poland, in 2003, the average length of hospital stay for treatment of cataract was 5 days (Fig. 3.20.) and, similarly to Slovakia, was the longest in the EU. As the figure shows, in Poland, the trend concerning shortening of the length of hospital stay for cataract treatment is noticeably clear and stable as compared to other countries. In recent years, the length of hospital stay for cataract treatment in Poland has been 1.8 days, while in Belgium it was 1.2 days and in Czech Republic 2.8 days, with some unexplained fluctuations recorded in the previous years. In general, the length of hospital stay for cataract treatment is shortening in nearly all countries, mostly due to the implementation of modern technology and a shift towards one-day hospital stays or treatment of cataract in out-of-hospital facilities.

In Poland, the average length of hospital stay for treatment of myocardial infarction is 6.2 days and is shorter than in the majority of the EU Member States (Fig. 3.21). The longest period of treatment of the myocardial infarction was recorded in Germany, with nearly 10 days on average, and the shortest period, 3 days, was observed in Norway and Denmark. In Poland, in the years 2003-2018, the length of hospital stays for treatment of myocardial infarction decreased by 60%. In the last 3 years, the hospital stays for this cause have become a little longer and increased from 6.1 to 6.6 days.

The average length of hospital stay for acute appendicitis has fluctuated in recent years to a small extent – from 2 to 5 days, depending on the country (Fig. 3.22). The continuous shortening of hospital stays for acute appendicitis has been observed in nearly all countries. In 2000, it was over 6 days (the Czech Republic). The shortest length of hospitalisation for acute appendicitis is currently observed in Sweden, Denmark and Norway (2.5 days). As the figure shows, Poland is one of the countries with the longest length of hospitalisation for acute appendicitis (4.7 days), although, inhabitants of the Czech Republic are hospitalised for acute appendicitis for a slightly longer period of time (5.2 days).

3.9. Hospital fatality

The fatality rate for treatment provided in general hospitals in Poland insignificantly decreased in the years 2003-2006, and in 2010, it dropped from 2.3% to 2.1%, in 2015 it was equal to 2% and in 2016 to 1.9% for all causes of hospitalisation. In the last two years (the year 2017 and 2018) it was 1.95% and 2.0%, respectively.

The greatest positive changes in the hospital fatality rates were observed in relation to all types of neoplasms: from 5% in 2003 to 3.6% in 2006, and then 3.2% in 2015, 3% in 2016 and 2.7% in 2018. The fatality rates for all types of diseases of the circulatory system also decreased from 6.3% to 5.9% and to 5.6% in 2015 (5.3% in 2016). In 2018, the fatality for diseases of the circulatory system increased to 5.9%, although in 2017 it was 5.7%.

In recent years, the hospital fatality rates for other causes have not changed significantly, and in 2018 they were the highest for diseases of the respiratory system (3.8%), infectious diseases (3.4%), diseases of the digestive system (2.2%), endocrine disorders and diseases of blood and blood-forming organs (2.1% each). A relatively high hospital fatality rate (2.6%) was registered for other ill-defined symptoms and signs (code ICD-10:R00-R99).

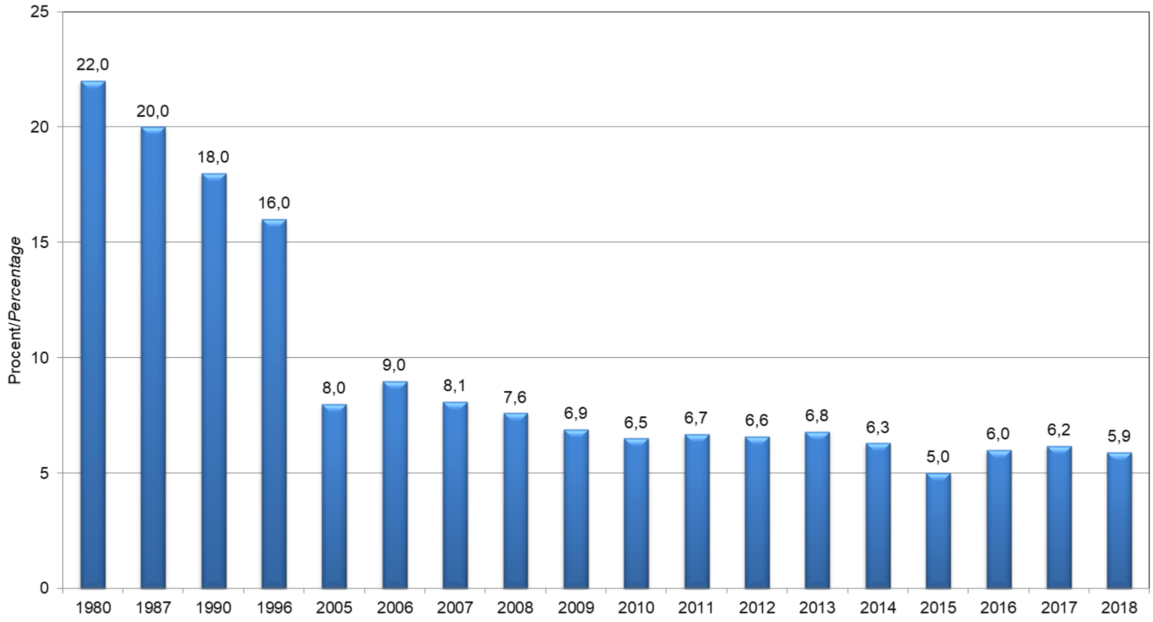
In the case of certain diseases, hospital fatality rate may be the determinant of the treatment quality. From among all rates recommended for the assessment of the quality of medical services, the Organisation for Economic Co-operation and Development[35] selected two

[35] Organisation for Economic Co-operation and Development, OECD.

referring to hospital fatality rates. The first relates to hospital fatality rates among patients hospitalised for myocardial infarction over a period of 30 days[36], and the second relates to fatality rates for cerebral stroke.

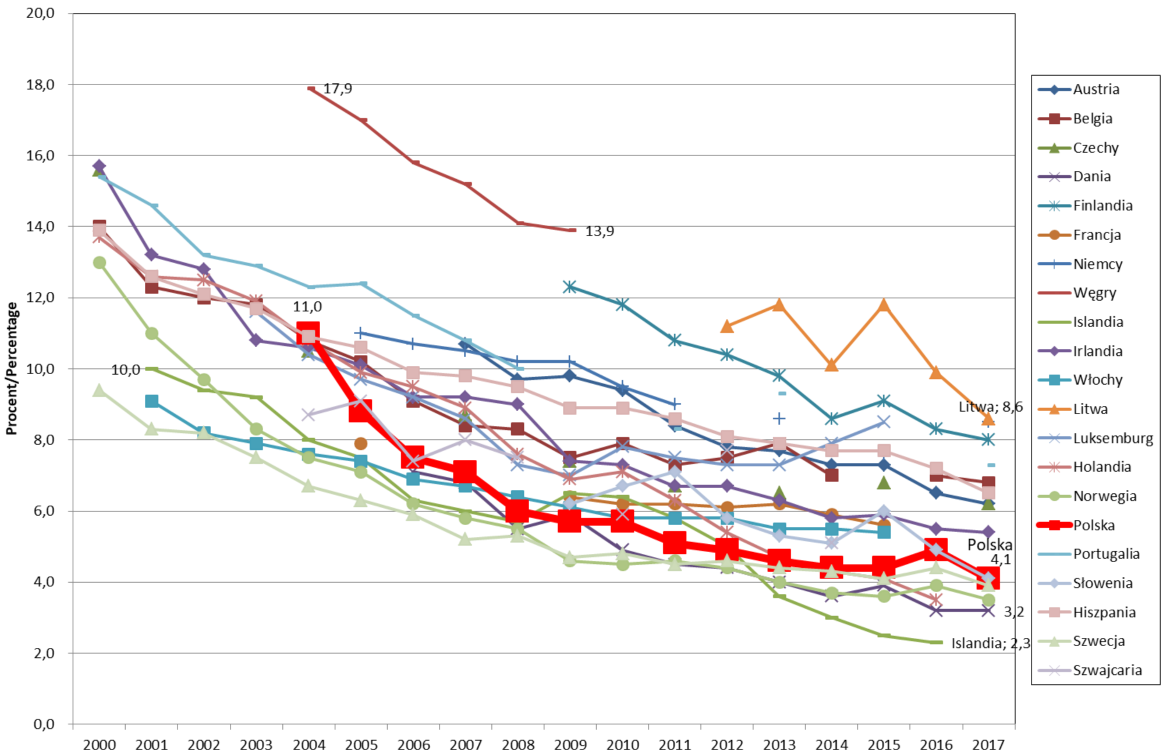
NIPH-NIH data (Fig. 3.23) show that the fatality rate for myocardial infarction patients gradually decreased in the years 1980-2005 from 22% to 8.0% and then to 5% in 2015, and ultimately to 5.9% in 2018, which proves a significant improvement in the effectiveness of cardiological units, and especially cardiosurgical wards. In addition, compared to other OECD member countries, Poland has been doing very well (Fig. 3.24) especially considering the fact that in 2015, in terms of its 30-day hospital fatality date for myocardial infarction patients, Poland was outranked only by Norway (3.5% of deaths), Denmark (3.2% of deaths) and Iceland (2.3 of deaths). The figure shows the large improvement that occurred in our country in terms of treating myocardial infarction, as 10 years ago, the fatality rate for myocardial infarction patients treated in hospitals was 11%, i.e. was two times higher.

[36]This rate corresponds to patients aged 45 or older.



Ryc. 3.23. Śmiertelność szpitalna w okresie 30 dni osób hospitalizowanych z powodu zawału serca w Polsce, 1980-2018 (dane NIZP-PZH)

Fig. 2.23. Hospital fatality rates during the 30 days after admission for myocardial infarction in Poland, selected years 1980-2018 (NIPH-NIH data)



Ryc. 3.24. Standaryzowane wg wieku i płci współczynniki śmiertelności szpitalnej 30 dniowej z powodu zawału serca osób w wieku 45 lat i więcej w latach 2000-2017 w Polsce i innych krajach UE (dane OECD)

Fig. 3.24. Hospital fatality during 30 days after admission for myocardial infarction among people 45 years and more in Poland and EU countries, 2000-2017, age and sex standardised data (OECD data)

The situation concerning cerebral strokes is different. In 2005, hospital fatality (death within 30 days of hospitalisation) among patients treated for cerebral haemorrhage in Poland was one of the highest among the OECD member countries - 36.9% (unfortunately, there is no recent information concerning Poland in the OECD database [37]). In 2005, the situation concerning fatality for ischaemic stroke slightly improved – 11.6% which, at that time, was the value slightly lower than that recorded in 2005 in 7 OECD members countries.

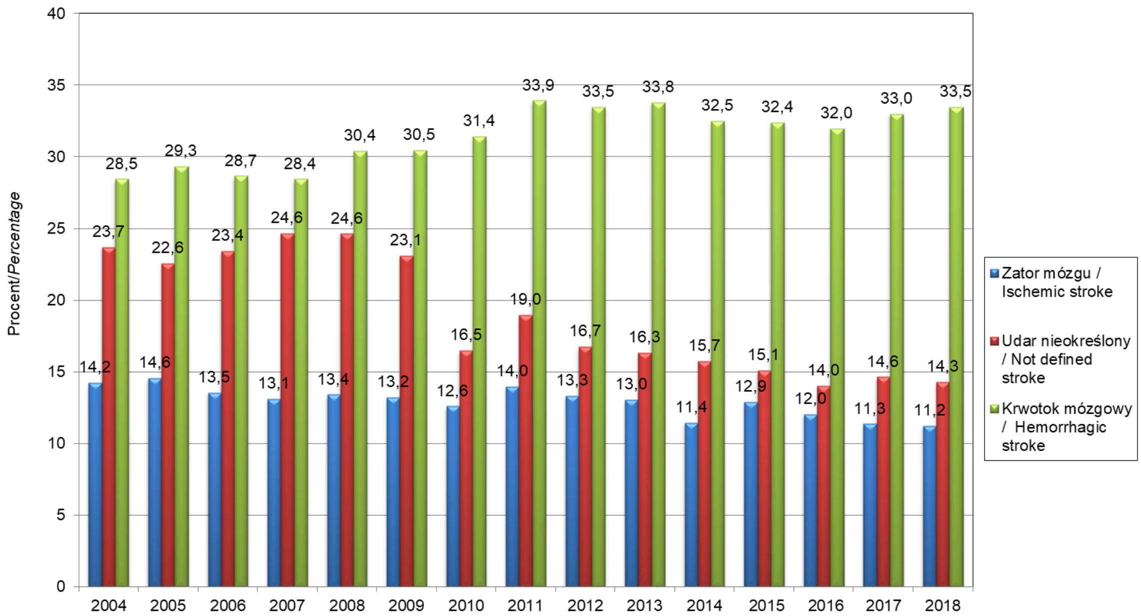
According to data from the National Institute of Public Health (Fig. 3.25), in the years 2004-2007, the hospital fatality for haemorrhagic stroke in Poland was very high, and not only did it not improve but even deteriorated in the years 2008-2013, which is quite disturbing. A slow decrease in fatality rates had been observed from 2014, but, unfortunately, in 2017 and 2018 the rates increased to the levels from 2012.

[37] Because unspecified stroke (I64) accounted for too many data from Poland, our data are not included in the OECD database on hospitalisation – cerebellar strokes.

The hospital fatality rate for ischaemic stroke is at a significantly lower level in Poland and had decreased very slowly from 14% in 2004 to 11% in 2014. However, there were certain years, like 2015, when the situation shortly deteriorated. Fortunately, in recent years, the hospital fatality rate has improved, and in 2004-2018 dropped by 3%.

Fatality for unspecified stroke (I64 – ICD10) is a separate, serious problem. It changed slightly in the years 2004-2009 (from 23.7% to 23.1%) but it decreased significantly in 2010 – to 16.5%. It increased again in the following year, but a significant improvement has been recorded in recent years, 14.3% in 2018, i.e. nearly two times less than in 2004. This should probably be partially attributed to the improvement in diagnoses concerning both above-mentioned disease entities, which would make the cited fatality rates for these diseases even higher. This process is already ongoing, and, as a result, fatality rates for haemorrhagic stroke have continued to be at a high level for a few years now.

It is disturbing that, although some programmes designed to improve the situation concerning haemorrhagic stroke[38] have been implemented for some time now, nationwide data for Poland have not shown any positive changes in the situation which would be reflected in a significant improvement in fatality rates for haemorrhagic stroke.



[38] National Stroke Prevention and Treatment Programme.

Ryc. 3.25. Śmiertelność szpitalna w okresie 30 dni, osób hospitalizowanych z powodu zatoru mózgu i krwotoku mózgowego w Polsce, 2004 - 2018 (dane NIZP-PZH)
Fig. 3.26. Hospital fatality within 30 days after admission among persons hospitalized for brain infarction and cerebral haemorrhage, Poland, 2004 - 2018 (NIPH-NIH data)

3.10. Hospitalisation in Poland for poisoning

Poisoning (ICD-10 code: T36-T65) forms part of the chapter of the International Statistical Classification of Diseases and Related Health Problems ICD-10 entitled "Injury, poisoning and certain other consequences of external causes". Each more severe injury or poisoning requires first aid, medical consultation or, in some cases, hospitalisation.

Hospitalisation statistics show that, in total, injuries and poisoning were the causes of 8.8% of hospital stays in Poland in 2017, and poisoning alone was the cause of 0.5% of all hospital stays. This might not look like a significant percentage, but sometimes, despite hospital treatment, patients showing signs of poisoning die. In our country, poisoning (ICD-10 code: X40-X49) was the cause of 1,288 deaths in 2017 and represented 0.2% of all deaths.

The rates of deaths for poisoning are among the rates used to monitor sustained development across the world until 2030 (United Nations - The 2030 Agenda for Sustainable Development). Therefore, the data concerning this rate are published for many countries across the world. A review of these international data shows that the number of deaths for this cause is constantly increasing. In Europe, the rate of deaths for poisoning between 2000 and 2016 increased slightly from 0.8% to 1.0% per 100,000 inhabitants. In the same period, the increase in the United States was 10 rate units (from 4 per 100,000 to 14 per 100,000).

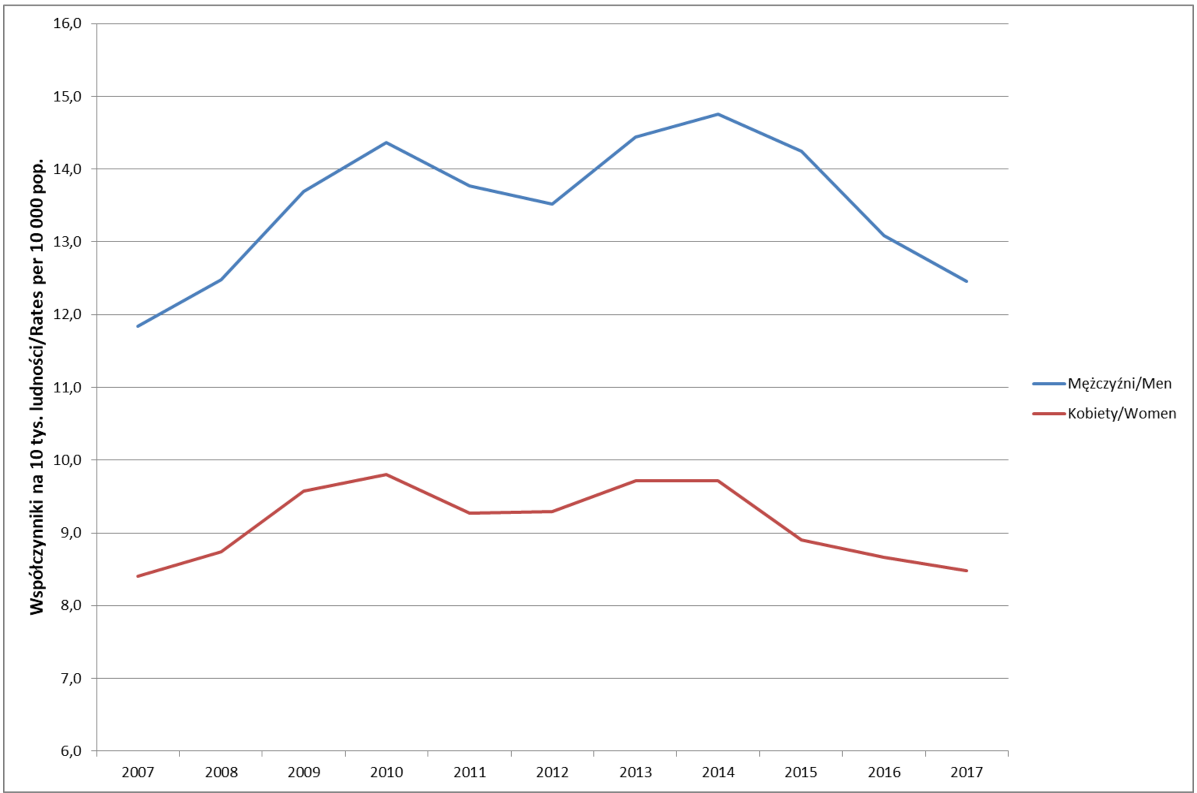
According to Eurostat data, in Hungary in 2017 some 20 patients per 10,000 inhabitants were hospitalised for poisoning while in Italy only 1.2. According to Eurostat data, in Poland, the frequency of hospitalisation for poisoning was 8.3 per 10,000 inhabitants, but according to NIPH-NIH data, the rate of hospitalisation for poisoning in the years 2007–2017 varied from 10 per 10,000 inhabitants to 12.3 per 10,000 inhabitants. On average, this represents some 43,000 cases treated in all Polish hospitals annually.

The analysis presented below is based on the data from the Nationwide General Hospital Morbidity Study carried out by NIPH-NIH as part of official statistics.

The below analysis concerns the assessment of the frequency of hospitalisation for poisoning in Poland in the years 2007–2017 and discusses the changes in trends concerning the rates of hospitalisation (per 10,000 population) in that period, taking into account sex, age group and place of residence.

3.10.1. Total hospitalisation rates for poisoning by sex, age and place of residence

In the years 2007-2017, the number of patients treated in Polish hospitals for poisoning was from 38,350 to 39,978, and the largest number of patients treated for this cause, 46,778, was recorded in 2014.



Ryc. 3.26. Współczynniki hospitalizacji ludności Polski z powodu zatruć (T36-T65) według płci w latach 2007-2017, mężczyźni i kobiety (dane NIZP-PZH)

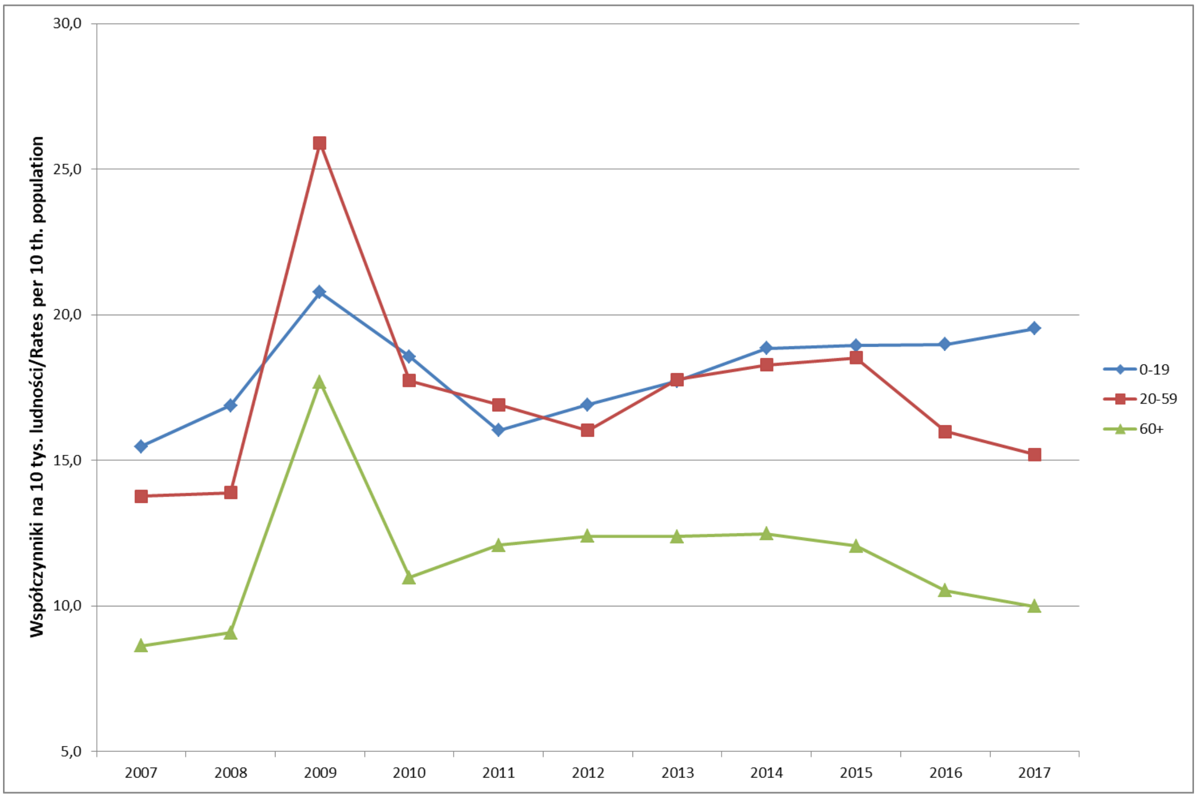
Fig. 3.26. Hospitalization rates for poisoning (T36-T65) by sex in Poland, 2007-2017 (NIPH-NIH data)

Despite certain fluctuations, in the initial period (2007) the frequency of hospitalisation for poisoning had increased until 2014, and a clear downward trend was observed in the following years when the rate dropped nearly to the level recorded in 2007 (Fig. 3.26).

In all analysed years, women were hospitalised less frequently than men. In 2007, 16,548 women were hospitalised for poisoning, and the largest number of them was hospitalised in 2010 – 19,360 women. Changes in the rates of hospitalisation among women were similar to the rates corresponding to men, but on a much lower level.

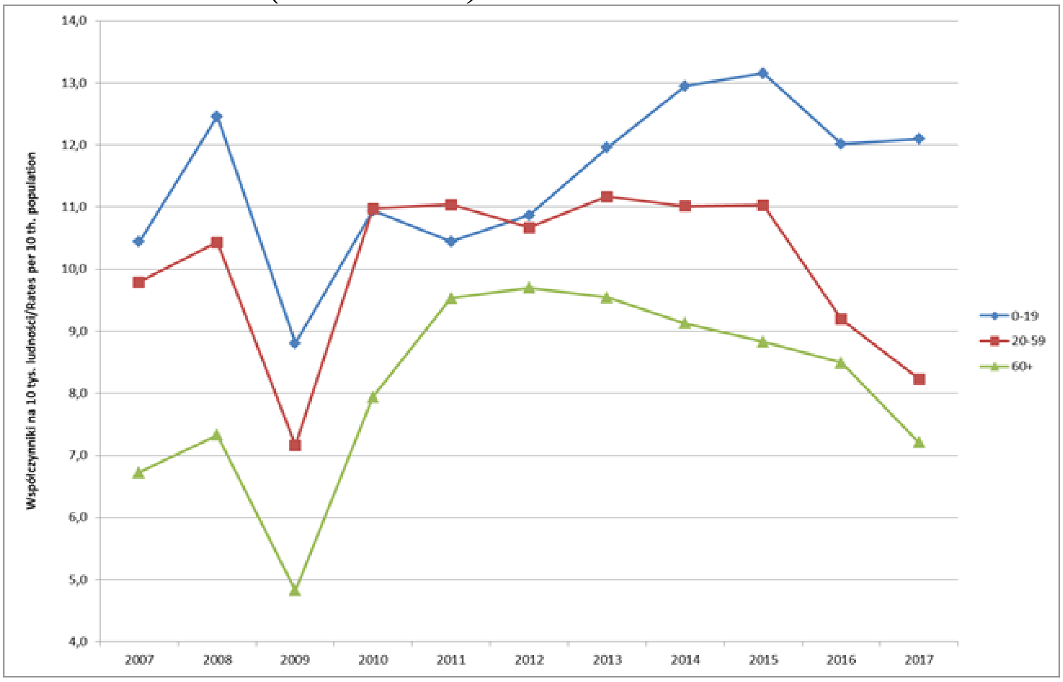
The group of men hospitalised in Poland for poisoning in the years 2007-2017 included two times more inhabitants of urban areas than inhabitants of rural areas. In 2007, this was 14,824 inhabitants of urban areas and 7,053 inhabitants of rural areas, and in 2017 – 16,539 from urban areas and 6,827 from rural areas. The rates of hospitalisation among men from urban areas were about 15 cases per 10,000 population, and the rates corresponding to inhabitants of rural areas – about 10 cases. In Poland, in the years 2007-2017, hospitalisation of women for poisoning encompassed in total – similarly to men – over two times more patients from urban than from rural areas. In 2007, this was 11,822 hospitalised patients from urban areas and 4,740 from rural areas, and in 2017 – 12,216 from urban areas and 4,620 from rural areas. The rates of hospitalisation among women from urban areas were about 12 cases per 10,000 population and in the group of women from rural areas – about 12 cases per 10,000 population.

Figs. 3.27–3.30 illustrate changes in the frequency of hospitalisation for poisoning in the years 2007-2017 by age, sex and place of residence. These figures show that in the groups of men and women, regardless of their place of residence, patients aged 0-19 were the most frequently hospitalised for poisoning, especially over the last 5 years, and this was particularly noticeable among women.



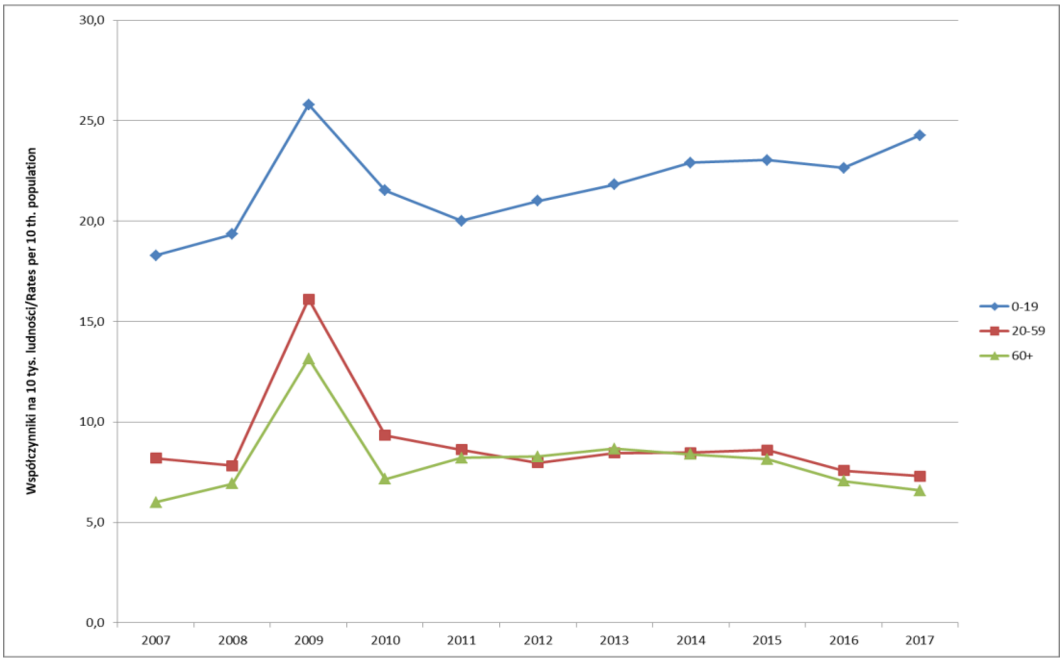
Ryc.3.27. Współczynniki hospitalizacji mężczyzn mieszkańców miast z powodu zatruć (T36-T65) w latach 2007-2017 wg. grup wieku (dane NIZP-PZH)

Fig. 3.28. Hospitalization rates for poisoning (T36-T65) among men in urban areas, by age group, 2007-2017 (NIPH-NIH data)



Ryc.3.28. Współczynniki hospitalizacji mężczyzn mieszkańców wsi z powodu zatruć (T36-T65) w latach 2007-2017 wg. grup wieku (dane NIZP-PZH)

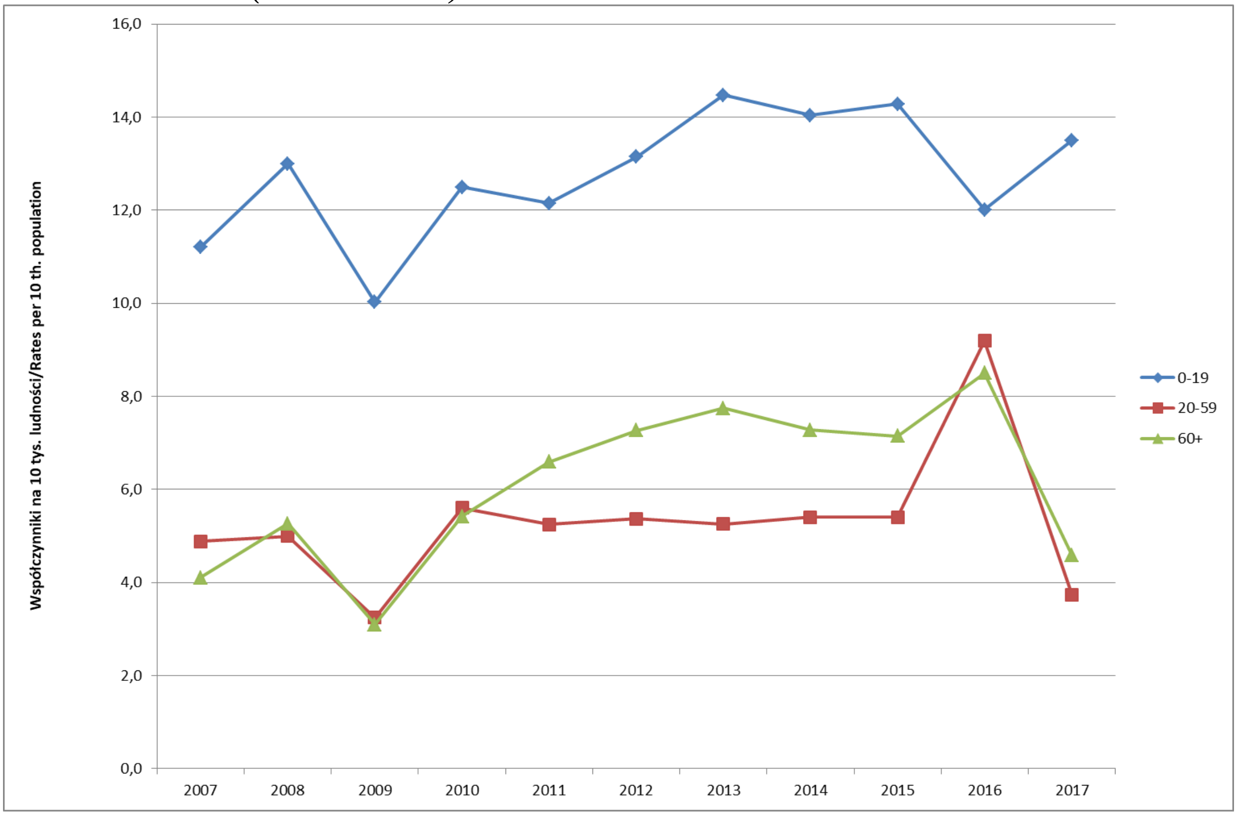
Fig. 3.28. Hospitalization rates for poisoning (T36-T65) among men in rural areas, by age group, 207-2017 (NIPH-NIH data)



Ryc.3.29. Współczynniki hospitalizacji kobiet mieszkanek miast z powodu zatruć (T36-T65) w latach 2007-2017 wg. grup wieku

Fig. 3.29. Hospitalization rates for poisoning (T36-T65) among women in urban areas, by age group,

2007-2017 (NIPH-NIH data)



Ryc.3.30. Współczynniki hospitalizacji kobiet mieszkanek wsi z powodu zatruć (T36-T65) w latach 2007-2017 wg. grup wieku (dane NIZAP-PZH)

Fig. 3.30. Hospitalization rates for poisoning (T36-T65) among women in rural areas, by age group, 2007-2017 (NIPH-NIH data)

In recent years, there has been a slight upward trend in the frequency of hospitalisation for poisoning in the youngest group. The oldest patients, over 60 years of age (especially men) were the least likely to be hospitalised for poisoning compared to patients from other age groups. To some extent, this more frequent hospitalisation of men and the youngest persons may be partially due to the risky behaviours practiced by the persons from these age and sex groups.

3.11. Poisoning by selected substances

3.11.1. Toxic effect of pesticides (ICD-10: T60)

In Poland, hospitalisation for poisoning by pesticides is quite rare – in 2007 there were 346 cases, in 2008, 400 cases, in 2009, 399 cases, at the end of the analysed period, in 2016, 194 cases, and in 2017, 167 cases. Nonetheless, when the data were analysed by age and sex, certain regularities emerged, namely, men (aged 0-19) were definitely more frequently hospitalised for poisoning by pesticides than women (aged 0-19). In addition, the youngest were hospitalised more frequently than older men and women in the entire analysed period 2007-2017. In the analysed period, there was a regular decrease in the rates of hospitalisation across all analysed age groups. Therefore, poisoning by pesticides was becoming a less and less common cause of the hospital treatment.

Inhabitants of rural areas were definitely more frequently poisoned by pesticides compared to inhabitants of urban areas – the statistical data confirm the common belief that poisoning by pesticides in the most common in rural areas. The lowest prevalence of poisoning by pesticides was recorded among adults from urban areas who were over 20 years of age. The highest risk of poisoning by pesticides was present among the youngest, namely, persons aged 0-19.

3.11.2 Poisoning by alcohol

Alcohol abuse is a serious social and medical problem. Some people having problems with alcohol are treated in psychiatric hospitals and patients with alcohol poisoning who require toxicology treatment are admitted to general hospitals.

Tabela 3.4. Osoby leczone w szpitalach ogólnych w Polsce w 2017 roku z powodu zatrucia alkoholem (dane NIZP-PZH)

Table 3.4. People treated for alcohol poisoning in general hospitals in Poland in 2017 (NIPH-NIH data).

No	Rodzaj alkoholu/ *Alcohol type*	Kod ICD-10/*ICD-10 code*	Częstość/ *Frequency*	Odsetki/ *Percentage*
1	Alkohol/Alcohol	T51	1,361	10.6
2	Etanol/Ethanol	T51.0	9,271	72.1
3	Metanol/Methanol	T51.1	84	0.7
4	2-propanol/2-propanol	T51.2	7	0.1
5	Inne alkohole/Other alcohols	T51.8	160	1.2
6	Alkohol nieokreślony/Unspecified alcohol	T51.9	1,972	15.3
7	Ogółem/Total		12,855	100.0

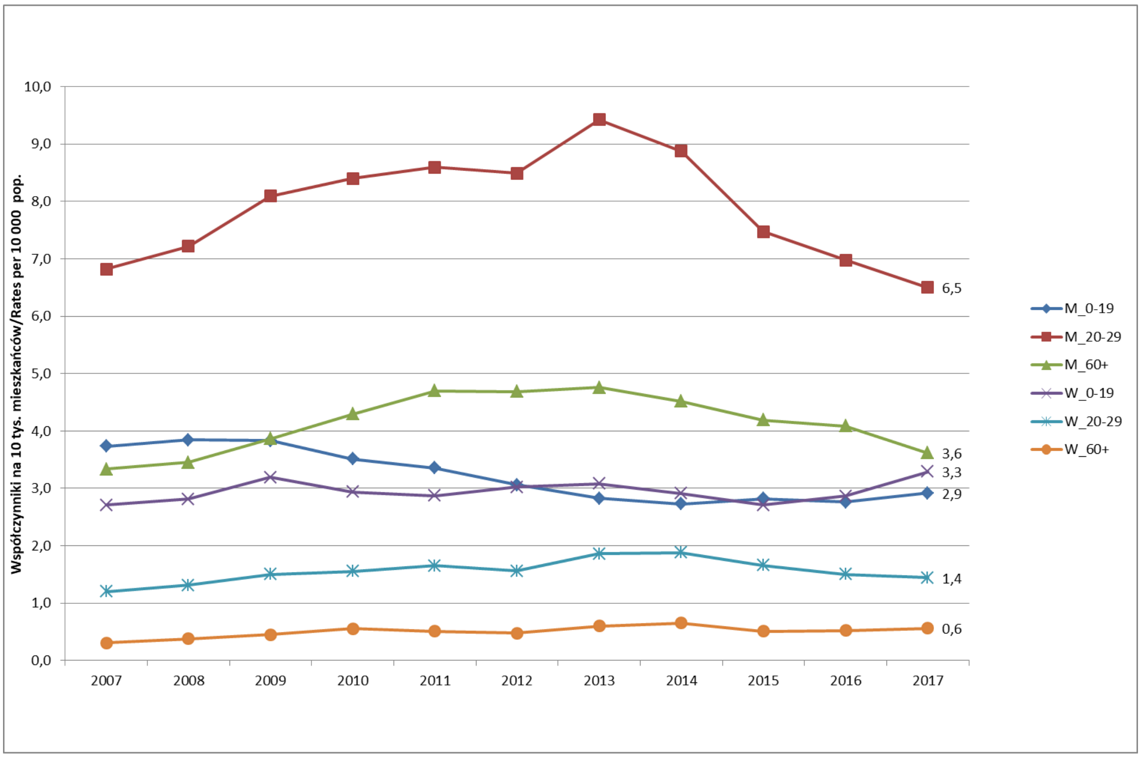
The largest number of alcohol poisonings (72%) were caused by ethanol, but there were also 84 persons in Poland who were poisoned by methanol. In 2007, 12,855 persons were admitted to general hospitals for poisoning by alcohol. In the analysed period (2007-2017), this number fluctuated from the lowest, 12,855 in 2017, to the highest, 17,048 in 2013.

This analysis was hampered by the inaccuracy of hospital discharge forms, because in nearly 26% of cases the type of alcohol causing the poisoning of the treated patients was not identified (Tab. 3.4 items 1 and 6).

Fig. 3.31 shows that in the years 2007-2017, men aged 20-29 were the most frequently treated for alcohol poisoning. In 2009, this number was as many as 9 persons per 10,000 population. Fortunately, the prevalence of this poisoning in this age group decreased in 2017, but it is still equal to 6.5 per 10,000. This rate is two times higher than that for the group of men aged 60 or older.

Women aged 20-29 and also 60+ were far less frequently admitted to hospitals for poisoning by alcohol compared to men. What is particularly surprising in the finding that the number of girls aged 0-19 and treated in hospitals for alcohol poisoning was nearly equal to that for boys at the same age.

Adult women aged 20-59 were slightly more frequently hospitalised than older women, and variability in the analysed period is rather similar. On the other hand, men in their prime are the most likely to be admitted to the hospital for alcohol poisoning. The similarity of the frequency of hospitalisation for this cause among men at a very young age and among significantly older men reveals that social and economic limitations concerning consumption of alcohol are effective only for the youngest and the oldest groups.



Ryc. 3.31. Zatrucia alkoholem leczone w szpitalach w Polsce w latach 2007-2017 według wieku i płci (współczynniki na 10 tys. lud. w grupach wieku) (dane NIZP-PZH)
Fig. 3.31. Hospital rates for alcohol poisoning by sex and age group in Poland, 2007-2017 (NIPH-NIH data)

3.11.3 Hospitalisation for poisoning by mushrooms

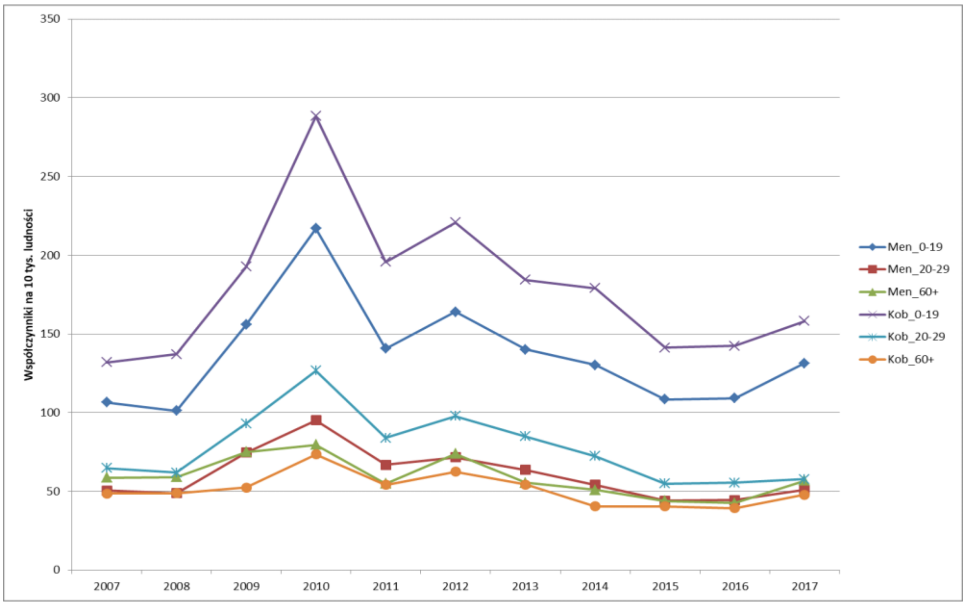
Poisoning by mushrooms is relatively rare because in the years 2007-2017, the average number of persons poisoned by mushrooms was 325 (from 152 to 586 in the following years). There was no clear upward trend in the frequency of hospitalisation for poisoning, but there were some clear fluctuations in the frequency of hospitalisation for poisoning by mushrooms. This was probably related to the cycles of abundance of mushrooms in the following years.

Children (aged 0-19) were definitely more frequently hospitalised than adults. There were marked differences in the frequency of hospitalisation between the youngest and the oldest group, regardless of their place of residence. Children from urban and rural areas were equally likely to become victims of poisoning by mushrooms. On the other hand, patients aged 20 or older were clearly less frequently treated for poisoning by mushrooms.

3.11.4 Hospitalisation for poisoning by carbon monoxide

The issue of carbon monoxide poisoning is each year widely commented by media as an important problem which needs to be addressed. In Poland, in the years 2007-2017, the average number of hospital stays for poisoning by carbon monoxide was 3,262 and it fluctuated in individual years from 2,419 to 5,137, with the largest number of carbon monoxide poisoning cases recorded in 2010.

From 2007, the frequency of hospitalisation for poisoning by carbon monoxide was increasing in nearly all age and sex groups, and then, from 2010 was regularly decreasing, reaching in 2017 nearly the same level as in 2007. The patients who were the most frequently treated in hospitals were children aged 0-19. It is important to note that they were hospitalised nearly twice as often as people from the other age groups. Boys from urban areas (aged 0-19) were the most frequently hospitalised for poisoning by carbon monoxide.



Ryc. 3.32. Hospitalizacja z powodu zatruć tlenkiem węgla w latach w Polsce 2007-2017 wg wieku i płci (dane NIZP-PZH)

Fig. 3.32. Hospitalisation for carbon monoxide poisoning by sex and age group in Poland, 2007-2017 (NIPH-NIH data)

3.11.5 Hospital fatality for poisoning in Poland

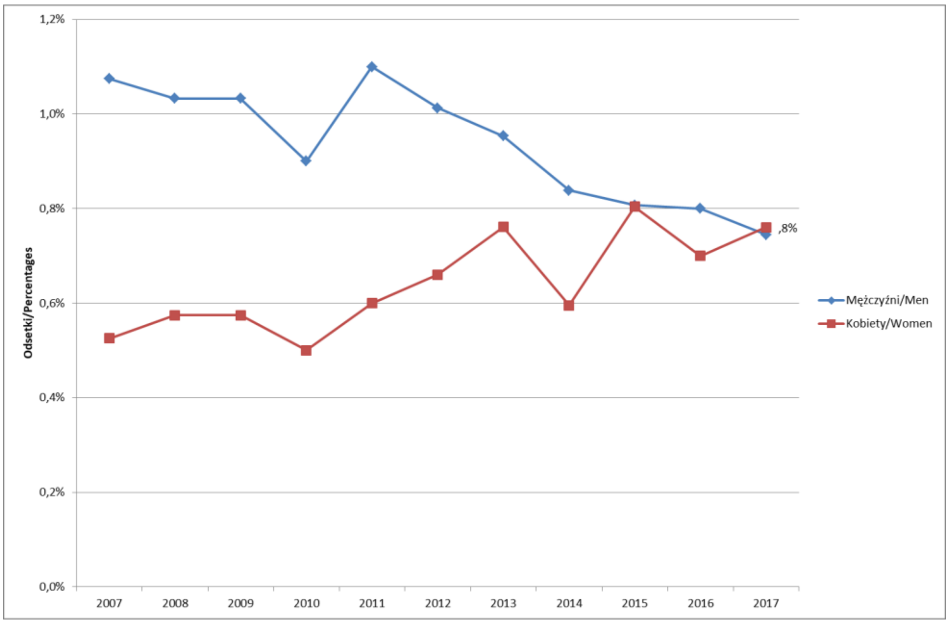
In the years 2007-2017, the average number of persons who were treated and died in Polish hospitals due to poisoning was 349 (from 302 to 405 deaths annually).

As Figure 3.3. shows, the percentage of deaths as compared to the number of patients treated for this cause (hospital fatality) was significantly decreasing among men and increasing among women, and reached nearly identical value of 0.8% in 2017. The fatality rate for this cause seems to be relatively small compared to the total hospital fatality for all causes and recorded in all hospitals, which in the years 2007-2017 was below 3%.

It is important to bear in mind that, as noted in the introduction, in 2017, in Poland, the total number of deaths due to poisoning was 1,288, while the number of persons who died in Polish hospitals due to poisoning was 302, which represents 23% of the first figure. Therefore, the three out of every four deaths due to poisoning occurred out of hospital.

The highest risk of death during hospital treatment was recorded for the group of patients suffering from poisoning by pesticides (4.2% of deaths; 7 per 160 treated patients), organic solvents (4.1%; 15 per 351 treated patients), or chemical substances primarily affecting specific systems and blood components (3.7%; 112 per 2,911 patients hospitalised for this cause).

The risk of death due to poisoning by alcohol and narcotic drugs is relatively lower than for poisoning by pesticides, solvents and chemical substances affecting specific systems, respectively – 0.55% in 12,785 hospitalised patients and 0.4% of deaths in 3,541 treated patients).



Ryc. 3.33. Śmiertelność szpitalna leczonych z powodu zatruć w Polsce wg płci w latach 2007 – 2017 (dane NIZP-PZH)
Fig. 3.33. Hospital fatality among patients treated for poisoning by sex in Poland, 2007 – 2017 (NIPH-NIH data)

In brief, it may be said that

- regardless of sex and place of residence, in the years 2007-2017, children aged 0-19 were the most frequently hospitalised for poisoning and the oldest patients (aged 60 or older) were the least frequently hospitalised for poisoning);
- in the years 2007-2017, the frequency of hospitalisation for poisoning among men and women had been increasing until 2015, and then, decreased to the level recorded in 2007. The rates of hospitalisation among men were nearly 50% higher than those among women;
- in the years 2007-2017, the frequency of hospitalisation for poisoning among inhabitants of urban areas was markedly higher than the frequency of hospitalisation among the inhabitants of rural areas.

3. 12. Hospitalisation in Polish hospitals for COVID-19

The data presented below are from the Nationwide General Hospital Morbidity Study carried out according to the Programme of Statistical Surveys for the Purpose of the Official Statistics for 2020.

According to the guidelines implemented by the World Health Organisation in relation to COVID-19 pandemics, codes corresponding to two new disease entities were included to the International Statistical Classification of Diseases and Related Health Problems (ICD-10):

1. U07.1 COVID-19 – when the COVID-19 virus has been confirmed by laboratory testing (molecular testing by means of RT-PCR method), cases confirmed according to the definition of cases of infectious diseases for the purpose of epidemiological control,
2. UO7.2 COVID-19 – when the virus has not been identified and COVID-19 was confirmed by clinical symptoms or epidemiological criteria, but laboratory testing is inconclusive or not available.

From the set of data collected by NIPH-NIH as part of the above-mentioned 2020 study on hospital morbidity, we selected a subset of data concerning persons staying in hospitals to whom one of the two above-mentioned codes was assigned at the discharge as the main cause for hospitalisation.

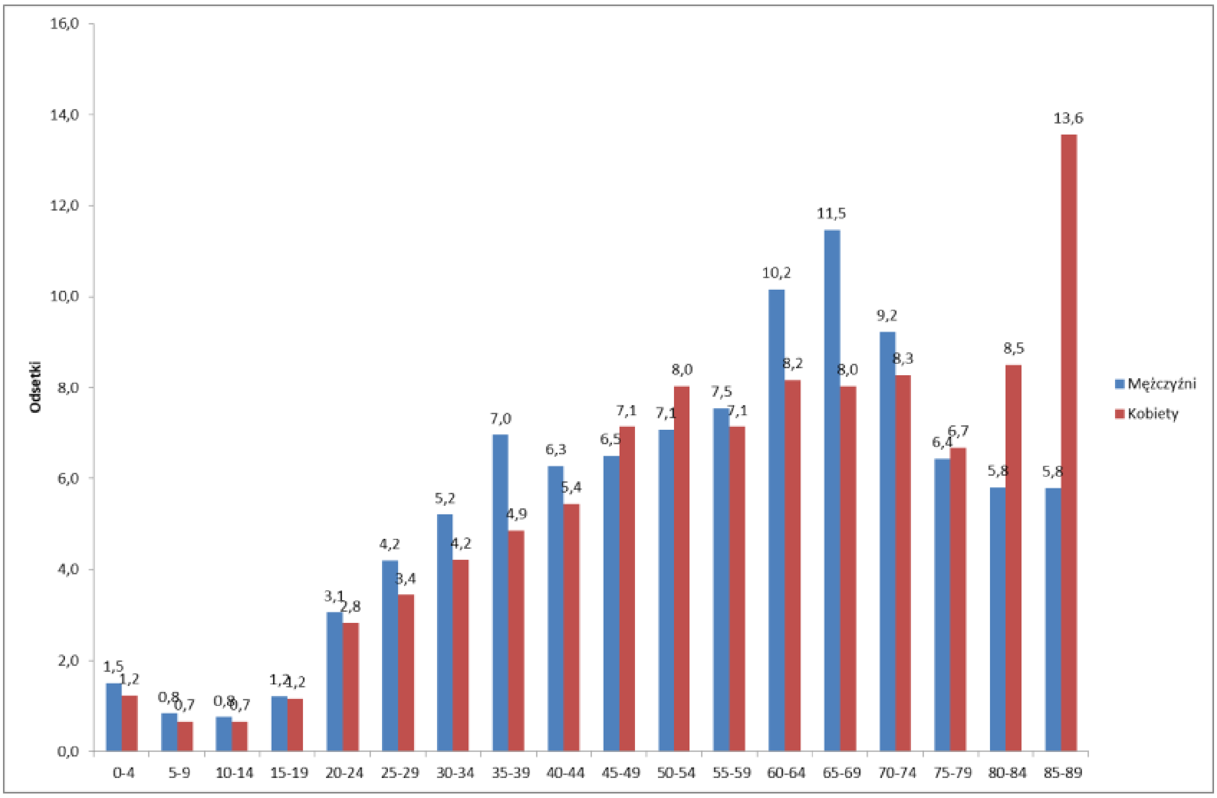
As part of a preliminary analysis of the data collected during the pandemics, we discussed some basic statistical features of this group of patients.

The number of hospitalised cases subject to analysis included 8,904 patients (the most recent data were entered in the NIPH-NIH database on 30 September 2020) which represents 43% of all cases registered by the Chief Sanitary Inspectorate under fortnightly reports on infectious diseases.

The analysis of the data set shows that 96% of patients were admitted to the hospital as: "a person brought in by an emergency response team"[39] - 22% or "admitted in emergency mode – other cases" - 74%. The number of hospitalised patients included 51% of men and 49% of women aged on average 55.6 and 59.6, respectively, meaning that the hospitalised men were

[39] Categories "Modes of admission to hospital" – General hospital statistical form Mz/Szp-11.

younger than women and the difference was statistically significant. Fig. 3.34 illustrates the age structure of the hospitalised men and women.



Ryc. 3. 34. Struktura wieku mężczyzn i kobiet hospitalizowanych z powodu COVID-19 w 2020 r.

Fig. 3.34. Age structure of men and women hospitalized for COVID-19 *in March-September 2020*

As the figure shows, men representing nearly all age groups, except for the oldest, over the age of 75, were hospitalised more frequently than women, but there were more than twice as many women in the group aged 85 or older. It should be noted that the youngest group, aged 0-4, included 122 patients and 5 infants born in hospital were infected with COVID-19.

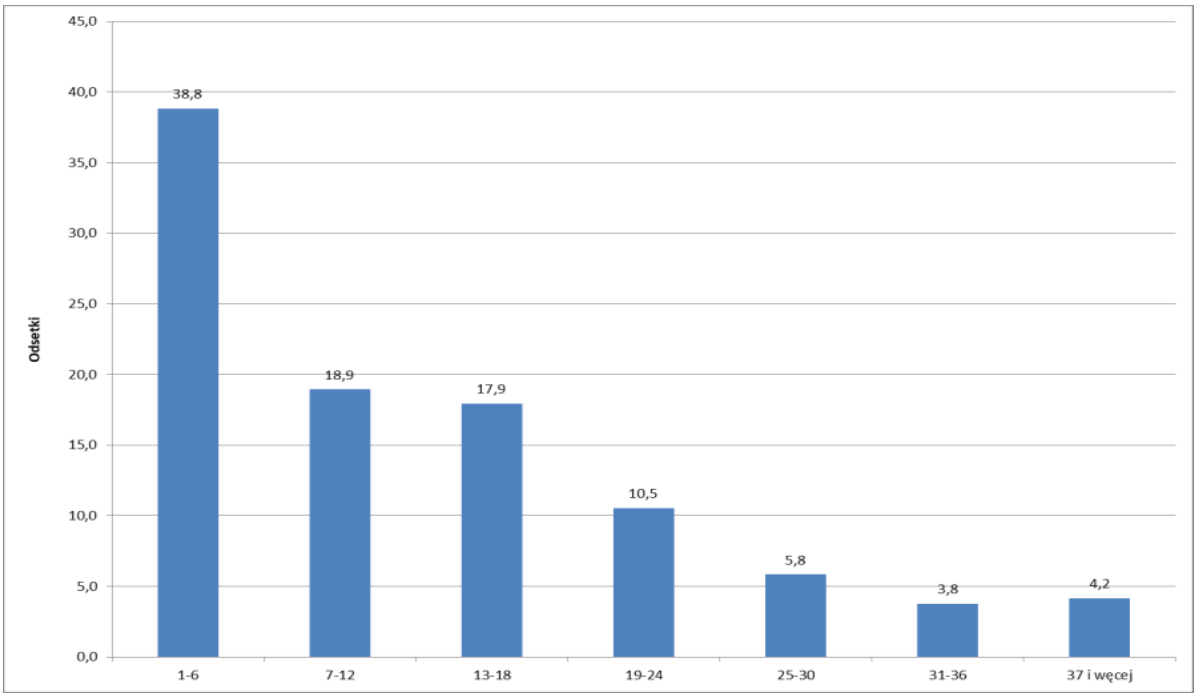
As many as 948 patients were discharged on the day of admission to the hospital, and for 34% of them the therapeutic procedure was considered completed, 32% were referred to another hospital and 24% were "referred for further treatment in a medical facility conducting therapeutic activities in the form of inpatient and 24-hour healthcare". 3% of patients staying in a hospital for one day (not staying for the night) died. It should be noted that the ICD-10 = U07.2 code was assigned to a large group of "one-day" patients as the main cause of hospitalisation, so in their case COVID-19 was not confirmed by laboratory tests.

Tabela. 3.5. Leczeni w szpitalach w Polsce z powodu COVID-19 wg. miejsca zamieszkania i płci

Table. 3.5. Men and women hospitalised in Poland for COVID-19 *by place of residence, March-September 2020*

Płeć/*Sex*	Miasto/*Urban*		Wieś/*Rural*		Ogółem/*Total*
	N	%	N	%	
Mężczyźni/*Men*	3,823	84.7	693	15.3	4,516
Kobiety/*Women*	3,608	82.2	780	17.8	4,388
Ogółem/*Total*	7,431	83.5	1,473	16.5	8,904

The majority of patients treated in Polish hospitals for COVID-19 lived in urban areas and only 16.5% represented the inhabitants of rural areas (Tab. 3.5.). The question is whether this is related to the lesser morbidity among inhabitants of rural areas or poorer availability of hospital treatment.



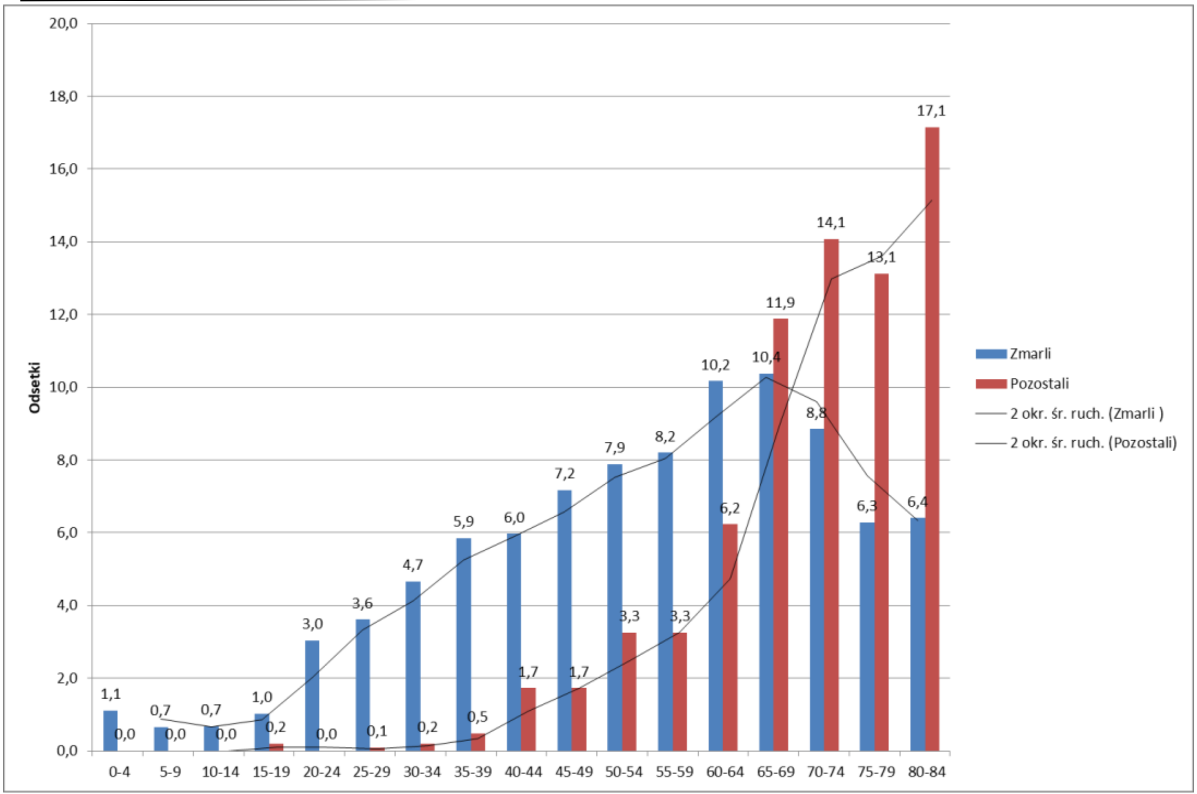
Ryc. 3.35. Struktura długości pobytu w szpitalu leczonych z powodu COVID-19 w 2020 r.
Fig. 3.36. Length of hospital stay for patients hospitalized for COVID-19, *March-September 2020.*

The length of hospital stay among patients treated in Poland for COVID-19 was 11.8 days among men and 12.3 days among women, and this difference was statistically significant. Due to skewed distribution, the median for hospital stay was lower and equalled 10 days, however, the length of the hospital stay among all patients diagnosed with COVID-19 and treated in hospitals varied from 1 to 131 days. It should be noted that, on average, inhabitants of urban areas stayed at the hospital for 12 days while inhabitants of rural areas for 14 days, and this difference was statistically significant.

What needs to be accounted for are comorbidities among persons admitted to hospitals for COVID-19. Data from the Nationwide General Hospital Morbidity Study shows that the most frequently diagnosed groups of comorbidities were, in the order of their prevalence, diseases of the respiratory system (10.9%), diseases of the circulatory system (8.7%), and endocrine disorders (2.5%). As far as specific diagnoses are concerned, they included essential (primary) hypertension (I10), viral pneumonia (J12), pneumonia, unspecified organism (J18), acute respiratory failure (J96), congestive heart failure (I50), type II diabetes (E11), atherosclerosis (I70), and chronic kidney disease (N18). Unfortunately, in many cases doctors did not record any comorbidities for patients admitted to hospitals for COVID-19, and therefore, it is impossible to draw any valid conclusions about the range of comorbidities in patients hospitalised for COVID-19.

During their hospital stay, some patients treated for COVID-19 died. There were 1,044 such cases, representing 13% of all hospitalised patients. It should be noted that most of the deceased patients, 16.7%, were from rural areas and only 12.4% were from urban areas. At the same time, the percentage of deceased men was significantly higher than that for deceased women (14% and 12%, respectively).

Fig. 3.36 illustrates the distribution of the deceased and other patients by age. The age of the deceased was significantly different than the age of other patients, and was, respectively, 57 and 75. It should be noted that 3.4% of patients staying in hospitals for only 1 day died, while for the other patients this was 13%.



Ryc. 3.36. Struktura wieku zmarłych i pozostałych hospitalizowanych mężczyzn i kobiet z powodu COVID-19 w 2020 r.

Fig. 3.36. Death rates among men and women hospitalized for COVID-19 *by age in March-September 2020.*

SUMMARY

1. In 2018, 3,833,000 men and 4,791,000 women were hospitalised in general hospitals in Poland. The total rate of hospitalisation was 2.093 per 10,000 population. Hospital patients were most frequently treated for diseases of the circulatory system (13% of hospitalised patients), all types of neoplasms, injuries or poisoning (10.2% and 8.7% of hospitalised patients, respectively) and diseases of the genitourinary, digestive or respiratory systems (7.4%, 7.2%, 6.3% of hospitalised patients, respectively).

2. In absolute numbers, women were more frequently hospitalised than men (the difference is 861,000), although, the analysis of major causes of diseases shows that, following standardisation of the rates of hospitalisation, men were at a higher risk of hospitalisation for most of the main causes of hospital stays. The standardised rates of hospitalisation among women were higher only for the following: diseases of the nervous system, hypertensive disease, neoplasms, endocrine disorders, and diseases of the genitourinary system.

3. Men and women from urban areas were treated in hospitals 15% more frequently than inhabitants of rural areas, and this difference increased compared to previously published reports, which suggests a drop in the availability of the hospital treatment for inhabitants of rural areas. However, there are certain causes of hospitalisation, such as burns, frostbites and pneumonia for which inhabitants of rural areas, both men and women, were hospitalised more frequently. Women from rural areas were hospitalised more frequently than women from urban areas for chronic diseases of the lower respiratory system, injuries and poisoning.

4. From 2003 onwards, many countries recorded a decrease in the rate of hospitalisation. Poland is among the EU Member States with a moderate frequency of hospitalisation in general, with a slight upward trend (by 30%), although in the last year of the analysis (2018), the rate of hospitalisation slightly decreased.

5. Hospitalisation in Poland is different than in the majority of EU Member States in relation to the high frequency of treatment provided to the youngest (under the age of 5) and the significantly less frequent hospitalisation of the oldest persons (over 75 years of age).

6. In Poland, the total length of hospital stay for all causes is one of the shortest in the EU, however, it is the longest for certain diagnoses, for example, in the case of hospitalisation for treatment of appendicitis and cataract.

7. The current, relatively low, hospital fatality for myocardial infarction in Poland confirms good quality of hospital treatment. The fatality for this cause decreased in the years 1980-2018 by threefold, from 22% to 5.9%. On the other hand, the 30-day fatality for myocardial infarction, published for Poland by OECD, was equal to 4.1%[40] and, following Iceland (2.3%), Norway and Denmark, is the third lowest among the member countries of the Organisation.

8. On the other hand, fatality for cerebellar stroke is disturbingly high in Poland. The proportion of hospital deaths due to cerebral haemorrhages has even worsened (28.5% in 2004 and 33.5% in 2018). There was some improvement in fatality rates for ischaemic stroke (14.2% in 2004 and 11.2 in 2018) and unspecified stroke (from 23.7% in 2004 to 14.3% in 2018), although there were certain fluctuations in 2004-2014.

9. The rates for the quality of healthcare established by OECD and based on hospitalisation

[40] For persons aged 45 or older.

rates, excluding hospitalisation for diabetes, were higher than for the “old EU” Member States, although these are showing some improvement.

10. In the years 2007-2017, children aged 0-19 were the most frequently hospitalised and the oldest patients (aged 60 or older) were the least frequently hospitalised for poisoning, regardless of their sex and place of residence.
11. In the years 2007-2017, the frequency of hospitalisation for poisoning among men and women showed an upward trend until 2015 and then dropped to the level recorded in 2007. The rates of hospitalisation for men were 50% higher than those for women.
12. In the years 2007-2017, the frequency of hospitalisation for poisoning among the inhabitants of urban areas was markedly higher than among the inhabitants of rural areas.
13. In the group of patients hospitalised in Poland for COVID-19 from March to October, there were slightly more men than women (51% and 49%, respectively), with women admitted to hospitals being a little older (59.6 compared to 55.6 for men).
14. Across nearly all age groups up until the age of 70, there were more hospitalised men. But in the oldest group, there were twice as many women.
15. Inhabitants of rural areas represented only 16.5% of all patients hospitalised for COVID-19.
16. Women were hospitalised for COVID-19 for slightly longer periods of time than men (12.3 days for women and 11.8 days for men) and the inhabitants of urban areas stayed in hospitals for shorter periods than the inhabitants of rural areas (12 and 14 days, respectively).
17. 13% of patients hospitalised for COVID-19 died, with the number of deceased inhabitants of rural areas being higher (16.7% and 12.4%, respectively). The death rate for men was higher than that for deceased women (14% and 12%, respectively).

4. INCIDENCE OF MALIGNANT NEOPLASMS IN POLAND

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The source of information on the incidence of cancer in Poland is the National Cancer Register (Krajowy Rejestr Nowotworów - KRN). The KRN operates pursuant to the Regulation of the Minister of Health (Journal of Laws of 2018, item 1197). Data on cancer incidence have been available since mid-1960s[41]. Annual reports on the epidemiological situation regarding cancer have been published since 1979, whereas data on incidence have also been published on the website operated by the National Cancer Register since 1999[42].

Neoplasms have always accompanied human population, as the first mentions of cancer cases in people date back to over 3000 years BC, and descriptions indicating breast tumours can be found in the Code of Hammurabi (1950 BC) and in the Ebers Papyrus (around 1660 BC)[43] The problem of cancer diseases is a huge health, social and economic challenge nowadays worldwide, irrespective of the affluence level of a given country.

The number of cancer cases worldwide in 2018 was estimated by an international expert team at over 18 million[44], out of which over a fifth can be attributed to Europe. The most frequently diagnosed neoplasm in men in Europe is prostate cancer (23.2%), and breast cancer in women (28.7%)[45].

The 20th century in Poland saw the so-called demographic transition characterised by the gradual shift in the age structure of the population resulting from the reduction of women fertility rates, the older age on which they give birth to their first child and next children, the decreasing rate of natural increase, and the increase in the average life expectancy. In the 21st

[41] Koszarowski T., Gadomska H., Wronkowski Z., Romejko M.: Nowotwory złośliwe w Polsce w latach 1952-1982. (Malignant Neoplasms in Poland in 1952-1982). The Maria Sklodowska-Curie National Research Institute of Oncology, Warsaw 1987

[42] http://onkologia.org.pl/

[43] Berner J. Rak piersi od starożytności do współczesności (Breast Cancer from Antiquity to Contemporary Times). NOWOTWORY Journal of Oncology, 2012, 62 (1), 42–48.

[44] Bray F, Ferlay J, Soerjomataram I, Siegel RL, Torre LA, Jemal A. Global cancer statistics 2018: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. CA Cancer J Clin, Published online 12 September 2018; http://dx.doi.org/10.3322/caac.21492

[45] Source: ECIS - European Cancer Information System; https://ecis.jrc.ec.europa.eu, accessed on 10.09.2020 © European Union, 2020

century, the trends gained momentum, which has led to the increase in the number of the elderly (over 65 years old) in society (6.4 million in 2017), and their growing share in general population (16.7% in 2017). Despite the fact that demographic and health-related processes, which can currently be observed in Poland, occurred somewhat later than in developed countries, in particular in Western European countries, chronic diseases, including cancer, are currently a major health issue in Poland.

Over the last five decades, the epidemiology of cancer in men in Poland was dominated by three affected locations - gastric cancer which was dominant until early 1970s, lung cancer, the frequency of which was increasing until the first half of 1990s, and prostate cancer, which has been the most frequent neoplasm in men for two years now (Tab. 1). As regards women, until the early 1970s, cervical cancer was the most frequent type of cancer, yet the drop in the frequency of this neoplasm and a rapid growth of incidence of breast cancer have resulted in changes. The most frequent cancer types in women currently include breast cancer, colorectal cancer and lung cancer (Tab. 4.1).

Table 4.1 Cancer cases by gender in Poland in 1970 and in 2017.

MEN	1970				2017			
	Number	**%**	**Crude rate**	**Age-adjusted rate (ESP 2013)**	**Number**	**%**	**Crude rate**	**Age-adjusted rate (ESP 2013)**
Total	**27,101**		**171.6**	**354.1**	**82,450**		**443.6**	**565.9**
Stomach	5329	19.7	33.7	72.7	3261	4.0	17.5	23
Colon	1566	5.8	9.9	21.6	10,178	12.3	54.8	71.4
Lung	5019	18.5	36.6	72.4	13,798	16.7	74.2	93.0
Melanoma	264	1.0	1.4	2.3	1796	2.2	9.7	11.9
Prostate	1163	4.3	7.4	23.3	16,253	19.7	87.4	114.8
Kidney	451	1.7	2.9	5.3	3,144	3.8	16.91	20.2
Bladder	972	3.6	6.2	15.3	5,488	6.7	29.5	39.9

WOMEN	1970				2017			
	Number	**%**	**Crude rate**	**Age-adjusted rate (ESP 2013)**	**Number**	**%**	**Crude rate**	**Age-adjusted rate (ESP 2013)**
Total	**28,813**		**172.2**	**263.9**	**82,425**		**415.6**	**406.7**
Stomach	3,075	10.7	17.5	32.1	1,953	2.4	9.8	9.7
Colon	1,734	6.0	10.4	17.5	10,178	12.3	54.8	71.4
Lung	1,002	3.5	6.0	8.9	7,747	9.4	74.2	93.0
Melanoma	217	0.8	1.6	2.2	1,796	2.2	9.7	11.9
Breast	3,862	13.4	32.1	32.8	18,529	22.5	93.4	91.3
Endometrial cancer					5,488	6.7	30.2	29.6
Cervical cancer	5,487	19.0	32.8	41.9	2,502	3.0	12.6	12.3

Ovary	1,569	5.4	9.3	12.7	3,775	4.6	19.0	18.8

The past fifty years (1970-2017) saw the growth in the number of cases of over 55,000 (27,101 versus 82,450) in men, and nearly 54,000 in women (28,813 versus 84,425). The increase in the number of cases affected the incidence rate values, both crude and age-adjusted ones. The increase in the incidence of cancer in the initial stage until the early 1980s should be associated with the improvement in the complete registration of malignant neoplasms. In the male population, since the beginning of the 1980s, there has been an upward trend in incidence values, expressed as crude incidence rates, which amounted to $444/10^5$ in 2017. Age-adjusted[46] incidence rates in men were characterised by a rapid increase between 1965 and 1995. After 1995, the growth rate significantly decreased, and incidence expressed in age-adjusted rates rose from $548/10^5$ to $566/10^5$ between 1995 and 2017. As regards female population, the incidence, measured with the use of both crude and age-adjusted rates, is characterised by an upward trend, which has accelerated greatly since the beginning of the 1990s (Fig. 4.1). The trends in cancer incidence show various patterns depending on the age of the patients (Fig. 4.2 and 4.3).

[46] The age-adjusted rates used in this study were calculated by applying the European Standard Population, revised in 2013 - ESP 2013, https://ec.europa.eu/eurostat/documents/3859598/5926869/KS-RA-13-028-EN.PDF/e713fa79-1add-44e8-b23d-5e8fa09b3f8f

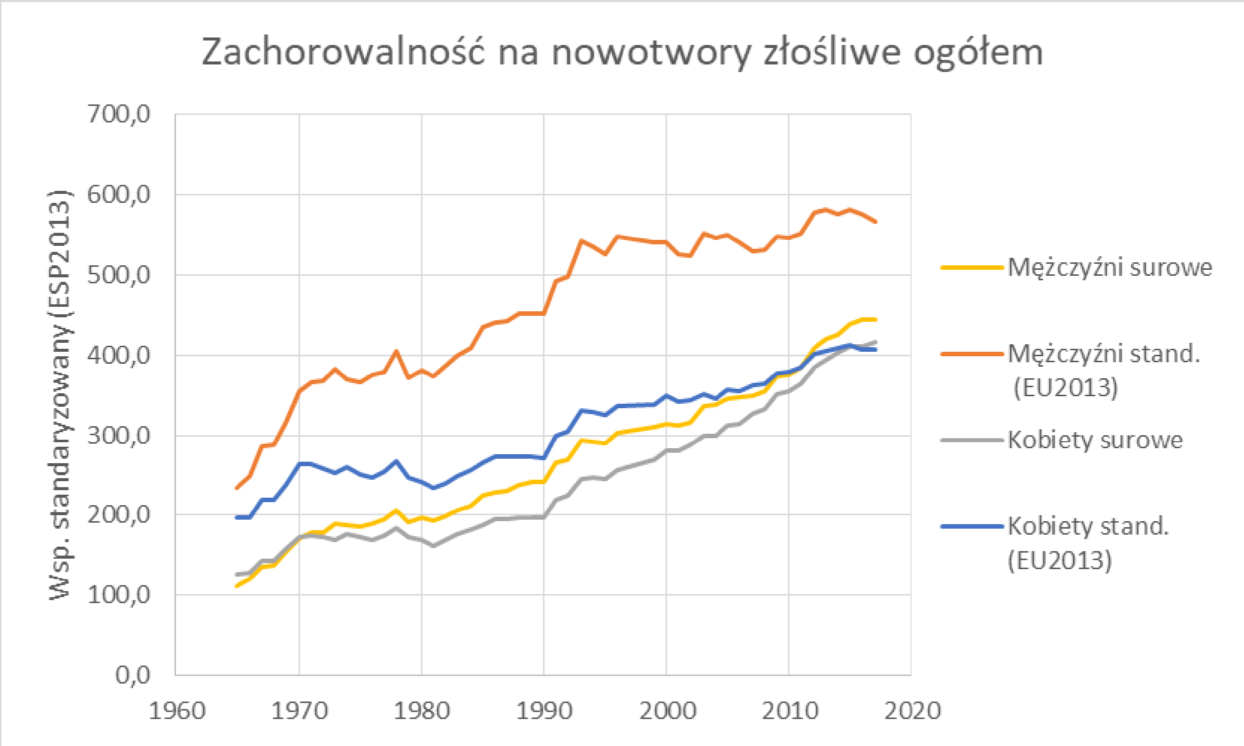

Fig. 4.1. Cancer incidence trends, Polish total in 1965-2017

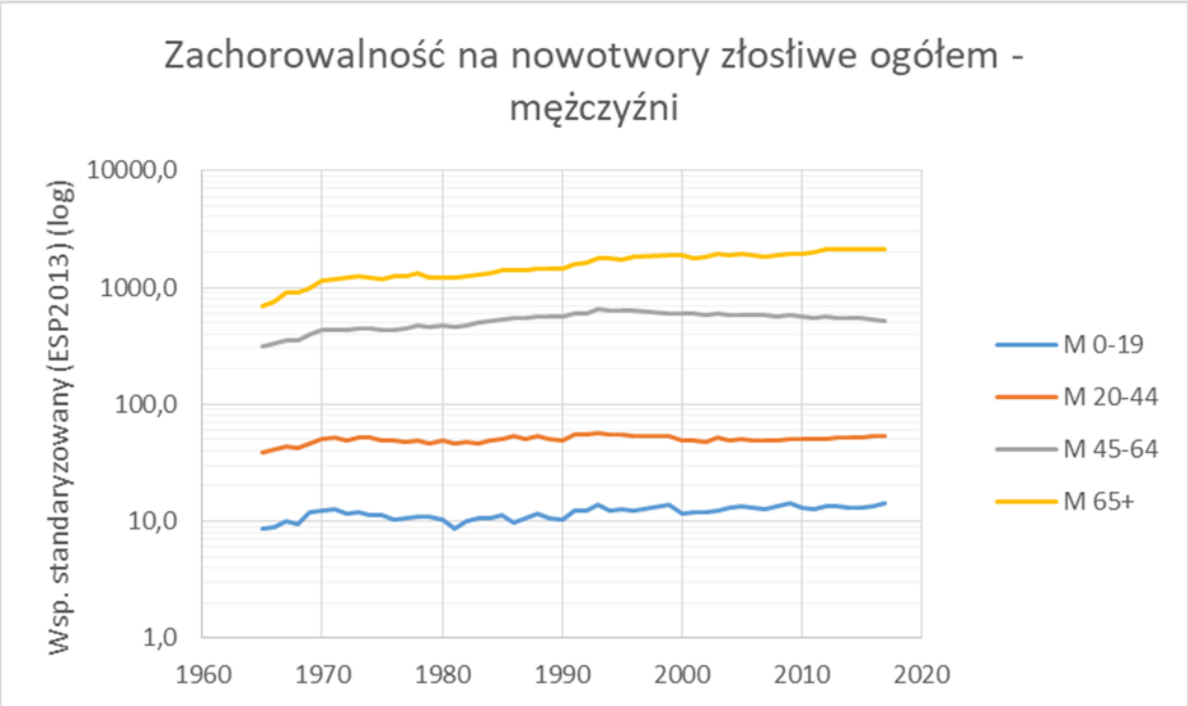

Fig. 4. 2. Cancer incidence in men in Poland in 1965-2017

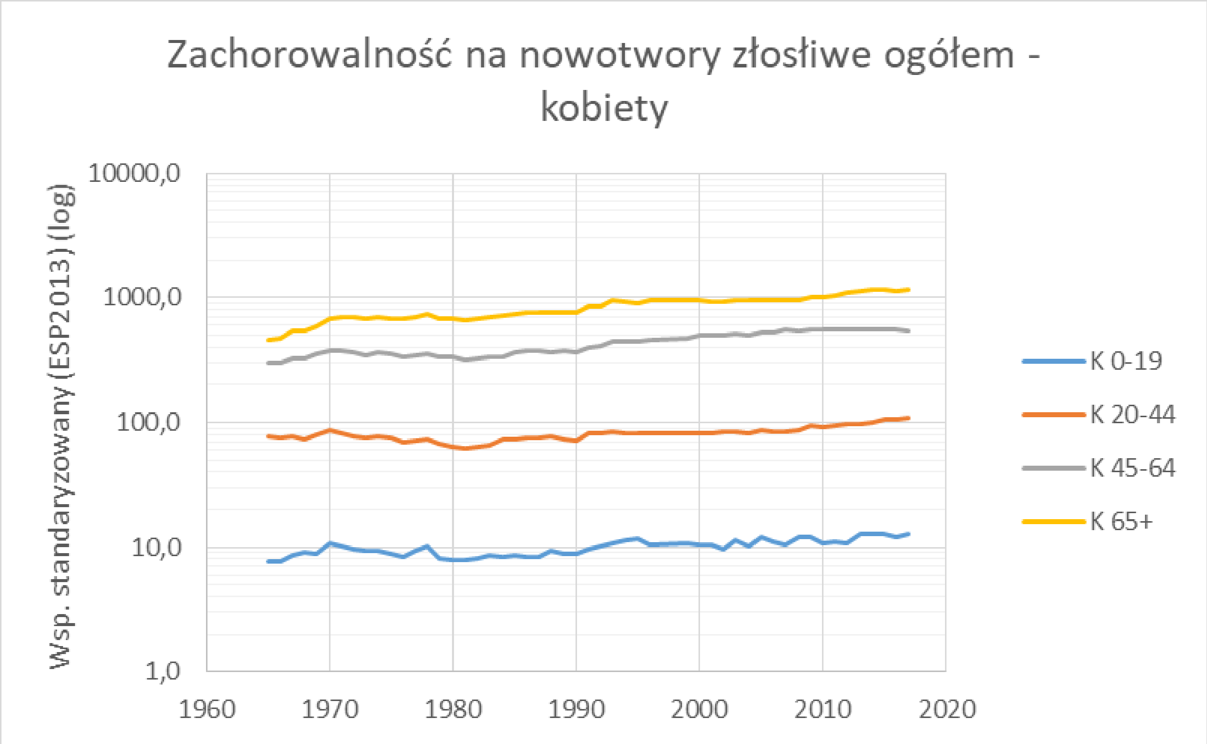

Fig. 4.3. Cancer incidence in women in Poland in 1965-2017

Cancer diseases in children (0-19 years old) are relatively rare (in 2017, the incidence among boys amounted to $14/10^5$, and among girls - $13/10^5$). A slight upward trend can be found both for girls and boys. The morbidity structure for cancer is significantly different in this age group from the pattern in the group of adults. As regards paediatric cancer, the most common types in Poland included leukaemia, lymphomas and brain cancer (accounting for approx. 56% of cases, and approx. 60% of deaths).

Among young adults (20-44 years old) incidence rates (ESP2013) in women are nearly twice higher than in men (in 2017 - $109/10^5$ versus $53/10^5$), and this gap, unfavourable to women, has been growing since the early 1980s. Incidence in men has remained at a steady level for the last fifty years. Incidence among women has been increasing slightly until the end of the 20th century. However, in the last decade the increase accelerated, as an increase of 33% was recorded for this value between 2004 and 2017. In 2017, the most common types of malignant neoplasms in young men included testicular cancer (24%), colorectal cancer (7%) and melanoma (7%). Among the young female population, the most common types were breast cancer (27%), cervical cancer (6%), ovarian cancer (5%) and colorectal cancer (4%).

Incidence of malignant neoplasms in middle-aged men (45-64 years old) was characterised by a rapid increase since early 1990s ($629/10^5$ in 1994), after which a shift to a downward trend occurred, as demonstrated by a rapid decrease in incidence rates (to $523/10^5$ in 2017). As regards the female population, the beginning of the 1990s saw an increased incidence growth rate, which significantly slowed down in the last decade. Since the beginning of the 1990s, the disparity between incidence in men and women was decreasing, and since 2010 incidence in middle-aged women has been higher than in men. The most common types of cancer in middle-aged men included lung cancer (18%), prostate cancer (17%), and colorectal cancer (12%). Among the middle-aged female population, the most frequently diagnosed cancer types included breast cancer (28%), lung cancer (9%) and endometrial cancer (9%).

In the oldest age group (over 65 years old) it is possible to observe a steady increase in incidence for both male and female populations, which was temporarily stopped at the turn of the centuries. As regards men in the oldest age group, the most common types of malignant neoplasms in 2017 were prostate cancer (23%), lung cancer (17%) and colorectal cancer (13%). Among women in the oldest age group, the most frequently diagnosed cancer types included breast cancer (18%), colorectal cancer (12%), and lung cancer (11%).

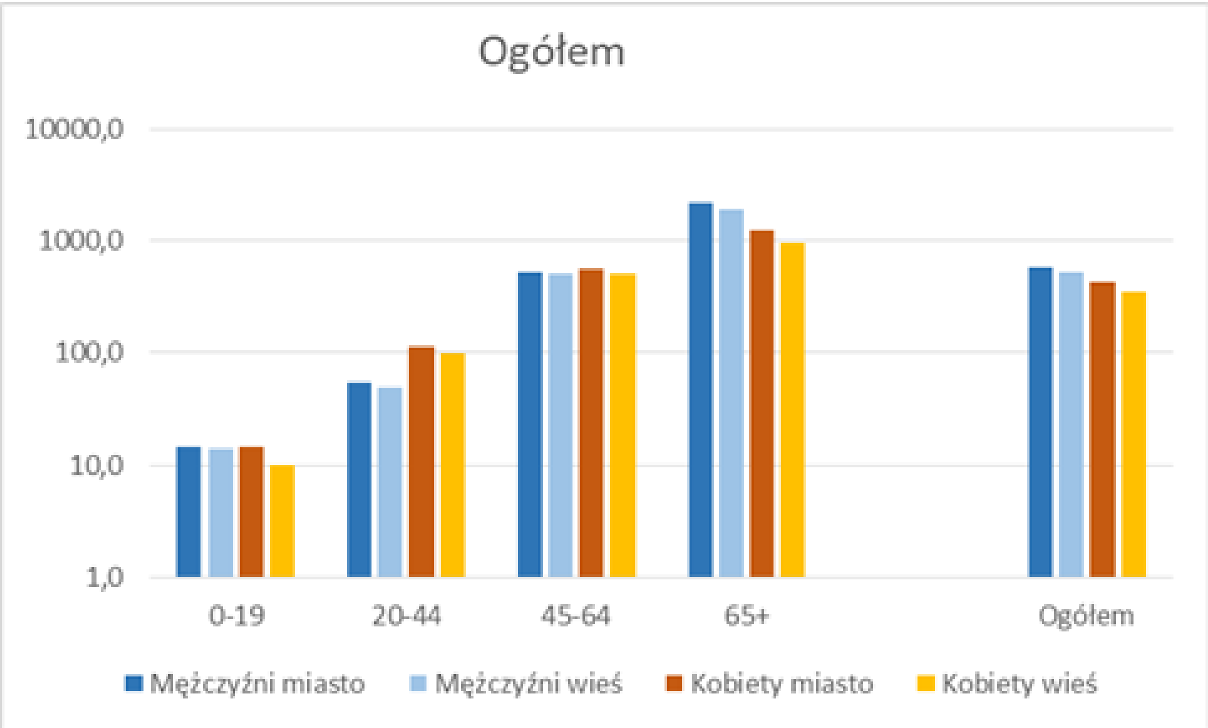

Fig. 4.4. Incidence of malignant neoplasms in total, by age and place of residence. Poland 2017 (age-adjusted rates per 100,000 inhabitants).

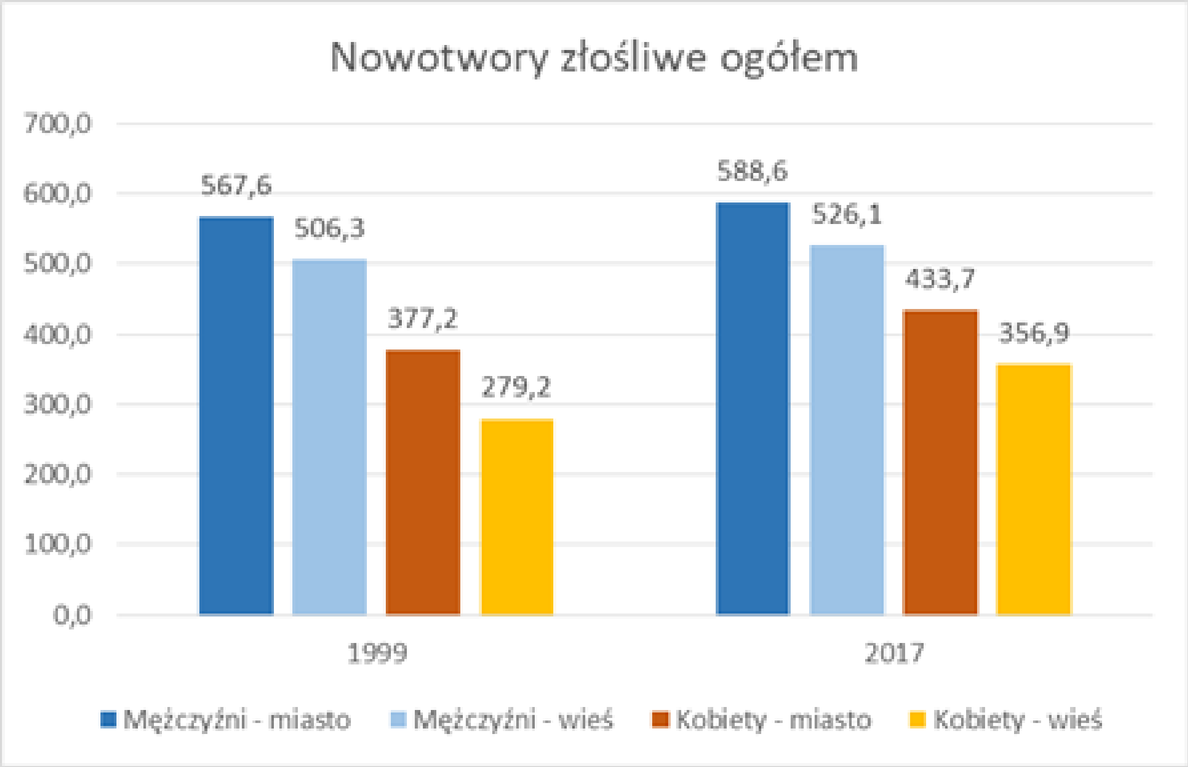

Fig. 4.5. Incidence of malignant neoplasms in total, by place of residence. Poland 1999 versus 2017 (age-adjusted rates per 100,000 inhabitants).

Place of residence is a differentiating factor as regards the risk of being diagnosed with cancer for both male and female populations, and in all age groups. The incidence among inhabitants of rural areas is lower than that among residents of urban areas (Fig. 4.4). The most insignificant difference in cancer incidence between the inhabitants of urban and rural areas is characteristic for middle-aged people (45-64 years old). Both in rural and urban areas the risk of cancer in young women is higher than the risk of young men being diagnosed with malignant neoplasms. Between 1999 and 2017, there was an increase in cancer incidence among the inhabitant of rural and urban areas, whereas the highest growth can be attributed to women from rural areas - with an increase of nearly $80/10^5$ (Fig. 4.5).

Trends in the incidence of malignant neoplasms in Poland in the past decades (1980-2017) were characterised by different patterns for men and women, where an essential disparity was found in changes to the incidence of tobacco-related cancers, as a reduction in rate values was observed in men (Fig. 4.6), whereas for women the rates significantly increased (Fig. 4.7).

As regards the male population, the highest rise in incidence was found for prostate cancer, colorectal cancer, and melanoma. Lung cancer, dominating incidence rates until the end of the 20th century, can be characterised by a long-term downward incidence trend (since 1995).

Similarly, as in the case of laryngeal cancer, the reduction in smoking frequency contributed to the steady downward incidence trend. The next cancer type characterised by a decreasing frequency is gastric cancer (Fig. 4.6).

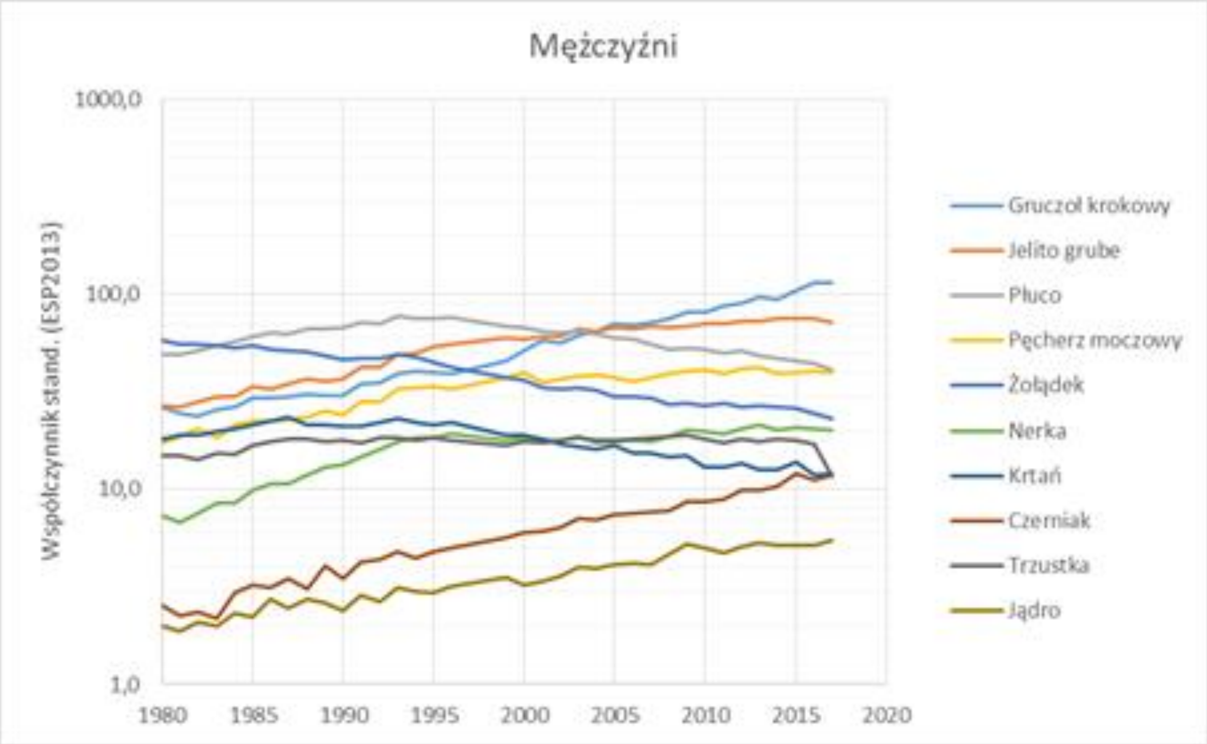

Fig. 4.6. Trends in the incidence of the most frequent cancers, men, Poland 1970-2017

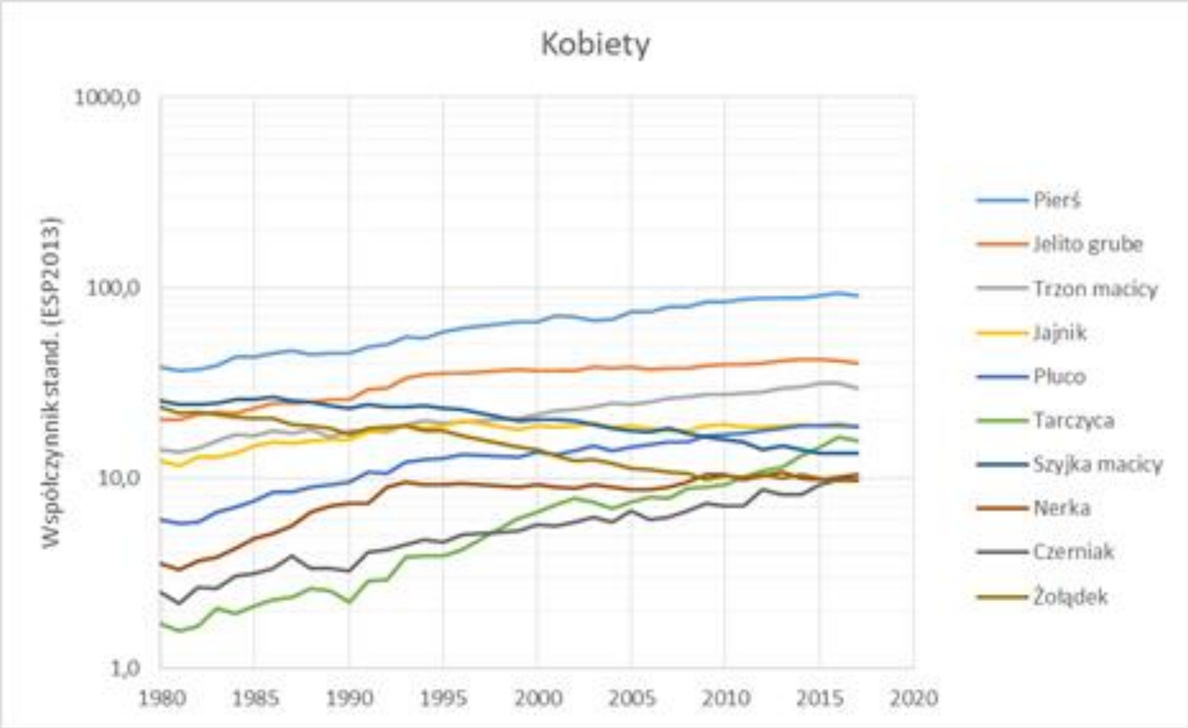

Fig. 4.7. Trends in the incidence of the most frequent cancers, women, Poland 1970-2017

As regards the female population, a downward trend can be observed only in the incidence of gastric cancer and cervical cancer. The highest incidence growth dynamics can be attributed to breast cancer, lung cancer, endometrial cancer, and thyroid cancer (Fig. 47).

The enactment of the National Oncological Strategy Act (NOS) paved the way for defining priorities aimed at facilitating a change in epidemiological trends and ensuring a more effective protection of Polish society against the outcomes of cancer diseases. The authors of the strategy indicated six neoplasms which respond well to primary prevention measures (lung cancer, cervical cancer, melanoma), to secondary prevention (breast cancer, cervical cancer, colorectal cancer), and those which pose a significant problem (prostate cancer).

4.1. Colorectal cancer

Colorectal cancer is the third most frequent malignant neoplasm in Poland, both in men and women, though the incidence is higher for men (in 2017 age-adjusted incidence rate for men amounted to $71/10^5$, and for women - $40/10^5$). Incidence of colorectal cancer, in both men and women, is characterised by a steady upward trend in the case of crude rates, and also in the case of age-adjusted rates for men. As for the female population after 1995, the growth dynamics of age-adjusted rates slowed down (Fig. 4.8.

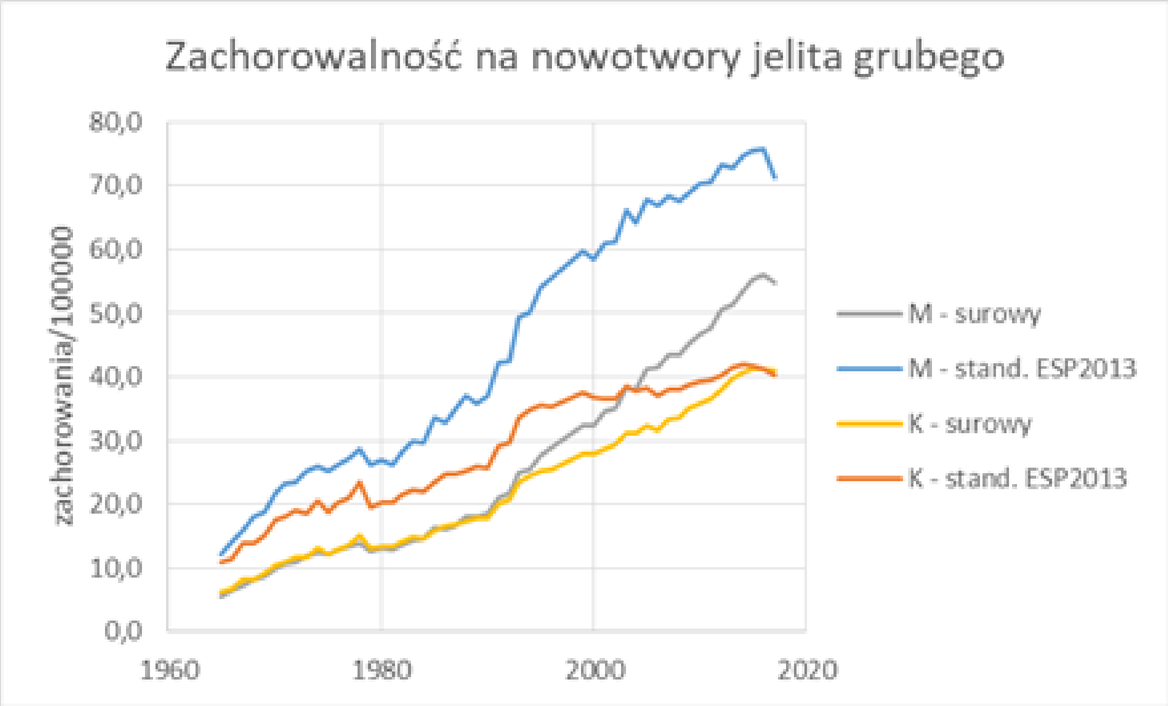

Fig. 4.8. Trends in the incidence of colorectal cancer, Poland 1970-2017

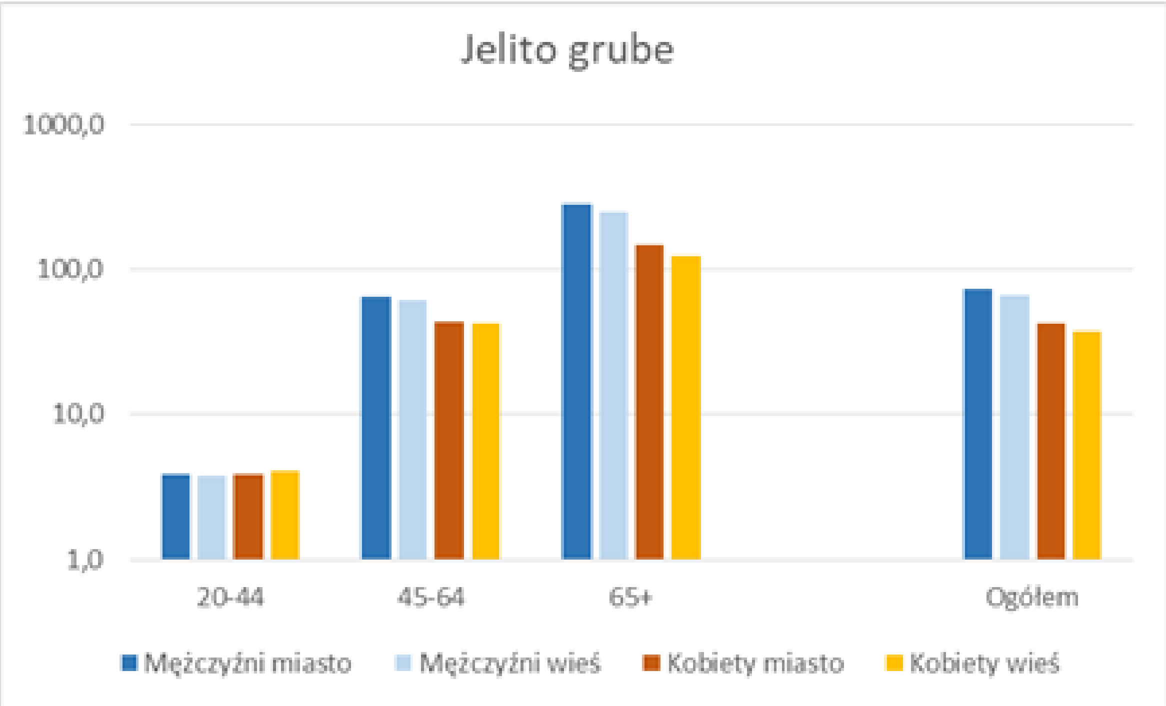

Fig. 4.9. Incidence of colorectal cancer, Poland 2017 (age-adjusted rates per 100,000 inhabitants).

Incidence of colorectal cancer is slightly higher among the inhabitants of urban areas than among the inhabitants of rural areas (Fig. 4.9). Incidence rates for men are at a similar level than those for women only in the young adult group (20-44), whereas in the remaining groups the risk for colorectal cancer is higher for men than for women. The increase in incidence between 1999 and 2017 was observed in the male population, both in urban and rural areas, while the incidence among women was at nearly the same level, both in the case of inhabitants of rural and urban areas (Fig. 4.10).

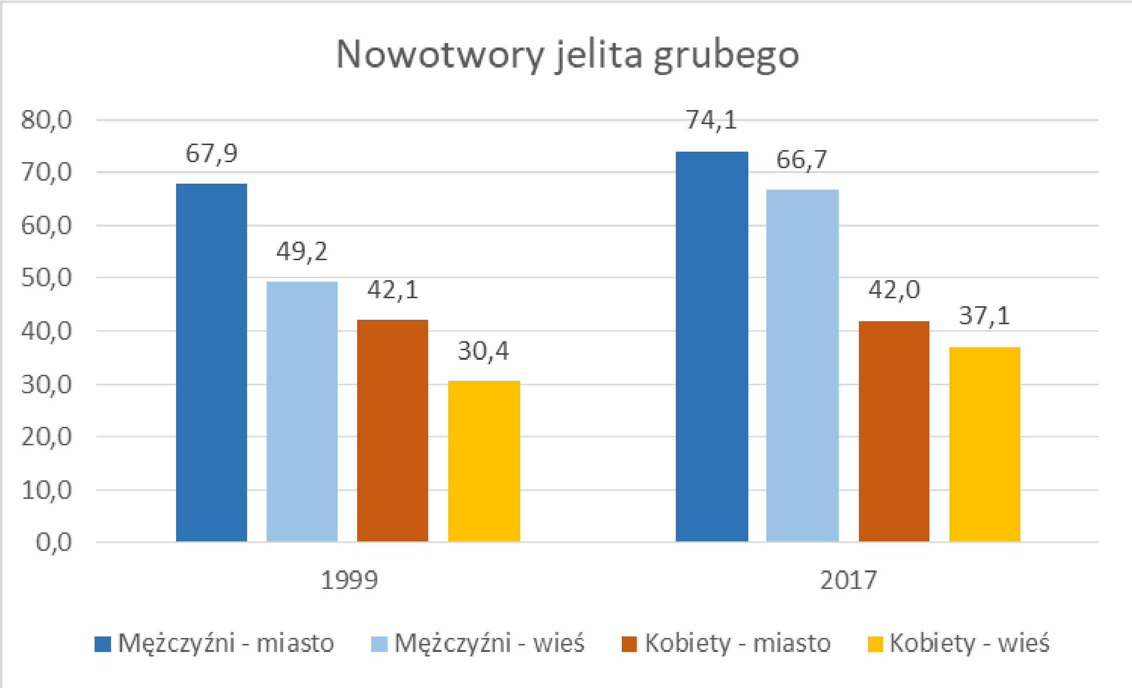

Fig. 4.10. Incidence of colorectal cancer, by place of residence, Poland, 1999 and 2017 (age-adjusted rates per 100,000 inhabitants).

4.2. Lung cancer

Lung cancer is the second most frequent malignant neoplasm in men, and third most frequent in women, though it is the most frequent cause of death among cancer diseases, both in men and women. Incidence among men, expresses both as crude and age-adjusted rates, was increasing until the first half of the 1990s, after which a reduction in the incidence was recorded. Crude indicator values decreased at a slower pace than age-adjusted indicators. Among the female population there is a steady increase in the incidence of lung cancer (Fig. 4.11). In 2017, the incidence of lung cancer among men was slightly higher for inhabitants of rural areas, whereas the incidence among women was higher for the inhabitants of urban areas (Fig. 4.12). A particularly substantial disparity in lung cancer incidence between the inhabitants of urban and rural areas is characteristic for the group of oldest women ($145/10^5$ versus $89/10^5$).

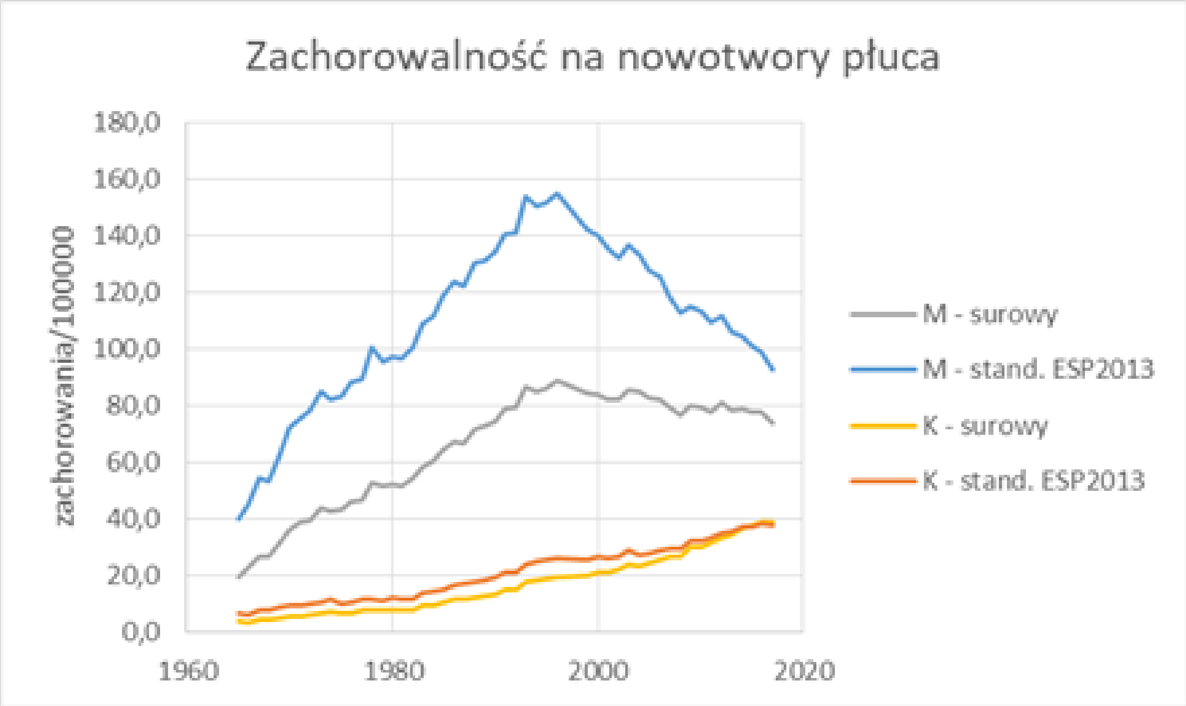

Fig. 4.11. Trends in the incidence of lung cancer, Poland 1970-2017

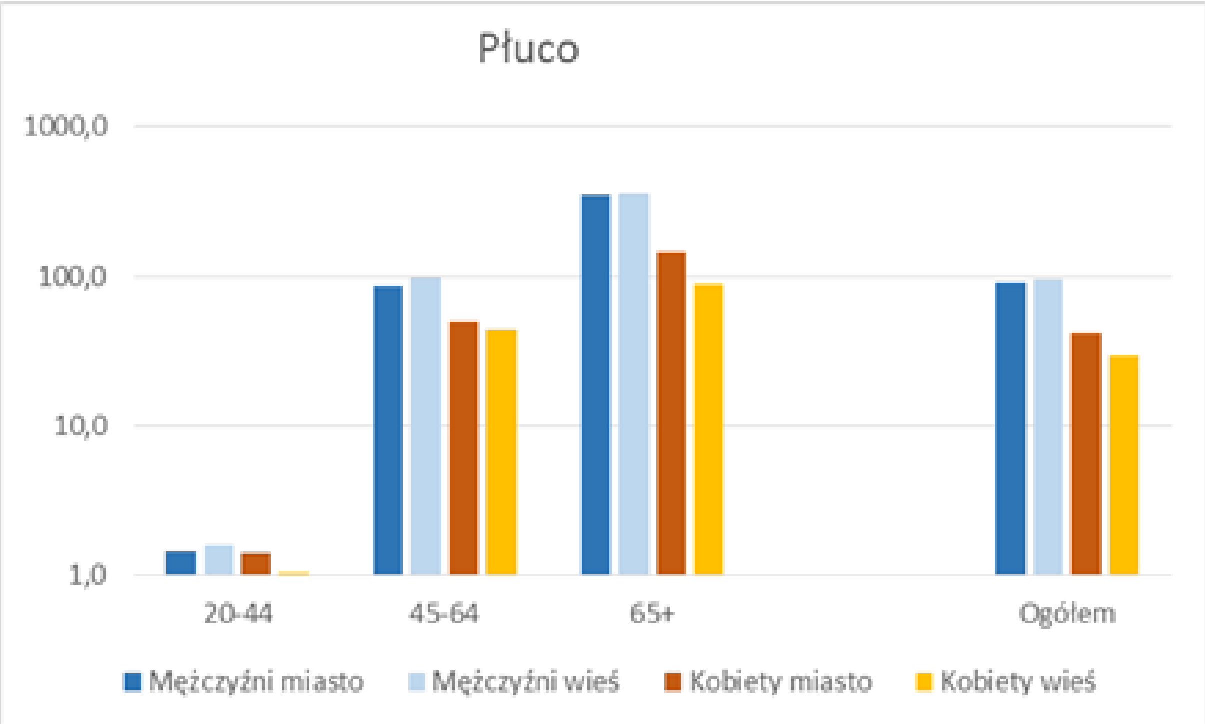

Fig. 4.12. Incidence of lung cancer, Poland 2017 (age-adjusted rates per 100,000 inhabitants).

By comparing the cancer incidence among the inhabitants of urban and rural areas in 1999 and in 2017, the same tendency as in the case of the general population can be observed.

The incidence among men decreased, both in urban and in rural areas, and the difference between age-adjusted rates was also reduced for both groups in question, although the incidence among men is still higher in rural areas than in urban areas. As regards the female population, the value of the rates was higher in both years among the inhabitants of urban areas, and increased during the period in question in both groups (by 35% in urban areas, and by 70% in rural areas) (Fig. 4.13).

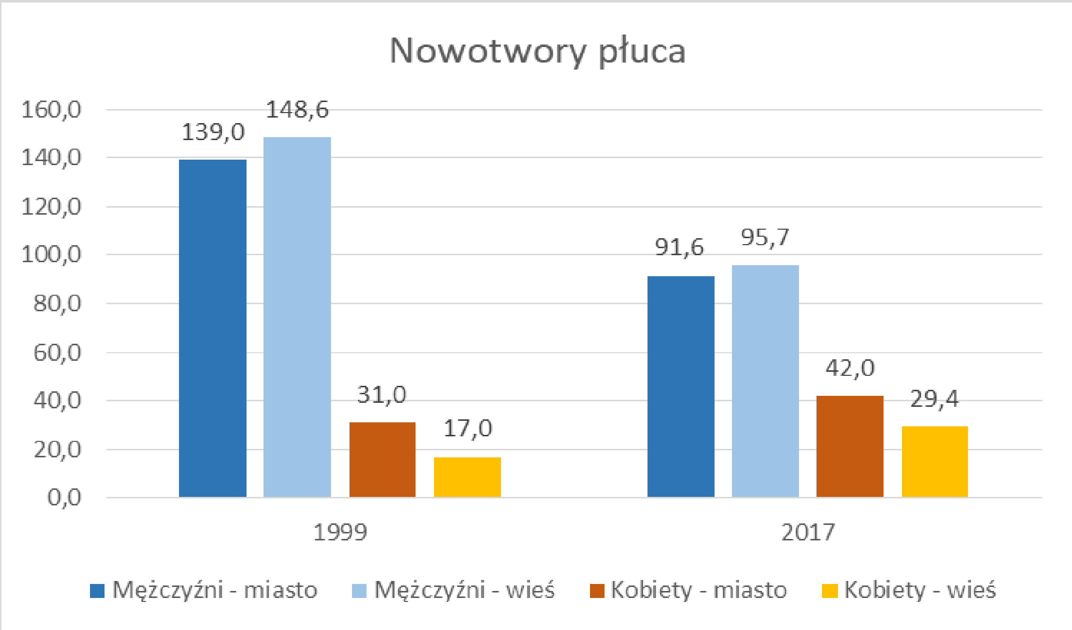

Fig. 4.13. Incidence of lung cancer, by place of residence, Poland, 1999 and 2017 (age-adjusted rates per 100,000 inhabitants).

4.3. Melanoma

Melanoma is a neoplasm the frequency of which is on the rise in Polish population, both expressed as crude incidence rates and age-adjusted rates. The accelerating increase in the risk posed by this cancer has been noticeable since mid-1990s (Fig. 4.14). Melanoma is most frequently diagnosed in patients over 65, but the risk of this cancer is higher among men than among women (Fig. 4.15). The incidence of melanoma is higher among inhabitants of urban areas, both for men and women.

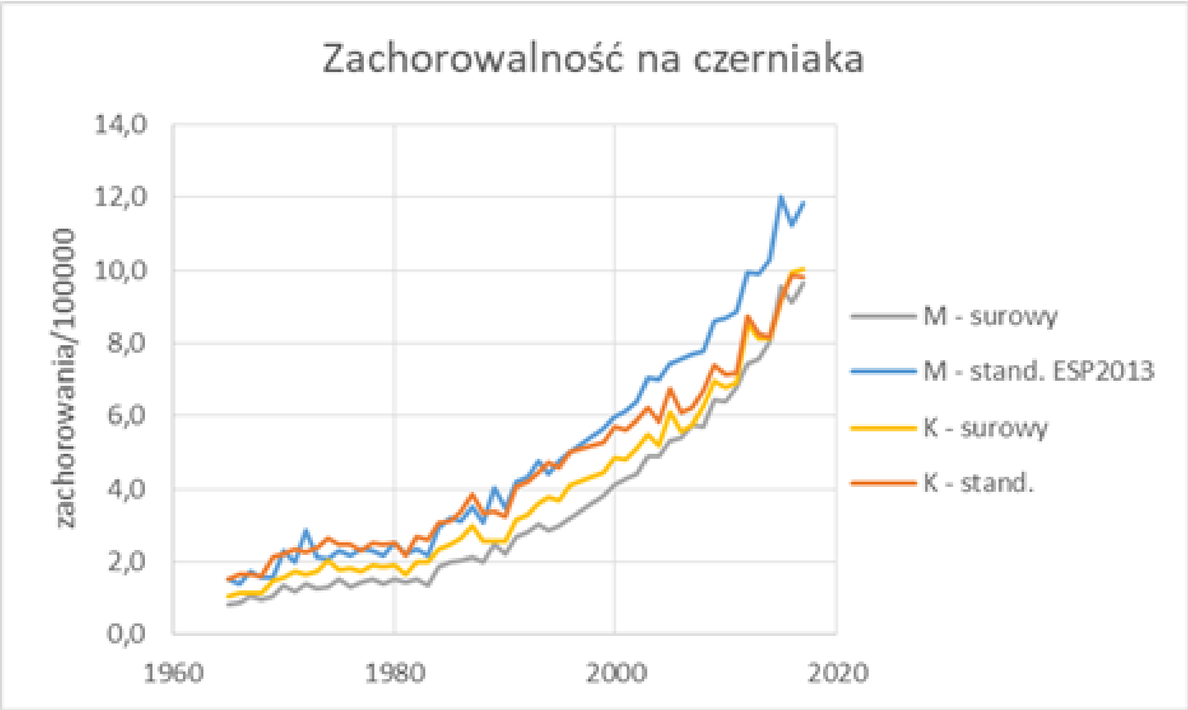

Fig. 4.14. Melanoma incidence in Poland, 1965-2017

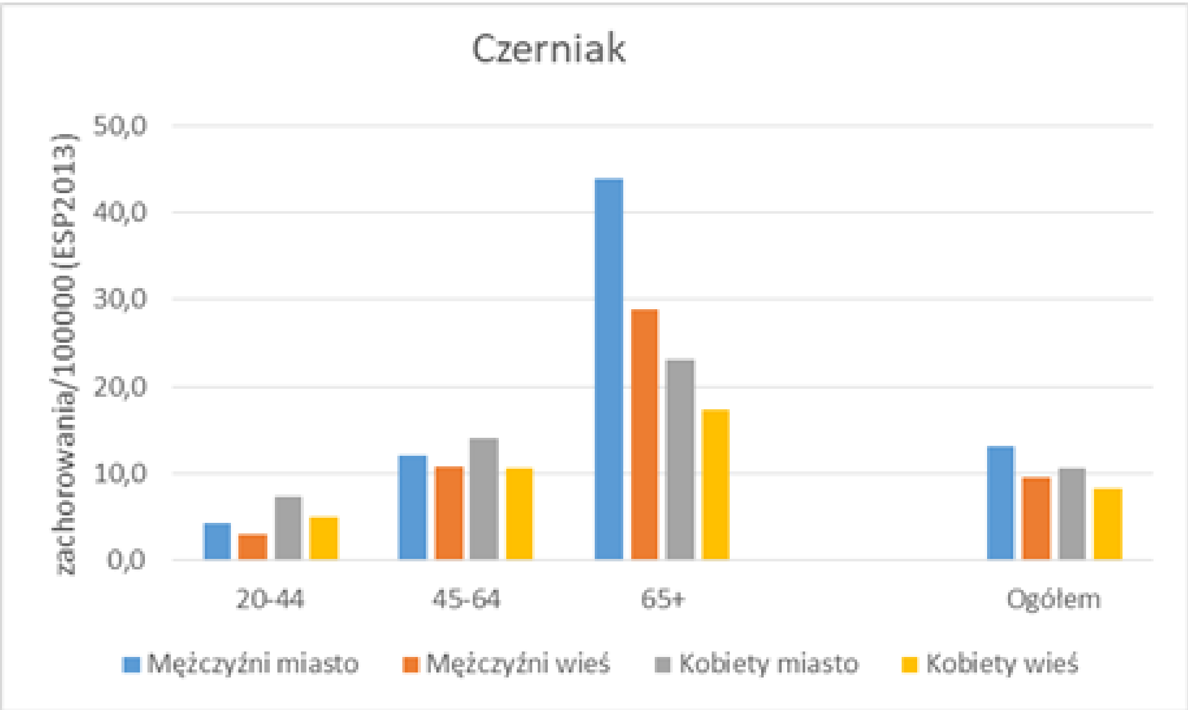

Fig. 4.15. Melanoma incidence in Poland, 2017

Incidence of melanoma in the past two decades increased by about 100%, both among men and women, irrespective of their place of residence, while the most substantial increase of the age-adjusted incidence rate was recorded for men living in rural areas (by 120%). In 2017, the highest value of age-adjusted incidence rate was observed among men living in urban areas ($13.2/10^5$), and the lowest value could be attributed to women living in rural areas ($8.4/10^5$) (Fig. 4.16).

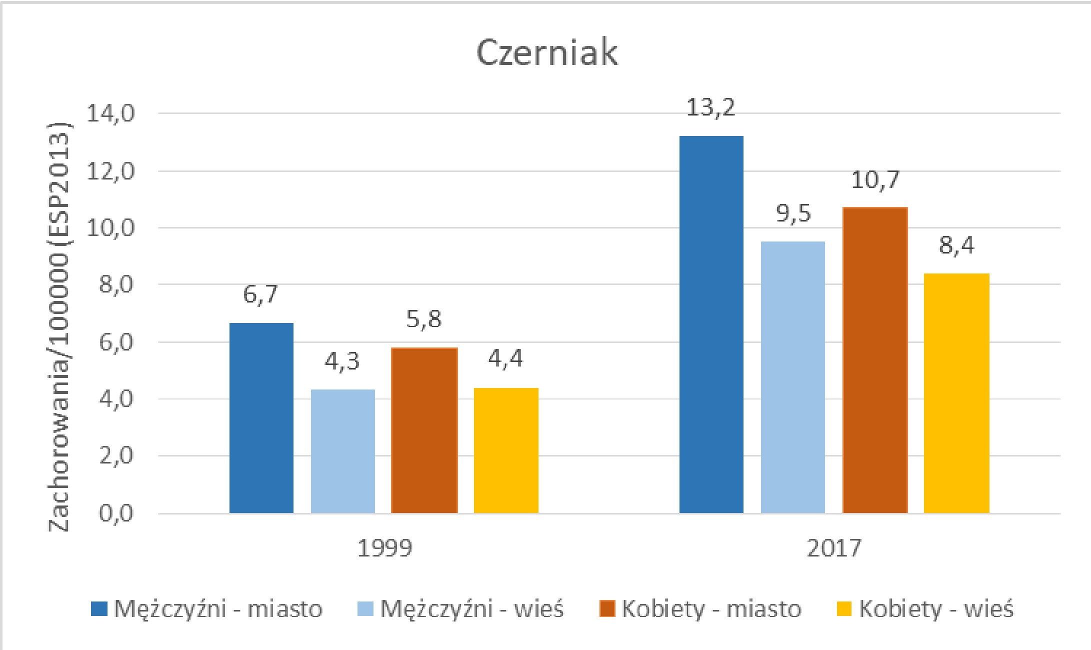

Fig. 4.16. Melanoma incidence by place of residence, Poland in 1999 and 2017.

4.4. Breast cancer

Breast cancer is the most frequent neoplasm in women. The incidence of breast cancer has been on the rise in Poland since mid-1960s - during the past fifty years the age-adjusted incidence rate increased nearly four times ($23/10^5$ versus $91/10^5$) (Fig. 4.17). Breast cancer is rare among young women (20-44 years old), but the risk of this diseases increases with age. The incidence of breast cancer is higher among women, inhabitants of urban areas in all age groups (Fig. 4.18).

Fig. 4.17. Trends in the incidence of breast cancer, Poland 1965-2017

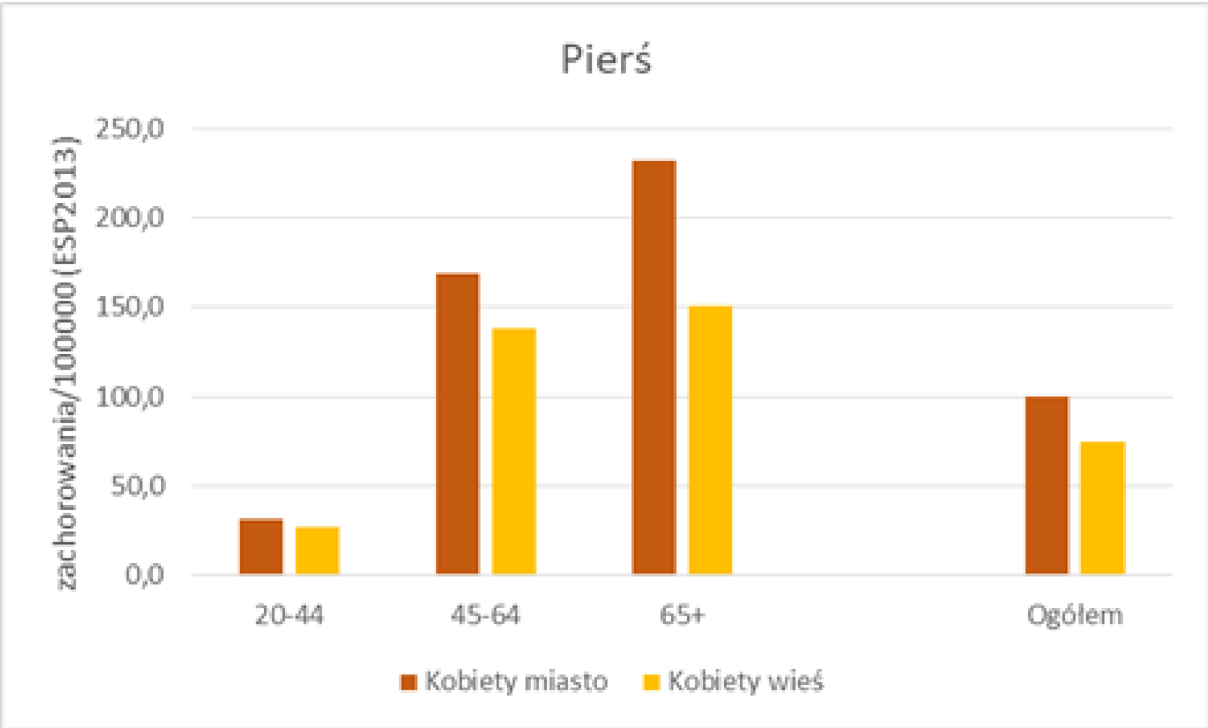

Fig. 4.18. Breast cancer incidence in Poland, 2017

The incidence of breast cancer is characterised by an upward trend, both among the inhabitants of urban and rural areas. Between 1999 and 2017, the value of age-adjusted incidence rate grew by about 30% among women living in urban areas, and by nearly 57% among women living in rural areas, which means that the risk for both sub-populations has reached similar levels.

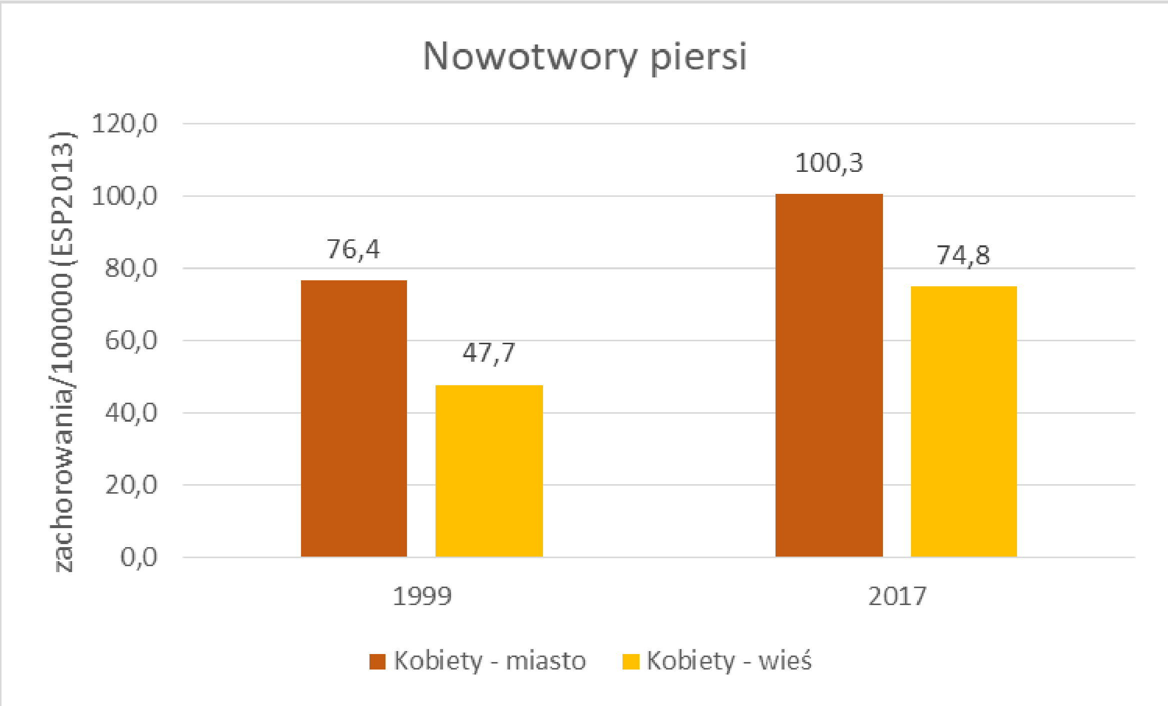

Fig. 4.19. Breast cancer incidence by place of residence in Poland in 1999 and 2017.

4.5. Cervical cancer

In the 1960s, cervical cancer was the most frequently diagnosed malignant neoplasm in women. In the past five decades, the decrease in the frequency of cervical cancer, measured both with crude and age-adjusted incidence rates, has resulted in the fact that this disease has become the seventh most frequent malignant neoplasm among women. (Fig. 4.20). The incidence of cervical cancer increases with each subsequent age group, and is higher among women living in urban areas (Fig. 4.21).

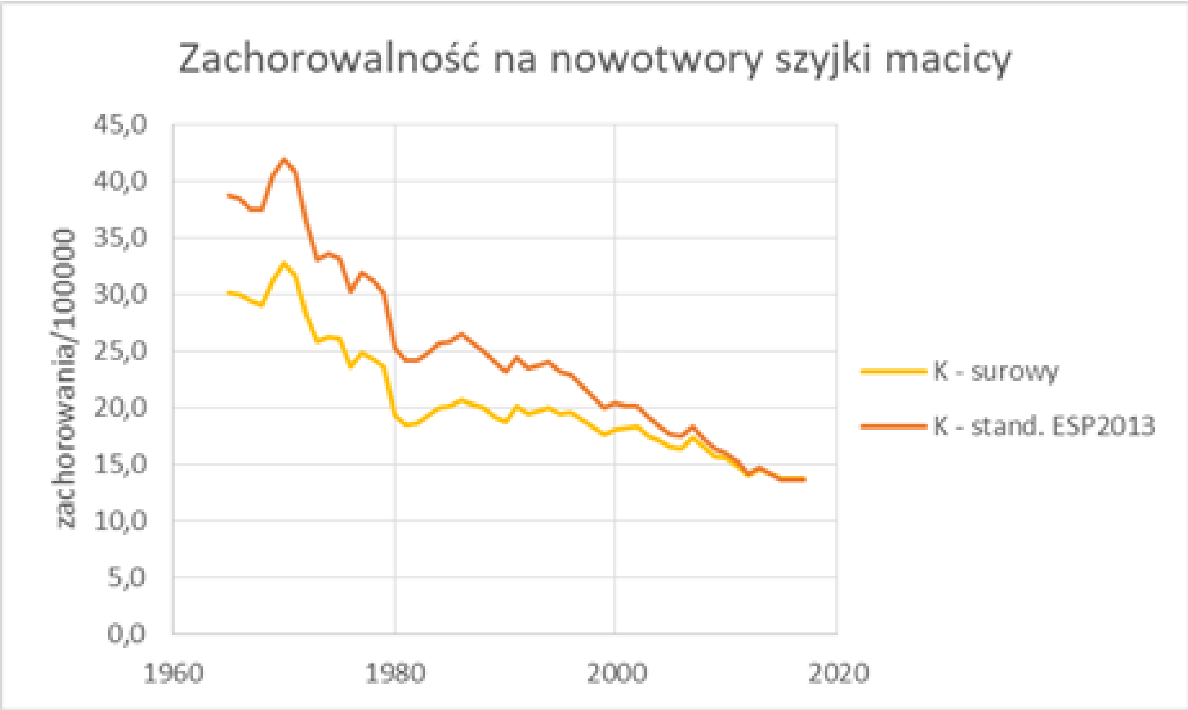

Fig. 4.20. Trends in the incidence of cervical cancer, Poland 1965-2017

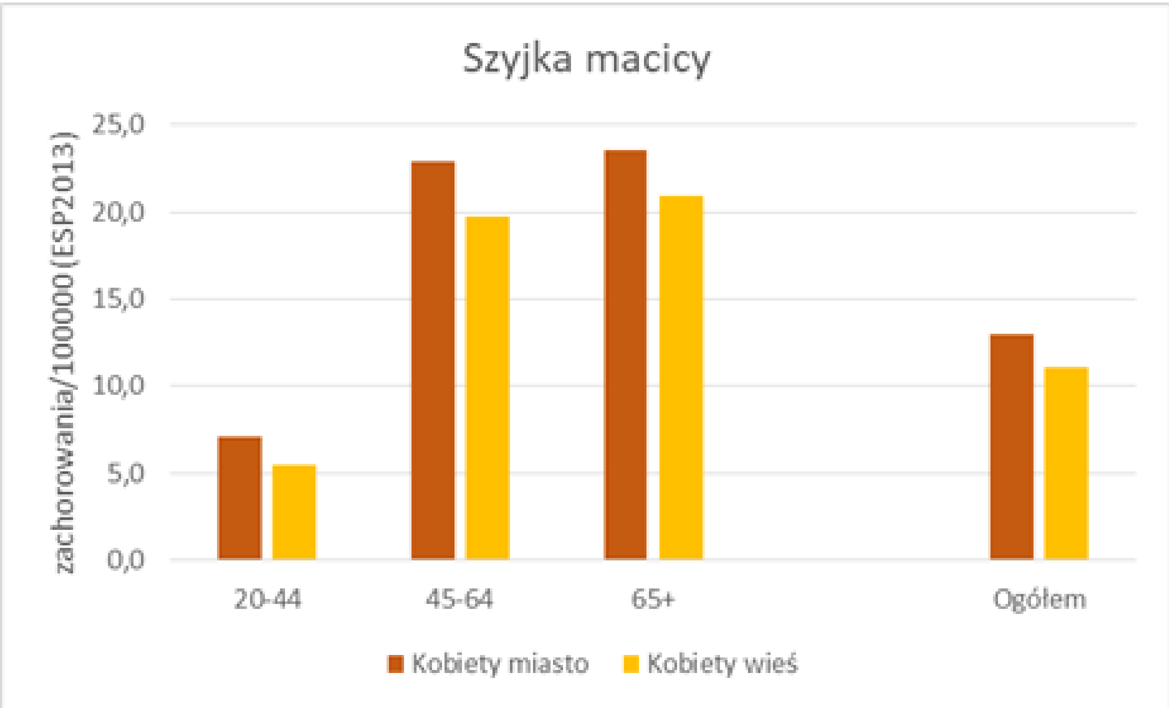

Fig. 4.21. Cervical cancer incidence in Poland, 2017

Between 1999 and 2017, the incidence of cervical cancer dropped for both women living in urban areas (by 42%) and for women living in rural areas (by 34%).

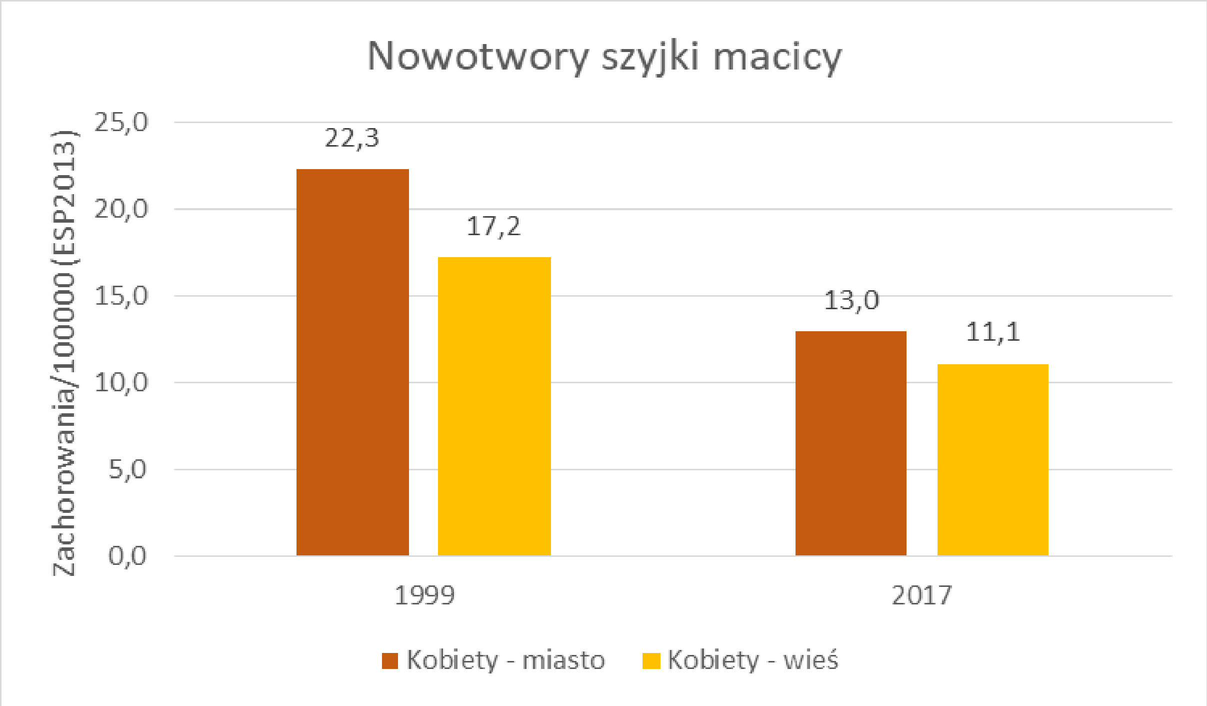

Fig. 4.22. Breast cancer incidence by place of residence in Poland in 1999 and 2017.

4.6. Prostate cancer

For two years now, prostate cancer is the most frequent malignant neoplasm in men in Poland. Since mid-1990s, the incidence of prostate cancer, expresses both as crude and age-adjusted rates has been growing rapidly (Fig. 4.23). Prostate cancer cases are very rare in patients under 45, as the incidence in this group does not exceed 0.2-0.3/10^5. As for men over 45, the risk of prostate cancer significantly increases, both among the inhabitants of urban and rural areas, although men living in rural areas are exposed to a slightly lower risk of being diagnosed with prostate cancer than those living in urban areas (Fig. 4.24).

Fig. 4.23. Trends in the incidence of prostate cancer, Poland 1965-2017

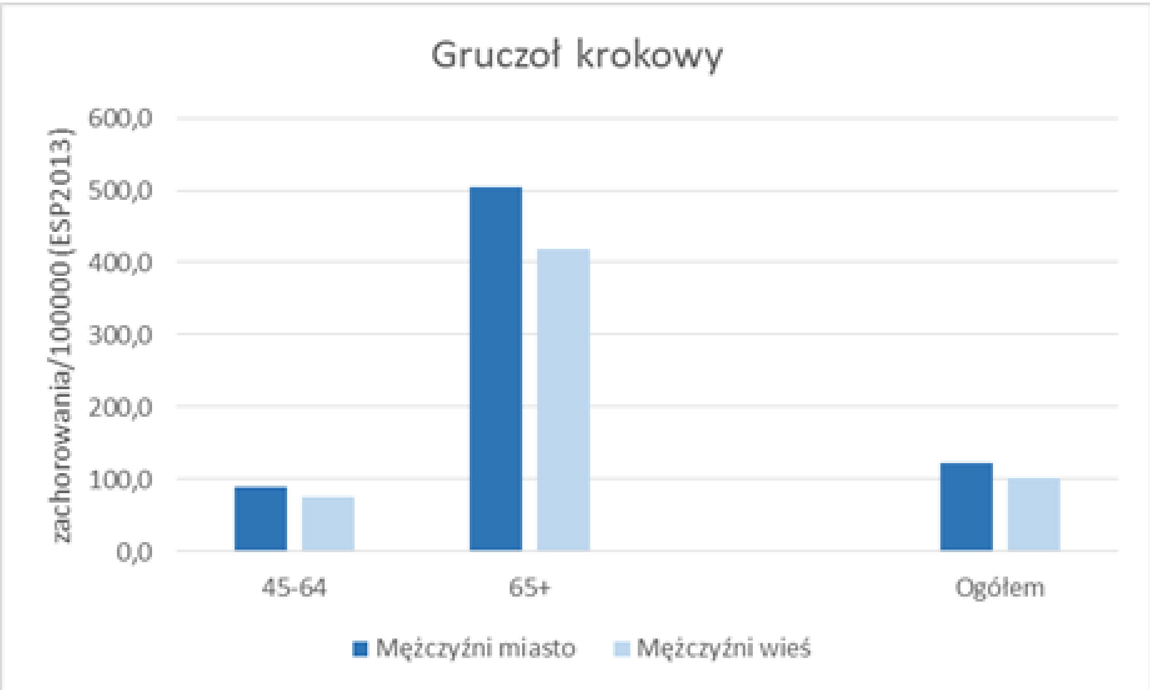

Fig. 4.24. Prostate cancer incidence in Poland, 2017

Over the last two decades, a more than a twofold increase in the incidence was recorded, both among the urban and rural populations (Fig. 4.25).

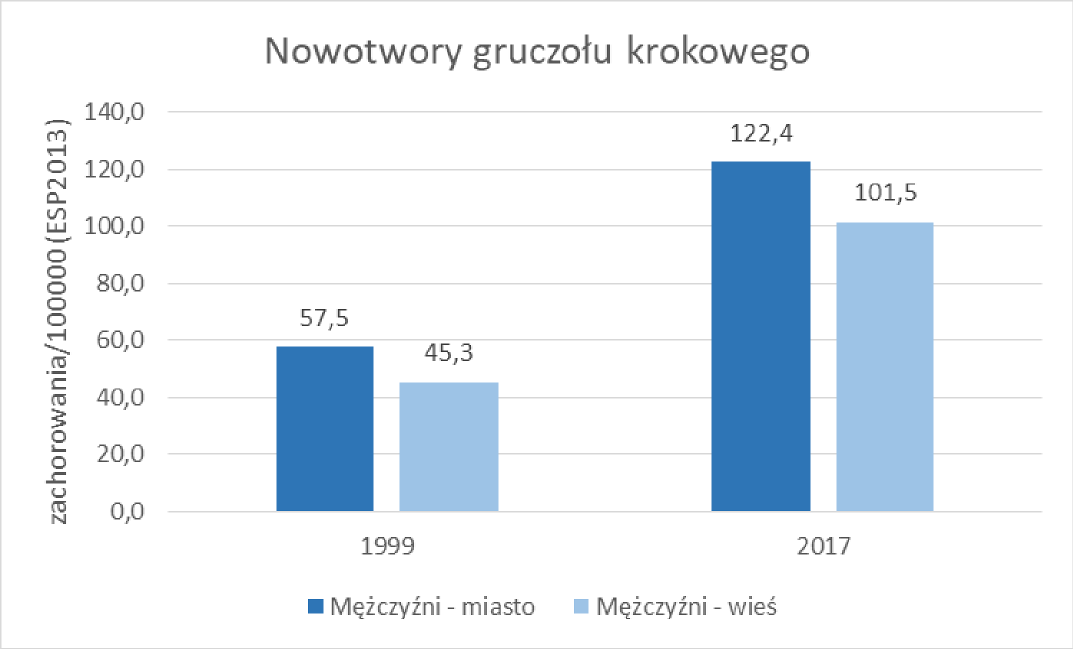

Fig. 4.25. Prostate cancer incidence by place of residence, Poland in 1999 and 2017.

CONCLUSIONS

1. The number of cancer cases in Poland is on the rise, as it reached over 164,000 in 2017. The number of cancer cases among men and women is roughly the same (approx. 82,000 for each group).

2. The most frequent malignant neoplasms in men include prostate cancer (19.7%), lung cancer (16.7%), and colorectal cancer (12.3%), while women most frequently suffer from breast cancer (22.5%), colorectal cancer (9.9%) and lung cancer (9.4%).

3. The National Oncological Strategy points to six neoplasms which require special focus, and these include colorectal cancer, melanoma, lung cancer, breast cancer, cervical cancer and prostate cancer.

4. As regards colorectal, breast and cervical cancers, population screening-test programmes were implemented with a view to providing early cancer detection.

5. Neoplasms which are responsive to primary prevention measures (lung cancer, melanoma) require the implementation of educational programmes with an emphasis placed on risk factors. The reduction of smoking among men resulted in a lower incidence of lung cancer. Disseminating knowledge on the need to protect your skin against UV radiation should also effectively reduce the number of melanoma cases.

6. Prostate cancer, the most frequent malignant neoplasm in men, can develop in older patients, which is probably the cause of a sharp rise in the number of cancer cases related to the increased share of older men in general population.

A steep rise in the number of cancer cases and convalescents might result in a public health crisis and a burden to the Polish healthcare system. The main challenge for the Polish health care system in the decades to come will be to implement measures aimed at limiting the number of cancer cases and deaths, and finding resources for the treatment of cancer diseases and financing palliative and terminal care for a growing number of cancer patients. The measures should be based on the possibilities provided by evidence-based health policy. The cancer register is a reliable source of information. The development of the National Cancer Register, and support for registering cancer cases is indispensable, in particular in the sphere of finding doctors' approval for cooperating with the register.

5. MENTAL AND BEHAVIOURAL DISORDERS

Daria Biechowska (Institute of Psychiatry and Neurology)

Mental health and mental disorders are a significant area in public health. WHO defines mental health as a state of well-being in which an individual realises his or her own potential, can cope with various life situations and is able to contribute to her or his community and work productively.

The current data and predictions regarding mental health demonstrate that mental disorders are a serious and growing issue globally. The world's two most common mental disorders are depression and alcohol abuse disorders. Depression has been ranked among the 20 leading causes of disability around the world. It affects 120 million people and this number is continually growing. It is estimated that fewer than 25% of people living with depression have access to proper healthcare and therapy. Mental disorders and diseases put a heavy burden on individuals and the population at large, especially when untreated. In fact, mental disorders and substance use disorders account for as much as 31% of the Global Burden of Disease. According to WHO's predictions, depression will become the leading cause of the GBD in 2030. It is estimated that depression may contribute to the GBD more significantly in high-income countries than in low-income countries. Mental disorders cause severe disability, even though they might not affect premature mortality, except for those which lead to suicide. As far as the Global Burden of Disease measured by DALY is concerned, depression, violence and alcohol abuse disorders rank among the leading factors contributing to the GBD in all WHO regions. According to WHO data, the number of suicides increased by 60% over the last 45 years. Suicide is one of the three leading causes of death in the population aged 15-44 and it is estimated that the number of suicide attempts is 20 times higher than that of suicide deaths. These numbers are rising among young people. About 90% of suicide cases involve depression and substance abuse, including alcohol and drugs.

Numerous countries have made efforts to strengthen their mental healthcare systems and integrate people suffering from mental disorders in the life of their communities, which can benefit from their meaningful work.

To address the issue of mental health among Polish inhabitants, the Council of Ministers adopted the Ordinance on the National Mental Health Protection Programme (Journal of Laws of 2011, No. 24, item 128). The programme was implemented between 2011 and 2015. On

2 March 2017, the Council of Ministers published the Ordinance on the National Mental Health Protection Programme for 2017-2022 (Journal of Laws of 2017, item 458). The programme defines a strategy of actions aimed at providing people with mental disorders with comprehensive, multifaceted and universal healthcare and other forms of care and support they need to function in their family and social environments; shaping the right public attitudes to people with mental disorders, especially those of understanding, tolerance, kindness, and acting against discrimination. The National Health Programme for 2016-2020 also addresses mental health issues and its operating objective 3 concerns the prevention of mental health disorders and improvement of society's mental well-being. It indicates the need to monitor depression morbidity and the rate of attempted and completed suicides.

Below we present the figures for and dynamics of the selected mental health problems in Poland based on the existing routine health information systems. Due to the specific nature of mental disease, for many years, information about Polish inhabitants treated for mental disorders in mental health centres (hospitals, care and treatment centres, addiction treatment centres, rehabilitation centres for addicts) has been collected as part of the National Psychiatric Hospital Disease Examination implemented by the Institute of Psychiatry and Neurology in Warsaw, which conducts data analysis and processing. The results are published in the statistical yearbook issued by the Institute. The presented coefficients relate to people, not cases, as for the purposes of statistical analysis, multiple hospitalisations were combined in accordance with the identification key determined by the Institute. These systems are supervised in substantive terms by the Institute of Psychiatry and Neurology in Warsaw.

At this point, we should refer to the data regarding the mortality of Polish inhabitants and emphasise that among Polish men one of the leading symptoms of mental health problems, which is the death rate by suicide, is higher (21.0 / 100,000 in 2018) than the EU average (17.0 / 100,000 in 2016). (coefficients standardised by age). However, the death rate by suicide among women in Poland (2.9 / 100,000) is many times lower than the death rate of men and is considerably lower than the average rate for the EU28 (4.5 / 100,000)[47]. Such a large and permanent gender disparity is not observed in any of the other countries of the European Union.

5.1. Patients treated in psychiatric outpatient care facilities

[47] See Chapter "Life expectancy and mortality of the population of Poland"

Information on patients treated in psychiatric outpatient care facilities concerns treatment in outpatient mental health centres, alcohol addiction treatment clinics and psychoactive substances addiction treatment centres. This information is processed at the Institute of Psychiatry and Neurology in Warsaw and published in the statistical yearbook “Zakłady psychiatrycznej opieki zdrowotnej” (Mental healthcare facilities) published by the Institute. The yearbook presents the total number of treated patients and those treated for the first time. The total number of treated patients applies to people who were registered in outpatient healthcare institutions in a given year. A patient is included in the records once, regardless of the number of consultations during the year. Patients treated for the first time are people registered (in a given year) in a certain type of clinic for the first time in their life. The aggregated form of data collection restricts the possibility of performing a detailed analysis, but still affords an important source of information on the incidence of mental disorders in Poland.

In 2018, 1,620,000 people with mental disorders were treated in outpatient care facilities (1,420,000 patients were treated in MHC, 180,000 patients in AATC, and 20,000 patients were treated in PSATC), including 415,500 people for the first time. In 2010-2018 the total number of patients treated and those treated for the first time saw a significant increase (Fig. 5.1a).

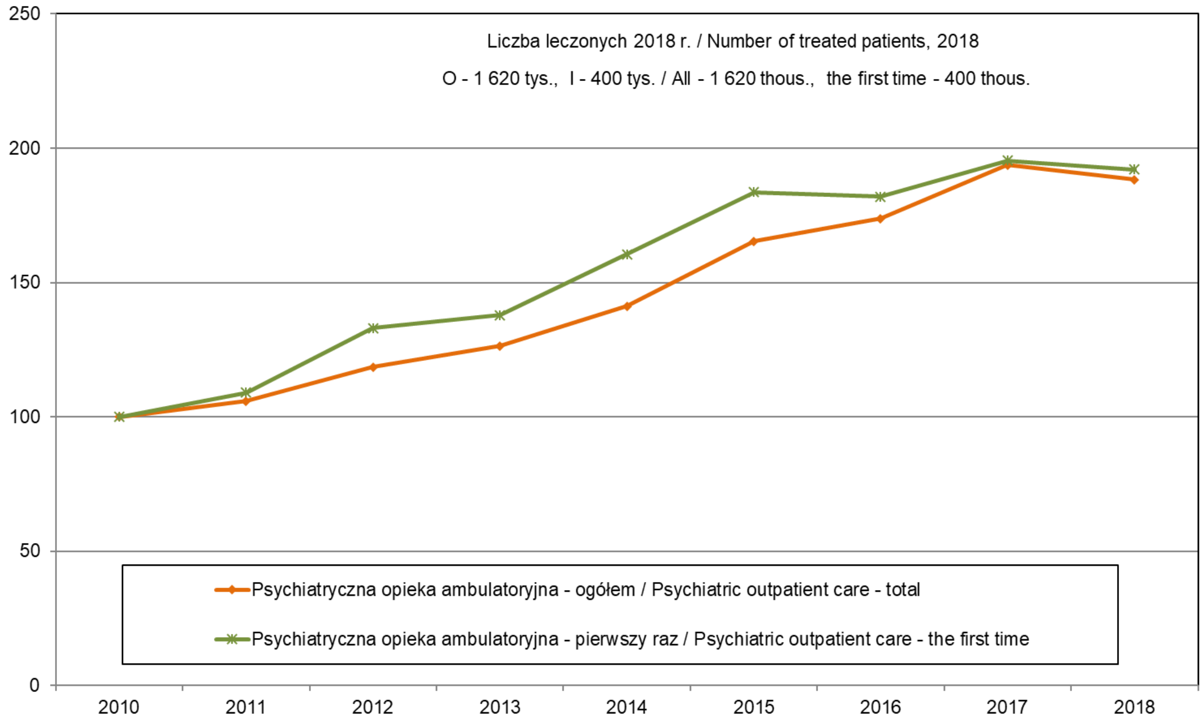

Fig. 5.1a. Outpatient mental healthcare – dynamics of the number of all treated patients (O) and first-time treated patients (I) during 2010-2018, 2010=100 (based on the data of the Institute of Psychiatry and Neurology)

Tab. 5.1a. Outpatient mental healthcare – all treated patients and first-time treated patients by selected diagnosis, 2015-2018 (per 100,000 population)

Diagnosis	All treated patients				First-time treated patients			
	2015	2016	2017	2018	2015	2016	2017	2018
Organic, including symptomatic, mental disorders (F00-F09)[1]	540.4	543.2	532.2	550.4	115.4	110.1	106.0	110.3
Schizophrenia (F20)[1]	362.0	367.4	354.8	371.3	36.2	33.2	29.9	32.9
Mood [affective] disorders (F30-F39)[1]	824.8	816.6	829.9	850.1	166.6	152.0	150.0	157.3
Neurotic, stress-related and somatoform disorders (F40-F48)[1]	1000.9	1058.7	1149.4	1217.8	311.8	319.5	340.4	354.3
Mental and behavioural disorders due to use of alcohol (F10)[2]	446.2	429.7	419.1	437.4	175.4	159.1	146.4	149.0
Mental and behavioural disorders due to psychoactive substance use (F11-F19)[2]	108.0	104.8	105.7	116.4	49.5	42.3	38.1	42.7

[1]) *patients treated in mental health centres*
[2]) *patients treated in mental health centres and alcohol and drug addiction therapy centres*
Source: based on data of the Institute of Psychiatry and Neurology

The largest group among people treated in psychiatric outpatient care included patients with neurosis related to stress and somatoform disorders, for which in 2018 MHCs treated 1217.8 people per 100,000 inhabitants, including 354.3 for the first time (the respective absolute values were 468 thousand and 136 thousand people) (Tab. 5.1a). The second most numerous group involved people treated for mood (affective) disorders – 850 / 100,000, of which 157 / 100,000 were treated for the first time. There is no clear trend in the number of people who have been treated for these two disorder groups over the past four years.

Patients treated for alcohol-related disorders represent the fourth largest group of the total number of patients in the open healthcare system, but the third-largest among first-time treated. In 2018 the total number of people treated in this group was 168 thousand (437 / 100,000). In the years 2015-2017, there was a slight downward trend in the number of people treated for alcohol disorders, but 2018 saw an increase.

In 2018, the total number of patients with mental disorders treated in mental health centres amounted to 1,420,000 people (3383 / 100,000) (Tab. 5.2a). Of this, 327,000 (850 / 100,000) were treated for the first time. Slightly over 50% more women were treated in mental health centres than men (2658 / 100,000 men and 4063 / 100,000 women). It should be borne in mind that only a small part of patients with mental disorders caused by alcohol and psychoactive substances are treated in mental health centres, because they are mainly treated in detoxification clinics, as well as outpatient clinics for prevention, treatment and rehabilitation of addicts. In psychiatric outpatient care, the predominance of women over men is lower. In 2018, 21% more women were treated than men (3786 / 100,000 men and 4614 / 100,000 women). In 2015 the difference was 14.4%, which indicates a greater increase in women receiving treatment than men.

Dissimilar trends particularly involve those treated in alcohol addiction treatment clinics and psychoactive substances addiction treatment centres

Tab. 5.2a. Outpatient mental healthcare, mental health centres – all treated patients with mental disorders by sex and by place of residence, 2011-2018 (per 100,000 population)

Year	Total	Men	Women	Urban area	Rural area
Outpatient mental healthcare					
2011	3601.4	3351.7	3835.6	4323.3	2484.0
2012	3969.7	3632.0	4289.5	4879.2	2569.4
2013	4124.1	3781.6	4445.3	5069.5	2676.3
2014	4066.6	3658.3	4449.4	5017.1	2616.7
2015	3809.7	3360.1	4231.2	4694.1	2464.2
2016	3859.7	3385.0	4304.7	4857.8	2347.4
2017	4050.0	3676.4	4400.1	5099.4	2463.5

2018	4213.1	3785.7	4613.6	5280.5	2603.6
Inpatient mental health centres					
2011	2860.7	2150.7	3392.0	3409.9	2010.6
2012	3205.8	2549.4	3821.4	3922.2	2102.7
2013	3364.8	2696.9	3991.3	4132.7	2188.9
2014	3270.3	2562.9	3933.7	4031.7	2109.0
2015	3288.2	2609.9	3924.1	4041.7	2141.9
2016	3347.0	2654.7	3996.0	4212.3	2035.9
2017	3252.1	2579.8	3882.2	4100.1	1969.9
2018	3383.3	2658.2	4062.9	4257.0	2066.0

Source: based on data of the Institute of Psychiatry and Neurology

Mental health centres treat a considerably greater proportion of residents of urban areas than those coming from rural areas – in 2018 the difference was as high as 107% (inhabitants of urban areas 4257 / 100,000, inhabitants of rural areas 2066 / 100,000) (Tab. 5.2a). A similar surplus (103%) of inhabitants of urban areas (5280 / 100,000) in relation to inhabitants of rural areas (2604 / 100,000) can be observed in outpatient mental healthcare, which covers, covering both alcohol addiction treatment clinics and psychoactive substances addiction treatment centres. Both surpluses changed in relation to the period covered by the previous report by about 15%. It is worth noting that the number of urban residents treated (in the period from 2011 to 2018) is growing, while the number of rural inhabitants treated is slightly decreasing. Such large differences of indicators between urban and rural inhabitants may indicate large gaps in meeting the needs related to mental health of the latter group of people, especially considering, for example, the significant surplus of mortality due to suicides among rural inhabitants compared to the figures for urban inhabitants (see Chapter 2).

5.2. Patients treated in inpatient mental health facilities

In 2018, the total number of people with mental disorders treated in inpatient mental health facilities was 263,000 (100 / 100,000 inhabitants), including 99,000 people (258 / 100,000) treated for the first time. The relatively stable dynamics of the total number of patients and the first-time treated per 100,000 people in inpatient mental health facilities in 2010-2018 shows three moments of increase by more than ten percent in 2010-2011, 2014-2015 and 2018 (Fig. 5.1.b).

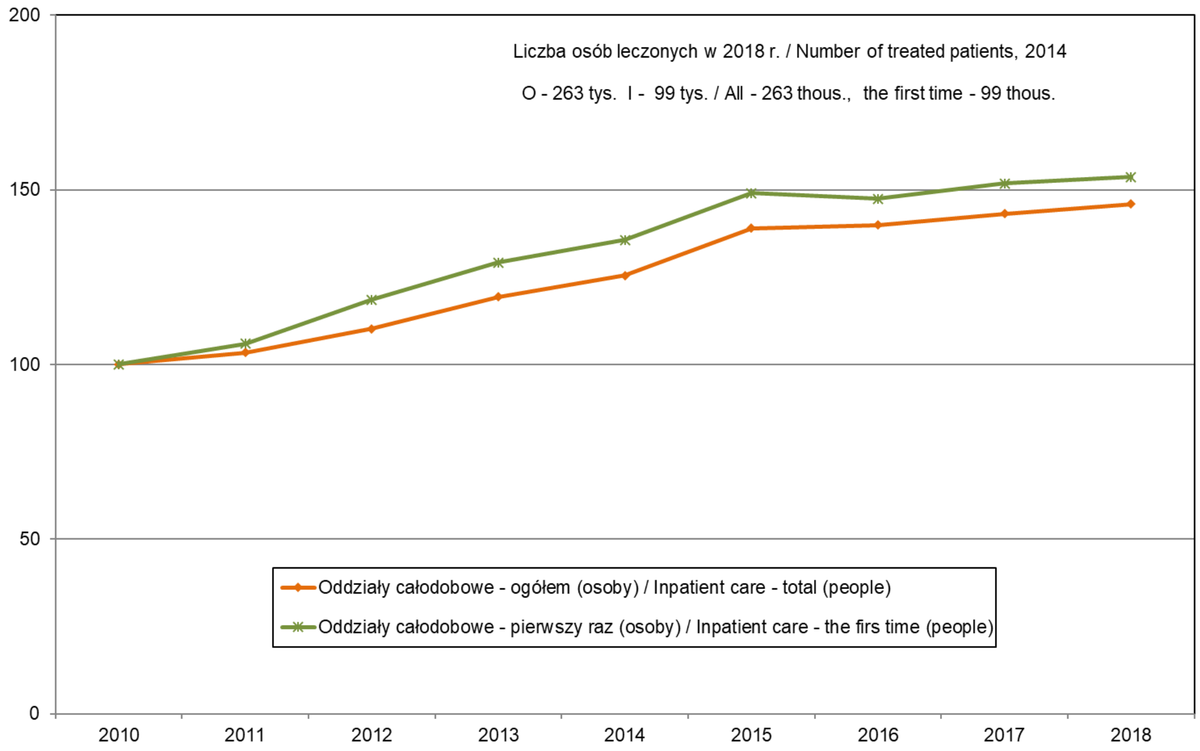

Fig. 5.1b. Inpatient mental healthcare – dynamics of the number of all treated patients (O) and the first-time treated (I) during 2010-2018, 2010=100 (based on the data of the Institute of Psychiatry and Neurology)

While in outpatient mental health centres women were treated more often than men, in inpatient care psychiatric facilities men (in 2018) were treated more often than women by over 112% and this surplus is relatively constant in recent years (Tab. 5.2a).

Tab. 5.1b. Inpatient mental healthcare – all treated patients and the first-time treated patients by selected diagnosis, 2015-2018 (per 100,000 population)

Diagnosis	All treated patients				First-time treated patients			
	2015	2016	2017	2018	2015	2016	2017	2018
Organic, including symptomatic, mental disorders (F00-F09)	81.0	76.7	87.3	82.2	32.5	28.2	33.0	30.5
Schizophrenia (F20)	93.5	87.7	114.2	108.4	15.0	12.4	16.5	15.3
Mood [affective] disorders (F30-F39)	63.7	60.5	67.9	65.2	21.7	19.2	21.5	20.4
Neurotic, stress-related and somatoform disorders (F40-F48)	58.5	56.6	44.3	47.2	35.7	31.3	25.9	26.5
Mental and behavioural disorders due to use of alcohol (F10)	204.3	206.9	263.1	254.3	101.6	95.9	114.3	109.4
Mental and behavioural disorders due to psychoactive substance use (F11-F19)	46.4	43.9	62.3	60.1	22.3	17.5	25.9	24.7

Source: based on Institute of Psychiatry and Neurology data.

Tab. 5.2b. Inpatient mental healthcare – all treated patients with mental disorders by sex and by place of residence, 2011-2016 (per 100,000 population)

Year	Total	Men	Women	Urban area	Rural area
2011	534.9	709.2	371.4	566.6	449.9
2012	520.1	687.8	362.8	546.9	440.0
2013	523.8	695.7	362.6	547.2	444.4
2014	532.0	709.4	365.7	550.3	462.1

2015	614.8	806.0	435.4	680.2	515.2
2016	594.9	784.8	417.0	661.9	493.5
2017	707.7	973.1	459.0	771.3	611.6
2018	683.6	941.1	442.4	729.2	614.9

Source: based on Institute of Psychiatry and Neurology data.

A 20% higher proportion of urban inhabitants were treated in inpatient mental health facilities than rural inhabitants – both for first-time patients and in total. The higher proportion for urban inhabitants than for rural inhabitants is present in all disorder groups. The largest (more than twofold) difference between the residential environments of patients concerned the hospitalisation of disorders caused by the use of psychoactive substances (rural areas – 27.5 / 100,000 inhabitants, urban areas – 60.1 / 100,000), personality and behavioural disorders of adults (8.2 and 18.6 / 100,000, respectively), as well as behavioural and emotional disorders usually starting in childhood and adolescence (8,4 vs. 16.7 / 100,000).

The largest group of patients in inpatient mental health facilities consists of patients treated for alcohol-related disorders. In 2018, this group involved 101,000 people, i.e. 254 / 100,000 inhabitants (38% of the total number of patients treated in inpatient mental health facilities, and as much as 47% of the first-time treated). Those were mainly men, who accounted for as much as 85% of all patients treated for this disorder. Over the last four years, the total hospitalisation rate due to alcohol-related disorders has remained at a stable level. In 2018, the total hospitalisation rate due to alcohol-related disorders among men was five times greater than among women. This relationship also applies to patients treated for the first time. Rural inhabitants were slightly more often hospitalized than urban inhabitants (215 / 100,000 and 211 / 100,000, respectively).

Patients treated for schizophrenia constitute the second largest group among all hospitalised patients (17%). However, they are not among the largest groups among people treated for the first time (8%). In 2018, 42,000 people were treated in inpatient institutions for this disorder (121 / 100,000 men and 98 / 100,000 women, 118 / 100,000 urban inhabitants and 92 / 100,000 rural inhabitants). Among the first-time hospitalised (6,000 patients), the rates were – 22 / 100,000 men and 16 / 100,000 women, 20 / 100,000 urban inhabitants and 17 / 100,000 rural inhabitants). In the last three years, the hospitalisation rate due to schizophrenia (both in total and for the first time) has remained at a stable level.

The next largest group consists of patients with organic mental disorders (13%) (77 / 100,000 men and 73 / 100,000 women, 87 / 100,000 urban inhabitants and 64 / 100,000 rural inhabitants). In the last three years, the hospitalisation rate due to this group of disorders (both in total and for the first time) remains at a stable level.

The total rate of hospitalisation of Polish inhabitants for mood (affective) disorders is 38% higher than hospitalisation due to neurotic disorders, while in the case of first-time hospitalisations, the difference is reversed – hospitalisations due to neurotic disorders are more frequent by approx. 70%. For both disorder groups, the hospitalisation rates of women were higher than those of men, but while the difference was clear for mood disorders (77 / 100,000 and 47 / 100,000, respectively), for neurotic disorders it was only slight (61 / 100,000 and 57 / 100,000) and the difference was similar for first-time hospitalisations. Both mood disorders and neurotic disorders were a more frequent cause of hospitalization of urban inhabitants than people living in the village (by 50% and 73%, respectively).

The number of patients treated for disorders caused by using psychoactive substances is clearly growing – the rate for all patients treated for this reason in the period from 2015 to 2018 increased by 30%, while for people treated for the first time, the increase was smaller and amounted to 14%. In 2018, 23,000 people were treated in inpatient institutions for this disorder (72 / 100,000 men and 18 / 100,000 women, 57 / 100,000 urban inhabitants and 24 / 100,000 rural inhabitants). Among the first-time hospitalised (6,700 patients), the rates were – 30 / 100,000 men and 8 / 100,000 women, 25 / 100,000 urban inhabitants and 14 / 100,000 rural inhabitants).

As in the previous years, there are significant differences in the frequency of treatment in inpatient facilities due to mental disorders (both in general and for the first time) for inhabitants of individual Voivodships (Fig. 5.2. The difference in the frequency of hospitalisations between the extreme Voivodships was double for both total patients treated and for first-time patients. In 2018, for total treated patients, these rates ranged from 371 / 100,000 in the Małopolskie Voivodship to 683 / 100,000 in the Łódzkie Voivodship. Three Voivodships stand out from the other Voivodships in terms of first-time hospitalisations of their inhabitants – i.e. Łódzkie, Warmińsko-mazurskie and Podlaskie. In comparison with 2016, the first-time hospitalisation rate increased the most in the Podlaskie (25%), Śląskie (24%) and Pomorskie (23%) Voivodships. The most significant decrease in first-time hospitalisations was observed in the Lubelskie (by as much as 41%), Mazowieckie (22%) and Łódzkie (7%) Voivodships.

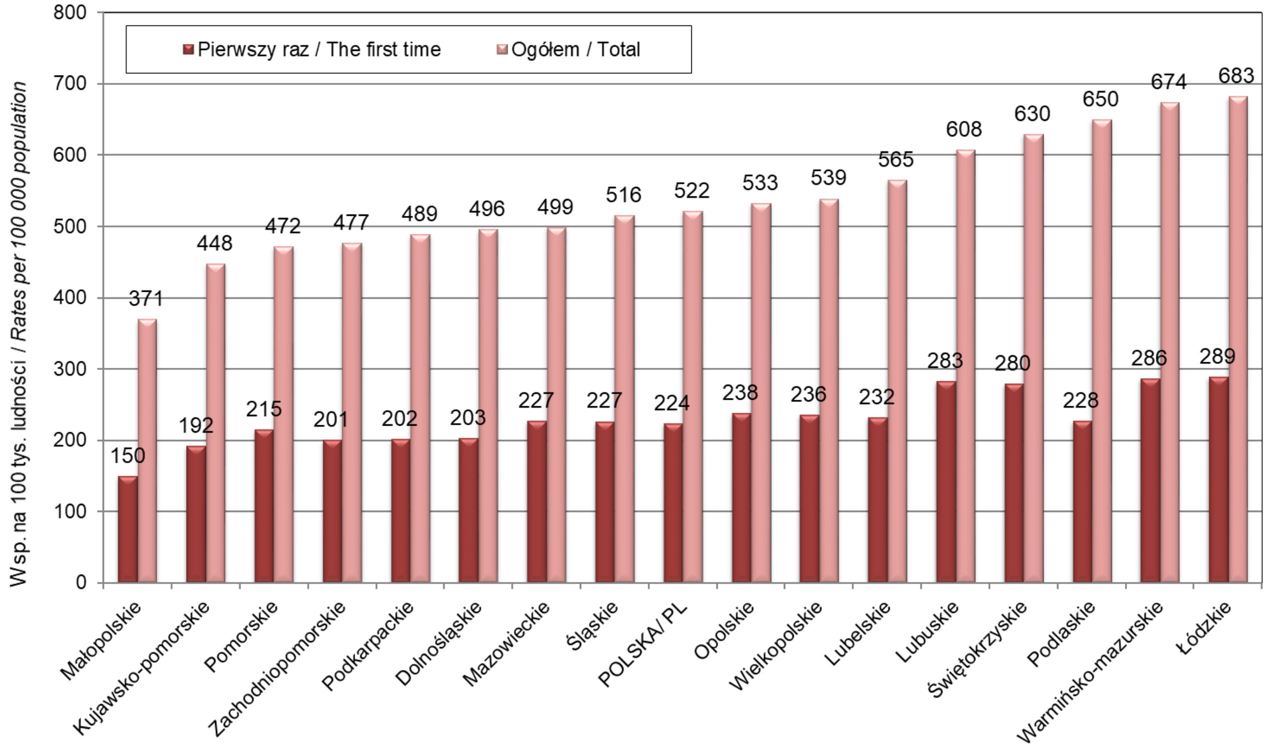

Fig.5.2 Inpatient mental health facilities – all patients and the first time treated patients by Voivodship (region) 2018 (data of the Institute of Psychiatry and Neurology)

Inter-Voivodship differences in the incidence of alcohol-related mental disorders requiring treatment in inpatient mental health facilities are also significant. The total hospitalisation rate for inhabitants of individual Voivodships ranged from 125 / 100,000 in the Małopolskie Voivodship to 315 /100,000 in the Świętokrzyskie Voivodship (Fig. 5.3) – the extreme voivodships are the same as in 2016. A high hospitalisation rate was observed in the Warmińsko-mazurskie, Podlaskie and Łódzkie Voivodships. This also applied to people treated for the first time. Compared to 2016, hospitalisation rates of people with alcohol-related disorders show a high variability. An about 20% increase was observed in the Lubelskie Voivodship and in the Mazowieckie, Śląskie and Opolskie Voivodships there was a 17% decrease.

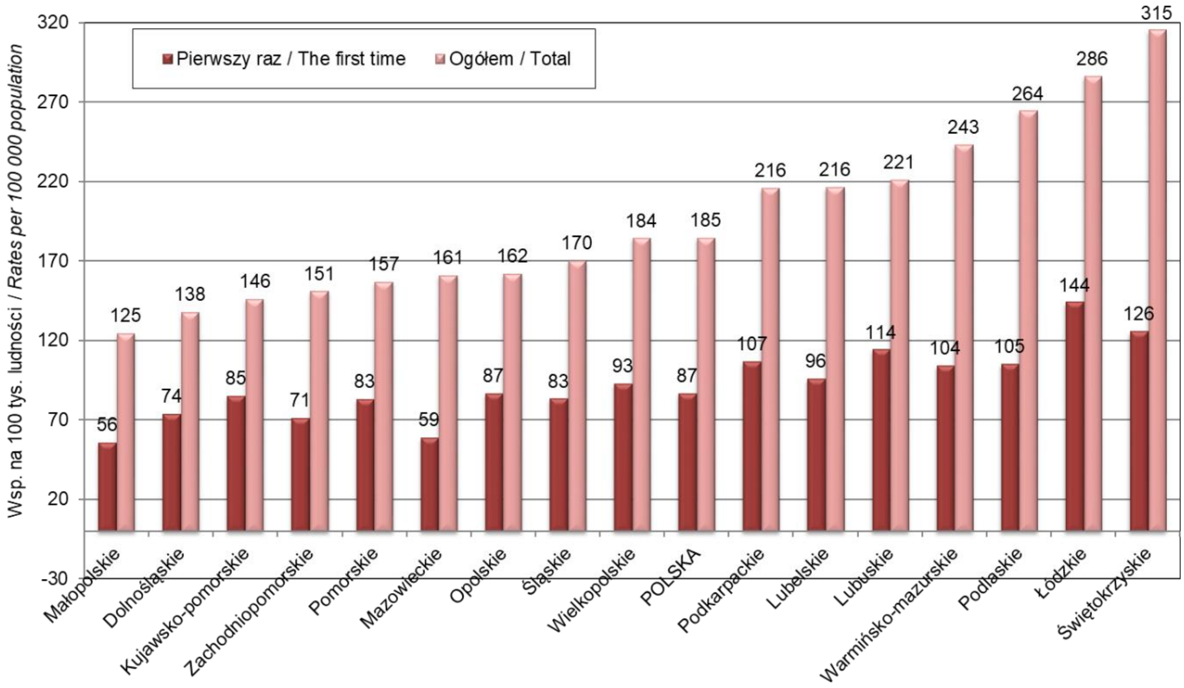

Fig. 5.3. Inpatient mental health facilities– all treated patients and the first-time treated for mental and behavioural disorders due to use of alcohol by region in 2018 (data of the Institute of Psychiatry and Neurology)

The World Health Organization predicts that in the next 20 years depression will become the most common health problem. There are many negative social consequences connected with this disorder, i.e., people suffering from severe depression often have to quit their jobs and may remain unemployed for prolonged periods. This causes an increase in expenses for sickness benefits and unemployment benefits.

Depression is one of the mental disorders that make it impossible for people to function normally on a daily basis. Its main symptoms include low mood, lack of energy, aversion to activity and loss of interest.

Depressive disorders often begin at a very early age and are usually recurring. It is emphasised in the literature that depression is a systemic disease, which, when not treated properly, increases the risk of occurrence of physical illnesses. Conversely, physical illnesses, particularly chronic, also increase the risk of depression.

According to the document of the World Health Organization under the title Mental Health Action Plan 2013-2020, depression constitutes 4.3% of the global burden of all diseases and one of the largest single causes of disability on a global scale (11% of disability-adjusted life years – DALY3 – globally). It is especially common among children and adolescents, as well as among elderly people. Around 350 million people suffer from it in the world.

Statistically, the number of people treated for affective disorders in Poland in 2014-2018 remained stable, i.e. 325,029 in 2014, 321,541 in 2015, 318,402 in 2016, 318,886 in 2017 and 326, 566 in 2018. The tendency observed in Poland was an increase in the number of patients aged 0-18 and 65+ and an increase in the number of patients treated for bipolar affective disorder (F31) and recurrent depressive disorder (F33). On the national scale in 2018, the number of treated patients and the number of patients treated for the first time for affective disorders (per 100,000 inhabitants in Poland) amounted to 850.1 and 157.3 people, respectively.

Inter-Voivodship differences in the incidence of mental disorders caused by mood disorders, including depression and disorders requiring treatment under inpatient care, are also significant. The total rate of hospitalisation among inhabitants of individual Voivodships ranged from 38 / 100,000 in the Świętokrzyskie Voivodship to 62 / 100,000 in the Wielkopolskie Voivodship (Fig. 5.4) – in 2016 the Voivodships with extreme values were Lubelskie and Wielkopolskie, respectively. A high rate of hospitalisation was also observed in the Podlaskie, Łódzkie and Kujawsko-pomorskie Voivodships. This also applied to people treated for the first time. Compared to 2016, the hospitalisation rates of people with mood disorders show variability. A slight decrease was observed in most Voivodships.

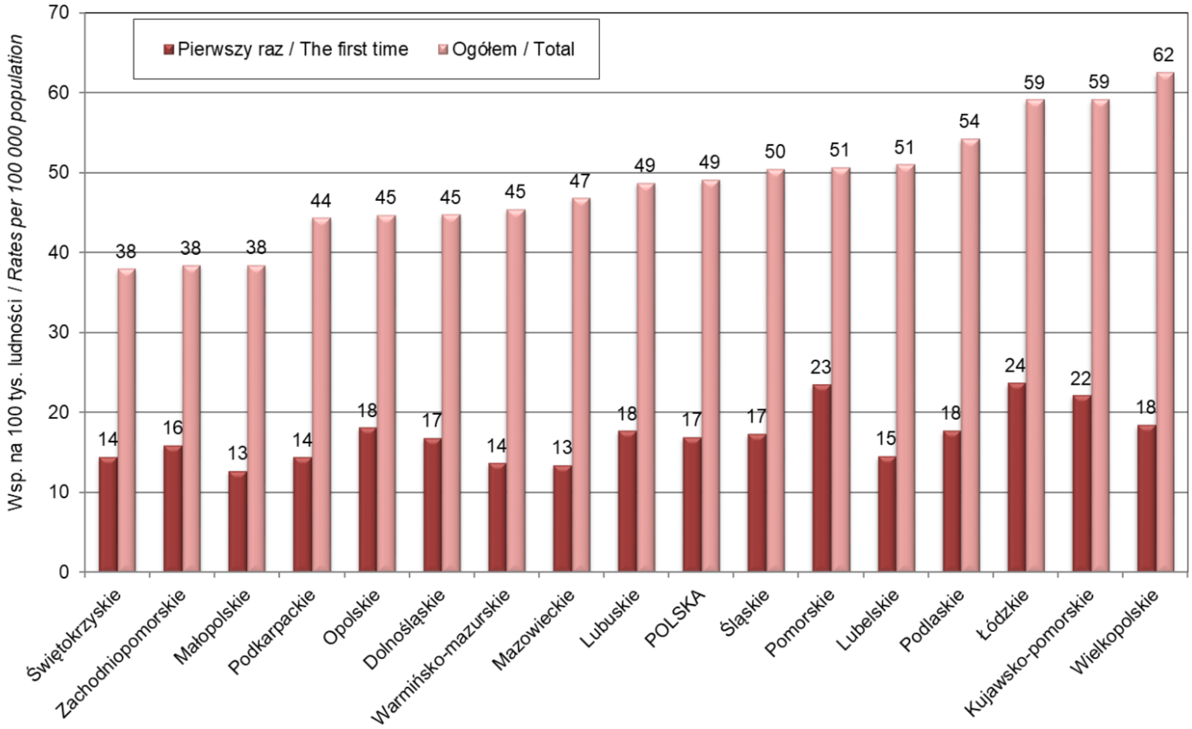

Fig. 5.4. Inpatient mental health facilities– all treated patients and the first-time treated for affective disorders by region in 2018 (data of the Institute of Psychiatry and Neurology)

Inter-Voivodship differences in the incidence of mental disorders caused by depression and requiring treatment under inpatient care, are significant. The total frequency of hospitalisation for inhabitants of individual Voivodships ranged from 20 / 100,000 in the Małopolskie Voivodship to 39 / 100,000 in the Wielkopolskie Voivodship (Fig. 5.5) – in 2016 the Voivodships with extreme values were Lubelskie and Łódzkie, respectively. A high hospitalisation rate was also observed in the Podlaskie, Pomorskie and Łódzkie Voivodships. This also applied to people treated for the first time. Compared to 2016, hospitalisation rates of people with depression show high variability. In the Warmińsko-mazurskie and Śląskie Voivodships these rates decreased by several percent.

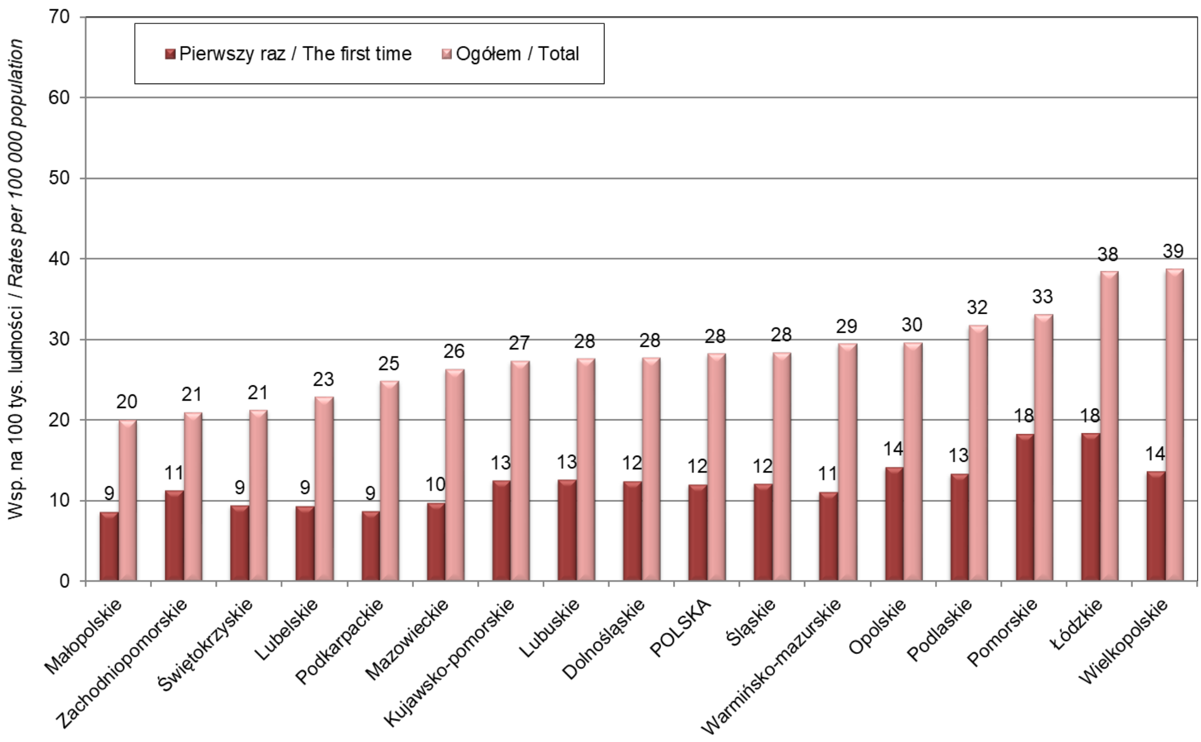

Fig. 5.5. Inpatient mental health facilities– all treated patients and the first-time treated for depression by region in 2018 (data of the Institute of Psychiatry and Neurology)

SUMMARY

1. The total number of patients covered by psychiatric outpatient care is over one million six hundred thousand people. The number of patients treated in the period 2016-2018 remained at a relatively constant level, although there was an increase in the number of patients treated for the first time. There are still tendencies associated with the fact that women are treated more often than men (by over 20%), and in mental health centres – by 50%. Urban inhabitants are treated considerably more often than rural inhabitants. In 2018, in psychiatric outpatient care–, this surplus was as high as 106%, and this difference indicates the unequal satisfaction of the health needs of these two populations.
2. The most common health problems among people treated in psychiatric outpatient care include (and have included for several years) neurosis related to stress and somatoform disorders, as well as mood (affective) disorders.

3. In the years 2011-2018, the number of Polish inhabitants treated in inpatient mental health facilities was rising. In 2018, 263,000 people were treated for mental disorders. Men were more often treated than women (112% more men) – 941.1 / 100,000 inhabitants and 442.4 / 100,000 inhabitants, respectively. Urban inhabitants were treated more often than rural inhabitants by 20% (729.2 / 100,000 inhabitants and 614.9 / 100,000 inhabitants, respectively). This difference was much smaller than in the case of outpatient treatment. However, it has nearly doubled in the last eight years.
4. The most frequent diagnosis among people treated in inpatient mental health facilities was alcohol-related mental disorders – in 2018, 254.3 / 100,000 inhabitants, and in patients treated for the first time 109.4 / 100,000 inhabitants. An especially large number of inhabitants, just like three years ago, are treated in the Podlaskie, Łódzkie and Świętokrzyskie Voivodships.

6. INFECTIOUS AND PARASITIC DISEASES

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By referring to the most general indicator of the epidemiological situation of infectious and parasitic diseases, i.e., the infectious disease mortality rate, it can be stated that the epidemiological situation in this respect has been relatively favourable and stable for the past 30 years in Poland. Considering the slight – yet noticeable - downward trend observed during that time, the rates of mortality from infectious and parasitic diseases in Poland oscillate between 5 and 8 deaths annually per 100,000 population. In individual years, this rate corresponds to the share in all-cause mortality in Poland of approximately 0.5%-0.8%.

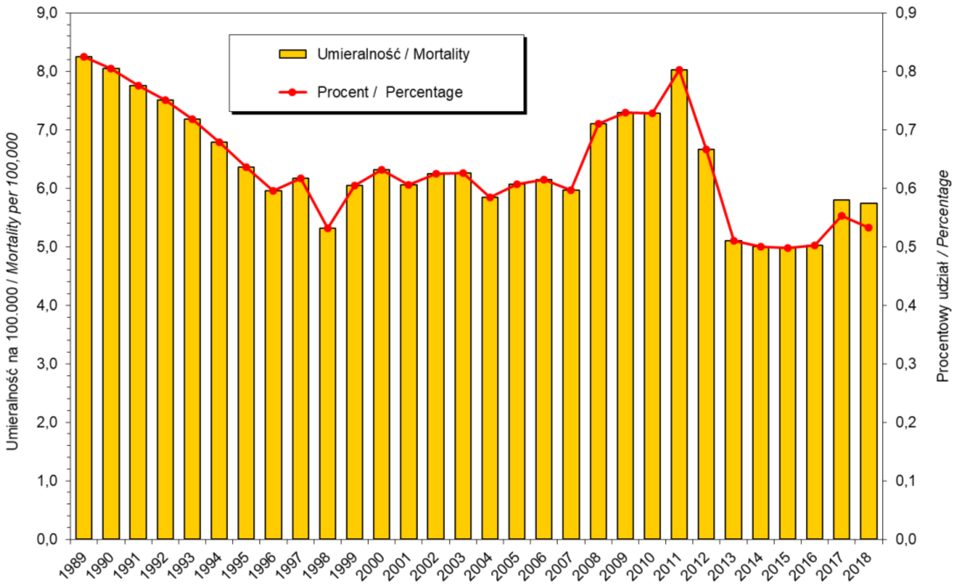


Fig. 6.1. Mortality from infectious diseases per 100,000 population, and the share of deaths from infectious diseases in the total number of deaths in Poland, 1989-2018

Importantly, there are no significant differences between individual regions of the country. For instance, in 2018 the share of deaths caused by infectious and parasitic diseases in individual voivodships ranged from 0.16% (in the Świętokrzyskie Voivodship) to 0.80% (in the Łódzkie Voivodship), with a country-wide percent of 0.53%. This percent values have been subject to some fluctuations throughout the years and across the individual voivodships, yet the differences (range) between the voivodships tended to fall within the range of approx. 0.5 percentage point.

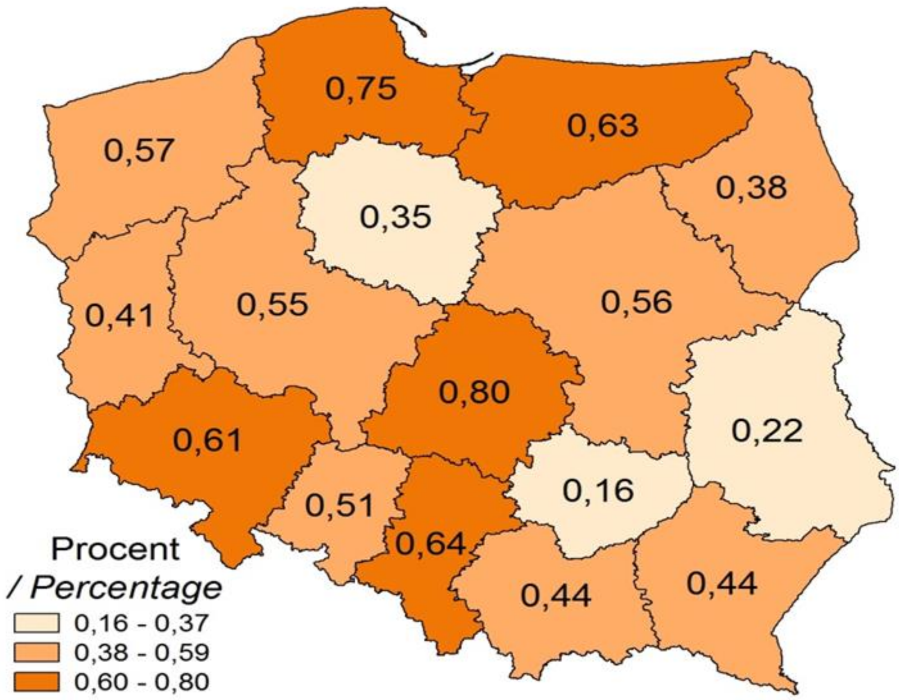


Fig. 6.2. The share of deaths from infectious diseases in the total number of deaths in Poland in 2018 by voivodships

However, the relative stability of the overall epidemiological situation does not mean that epidemiological situation regarding individual infectious diseases does not change, or their annual recorded incidence remains at a similar level. Nonetheless, leaving aside the seasonal increase in the number of cases of certain diseases related to their natural epidemic cycles, or random fluctuations in the annual numbers of recorded cases, the data collected as part of the surveillance of infectious diseases show that the incidence rates related to the majority of diseases indicate a more or less significant downward trend, or that the incidence remains at a relatively stable level. If the incidence rates with regards to some of the diseases increase, in certain cases it can be attributed to the improvement of the epidemiological surveillance of these diseases (for instance, due to imposing an obligation on the laboratories to communicate positive test results for the diseases), an increased detection of some disease cases (as a result of the development and availability of laboratory diagnostics), or due to the changes in the definitions of a case adopted for surveillance purposes.

The epidemiological situation regarding infectious and parasitic diseases of particular importance for public health is annually analysed and discussed in “Kronika Epidemiologiczna” (“*Epidemiological Chronicle*”) published in “Przegląd Epidemiologiczny” (“*Epidemiological Review*”)[48], while the detailed numerical data on the documented cases of all infectious diseases under surveillance in Poland are published in the annual bulletin entitled “Choroby zakaźne i zatrucia w Polsce” (“*Infectious diseases and poisonings in Poland*”)[49]. Therefore, this chapter is limited to a discussion of selected issues. However, Table 6.1 contains the basic data characterising the situation of a wider range of infectious diseases covered by surveillance than the diseases discussed in this chapter, including the number of registered cases and incidence rates in 2019, as well as the medians of those values between 2009-2013 and 2014-2018, which allows an overall assessment of the direction and dynamics of the changes taking place.

[48] A quarterly published by the National Institute of Public Health – PZH and the Polish Society of Epidemiologists and Infectious Disease Specialists, available at: http://www.przeglepidemiol.pzh.gov.pl/
[49] The bulletins are published by the National Institute of Public Health - PZH and the Chief Sanitary Inspectorate, available at: http://wwwold.pzh.gov.pl/oldpage/epimeld/index_p.html#04

Table 6.1 Selected notifiable infectious diseases in Poland. Number of cases and incidence per 100,000 population, 2009-2019

Disease (in order by ICD-10)		Median 2009-2013		Median 2014-2018		2019	
		No. of cases	Incidence	No. of cases	Incidence	No. of cases	Incidence
Cholera		0	0	0	0	0	0
Typhoid		2	0.005	3	0.008	3	0.008
Paratyphoid A, B, C		5	0.013	2	0.005	2	0.005
* Salmonellosis		8,813	22.9	9,957	25.9	9,234	24.1
including:	Foodborne intoxications	8,652	22.5	9,651	25.1	8,919	23.2
	* parenteral infections	161	0.44	290	0.75	315	0.82
Shigellosis		19	0.05	44	0.11	37	0.10
* Other bacterial intestinal infections		6,595	17.3	13,311	34.6	15,047	39.2
including:	Verotoxigenic E.coli	5	0.013	8	0.021	17	0.044
	* Diarrheagenic E. coli	650	1.69	330	0.86	288	0.75
	* Other specified and unspecified E.Coli infections	845	2.19	326	0.85	281	0.73
	Campylobacteriosis	375	0.98	726	1.89	715	1.86
	Yersiniosis	206	0.54	172	0.45	196	0.51
	caused by *Clostridium difficile*	.	.	8,976	23.3	11,310	29.5
	* other specified and unspecified	.	.	2,644	6.88	2,240	5.84
* Other bacterial foodborne intoxications		1,915	5.01	1,033	2.69	452	1.18
including:	* Staphylococcal enterotoxin	147	0.38	66	0.17	13	0.03
	botulism	31	0.081	26	0.068	15	0.039
	* *Clostridium perfringens*	8	0.021	1	0.003	0	0
	* other specified	52	0.135	13	0.034	43	0.112
	* other unspecified	1,561	4.05	957	2.49	381	0.99
Giardiasis		1,881	4.89	1,446	3.76	784	2.04
Cryptosporidiosis		1	0.003	5	0.013	1	0.003
* Viral and other specified intestinal infections		39,462	102.4	51,561	134.0	62,333	162.4
including:	* rotaviruses	23,529	61.1	32,995	85.9	34,019	88.6

Disease (in order by ICD-10)	Median 2009-2013		Median 2014-2018		2019	
	No. of cases	Incidence	No. of cases	Incidence	No. of cases	Incidence
* noroviruses	1,475	3.83	3,637	9.46	5,636	14.68
* other	12,735	33.1	19,067	49.6	22,678	59.1
* Diarrhoea in children under 2 years, unspecified	13,068	1591.4	17,488	2260.9	18,525	2420.9
Tuberculosis [1)]	7,542	19.7	6,430	16.7	5,321	13.9
including: respiratory system [1)]	7,018	18.3	6,078	15.8	5,075	13.2
Plague	0	0	0	0	0	0
Tularaemia	6	0.016	16	0.042	21	0.055
Anthrax	0	0	0	0	0	0
Brucellosis (new cases)	0	0	2	0.005	2	0.005
Leptospirosis	4	0.010	4	0.010	4	0.010
Listeriosis	58	0.15	101	0.26	121	0.32
Tetanus	16	0.042	12	0.031	17	0.044
Diphteria	0	0	0	0	0	0
Pertussis	2,182	5.67	3,061	7.97	1,629	4.24
* Scarlet fever	18,267	47.4	20,369	53.0	20,837	54.3
Meningococcal disease	251	0.65	200	0.52	193	0.50
including: meningitis and/or encephalitis	165	0.43	121	0.31	94	0.24
sepsis	167	0.43	139	0.36	126	0.33
* Erysipelas	3,425	8.9	5,492	14.3	6,163	16.1
Legionellosis	11	0.03	27	0.07	87	0.23
Syphilis (total) [2)]	993	2.58	1,457	3.79	1,643	4.28
Gonorrhea [2)]	402	1.05	393	1.02	558	1.45
Sexually transmitted chlamydia [2)]	406	1.05	230	0.60	418	1.09
* Lyme disease	9,157	23.8	20,150	52.5	20,630	53.7
Q fever	0	0	0	0	4	0.010
* Typhus fever, spotted fever and other rickettsioses	2	0.005	3	0.008	4	0.010
Poliomyelitis	0	0	0	0	0	0
* Creutzfeldt-Jakob disease	18	0.047	24	0.062	30	0.078
Variant Creutzfeldt-Jakob disease	0	0	0	0	0	0
Rabies	0	0	0	0	0	0

Disease (in order by ICD-10)	Median 2009-2013		Median 2014-2018		2019	
	No. of cases	Incidence	No. of cases	Incidence	No. of cases	Incidence
* Viral encephalitis	399	1.04	329	0.85	357	0.93
including: * tick-borne	227	0.59	197	0.51	265	0.69
* other specified	38	0.100	31	0.081	29	0.076
* other unspecified	124	0.32	94	0.24	63	0.16
* Viral meningitis	1,058	2.75	943	2.45	943	2.46
including: * enteroviral	37	0.10	71	0.18	134	0.35
*other specified and unspecified	1,016	2.64	889	2.31	809	2.11
Dengue fever (classical and haemorrhagic)	5	0.013	29	0.075	55	0.143
Yellow fever	0	0	0	0	0	0
Lassa fever	0	0	0	0	0	0
Crimean Congo haemorrhagic fever	0	0	0	0	0	0
Disease caused by Marburg or Ebola virus	0	0	0	0	0	0
* Varicella	178,501	463.6	173,196	450.8	180,641	470.6
Measles	70	0.18	110	0.29	1,511	3.94
Rubella	6,263	16.25	1,105	2.88	285	0.74
including: congenital rubella syndrome	1	0.24	0	0	0	0
Hepatitis A	71	0.18	76	0.20	1,067	2.78
Hepatitis B [3)]	1,583	4.11	3,363	8.75	2,854	7.43
including: acute	104	0.27	55	0.14	45	0.12
Hepatitis C [4)]	2,241	5.8	4,010	10.4	3,344	8.7
* Viral hepatitis - other and unspecified	39	0.101	9	0.023	13	0.034
AIDS	162	0.42	111	0.29	85	0.22
Newly detected HIV infections	1,100	2.86	1,278	3.32	1,468	3.82
Mumps	2,754	7.21	1,978	5.15	1,338	3.49
Malaria	22	0.058	28	0.073	24	0.063
Echinococcosis	28	0.07	51	0.13	70	0.18
Trichinosis	23	0.060	9	0.023	2	0.005

Disease (in order by ICD-10)	Median 2009-2013		Median 2014-2018		2019	
	No. of cases	Incidence	No. of cases	Incidence	No. of cases	Incidence
Disease caused by *Streptococcus pneumoniae*	430	1.12	979	2.55	1,538	4.01
including: meningitis and/or encephalitis	180	0.47	197	0.51	181	0.47
sepsis	188	0.49	646	1.68	1,043	2.72
other specified and unspecified	121	0.31	377	0.98	567	1.48
Disease caused by *Haemophilus influenzae*	25	0.07	69	0.18	99	0.26
including: meningitis and/or encephalitis	11	0.029	11	0.029	10	0.026
sepsis	14	0.04	42	0.11	53	0.14
* Bacterial meningitis and/or encephalitis – other specified	139	0.36	125	0.33	121	0.32
* Bacterial meningitis and/or encephalitis – other unspecified	353	0.92	245	0.64	177	0.46
* Meningitis - other and unspecified	506	1.33	720	1.87	766	2.00
* Encephalitis other and unspecified	96	0.25	107	0.28	100	0.26
Influenza and influenza-like illness	1,156,357	3,001.5	4,316,823	11,233.9	4,790,033	12,478.4
Congenital toxoplasmosis	7	1.69	19	4.97	14	3.73

6.1. Diseases covered by mandatory vaccination in Poland

The introduction of the **National Immunization Programme** in Poland in the 1950s and 1960s, and its further continuous implementation with periodically updated dosage regimens and new vaccinations, has considerably changed the national epidemiological situation. Mandatory vaccinations for children and adolescents between the age of 0 and 19 are of particular significance in this respect. The mandatory vaccinations have considerably reduced or eliminated cases of diseases such as diptheria, tetanus, poliomyelitis, measles, rubella, viral hepatitis B or diseases caused by *Hemophilus influenzae*. Such result, i.e. the decrease in the number of cases and in the frequency of disease complications, is also expected from the vaccination against *Streptococcus pneumoniae* introduced in 2017 to the Mandatory Vaccination Schedule. Pneumococcal infection can result in severe meningitis, sepsis, pulmonary infections, otitis media, and deaths in children. Epidemiological surveillance includes invasive pneumococcal diseases, including pneumococcal meningitis and/or pneumococcal encephalitis, sepsis, and other invasive diseases, specified and unspecified (B95.3; J13 in accordance with ICD10). During the period prior to the introduction of mandatory vaccination, for instance in 2015 and 2016, there was a total of approximately 1000 cases (incidence at 2.51 and 2.55 per 100,000 population) reported. In 2017, the incidence of invasive pneumococcal disease amounted to 3.10 per 100,000 population, while in the subsequent years it was 3.53 per 100,000 population in 2018, and in 2019 it increased to 4.02 per 100,000 population. That effect, i.e. the increased incidence of invasive pneumococcal disease in comparison with the period prior to the vaccinations should be attributed to the increased sensitivity of the surveillance system. However, the actual effects of the pneumococci vaccination scheme will not be demonstrable until multiple cohorts of children complete full vaccination cycles. Even more so, as the initial data related to immunization of children born in 2017 carried out in 2018 and 2019 are exceptionally satisfactory - the vaccination coverage rate amounted to a high level of 94.1% and 94.3% respectively.

In the case of pertussis, the epidemiological situation is much more complex, as after a significant decrease in the incidence and mortality of pertussis, the second half of the 1990s an increase in incidence is observed, reaching a level of 2000-3000 cases per year.

Since 2016, when 6,828 cases were registered, there has been a downward trend in pertussis incidence, and 3,067 cases were reported in 2017 with an incidence rate of 7.98 per 100,000 population. There was a further decrease in the pertussis incidence in 2018, with a total number of 1,548 reported cases, i.e. 49.4% less than the year before. The incidence rate in Poland in 2018 amounted to 4.0 per 100,000 population, while in 2019 it slightly increased to 4.25 per 100,000 inhabitants, with 1,630 reported cases, which confirms the occurrence of pertussis epidemic in cycles lasting 3 to 5 years, and indicates a sustained circulation of bacteria in the environment and persistent susceptibility to infection across the population (Fig. 6.3).

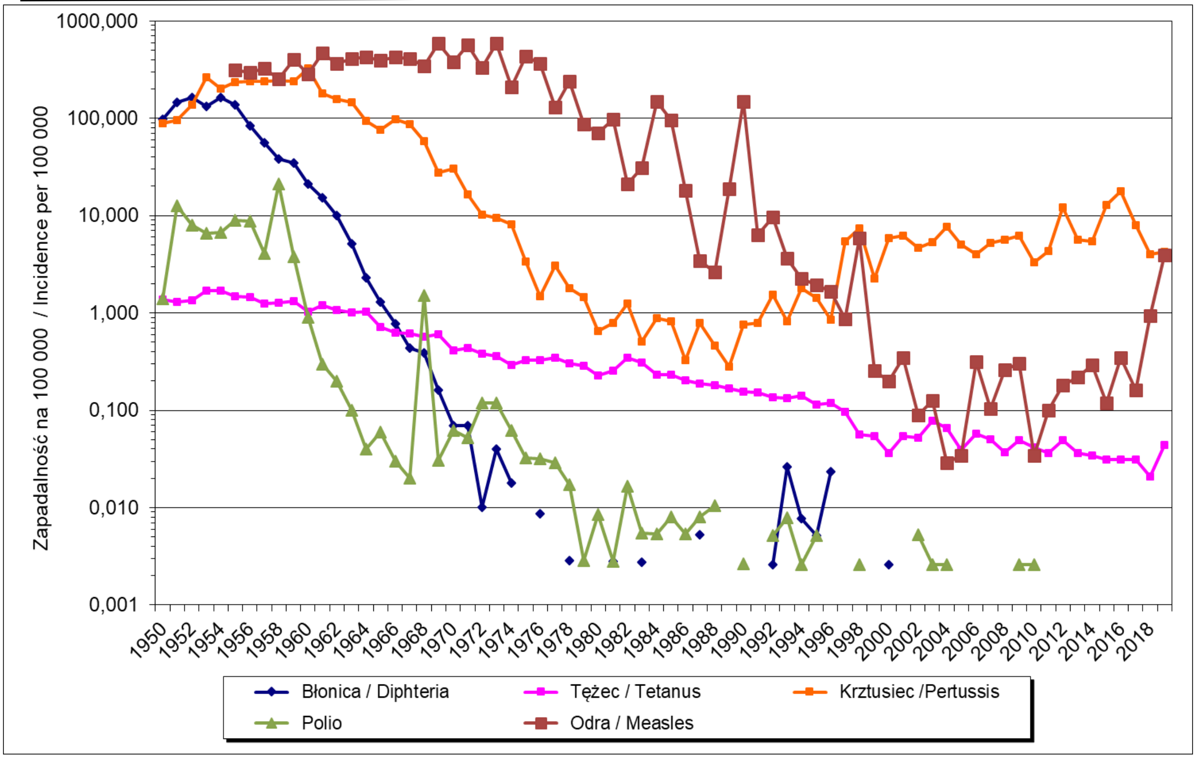


Fig. 6.3. Incidence of selected infectious diseases covered by mandatory vaccinations for children and adolescents, in 1950-2019

It must be noted that immunisation against diphtheria, tetanus, pertussis, poliomyelitis, measles and rubella was carried out at a very high level in most years, as the coverage ranged between 95% and 100%. The information on the implementation of the routine immunisation programme in Poland is sourced from the data on the vaccination of children and adolescents, collected annually by the employees of the sanitary and epidemiological stations from all the healthcare facilities in Poland. These data show, that during the recent years, 95% of children and adolescents have been vaccinated (Fig. 6.4.). As regards the majority of vaccinations, the total coverage ranged between 92.6% and 97.7% in 2019 with a steady, alarming downward trend of vaccination coverage (Fig. 6.5).

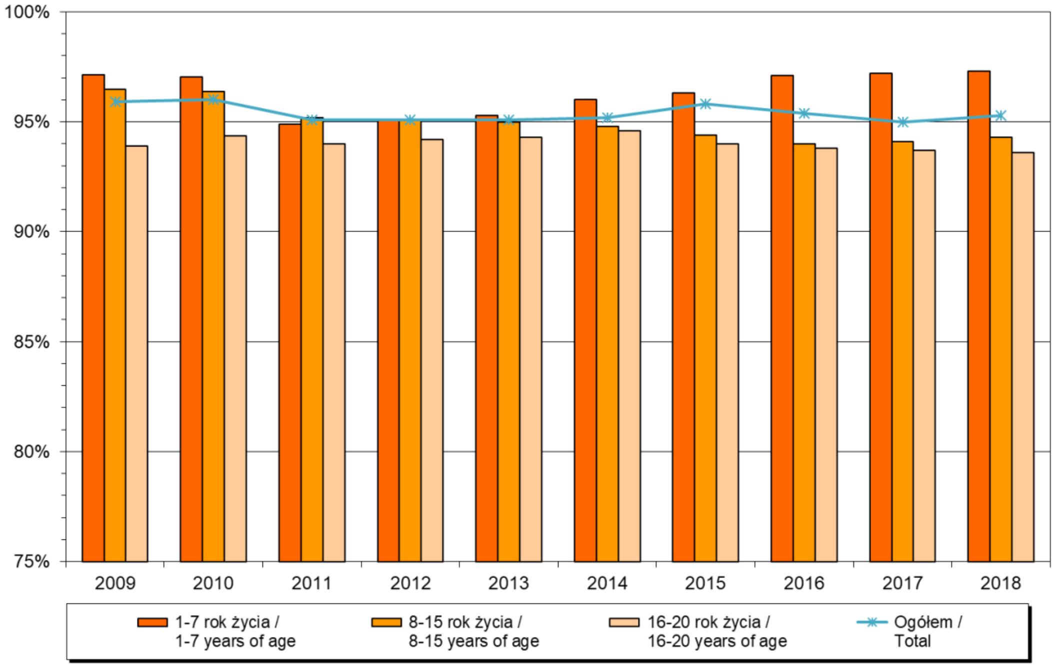


Fig. 6.4. The National Immunization Programme in 2006-2018. The percentage of children and adolescents covered by supervision over the implementation of the Programme

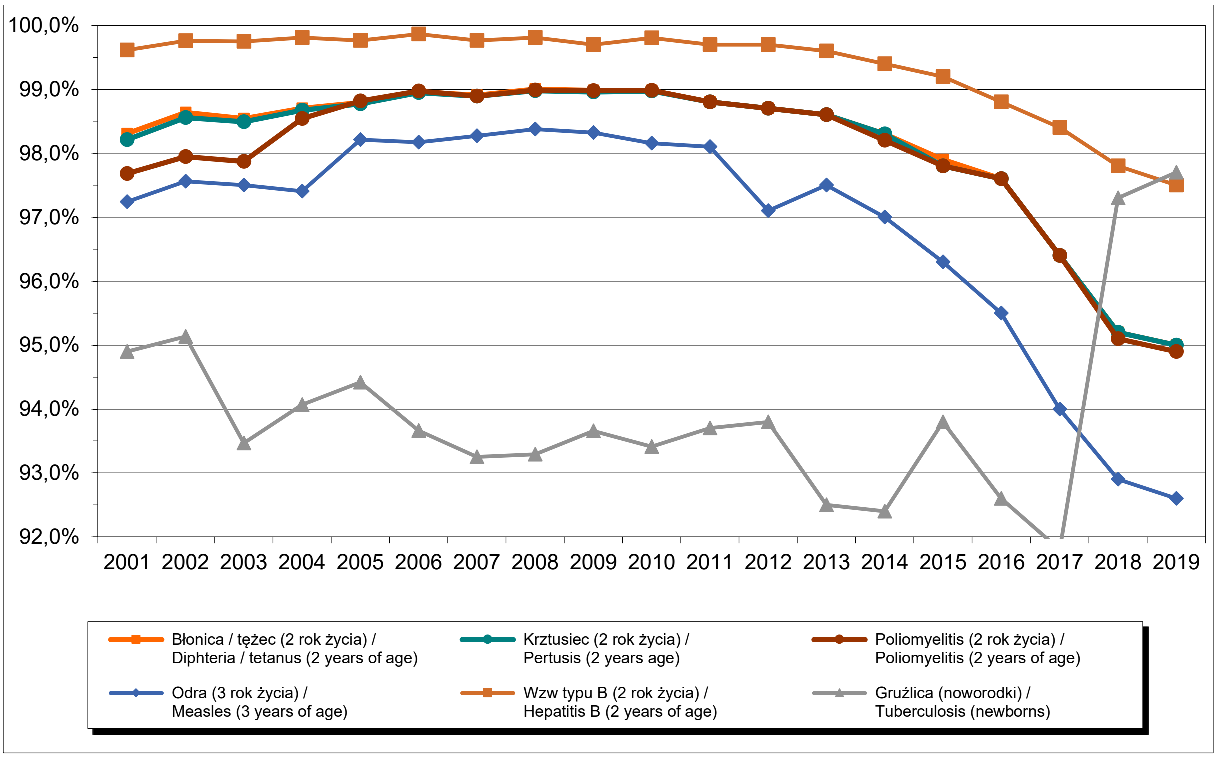


Fig. 6.5. The National Immunization Programme in 2001-2019. The percentage of children aged 1-3 vaccinated against selected diseases

It must be added, that based on the preliminary data for 2019, the vaccination coverage at the voivodship level varied, but was not lower than 87.5%, and ranged between 87.6% and 99.2%. The vaccination coverage level in the population subject to mandatory vaccination remaining at above 90.0% is still enough to reach herd immunity, preventing the epidemic spread of diseases, however in the event that the current downwards trend in vaccine coverage persists, the current favourable situation may change within the next few years (Tab. 2).

Tab.6.2. Vaccine coverage in Poland in 2019 (preliminary data)

Type of vaccine	The average coverage in the country	Min. and max. coverage, by voivodship	Age of children covered by assessment of coverage
Diphteria/tetanus	95.0%	90.5% - 98.4%	second year of life
Pertussis	95.0%	90.5% - 98.4%	second year of life
Poliomyelitis	94.9%	90.5% - 98.4%	second year of life
Measles/mumps/rubella	92.6%	87.6% - 97.8%	third year of life
Rubella	99.8%	98.6%-100%	fifteenth years of life
Hib /*Hemophilus influenzae*	94.8%	92.7% - 98.4%	second year of life
Streptococcus pneumoniae	94.3%	89.0% - 98.8%	second year of life
Hepatitis B	97.5%	95.2% - 99.1%.	second year of life
Tuberculosis	97.8%	95.2% - 99.2%.	second year of life

It must be emphasised that as a result of the conducted vaccinations, the last case of poliomyelitis (Heine-Medin Disease) caused by a wild polio virus strain in Poland was documented in 1984 (Fig. 6.3). Since then, despite active search of infections causes by polio viruses in persons displaying symptoms of acute flaccid paralysis (subject to mandatory surveillance), only singular cases of disease caused by vaccine strains of the virus were detected (one case per year in 2009, 2010 and 2013). From the perspective of the Global Polio Eradication Initiative coordinated by the World Health Organization, Poland has achieved and maintains the status of a polio-free country.

Diphtheria cases in Poland after 1975 have occurred sporadically (Fig. 6.3) - the last case of diphtheria was imported from the territory of the former Soviet Union in 2000. However, it is important to keep in mind, especially considering the epidemiological situation in Eastern Europe, that the diphtheria risk persists in the situation where the given population includes persons susceptible to infection and children who have not been immunised. Therefore, the strategy to combat this disease must be based on two main elements:

- maintaining a high level of vaccination of children and adolescents in accordance with the current vaccination schedule, and

- periodic booster doses with a reduced amount of diphtheria toxoid, Td vaccine, administered every 10 years.

Since 1998, the number of tetanus cases has not exceeded 30 cases per year, and there was a downward trend in documented cases, with no more than a dozen cases per year. Only 8 infections were reported in 2018, i.e. 33% less in comparison to the previous years, while 17 persons were infected with tetanus in the following year. The incidence of this disease in Poland stabilized during the recent years, and remains at an above-average level in comparison to other EU Member States (Fig. 6.6).

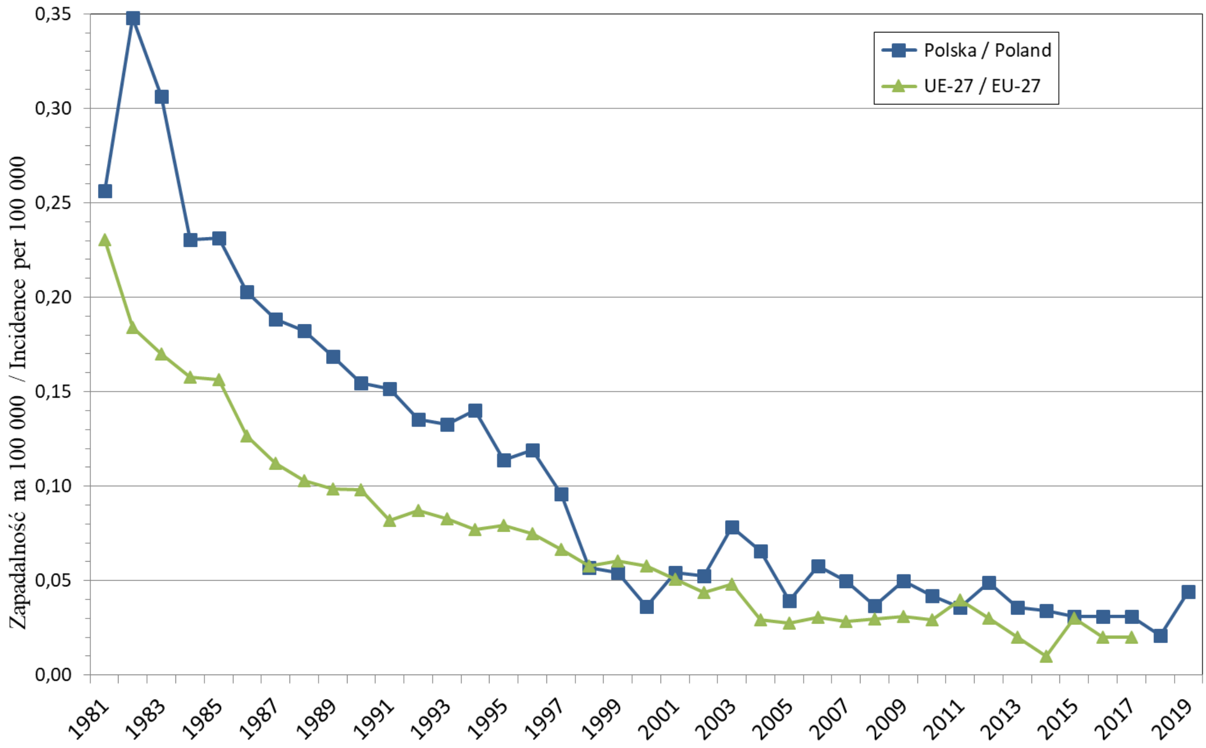


Fig. 6.6. Tetanus incidence in Poland and average incidence in EU/EEA countries in 1981-2019 (source: WHO HFA DB, ECDC)

The great success of the vaccinations against tetanus is the fact that neonatal tetanus has not been reported for numerous decades. The specificity of tetanus lies in a widespread presence of *Clostridium tetani* bacteria in the natural environment, as their spores exist in the soil, they are present in human and animal faeces, near humans. In addition, there is not herd immunity phenomenon for tetanus. For that reason, each person's immunity determines the community’s vulnerability to infection. Considering the fact that injuries remain a medical issue in urban and rural areas, continual increase in immunisation remains the only effective method for preventing the disease. The exposure to bacterial spores related to the frequency of injuries, and low immunisation works in favour of transmission. In Poland, the vast majority of cases occur in people aged over 50. Age also plays a significant role in the disease course severity and case fatality.

After years of systematic decrease in the incidence of diseases subject to elimination programmes: measles, rubella and congenital rubella syndrome, the epidemiological situation of these diseases has changed in the recent years. After several subsequent years of approximately 100 documented cases of measles (133 documented cases in 2016, and 63 documented cases in 2017 – which means that the average incidence was multiple times lower than the average incidence in EU Member States (Fig.6.7)), 2018 saw an increase in the incidence of measles, with 359 documented cases and incidence rate at 0.93 per 100,000 population.

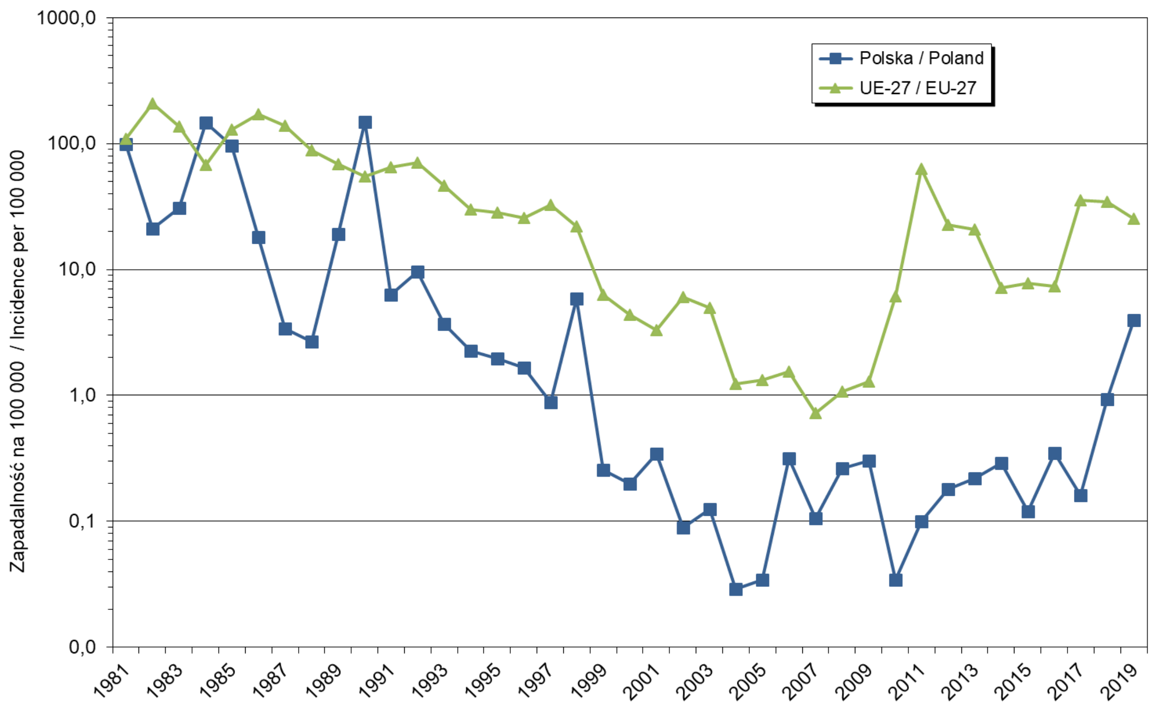


Fig. 6.7. Measles incidence in Poland and average incidence in EU/EEA countries in 1981-2019 (source: WHO HFA DB, ECDC)

It must be stressed that the highest number of cases, i.e. 233, was recorded in Q4 2018. They constituted 65% of the total 2018 incidence, and started an epidemiologic increase in measles which continued for three consecutive quarters of 2019. In total, 1511 people were infected in Poland in 2019, while the incidence rate per 100,000 population amounted to 3.94 (Fig.6.7.). The incidence was related mostly to adults aged between 30 – 44 years. A similar situation, i.e. an increase in the incidence of measles, was also reported in other European countries. 2017 saw a 300 percent increase in the incidence of measles in Europe. 21,315 cases of measles and 35 deaths were documented in the WHO European Region, with the largest numbers reported in Romania and Italy. The reasons for the unfavourable situation in European countries, including Poland, can be attributed to several observable social phenomena:

1. a growing number of parents who object to their children being vaccinated against measles, which contributes to the decreasing immunisation against measles and epidemic outbreaks. Measles requires a high vaccine coverage ratio at the level of approximately 90%-95% for the herd immunity to be achieved, which is a condition for stopping the circulation of the virus in the natural environment. It is particularly important for the

people who cannot be vaccinated as they are too young, i.e. infants, or who have contraindications to vaccination, i.e. immunocompromised people. In addition, it is worth noting that obtaining a high vaccination coverage with two doses of vaccination with measles component, i.e. the MMR combination vaccine, ensures sustainable immunisation against measles at the level of 98-99% which lasts for a lifetime.

2. increased international and domestic mobility of certain ethnic groups and economic migrants who had not been vaccinated against measles, which results in a continuous occurrence of small-scale outbreaks of the infection in various regions of Poland, regardless of local immunisation levels. The inability to predict the location of potential outbreaks creates a significant risk to unvaccinated persons, or to children for whom vaccination was delayed. Such situation may also cause infections in other patients and in partially immune medical personnel.

From the perspective of the implementation of the measles elimination programme coordinated by the WHO, the epidemiological situation of measles observed in Europe has delayed the achievement of the aim to eliminate the disease; however, the achievement of this milestone seems plausible in the years to come. The number of rubella cases after the period of compensatory (cyclic) epidemic, beginning in 2015 has significantly decreased (Fig.6.8). 437 rubella cases were registered in 2018 which corresponds to an incidence of 1.1 per 100,000 population, whereas in 2019 the number of recorded cases was 283 (incidence of 0.7 per 100 000 population).

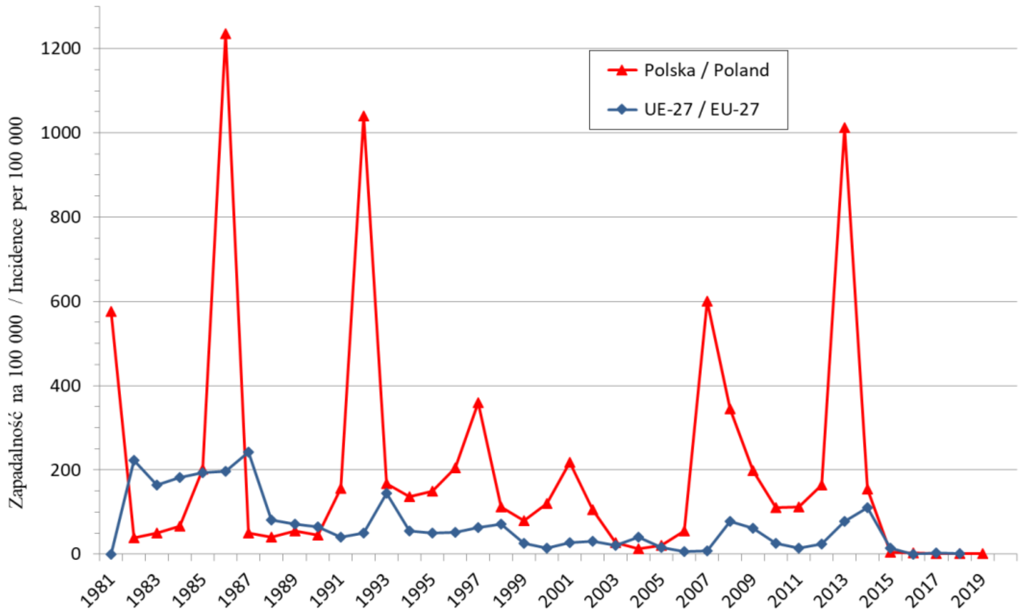


Fig. 6.8. Rubella incidence in Poland and average incidence in EU/EEA countries in 1981-2019 (source: WHO HFA DB, ECDC)

The largest number of rubella cases in 2019 occurred in children aged 0-4 and 5-9 (Fig. 6.9), similarly to the previous years. In comparison to previous years, however, a stable downward trend can be observed. The reported and registered number of cases, higher in children aged 0-4 and 5-9 stems from the fact that in the case of the youngest children, rubella may clinically resemble other viral rash infections, i.e. caused by parvoviruses, enteroviruses or adenoviruses; for that reason, laboratory tests play a key role in a correct diagnosis. Unfortunately, they are not performed in each suspected case of rubella, which results in overdiagnosis of the disease in children.

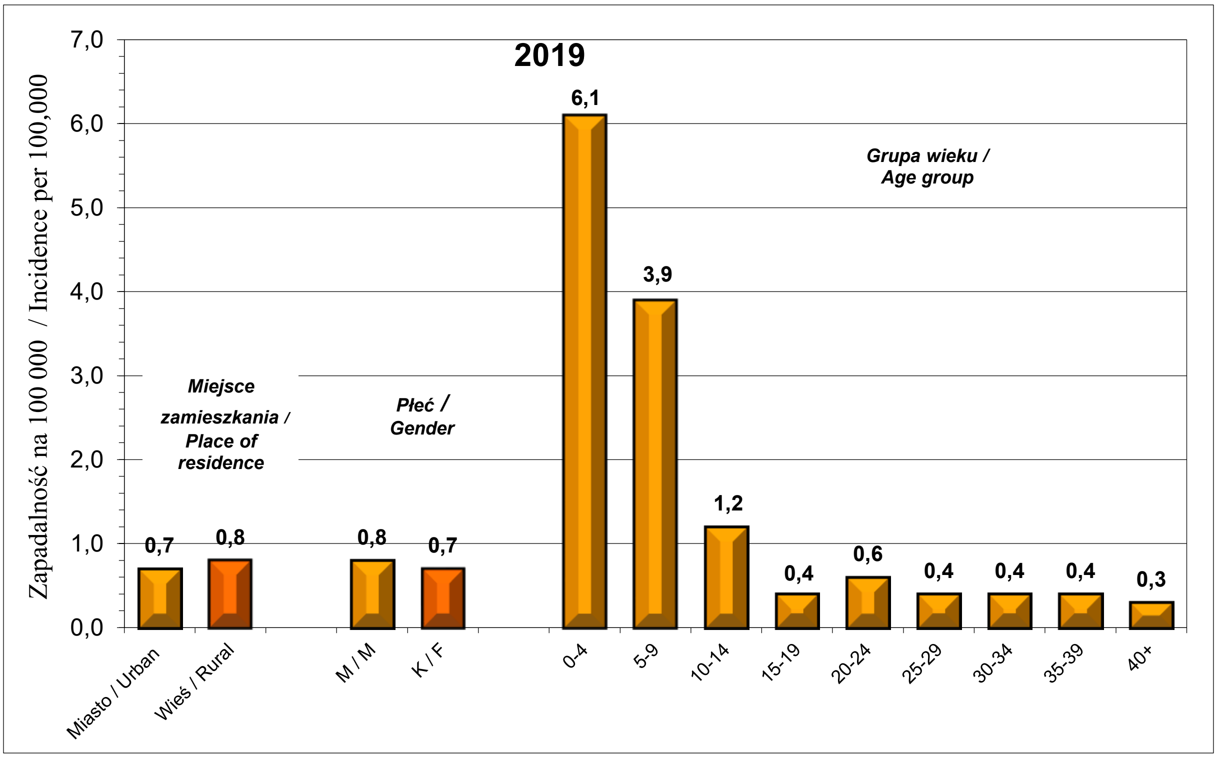


Fig. 6.9. Rubella incidence in 2019 by place of residence, sex and age (preliminary data)

The implementation of mandatory vaccinations against measles, mumps and rubella in the years to come is expected to decrease the incidence of rubella and persistent parotitis (mumps). Approximately 1500 people are diagnosed with mumps each year. 1585 patients were diagnosed with this disease in 2018 (incidence at 4.1/100,000 population), while in 2019 the number of cases amounted to 1338 (3.5/100,000 population). The incidence of mumps in the preceding years displays a stable, albeit slow downward trend, not as spectacular as int he case of other infectious diseases, due to the cyclical epidemics occurring every 3-4 years. However, the incidence of mumps in Poland still exceeds the average incidence in EU Member States (Fig. 6.10).

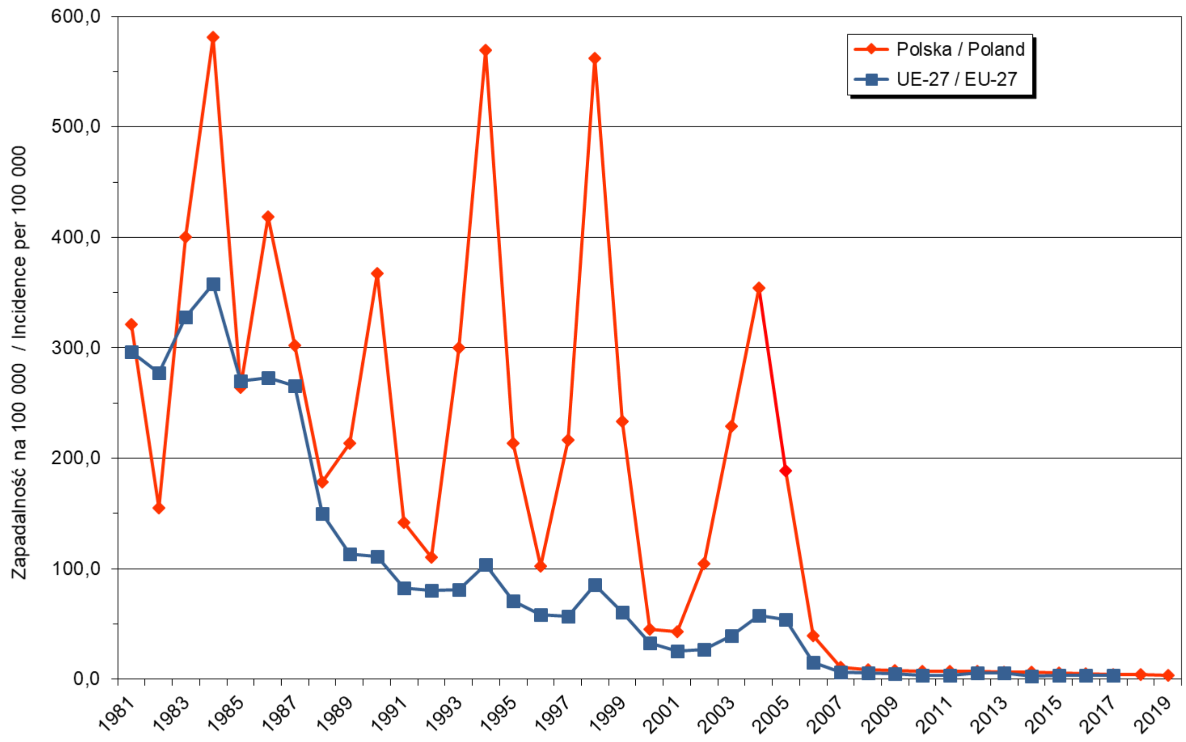
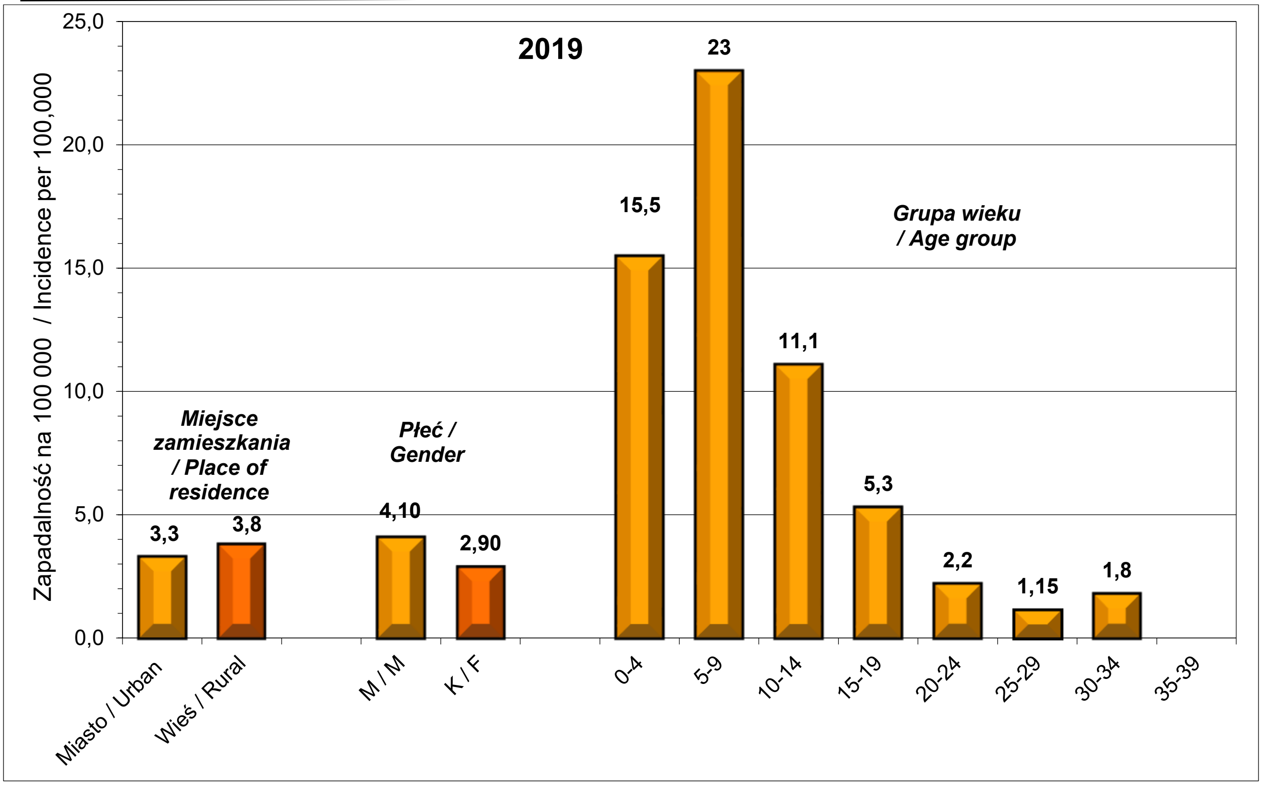


Fig. 6.10. Mumps incidence in Poland and average incidence in EU/EEA countries in 1981-2019 (source: WHO HFA DB, ECDC)

The introduction of widespread vaccinations against measles, mumps and rubella constituted another key factor contributing to the improvement of the epidemiological situation of mumps; in that case, the incidence decrease reached a rate comparable to that of rubella; similarly, the incidence distribution by age is comparable to rubella (Fig. 6.11).



Ryc. 6.11. Zapadalność na świnkę w 2019 r. wg miejsca zamieszkania, płci i wieku (dane wstępne)

Fig. 6.11. Mumps incidence in 2019 by place of residence, sex and age (preliminary data)

However, the rate of laboratory confirmation of suspected rubella cases remains disturbingly insufficient. It is a crucial component required for appropriate diagnosis and confirmation of a given case; at the same time it results from Poland's participation in the implementation of the disease elimination program. The collection of material for laboratory testing in order to confirm the clinical diagnosis also applies to cases of measles and acute flaccid paralysis among children aged under 15. The aforementioned programmes are coordinated by the World Health Organization (WHO).

The undoubtable success of the immunisation programme in Poland includes the spectacular improvement of the situation regarding **viral hepatitis B (HBV).** At the beginning of the 1990s, the incidence of the disease exceeded the European average twofold (Fig. 6.12). It must be noted however, that although important epidemic control measures were implemented as early as in mid-1980s by improving sterilisation in the hospitals, as well as by commencing vaccinations of selected groups, including healthcare providers, chronically ill patients and patients being prepared for surgery, the incidence rate in children below the age of

3 remained high. A significant and rapid improvement has been brought as a result of the introduction of HBV vaccinations to the mandatory vaccination schedule for newborn children. Considering the fact that contrary to the infections in adults, vertical infections and infections in small children are much more likely to cause the development of chronic infections, the vaccination of newborn children and infants is the most crucial component of the strategy to eliminate chronic HBV infections. Currently, WHO estimates that approximately 85% of small children are covered by three doses of the vaccine (to compare, the percentage amounted to 30% in 2000). However, the coverage with the so-called birth dose (during the initial 24 hours of life) still remains too low. The evasion or delaying vaccinations, which has been recently observed in Poland, is worrying in that context.

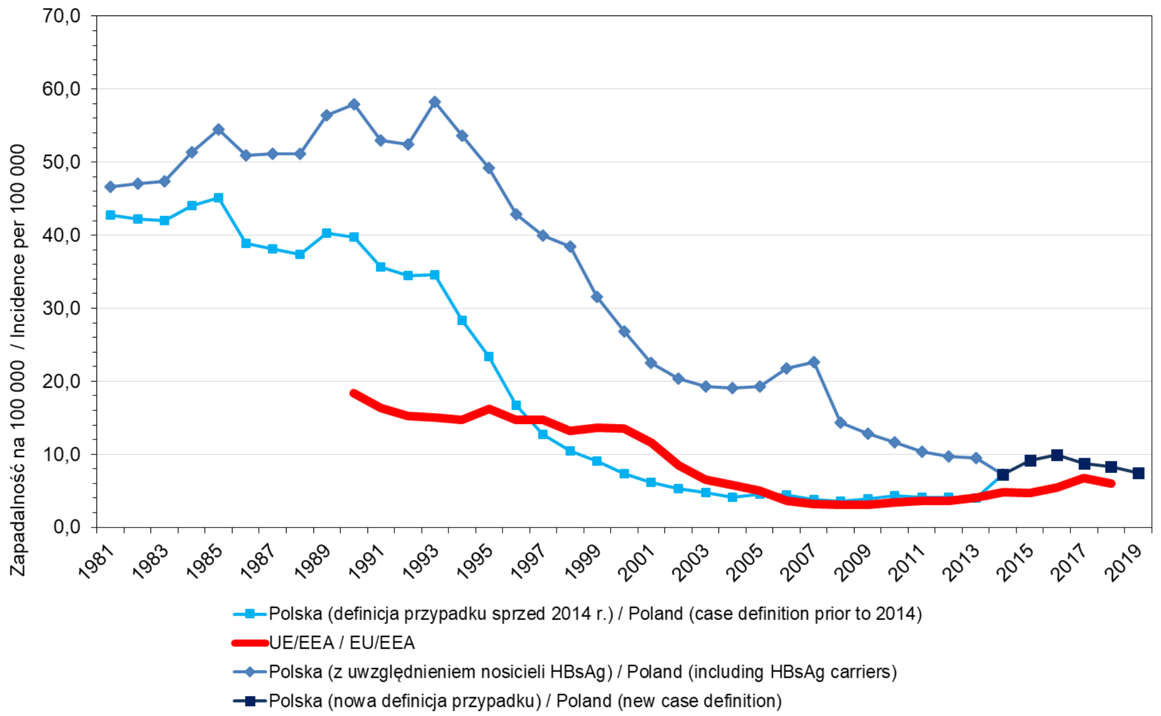


Fig. 6.12. Hepatitis B incidence in Poland and average incidence in the EU/EEA countries, 1981-2019 (source: ECDC surveillance atlas)

In countries with a routine HBV vaccination programme, the incidence rate continues to significantly decrease. Since 2010, i.e. after the introduction of a separate acute HBV registration in Poland, incidence has decreased from 0.34 per 100,000 population to 0.10 in 2018 and 0.11 in 2019. Currently, Poland documents only few cases of acute HBV in birth cohorts covered by neonatal and infant vaccinations, i.e. people born after 1995, as well as people vaccinated as part of supplementary vaccinations for 14-year-olds born between 1986 and 1995. The incidence rate is higher in urban areas (0.13 vs. 0.07 in rural areas) and among men (0.18 vs. 0.06 among women) (Fig. 6.13). In addition, with regards to men - in particular those living in urban areas, medical exposures are less frequently identified as a probable sources of infection, which points towards non-medical procedures and injections and sexual contacts as the dominant transmission routes within the group.

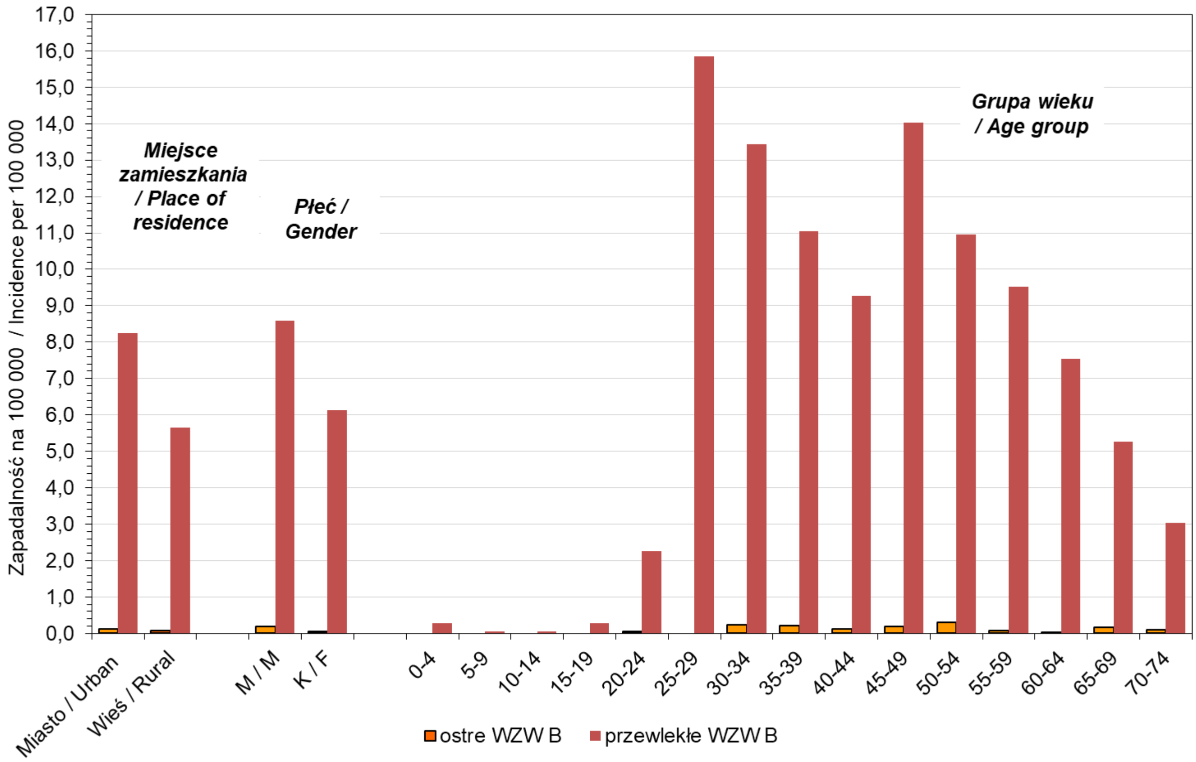


Fig. 6.13. Hepatitis B incidence in 2019 by place of residence, sex and age

On the one hand, chronic HBV in Europe stems from either high incidence in the past, which is also the case in Poland, or it concerns imported from highly endemic countries cases of vertically transmitted infection. The latter mechanism is particularly relevant for countries with high immigration rates and has not been observed in Poland as of yet. However, this situation may change with the influx of immigrants from Eastern Europe, especially people coming from Ukraine, where the vaccination coverage rate in children is below 70%.

Insufficient diagnostics remain a major issue. As a result, the incidence trends for chronic HBV depend to a large extent on the number of tests performed. Currently, apart from testing pregnant women and candidates for blood donors in Poland, there are no detailed guidelines for screening for HBV. Consequently, the disparities between voivodships, presented in Figure 6.14, may depend on the differences in the practices of HBV screening and the availability of screening programmes organised, among others, by local governments.

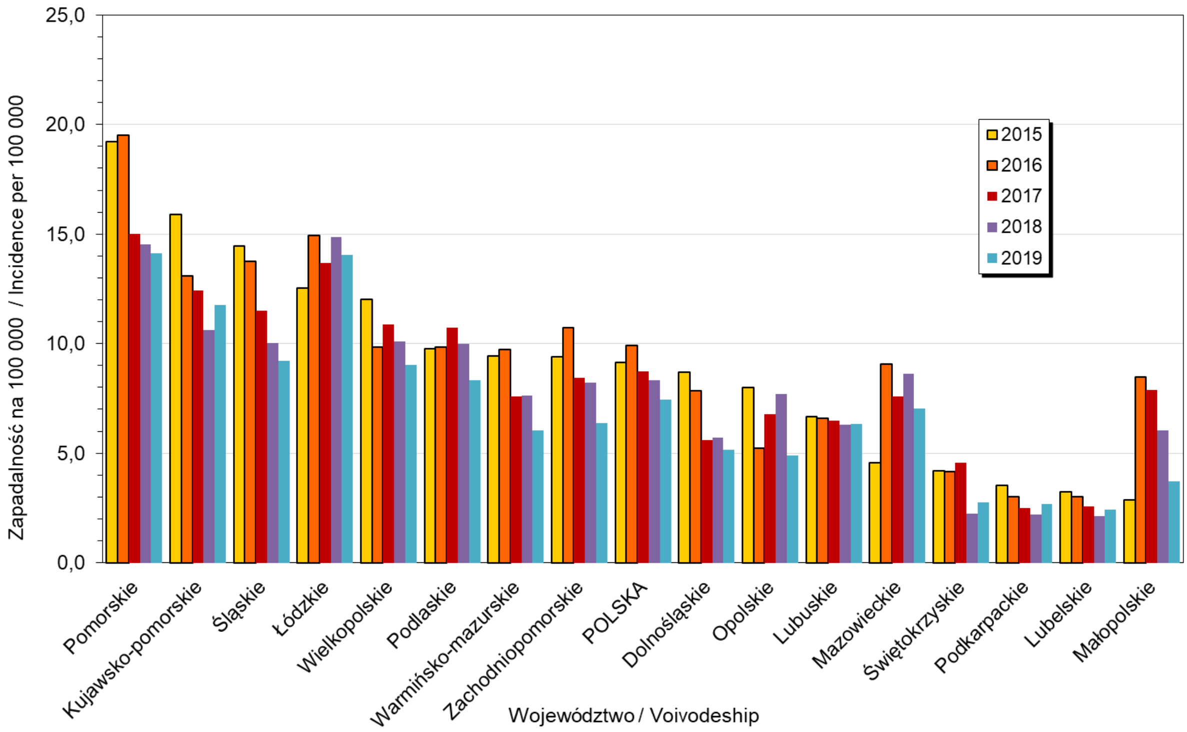


Fig. 6.14. Hepatitis B incidence in 2015-2019, by voivodship

Vaccination against infections caused by ***Haemophilus influenzae* type B** was first introduced in the immunisation programme in 1997 as vaccination recommended for two-month-old children and older, as a preventive measure against meningitis and sepsis, among others. It was first introduced in 2004 as a mandatory vaccination for children in the 1st and 2nd year of life; initially, it was intended for children from children's homes. Starting from 2005, the vaccination was also mandatory for children raised in large families (at least three children), whereas, since 2007, it has been mandatory for all two-months-old children. In the same year, the incidence of invasive *H. influenzae* diseases decreased by 42.6% and the incidence of meningitis and/or encephalitis decreased by 40.6%. The number of cases of meningitis and/or encephalitis caused by *H. influenzae* type B remains low - with 6 cases in 2018 and 9 cases in 2019. Despite a slight increase in the incidence, the incidence rate remains at the same level as in 2018, i.e. 0.02 per 100,000 population.

In 2019, the vaccination status of 2-year-olds (primary vaccination) against *H. influenzae* in individual voivodships ranged from 92.1% in the Podlaskie Voivodship to 98.4% in the Warmińsko-mazurskie Voivodship. The total value for Poland amounted to 94.8%. (Fig.6.15)

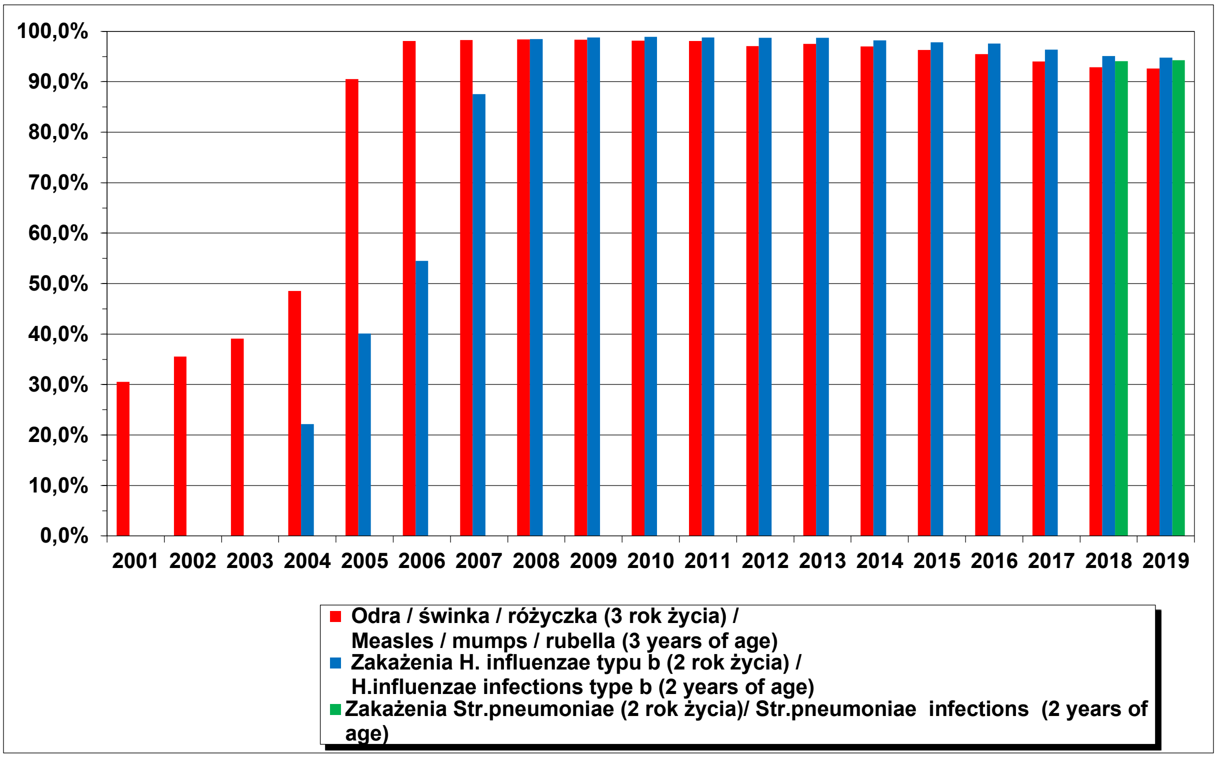


Fig. 6.15. The Immunisation Programme in 2001-2019. The percentage of children aged 1-3 vaccinated against measles-mumps-rubella and Haemophilus influenzae type b infections.

Vaccinations for **tuberculosis** have been carried out for numerous years, and the coverage remains high, despite the downward trend observed in recent years (Fig. 6.5). The effectiveness of this method of protecting the health of the population is relatively the lowest. Maintaining tuberculosis vaccination in the schedule is due to the fact that it prevents TB meningitis and encephalitis; in addition, WHO recommends the vaccination for countries with an increased incidence of tuberculosis. The epidemiological situation as regards tuberculosis in Poland is improving, but the process is relatively slow (Fig. 6.16).

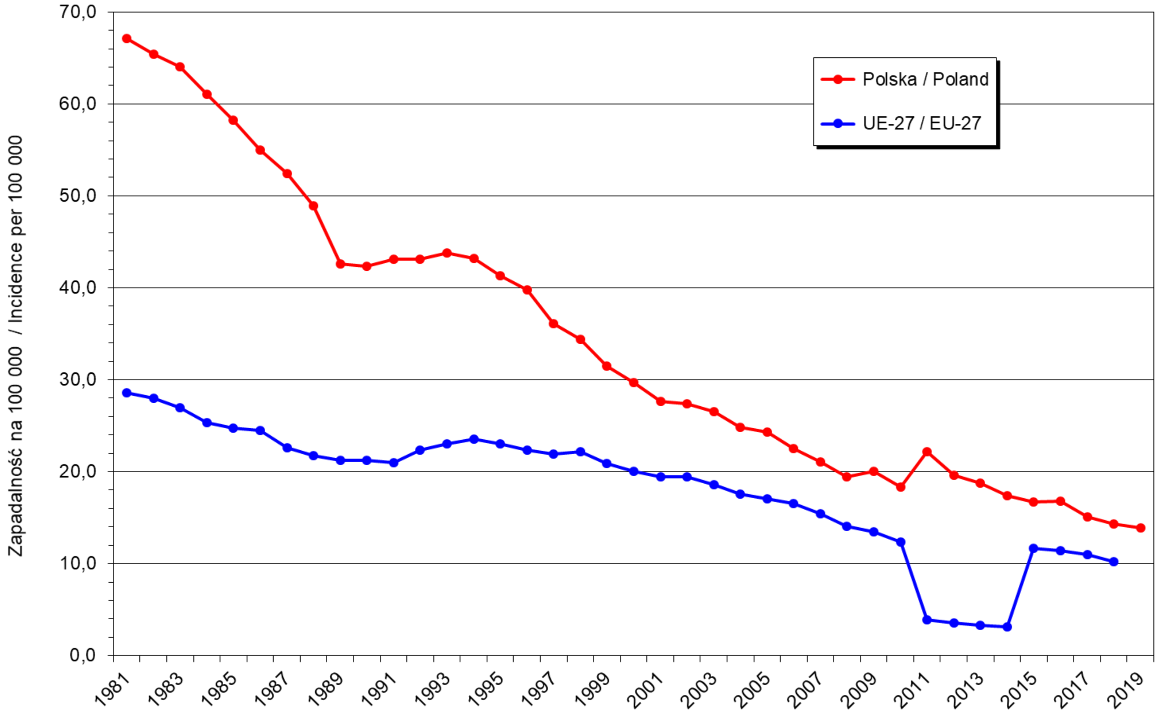


Fig. 6.16. Tuberculosis incidence in Poland and average incidence in EU/EEA countries in 1981-2019 (source: WHO HFA DB, ECDC)

Despite the continuing downward trend in the incidence of tuberculosis, Poland still belongs to the group of countries with a higher incidence of tuberculosis in relation to the Western European average. The incidence of tuberculosis in 2018 in the EU/EEA amounted to an average of 10.2 cases per 100,000 population (Fig. 6. 16). In Poland, the incidence of all forms of tuberculosis was lower in 2018 in comparison to the previous year (14.3 vs. 15.1 per 100,000 population), and the trend was maintained throughout 2019 and amounted to 13.9 per 100,000 population. The most common form of tuberculosis was lung tuberculosis, which accounted for 95.4% of all tuberculosis cases in 2019. The remaining forms included tuberculous pleural effusion, tuberculous lymphadenitis, bone and joint tuberculosis, genitourinary tuberculosis. In 2019, there was no incident cases of tuberculosis meningitis and encephalitis in the group of children aged 0-14, while 6 cases were reported in older age groups. In 2019, the incidence rate increased with age, but only until the age of 45-64. The incidence rates ranged from 1.4 in children aged under 14, to 23.9 in persons aged between 45 and 64. Patients aged 45-64 constituted the largest percentage of all tuberculosis patients (45.2%). In previous years, the highest incidence rates were recorded in the oldest age group, i.e. in people aged 65 or older. Since 2015, the highest incidence ratios have been occurring in the age group between 45 and 64 years. In 2019, the incidence rate in people aged 65 years and older was

19.8 and was lower than in the group of persons aged 45-64. In 2019, similarly to the preceding years, the incidence of tuberculosis in men was twice as high as in the case of women. There were 3897 reported cases among men (21.0/100,000) and 1424 cases among women – (7.2/100,000). Tuberculosis in men accounted for 73.2% of all cases. In 2019, the incidence of tuberculosis among inhabitants of urban areas was once again higher in comparison to the inhabitants of rural areas. 3335 cases of tuberculosis were registered in urban areas, and 1986 in rural areas. The incidence rate for the inhabitants of urban areas was 14.5, while in the case or inhabitants of rural areas the rate amounted to 13.0. The total number of patients with diagnosed tuberculosis in 2019 included 121 foreigners, and the majority of them – 87 people – were aged between 20 and 44. Tuberculosis in foreigners accounted for 2.3% of all cases. The largest group – 59 people – came from Ukraine, followed by immigrants from India (9 patients), Vietnam (8 patients) and Nepal (7 patients). In total, foreigners who were diagnosed with tuberculosis came to Poland from 24 countries. The country of origin was unknown in 10 cases. In 2019, similarly to the preceding years, the co-infection with tuberculosis and HIV was a rare phenomenon in Poland. Tuberculosis was an AIDS indicator disease in 7 HIV-infected patients. In 2019, MDR-TB was diagnosed in 39 patients, including 17 foreigners. MDR-TB cases constituted 1.0% of all bacteriologically confirmed tuberculosis cases and 1.1% of all cases with known drug susceptibility results.

The highest incidence in 2019, similarly to the preceding years, was registered in the Lubelskie Voivodship and amounted to 20/100,000. It is a disturbing indicator, considering the known interlink between the incidence of tuberculosis and the socio-economic situation of the population. Moreover, in the case of the Lubelskie Voivodship, the situation also results from cross-border interactions with countries with an exceptionally high incidence of tuberculosis and the presence of multidrug-resistant M. tuberculosis strains in these areas (Fig. 6.17).

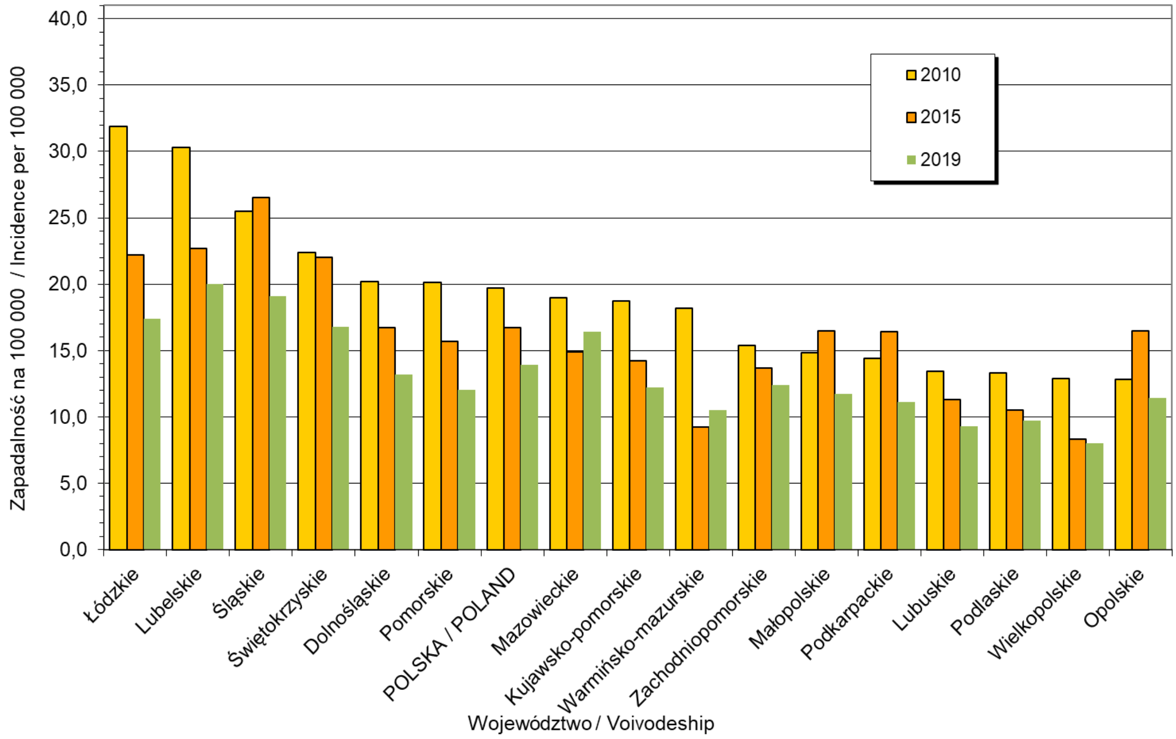


Fig. 6.17. Tuberculosis incidence by voivodeships in 2010, 2015 and 2019 (source: the Institute of Tuberculosis and Pulmonary Diseases)

It should be stressed that the incidence of tuberculosis is higher in Poland than in most European countries, but unfavourable epidemiological phenomena such as tuberculosis in children, co-infection with tuberculosis and HIV, and multidrug-resistant tuberculosis are less frequent in Poland than in the entire EU/EEA.

Deaths from tuberculosis accounted for 0.1% of all-cause mortality in 2018 in Poland and accounted for 28.3% of all deaths from infectious and parasitic diseases. Pulmonary tuberculosis was the main cause of death from tuberculosis, similarly as in the preceding years.

Out of all diseases subject to multi-annual vaccination programmes, only a significant deterioration of the epidemiological situation occurred only in the case of pertussis. That is not an isolated phenomenon, as many European and non-European countries are also experiencing an increase in the incidence of this disease (Fig. 6.18).

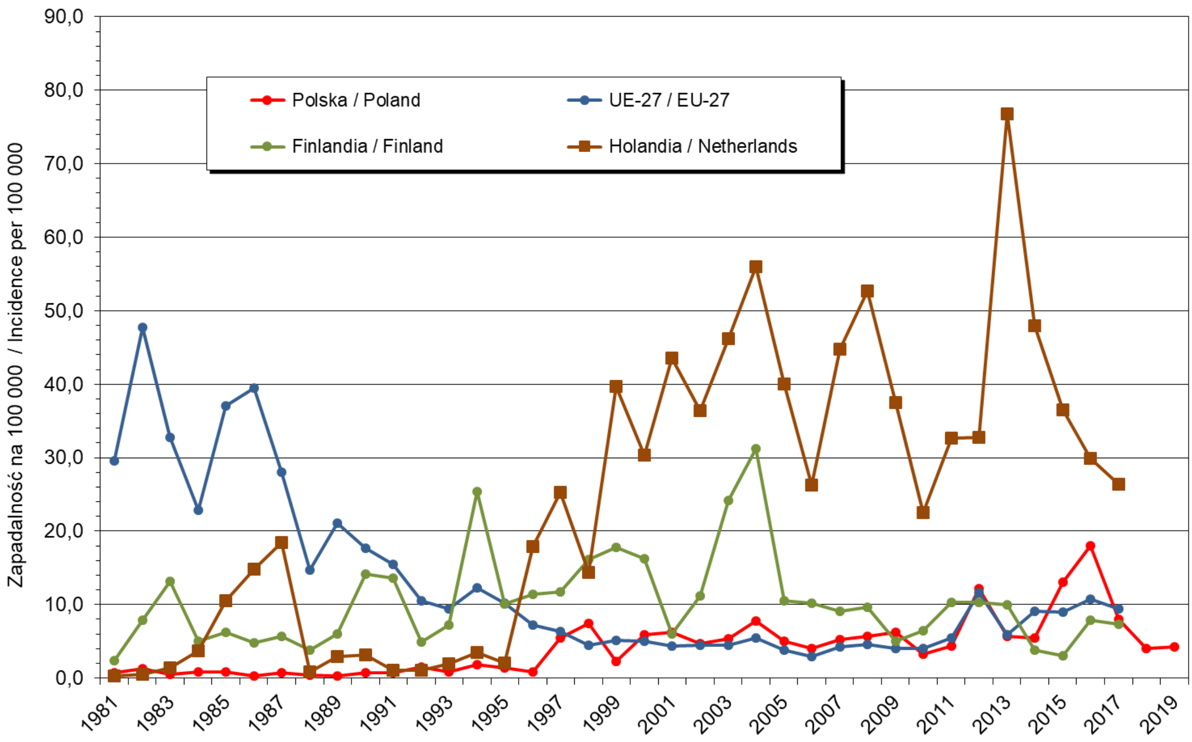


Fig. 6.18. Pertussis incidence in Poland, the Netherlands and Finland and average incidence in EU/EEA countries in 1981-2019 (source: WHO HFA DB, ECDC)

An increase in the number of cases has been observed in Poland since 1996, while the average level of incidence in EU countries was exceeded for the first time in 1998 (Poland 7.4 per 100,000 population, EU 4.3). Due to the fact that the majority of the cases concerned children aged between 5 and 14 years, at the turn of 2003 and 2004 a booster dose of a combined vaccine with a pertussis component for children at the age of 6 was introduced into the vaccination schedule by replacing the DT vaccine with DTaP. A decrease in the incidence to a level which would be at least comparable to that of the 1980s, i.e. below 1 case per 100,000 population was expected to occur in subsequent years after the introduction of the vaccination. Unfortunately, the introduction of a booster dose of DTaP vaccines did not meet the expectations. There is still an increase in pertussis in adolescents and older adults, who remain a source of infections in the youngest children who have not yet received or completed a full vaccination cycle (Fig. 6.19). However, it must be stressed that maintaining vaccination against pertussis in accordance with the current schedule until a new vaccine is developed remains the only preventive measure for pertussis.

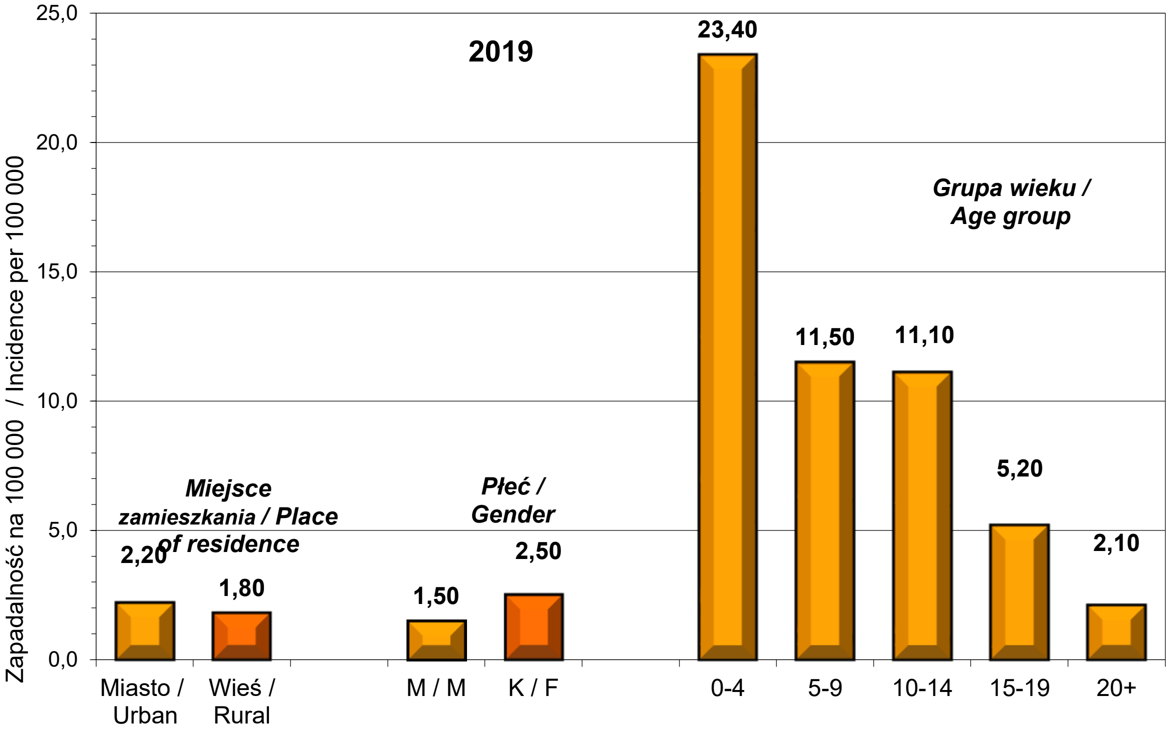


Fig. 6.19. Pertussis incidence in 2019 by place of residence, sex and age

Despite the spectacular success of vaccinations and the achievement of favourable epidemiological situation, in recent years we have been observing a highly worrying and increasing issue of avoiding vaccinations, and refusing to be vaccinated. The analysis of data from periodic reports of healthcare facilities submitted to the Sanitary Inspection shows that over 50,000 children were not vaccinated in 2019 (Fig. 6.20).

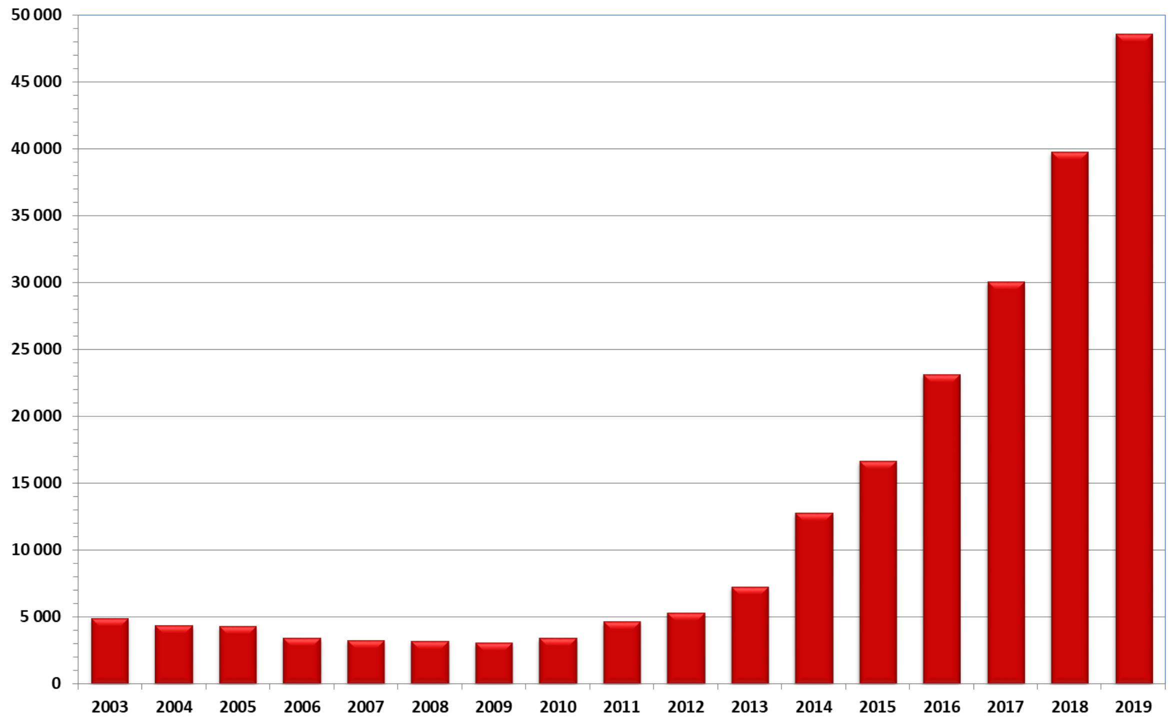


Fig. 6.20. The number of persons avoiding mandatory vaccinations in 2003-2019

Such a situation results, on the one hand, from an increase in the number of supporters of anthroposophy, living in harmony with nature, religious views and the strengthening of the position of anti-vaccination movements, and on the other hand, through aggressive campaigns which these movements initiate, spreading false information about the harmfulness and threats resulting from the use of vaccinations. It should be emphasised that maintaining such a rapid growth rate of the number of people who resign from vaccinations, in the perspective of the next few years poses a serious risk of the return of diseases that we were able to eliminate with the use of vaccinations.

Monitoring of the Adverse Events Following Immunization (AEFI), subject to mandatory reporting and registration for over 20 years now (the notification and registration system has been in operation since 1996), is a key tool for evaluating the safety of vaccinations in Poland. AEFIs are the outcomes of vaccinations performed with the use of vaccines registered in Poland and available on the market. Since the beginning of registration until 2018, we can observe an increase in the number of reported AEFIs. This fact should be interpreted from the perspective of the observed constant increase in the sensitivity of the surveillance system, not the increase in immunization reactivity. Furthermore, it is necessary to consider the fact that the number of vaccine preparations and the described types of reactions subject to reporting, have increased multiple times over the past 20 years of surveillance and – what is particularly important from the perspective of surveillance and vaccination safety – using a very comprehensive definition of an AEFI, which, pursuant to the applicable legal regulations, is any reaction diagnosed or suspected by a physician. In 2018, physicians diagnosed and reported a total number of 3,639 AEFIs to the Sanitary Inspection, including 3,439 mild adverse events, 189 serious adverse events and 11 severe adverse events. The annual study of Adverse Events Following Immunization in 2018 assumed that in case of simultaneous administration of several vaccines to a child, the described reaction was calculated for each of the individual vaccines. The analysis of AEFIs reported for surveillance purposes is performed by employees of the Department of Epidemiology of Infectious Diseases and Surveillance of NIZP-PZH and published annually in the Bulletin titled "Vaccinations in Poland". The importance of monitoring of adverse reactions is multi-dimensional; on the one hand, it is aimed at detecting the occurrence of new, unusual and rare reactions, as well as at the monitoring of already known reactions, and on the other hand, at the determination of the risk factors for specific types of reactions, identification of vaccine batches with an increased reactogenicity, or safety control of newly introduced vaccines. Therefore, it is one of the most important monitoring tools for the post-registration immunization safety.

6.2. Other infectious diseases

6.2.1. Infections with human immunodeficiency virus (HIV)

More than 30 years have passed since the detection of the first infections with the human immunodeficiency virus (HIV), which leads to the development of the acquired immunodeficiency syndrome - AIDS. It remains the cause of death of almost 700,000 people each year[50]. The introduction of highly active antiretroviral therapy (HAART), which limited the effects of the virus on the infected person's body, significantly reduced AIDS-related mortality. The next step was to show that a person who is effectively treated, and has undetectable viral load, is not infectious. Successful treatment can therefore become a part of preventive measures if a sufficient percentage of the infected patients are properly treated. This has enabled UNAIDS to set the goal of a care continuum assuming that 90% of all people living with HIV will know about their HIV status; out of that number, 90% will receive treatment, and

[50] WHO: Summary of the global HIV epidemic (2019), available on: https://www.who.int/hiv/data/2019_summary-global-hiv-epi.png?ua=1

90% will achieve viral suppression[51]. According to the latest data[52], most of the countries of the Western European region have managed to achieve the proposed targets, which may explain the favourable epidemiological trend observed in this European region (Fig. 6.21).

It is therefore essential to promptly detect new infections, and to immediately start treatment. A prerequisite for reaching this target is to perform tests for HIV infections on a large scale and repeat them in groups with continuous exposure to the infection. However, as the epidemiological data indicate, an insufficient number of tests are performed in Poland each year with only approximately 11 tests per 1,000 people[53]. Insufficient diagnostics is also confirmed by the first estimated models of the care continuum for Poland[54] in relation to the 90-90-90 target, which are currently at a level of 82% (diagnosed) - 85% (treated) - 96% (with viral suppression), which clearly shows that the diagnosing of people unaware of their infection is the most difficult target to be achieved in Poland. In order to improve diagnosis, the recommendations issued by the WHO[55] and ECDC[56] suggest the use of various forms of testing for HIV, e.g. community-based HIV testing by lay providers or self-testing.

Numerous European countries, especially in Eastern Europe, have high rates of new diagnoses[57]. Moreover, the continuous increase in the number of new diagnoses remains an issue in Central (increase by 175%) and Eastern European countries (increase by 40%, excluding the year 2018, when data from Russia was reported for the first time, which generally contributed to a 90% increase in the frequency of new infections detected in Eastern Europe

[51] 90–90–90 - An ambitious treatment target to help end the AIDS epidemic. UNAIDS 2014; Available at: http://www.unaids.org/sites/default/files/media_asset/90-90-90_en.pdf

[52] European Centre for Disease Prevention and Control. Continuum of HIV care. Monitoring implementation of the Dublin Declaration on partnership to fight HIV/AIDS in Europe and Central Asia: 2018 progress report. Stockholm: ECDC; 2018

[53] Szmulik K., Niedźwiedzka-Stadnik M., Rosińska M.; Zakażenia HIV i zachorowania na AIDS w Polsce w 2017 roku* (HIV and AIDS in Poland in 2017). Przegląd epidemiologiczny (Epidemiological Review) 2019;73(2): 179-192

[54] M. Rosińska, M. Niedźwiedzka-Stadnik, K. Zakrzewska, K. Szmulik, W. Niemczyk, A. Marzec-Bogusławska. Human Immunodeficiency Virus (HIV) cascade of care in Poland: improving, but still not on target. Poster at ESCAIDA conference, Stockholm 2019, data available at: https://www.escaide.eu/sites/default/files/documents/ESCAIDE-abstract-book-2019.pdf

[55] WHO recommends HIV self-testing – evidence update and considerations for success, WHO, 27 November 2019; available at: https://www.who.int/publications/i/item/who-recommends-hiv-self-testing-evidence-update

[56] European Centre for Disease Prevention and Control. Public health guidance on HIV, hepatitis B and C testing in the EU/EEA – An integrated approach. Stockholm: ECDC; 2018; available at: https://www.ecdc.europa.eu/sites/default/files/documents/hiv-hep-testing-guidance_0.pdf

[57] European Centre for Disease Prevention and Control/WHO Regional Office for Europe. HIV/AIDS surveillance in Europe 2019 – 2018 data. Stockholm: ECDC; 2019; available at: https://www.ecdc.europa.eu/en/publications-data/hivaids-surveillance-europe-2019-2018-data

between 2017 and 2018). Only Western European countries have seen a 23% decrease in new HIV diagnoses over the period of 2007-2018 (Fig. 6.21).

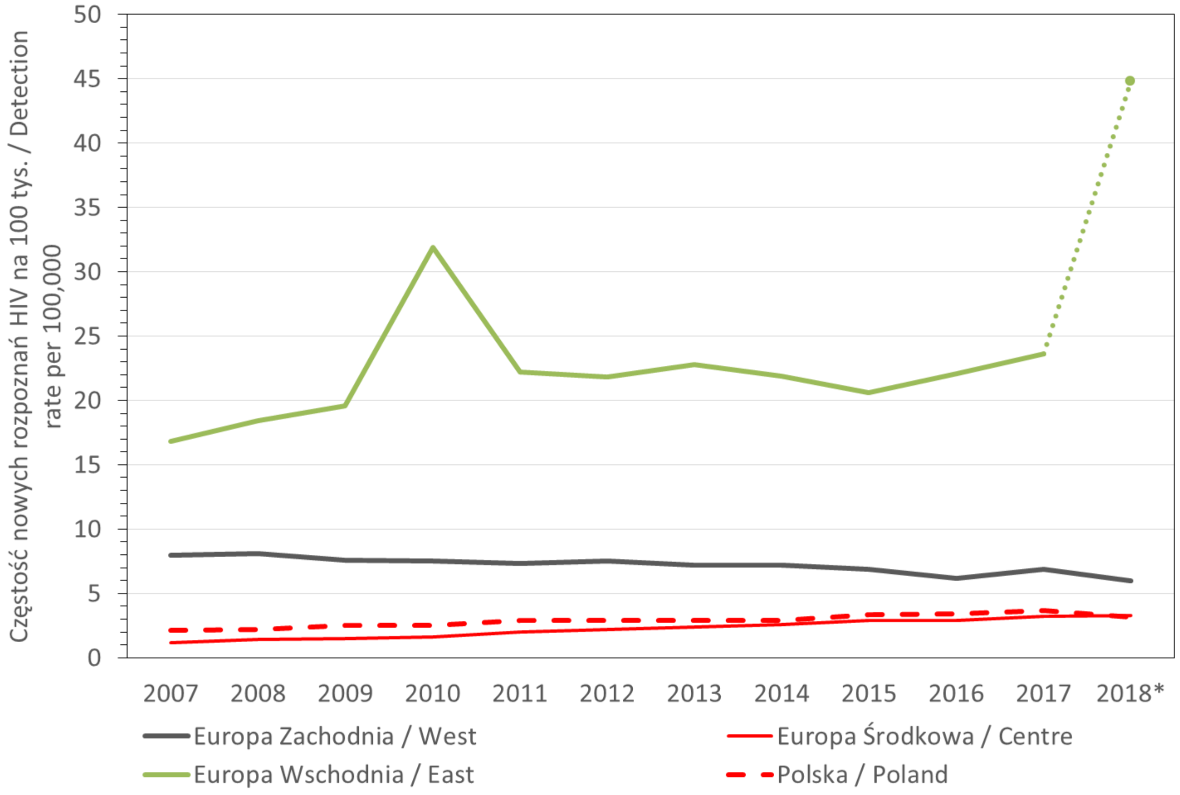


Fig. 6.21. HIV detection rate per 100,000 population in 2007 – 2018 in Poland and subregions of the WHO European Region (source: ECDC surveillance atlas)

Over the past dozen or so years, the rate of newly detected HIV infections has been growing (ranging from 2.1 cases per 100,000 inhabitants in 2007, to 3.5 cases per 100,000 inhabitants in 2019). The number of newly detected HIV infections is currently at its highest since the beginning of the epidemic, with an average of approximately 1,223 new cases per year detected since 2011 (an increase from 955 in 2010 to 1335 in 2019). Infections among women remain at similar levels, and they account for approximately 15% of all newly diagnosed infections. A significant increase was noted in men (Fig. 6.22). Most infections among women, i.e. over 20% of all cases, between 2017 and 2019 were reported in Lubelskie, Łódzkie, and Warmińsko-mazurskie Voivodships (Tab. 6.3).

For several years, there has been a trend of increased detection of infections in older age groups. The largest increase in newly diagnosed infections concerned people aged over 50. A growing number of new diagnoses has also been observed in the 40-49 age group. These accounted for 21.6% of all infections in 2019. The most numerous group, similarly to the previous years, included people aged 30-39, who accounted for over 35% of all the registered infections. The number of newly detected infections among adolescents remains at a similarly low level. The number of infections among young adults under 30 has not been significantly increasing.

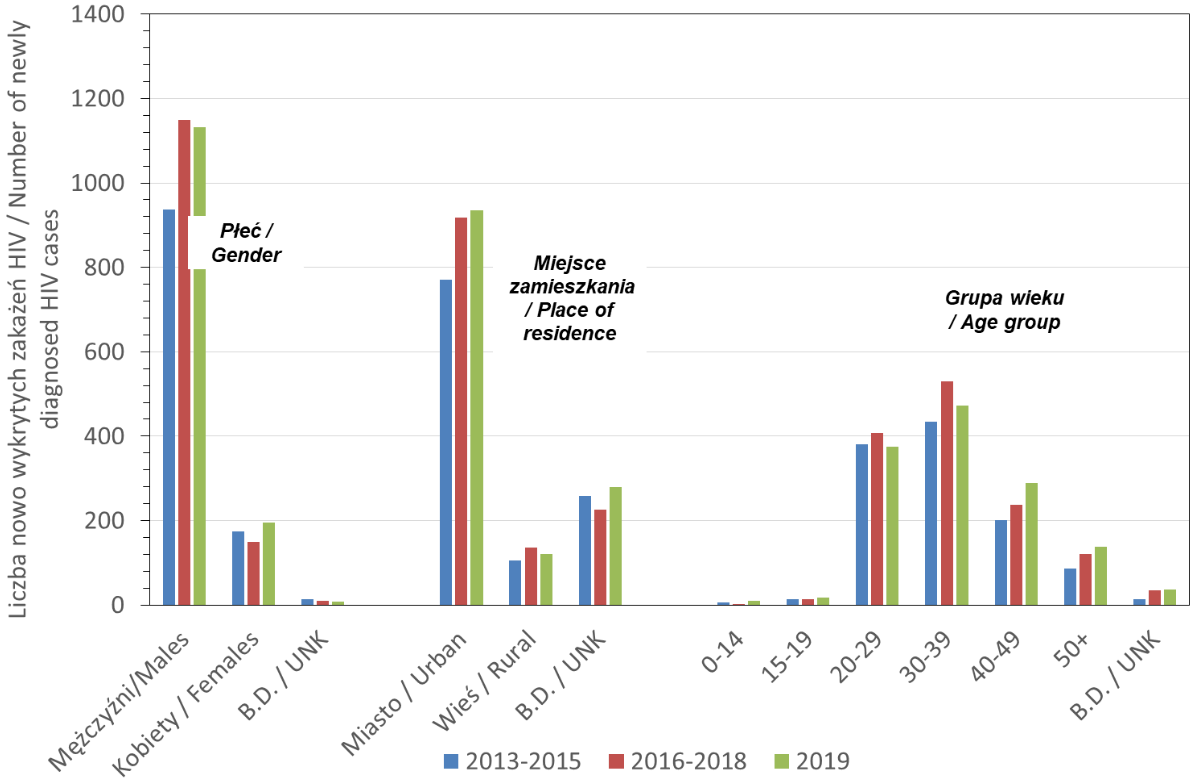


Fig. 6.22. Newly detected HIV cases in Poland, in 2013 – 2019, by sex, age group and place of residence

Inhabitants of urban areas constitute the majority of newly diagnosed HIV infections, although the increase in the number of new diagnoses observed in recent years included the inhabitants of urban and rural areas alike (Fig. 6.22). The trends in newly detected infections also varied between individual voivodships. In most voivodships, there was an increase in the number of infections, including the largest increases in Dolnośląskie, Mazowieckie and Śląskie Voivodships. Sligh reductions were recorded in Lubelskie, Opolskie, Pomorskie and Świętokrzyskie Voivodships. In the remaining regions, the number of reported infections was at a level similar to the ones seen in preceding years (Tab. 6.3).

Table 6.3. HIV diagnosis rate per 100,000 population in 2013 – 2019 and the characteristics of cases diagnosed in 2017 – 2019, by voivodeship

Województwo / voyevodship	2013-2015	2016-2018	2019	Zakażenia wykryte w latach 2017-2019 /			
				%kobiet / %female	%MSM*	%PWID*	%MSW,WSM*
DOLNOŚLĄSKIE	4,4	4,6	5,6	15,2%	75,0%	8,1%	16,9%
KUJAWSKO-POMORSKIE	1,5	1,3	1,5	18,3%	78,6%	0,0%	21,4%
LUBELSKIE	1,6	1,4	1,0	22,2%	76,0%	0,0%	24,0%
LUBUSKIE	3,0	2,8	3,0	15,2%	71,4%	14,3%	14,3%
ŁÓDZKIE	2,6	2,7	3,0	20,5%	66,7%	8,6%	24,7%
MAŁOPOLSKIE	2,4	3,1	2,8	8,0%	85,4%	2,4%	12,2%
MAZOWIECKIE	4,3	5,2	5,5	10,0%	82,8%	2,2%	15,1%
OPOLSKIE	2,3	2,7	1,3	19,4%	52,9%	29,4%	17,6%
PODKARPACKIE	1,5	1,2	1,6	9,8%	69,7%	3,0%	27,3%
PODLASKIE	1,4	1,3	1,7	15,8%	53,1%	3,1%	43,8%
POMORSKIE	2,6	3,1	0,9	12,9%	77,3%	1,5%	21,2%
ŚLĄSKIE	3,1	3,9	4,8	14,2%	73,0%	7,4%	19,7%
ŚWIĘTOKRZYSKIE	1,3	1,1	0,3	6,7%	56,3%	0,0%	43,8%
WARMIŃSKO-MAZURSKIE	1,7	1,8	1,9	20,5%	48,1%	14,8%	37,0%
WIELKOPOLSKIE	3,1	4,4	3,3	7,9%	81,0%	8,6%	10,5%
ZACHODNIOPOMORSKIE	2,5	3,7	2,9	19,8%	58,3%	11,7%	30,0%
POLSKA / POLAND	2,9	3,4	3,5	12,8%	75,7%	5,4%	18,9%

*percent with respect to cases with known transmission category (33.9% of all cases);
MSM - men who have sex with men; PWID - people who inject drugs; MSW, WSM - men who have sex with women and women who have sex with men

The proportion of newly detected infections from drug injections has decreased from approximately 80% between 2000 and 2001 to approximately 5.4% between 2017 and 2019. The changes in drug use are a probable cause of the decrease. The highest percentage of infections, which occurred by means of drug injections, was recorded in Opolskie, Warmińsko-Mazurskie and Lubuskie Voivodships (14-30% of all cases).

However, unlike drug-related infections, the last decade brought a steady increase in the number of sexually transmitted infections, especially among men who have sex with men (MSM). On a national level, between 2017 and 2019, they accounted for nearly 76% of all newly diagnosed cases with an identified transmission route. Particularly high proportions of MSM among newly detected HIV infections occurred near the largest urban agglomerations, i.e. in the Małopolskie, Mazowieckie and Wielkopolskie Voivodships (Tab. 6.3). Despite the fact that transmissions in the MSM group are dominating, infections through heterosexual contacts should not be disregarded. In certain Voivodships, such as Podlaskie or Świętokrzyskie, they account for as much as 50% of all infections. However, the overall number of new infections attributable to this transmission route decreased by over 44% between 2007 and 2017.

6.2.2. Hepatitis C

The time limit for achieving the first targets of the plan to eradicate hepatitis C as a public health issue passes in 2020[58][59]. Despite the fact that HCV affects approximately 71 million people worldwide and contributes to nearly 400,000 deaths per year, only the development of an effective treatment has increased the pace of efforts taken to combat the disease. The WHO Global Health Sector Strategy (GHSS) on Viral Hepatitis adopted in 2016 and the Action plan for the health sector response to viral hepatitis in the WHO European Region adopted in 2017 combine the elements of prevention, including the prevention of infections transmitted by the injection of drugs, with improved diagnostics and increased access to treatment. The targets to be achieved by 2030 include a 90% reduction in incidence and a 65% reduction in mortality from chronic HCV and its effects. The indicator of the effective implementation of the programme by 2020 includes a 30% decrease in incidence and a 10% decrease in mortality. Unfortunately, the current data show that these objectives will not be met. Moreover, the available analyses show that 80% of high income countries will not be able to meet the 2030 targets. That proportion is even less favourable among low and middle income countries[60]. The reasons for such situation may range from a lack of funding for treatment, the lack of screening programmes through organisational problems in reaching marginalised populations, as well as the active exclusion of treating infected patients from certain populations key to the spread of the infection. The insufficient coverage of marginalised groups, such as homeless people, drug users and prisoners is seen as the most important reason for the failure to meet the elimination targets in highly developed countries.

A significant decrease in the number of deaths directly related to the HCV was noted in Poland in recent years (2015-2018) (Fig. 6.23). However, the number of detected acute infections remains at a similar level, which indicates the ineffectiveness of the measures taken to prevent new infections. The annual number of diagnosed chronic HCV cases shows a downward trend following the increase recorded in the period between 2013 and 2016 which occurred due to the implementation of a testing scheme for pregnant women. Considering the significant number of undiagnosed infections in the population shown in previous studies, the data most probably indicate issues with diagnosing chronic HCV. The efforts to improve diagnosis which are currently in place have so far focused on screening the more accessible

[58] WHO EURO. Action plan for the health sector response to viral hepatitis in the WHO European Region. WHO 2017

[59] WHO. Global Health Sector Strategy On Viral Hepatitis 2016–2021towards Ending Viral Hepatitis. WHO, 2016

[60] Cox, A.L., El-Sayed, M.H., Kao, J. *et al.* Progress towards elimination goals for viral hepatitis. *Nat Rev Gastroenterol Hepatol* **17,** 533–542 (2020).

general population. In this population, infections were mainly caused by medical treatments without applying proper procedures, which occurs less frequently nowadays; additionally, they were also caused by blood transfusions, before the implementation of tests on candidates for blood donors, which is currently not the case. In all probability, the majority of these infections have already been identified. This is confirmed by the results of large-scale screening tests carried out between 2018-2019, where the frequency of diagnoses among people tested in primary care amounted to <0.1%[61].

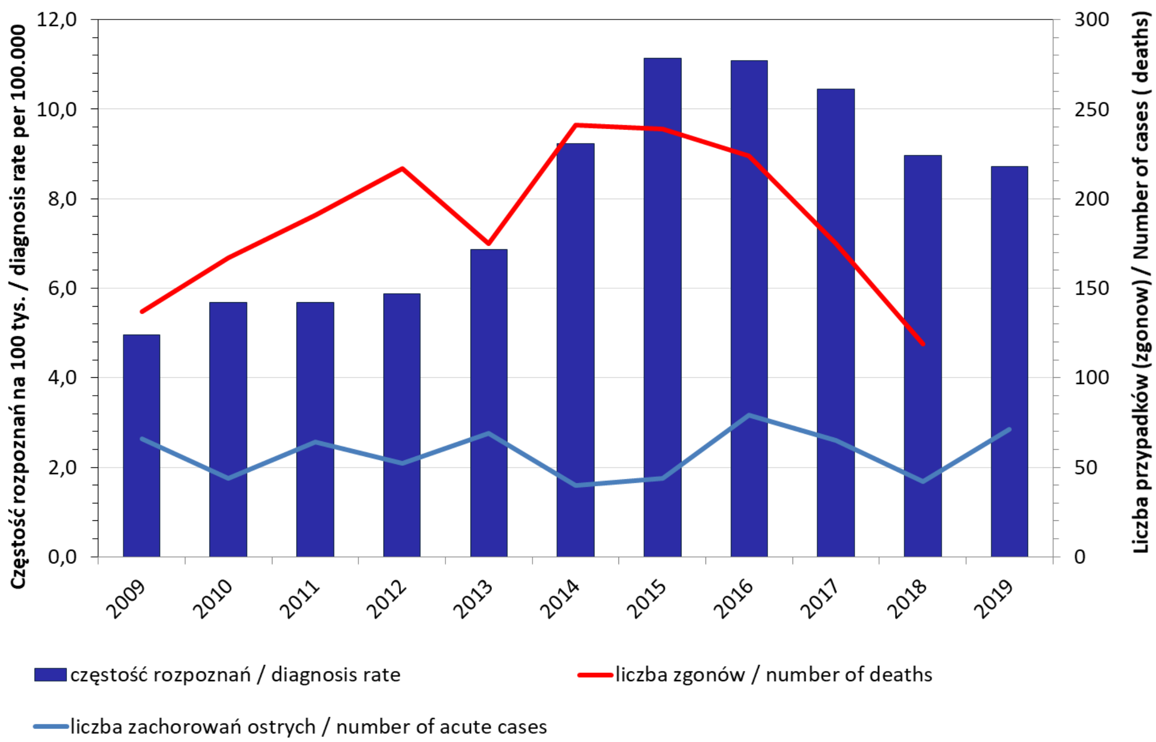


Fig. 6.23. HCV diagnosis rate per 100,000 population, number of acute cases and the number of deaths due to Hepatitis C, ICD-10 code B17.1, B18.2 (source: epidemiological surveillance and Statistics Poland - GUS)

The growing proportion of undiagnosed infections may therefore affect people from marginalised populations. In particular, people who inject drugsplay a significant role as a group where the HCV virus spreads easily. According to the recommendations issued by the European Centre for Disease Prevention and Control and the European Monitoring Centre for Drugs and Drug Addiction, screening tests in that group should be carried out at least once

[61] Piekarska A, Tomasiewicz K, Halota W, et al. Searching for the optimal population for hepatitis C virus screening in Poland. Clin Exp Hepatol. 2020;6(2):74-76. doi:10.5114/ceh.2020.94969

every 12 months[62]. On the other hand, the clinical guidelines of the European Association for the Study of the Liver indicate the need for priority treatment of that group for epidemiological reasons[63]. By referring these recommendations to the data available in Poland, it may be concluded that drug users are not tested as often as they should[64]. This can explain the small number of diagnoses recorded in this group (Fig. 6.24). On the other hand, restrictions on treatment of addicted persons continue to apply in Poland. The lack of screening among the people who use or are addicted to psychoactive substances and the restrictions on treatment described above contribute to the difficulty in achieving the HCV eradication rates in Poland.

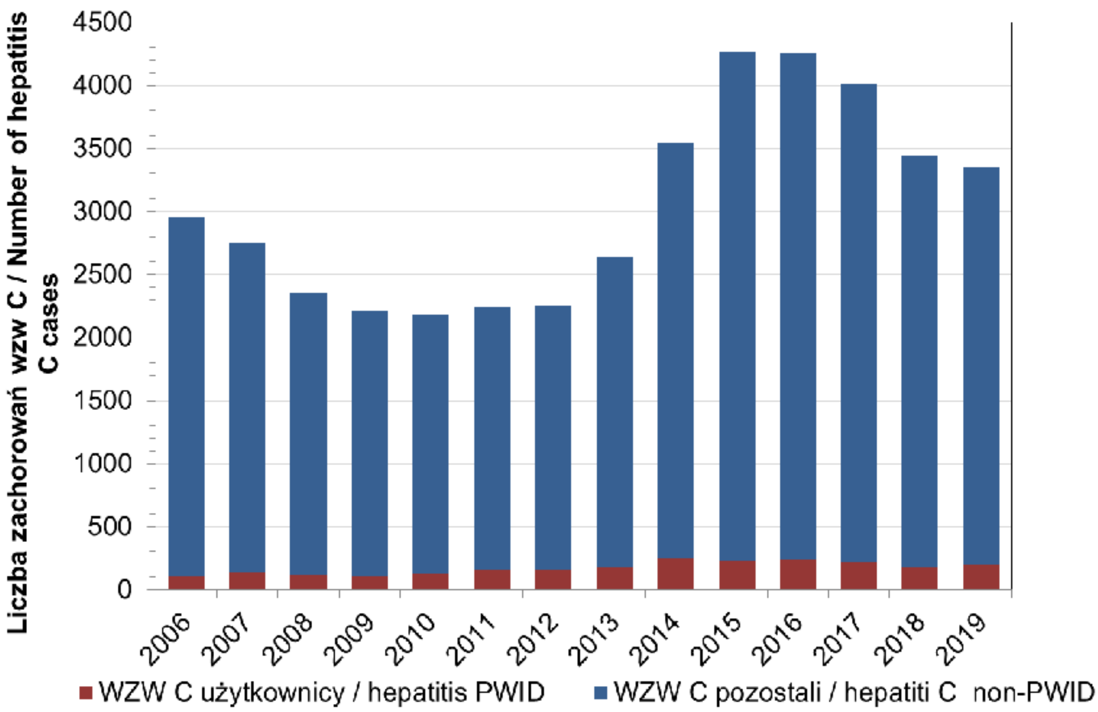


Fig. 6.24. The number of newly-diagnosed HCV cases, including cased in people who inject drugs (PWID), Poland, 2009-2019

6.2.3. Food poisonings and infections

Foodborne diseases include a wide group of diseases which differ in terms of the

[62] European Centre for Disease Prevention and Control and European Monitoring Centre for Drugs and Drug Addiction. Prevention and control of infectious diseases among people who inject drugs. Stockholm: ECDC; 2011.
[63] European Association for the Study of the Liver.. EASL recommendations on treatment of hepatitis C: Final update of the series☆. J Hepatol. 2020 Sep 15:S0168-8278(20)30548-1. doi: 10.1016/j.jhep.2020.08.018.
[64] Zakrzewska K, Szmulik-Misiurek K, Rosińska M. Low access to HIV and HCV testing among People Who Inject Drugs (PWID) in Poland. Cross-sectional multicenter study 2017. https://www.eurotest.org/Portals/0/PO3_05.pdf

underlying pathogens and their clinical symptoms, while the route of infection is their common feature. This group of diseases plays a particularly important role in public health, as a basic indicator of food safety and sanitary and hygienic conditions of households, places where meals are prepared and served as part of mass catering operations and places of food production, including primary production. The dynamics of incidence of bacterial infections and food poisoning since 1981 is presented in Fig. 6.25.

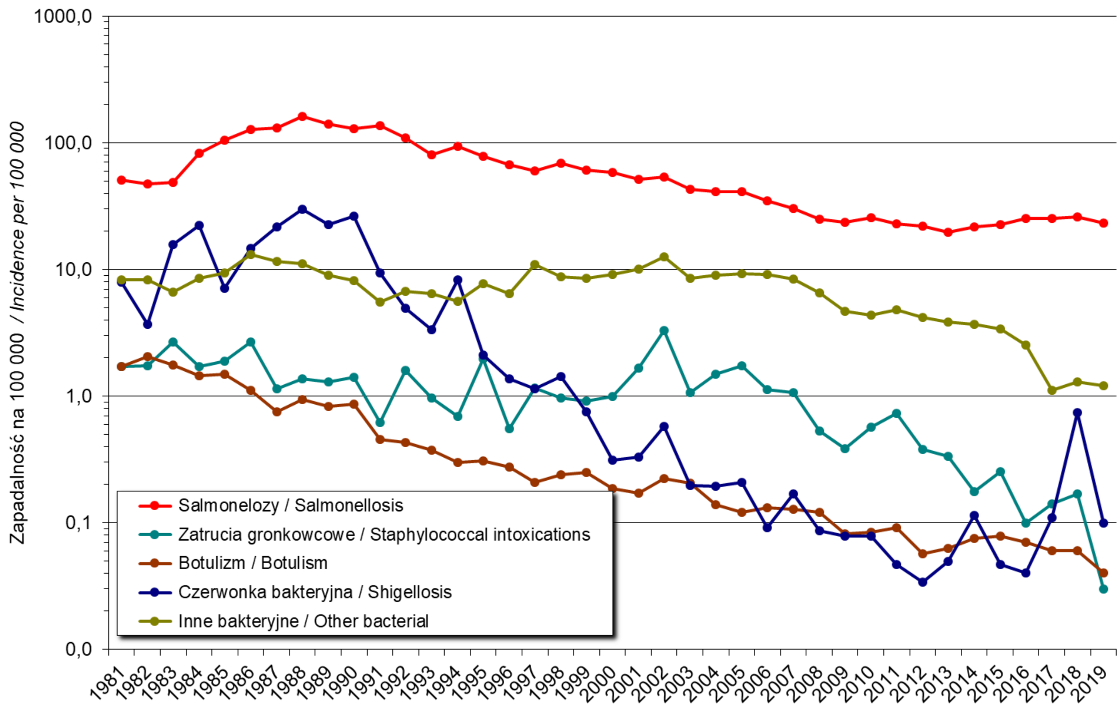


Fig. 6.25. Salmonellosis and other bacterial foodborne intoxications and infections incidence in 1981-2019

The curves (on a logarithmic scale) display significant differences in incidence between individual diseases. They illustrate decreasing trends in the incidence of salmonellosis, shigellosis, botulism and staphylococcus toxin poisoning. The only disease within the group which shows a particularly strong upward trend is intestinal infections caused by *Clostridium difficile*. 4,738 cases were reported in 2013, when the infections caused by these bacteria were first documented as a separate item. The subsequent years saw a steady increase in the number of registered cases. In 2017, that number was twice as high, amounting to over 11,000 cases, and it has since stabilised at that level, with 11,310 cases in 2019.

In Poland, *Salmonella* bacteria have been the dominant cause of food-borne infections for many decades. Out of them, *S. Enteritidis* is the most commonly occurring serotype. In

1991, the percentage of all outbreaks of food poisonings/infections caused by that pathogen exceeded 90% (Fig. 6.26). However, the share of these pathogens among the identified etiological agents for outbreaks has been gradually decreasing and has not exceeded 40% in recent years. At the same time, the percentage of food infections caused by other agents has increased. Specifically, this upward trend includes viral infections. Between 2011 and 2019, the percentage of outbreaks of food poisonings and infections in Poland, where the causative organism was not detected was gradually decreasing, although in some years it still reached nearly 30%. Such a high percentage of food infections with an undiagnosed pathogen is largely due to insufficient laboratory facilities and the lack of interest of physicians in a more accurate diagnosis of the cause of gastrointestinal infections.

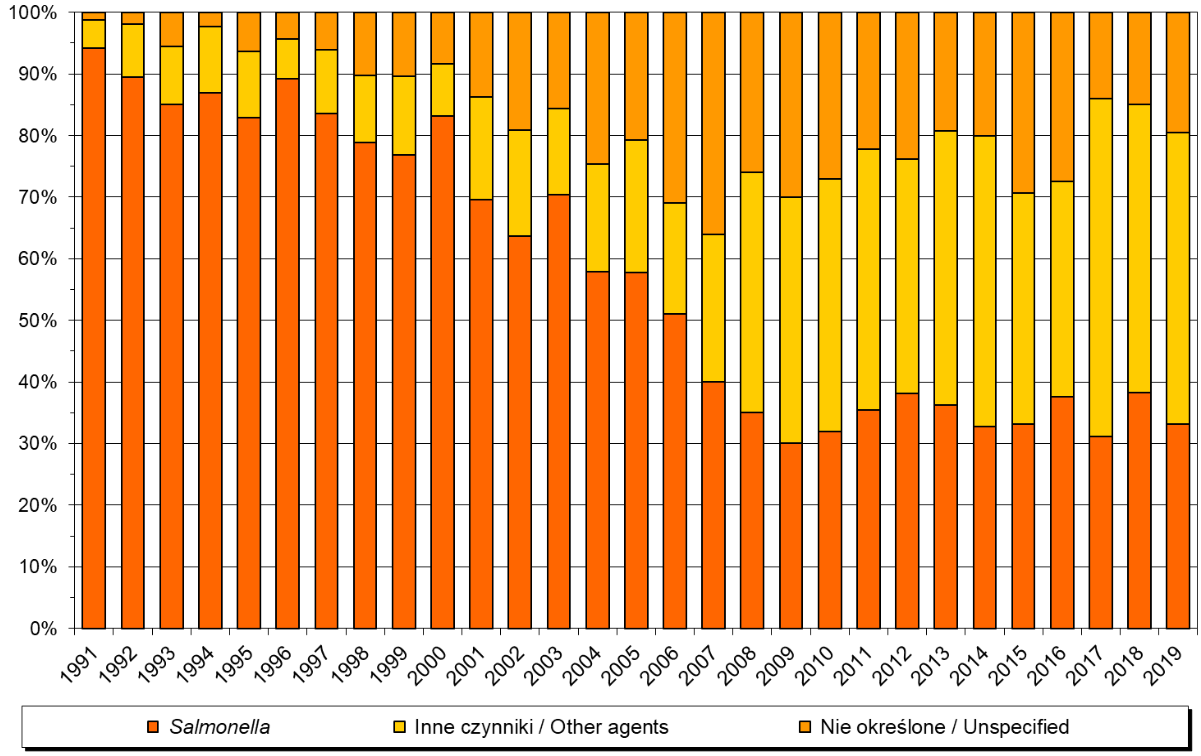


Fig. 6.26. Foodborne infection and intoxication outbreaks in Poland in 1991-2019 by causative organism

The etiological agents of foodborne diseases other than *Salmonella* are found much less frequently, also due to the lower frequency of testing. The period of particular increase in the incidence of salmonellosis was the second half of the 1980s. In the 1990s, there was a clear decrease in the incidence of foodborne infections caused by *Salmonella* bacilli. As of the second half of the 1990s, the incidence in Poland did not significantly differ from the average for EU countries (Fig. 6.27). Since 2016, however, there has been an increase in both the number of cases and incidence of salmonellosis, which was mainly due to the introduction of eggs contaminated with *Salmonella* bacilli from Poland to the national and international markets. This caused an international outbreak, which lasted from 2016 to 2019, with an increase in the incidence during the summer season in each of the subsequent years. In January 2020, the outbreak was still considered to be ongoing by the EU institutions responsible for the surveillance of communicable diseases.

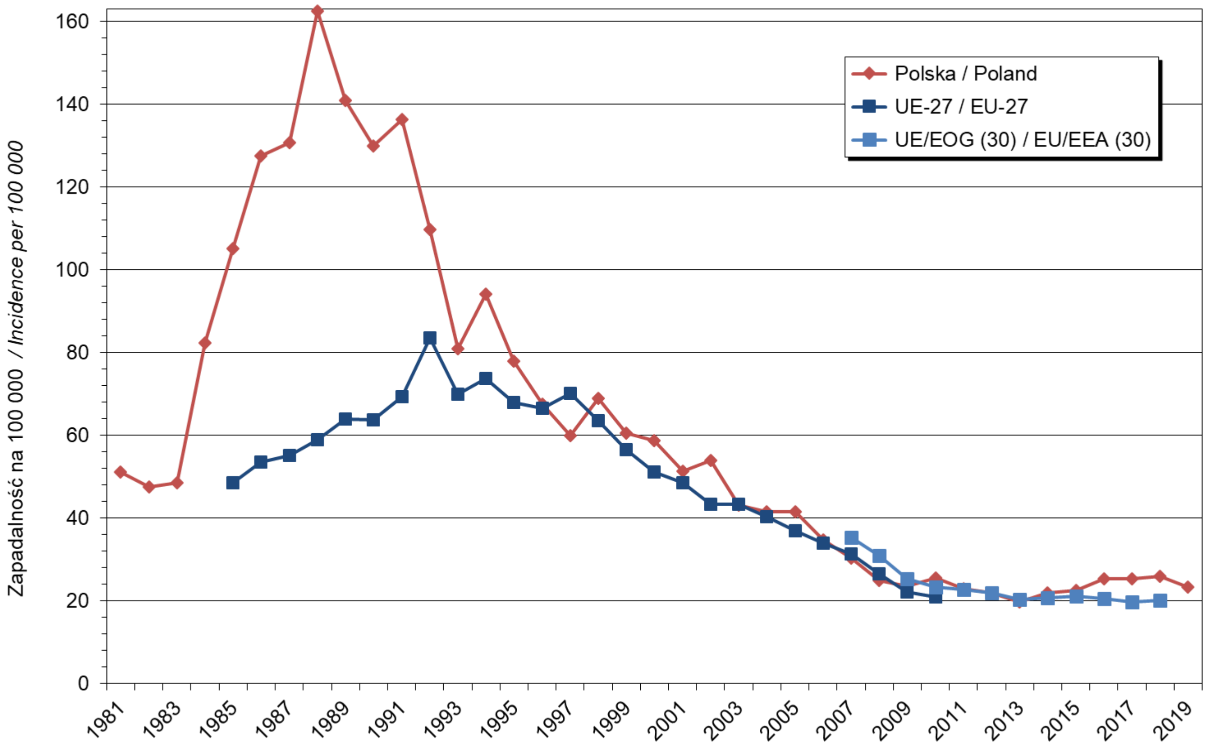


Fig. 6.27. Salmonellosis incidence in Poland and average incidence in EU countries in 1981-2019 (source: WHO HFA DB, ECDC Atlas)

The incidence of foodborne diseases caused by *Salmonella* as well as other pathogens, remains the highest and most frequently reported in the youngest age groups. In 2019, the incidence rate in children aged 0-4 amounted to 190 per 100,000. The highest values occurred in children aged 2 and 3. It decreased with age to the lowest level of 6.03 in the group of people aged between 40 and 44, followed by a slight increase in subsequent age groups, reaching 13.55 in people over 75. The incidence rate was slightly higher among men than among women and higher in rural areas than in urban areas (Fig. 6.28).

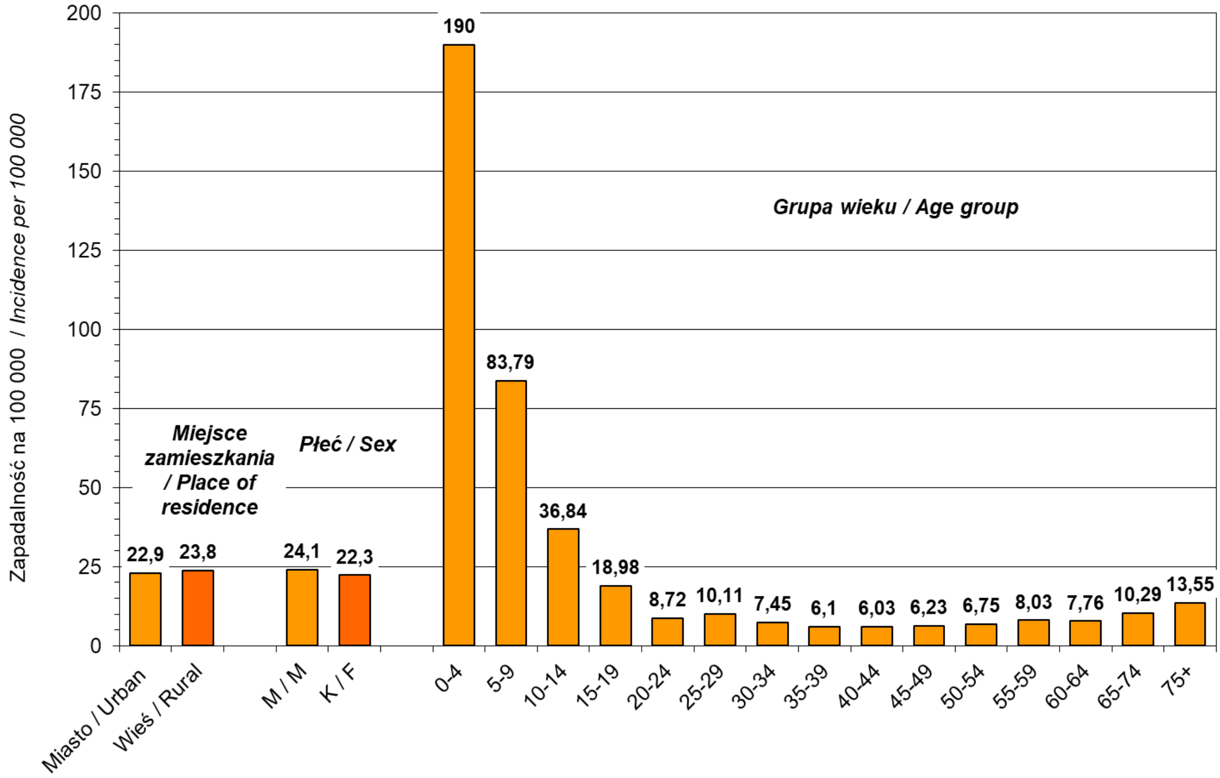


Fig. 6.28. Salmonellosis incidence in 2019 by place of residence, gender and age

There are significant territorial differences related to the incidence of salmonellosis. In 2019, the incidence rate in individual voivodships ranged from 8 per 100,000 population in the Wielkopolskie Voivodeship to 53.8 in the Podkarpackie Voivodeship (Fig. 6.29).

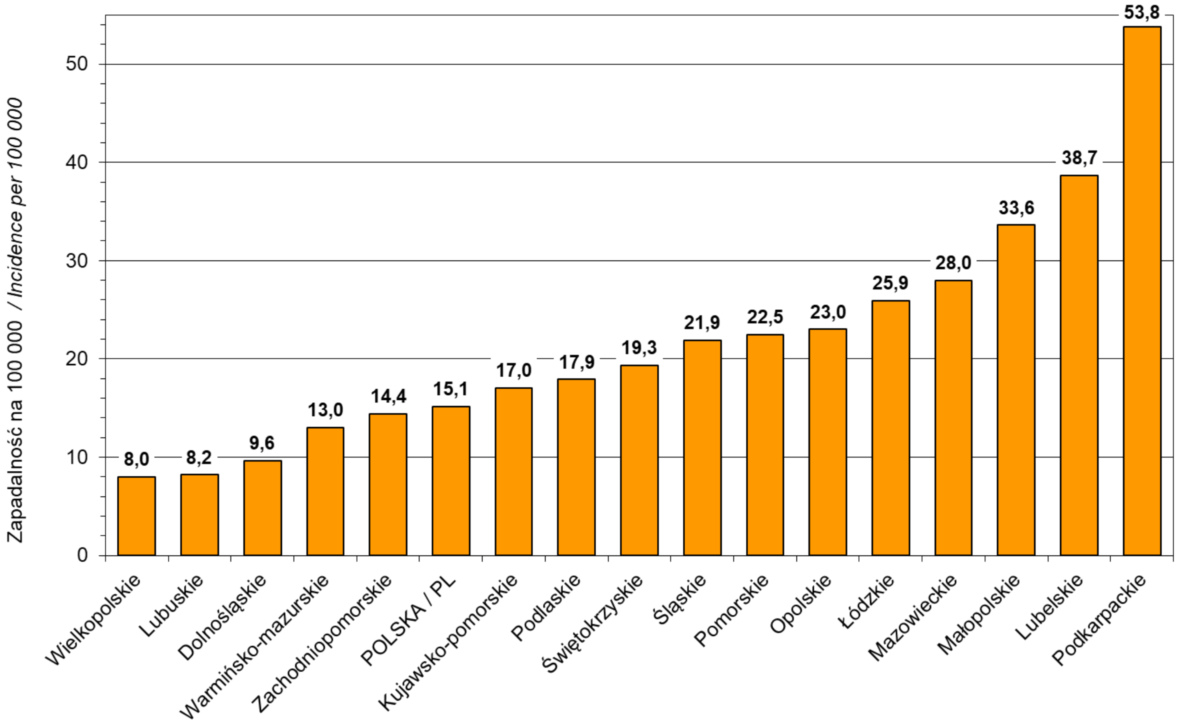


Fig. 6.29. Salmonellosis incidence in 2019 by Voivodships

Two particularly important types of bacteria that cause food infections – *Campylobacter* and *Yersinia* – are diagnosed increasingly frequently, although still much less frequently than in Western European countries. Since 2002, infections caused by *Campylobacter spp.* have been reported as a separate item as part of the communicable disease surveillance system. The number of diagnosed and reported cases of campylobacteriosis was on the rise each subsequent year, with a concurrent extension of the areas where the cases were reported. In 2003 and 2004, the reports came only from the Małopolskie and Mazowieckie Voivodships. Further voivodships joined in subsequent years, where the methodology of *Campylobacter* detection in clinical material was successively being introduced in laboratories. In 2017, all 16 voivodships reported the highest number of cases of campylobacteriosis (however two voivodships reported only singular cases), i.e. a total of 877 cases. The following two years saw a decrease in the number of registered cases which amounted to 726 and 715 in 2018 and 2019 respectively. The slow but steady increase in the number of cases can most likely be attributed to an increase in the number of laboratories carrying out laboratory testing in that area, an increase of the awareness of physicians regarding the possibility of intestinal infections caused by that pathogen and the introduction of the obligation for laboratories to report positive diagnostic results for these pathogens. In 2003, the proportion of hospitalised persons diagnosed with campylobacteriosis reached nearly 87%. However, in subsequent years it was decreasing and amounted to 54.1% in 2010, but started to increase again from 2013 and reached the level of 81.4% in 2019. The numbers are much lower in the Śląskie and Warmińsko-Mazurskie Voivodships and remain at 50-63%. Such high percentage of hospitalisations indicate insufficient reporting of campylobacteriosis, and shows that the tests are performed mainly in people who have been hospitalised due to the symptoms.

The numbers of recorded *Yersinia* infections are also increasing. During the initial two years (2003 and 2004) in which the disease was reported, the number of reported cases amounted to 71 and 84 respectively. 136 cases were reported to the surveillance system in 2005. A similar number was recorded in 2006, with 140 cases, while 206 cases were recorded in 2010. Since this year, the number of cases of yersiniosis has remained at a similar level. Since the beginning of the yersiniosis reporting period, the proportion of patients hospitalised in consequence of the disease was high, ranging from 59.2% in 2003 to 83.1% in 2005. In recent years, there has also been a large territorial disparity in the percentage of hospitalisations. Since 2004, the reported cases of diseases caused by *Y. enterocolitica* included cases caused by serotype O8 (the so-called “American serotype”). Initially, the disease was limited to 2-3 Voivodeships, however later it was discovered across the entire country. However, in 2014 the number of reported cases caused by the type significantly decreased - only 4 such cases were reported. Due to the decline in the percentage of isolated *Yersinia* strains with defined serological type , it is increasingly difficult to assess the situation of this disease in terms of the serotypes in circulation. In 2014-2015 and 2017, approximately 70% of the isolates were not serotyped, while in 2016 it was nearly 80% and in 2019 more than 75%.

Other foodborne diseases which have been recorded in Poland for a number of years, such as botulism, staphylococcus toxin poisoning and shigellosis, are currently diagnosed in smaller numbers in Poland and play a less significant role as threats to public health. In the case of shigellosis, there was a significant increase in the number of cases in 2018 – with a total of 284 cases recorded. This number is mainly made up of diseases which occurred in two outbreaks – one outbreak occurred in the country, although it involved the international community, while the other was related to the holiday stay of Poles in Albania.

Until 2016, the Hepatitis A (HAV) occurrence was similar to the aforementioned diseases. However, the increase in the number of HAV cases in Western European countries in 2016, which mostly concerned men having sex with other men, contributed to an epidemic increase in the number of cases in Poland as well. In 2017, there was a record number of HAV cases - 3014. Paradoxically, such rapid increase was caused by the favourable epidemiological situation in Poland regarding HAV (since 2002, Poland has been regarded a country with a very low endemic incidence of HAV). The low endemic occurrence is linked to the lack of circulation of hepatitis A virus (HAV) in the population and the growing proportion of people who are susceptible to infection, especially people aged under 45. It translates into an increased risk of a local epidemic or even an outbreak affecting a larger area of the country, as was the case in 2017. Over the next two years, the number of cases was steadily decreasing. However, in comparison to the previous period it remained very high, at 1455 in 2018 and 1066 in 2019.

6.2.4. Sexually Transmitted Infections (STI)

It is estimated that globally approximately 376 million people suffer from sexually transmitted diseases every year, which translates into over 1 million new cases per day[65]. The most common infections are those caused by *Trichomonas vaginalis* (approximately 156 million cases of trichomoniasis), *Chlamydia trachomatis* (127 million cases of chlamydiosis), *Neisseria gonorrhoea* (87 million cases of gonorrhoea) and *Treponema pallidum* (6 million cases of syphilis). Out of the sexually transmitted pathogens, syphilis, gonorrhoea and chlamydiosis are under surveillance in the European Union. The surveillance of sexually transmitted infections is mandatory in most countries, and case reporting should be carried out in all medical units. In some countries, a sentinel system has been introduced, where information on infections is reported in greater detail only by selected medical centres. In some countries, such as the United Kingdom, a large number of detected cases is the result of screening programmes covering the general population[66].

The incidence of syphilis in Europe showed a steady upward trend between 2007 and 2018 (from 4.52 per 100,000 population in 2007 up to 7.03 per 100,000 population in 2018). This increase has mainly affected men, and most cases are recorded among men who have sex with men[67]. The incidence recorded in Poland (4.23 per 100,000 population in 2018 and 4.24 per 100,000 population in 2019) remained below the European average. However, there has

[65] Report on global sexually transmitted infection surveillance, 2018. Geneva: WHO 2018. Licence: CC BY-NC-SA 3.0 IGO
[66] European Centre for Disease Prevention and Control. Annual epidemiological report for 2017. Surveillance systems overview for 2017 [Internet; Excel workbook]. Stockholm: ECDC; 2018
[67] European Centre for Disease Prevention and Control. Syphilis. In: ECDC. Annual epidemiological report for 2018. Stockholm: ECDC; 2020

also been a clear increase in Poland, and currently the number of documented infections is twice as high as in the preceding years (Fig. 6.30).

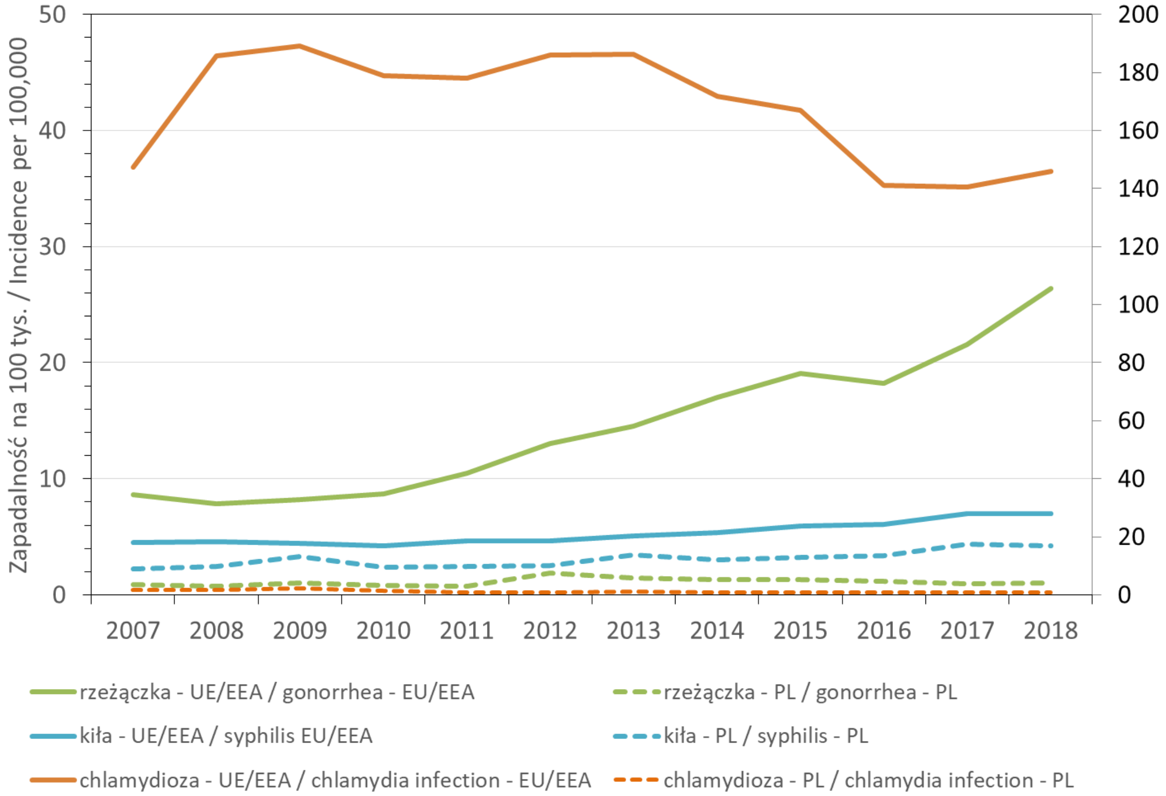
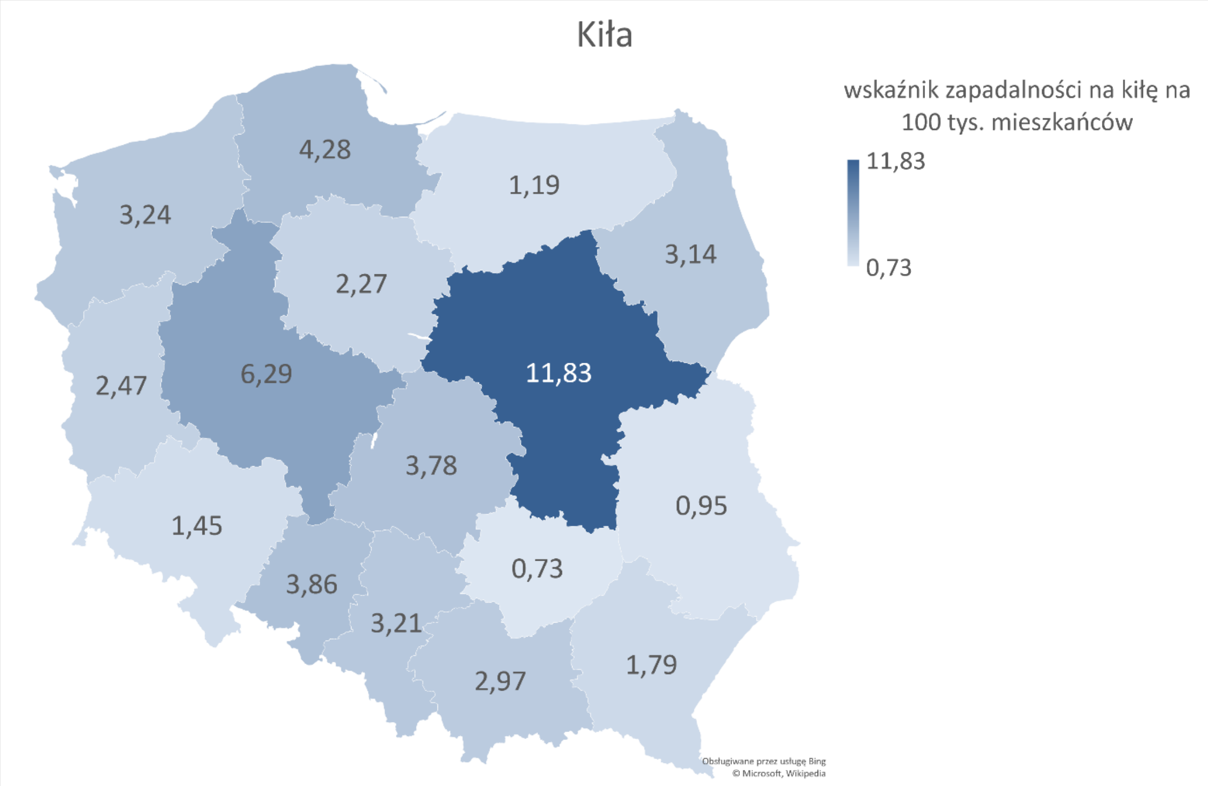


Fig. 6.30. Average syphilis, gonorrhoea and Chlamydia trachomatis incidence per 100,000 population in the EU and in Poland in 2007 – 2018 (source: CSIOZ, currently Centrum e-Zdrowie:MZ-14 and the ECDC surveillance atlas)

A large variability of incidence rates between voivodships is noticeable, e.g. in 2019 the incidence rate ranged from 0.73 per 100,000 population in the Świętokrzyskie Voivodship to 11.83 in the Mazowieckie Voivodship (39.4% of all infections) (Fig. 6.31). Most cases of syphilis are registered in the clinical stage of early syphilis, mostly symptomatic and in the most transmissible period of infection (over 52% of cases registered in 2018). An average of approximately 621 cases of early syphilis were recorded between 2013 and 2016. Since then, there has been an almost 40% increase in the number of cases recorded in this phase of the infection.


Kiła
wskaźnik zapadalności na kiłę na 100 tys. mieszkańców
11,83
0,73
4,28
1,19
3,24
3,14
2,27
11,83
2,47
6,29
3,78
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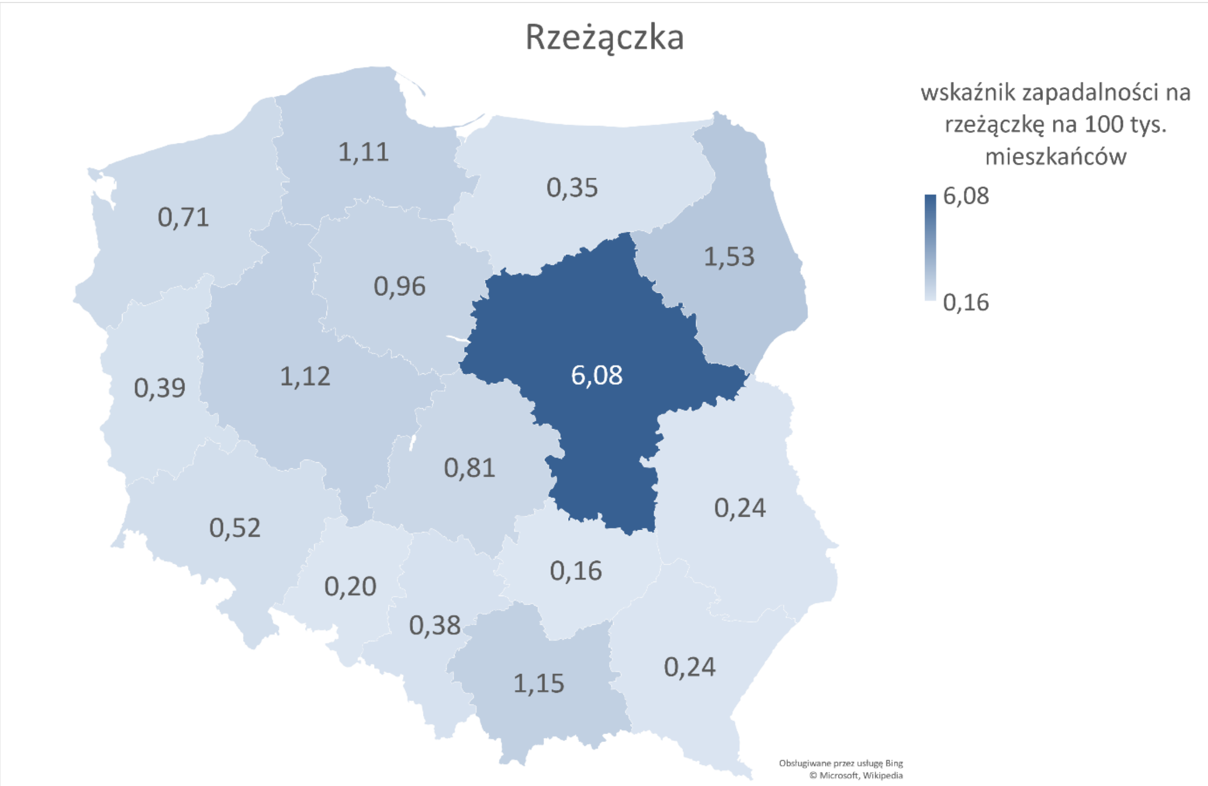
Rzeżączka
wskaźnik zapadalności na rzeżączkę na 100 tys. mieszkańców
6,08
0,16
1,11
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1,53
0,96
6,08
0,39
1,12
0,81
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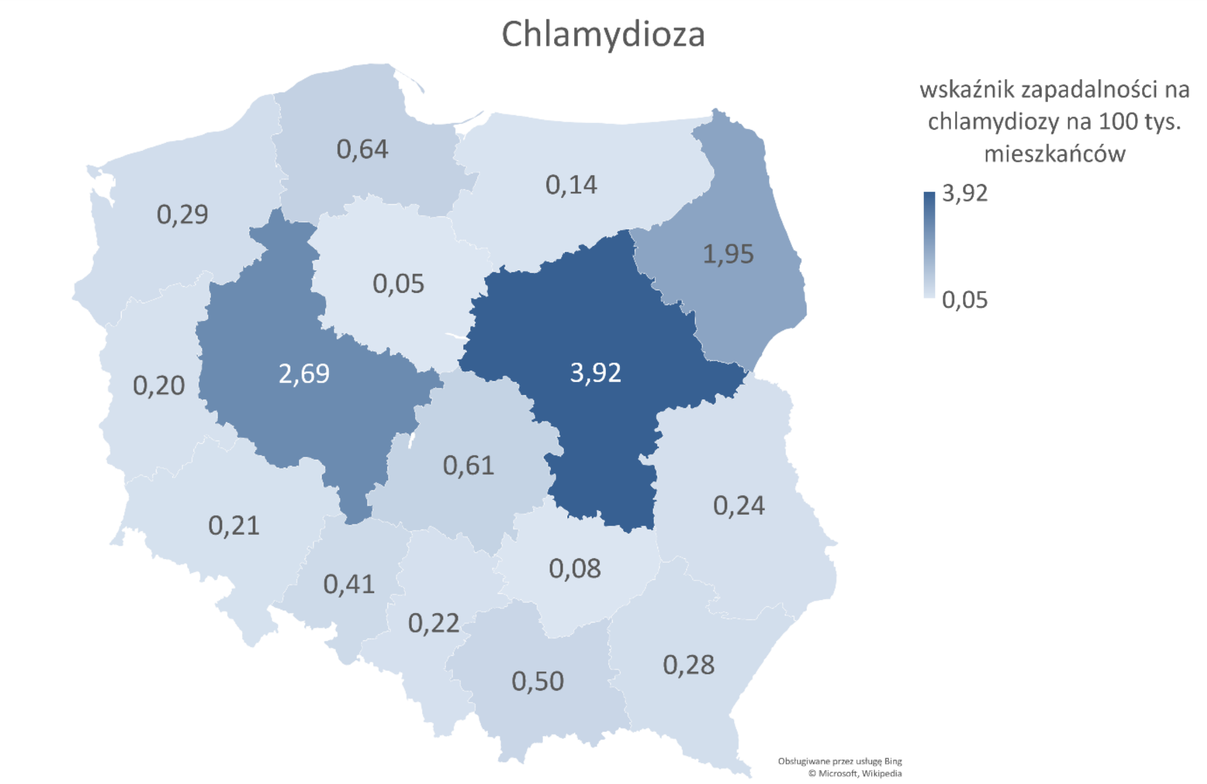

Fig. 6.31. Syphilis, gonorrhoea and Chlamydia trachomatis incidence per 100,000 population by voivodeships in Poland in 2019 (source: CSIOZ, currently Centrum e-Zdrowie: MZ-54)

The incidence of gonorrhoea also shows a clear upward trend. On average, there are over 26 cases per 100,000 population in Europe[68]. The incidence of gonorrhoea far exceeds the incidence of syphilis (Fig. 6.30). The situation in Poland is different. Although the incidence of gonorrhoea continues to increase, it is disproportionately low in Poland. That fact is most probably due to the limited diagnosis (the number of tests performed), the fact that infected persons do not report to medical care or the under-reporting of gonorrhea, which is clearly visible when analysing the distribution of infections in individual voivodships. In some voivodships, only isolated cases are recorded annually. In 2019, 5 or fewer cases were reported in the Lubelskie, Lubuskie, Opolskie, Podkarpackie, Świętokrzyskie and Warmińsko-Mazurskie Voivodships (incidence below 0.40 per 100,000 population). In the remaining voivodships, excluding Mazowieckie Voivodship, the number of new infections did not exceed 40 cases. In comparison to 329 cases from Mazowieckie Voivodship, representing nearly 60% of all infections (incidence of 6.08 per 100,000 population), this may indicate a significant

[68] European Centre for Disease Prevention and Control. Gonorrhoea. In: ECDC. Annual epidemiological report for 2018. Stockholm: ECDC; 2020

underestimation of this disease in Poland (Fig. 6.31).

Chlamydia trachomatis is the most common sexually transmitted disease in the European Union. It particularly affects young people, shortly after sexual initiation. The incidence of chlamydiosis in European countries varied between 140.46 and 189.15 cases per 100,000 population between 2007 and 2018, although the average incidence rate was slightly lower in the last three years of that period. Compared to that data, it is clear that the issue of *Chlamydia trachomatis* infections is highly underestimated in Poland (Fig. 6.30).

As in the case of gonorrhoea, it is most likely linked to limited diagnosis and the failure to register infections. Also in the case of chlamydiosis, some voivodships record only singular cases each year, e.g. in the Dolnośląskie, Kujawsko-Pomorskie, Lubelskie, Lubuskie, Opolskie, Podkarpackie, Świętokrzyskie, Warmińsko-Mazurskie and Zachodniopomorskie Voivodships, 6 or fewer cases were recorded in 2019 (incidence below 0.41 per 100,000 population). In turn, in the Łódzkie, Małopolskie, Pomorskie, Podlaskie, Śląskie and Wielkopolskie Voivodships the number of new infections did not exceed 25. More than half of all registered cases, i.e. 212, were reported in the Mazowieckie Voivodship, but even there, the recorded incidence rate of 3.92 per 100,000 inhabitants is unusually low in relation to the other European countries (Fig. 6.31).

According to the ECDC reports cited above, gonorrhoea is more prevalent in the EU countries among MSM. In 2018, the combined incidence rate among heterosexual women and men was lower than that of MSM, 12.4% in heterosexual men and 11.3% in women and 34.2% in MSM respectively. There is an even greater imbalance in the case of syphilis. Out of all syphilis cases, the most numerous group included MSM (37.0%) and heterosexual men – 7.6%. Unlike syphilis and gonorrhoea, chlamydia infections dominated among heterosexual women with 17.5% of cases, and heterosexual men with 11.0%, while infections among MSM in 2018 accounted for only 3.9% of cases.

Information on the transmission route of sexually transmitted diseases have not been available yet under the routine epidemiological surveillance in Poland. However, both syphilis and gonorrhoea display similar demographic characteristics in Poland as in the other EU countries (Fig. 6.32), with incidence rates several times higher among men than among women, as well as a peak incidence rate in the group aged between 20 and 40. In 2019, the incidence of syphilis and gonorrhoea was respectively 6.7 times and 18.9 times higher among men than among women, which might indicate the spread of syphilis and gonorrhoea in the MSM population. In the case of chlamydiosis, on the other hand, similarly to other EU countries, the incidence rate was slightly higher in women.

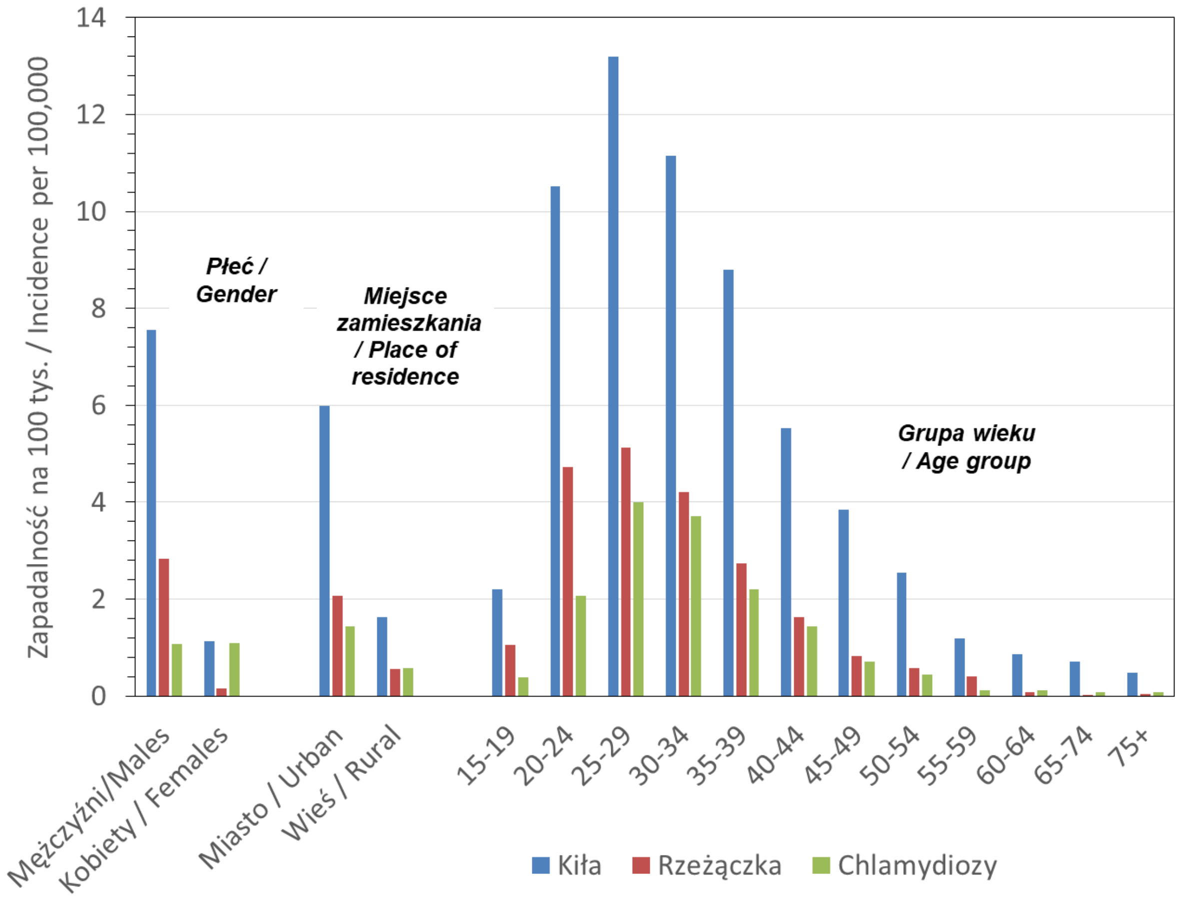

Fig. 6.32. Syphilis, gonorrhoea and Chlamydia incidence in 2019 by place of residence, gender and age

6.2.5 Influenza

Influenza is the most common infectious disease covered by epidemiological surveillance in Poland. Each year, at the peak of the epidemic season, which most frequently occurs in Poland between January and March, influenza and influenza-like diseases cause significant overload of the healthcare system, and become the main cause of sickness absence, generating enormous economic and social costs. According to the data obtained from routine surveillance after 2015, one in ten Poles received medical advice in connection with influenza and influenza-like diseases each year. In 2018, the year with the largest number of cases reported within the last three decades, over 5 million people sought medical advice (Fig. 6.33). Even though influenza cases rarely require hospitalisation (in 2019, primary care physicians referred 0.38% of their patients to hospitals), and rarely lead to severe complications or deaths, due to millions of cases reported, even these small proportions lead to thousands of hospitalisations (18,198 in 2019), and a significant number of complications and deaths (according to the data from Statistics Poland – 110 deaths from influenza were registered in 2018, while the data for 2019 have not been published yet). The serious consequences of influenza can occur in patients of all ages, but they are particularly common in people aged over 60 and in infants.

The analysis of the data on influenza cases collected by sanitary and epidemiological stations shows a sharp increase in the incidence of influenza after the A(H1N1) influenza pandemic in 2009/2010 in Poland (Fig. 6.33). This increase, however, raises the difficult question of the extent to which the real increase in the incidence of influenza has been observed in the post-pandemic years, and to what extent it was the result of improvement in the sensitivity of influenza surveillance. The higher incidence rate is supported by the increase in the number of deaths related to influenza recorded by Statistics Poland, while the improvement in the sensitivity of surveillance can be substantiated by a clear growth in the interest in influenza in the period after 2009 and the changes introduced in surveillance, including the facilitation of disease reporting related to the development of the technical base.

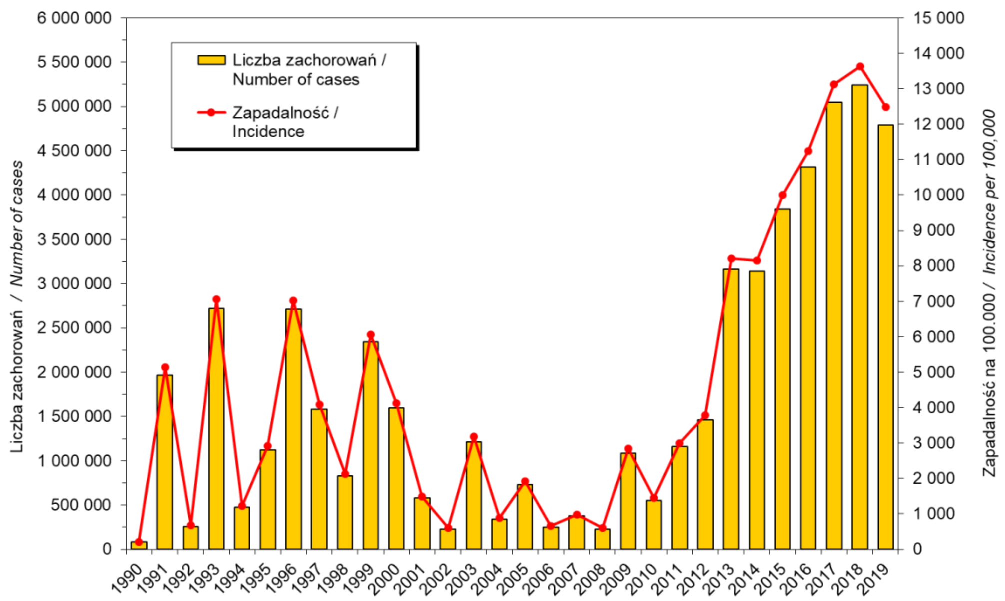

Fig. 6.33. Influenza and influenza-like diseases in 1990-2019. The number of cases and incidence per 100,000 population

Epidemiological surveillance of influenza in Poland – similarly to many other countries – is based on documenting upper respiratory tract infections, defined in Poland as "confirmed and suspected cases of influenza", and including (in accordance with the case definition adopted for the purpose of surveillance) both acute respiratory tract infections and influenza-like cases. Influenza virus cases, as indicated by data from the NIZP-PZH National Influenza Centre collected as part of the virological surveillance of influenza, represent only a certain percentage of cases in this group (estimated at around 42% in 2018/19[69]), which varies considerably between individual years. The method of influenza surveillance adopted in Poland is, in principle, sufficient to assess the incidence trends in this area and to compare individual seasons, but it cannot constitute a basis for direct international comparisons. In addition, due to the clearly differentiated sensitivity of influenza surveillance in individual voivodships, the assessment of influenza activity in different regions of the country, based on surveillance data, becomes unreliable. Thus, the tenfold difference between the highest annual incidence rate in Poland in 2018 (37,636 per 100,000 inhabitants in the Pomorskie Voivodship) and the lowest incidence rate (3,758 in the Podkarpackie Voivodship), is primarily the result of differences in the sensitivity of local surveillance, rather than differences in the actual epidemiological situation (Fig. 6.34).

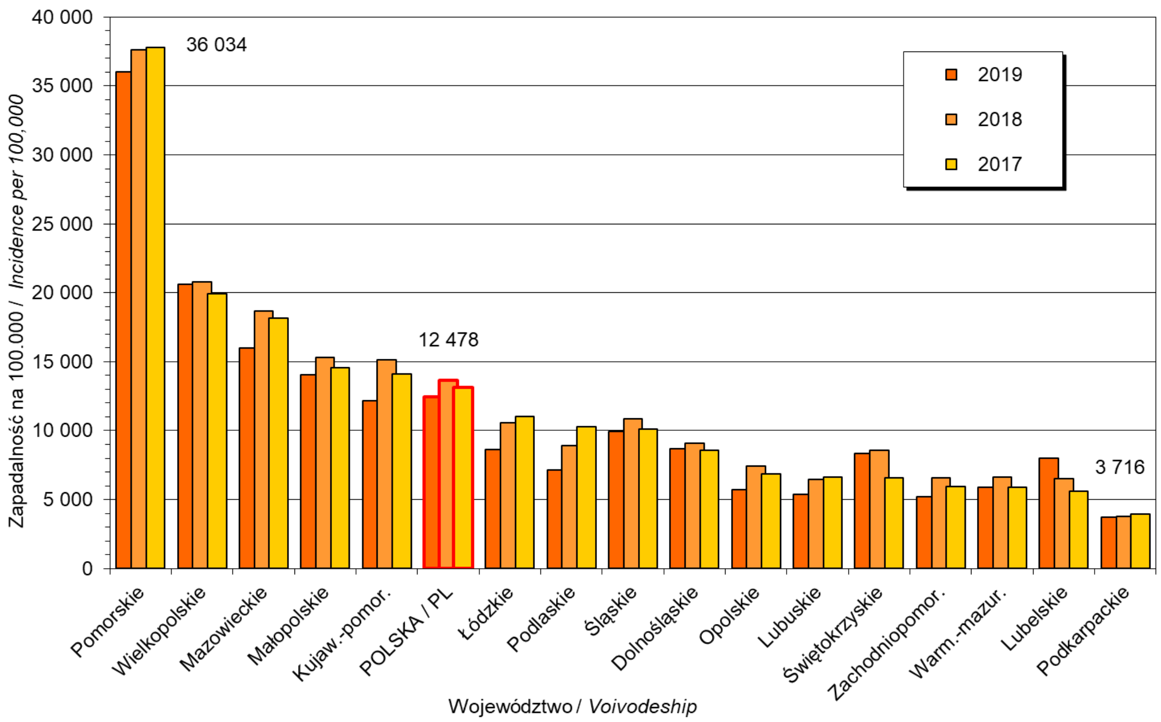

Fig. 6 .34. Influenza and influenza-like diseases in 2017-2019. Incidence per 100,000

[69] National Institute of Public Health – National Institute of Hygiene, Chief Sanitary Inspectorate. Epidemiological Reports Cases of influenza and suspected influenza. 2019, 9A (33), 131-2.

population by voivodeships

Although the varying sensitivity of surveillance in individual voivodships can be a problem, it is still possible to assess the differentiation of incidence rates for influenza and influenza-like diseases in individual age groups (Fig. 6.35). Comparing these coefficients, each year the highest values in Poland are observed among children, especially the youngest ones – aged 5 or younger (in 2019, 61,372 per 100,000 children in this age group). The incidence in this group in certain years is even five times higher than in the overall population. The incidence rate for children and adolescents aged 5-14 is lower by a half, but it is significantly higher than for older youth and adults. The lowest incidence rate always occurs among the oldest population, aged over 64 (6,821 in 2019). In the last two decades, children and adolescents aged under 14 have accounted for 25% to 55% of the total annual incidence of influenza and influenza-like diseases.

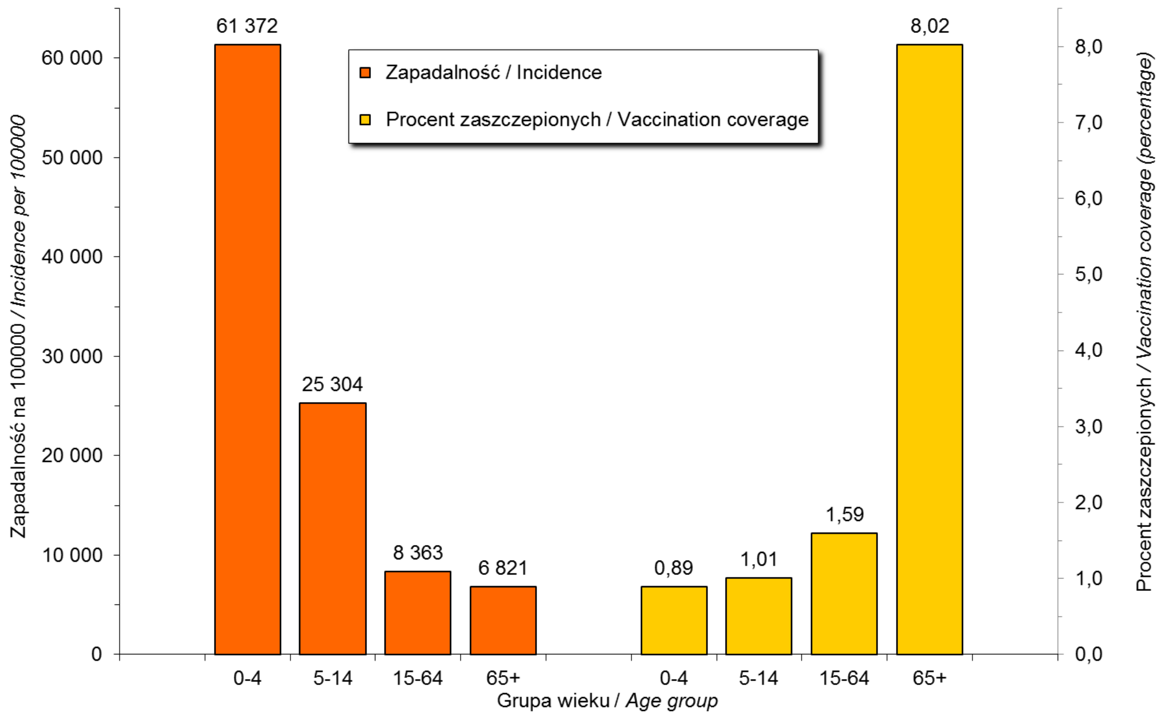

Fig. 6.35. Influenza and influenza-like diseases in 2019. Incidence per 100,000 population and vaccine coverage (percentage) by age

Considering the preliminary data collected by sanitary and epidemiological stations as part of the Official Statistics System in 2019 a total of 1,020,768 people were vaccinated against influenza throughout Poland, i.e. only approximately 2.7% of the population. Although the number of vaccinated people increased in comparison to 2018, the increase was only by 1.1%, and it did not affect the significant improvement in the state of immunization recorded in previous years. The majority of vaccinated people were aged over 65 (Fig. 6.35). A total of 557,461 people belonging to that age group have been vaccinated, i.e. 8.02%. However, in the groups of children aged 0-4 and children and adolescents aged 5-14 with the highest incidence of influenza, vaccination covered only 17,145 (0.89%) and 39,897 (1.01%) people respectively. Even assuming that the data issued by sanitary inspection may be significantly underestimated, since there is no legal obligation for the health care services to report on the performance of non-mandatory vaccinations, the figures are still embarrassingly low in comparison with other European countries. Some hopes for an improvement in the situation may be linked to the fact that after ten years of a continuing downward trend in the number of people vaccinated against influenza, this number started to increase again in the period between 2016 and 2019 (Fig. 6.36).

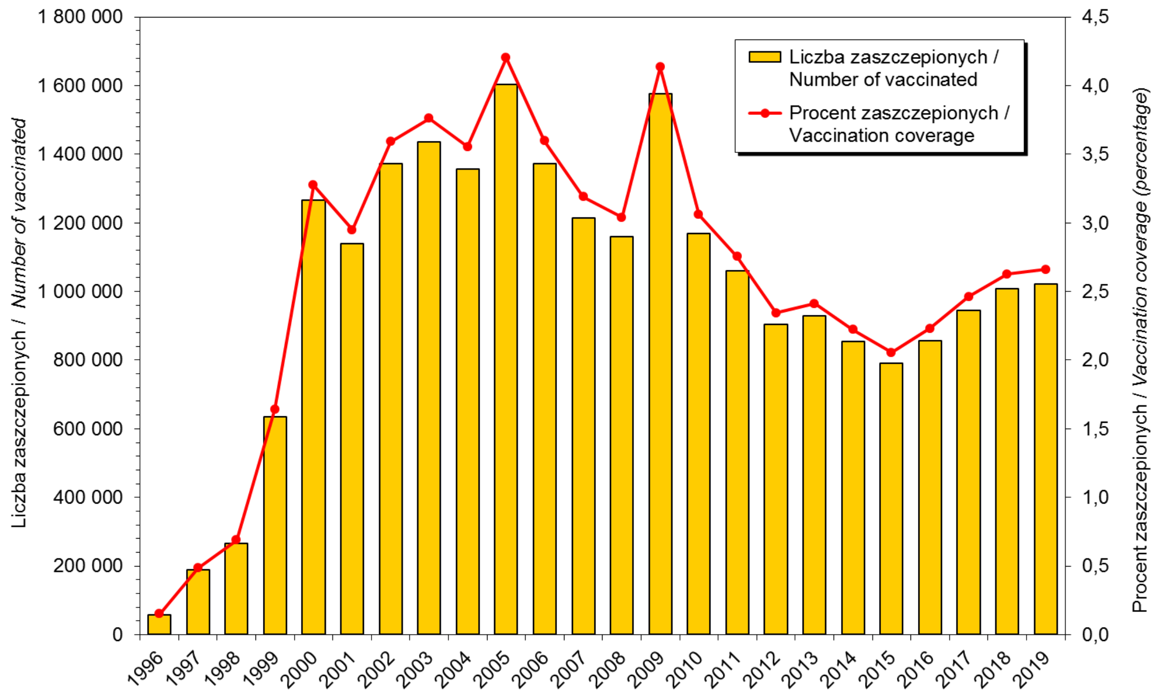

Fig. 6.36. Vaccination against influenza in 1996-2019. The number of vaccinated persons and vaccine coverage (percentage)

6.3. International public health issues related to communicable diseases

The increasing, faster and easier movement of people and goods between different parts of the world means the previous local-scale hazards can now pose a serious problem in other, at times very remote regions. Therefore, the monitoring of such events and the rapid exchange of information between countries about their occurrence is one of the key factors contributing to limiting their spread. It also allows all countries to better prepare themselves for possible threats and to introduce measures which minimise the possibility of contracting and introducing such diseases into the population at a national level. The most important events that occurred in recent years are described below, as well as in previous editions of the Report.

In 2014, there was an outbreak of Ebola fever in West Africa, which was classified by the WHO as a public health emergency of international concern (PHEIC). This outbreak lasted over 2 years and there were almost 29,000 cases (confirmed, probable and suspected in total), of which more than 11,000 were fatal. It was the largest outbreak of Ebola fever since the virus was discovered in 1976. The spread of the outbreak to large African cities with air links to the countries of the European Union and America resulted in a significant increase in the risk of the virus being spread to other continents. Therefore, the majority of countries, including Poland, had to take action to quickly detect possible cases and implement appropriate procedures to identify and treat them. In 2018, another Ebola incident occurred in the Democratic Republic of Congo, which was the second largest outbreak of Ebola in the world. However, during the meeting of the IHR Crisis Committee, it was concluded that this outbreak does not constitute an international public health threat (PHEIC).

Another disease with significant public health implications was the MERS (MERS-CoV) coronavirus infection, which was first identified in 2012 in people from the Arabian Peninsula. So far, MERS-CoV infections have been diagnosed in people in 26 countries worldwide, including 8 countries in Europe. Until present, all the infections have occurred in the countries of the Middle East or have been linked to people who were infected in the Middle East. According to the WHO, since the first cases were registered in 2012 until January of 2020, the total number of laboratory-confirmed MERS-CoV infections in the world amounted to 2,519, including at least 866 deaths. The virus it thought to be sourced from camels with one hump (dromedaries). The virus may be found in the respiratory secretions, faeces, urine and milk of infected animals.

6.3.1 The issue related to importing infectious diseases to Poland

The epidemiological situation in other countries, especially in European countries, may pose a threat to Poles travelling abroad as well as those staying in the country, in connection with the potential spread of the disease or its transmissions with goods imported from other regions of the world.

In order to limit the incidence among Polish citizens, as well as to reduce the risk of transmission, in accordance with the Act of 1997 on tourist services, persons who leave the country should be informed (also in writing) by tour operators or travel agents about the threats occurring in the areas visited during the trip. Notwithstanding the obligational the part of tour operators, in the case of planning a trip, especially to the more distant parts of the world, it is also advisable to seek medical advice about recommended vaccinations and other forms of preventive treatment aimed at protecting from infections. In the current vaccination scheme for travellers, depending on the destination country, vaccinations against hepatitis A, yellow fever, rabies may be recommended. However, other vaccinations may also be indicated in individual cases. Additional information on the risks of infectious diseases and the prevention of diseases occurring in other countries can also be obtained in travel medicine units (the list is available at: www.gis.gov.pl).

Diseases which do not occur in Poland or which are rare may be important from the point of view of the epidemiological situation. As regards the diseases which do not occur in Poland, malaria is noteworthy, which is most frequently imported from Africa (between 2010 and 2019, there were 21-38 recorded cases per year) due to the increased mortality associated with delayed diagnosis. In 2011, there was a local malaria outbreak in Europe, specifically in Greece. Each year, there is an increasing number of imported cases of dengue fever. In recent decades, the world has seen a significant increase in the incidence of dengue, which is now endemic in African, American, South Asian and Pacific Island countries. Large-scale epidemics occurred in recent years in South America (e.g. Venezuela). Poliomyelitis is also noteworthy, as it is a disease that was eradicated in the WHO European Region in 2002. Unfortunately, in 2010, there was a large outbreak of poliovirus infections in Tajikistan and cases in the bordering areas of the Russian Federation. The low immunization level of the child population has also led to the occurrence in 2015 of two cases of cVDPV-induced poliomyelitis in Ukraine, in the Zakarpatska Oblast bordering with Poland. These examples show that there is a real risk of the wild polio viruses being brought into Poland, although the risk of an outbreak comparable to that which occurred in Tajikistan is very low, due to the high proportion of people in Poland vaccinated against polio. A serious health problem can be posed by infections that relatively often affect groups migrating to Poland or periodically staying in refugee camps - such as tuberculosis and HIV/AIDS infections. They require increased surveillance and coordinated action to prevent the spread of these diseases and to provide treatment.

A separate problem is that of foodborne infections, which affect people travelling to endemic areas. Hepatitis A is relatively often imported into Poland. Therefore, before leaving for a country with medium and high endemic occurrence of Hepatitis A, vaccines for travellers are recommended. In addition, diseases such as cholera and typhoid can also be contracted. Cholera outbreaks regularly occur in Africa and South Asia. The higher risk of typhoid fever concerns parts of North and West Africa, South Asia, parts of Indonesia and Peru. Infections spreading through the food chain are linked to the consumption of contaminated food or drink and the lack of compliance with basic hygiene rules. Therefore, the World Health Organisation has developed 5 main recommendations for travellers. These recommendations include: washing hands frequently, avoiding uncooked or under-cooked food, avoiding ready-made food stored at improper temperatures (e.g. buffets, street stalls), peeling all fruit and vegetables, drinking only bottled water.

6.4. Necessary changes to the epidemiological surveillance system for infectious diseases in Poland and their perspectives

A properly functioning epidemiological surveillance system is required to assess the health situation of the population with respect to the occurrence of infectious diseases. Numerous components affect the proper functioning of the system. One of them is the time when data is available at different levels from the moment of occurrence / detection of the event. Access to real-time data, which is very important from the point of view of taking appropriate action, can be guaranteed by the digitalisation of the surveillance system, which will also affect the scope and quality of the data. From 2016, digitalisation is gradually being introduced into routine epidemiological surveillance for individual disease units, and from 2020, after the implementation of the EpiBaza system in Poland, the data obtained as part of the epidemiological surveillance will be fully collected via the electronic system and transmitted digitally.

Another very important element affecting both the specificity and sensitivity of epidemiological surveillance is the availability of basic laboratory diagnostics for epidemiological purposes. There are currently no mechanisms for financing such tests that would guarantee their routine commissioning and performance. Rare referrals for laboratory tests, which are important from the point of view of epidemiological surveillance, make it difficult to identify (quickly) the source and take adequate actions. The introduction of molecular methods to the routine epidemiological surveillance and the study of drug resistance are equally important. Current techniques based on analyses concerning data on the whole genome sequencing (WGS) of pathogens are becoming an increasingly important and precise tool to find links between individual cases of diseases. In 2017, for the first time in Poland, the WGS method was used in order to investigate the outbreak caused by *Salmonella* Enteritidis coming from eggs sold by a Polish manufacturer.

In surveillance systems, additional research plays a very important role. This includes, among others, monitoring of wastewater, seroprevalence studies, specific studies focusing on selected diseases / risk factors in selected groups, sentinel surveillance and studies using additional data sources. Currently, some of such studies are being carried out as a part of the tasks of the National Health Programme for 2016-2020.

SUMMARY

1. The data collected as a part of routine surveillance of infectious diseases and data about causes of deaths indicate that the epidemiological situation of infectious and parasitic diseases in Poland is relatively favourable and stable.
2. The Immunization Programme, implemented for over half a century in Poland, has been gradually changing. In 2017, widespread pneumococcal vaccination was introduced which contributed to a substantial vaccination coverage among children, i.e. over 90%. The clinical effects of the programme can be assessed after several years of vaccination of child cohorts born on the same year.
3. The favourable downward trend in the incidence of rubella and mumps, the diseases most common in small children, continues. Due to the low percentage of laboratory confirmations, rubella is over-diagnosed.
4. Despite the high proportion of people vaccinated over the years, the unfavourable trend in the vaccinations of children and young people continues.
5. The widespread promotion of vaccination in society as the best method of preventing infectious diseases remains an ongoing challenge, especially in view of the intense activity of vaccination opponents.
6. The constant increase in the number of newly detected HIV infections among men who have sex with men as well as syphilis and gonorrhoea in the male population in general,

indicates the limited effectiveness of the measures taken to date with regards to that group. It is necessary to evaluate and intensify measures, as well as to consider the introduction of other interventions with proven effectiveness, such as HIV pre-exposure prevention.

7. Rapid diagnosis and treatment are important elements in the prevention of HIV, HCV and other sexually transmitted diseases. The available data indicate that there are large shortcomings in Poland, especially in terms of diagnostics. A wider access to tests, the promotion of HIV and HCV testing, and the integration of testing (offering a package of tests) for these and other sexually transmitted diseases, remain priority issues.
8. With regard to the diagnosis and treatment of HCV, HIV and other sexually transmitted diseases, it is important to take action to include marginalised populations, such as intravenous drug users, homeless people and illegal migrants, in the medical system. To this end, the diagnostic process must be simplified by using rapid tests and community-based testing by lay providers.
9. Significant differences in recorded incidence rates of sexually transmitted diseases indicate gaps in the system of diagnosis and/or reporting of these diseases in most voivodships. It will be necessary to take action to improve access to diagnostics, as well as to develop acceptable ways of monitoring sexually transmitted infections across Poland.
10. Accurate diagnosis of the epidemiological situation for influenza, and thus planning and performing rational preventive measures in Poland requires a uniform surveillance of influenza in individual voivodships.
11. Considering the enormous economic and social costs of influenza borne every year, efforts should be intensified for a significant increase in the percentage of people vaccinated against this disease.
12. Effective prevention and combatting of infectious diseases require efficient actions aimed at eradicating the limitations in the scope of laboratory diagnostics performed for epidemiological purposes, i.e. for the needs of public health, and not for the purpose of determining therapeutic treatment.
13. Successive implementation of modern molecular methods for the routine surveillance system, e.g. whole genome sequencing, can significantly contribute, especially during epidemiological investigations in outbreaks (including international investigations), to identify the carrier and / or source of infection.
14. The implementation of the comprehensive electronic Epibaza system for epidemiological surveillance, which took place on 1 January 2020, should, in the near future, improve the collection and transfer of data as part of epidemiological surveillance and support timely,

appropriate and effective action to prevent and combat communicable diseases.

15. Increased tourist travel to various parts of the world requires actions to raise public awareness of the health risks connected with such travels and determine methods for the prevention of these threats.

7. COVID-19 EPIDEMIC IN POLAND IN SPRING AND SUMMER 2020

Magdalena Rosińska, Małgorzata Sadkowska – Todys, Małgorzata Stępień, Wioleta Kitowska, Małgorzata Milczarek, Grzegorz Juszczyk

The COVID-19 pandemic is clearly the largest global public health crisis related to infectious diseases in decades. As at the end of September 2020, over 33.7 million cases and more than 1 million related deaths were recorded. In the European Union, along with the states of the European Economic Area and the United Kingdom, over 3 million people were infected and more than 180 died due to COVID-19. Public health interventions have been applied on an unprecedented scale and, just like the pandemic itself, have affected the majority of the global population.

In early December 2019, the pneumonia of unknown etiology (PUE) surveillance system implemented in China detected an outbreak of severe pneumonia in the city of Wuhan, Hubei Province[70,71]. The first detected cases were associated with a wet market and live animals, so it was suspected that the new virus had a zoonotic source. This was confirmed in later genetic analyses, which indicate a considerable similarity between the novel coronavirus and the coronaviruses present in the bat population[72].

On 31 December 2019, the Chinese authorities notified the World Health Organisation about the discovery of infections of a previously unidentified disease, with only 44 cases recorded.[73]. Not long after, the virus itself was also isolated. The information that it was a betacoronavirus with a considerable genetic similarity with the SARS virus was released on 10 January 2020. The SARS virus was called SARS-CoV-1, and the novel virus – SARS-CoV-2. At first, the significance of human-to-human spread of the virus was uncertain. However, the first clusters were recorded in China as early as in the first days of January[74], and the rapid

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[70] Li Q, Guan X, Wu P, Wang X, Zhou L, Tong Y, et al. Early Transmission Dynamics in Wuhan, China, of Novel Coronavirus–Infected Pneumonia. N Engl J Med. 2020 Mar 26;382(13):1199–207;

[71] Xiang N, Havers F, Chen T, et al. Use of national pneumonia surveillance to describe influenza A(H7N9) virus epidemiology, China, 2004–2013. Emerg Infect Dis 2013;19:1784-1790

[72] Vilcek S. SARS-CoV-2: Zoonotic origin of pandemic coronavirus. Acta Virol. 2020 Sep 28. doi: 10.4149/av_2020_302. Epub ahead of print. PMID: 32985202.

1. WHO. Pneumonia of unknown cause – China. Disease outbreak news, 5 January 2020. https://www.who.int/csr/don/05-january-2020-pneumonia-of-unkown-cause-china/en/

[74] Chan JF, Yuan S, Kok KH, To KK, Chu H, Yang J, Xing F, Liu J, Yip CC, Poon RW, Tsoi HW, Lo SK, Chan KH, Poon VK, Chan WM, Ip JD, Cai JP, Cheng VC, Chen H, Hui CK, Yuen KY. A familial cluster of pneumonia associated with the 2019 novel coronavirus indicating person-to-person transmission: a study of a family cluster. Lancet. 2020 Feb 15;395(10223):514-523. doi: 10.1016/S0140-6736(20)30154-9.

continued spread of the virus confirmed the epidemiologists' suspicions that this was the main mode of transmission of the virus, making it a potential global threat[75]. It was found at an early stage that the virus spreads through droplets, like other coronaviruses, as well as the influenza virus, and was similarly infectious. Soon the transmission from asymptomatic individuals was also confirmed [76,77], a feature that makes it significantly more difficult to introduce effective control measures. The number of infections started to grow in Wuhan, Hubei Province. On 23 January, the Chinese authorities decided to take drastic countermeasures and cut off the city of Wuhan and the Hubei Province from the rest of the country. A lockdown was imposed, factories suspended production, schools and public places were closed, public transport services ceased operation and public events were cancelled.[78] A "cordon sanitaire" was established. The authorities immediately began the construction of a hospital for 1,000 patients with respiratory failure caused by the novel coronavirus. The actions taken in China, as well as the restrictions on international traffic imposed by other countries, slowed down the spread of the epidemic. Nevertheless, these measures failed to stop the epidemic completely and infections started appearing in other countries, initially in Asia (the first imported case in Thailand was discovered on 13 January), then in Europe, and in other continents. On 30 January 2020, WHO declared the outbreak of the novel coronavirus a Public Health Emergency of International Concern[79] (PHEIC). WHO announced the pandemic of COVID-19 (the official name of the disease adopted on 25 February) on 11 March.[80] At that time the number of confirmed infections globally was more than 118,000 and covered 84 countries on all continents.

The first cases in Europe concerned infections imported from China to France (detected on 24 January), Germany (detected 28 January), Finland (detected 29 January) and

[75] Riou J, Althaus CL. Pattern of early human-to-human transmission of Wuhan 2019 novel coronavirus (2019-nCoV), December 2019 to January 2020 [published correction appears in Euro Surveill. 2020 Feb;25(7):]. Euro Surveill. 2020;25(4):2000058. doi:10.2807/1560-7917.ES.2020.25.4.2000058
[76] Zhang J, Tian S, Lou J, Chen Y. Familial Cluster of COVID-19 Infection From an Asymptomatic. Crit Care. 2020 Mar 27;24(1):119. doi: 10.1186/s13054-020-2817-7.
[77] Rothe C, Schunk M, Sothmann P, et al. Transmission of 2019-nCoV infection from an asymptomatic contact in Germany. N Engl J Med. 2020; doi: 10.1056/NEJMc2001468
[78] Tian H, Liu Y, Li Y, Wu C-H, Chen B, Kraemer MUG, et al. An investigation of transmission control measures during the first 50 days of the COVID-19 epidemic in China. Science. 2020 Mar 31;eabb6105
[79] WHO Director-General's statement on IHR Emergency Committee on Novel Coronavirus (2019-nCoV). Available from: https://www.who.int/dg/speeches/detail/who-director-general-s-statement-on-ihr-emergency-committee-on-novel-coronavirus-(2019-ncov)
[80] WHO Director-General's opening remarks at the media briefing on COVID-19 - 11 March 2020. Available from: https://www.who.int/dg/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---11-march-2020

the United Kingdom (detected 6 February).[81] These cases were identified quickly and although there were incidents of secondary transmission, local transmission did not occur. However, this happened in Italy. On 22 February, the Italian authorities reported several clusters in a few of the regions of Northern Italy (Lombardy, Veneto, Piedmont). By early March, Western Europe and North America had become the global epicentres of the epidemic. In Europe, particularly high incidences in the early period were observed in Italy, Spain, and Belgium. The wave of infections in the United States quickly exceeded the total number of cases in Europe, where most countries (except for Sweden) imposed a *lockdown* similar to that introduced by China. The arrival of winter in the southern hemisphere brought an increase in infections in Latin America. The situation started stabilising in this area only towards the end of August 2020. The global incidence is continually growing, and the situation is becoming worse in Asia, especially India, but also in Europe due to the milder restrictions and the autumn season.

7.1. The course of the epidemic in Poland

7.1.1. Outbreak in Poland

Poland started preparations for SARS-CoV-2 infections that could be imported into the country as early as in January 2020. The diagnostic pipeline for performing molecular tests for SARS-CoV-2 was launched on 29 January at the National Institute of Public Health – National Institute of Hygiene. The WHO and ECDC guidelines were used as a basis for developing procedures to handle suspected cases, in terms of, i.a., quarantine and epidemiological surveillance, as well as testing guidelines. The procedures could be tested in practice in connection with the evacuation of Polish citizens from Wuhan after it had been locked. A group of students came back from Wuhan on 25 January, and another large group on 2 February. In accordance with the procedures applicable at the time, all students were hospitalised and tested, none was infected. The first case of COVID-19 in Poland was diagnosed on 4 March 2020 in a person who arrived by coach from Germany[82].

7.1.2. Legal status and restrictions

[81] European Centre for Disease Prevention and Control. Outbreak of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2): increased transmission beyond China − fourth update, 14 February 2020. ECDC: Stockholm; 2020.
[82] The first case of the new coronavirus in Poland. Available from: https://www.gov.pl/web/zdrowie/pierwszy-przypadek-koronawirusa-w-polsce

Formally, COVID-19 was included in the list of communicable diseases subject to the Act on preventing and combating infections and infectious diseases in humans by way of the Regulation of the Minister of Health of 27 February 2020 on SARS-CoV-2 infection (Journal of Laws of 2020, item 325). On 2 March 2020, the Polish Parliament (Sejm) adopted the Act on special solutions related to preventing, counteracting and combating COVID-19, other infectious diseases and the resulting crisis. The state of epidemic emergency was imposed in the Regulation of the Minister of Health of 13 March 2020 (Journal of Laws of 2020, item 433), and on 20 Match the Minister of Health imposed the state of epidemic (Journal of Laws of 2020, item 491).

Further regulations focused on the issue regulated the matters of isolation and quarantine, as well as the introduction, and then lifting, of the restrictions responding to the epidemic. The chronology of the introduced restrictions is as follows[83]. The first regulations on quarantine, isolation and epidemiological surveillance for COVID-19 were introduced already on 7 March. Border checks started on 9 March and the borders were closed on 15 March. Polish citizens returning from abroad were subject to 14-day quarantine on arrival. All mass events as of 10 March were cancelled. On 12 March, all universities and schools were closed (schools were additionally obliged to provide care for children on 12 and 13 March), as well as cultural and entertainment facilities. Bans on restaurants, bars, cafés, discos, clubs, etc. were introduced alongside the state of epidemic emergency, which also led to cancelling sports events and trade fairs. Gatherings of more than 50 people were forbidden. At that time, the healthcare system also started preparing for a potential wave of new infections. 19 hospitals were converted into single-purpose hospitals, which were to provide services only for COVID-19 patients who require specialised medical assistance due to coexisting medical conditions or the need to undergo surgeries. These restrictions slowed down the growth of the epidemic, but exponential growth was still observable. A complete lockdown was imposed on 25 March, including a ban on gatherings of more than 2 people and religious gatherings, restrictions on movement and recommendations to work from home. Even stricter rules were introduced on 1 April, with new trade restrictions and bans on entering parks and leisure areas. In addition, beauty and hair salons were closed and rehabilitation sessions were suspended[84]. These restrictions resulted in

[83] Pinkas J, Jankowski M, Szumowski Ł, Lusawa A, Zgliczyński WS, Raciborski F, Wierzba W, Gujski M. Public Health Interventions to Mitigate Early Spread of SARS-CoV-2 in Poland. Med Sci Monit. 2020 Apr 13;26:e924730. doi: 10.12659/MSM.924730.

[84] Kolejne kroki w walce z koronawirusem – w sklepie mniej osób, ograniczenia w poruszaniu nieletnich, a parki, plaże i bulwary zamknięte (Further steps in the fight against the coronavirus – fewer customers in shops, restrictions on movement of minors, closed parks, beaches and promenades). https://www.gov.pl/web/koronawirus/kolejne-kroki

slowing down the growth of the epidemic. On 20 April the stage referred to as “the unfreezing of the economy”[85] began, but obligations were imposed to wear masks in public, maintain a distance of at least 2 m (later reduced to 1.5 m) and strictly follow hygiene rules, including hand disinfection. The first stage involved relaxing the restrictions on customers in shops and outdoor movement. On 4 May, shopping centres, hotels and other hospitality facilities were opened, rehabilitation sessions were resumed, and nursery schools and nurseries returned to normal operations. On 18 May, hair and beauty salons, as well as restaurants, were allowed to open, albeit under a strict sanitary regime. Organised activities for children in grades 1-3 of primary school and consultations with teachers of older children were also allowed. On 30 May, the obligation to cover the mouth and nose was restricted to crowded places where maintaining distance is not possible, as well as public transport vehicles, shops, cinemas and theatres, churches and offices. Gatherings of up to 150 people were allowed. Additional cultural events, wedding receptions and other family events were allowed starting from 6 June. In practice, throughout the summer holidays the pandemic restrictions were rather loose. To prepare to the autumn season and resume education in schools, a system for reimposing local restrictions was developed. On 1 September poviats were divided into three zones – green, yellow and red – depending on the values of epidemiological indicators. Some restrictions are being reintroduced in the yellow and red zones. These mainly involve bans or restrictions on holding public events, numbers of passengers in public transportation vehicles and extending the obligation to wear masks.

7.1.3. The course of the epidemic in Poland vs. in other European countries

At first the COVID-19 epidemiological situation was shaped by imported cases. In the first half of March, before the borders were closed, they accounted for 29.1% of the diagnosed cases and in the second half of March this proportion was 16.4%. At first, most cases brought into the country from abroad came from Italy due to the high tourist traffic in the period of the winter holidays and also the highest incidence in northern Italy found in that period. Due to the incubation period, the second half of March was still shaped partly by cases imported before the borders were closed and partly by those resulting from the Lot do domu (Flight home) campaign, which took place on 15 March - 6 April 2020[86]. In that period most cases were those

[85] Cztery etapy odmrażania gospodarki (The four stages of unfreezing the economy). https://www.biznes.gov.pl/pl/firma/sprawy-urzedowe/chce-przestrzegac-przepisow-szczegolnych/cztery-etapy-odmrazania-gospodarki

[86] https://www.lot.com/pl/pl/lot-do-domu

of Poles returning from the United Kingdom, France, Spain, Austria and Germany (Fig. 7.1). Local transmission was present in those countries at the time, while Poland still had very few such infections.

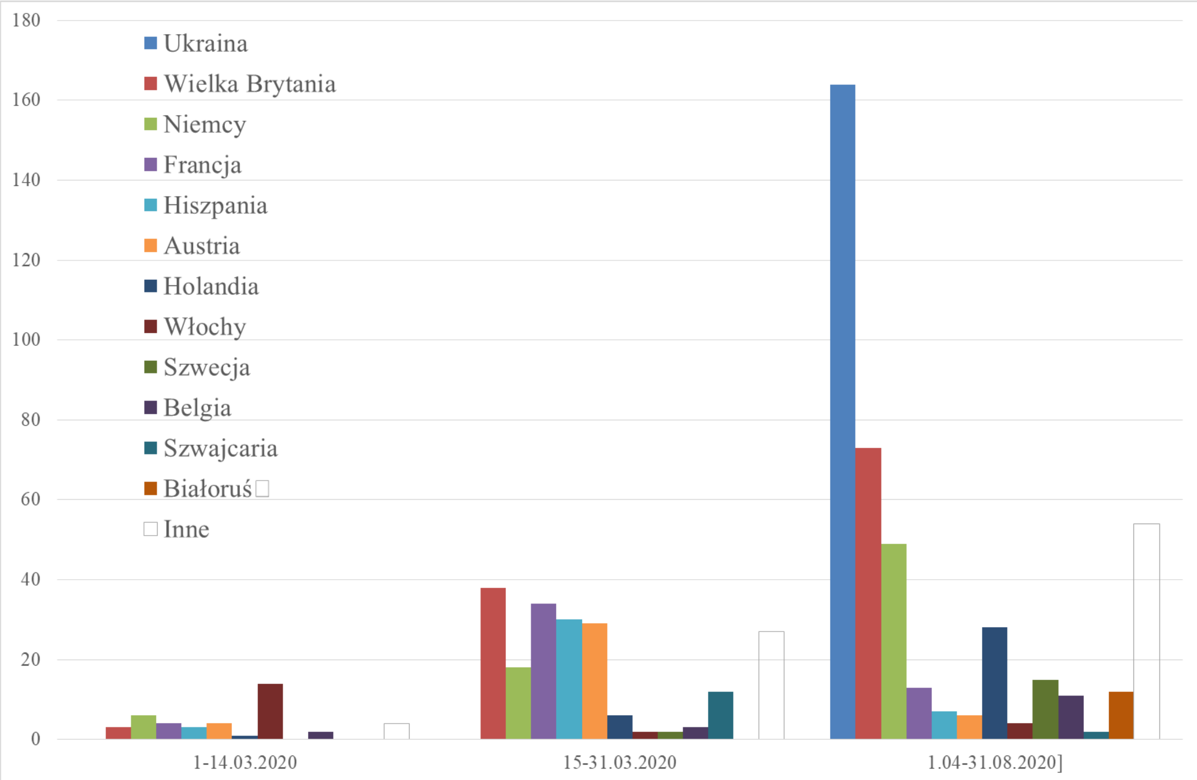

Fig. 7.1. Most common source countries of imported SARS-CoV-2 infections to Poland, by diagnosis period. (Source: epidemiological surveillance data registered in the SRWE)
[Ukraine, United Kingdom, Germany, France, Spain, Austria, the Netherlands, Italy, Sweden, Belgium, Switzerland, Belarus, Other]

After the borders had been closed, people returning from abroad were subject to quarantine. In the period starting in early August, according to the epidemiological surveillance data (Epidemic Investigation Registration System, SRWE), imported cases accounted for only 3% of all infections, despite the fact that people on quarantine after arrival to Poland were also tested in that period. Most imported cases involved Ukrainian citizens, which resulted from the heavy traffic between both countries. These were, however, not particularly numerous and it can be stated with high certainty that, except for the first weeks of the epidemic, imported cases were not a significant contributor to incidence in this country.

The epidemic did not spiral out of control in Poland in spring 2020 owing to the rapid introduction of the restrictions. While the 14-day notification rate (the number of new diagnosed cases recorded in 14 days per 100 thousand inhabitants) in the EU, EEA and the United Kingdom reached the average value of 89.2 per 100,000, Poland had values of 9-10 per 100,000

(Fig. 7.2). For comparison, in the peak of what came to be called the first wave, the notification rate in Spain was 214, in Italy 143, and in Belgium 248 per 100,000 inhabitants. In late spring and summer, due to intensive counter-epidemic measures and restrictions, the incidence in most countries dropped below the level in Poland[87]. Such measures were taken due to the risk of exceeding healthcare system capacity in terms of caring for patients with respiratory failure caused by severe COVID-19. The notification rate in Poland in the summer period was similar to the EU average. It was affected by a large outbreak, which occurred in Silesian mines. The EU average was increased by the notification rate in Sweden, which remained at the level of about 90 per 100,000. Sweden never decided to impose a complete lockdown.

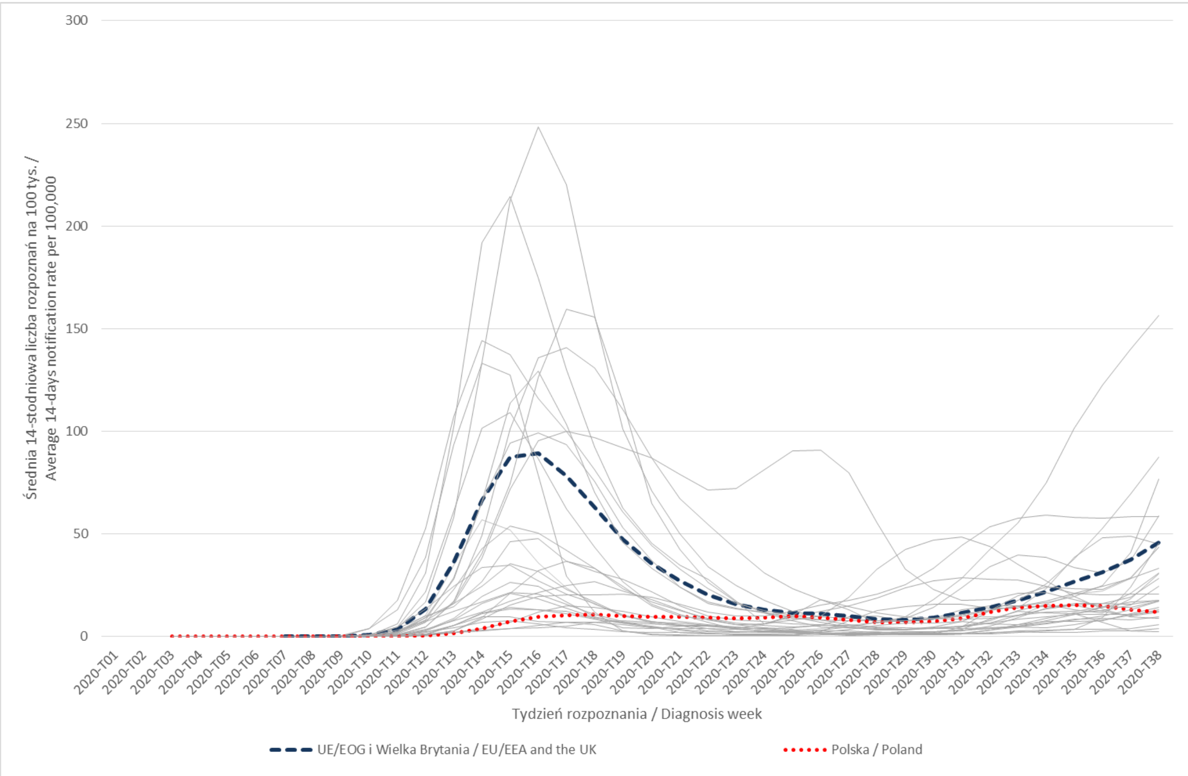

Fig. 7.2. 14-day notification rate in countries of the European Union, European Economic Area and the United Kingdom. (Source: ECDC COVID-19 Data)

In countries which decided to impose a lockdown, the social and economic costs were so severe that their authorities were looking for alternative solutions to counteract the pandemic. Such a solution is mass COVID-19 testing, to isolate the infected as soon as possible and

[87] Flaxman S, Mishra S, Gandy A, et al. Estimating the effects of non-pharmaceutical interventions on COVID-19 in Europe. Nature. 2020;584(7820):257-261. doi:10.1038/s41586-020-2405-7

quarantine those who were in contact with the infected[88]. Due to adopting this method, countries gradually increased their laboratory capacity while extending the list of indications for testing. Some countries, such as Luxembourg, decided to introduce a strategy of testing all citizens[89]. As a result a considerable increase in tests carried out in European countries could be observed (Fig. 7.3). Poland is an exception in this context. The number of tests carried out in this country has always remained below the European average and did not change throughout the summer and the first weeks of September. In mid-September Poland carried out the lowest number of tests for SARS-CoV-2 of all EU/EEA countries and the UK. As the research results indicate, a lower percentage of identified cases reduces the effectiveness of quarantine measures as a tool to curb the spread of the epidemic. This results either in a rapid increase in cases or the need to reintroduce restrictions[90].

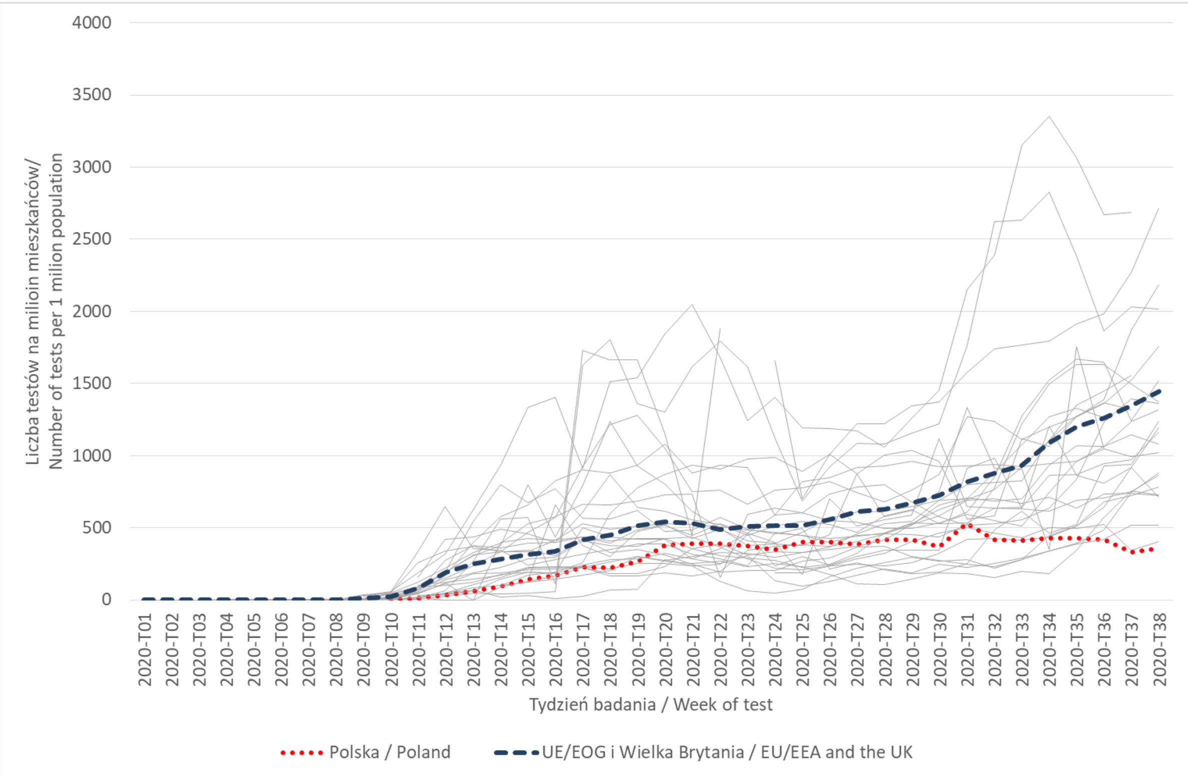

Fig. 7.3. Number of COVID-19 tests per 1 million population performed in countries of the European Union, European Economic Area and United Kingdom. (Source: ECDC COVID-19 Data). For clarity countries with very high index during the latest week were excluded from the Figure: Denmark (>5900), Luxembourg (>6600) and Iceland (>4700).

[88] European Commission. Joint European Roadmap towards lifting COVID-19 containment measures. 2020/C 126/01. https://op.europa.eu/en/publication-detail/-/publication/14188cd6-809f-11ea-bf12-01aa75ed71a1/language-en
[89] Large Scale Testing. https://coronavirus.gouvernement.lu/en/test-covid.html
[90] Piasecki T, Mucha P, Rosińska M. A new SEIR type model including quarantine effects and its application to analysis of Covid-19 pandemia in Poland in March-April 2020. https://arxiv.org/abs/2005.14532

The increased number of tests can explain the high number of cases recorded in some countries. The average percentage of positive results among those tested in the EU/EEA and the United Kingdom has remained at a relatively low level, about 2% – 3% (Fig. 7.4). A rising positivity rate, which is higher than the EU average, has recently been observed in Spain, the Czech Republic, Hungary, Romania, and the Netherlands. The percentage of positives recorded in early September in Poland, i.e. about 3.5%, was relatively high, which probably resulted from the considerable narrowing down of the testing criteria in early September. These criteria only included cases with typical symptoms.

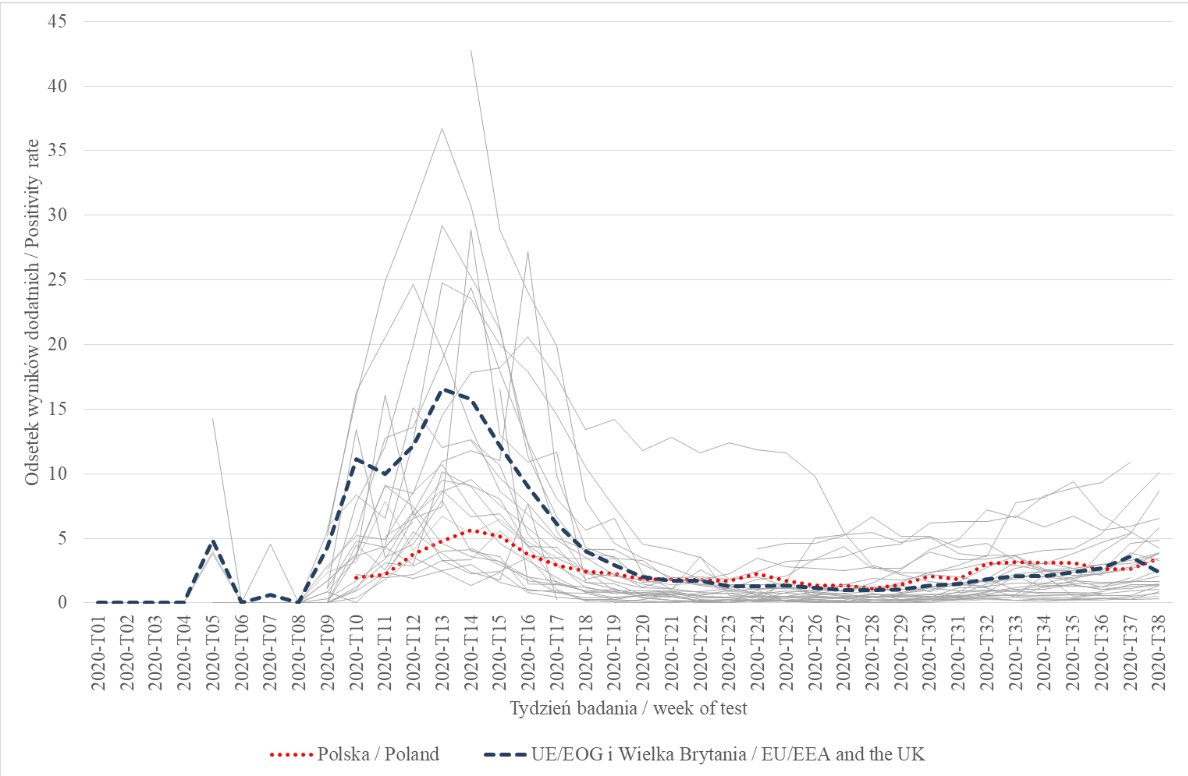

Fig. 7.4. Positivity rate among tested for COVID-19 in countries of European Union, European Economic Area and United Kingdom, by testing week. (Source: ECDC COVID-19 Data).

Similar conclusions can be reached when analysing the frequency of hospitalisations due to COVID-19 in relation to the number of inhabitants. Not all countries publish these data, but in relation to those for which is the data are available, the values of this indicator in Poland are relatively high (Fig. 7.5). It is worth noting that the hospitalisation rate in Poland in September 2020 was at a similar level as in France or Spain, while the notification rate in those countries was 7 and 13 times higher, respectively. The discrepancy between the low notification rate and the high hospitalisation rate indicates that cases with milder or atypical clinical presentations are not diagnosed effectively. Therefore, the lower numbers of tests in Poland should not be considered as resulting from better targeted testing. The data suggests that it is rather a sign of weakness of our diagnostic system that could directly affect this country's ability to respond to the epidemic in the coming months.

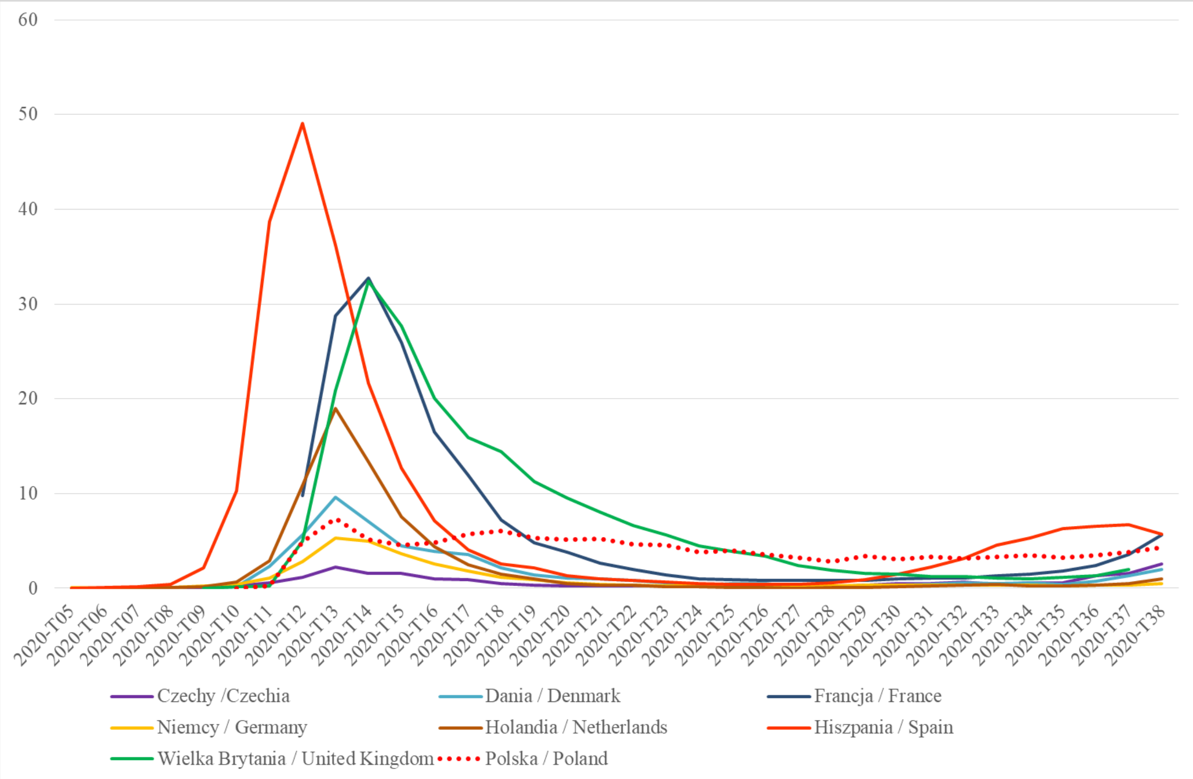

Fig. 7.5. Weekly indicators of new hospital admissions due to COVID-19 per 100 thousand population in Poland and in selected European countries. (Source: ECDC COVID-19 Data)

Attention should be paid to the spatial diversity of the epidemic in Poland (Fig. 7.6). In the early period, when infections from abroad were brought in, the poviats with slightly higher incidences were visibly scattered. Most cases brought into Poland did not result in outbreaks in March and April. However, in some locations there were cluster infections in healthcare facilities and nursing homes. In May and June, after the lockdown was introduced, the infections concentrated in several areas in which workplace clusters were found. In virtually all of northern Poland, the incidence remained at a very low level. This only changed during the summer holidays. However, considerable differences in transmission intensity in poviats are still observable, which justifies adopting local measures.

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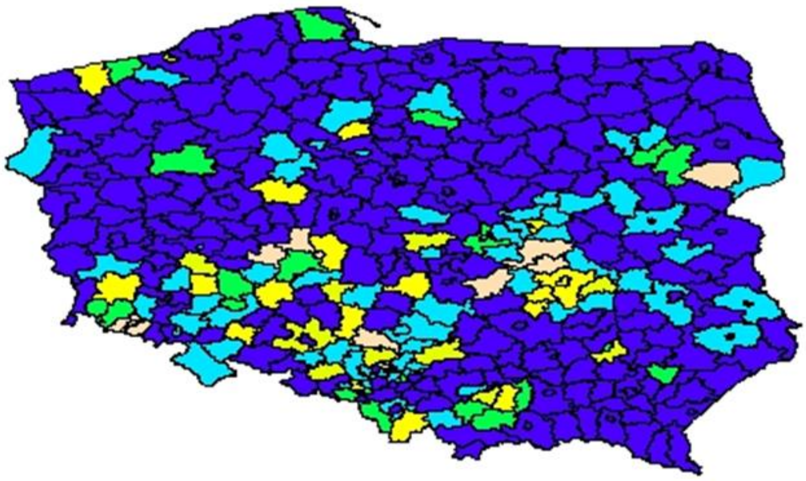

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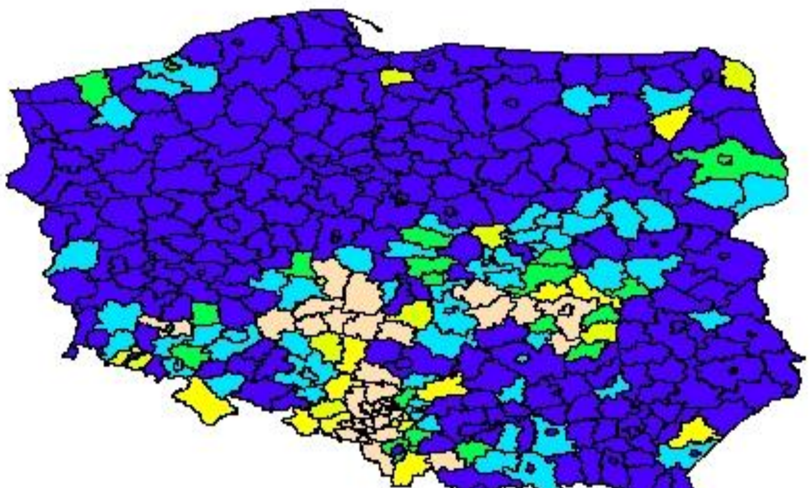


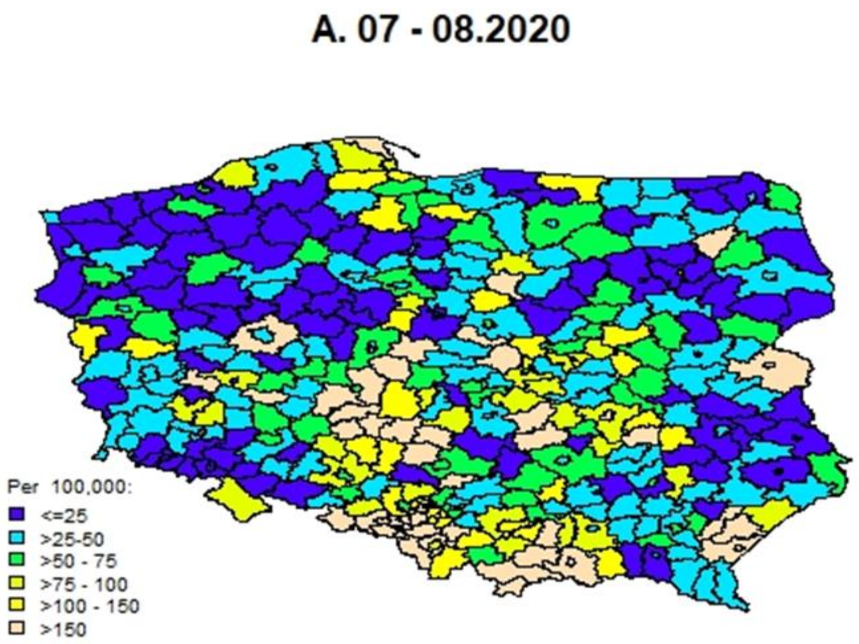


Fig. 7.6. Cumulative incidence in March – April, May – June and July – August, by poviat. (Source: official data, collected by M. Rogalski, accessible at bit.ly/covid19_powiaty)

7.1.4. Characteristics of cases

A detailed characteristics of cases is extremely important to learn about and understand the ways in which the virus spreads, identify the groups at risk and the effectiveness of the public health interventions made. The need for data on the course of the epidemic resulted in creating multiple information systems in Poland. Some of them were meant to facilitate the rapid communication of basic information on the number of infections to the voivodship and central levels, others, such as e.g. the clinical register, were created to perform the future analysis of the progress of disease and treatment results in Poland. However, detailed epidemiological information is collected, as in the case of other infectious diseases, as part of the existing infectious disease surveillance system. The epidemiological data obtained by the District Sanitary and Epidemiological Stations during their epidemiological investigations are recorded in the Epidemic Investigation Registration System. Only about 50% – 60% of all cases are currently recorded in the system and there are generally considerable delays from the detection/notification of a case to its being recorded in the system. 7.7).

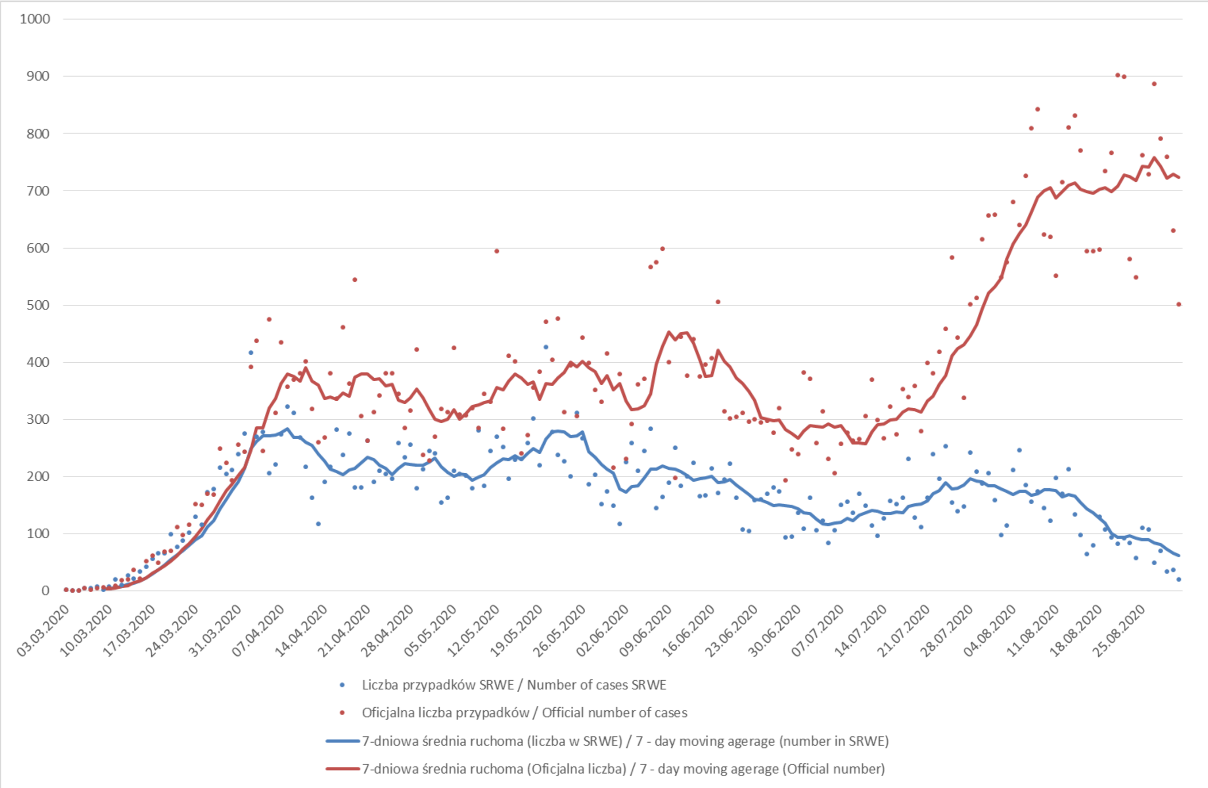


Fig. 7.7. Comparison of the number of cases registered in the Epidemic Investigation Registration System (SRWE) and the numbers reported daily by the Minister of Health of Poland. (Source: SRWE as at 31.08.2020 and ECDC COVID-19 Data)

The data presented below come from the SRWE data registry. The detected COVID-19 infections in all periods under analysis covered both urban and rural areas (Fig. 7.8). The percentage distribution is roughly similar to the population distribution, although the percentage of inhabitants of cities with populations over 50,000, including cities with populations over 100,000, is lower than in the population. This divergence only increased in time. The reasons for this are not fully understood, as typically incidence in cities, with larger population densities, tends to be higher. This is probably connected with the less comprehensive recording of cases by the sanitary and epidemiological stations operating in urban areas and covering larger populations than stations operating in less urbanised areas. The percentage of children and young adults is relatively low, which is probably caused by closures of schools and universities. In addition, children tend to have asymptomatic infections, which might make them go unnoticed. The trends among adults are similar to the general epidemiology of the virus in Poland. At an early stage there were recorded outbreaks in nursing homes and clusters in hospitals, which contributed to a higher percentage of cases among the elderly (Fig. 7.8). It was a period of shortages of basic personal protection equipment in healthcare. Large numbers of healthcare professionals and patients became infected. Over the succeeding months, outbreaks occurred in workplaces, and the largest of these involved coal mines in Silesia. According to press information, by the end of August 2020 over 8,200 miners had been infected[91]. The problem of COVID-19 clusters in mines is not specific to Poland. According to a report by the Global Energy Monitor, the epidemic affected the mining industry in over a dozen other countries, including the US, Ukraine, South Africa, China, Canada, Australia, and the Czech Republic[92]. The summer months brought an increase in the percentage of infections resulting from social contacts or for which there was no identifiable source (Fig. 7.9). This change is probably connected with a more relaxed adherence to social distancing measures in the summer period.

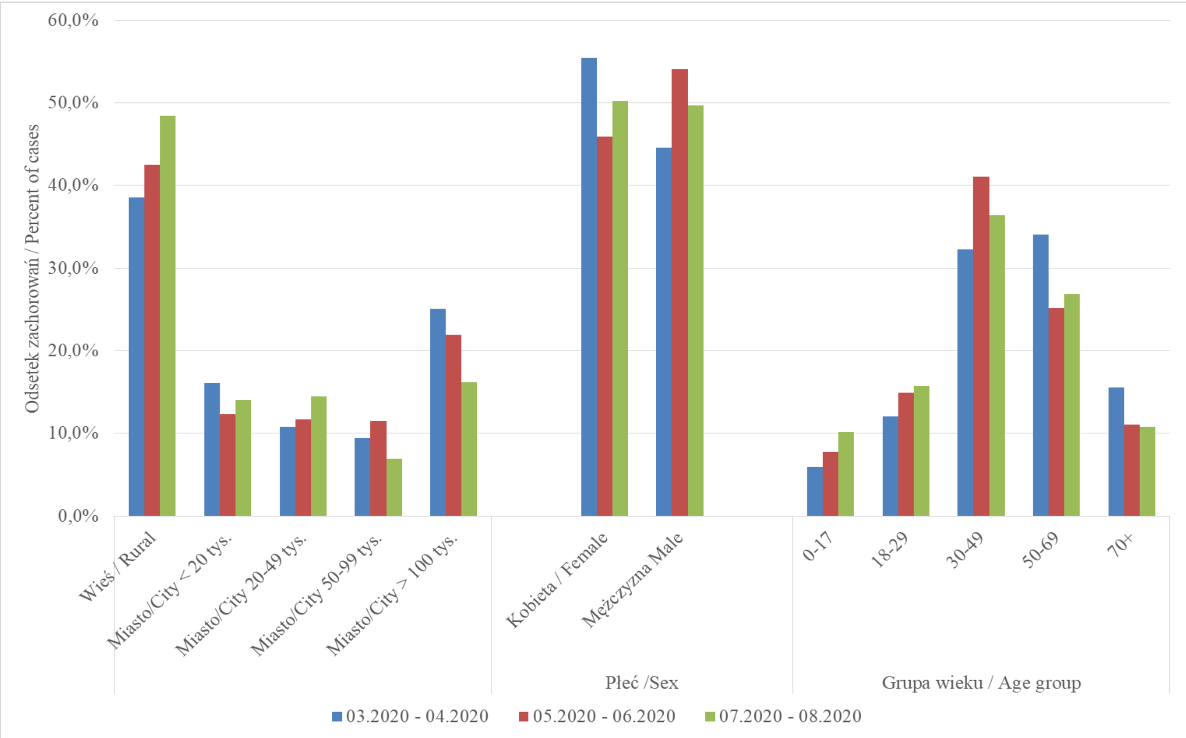


Fig. 7.8. Demographic characteristics of COVID-19 cases in Poland in March – April, May – June and July – August 2020. (Source: data of the State Sanitary Inspection and NIPH – NIH in SRWE)

[91] Koronawirus w Polsce: nowe przypadki w kopalniach (Coronavirus in Poland: New cases in mines). PAP 3.09.2020. https://300gospodarka.pl/live/koronawirus-w-polsce-nowe-przypadki-w-kopalniach
by PAP, 3 September 2020

[92] Global Energy Monitor. Coal Mine Impacts from COVID-19.
https://www.gem.wiki/Coal_Mine_Impacts_from_COVID-19

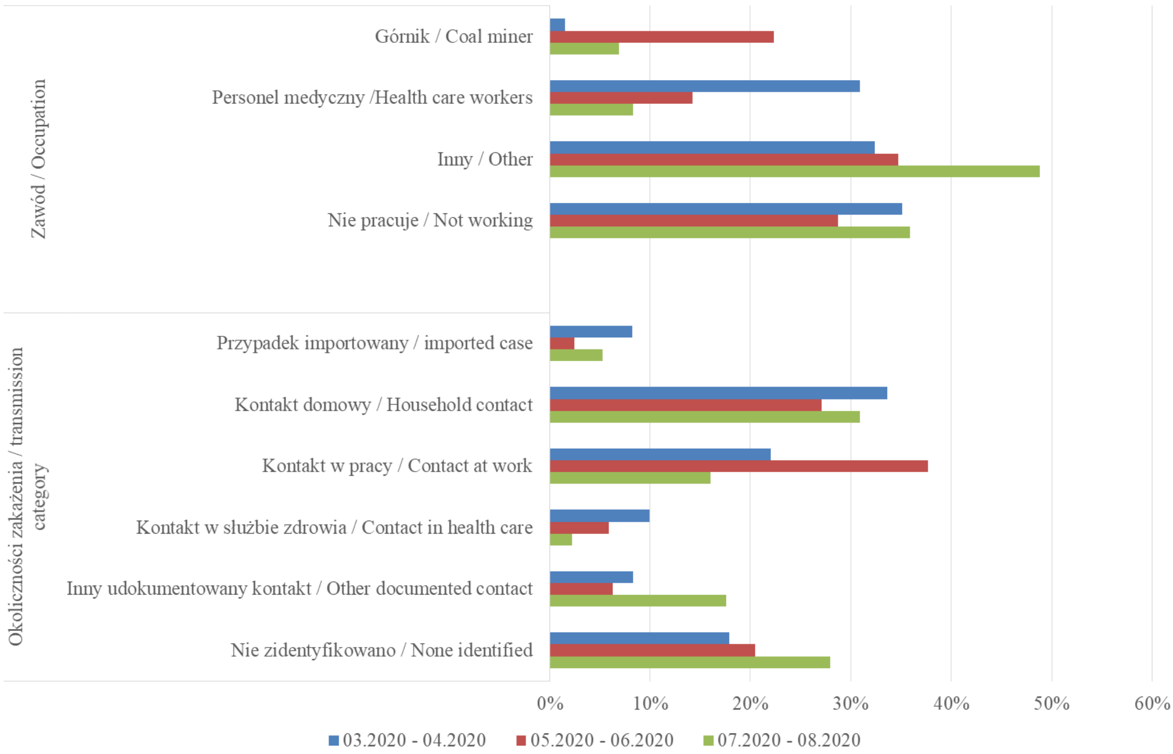


Fig. 7.9. Distribution of transmission category and occupation (among adult cases) in Poland in March – April, May – June and July – August 2020. (Source: data of the State Sanitary Inspection and NIPH – NIH in SRWE)

7.2. Seroprevalence studies

7.2.1. Prevalence in nursing homes

Nursing homes (DPS) and other long-term care facilities are particularly at risk of the rapid spread of the virus and infection clusters. Residents of such facilities are often elderly people or people suffering from chronic diseases. In addition, COVID-19 infections in this group are more severe and life-threatening. In 2013 there were 63,000 such facilities in Europe with a total of 3.6 million places[93] and since the beginning of the pandemic they have faced numerous coronavirus outbreaks[94].

According to a report by the Ministry of Family, Labour and Social Policy on residential care facilities, as at 31 December 2019 there were 823 facilities of this type in Poland, with a total number of 79,766 residents. Depending on the voivodship, the number of

[93] ECDC. Healthcare-associated infections in long-term care facilities. https://www.ecdc.europa.eu/en/healthcare-associated-infections-long-term-care-facilities
[94] European Centre for Disease Prevention and Control. Surveillance of COVID-19 in long-term care facilities in the EU/EEA, 19 May 2020. Stockholm: ECDC; 2020. © European Centre for Disease Prevention and Control, Stockholm, 2020

facilities ranged from 22 in the Podlaskie Voivodship to 98 in the Śląskie Voivodship and the number of residents ranged from 2,323 in the Lubelskie Voivodship to 9,327 in the Mazowieckie Voivodship (Tab. 7.1). Infection clusters in nursing homes have also been recorded in Poland. To determine the scale of this phenomenon in Poland, the National Institute of Public Health – National Institute of Hygiene, invited the facilities via Voivodship Offices to fill in a questionnaire on the situation of COVID-19 and also provided rapid serological tests for residents and personnel. This measure was adopted in September 2020.

Tab. 7.1. Number of nursing homes and number of residents of these facilities, by voivodship, as compared to the number of facilities, residents and personnel of these facilities that took part in the study.

Voivodship	Total number of nursing homes in the voivodship	Total number of nursing home residents in the voivodship	Number of nursing homes included	Number of nursing home residents included	Number of healthcare professionals included
Dolnośląskie	57	5807	26	719	650
Kujawsko-pomorskie	46	3984	8	1529	403
Lubelskie	44	4378	24	822	994
Lubuskie	23	2323	7	726	530
Łódzkie	55	6126	7	983	532
Małopolskie	92	7984	9	850	590
Mazowieckie	94	9327	9	1363	816
Opolskie	29	3041	16	1047	1152
Podkarpackie	50	4707	5	291	215
Podlaskie	22	2336	10	978	990
Pomorskie	42	4094	15	1031	676
Śląskie	98	8594	4	927	497
Świętokrzyskie	34	3240	6	981	632
Warmińsko-mazurskie	42	3665	14	971	525
Wielkopolskie	63	6313	6	1044	848
Zachodniopomorskie	32	3847	25	769	773
TOTAL	823	79766	191	15031	10823

In total, 191 facilities from all over Poland completed the survey questionnaire on the parameters of the facility and the occurrence of COVID-19 cases in the period from the beginning of the epidemic in Poland. Six facilities did not specify whether there had been any COVID-19 cases. Of the remaining 185 facilities, 25 (13.5%) experienced infections, of which 20 reported isolated cases and 5 identified clusters, four of which affected both the personnel and the residents and one only residents. It should be noted that COVID-19 testing was carried out in most facilities covered by the programme (91%). 90% of facilities conducted screening tests of the personnel and another 3% tested the personnel for clinical symptoms suggesting COVID-19. However, in 12 out of 173 facilities which responded to these questions (7%), the personnel has never been tested for COVID-19.

Screening tests of the residents were much rarer than those of the personnel. Only 39% facilities conducted these and in an additional 6% screening tests were carried out due to clinical symptoms among residents. In 96 out of 173 facilities (55.5%) there had been no prior tests among the residents for COVID-19.

Out of 15,031 residents who were covered by our study, 3,886 (25.9%) underwent molecular testing for COVID and 163 (4.2%) were diagnosed with SARS-CoV-2. Serological studies suggest that antibodies are not found in most recovered patients. Of the residents who had been previously tested positive for COVID-19, antibodies were identified in only 5 (3%). Valid results of serology tests were obtained for 14,964 residents, and IgG or IgM antibodies were found in 27 (0.2%) (Tab. 7.2). The prevalence of antibodies was similar regardless of age group and sex. A significantly higher prevalence of antibodies was found in the group of people who reported that they were in contact with a confirmed case of COVID-19 (1.1%). However, in this group, 93% were tested for COVID-19, of which SARS-CoV-2 infections were diagnosed in 20%.

Out of 11,557 members of nursing home staff, not only medical personnel, 634 (5.5%) worked during the pandemic in more than one workplace. In the personnel group, 8,595 (74.4%) confirmed that they had been tested for COVID-19 and SARS-CoV-2 infections had been diagnosed in 82 of them (0,95%). As in the case of residents, antibodies were found only in 5 (6.2%) members of the personnel with previous confirmed infections. The prevalence of antibodies among the personnel did not significantly differ by sex or age and was higher in people who came into contact with a confirmed COVID-19 case.

Tab. 7.2. Prevalence of anti-SARS-CoV-2 antibodies among residents and personnel of elderly care facilities, by sex, age and whether contact with confirmed case took place

		Wyniki badań serologicznych wśród pensjonariuszy / Test results among residents			Wyniki badań serologicznych wśród personelu / Test results among personnel		
		Ujemne / Negative	Dodatnie / Positive	% Dodatnich / % Positive	Ujemne / Negative	Dodatnie / Positive	% Dodatnich / % Positive
Grupa wieku / age group	0-19	232	1	0,4%	9	0	0,0%
	20-39	1657	1	0,1%	2382	5	0,2%
	40-59	3791	4	0,1%	7084	18	0,3%
	60-69	3628	5	0,1%	960	1	0,1%
	70-79	2518	6	0,2%	55	0	0,0%
	80-89	2182	5	0,2%	11	0	0,0%
	90+	866	4	0,5%	1	0	0,0%
	B.D. / Unknown	63	1	1,6%	102	1	1,0%
Płeć / sex	Kobieta / Female	7127	14	0,2%	9123	22	0,2%
	Mężczyzna / Male	7747	12	0,2%	1382	2	0,1%
	B.D/ Unkown	63	1	1,6%	99	1	1,0%
Kontakt z przypadkiem / Contact with case	Nie / No	14072	17	0,1%	10015	19	0,2%
	Tak / Yes	801	9	1,1%	481	5	1,0%
	B.D. / Unknown	64	1	1,5%	108	1	0,9%
	Total	14937	27	0,2%	10604	25	0,2%

SUMMARY

1. In spring 2020 the COVID-19 epidemic was curbed through the introduction of significant restrictions on social contacts. These restrictions were introduced in Poland at a very early stage of the epidemic and resulting in a low incidence.
2. The low test rate per 100,000 residents paired with the high hospitalisation rate due to COVID-19 indicate that the notification rate may be much lower than the actual incidence, which means that the control measures based on the rapid detection of cases and quarantining individuals who have been in contact with the infected may be of limited impact on the epidemiological situation for COVID-19.

3. In spring 2020, the COVID-19 epidemic (known as the “first wave”) was shaped by infections in the workplace and health care facilities. In the summer season, infections resulting from social contacts, probably also in the context of holiday travel, became more numerous. This significantly limited the possibility of applying well-targeted and timely control measures, leading to a more uncontrolled spread of the epidemic.
4. COVID-19 cases were detected in a large proportion of nursing homes, both among the personnel and the residents. Contrary to expectations, antibodies were undetectable in most recovered patients when they were subjected to serology tests. The period in which the infections occurred is unknown, but it is possible that they occurred several months before the test and the level of antibodies might have dropped below the detectable level, which suggests susceptibility to re-infection.

8. ACCIDENTS AND ACCIDENTAL POISONINGS AS A THREAT TO HEALTH

Rafał Halik, Wojciech Seroka

8.1 Introduction

Accidents are a heterogeneous group of sudden and unintentional threats to health that cause damage to human health. According to the WHO ICD-10 classification of diseases and health problems, accidents belong to the category of diagnoses from V01 to X59. According to ICD-10 criteria, other external causes of death or illness related to intentional activities, such as suicides and self-harm, violence, criminal activities and medical complications, are not included in category of accidents. Accidents constitute a serious public health problem due to generating high economic and social costs. They also contribute to the premature mortality of the population and are the first cause of mortality of young men (10-39 years old) and women aged 5-24.

According to Statistics Poland (SP), in 2018, more than 12,700 people died as a result of injuries in accidents (more than 63% of the deaths due to external causes). According to the model presented by the European Association for Accident Prevention and Safety Promotion EuroSafe,[95] on average per each accident fatality there are 22 hospital admissions and and 220 casualties who require outpatient medical assistance in EU countries. Taking into account the above proportions, it can be considered that the scale of the number of accidents and their health consequences is exceptionally large and alarming in Poland. Despite these circumstances, the state of knowledge and research on the conditions and frequency of all accidents is still unsatisfactory. A number of information systems have been established in Poland registering various types of accidents, run by Statistics Poland, the Police and the State Fire Service (PSP), but these systems apply diverse and non-uniform criteria for classifying accidents independent of the classification of ICD-10 diseases (e.g. a car accident of a professional driver is recorded differently as part of the registration of accidents at work and differently as part of registration by the Police). Due to the different classification of accidents, for the purposes of this chapter

[95] Rupert Kisser, Angharad Walters, Wim Rogmans, Samantha Turner, Ronan A Lyons Injuries in the European Union 2013-2015 Supplementary report to the 6th edition of "Injuries in the EU" - Report on trends in IDB data flow, country comparison and ECHI-injury indicators 2013-2015, 11 EuroSafe August 2017

reference is made to both the accident categories included in the ICD-10 classification and the legal accident categories, i.e. road accidents, accidents at work, etc.

8.2 General characteristics of the frequency of accidents among Polish citizens on the basis of surveys

According to the last EHIS survey carried out by Statistics Poland in 2014, every 20th person over the age of 15 suffered an accident requiring medical assistance within the last 12 months. It should be mentioned that in the previous edition of the EHIS survey in 2009 the frequency of reported accidents was at a similar level. In 2017, a field study was carried out under the National Health Programme (NHP) on a representative sample of 3,000 people aged over 20, which indicated an even higher percentage of people declaring the need for healthcare due to an accident than in EHIS surveys. According to this survey, 12.6% of the respondents indicated the need for medical intervention due to an accident in the last 12 months. The frequency of accidents reported by men in the NHP study was higher than that reported by women (13.8% vs. 11.5%). The accident rate also increased with age, and the group of special risk in terms of injuries suffered in accidents were women aged over 60. The high incidence of falls resulting in injuries is mainly responsible for the exceptionally high number of accidents in this group. The place where accidents are most frequent according to the NHP survey is the home environment, where 41% of the reported accidents occurred. The second place where injuries were the most frequent were means of transport as well as roads and streets, where 36% of the discussed events took place among all the casualties. Among senior citizens over the age of 60, the home and its surroundings were clearly more frequent environment in which an accident occurred, with 52% of casualties in this age group being injured under these circumstances.

According to the Nationwide General Hospital Morbidity Study, in 2018, approx. 435,000 cases of hospitalisation due to accidents were registered in Poland. In the case of identifying accidents involving hospitalisation, ICD-10 classification requires that two codes being provided in the diagnosis – the first describing the health effects, i.e. wounds, fractures, poisonings, and the second describing external causes. Unfortunately, a large percentage of hospitals do not specify a code describing external causes of accidents and, therefore, this number of cases of hospitalisation is significantly understated (in 2018 26% of ICD-10 codes describing injuries did not have a specified external cause). The data obtained from the three voivodships with the best reporting (Opolskie, Podkarpackie and Śląskie Voivodships) show that men are the most frequently hospitalised group due to accidents, the highest rates of hospitalisation due to accidents are recorded especially for young men aged 0-24, girls aged 0-14, and women aged over 65 (Fig. 8.1). The high frequency of hospital treatment in these age groups is most likely due to the high incidence of accidents among children and frequent falls resulting in injuries in older women. Contrary to the widespread opinion about the dominance of transport accidents, it can be observed that injuries related to the falls are by far the most numerous group of hospitalisation. Therefore, falls are not only a health problem for people in older age groups, but are also the major cause of hospitalisation of younger people, both men and women.

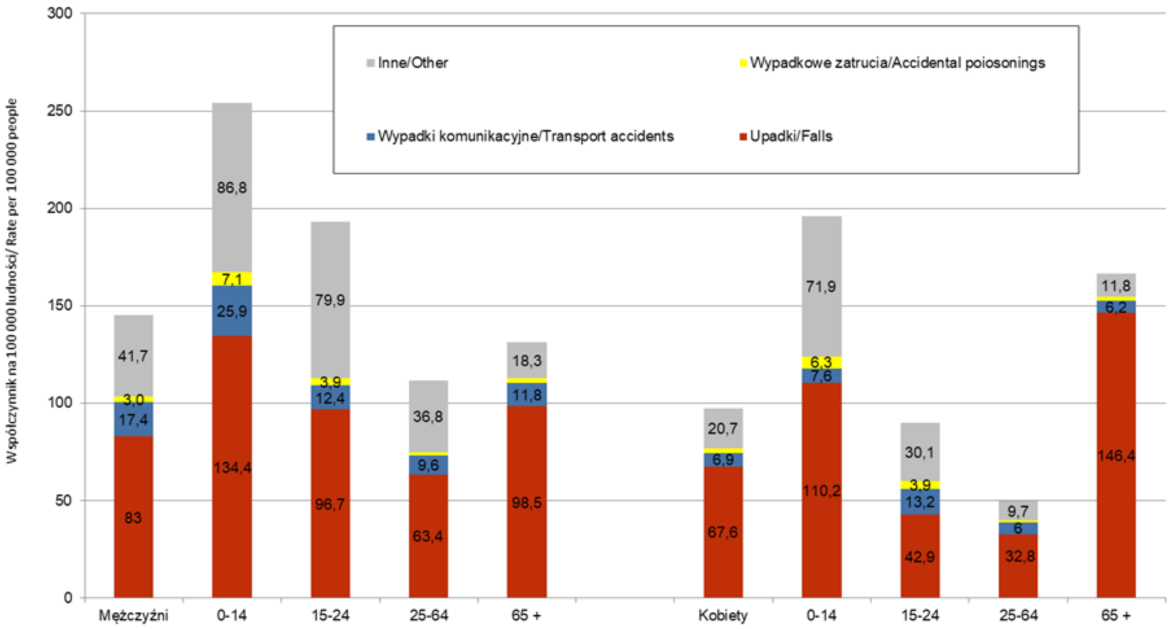


Fig. 8.1. Hospital discharge rates due to accidents (V01-X59) per 100,000 inhabitants in Opolskie, Podkarpackie and Śląskie voivodships, 2018 (Nationwide General Hospital Morbidity Study NIPH-NIH)

From 2000, a systematic decrease in the number of deaths due to accidents has continued in Poland. However, this decrease slowed down and stabilised at the same level in years 2016-2018. According to Eurostat calculations, a threat to life due to accidents in Poland in 2016 was 9.8% higher than the EU average (the standardised death rate estimated by Eurostat in Poland: 35 vs. 31.8 in the EU). A characteristic feature for Poland is a persistently high threat to men's lives due to accidents in rural areas (the standardised mortality rate in rural areas: 50.3 vs. 37.3 per 100,000 urban population in 2018). Among women, this difference is not so strongly marked (the standardised mortality rate: 12.6 vs. 10.9 per 100,000 population). A threat to life due to accidents is also strongly differentiated between voivodships (Fig. 8.2). For many years, the highest standardised mortality rates have been characteristic of the Podlaskie Voivodship (an average of 33.7 per 100,000 population in years 2016-2018). The most advantageous situation in this respect is observed in the Podkarpackie Voivodship (20.2 per 100,000 population).

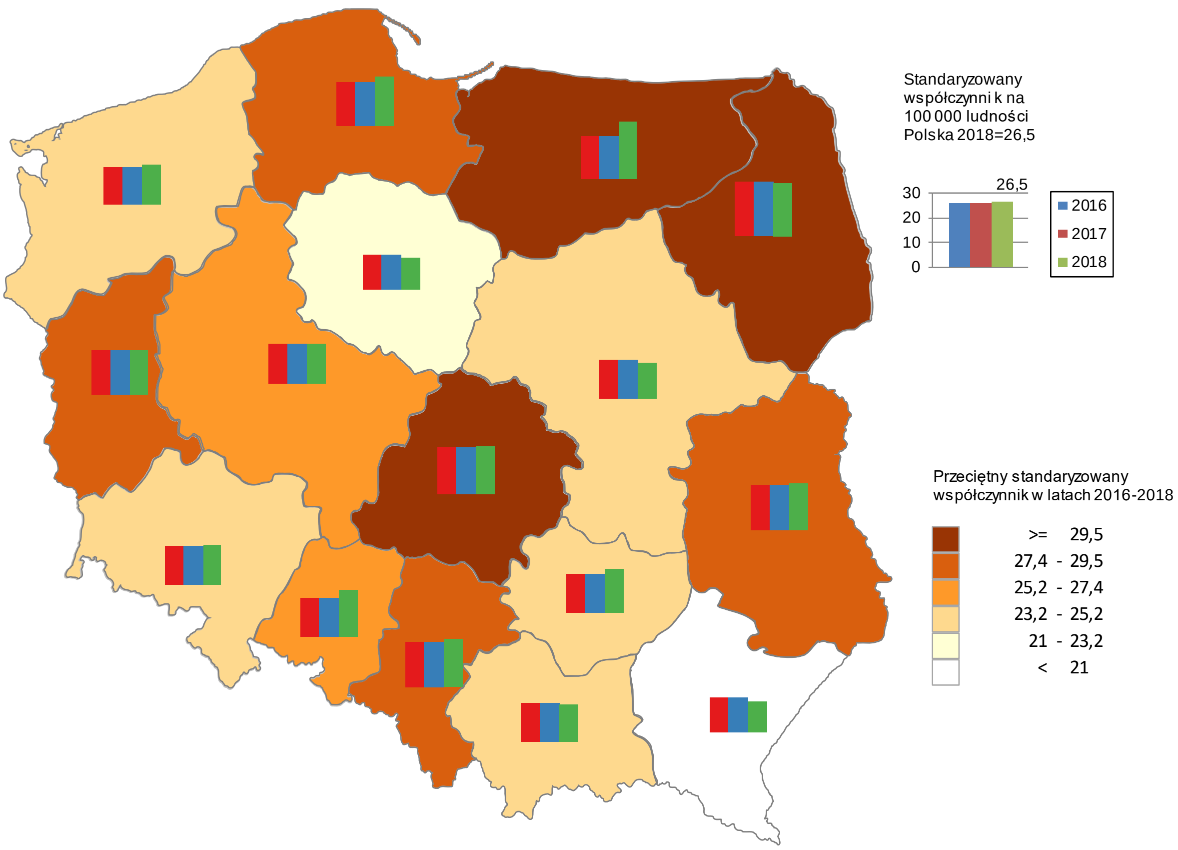


Fig. 8.2 Standardised mortality rates due to accidents (V01-X59) by voivodship in 2016-2018 (authors' own calculations based on SP data)

The most frequent causes of fatalities in 2018 were falls (crude mortality rate of 11.8 per 100,000 population) followed by transport accidents (9.6), poisonings (3.8), drownings (1.6), and exposition to the fire, smoke and flames (1.3). In all the aforementioned categories, according to Eurostat estimates, a threat to life in Poland is higher than the average in EU countries (Fig. 8.3).

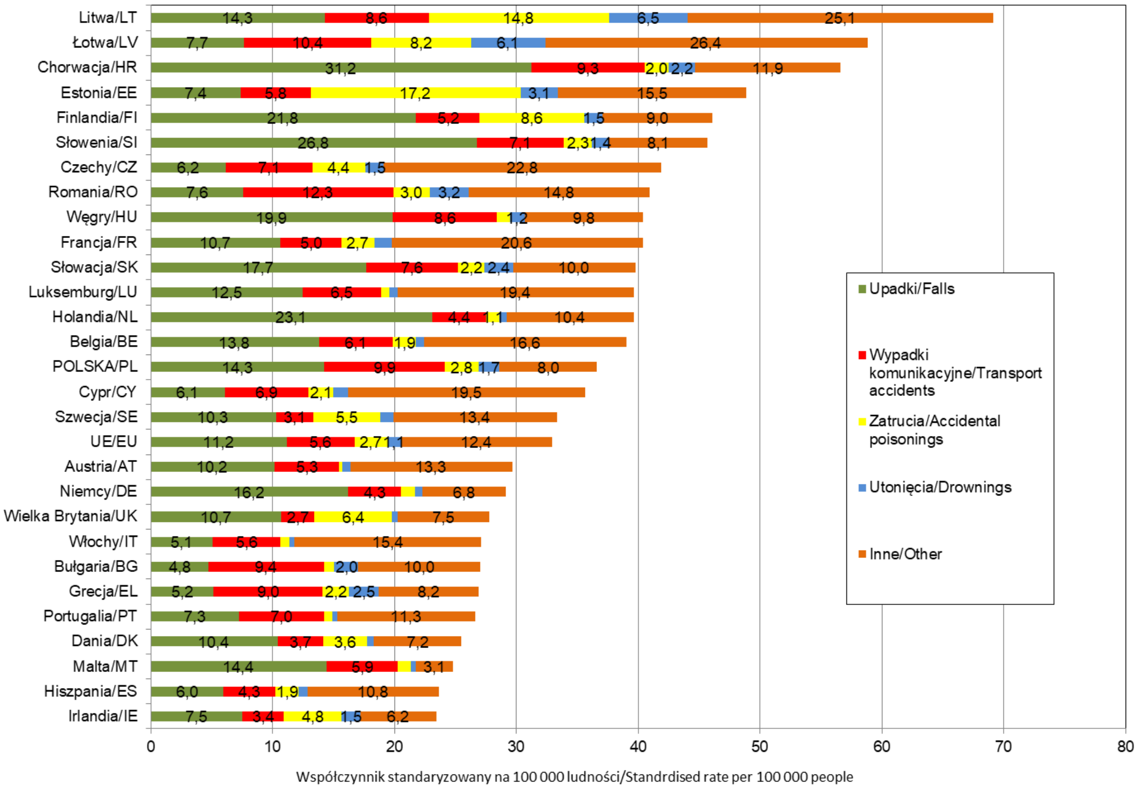


Fig. 7.3 Standardised mortality rates due to different categories of accidents in EU countries in 2016 (Eurostat database)

8.3 Falls

Falls are the major cause of hospitalisation and deaths due to all accidents in Poland and a growing public health problem in the country in connection with the ageing of the population. Despite the high prevalence of such accidents, this problem has not yet been subject to detailed epidemiological studies. Literature largely relates to the falls of older people and does not reffer much the issue of the prevalence of falls in younger age groups. Hospitalisation of injuries caused by falls alone accounted in 2018 for more than 58% of hospital admissions for men and more than 71% of hospitalisations for women due to all accidents. Falls in younger people are also common, as evidenced by the high frequency of hospitalisation among children and young adults.

In Poland, a total of 4,549 people died due to falls in 2018 (the standardised rate: 7.6 per 100,000 population). Nearly three quarters of all deaths due to falls involve older people aged over 65. Since 2015, a threat to the lives of Polish citizens due to falls has slightly decreased. Despite the more frequent hospitalisation of falls among women, a threat to men's lives due to the discussed causes in Poland (the standardised rate: 11.2 per 100,000 population in 2018) is higher than that of women (4.5 per 100,000 inhabitants). Hospital fatality related to injuries related to the falls is particularly high among people aged over 65 and is the highest among men in this age group at 6.0%, while it is 3.4% for women aged over 65. A threat to life due to falls varies greatly depending on the voivodship. The highest standardised mortality rate due to falls occurred in the Śląskie Voivodship (10.9), while similar high mortality rates were also characteristic for the Podlaskie and Opolskie Voivodships. The lowest rates (3.0 and 4.2) were in the Lubelskie and Świętokrzyskie Voivodships (Fig. 8.4). Such a large variation in the threat to life may also result from inter-voivodship differences in the quality of preparation of death certificates and the proper assignment of the external cause in the case of death caused by injuries.

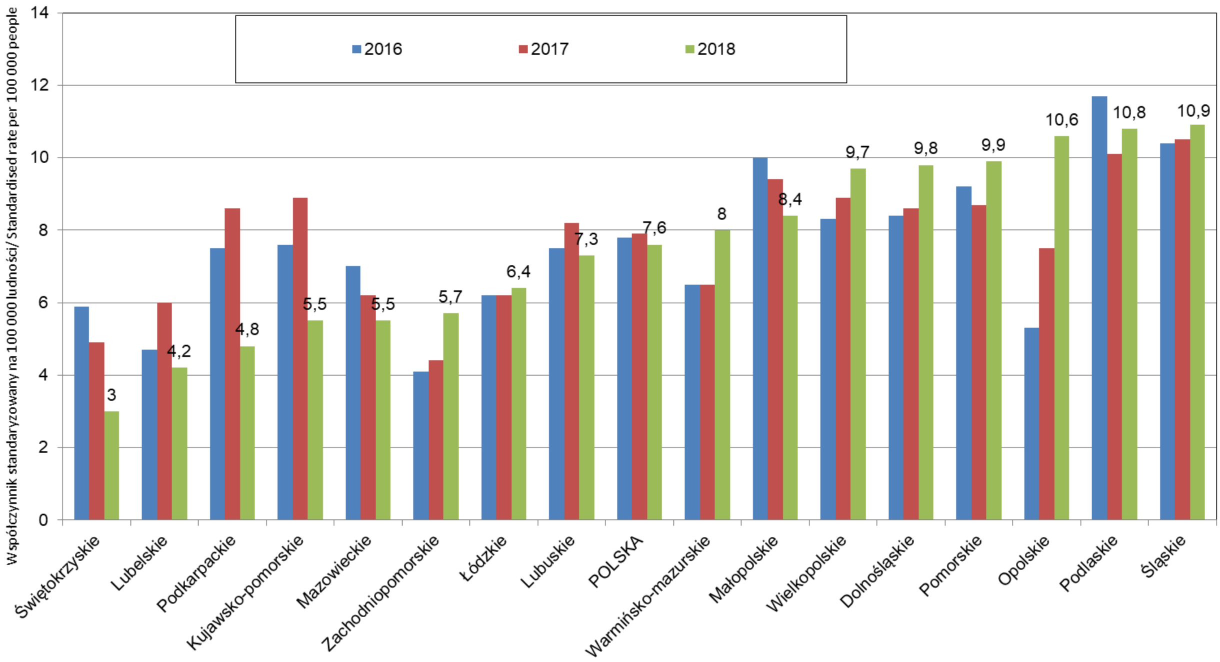


Fig. 8.4 Standardised mortality rates due to falls (W00-W19) by voivodship, 2016-2018 (authors' own calculations based on SP data)

In the case of 40% of fatal falls, the circumstances in which they occurred are unknown (code W19 according to ICD-10 classification). More than 40% of fatal falls were falls at the same level caused by slippage and trips (code W01). The second, less frequent cause of death is falls from stairs and other inclines (6.3% code W10).

Analyses carried out as part of the PolSenior survey on the health of the elderly in Poland indicated that during a year half of the surveyed men and half of the surveyed women aged over

65 experienced falls. 41% of the people who experienced such an accident suffered an injury. Nearly 25% of all casualties reported fractures and over 14% reported head injuries. Fractures were particularly common among women compared to men (73.8% vs. 23.2%). Up to 66.7% of all the falls reported during the PolSenior survey occurred while walking, 27.6% of the falls were related to sitting or standing up[96].

8.4 Transport accidents

According to road traffic law, a transport accident is any incident on a public road affecting road users where the incident results in death or personal injury or damage to property and where a moving vehicle is involved. For many years, Poland has been classified as one of the EU countries with one of the worst rates in terms of road safety. However, the situation has gradually improved in this area since 2010[97].

The presented analysis makes use of the data from the National Police Headquarters, the Polish Road Safety Observatory (POBR), the European Road Safety Observatory database (CARE database) and the studies of the OECD International Road Traffic Safety Data and Analysis Group. A methodological note should be added at this point that the Police database collects information on accidents involving foreigners and registers accidents according to the place of their occurrence and not the place of residence of accident participants. The methodology of registering persons injured in transport accidents by the Police is not consistent with the ICD-10 classification, and as a result, the group in question is not entirely included in the category of transport accidents, which also includes victims of accidents in rail, sea and air traffic, etc.

Since 2010, a sustained downward trend has been observed both in the number of accidents and their fatalities in Poland and, on average, in the entire EU. The rate of transport accident fatalities in Poland in 2010-2019 decreased by 26% (from 10.3 to 7.7 per 100,000 population). The change of decline was slightly higher than the EU average at the time in question, which was 23%. This means that the unfavourable mortality surplus due to transport

[96] Skalska A., Wizner B., Klich- Rączka A. Upadki i ich następstwa w populacji osób starszych w Polsce. Złamania bliższego końca kości udowej i endoprotezoplastyka stawów biodrowych in: Aspekty medyczne, psychologiczne, socjologiczne i ekonomiczne starzenia się ludzi w Polsce (Falls and their consequences for the elderly in Poland. Fractures of the proximal end of femur and hip joint endoprosthesis (in): Medical, psychological, sociological and economic aspects of ageing in Poland) ed. Mossakowska M., Więcek A., Błędowski P. Termedia 2012
[97] The European Commission communication "Road safety: Europe's roads are getting safer but progress remains too slow" of 11/06/2020 https://ec.europa.eu/transport/media/news/2020-06-11-road-safety-statistics-2019_en

accidents in Poland compared to the entire EU has been decreasing, but the rate of this decrease does not seem to be satisfactory given the still high mortality surplus in Poland.

According to the Police data, in 2019, 30,288 transport accidents were reported on public roads, in residential areas or traffic zones, in which a total of 2,909 people died and 35,477 people were injured (of which 10,633 were seriously injured). This means that the rate of the number of transport accident victims (injured and killed in total) was 100.0 per 100,000 population. However, the number of victims is characterised by great diversity between the voivodships. Particularly high rates of transport accident victims have been observed for many years in the Łódzkie Voivodship (174.0 in 2019). In 2019, the lowest number of victims per 100,000 population was in the Kujawsko-Pomorskie Voivodship: 57.2 (Fig. 8.5). It should be admited, that the Police do not differentiate between accidents on the basis of the victim’s place of residence, but on the basis of the location of the accident. These differences in the numbers of victims may be due to the different regional road safety features, which are related to a variety of factors, such as the overall traffic volume, conditions of the road network organisation, the degree of urbanisation, etc.

In 2018, the standardised mortality rate per 100,000 population due to all transport accidents (including those related to rail, air and sea transport, etc.) in Poland was 9.6. A threat to men’s lives is many times higher than that of women (the standardised rate for men: 14.0 vs. 3.8 for women). The phenomenon of particularly high mortality rates for men due to transport-related accidents is characteristic in rural areas where the standardised death rates due to transport accidents were 18.9 for men and 4.8 for women, respectively.

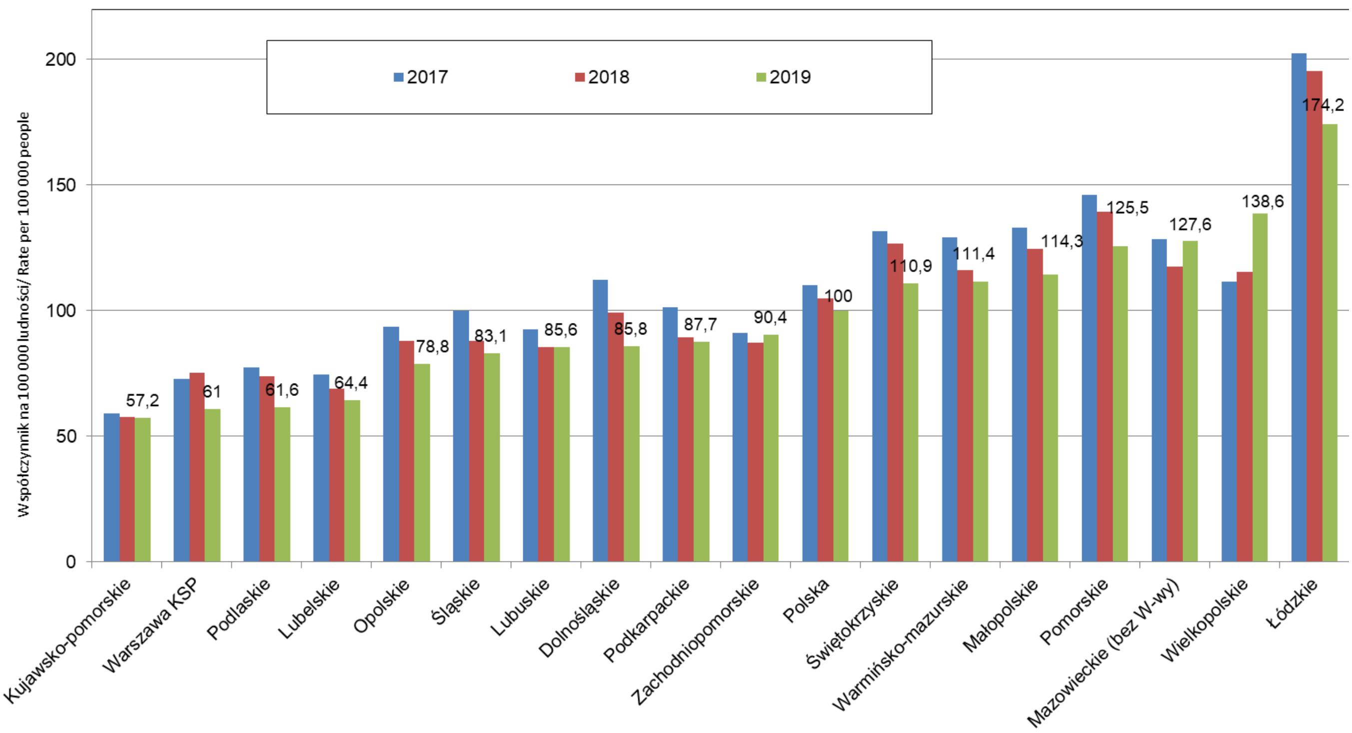


Fig. 8.5 Rates of casualties (killed and injured) in road accidents per 100 000 people according to the place of accident in years 2017-2019. Rate for the Mazowieckie Voivodship does not include the area of Warsaw Metropolitan Police (WMP) (the National Police Headquarters)

Compared to other EU countries, Poland is characterised by a high number of deaths per 100 transport accidents, which has persisted for many years. This rate shows the overall severity of injuries in the victims of transport accidents. The number of fatalities per 100 accidents in 2019 was 9.0 and has not changed much for many years. It should be noted that the average value of the above rate for EU countries according to the CARE database in 2015 was 2.4. A particularly unfavourable situation has been observed for the last three years in the Kujawsko-Pomorskie and Podlaskie Voivodships (22.4 and 18.1 fatalities per 100 accidents in 2019, respectively).

Compared to other EU countries, Poland is characterised by a high frequency of accidents involving unprotected road users, who according to the National Police Headquarters account for 40% of all transport accident victims. This situation, compared to other European countries, has also not changed significantly in recent years. Pedestrians account for 28% of fatalities in all transport accidents (Fig. 8.6). The large proportion of injured cyclists, who constitute 9% of fatalities in transport accidents, is also a cause for concern, although their proportion among road users is approx. 1%. Experts from the IRTAD in their report on road traffic safety in Poland also pointed out that in 2010-2017 a threat to the lives of senior citizens in transport accidents also increased and there was an alarming increase in the number of fatal accidents in that group of population[98].

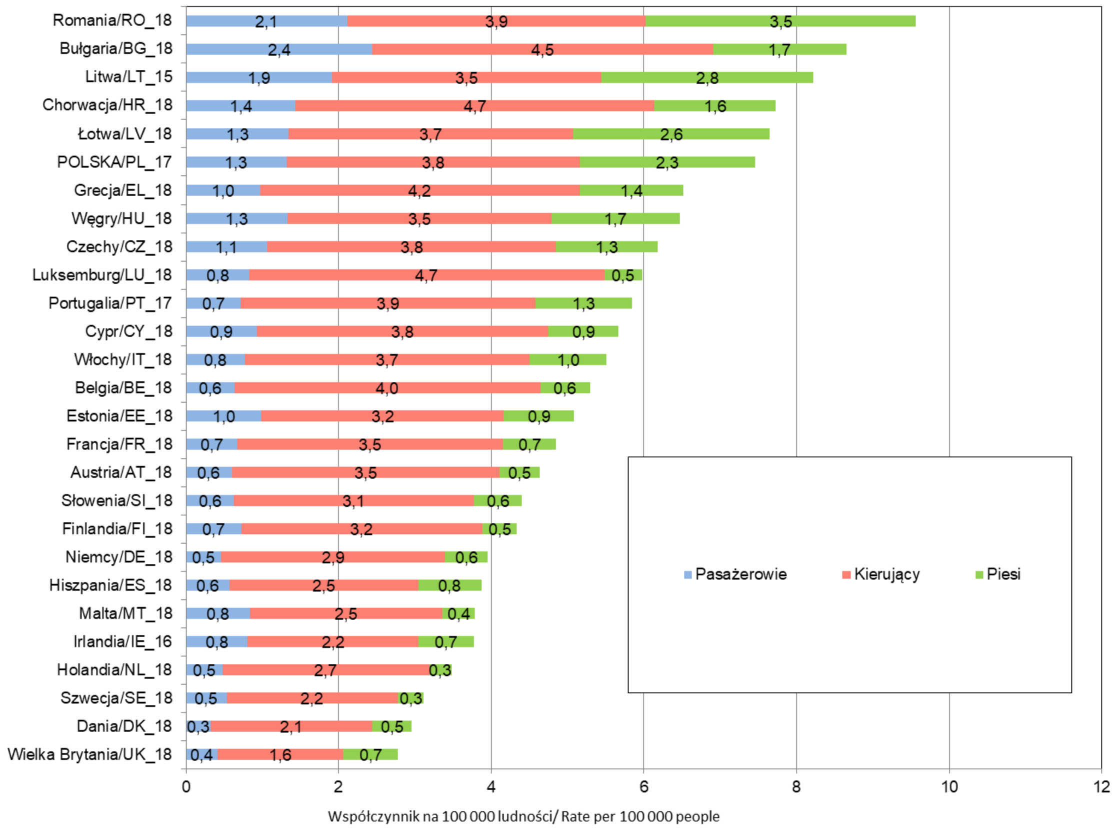


Fig. 8.6 *Road accident crude mortality rates according to categories of road users in Poland and EU countries (EU CARE database)*

According to the National Police Headquarters data, accidents are most often caused by men (73% of all accidents), and the group with the least safe attitude are young male drivers aged 18-24. Almost 21% of fatal accidents were caused by the youngest group of drivers.

Police statistics show that for many years the most frequent cause of transport accidents has been a failure to yield the right of way, which was the cause of 27.3% of transport accidents in 2019, while the second cause was the failure to adapt speed to traffic conditions (cause of 23.6% of transport accidents). On the basis of measurement studies carried out by the National Road Safety Council in 2014, it was estimated that 57% of all drivers exceeded the allowed speed. This percentage was the highest in the Lubelskie Voivodship (73.3%) and the lowest in

[98] Road Safety Annual Report 2019-Poland, International Transport Forum/OECD, 2019

the Dolnośląskie Voivodship (44.2%). At the same time, the percentage of drivers exceeding the permitted speed limit by more than 10 km/h is 30%[99]. According to POBR, compared to similar studies from 2002-2008, it was not found that the actual speed of driving in Poland had decreased. The international multi-centre survey on the declared behaviour of drivers with the acronym ESRA2 carried out in 2018 showed that 64.7% of Polish drivers declared exceededing permitted speed in built-up areas in the last 12 months. Outside built-up areas, even more than 73.5% of drivers declared exceed of the permitted speed limit. These results were higher than for the 20 European countries surveyed, where the average percentage was 56.3% and 67.5%, respectively.[100]

Another important risk factor for transport accidents is driving after drinking alcohol or after using psychoactive substances. According to the National Police Headquarters data, the percentage of intoxicated people involved in transport accidents has been steadily decreasing since 2000. In 2019, road users (drivers, pedestrians, passengers) under the influence of alcohol were involved in 9% of all transport accidents. As part of the already mentioned ESRA2 on declared driver attitudes, it was observed that the problem of driving under the influence not only of alcohol but also of medicines affecting psychomotor performance is a challenge to road safety. In this survey it was observed that in Poland 6.8% of all surveyed drivers declared that they had driven under the influence of alcohol at least once a year (the average value in the surveyed European countries: 20.6%). Driving after taking a medicine that may limit one's driving ability was reported in the survey by 12.8% of drivers (the average value in the surveyed European countries: 15.0%)[101].

8.5 Accidental poisonings

Accidental poisoning are the third cause of death as a result of accidents in Poland and, at the same time, one of the rarer causes of hospitalisation due to accidents in total (between 2% and 3% of cases of hospitalisation related to accidents). A methodological note should be added at this point that classifying a given chemical poisoning as accidental, or unintended and unintentional, is difficult for medical staff to assess, and therefore the scale of the phenomenon

[99] P. Bany, D. Jankowska-Karpa, K. Sicińska i inni., Prędkość pojazdów w Polsce w 2014., Ministerstwo Infrastruktury, Sekretariat Krajowej Rady Bezpieczeństwa Ruchu Drogowego (Speed of vehicles in Poland in 2014, the Ministry of Infrastructure, Secretariat of the National Road Safety Council), Warsaw 2014

100 S. Holocher., H. Holte, Speeding. ESRA2 Thematic Report No. 2. ESRA project (E-Survey of Road users' Attitudes). Bergisch Gladbach, Germany: Federal Highway Research Institute 2019

[101] Y. Stürmer, U. Meesmann,,H. Berbatovci, Driving under the influence of alcohol and drugs. ESRA2 Thematic Report No. 5. ESRA project (E-Survey of Road users' Attitudes). Bern, Switzerland: Swiss Council for Accident Prevention 2019

may be underestimated in official statistics on hospital morbidity and mortality. The most frequently recorded causes of hospital admissions due to accidental poisoning among both men and women are gas poisonings (22% of all cases of hospitalisation due to accidental poisonings) followed by poisonings caused by medicines (20%) and alcohol (16%). The issue of differentiation of hospitalisation of all poisonings regardless of their cause is discussed in Chapter 3 “Hospital morbidity”.

In 2018, a total of 1,468 fatal accidental poisonings were recorded (the standardised rate: 3.4 per 100,000 population). Mortality due to accidental poisonings increased again significantly after a strong decrease in 2014-2016. A special risk group in Poland is men, whose threat to life due to accidental poisonings is six times higher than that of women (the standardised rates of 6.0 and 1.0, respectively). The majority of fatal accidental poisonings are alcohol poisonings of men aged 25-64, which in 2016-2018 represented an average of 53% of all fatal accidental poisonings. The second cause of death was gas poisonings, which accounted for over 10% of all accidental poisonings. A large variation in a threat to life due to accidental poisonings can be observed between voivodships. This variation, as in the case of falls, may also be due to regional differences in the quality of preparation of death certificates and the correct assignment of the external cause in the case of death caused by poisoning. The most alarming situation with regard to the threat to life due to these causes is observed in the Łódzkie, Podlaskie and Pomorskie Voivodships. For many years a threat to life due to accidental poisonings in these areas has been clearly higher than the average in Poland. A strong increase in fatal accidental poisonings in the Warmińsko-Mazurskie Voivodship may also give rise to concern (Fig. 8.7).

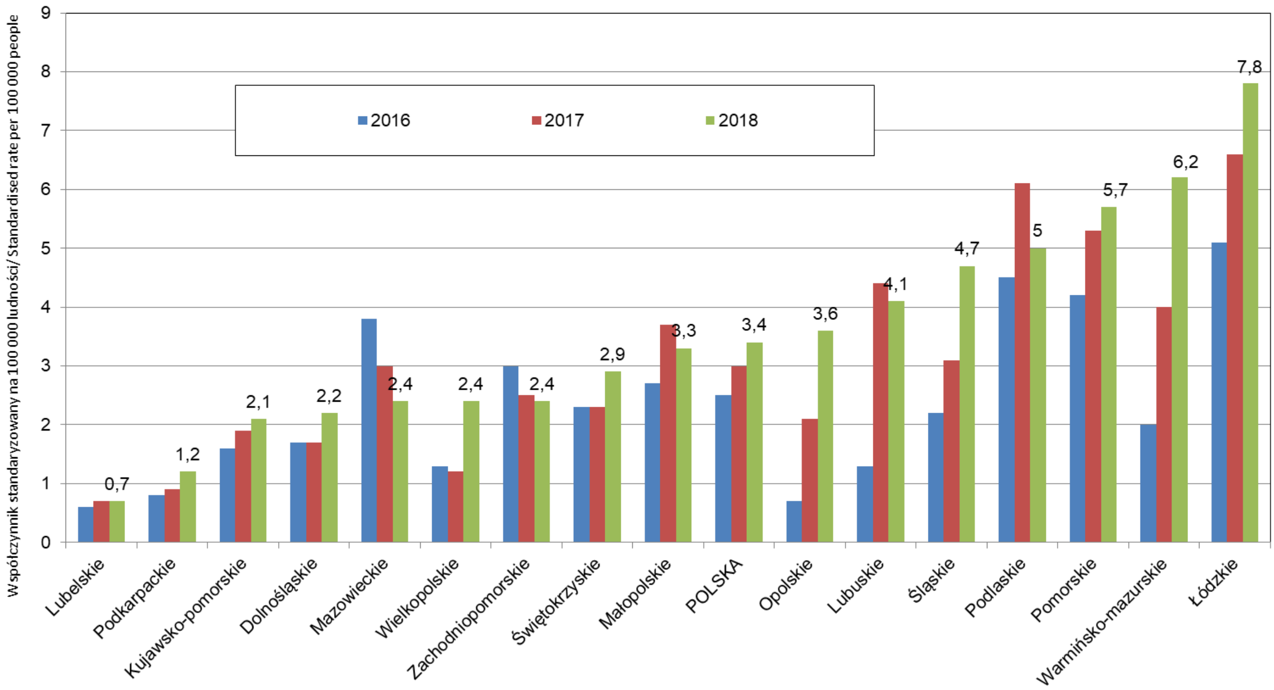


Fig. 8.7 Standardised mortality rates due to accidental poisonings (X40-X49) by voivodship, 2016-2018 (authors own calculations based on SP data)

A phenomenon that has been presented since 2010 has been a significant decrease in mortality due to accidental poisonings in rural areas. A threat to life due to accidental poisonings in rural and urban areas is currently quite similar (the average standardised mortality rate in 2016-2018 was 3.1 in rural areas and 2.9 in urban areas per 100,000 population).

8.6 Accidental drownings

Drowning from a medical point of view is defined as suffocation due to the immersion of the respiratory tract in liquid. In 2018 in Poland 659 people drowned (the standardised mortality rate of 1.6 per 100,000 population). In the case of this type of accidents, a threat to life in Poland is much higher than the European average (the standardised mortality rate of 1.1 per 100,000 population on average in the EU countries in 2016). From 2000, Poland experienced a downward trend in the number of accidental drownings, but this tendency slowed down after 2016.

Men represent the major risk group (the standardised mortality rate for men: 2.7 vs. 0.5 for women in 2018). A particularly high threat to life due to drowning is characteristic of men aged 25-64, who represent approx. 57% of all drowning casualties. Men who live in rural areas also face a higher threat to life due to drowning (the standardised mortality rate in rural areas: 3.6 vs. 2.1 in urban areas). The greatest share of all recorded drownings – 69% – are those in natural waters: rivers, lakes, open sea, and other waters (ICD-10 W-69 code). Another reason for drownings is fall into water – 17% (ICD-10 W-70 code). These percentages have not changed in Poland since the beginning of the last decade.

The risk of accidental drowning is strongly differentiated between voivodships, and for many years has been the highest among inhabitants of the Warmińsko-mazurskie, Pomorskie and Podlaskie Voivodships. An alarming phenomenon was an increase in the frequency of drownings in these regions of the country in 2016-2018. A sharp increase in mortality due to drownings in the Zachodniopomorskie Voivodship is also a cause for concern (Fig. 8.8). It is worth mentioning that the aforementioned voivodships with a particularly high threat to life due to drownings are characterised by a large number of water bodies.

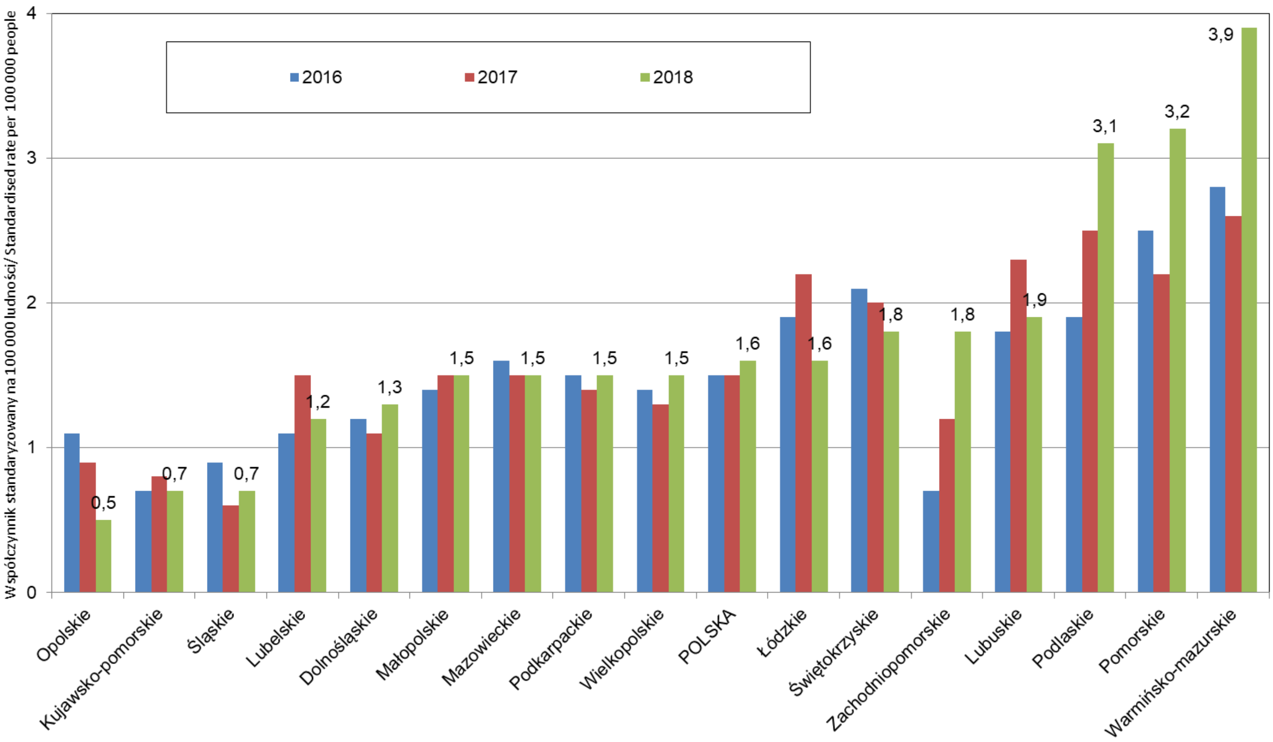


Fig. 8.8 Standardised mortality rates due to accidental drownings (W65-W74) by voivodship, 2016-2018 (authors' own calculations based on SP data)

One of major factors contributing to drowning is swimming or staying near water areas under the influence of alcohol. According to the National Police Headquarters data, in 2014-2019, in the case of 22% of drownings, casualties were under the influence of alcohol, and it should be noted that not in every case officers can verify whether the drowning person was under the influence of psychoactive substances, and this percentage may actually be much higher.

The analysis carried out in NIPH-NIH on accidental drownings also showed that education is a factor which differentiates men's threat to life due to drowning. The risk of drowning for men with vocational and lower education is more than ten times higher than for men with higher education[102].

[102] R. Halik ,A. Poznańska, W. Seroka, B. Wojtyniak, Wypadkowe utonięcia w Polsce w latach 2000-2012 (Accidental drownings in Poland in 2000-2012) Przegląd Epidemiologiczny 2014; 68: 591 - 594

8.7 Exposure to smoke, fire and flames

Fires are defined as uncontrolled combustion processes in places not intended for this purpose. In 2018, as a result of injuries caused by smoke, fire and flames (codes X00-X09) 432 people died, of whom 71.5% were men. In Poland, in 2016-2018, a similar threat to life due to injuries caused by fire, smoke and flames persisted (the standardised mortality rate of 1.0 per 100,000 population in 2018).

According to the data of the State Fire Service (PSP), in 2017-2019, a clear increase in the number of interventions as part of fires was observed in Poland (an increase from 125,892 to 153,497 interventions in 2019). According to the assessments of PSP, in 2019, 3,782 people were injured in fires (including 388 firefighters) and 508 people died. It is worth to admit that in the number of fire casualties constitute not only people who are not only injured due to exposure to smoke, fire and flames, but also due to injuries caused by other factors such as falls and poisonings.

From the point of view of a threat to human life and health, fires in residential buildings are particularly dangerous. In the years under analysis, more than every fifth intervention by SFS was related to such situations. It can be observed that most fires result from arson or carelessness of people. In the period in question, most of the interventions were related to arson – almost 33%, the second reason for interventions by firefighters was the improper use of open fire – 22% of all interventions related to fires in years 2017-2019. Another frequent reason for interventions by SFS due to fires is the improper use of solid fuel heating devices – more than 9% of the interventions related to fires.

The rate of injured and fatalities in the fires reported by PSP per 100,000 population in 2017-2019 slightly decreased to 11.2 in 2019 (Fig. 8.9). The highest number of fire casualties per population was observed in the Śląskie Voivodship (15.2 per 100,000 population). An unfavourable situation was also observed in the Dolnośląskie Voivodship, although a clear improvement in the number of fire-related casualties has been observed in this region recently.

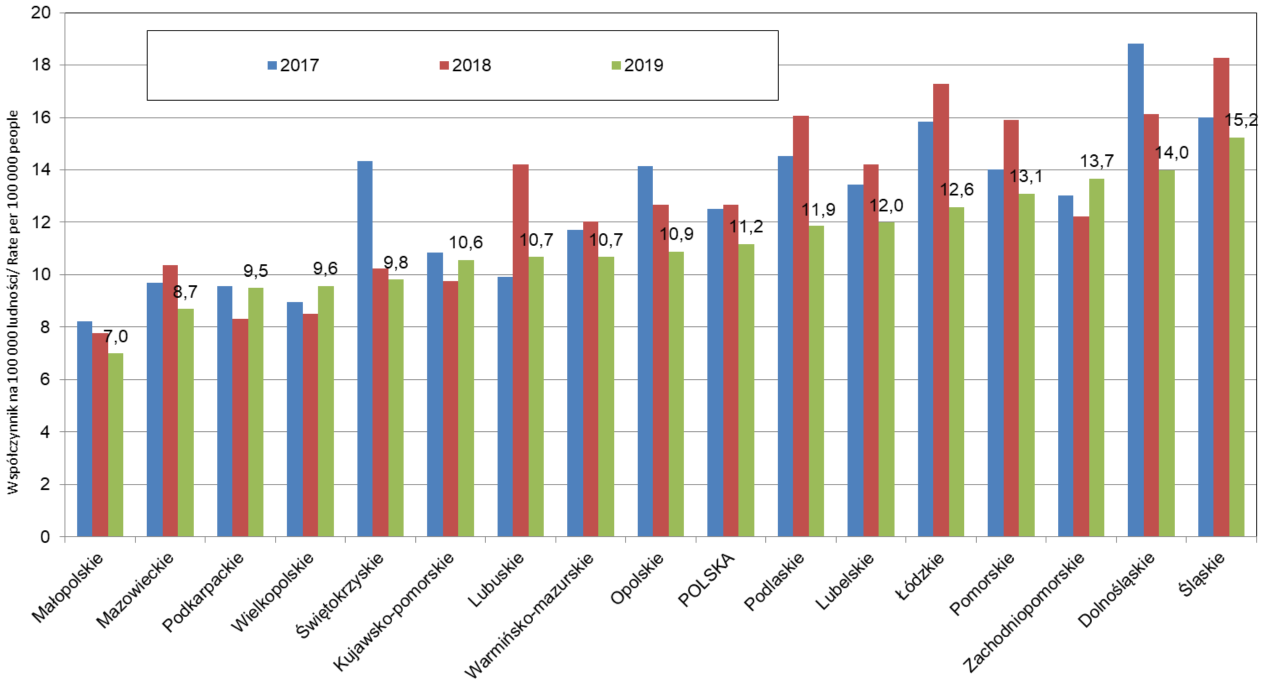


Fig. 8.9 The rate of casualties in fires reported by the Polish State Fire Service per 100,000 population by voivodship in 2017-2019 (authors' own calculations based on the State Fire Service data)

8.8 Accidents at work

An accident at work is considered to be a sudden event caused by an external cause resulting in an injury or death in connection with work:

1) during or in connection with the performance by an employee of the usual activities or instructions of their superiors and activities for the employer, also without instructions;

2) while an employee remains at the disposal of the employer on the way between the employer's premises and the place of performance of an obligation resulting from the employment relationship.

Statistics Poland obligatorily registers accidents which occurred at the place of employment (Z-KW statistical form). However, in this broad category of accidents, accidents in individual farms are not taken into account as these data are collected by the Agricultural Social Insurance Fund (KRUS).

According to estimates carried out by Statistics Poland, in 2019 83,205 people were reported as being injured in accidents at work, including fatal accidents. In 2017-2019, the nationwide rate of casualties in accidents at work per 1,000 employees continued to follow a downward trend – from 6.8 to 6.15 (Fig. 8.10). Men are more frequently injured than women, accounting for 62.6% of all reported accidents at work in 2017-2018. The highest accident rates have been observed for many years in the following voivodships: Dolnośląskie (7.55 per 1,000 employees in 2019), Wielkopolskie (7.26) and Śląskie (7.21), and the lowest in Mazowieckie (4.53) and Małopolskie (4.64). However, it should be noted that these differences are strongly conditioned by the employment structure and the economic characteristics of the voivodships.

The most accident-prone sectors of the economy have for years been mining and quarrying (15.7 per 1,000 employees in 2019), followed by water supply; sewerage, waste management and remediation activities (16.5 per 1,000 employees in 2019).

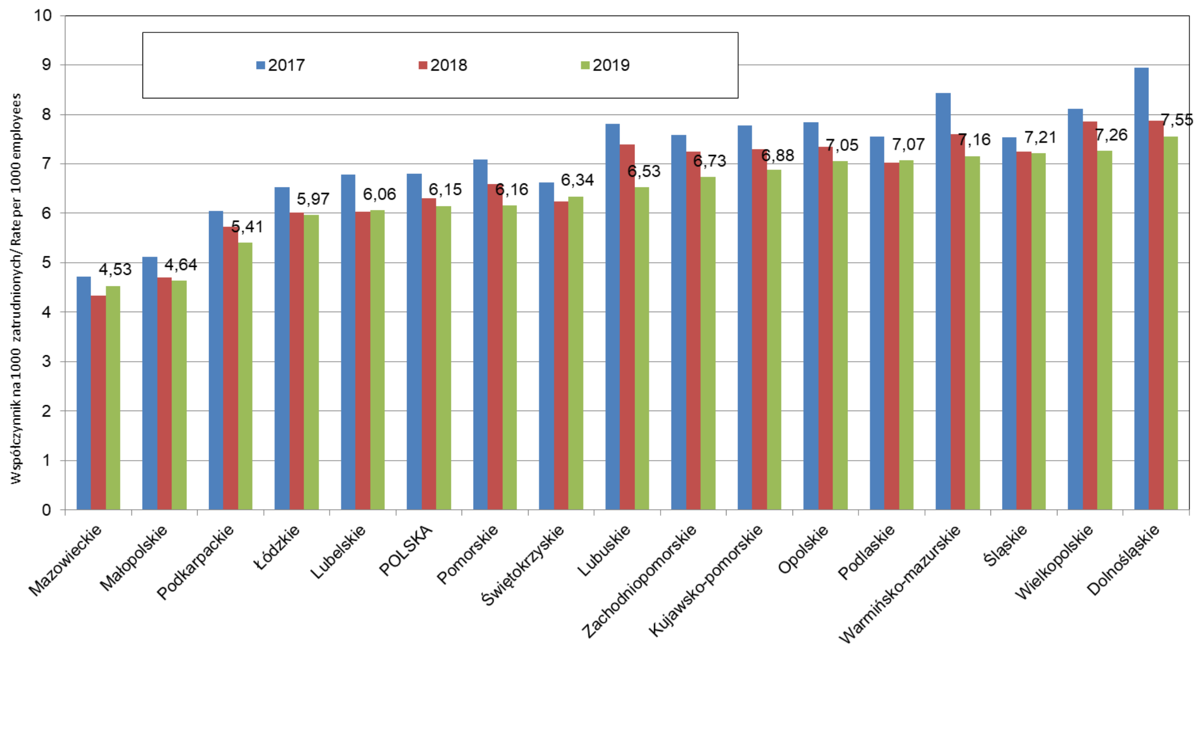


Fig. 8.10 The number of reported casualties in occupational accidents per 1000 employees by voivodship in years 2017-2019 (Statistics Poland)

A positive circumstance in the area of occupational safety is the systematic decrease in the percentage of employees working in positions where there is exposure to harmful factors related to the working environment, work nuisance and mechanical factors. According to Statistics Poland, in 2019 this percentage fell from 8.7% in 2015 to 7.3%[103]. The highest

[103] J.Auksztol, D. Kazanowska, M. Kazimierowska-Wasiołek, M. Pragacz Warunki pracy w 2019 r. Urząd Statystyczny w Gdańsku, Ośrodek Statystyki Warunków Pracy, Pomorski Ośrodek Badań Regionalnych (Working conditions in 2019

percentage of employees in positions where there is exposure to harmful factors is recorded in the Śląskie Voivodship – 13.9%, and the lowest in the Mazowieckie Voivodship - 3.4%.

SUMMARY

1. The mortality rate due to accidents in Poland has been steadily decreasing since 2000. Since 2016, this trend has slowed down. In 2016, a threat to the life of the Polish population due to accidents was 9.8% higher than the average for all EU countries according to Eurostat.

2. The major categories of causes of accidents are falls (crude mortality rate of 11.8 per 100,000 population), followed by transport accidents (9.6), poisonings (3.8) and drownings (1.6). According to EUROSTAT, in all the aforementioned categories a threat to life in Poland is higher than the average in EU countries.

3. In the last decade, an epidemiological change in the occurrence of accidents can be observed. The share of deaths due to accidents of elderly people is increasing, especially falls, which are also the major cause of hospital treatment due to all accidents in all age groups.

Statistical Office in Gdańsk, Centre for Working Conditions Statistics, Pomeranian Regional Research Centre), Warsaw, Gdańsk 2020

9. MULTIDIMENSIONAL ANALYSIS OF SICKNESS ABSENCE

Ewa Karczewicz, Hanna Zalewska (The Social Insurance Institution, ZUS)

The analysis of the reasons for sickness absence is one of the elements providing information on the health status of the population. This phenomenon is relevant to many aspects of the functioning of society. Its scale reflects, among the others, the effectiveness of the healthcare system, labour market organisation and represents an important, indirect cost of sickness. It also causes measurable financial effects for social insurances.

This paper presents the analysis of various aspects of sickness absence, including demographic features of persons on sick leaves and spatial diversity of absence in Poland.

The analysis is based on sick leaves confirming temporary incapacity for work due to sickness or the necessity to take care of a sick family member.

The Social Insurance Institution maintains the *Register of Medical Certificates*, where notes on temporary incapacity for work issued by physicians are collected.

Collected in the *Register*, these notes are issued to persons insured with the Social Insurance Institution (ZUS), the Agricultural Social Insurance Fund (KRUS) and to persons insured with other Polish insurance establishments and in another country.

In the year 2019, a total of 24.1 million sick notes confirming temporary incapacity for work were registered in the *Register of Medical Certificates* maintained by ZUS for a total of 284.3 million sick absence days (due to personal sickness or care provided to a sick child or another family member).

Table 9.1. Sickness absence in the year 2019

Specification	The number of days of absence	The number of medical leave certificates	The average duration of medical leave
	in million		in days
TOTAL	**284.3**	**24.1**	**11.78**
including, for:			
absence due to own illness	272.0	21.5	12.66
care provided to a sick child	9.9	2.3	4.36
care provided to another family member	2.3	0.4	6.33

The data provided in the table show that 95.6% of sick absence days refer involve the so-called personal sickness, and only 4.4% are attributed to care provided to a child or another family member. The average duration of a sick note is also worth noting, as in the year 2019, for personal sickness, it was nearly 13 days.

As compared to the years 2018, the number of sick absence days dropped by 1.7%, while the number of issued sick notes increased by 0.9%. This trend has been observed for several years now. Compared to the previous year, the number of sick notes increased, and in the year 2017, it increased by 2.6%, in the year 2018 by 1.2%, with the recorded downward trend in the number of sick absence days which in the year 2017 was higher by 1.9%, but dropped by 1.2% in the year 2018.

In the year 2019, persons insured with ZUS who took care of a sick child were issued 2,236.2 thousand sick notes for a total of 9,737.0 thousand days. They were mostly issued for 1-5 days – 1,750.6 thousand sick notes, and for 6-10 days – 390.8 thousand. The average duration of a sick note was equal to 4.35 day. Overall, care duration was the longest for children at the age of 3-4 years, and related sick absence days amounted to 2,623.1 thousand days, where the average duration of a sick note was lower than the total average and equalled to 4.27 days. The percentage of sick absence days resulting from the necessity of taking care of children younger than 2 was also high and equalled to 24.3%. On average, such care was provided for 4.55 days.

For the purposes of taking care of another family member, persons insured with ZUS received 351.9 thousand sick notes issued for 2,210.2 thousand sick absence days. The highest percentage of notes were issued for the period of 1-5 days – 221.3 thousand sick notes and for 11-14 days – 79.1 notes. The average sick note time was 6.28 days. Interestingly, more than half of notes related to providing care to another family member was issued to women, although men took care of another family member longer – by 1.6 day.

Presented below is a detailed analysis of sickness absence among persons insured with ZUS.

This group of insured persons received a total of 22.5 million medical leave certificates (namely, 93.4% of all medical leave) on 250.9 million days). This included 19.9 million medical leave of own illness. The number of days of absence for this medical leave was 238.8 million and the average sick note time was 11.99 days.

Table 9.2. Sickness absence of persons insured with ZUS in 2019

Specification	The number of days of absence (in million)	The number of medical leave certificates (in million)	The average duration of medical leave in days
TOTAL	**250.9**	**22.5**	**11.14**
including, for:			
absence due to own illness	238.8	19.9	11.99

The question about the average duration of the sickness of insured persons who were issued at least one sick note. This measure is called the accumulated (for the entire year) average duration of sickness absence. In the year 2019, it was equal to 36.23 days. However, accumulated absence among women was longer than among men by more than 7.5 days (32.24 days for men and 39.76 days for women).

Compared to the year 2018, the number of absence days due to personal sickness of persons insured with ZUS was 2.0% lower in the year 2019, and the number of sick notes was lower by 0.2%.

When analysing the number of sick absence days for Poland per one insured, certain differences become apparent. In the year 2019, this parameter for Poland was equal to 14.37 days. For comparison, in the year 2018, it was 14.85 days, slightly higher. The highest value was recorded in the following voivodships:

- Łódzkie – 17.21 days,
- Wielkopolskie – 16.07 days,

- Świętokrzyskie –16.06 days,
- Śląskie – 15.39 days,
- Podkarpackie – 14.95 days.

The lowest value was recorded in the following voivodships:

- Podlaskie –12.42 days,
- Mazowieckie – 12.87 days,
- Lubelskie – 13.11 days.

The sick notes are issued for various durations depending on sickness severity.

In the year 2019, the largest number of sick notes was issued for 11 to 30 days, and they represented 35.4% of the total number of sick notes. A high percentage was also found for 1-5 day sick notes – 34.4% of them issued for personal sickness, of which 4.1% were one-day notes and 24.7% were 6-10 day notes.

Compared to the year 2018, the percentage of sick notes issued for 1-5 days increased (from 32.0% to 34.4%, including one-day notes from 3.4% to 4.1%). On the other hand, the percentage of notes issued for 6-10 days dropped – from 26.1% to 24.7%, and 11-30 day sick notes also dropped – from 36.4% to 35.4%. It means that in the year 2019, the percentage of sick notes issued for up to 5 days increased significantly – by 2.4 percentage point. The number of one-day sick notes also increased from 668.6 thousand in the year 2018 to 819.8 thousand in the year 2019 – by 22.6%.

Table 9.3. The number days of absence according to medical leave certificates issued in 2019 due own illness of persons insured with ZUS, by duration of leave and sex

Specification	The number of medical leave certificates	The number of medical leave certificates by leave duration:					
		1-5 days	including: 1 day	6-10 days	11-20 days	21-30 days	31 days and more
	in million						
TOTAL	**19.9**	**6.8**	**0.8**	**4.9**	**4.2**	**2.9**	**1.1**
Men	8.9	3.0	0.3	2.5	2.0	0.9	0.5
Women	11.1	3.8	0.5	2.4	2.1	2.0	0.6

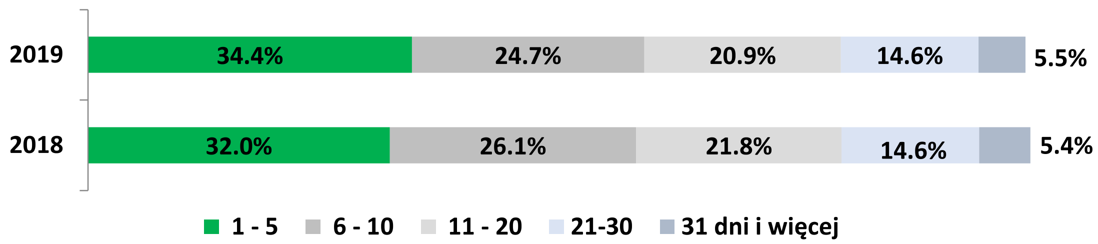


Fig. 9.1. The structure of the number of sick notes confirming sick absence time in the year 2018-2019

For years, there has been a clear prevalence of sick notes issued to women. In the year 2016 and 2017, these notes constituted 54.6% of sick notes issued due to personal sickness. In the year 2018, the percentage was equal to 54.8%.

In the year 2019, more than half of sick notes, 11.1 million, were issued to women, which represented 55.4% of sick notes issued for more than half of sick absence days – namely, 139.2 million days (which represented 58.3% of the total number of the sick absence days). In the year 2018, these percentages were slightly lower and as follows: 10.9 million sick notes and 140.4 million sick absence days (i.e. 57.6%).

When analysing the scale of sickness absence by gender and age of the insured, it is clear that in the year 2019, the highest percentage of sick absence days (15.4%) was for the insured aged 30-34 years. As far as absence among men is concerned, 13.1% were aged 60-64 years and 12.2%. – 55-59 years. For women, 18.7% of sick absence days was for the insured aged 30-34 years.

Table 9.4. The structure of number of days absence in 2019 due to own illness of persons insured with ZUS, by age and gender

Age	Total	Men	Women
TOTAL	**100.0**	**100.0**	**100.0**
19 years and under	0.8	1.0	0.6
20-24	6.0	5.9	6.1
25-29	13.8	9.5	16.9
30-34	15.4	10.7	18.7
35-39	13.2	11.9	14.2
40-44	10.9	11.5	10.4
45-49	9.9	10.6	9.4
50-54	9.7	10.3	9.2
55-59	10.7	12.2	9.7
60-64	7.6	13.1	3.7
65 years and over	2.0	3.3	1.1

When analysing absence by gender in the individual age groups, it is clear that the largest difference between sickness absence among women and men is observed for the age of 20-39 years, whereas sickness absence among women was 1.5 times longer than among men. In the group of persons aged 19 years and younger and older than 45 years, sick note times among men significantly exceeded those among women.

The questions arise about the reasons for this phenomenon. The aspect of absence among women who are incapable of working during pregnancy seems to be important in the analysis of sickness absence. Incapacity for work among pregnant women has a significant impact on the overall absence and absence among women. In the year 2019, the percentage of absence among pregnant women as compared to the total absence was 20.0% and the percentage of sickness absence among pregnant women as compared to sickness absence in this gender group was 34.3%. As far as the number of sick notes is concerned, every tenth sick note was issued due to incapacity for work during pregnancy and nearly every fifth woman received a certificate on incapacity for work during pregnancy.

The information on incapacity for work due to pregnancy is marked on a medical certificate with the letter B. It should be remembered that, at the request of an insured woman, a physician may not place the B code on a medical certificate. In accordance with the Act on social insurance benefits, if the code is placed on a medical certificate, it means the right to sickness allowance and its amount.

More than half, i.e., 58.0%, of medical certificates (with the “B” code) confirming incapacity for work during pregnancy among women insured with ZUS was issued for 21-30 days. 19.8% of all pregnancy notes (20.2% in the year 2018) were issued for 11-20 days. Sick notes for 6 to 10 days represented 5.7% of the total number of sick notes (5.5% in the year

2018). Sick notes issued for 5 days represented only 3.9% (in the year 2018 – 3.4%) of sick notes issued due to incapacity for work during pregnancy (including one-day sick notes – 0.7%).

As shown by the listing given below, sick notes issued for a short period of time, up to 5 days, and from 6 to 20 days, are the most often issued to persons whose incapacity for work is not pregnancy related.

Table 9.5 The structure of number of medical leave certificates in 2019 due to own illness of persons insured with ZUS, by leave duration

Specification	Total	Medical leave certificates by leave duration, in days:					
		1-5 days	including 1 day	6-10 days	11-20 days	21-30 days	31 days and more
	in percentages						
TOTAL	100.0	34.4	4.1	24.7	20.9	14.6	5.5
incapacity for work among women	100.0	34.7	4.5	21.9	19.4	18.4	5.7
incapacity for work during pregnancy	**100.0**	**3.9**	**0.7**	**5.7**	**19.8**	**58.0**	**12.6**

An analysis of the number of days by age also shows a strong influence of incapacity for work during pregnancy on the total sickness absence and absence among women. The highest percentage of pregnancy-related sick absence days was recorded in the group of women at the age of 30-34 years – it was equal to 35.5%, and in the age group of 25-29 years – 33.6% of all pregnancy-related sick absence days. In the case of the total sickness absence and absence among women (calculated together with the absence among men), the highest percentage of sick absence days was recorded in the group aged 50 and older.

Table 9.6. The structure of the number of days absence in 2019 due to own illness of persons insured with ZUS, by age

Age	Total	Incapacity for work among women	Incapacity for work during pregnancy
TOTAL	**100.0**	**100.0**	**100.0**
19 years and under	0.8	0.6	0.5
20-24	6.0	6.1	9.4
25-29	13.8	16.9	33.6
30-34	15.4	18.7	35.5

35-39	13.2	14.2	17.4
40-44	10.9	10.4	3.4
45-49	9.9	9.4	0.2
50 years and over	30.0	23.6	0.1

The seasonality of sickness absence may significantly disorganise work and company productivity. There are many reasons for absence seasonality, and the main one may originate from the seasonality of certain diseases (related to the season of the year), improper work conditions contributing to diseases, improper work organisation and poor incentives for employees. In the year 2019, for example, work downtime in the education sector was caused by teacher protests.

The tables below illustrate sickness absence in individual months of the year 2019.

Table 9.7. The number of days absence due to own illness of persons insured with ZUS, by individual months of the year 2019

Specification	The number of days absence (in thousands)	Trend – the previous month = 100	Trend – previous year's month = 100
TOTAL	**238,765.9**	**x**	**x**
January	23,775.2	122.5	101.2
February	20,749.6	87.3	92.4
March	20,260.9	97.6	88.0
April	20,980.9	103.6	106.3
May	18,712.7	89.2	101.9
June	17,404.8	93.0	92.4
July	19,473.8	111.9	100.4
August	17,484.1	89.8	93.6
September	19,285.3	110.3	106.3
October	21,683.4	112.4	96.2
November	18,800.6	86.7	95.8
December	20,154.6	107.2	103.9

The largest number of sick notes was issued in January (2,117.1 thousand) and in October (1,908.5 thousand), and their average duration differed significantly from the duration of notes overall (in January – 11.23 days and in October – 11.36 days).

Compared to the same month of the preceding year, the number of notes issued in January was 5.3% higher and the number of notes issued in October was slightly lower. Compared to the previous year, the number of notes issued in September increased by 12.2%, in April by 12.0% and in May by 8.9%. Sick note times were slightly longer in April and May than in all months. The notes for the longest periods were issued in June, July, August, and December.

Table 9.8. The number of medical leave certificates due to own illness of persons insured with ZUS, by months of the year 2019

Specification	The number of medical leave certificates (in thousand)	The average duration of medical leave in days
TOTAL	**19,913.0**	**11.99**
January	2,117.1	11.23
February	1,937.0	10.71
March	1,745.9	11.60
April	1,716.7	12.22
May	1,492.6	12.54
June	1,348.6	12.91
July	1,437.3	13.55
August	1,286.3	13.59
September	1,665.0	11.58
October	1,908.5	11.36
November	1,621.6	11.59
December	1,636.4	12.32

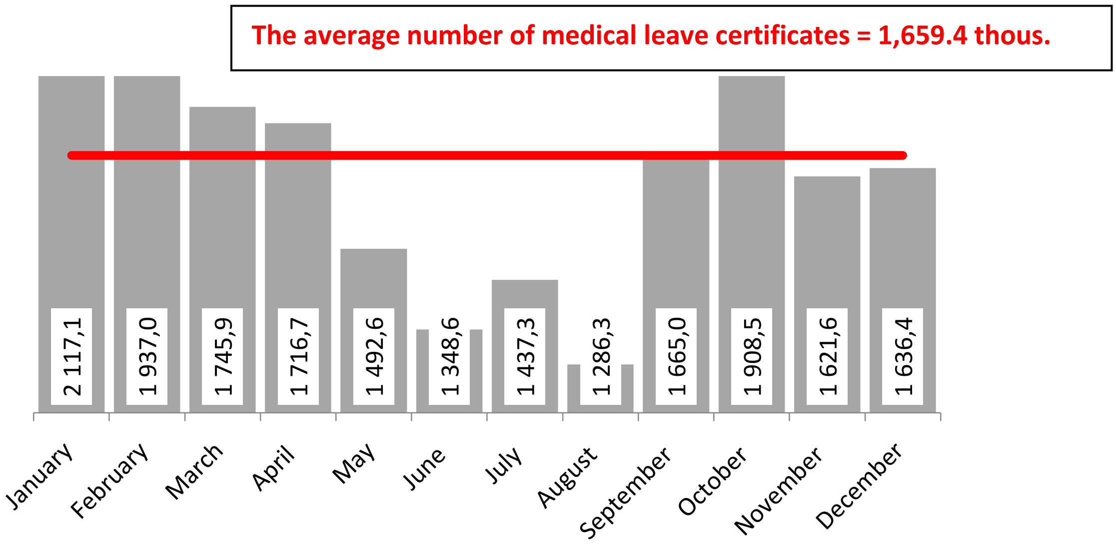


Fig. 9.2. The number of medical leave certificates due to own illness of persons insured with ZUS in months of the year 2019

The reasons for sickness absence.

In the year 2019, in terms of the **number of absence days**, sickness absence was mainly due to the following groups of diseases:

- pregnancy, childbirth, and puerperium – 19.4% of the total number of absence days (46.4 million of sick absence days), in the year 2018, diseases from this group represented 19.0% of the total number of sick absence days),
- diseases of the musculoskeletal, muscular system and connective tissue– 15.7% (37.6 million days), in the year 2018 – 15.4% (37.8 million days),
- injuries, poisoning, and other specified effects of external factors – 14.0% (33.4 million days), in the year 2018 – 13.8% (34.3 million days),
- diseases of the respiratory system – 12.3% (29.3 million of days), in the year 2018 – 13.5% (31.4 million of days).

The ranking of **disease entities** causing incapacity for work in the year 2019 (in terms of the number of sick absence days) varied by sex. The longest absence in the group of **men** resulted from:

- nerve root and plexus disorders (G54) – 6.7% of all sick absence days among men (in the year 2018 – 7.1%),
- acute upper respiratory infections of multiple and unspecified sites (J06) – 4.5% (in the year 2018 – 4.8%),
- dorsalgia (M54) – 3.9% (in the year 2018 – 3.6%).

For years, in the population of **women**, the longest sickness absence results from obstetric care due to other maternal disorders predominantly related to pregnancy (O26) – 26.7% of all sick absence days among women (in the year 2018 – 25.8%). The other disease entities causing sickness absence were:

- acute upper respiratory infections of multiple and unspecified sites (J06) – 3.9% (in the year 2018 – 4.2%),
- nerve root and plexus disorders (G54) – 3.8% (in the year 2018 – 4.1%).

The highest number of sick notes (28.1%) was issued to the persons at the age of 30-39 years – among women, it was 30.0%, among men – 25.7%. In the case of notes issued for the duration of 1-5 days, the persons aged 20-29 years also formed a large group – they received 26.8% of notes, and in the case of notes issued for 6-10 days –persons aged 40-49 years were in the majority (24.5% of notes).

In the year 2019, the largest number of sick notes was issued for 11 to 30 days (35.4%) and 1-5 days (34.4%). However, long sick notes – from 11 to 30 days – prevailed in the group of women (37.7% of notes issued to women), and in the group of men – short sick notes, from 1 to 5 days (34.1% of notes issued to men).

"Obstetric care due to other maternal disorders predominantly related to pregnancy" accounted for the largest number of sick notes issued in the year 2019 **in the group of women**

– 13.9% of notes. This was followed by “Acute upper respiratory infections of multiple and unspecified sites” – 9.5%. One of these two disease entities was predominant among women in each age group – sick notes issued with reference to “Obstetric care due to other maternal disorders predominantly related to pregnancy” were mostly issued to women at the age of 20-39 years, and “Acute upper respiratory infections of multiple and unspecified sites” were predominant in other age groups. In each age group, “Acute upper respiratory infections of multiple and unspecified sites” and "Acute nasal and throat inflammation (cold)” were the main reasons for short sick notes, i.e. for a duration of 1-5 and 6-10 days. In the case of the long sick notes, from 11 to 30 days, “Obstetric care due to other maternal disorders predominantly related to pregnancy” was the main reason for the issuance of notes in the group of women younger than 39 years, and in the group of women at the age of 40 and older – “Nerve root and plexus disorders” were the main reason for the issuance of sick notes.

Among men, “Acute upper respiratory infections of multiple and unspecified sites” were the disease entity generating the largest number of sick notes issued in the year 2019 – 9.3% of notes. “Nerve root and plexus disorders” were the next entity – 7.0%. One of the two disease entities was predominant in each age group – among men at the age of 49 years and younger, sick notes issued due to “Acute upper respiratory infections of multiple and unspecified sites” were predominant, and in the other age groups, sick notes were mostly issued due to “Nerve root and plexus disorders.”

As in the case of women, in each age group of men, “Acute upper respiratory infections of multiple and unspecified sites” and “Acute nasal and throat inflammation (cold)” were the main reasons for short sick notes, i.e., 1-5 days and 6-10 days. In the case of long sick notes, from 11 to 30 days, “Dislocations, sprains and strains of ankle and foot ligament lesions” were the main reasons for the issuance of notes to men at the age of 19 years, and among men from other age groups – “Nerve root and plexus disorders” were the main reason for the issuance of sick notes.

There were no neoplasms among the 10 disease entities accounting for the largest number of sick notes issued to women and men. They appear only in the fourth ten of disease entities accounting for sick notes among women and on the 95th place among sick notes issued to men.

Among men older than 40, the primary hypertensive disease appears in the ranking – the proportion of this disease entity varies from 2.2% to 8.3% in the group of women. It appears in the ranking for the group of persons aged 50 and older (at 2.3%-2.8%).

It is interesting to note the diseases based on which one-day sick notes were issued in the year 2019. The diseases of the respiratory system and broadly defined gastric disorders were the predominant reason of the issuance of one-day sick notes to men and women, and in the group of men, dorsalgia and nerve root and plexus disorders were also some of the main reasons for the issuance of one-day sick notes.

In the group of **women**, “Acute nasal and throat infections (cold)” were the disease entity generating the largest number of short, 1-day sick notes issued in the year 2019 – 7.4% of the notes. These were followed by:

- acute upper respiratory infections of multiple and unspecified sites – 5.9%;
- pelvis and abdominal cavity pain – 3.4%;
- dyspepsia – 3.4%;
- other, non-infectious gastrointestinal disorders and large-intestine disorders – 2.7%.

Two disease entities were predominant among women from each age group – “Acute nasal and throat infections (cold) and “Acute upper respiratory infections of multiple and unspecified sites” – their total proportion varied by age from 7.6% to 21.1%.

Unlike in the case of long sick notes, “Obstetric care due to other maternal disorders predominantly related to pregnancy” was not the main reason for the issuance of one-day notes. In the ranking of 10 disease entities, it was recorded only among women at the age of 20-29 years and 30-39 years and represented, respectively, 2.6% and 3.2% of one-day sick notes.

Among women older than 40 years of age, “Malignant breast neoplasms” appear in the ranking of 10 disease entities generating the largest number of 1-day sick notes. However, in the group of women aged 50-59 years, it ranks fourth (the reason of 3.4% of one-day sick notes).

In the group of **men,** “Acute nasal and throat infections (cold)” accounted for the largest number of short, 1-day sick notes issued in the year 2019 – 8.4% of the notes. These were followed by:

- Acute upper respiratory infections of multiple and unspecified sites – 6.1%;
- Dyspepsia – 4.1%;
- Other, non-infectious gastrointestinal and large intestine disorders – 3.4%.

Among men younger than 50 years of age, two disease entities were the predominant reason for the issuance of one-day sick notes – “Acute nasal and throat infections (cold) and “Acute upper respiratory infections of multiple and unspecified sites” – their total percentage varied depending on age from 10.8% to 22.4%.

In the group of men older than 40 years of age, the primary hypertensive disease was an important reason for the issuance of one-day sick notes – it represented the reason for the issuance of 3.0% to 4.2% one-day notes.

In the ranking of 10 disease entities accounting for the largest number of 1-day sick notes, the malignant prostate neoplasm starts to appear in the group of men older than 60 years of age.

Sick notes issued for the period of incapacity for work during pregnancy also relate to all circumstances and disorders requiring a change of a lifestyle and avoiding stress.

In the year 2019, the following were the most frequent reasons for absence during pregnancy (medical certificates with the code "B"):

- pregnancy, childbirth and puerperium – 95.6% of the total number of sick absence days (45.7 million of sick absence days),
- factors influencing health status and contact with health services – 3.2% (1.6 million of days),
- diseases of the respiratory system – 0.3% (0.1 million of days).

In the ranking of **disease entities**, the following were predominant:

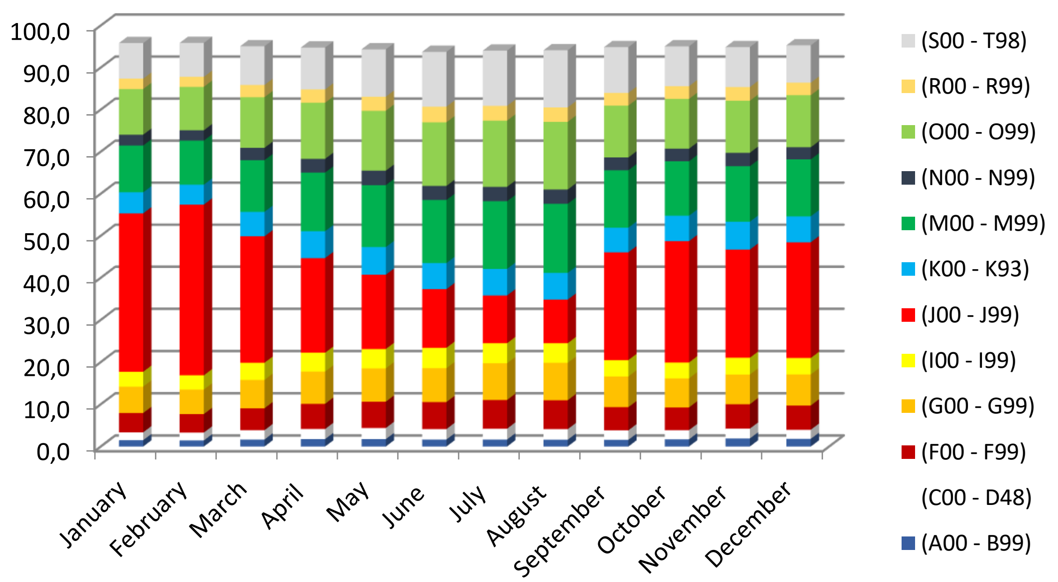
- maternal care for other conditions predominantly related to pregnancy (O26) – 77.1% of the total number of sick absence days among women incapable to work during pregnancy (36.8 million absence days), in the year 2018, it was 75.2%, i.e. 35.8 million absence days;
- haemorrhage in early pregnancy (O20) – 7.8% (3.7 million days), in the year 2018 – 9.2%, i.e. 4.4 million days;
- supervision of high-risk pregnancy (Z35) – 2.4% (1.1 million days);
- preterm labour and delivery (O60) – 2.0% (0.9 million days);
- false labour (O47) – 1.8% (0.8 million days).

In the structure of sick notes, irrespective of a month, notes issued due to incapacity for work resulting from diseases of the respiratory system are predominant. In January, they represented 37.6% of all sick notes issued in that month, in February 40.5%, March 30.0%, April 22.5%, and from May to August, they ranged from 22.5% to 10.3%, and in the following month, their rate increased to 28.8%. On average, sick notes issued due to diseases of the respiratory system were not long and were issued for 6 days.

Sick notes issued in individual months due to incapacity for work caused by diseases of the musculoskeletal, muscular system and connective tissue disorders ranked second. They represented from 10.5% to 16.4% of sick notes issued in individual months. The average duration of these notes was 13-14 days. Pregnancy, childbirth and puerperium were the next group accounting for 10.3% to 16.1% sick notes in individual months. The average sick note was issued for 23-24 days.

The figure below illustrates diseases causing sickness absence in individual months.

Fig. 9.3. . Disease causes of medical leave certificates by month of the year 2019 - by selected disease groups (ICD-10 codes)



The seasonality of absence due to diseases of the respiratory system is clearly noticeable in the distribution of the number of sick absence days for individual groups of diseases. In the 1st quarter, the number of sick absence days due to diseases of the respiratory system was equal to 42.0% of the total number of absence days resulting from these diseases. In the 2nd quarter, it was equal to 16.6%, in the 3rd quarter to 14.2% and in the 4th quarter to 27.2%. In the case of infectious diseases (A00-A99), the highest absence rate was observed in the 1st and 4th quarter (26.6% and 26.4%, respectively). Absence due to gastrointestinal disorders was also higher in the 1st quarter (25.8%), and in the 2nd quarter it was 24.7%, in the 3rd quarter – 23.5%, and in the 4th quarter, it increased to 26.0%. Absence resulting from pregnancy, childbirth and puerperium was balanced and, on average, in individual quarters, ranged from 24.7% to 25.4% of the number of days for that group of diseases.

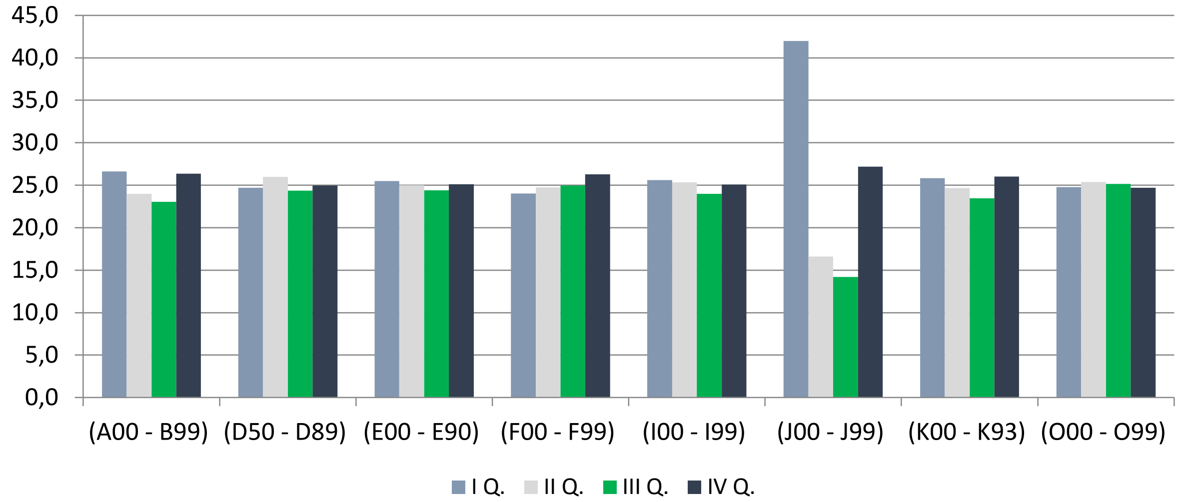


Fig. 9.4. The structure of number of the days of absence for selected disease groups (ICD-10 codes) by quarters of the year, 2019

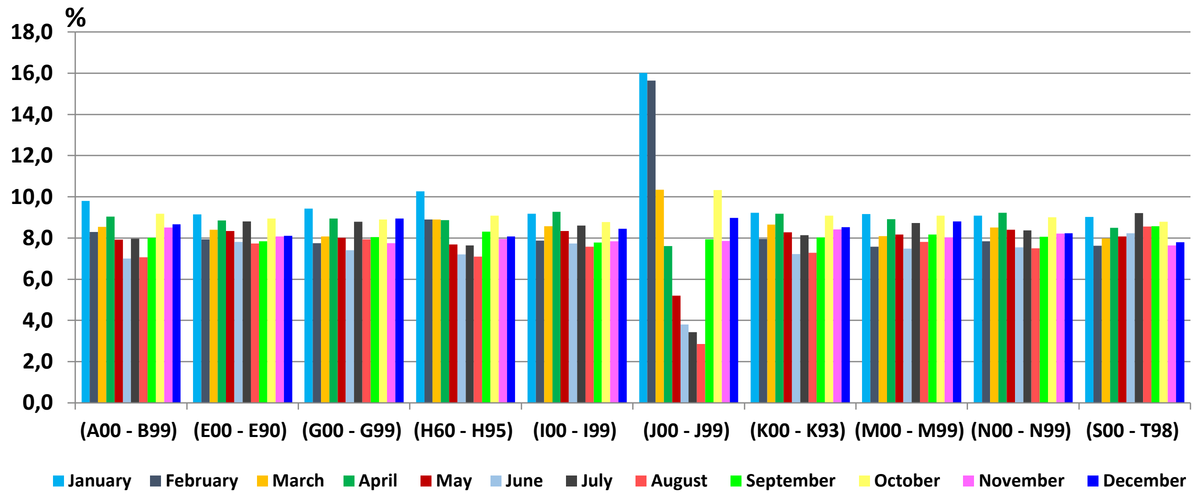


Fig. 9.5. The structure of number days of absence in month of the year by selected disease groups, 2019

9.1. Sickness absence in the first half of the year 2020

2020 is the year when the infectious COVID-19 disease, declared by the World Health Organization as pandemic on 11 March 2020, appeared all over the world and in Poland.

This part of the paper provides an analysis of sickness absence in the first half of the year 2020.

In the first half of the year 2020 (from January to June 2020), 12.1 million sick notes confirming temporary incapacity for work, issued for a total of 153.6 million sick absence days (due to personal sickness, care provided to a sick child or another family member) were registered in the *Register of Medical Certificates*.

As compared to the first half of the year 2019, we can see an increase in the number of sick absence days – by 5.4%, with a decrease in the number of sick notes – by 3.8%. It means an increased average sick note time.

Table 9.9. Sickness absence in the first half of the year 2020

Specification	The number days of absence *		The number of medical leave certificates	
	Total	including: persons insured with ZUS	Total	including: persons insured with ZUS
	in million			
I-IV 2019	145.8	128.5	12.6	11.8
I-VI 2020	**153.6**	**137.5**	**12.1**	**11.3**
trend				
I-VI 2019 = 100	105.4	107.0	96.2	96.3

* *including absence due to care provided to a sick child or another family member*

In the first half of the year 2020, persons taking care of a sick child received 942.2 thousand sick notes for a total of 4,868.4 thousand days. The average sick note time was 5.16 days. Compared to the same period of the preceding year, the number of issued sick notes decreased by 24.5% and the number of days by 12.7%.

Sick notes issued to persons insured with ZUS due to providing care to a sick child represented 97.7% of all sick notes issued for this reason.

Overall, persons insured with ZUS took care of sick children at the age of 9-14 years for the longest period of time, the absence due to this reason being 1 451.4 thousand days, although the average duration of sick leave was higher than the average (5.21 days) and was equal to 5,91 days. The percentage of absence days due to care provided to children at the age of 3-4 years was also high and equalled 21.9%. On average, the care was provided by 4.70 days.

As far as care provided to another family member was concerned, 174.0 thousand sick notes were issued for a total of 1,212.0 days. The sick note time was 6.97 days. Compared to the same period of the year 2019, only 1.1 thousand more sick notes were issued for the number of absence days higher by 11.3%.

The insured with ZUS took care of another family member for 1,174.7 thousand days, on average by 6.92 days. 169.9 thousand sick notes were issued.

In the first half of the year 2020, the number of sick notes issued due to personal sickness of persons insured with ZUS was 10.2 million and the number of sickness absence related to these notes was equal to 131.5 million. The average duration of a sick note was 12.85 days. The accumulated (from the beginning of the year) average duration of sickness absence was 31.30 days (27.75 days among men and 34.39 days among women).

Compared to the same period of the year 2019, the number of sick absence days due to personal sickness of persons insured with ZUS increased by 7.9% and the number of sick notes decreased by 1.2%.

Table 9.10. Absence due to own illness in the first half of the year 2020

Specification	The number of days of absence		The number of medical leave certificates		The number of persons	
	Total	including: insured with ZUS	Total	including: insured with ZUS	Total	including: insured with ZUS
	in million					
I-VI 2019	139.1	121.9	11.2	10.4	4.9	4.6
I-VI 2020	**147.4**	**131.5**	**11.0**	**10.2**	**4.5**	**4.2**
trend						
I-VI 2019 = 100	106.0	107.9	98.5	98.8	92.4	92.2

In the first half of the year 2020, more than half (i.e. 55.3%) of sick notes was issued due to the person sickness in the group of women. In the same period of the year 2019, the percentage was higher at 55.9%.

The following percentage of sick notes was issued in the analysed period:

- for 1-5 days – 27.0% of sick notes due to personal sickness, including 2.7% of one-day sick notes;
- for 6-10 days – 25.8% of all sick notes;

- for 11-30 days – 42.1% of all sick notes.

In the same period of the year 2019, the percentages were, respectively, 34.7% (including one-day sick notes 3.8%), 25.7% and 34.5%.

Compared to the same period of the preceding year, a significant decrease was recorded in in the number of sick notes issued for a short period of time (1-5 days) (by 7.7 percentage points), coupled with an increase in the number of sick notes issued for 11-30 days (by 7.6 percentage point).

Table 9.11. The number of medical leave certificates issued in the first half of the year 2020 due to own illness of persons insured with ZUS, by sex and absence duration

Specification	The number of medical leave certificates	The number of medical leave certificates by absence duration in days					
		1-5 days	including: 1 day	6-10 days	11-20 days	21-30 days	31 days and more
	in million						
Total	**10.2**	**2.8**	**0.3**	**2.6**	**2.7**	**1.6**	**0.5**
Men	4.6	1.3	0.1	1.3	1.3	0.5	0.2
Women	5.7	1.5	0.2	1.3	1.4	1.1	0.3

In the analysed period, the highest percentage – 27.9% of sick absence days was recorded in the age group from 30 to 39 years. In the population of women, it was 31.8%, and among men – 22.4%. In the same period of the year 2019, the percentages were 28.7%, 33.1% and 22.3%, respectively. It means that sickness absence among women from that age group decreased, and in the group of women at the age of 40-49 years, it slightly increased.

Table 9.12. The structure of days absence in the first half of the year 2020 due to own illness of persons insured with ZUS, by age and sex

Specification	Total	Men	Women
Total	**100.0**	**100.0**	**100.0**
19 years and under	0.5	0.6	0.4
20-29	18.5	14.4	21.4
30-39	27.9	22.4	31.8
40-49	21.6	22.6	20.9
50-59	20.3	21.8	19.2
60-64	8.4	13.5	4.8
65 years and over	2.9	4.7	1.6

In the first half of the year 2020, the following were the most common reasons for sickness absence:

- pregnancy, childbirth and puerperium – 18.0% of the total number of absence days (23.7 million of absence days);
- diseases of the musculoskeletal, muscular system and connective tissue – 16.7% (21.9 million of days;),
- diseases of the respiratory system – 13.9% (18.3 million of days);
- injuries, poisoning and other specified effects of external factors – 11.3% (14.9 million of days).

Diseases related to pregnancy, childbirth and puerperium were the dominant reason for sickness absence. As compared to the same period of the previous year, the number of sick absence days in this group of diseases decreased by 1.4 percentage point. At the same time, the number of sickness absence due to mental and behavioural disorders increased by 2.9 percentage points.

The ranking of disease entities causing incapacity for work in the first half of the year 2020 (in the context of the number of sick absence days) varied by gender. In the group of **men**, the longest sickness absence was due to:

- nerve root and plexus disorders (G54) – 7.7% of the total number of sick absence days among men (in the period of I-VI of the year 2019 – 6.5%);
- dorsalgia (M54) – 5.5% (in the period of I-VI of the year 2019 – 3.7%);
- acute upper respiratory infections of multiple and unspecified sites (J06) – 5.3% (in the period of I-VI of the year 2019 – 5.3%).

In the population of **women**, the longest sickness absence due to personal sickness was caused by:

- obstetric care due to other maternal disorders predominantly related to pregnancy (O26) – 25.1% of the total number of sick absence days among women (in the period of I-VI of the year 2019 – 26.3%);
- acute upper respiratory infections of multiple and unspecified sites (J06) – 4.6% (in the period of I-VI of the year 2019 – 4.5%);
- nerve root and plexus disorders (G54) – 4.5% (in the period of I-VI of the year 2019 – 3.7%).

Due to the epidemiological situation related to the outburst of the coronavirus SARS-CoV-2 pandemic, sickness absence is being monitored.

The World Health Organization created a special code – U07.1 COVID-19 – for the COVID-19 disease entity entered in Chapter XXII of the International Statistical Classification of Diseases and Related Health Problems – ICD-10 for special purposes.

In February 2020 (before the COVID-19 disease entity was entered in the Classification), sick notes were mostly issued due to acute upper respiratory infections of multiple and unspecified sites (J06). In total, 261.7 thousand sick notes were issued due to this entity, including 115.6 thousand in the group of men (44.2%) and 146.1 thousand in the group of women (55.8%). The number of sick absence days resulting from these notes was equal to 1,390.9 thousand (the average duration of a sick note was equal to more than 5 days).

In March 2020, (after the COVID-19 disease entity was entered in the Classification) 401.8 thousand sick notes were issued due to acute upper respiratory infections of multiple and unspecified sites (J06). This was 53.5% more than in February. In the group of men, 172.7 thousand sick notes were issued (as compared to February, 49.4% more), and 229.1 thousand sick leaves notes were issued to women (i.e., 56.8% more than in February). The number of days of incapacity for work due to acute upper respiratory infections of multiple and unspecified sites (J06) was more than two times higher than in February. In the case of women, this figure was 1 667.0 thousand days – a 119.2% increase compared to February, and in the case of men, 1 256.1 thousand days, a 99.3% increase compared to February.

Since code U07 was entered in the Classification of Diseases and Related Health Problems, until the end of March 2020, 323 sick notes were issued for 4.6 thousand sick absence days. The remaining disease entities given in the table are also related to the epidemic and the risk of infectious diseases. Due to the necessary prophylactics (including, the isolation of the sick), 10.3 thousand sick notes were issued for 128.5 thousand days.

In the period of **March-June 2020**, 19.1 thousand sick notes were issued due to COVID-19 for a total of 242.6 thousand sick absence days. On the other hand, the number of sick notes issued in that period due to quarantine (*excluding data on isolation ordered by sanitary services)* 46.3 thousand, accounting for 553.9 thousand sick absence days.

In **June 2020,** 9.7 thousand sick notes for a total of 112.1 thousand sick absence days were registered due to COVID-19.

Compared to May 2020, both the number of sick absence days and the number of sick notes increased by 27.3% and 45.7%, respectively. Compared to April 2020, the number of absence days nearly quadrupled and the number of sick notes increased by more than four times.

Also, it should be noted that in June 2020, sick notes due to COVID-19 were the most often issued in the Śląskie Voivodship and represented over 70% of all notes issued for this reason.

Table 9.13. Absence in March-June of 2020 due to selected disease entities related to the pandemic

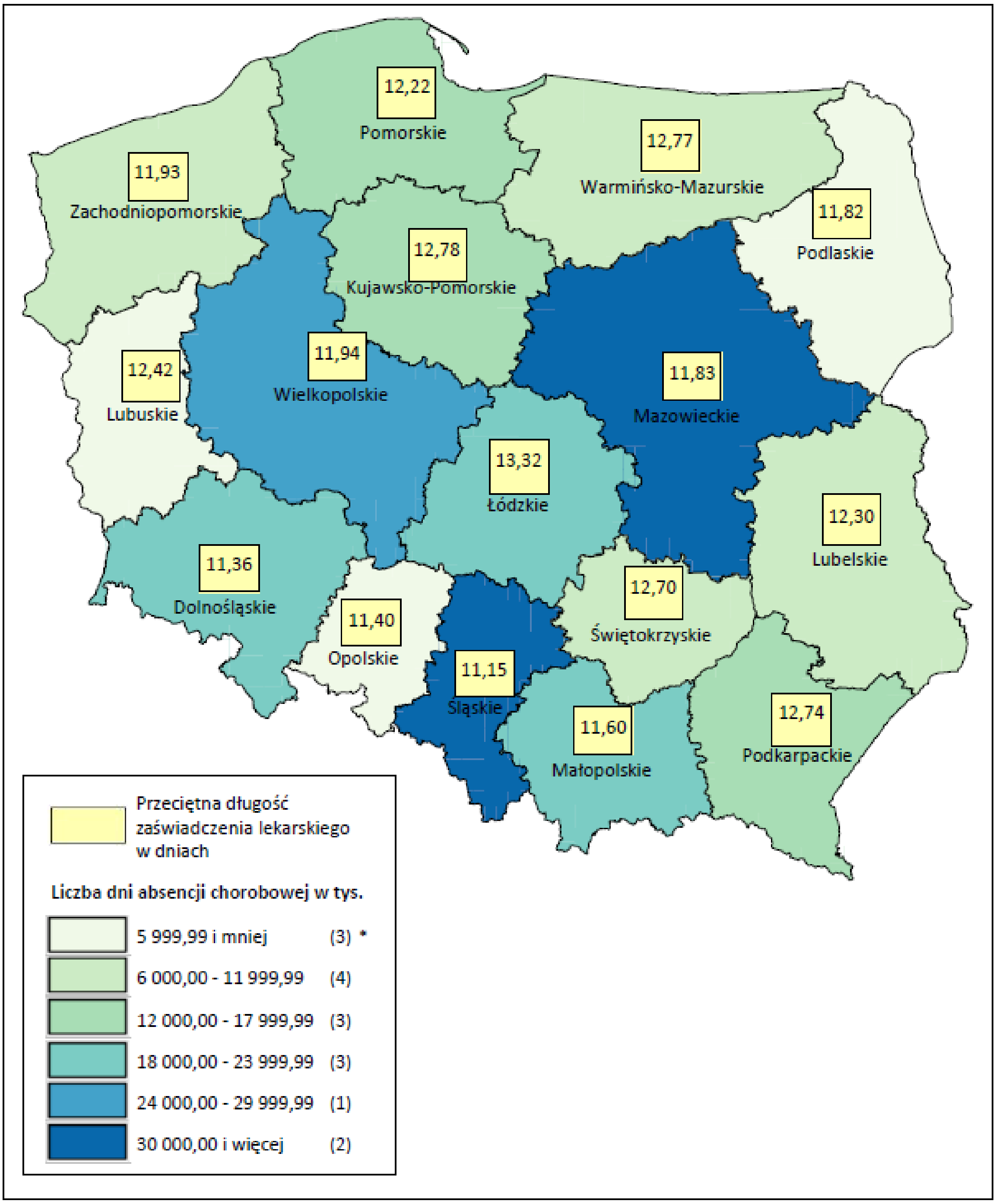
Specification	The number of days of absence		The number of medical leave certificates	
	in thousand			
	Total	including: insured with ZUS	Total	including: insured with ZUS
Total	**796.5**	**716.0**	**65.4**	**59.8**
COVID-19 (U07)	242.6	234.5	19.1	18.6
General examination and investigation of persons without complaint and reported diagnosis (Z00)	11.1	9.6	1.4	1.2
Contact with and exposure to communicable diseases (Z20)	332.6	297.6	28.1	25.6
Need for other prophylactic measures (including isolation) (Z29)	210.2	174.3	16.8	14.4

9.2. Spatial variations in the level of sickness absence

Various factors are influencing the spatial diversity of sickness absence, including those related to the natural environment, e.g., air quality, its degradation resulting from the type of industry prevailing in a given area or another type of human activity. The level of urbanisation, infrastructure in a given area, population density or labour market problems are also important.

Table 9.14. Absence due to own illness of persons insured with ZUS in 2019 by voivodship

Voivodship	The number of days of absence		The number of medical leave certificates		Change in the number of	
					days of absence	medical leave certificates
	in thousand	%	in thousand	%	the previous year = 100	
TOTAL	**238,765.9**	**100.0**	**19,913.0**	**100.0**	**98.0**	**99.8**
Dolnośląskie	18,192.2	7.6	1,601.0	8.0	98.2	100.3
Kujawsko-pomorskie	12,845.8	5.4	1,004.8	5.0	98.6	99.1
Lubelskie	10,807.5	4.5	878.9	4.4	99.3	101.2
Lubuskie	5,966.1	2.5	480.4	2.4	100.1	100.8
Łódzkie	18,645.6	7.8	1,399.9	7.0	95.8	97.1
Małopolskie	18,936.3	7.9	1,632.6	8.2	97.8	100.5
Mazowieckie	32,083.5	13.4	2,712.6	13.6	99.3	102.0
Opolskie	5,474.4	2.3	480.2	2.4	96.8	98.0
Podkarpackie	12,295.1	5.1	965.3	4.8	98.9	99.8
Podlaskie	5,649.9	2.4	478.1	2.4	99.9	101.2
Pomorskie	14,356.7	6.0	1,174.4	5.9	99.3	100.7
Śląskie	30,287.9	12.7	2,717.1	13.6	98.0	99.6
Świętokrzyskie	7,662.3	3.2	603.1	3.0	96.0	96.7
Warmińsko-mazurskie	7,840.8	3.3	614.0	3.1	96.8	99.2
Wielkopolskie	24,974.3	10.5	2,091.1	10.5	98.3	100.0
Zachodniopomorskie	9,803.4	4.1	822.0	4.1	98.6	100.8
unspecified voivodship	2,944.2	1.2	257.5	1.3	81.5	87.4

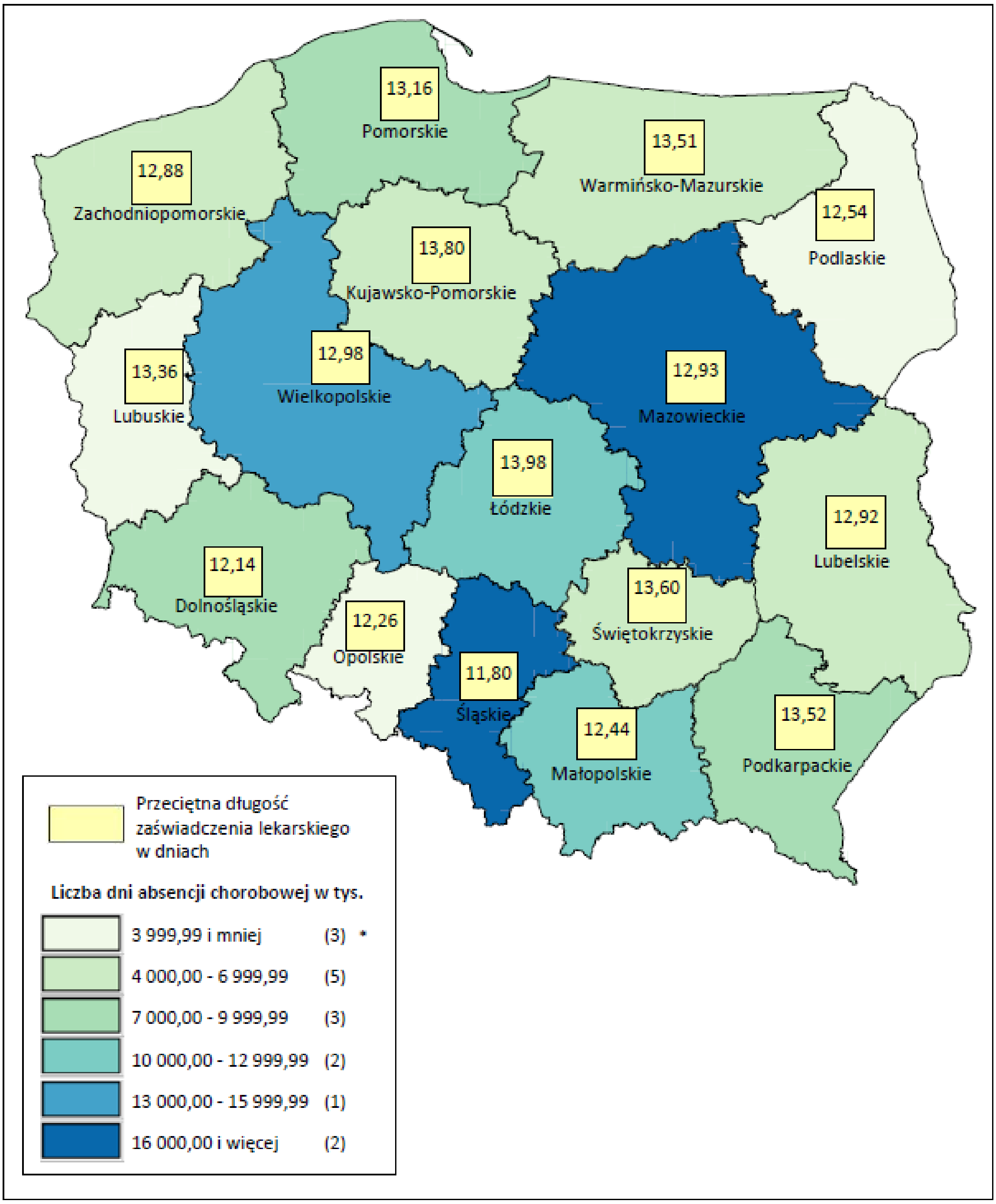


** liczba województw*

Fig. 9.6. The number of days of absence in 2019 due to own illness and the average duration of medical leave of persons insured with ZUS, by voivodship

Table 9.15. Absence in the first half of the year 2020 due to own illness of persons insured with ZUS, by voivodship

Voivodeship	The number of days of absence		The number of medical leave certificates		Change in the number of	
					days of absence	medical leave certificates
	in thousand	%	in thousand	%	previous year = 100	
TOTAL	**131,468.5**	**100.0**	**10,230.8**	**100.0**	**107.9**	**98.8**
Dolnośląskie	9,793.0	7.4	807.0	7.9	106.2	98.2
Kujawsko-pomorskie	6,929.0	5.3	502.0	4.9	106.7	96.4
Lubelskie	5,813.0	4.4	450.0	4.4	105.1	97.8
Lubuskie	3,042.0	2.3	227.6	2.2	100.9	91.5
Łódzkie	10,861.7	8.3	777.1	7.6	114.1	106.5
Małopolskie	10,738.0	8.2	863.4	8.4	110.5	101.2
Mazowieckie	17,575.0	13.4	1,359.4	13.3	107.1	96.5
Opolskie	2,930.0	2.2	239.0	2.3	104.0	94.8
Podkarpackie	7,152.6	5.4	529.0	5.2	114.1	105.0
Podlaskie	2,902.0	2.2	231.4	2.3	100.6	92.5
Pomorskie	7,731.0	5.9	587.5	5.7	106.0	96.4
Śląskie	17,014.4	12.9	1,441.8	14.1	109.3	101.7
Świętokrzyskie	4,290.8	3.3	315.5	3.1	109.4	99.7
Warmińsko-mazurskie	4,108.2	3.1	304.0	3.0	102.8	94.9
Wielkopolskie	13,953.5	10.6	1,075.3	10.5	109.6	99.0
Zachodniopomorskie	5,135.5	3.9	398.8	3.9	103.4	93.9
unspecified voivodship	1,498.8	1.1	122.0	1.2	98.5	91.2



** liczba województw*

Fig. 9.7. The number of days of absence in the first half of 2020 due to own illness and the average duration of medical leave of persons insured with ZUS by voivodship

In the year 2019, the highest percentage of sick absence days due to personal sickness of persons insured with ZUS was recorded in the following voivodships: Mazowieckie (13.4% of the total number of sick absence days), Śląskie (12.7%) and Wielkopolskie (10.5%). The average sick note time in those voivodships was, respectively, 11.83, 11.15 and 11.94 days.

Longer-than-average sick leaves were found for (11.99 days): inhabitants of the Łódzkie Voivodship, for more than 13 days, inhabitants of Kujawsko-pomorskie, Warmińsko-mazurskie, Podkarpackie, Świętokrzyskie, Pomorskie, Lubelskie and Lubuskie Voivodships – for more than 12 days.

In the first half of 2020, the highest percentage in the number of sick absence days was recorded in the Mazowieckie (13.4%), Śląskie (12.9%) and Wielkopolskie Voivodships (10.6%). The average sick note times was 12.85 days. Compared to the first half of the year 2019, it was higher by 9.2%. The average duration of a sick note was shorter than the average in the following Voivodships: Dolnośląskie, Małopolskie, Opolskie, Podlaskie and Śląskie.

Tables 9.16 – 9.17 and figures 9.8 – 9.9 illustrate the distribution of the number of sick absence days due to incapacity for work resulting from selected groups of diseases in individual Voivodships. In the year 2019, these groups of diseases accounted for 86.0%, and in the first half of the year 2020, for 87.0% of sick absence days.

In the year 2019, the highest percentage of sick absence days in each voivodship was recorded for diseases related to pregnancy, childbirth and puerperium. Women from the Małopolskie and Podlaskie Voivodships stayed on sick leaves for the longest periods of time. The long sickness absence resulted from diseases of the musculoskeletal, muscular system and connective tissue. Inhabitants of the Świętokrzyskie and Warmińko-mazurskie voivodship stayed on sick leave for the longest time, and their absence represented 15.5% and 17.4% of overall absence in each of the named voivodships. The proportion of sick absence days due to diseases of the respiratory system in each of the named voivodships ranged from 10% to 13%. The largest was recorded in the Mazowieckie and Opolskie Voivodships, 13.3% each. As far as mental and behavioural disorders are concerned, the largest number of days of incapacity for work was recorded in the Kujawsko-pomorskie (11.2% of sick absence days in this voivodship) and Wielkopolskie Voivodships (11.1%).

In the first half of the year 2020, compared to the 1st half of the year 2019, the number of sick absence days increased by 9.2%. The insignificant decrease in the proportion of the number of sick absence days due to pregnancy, childbirth and puerperium is observed in individual voivodships. In general, the percentage of diseases of the respiratory system in Poland was 13.9%. The percentage of sickness absence due to this reason in individual voivodships was 11.8% in the Kujawsko-pomorskie Voivodship and 15.3% in the Śląskie Voivodship. The mental and behavioural disorders resulting in incapacity for work in the Kujawsko-pomorskie Voivodship accounted for 15.2% of the total number of sick absence days in this voivodship. The high rate of absence due to this reason was recorded in the Wielkopolskie Voivodship 14.8%, Mazowieckie – 13.1%, Łódzkie – 12.4%, Pomorskie 12.1%.

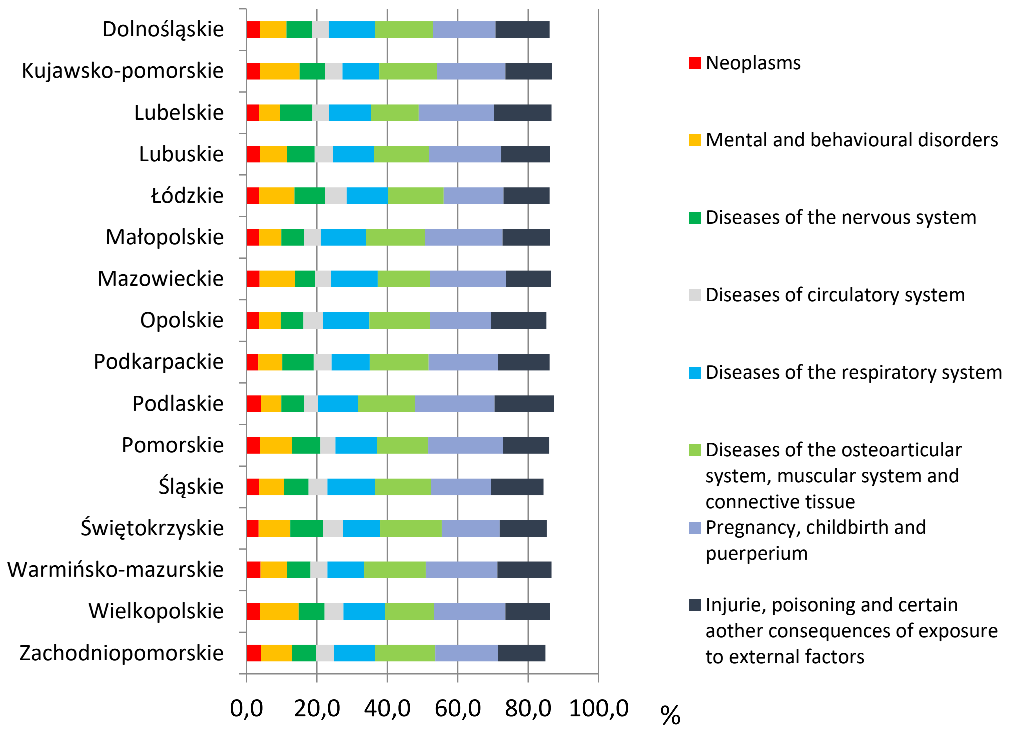


Fig. 9.8. The structure of days of absence in 2019, by voivodship and selected disease group

Table. 9.16. The structure of days of absence in 2019 due to own illness of persons insured with ZUS, by selected disease group and voivodship

Voivodships	Total number of days of absence	Neoplasms	Mental and behavioural disorders	Diseases of the nervous system	Diseases of the circulatory system	Diseases of the respiratory system	Diseases of the osteoarticular system, muscular system and connective tissue	Pregnancy, childbirth and puerperium	Injurie, poisoning and certain other consequences of exposure to external factors
TOTAL	**100.0**	**3.7**	**8.5**	**7.3**	**5.0**	**12.3**	**15.7**	**19.4**	**14.0**
including:									
Dolnośląskie	**100.0**	3.8	7.5	7.1	4.8	13.2	16.4	17.7	15.4
Kujawsko-pomorskie	**100.0**	3.9	11.2	7.2	5.0	10.4	16.4	19.5	13.2
Lubelskie	**100.0**	3.5	6.0	9.2	4.7	11.9	13.6	21.4	16.3
Lubuskie	**100.0**	3.9	7.6	7.8	5.3	11.6	15.6	20.6	13.9
Łódzkie	**100.0**	3.6	10.0	8.6	6.1	11.8	15.8	17.0	13.2
Małopolskie	**100.0**	3.6	6.3	6.4	4.7	13.0	16.7	22.1	13.5
Mazowieckie	**100.0**	3.7	10.0	5.8	4.5	13.3	14.9	21.5	12.7
Opolskie	**100.0**	3.6	6.1	6.5	5.5	13.3	17.2	17.4	15.7
Podkarpackie	**100.0**	3.3	6.8	8.9	5.2	10.8	16.8	19.7	14.7
Podlaskie	**100.0**	4.1	5.8	6.5	4.0	11.4	16.1	22.7	16.8
Pomorskie	**100.0**	3.9	9.1	8.0	4.2	11.8	14.6	21.2	13.1
Śląskie	**100.0**	3.6	7.0	7.0	5.4	13.4	16.1	17.0	14.9
Świętokrzyskie	**100.0**	3.4	9.0	9.3	5.7	10.6	17.5	16.5	13.3
Warmińsko-mazurskie	**100.0**	4.0	7.6	6.6	4.8	10.5	17.4	20.4	15.4
Wielkopolskie	**100.0**	3.8	11.1	7.3	5.4	11.9	13.8	20.3	12.7
Zachodniopomorskie	**100.0**	4.2	8.8	6.8	4.9	11.7	17.2	17.8	13.5

Table 9.17. The structure of days of absence in the first half of the year 2020 due to own illness of persons insured with ZUS, by selected disease group and voivodship

Voivodships	Total number of days of absence	Neoplasms	Mental and behavioural disorders	Diseases of the nervous system	Diseases of the circulatory system	Diseases of the respiratory system	Diseases of the osteoarticular system, muscular system and connective tissue	Pregnancy, childbirth and puerperium	Injurie, poisoning and certain aother consequences of exposure to external factors
TOTAL	**100.0**	**3.4**	**11.0**	**7.9**	**4.8**	**139**	**16.7**	**18.0**	**11.3**
including:									
Dolnośląskie	**100.0**	3.5	10.1	7.6	4.6	14.9	17.2	16.6	12.5
Kujawsko-pomorskie	**100.0**	3.4	15.2	7.9	4.5	11.8	17.0	17.6	10.7
Lubelskie	**100.0**	3.1	7.6	10.5	4.6	14.3	14.4	20.1	13.2
Lubuskie	**100.0**	3.8	9.7	8.4	4.9	12.7	15.7	19.9	12.0
Łódzkie	**100.0**	3.0	12.4	9.3	6.0	14.5	168	15.1	10.2
Małopolskie	**100.0**	3.3	8.3	6.9	4.8	14.3	18.4	20.3	11.0
Mazowieckie	**100.0**	3.4	13.1	6.1	4.3	14.9	15.4	20.3	10.2
Opolskie	**100.0**	3.4	7.6	6.8	5.2	14.5	18.0	18.2	12.7
Podkarpackie	**100.0**	2.9	8.6	10.2	5.1	12.7	18.6	17.5	11.7
Podlaskie	**100.0**	3.9	7.7	6.8	3.8	12.8	16.0	22.6	14.5
Pomorskie	**100.0**	3.7	12.1	8.6	3.9	13.5	15.2	19.8	10.6
Śląskie	**100.0**	3.1	8.9	7.6	4.9	15.3	17.5	15.6	11.8
Świętokrzyskie	**100.0**	3.0	10.7	10.5	5.5	12.0	18.7	15.1	11.3
Warmińsko-mazurskie	**100.0**	3.5	10.1	7.0	4.4	12.4	18.1	19.4	13.1
Wielkopolskie	**100.0**	3.4	14.8	8.0	5.0	13.1	14.7	18.2	10.2
Zachodniopomorskie	**100.0**	3.9	11.8	6.9	4.4	13.4	17.6	17.6	11.2

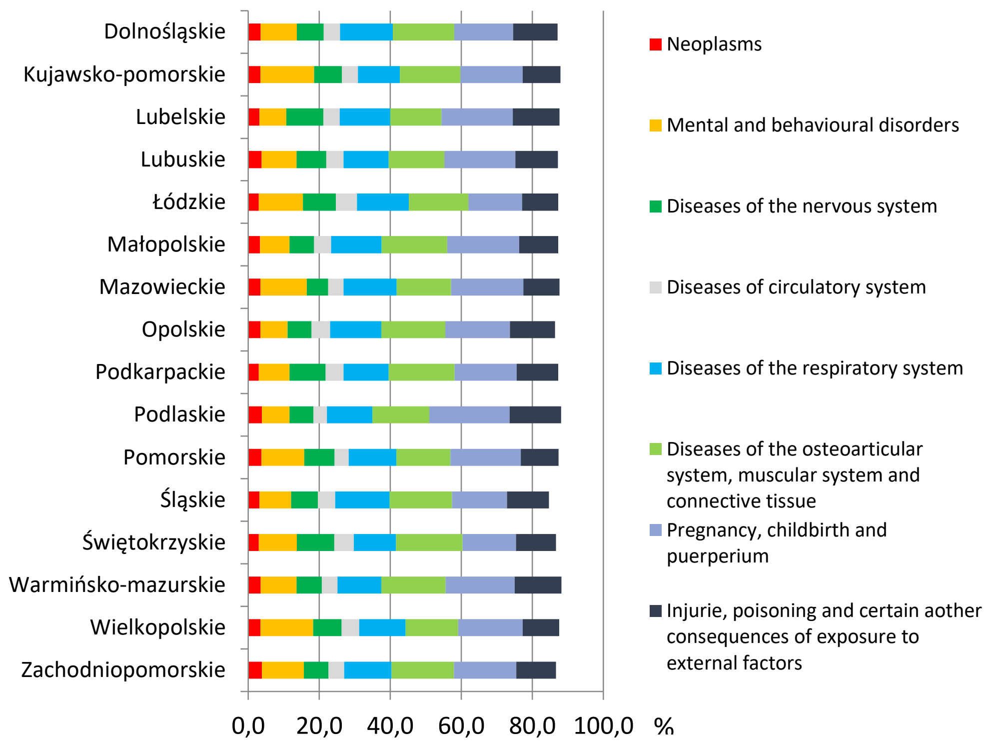


Fig. 9.9. The structure of days of absence in the first half of the year 2020, by voivodship and disease group

9.3. Sickness absence related to the hospitalisation of persons insured with ZUS in the year 2019 and first half of the year 2020

In the year 2019, sickness absence due to the hospitalisation of persons insured with ZUS represented 2.7% of sick absence days and was amounted to 6,404.3 thousand days (i.e. 23.9% less than in the year 2018). A total of 1,278.4 thousand sick notes were issued due to hospital stay, representing 6.4% of all sick notes issued to the insured with ZUS. The average duration of hospital stay was 5.01 days.

Women were the group which received sick notes due to hospitalisation and represented 53.8% of the hospitalised population. However, it should be noted that men were hospitalised for a longer time. The duration of sick absence due to hospitalisation was 13% longer among men compared to hospital absence among women. In terms of the age structure, women aged 40-49 formed the largest group (i.e. 27.7% of the population of women).

In terms of the number of days, persons aged 50-59 were hospitalised for the longest time – this was true for both men (25.6% of their population) and women (27.4% of their population).

Most of sick absence days due to hospitalisation resulted from mental and behavioural disorders – 12.5% of hospitalisation days, diseases of the circulatory system – 11.3%, diseases of the gastrointestinal system – 10.5% and diseases of the musculoskeletal, muscular system and connective tissue – 10.4%. The longest average hospital stay was 13.60 days (due to mental and behavioural disorders) and 8.30 days (due to infectious diseases).

Obstetric care due to other maternal disorders predominantly related to pregnancy (O26) (87.6 thousand days of hospitalisation), submucous leiomyoma of the uterus (D25) (97.8 thousand days), calculus of the gallbladder with acute cholecystitis (K80) (78.1 thousand days), alcohol-related mental and behavioural disorders (F10) (54.8 thousand days) were the most frequent (in terms of disease entities) reasons for sickness absence due to hospitalisation. Hospitalisation of men was mainly due to alcohol-related mental and behavioural disorders (F10) (308.1 thousand days), angina pectoris (I21) (79.9 thousand days), chronic rheumatic heart disease (I05) (78.2 thousand days) and inguinal hernia (K40) (77.1 thousand days).

In the first half of 2020, 455.8 thousand sick notes were issued to persons insured with ZUS due to hospitalisation for personal sickness. The number of days of absence - 2,306,7 thous. days. The average period in hospital was more than 5 days. On average, men were hospitalised for a longer period of time – 5.69 days, and women – 4.48 days.

Compared to the first half of the year 2019, the number of absence days due to hospitalisation decreased by 29.9%.

The highest percentage (26.2%) of persons who received sick notes due to hospitalisation was in the group aged 50-59. Men accounted for 52.2% of this group. The highest percentage of women was recorded in two age groups: 40-49 and 50-59 – 27.2% of the population of women per each these age groups.

Alcohol-related mental and behavioural disorders (F10) – 127.1 thousand days, calculus of the gallbladder with acute cholecystitis (K80) – 43.9 thousand days, angina pectoris (I21) – 40.5 thousand days, other intervertebral disc disorders (M51) – 40.0 thousand days were the most frequent reasons for sickness absence due to hospitalisation. Due to COVID-19 (U07), the number of sick absence days increased to 18.7 thousand.

RECAPITULATION

1. Many interesting phenomena are observed in the analysis of sickness absence based on data given in sick notes confirming temporary incapacity for work.
2. For many years, the majority of sick notes have been issued to women, their percentage oscillating around 55% of the total number of issued sick notes. This also confirms that sickness is more prevalent among women. In the year 2019, sickness absence in the group of women, confirmed with a sick note, amounted to 139.2 million days. This also translates into the percentage of accumulated sickness absence in that year. In the year 2019, this rate in the group of women was higher than the average accumulated absence among men by more than 7.5 days and amounted to 39.76 days (for men, it was 32.24 days).
3. Absence in the group of women incapable of working during pregnancy is an important element of the analysis of sickness absence. Incapacity for work among pregnant women has a significant impact on overall absence and absence in the population of women. In the year 2019, the percentage of sickness absence due to pregnancy relative to overall absence was 20.0%, and the percentage of sickness absence among pregnant women relative to sickness absence in the group of women was 34.3%. As far as the number of sick notes is concerned, every tenth sick note was issued due to incapacity for work during pregnancy and nearly every fifth woman received a sick note confirming incapacity for work during pregnancy.
4. Sickness absence is most likely to occur in the group of insured aged 30-39 years. In the year 2019, its proportion was 28.6% of absence days, and in the first half of the year 2020 – 27.9%.
5. The following disease entities caused the longest sickness absence among **men**:
   - nerve root and plexus disorders (G54) – 6.7% of the total number of sick absence days among men;
   - acute upper respiratory infections of multiple and unspecified sites (J06) – 4.5%;
   - dorsalgia (M54) – 3.9%.

For years, in the population of **women**, the longest sickness absence has been due to obstetric care due to other maternal disorders predominantly related to pregnancy (O26) – 26.7% of total sick absence days among women. Other disease entities, in order of prevalence, include:

- acute upper respiratory infections of multiple and unspecified sites (J06) – 3.9%;
- nerve root and plexus disorders (G54) – 3.8%.

6. In February 2020 (before COVID-19 was entered in the Classification), sick notes were most often issued due to acute upper respiratory infections of multiple and unspecified sites (J06).

In total, 261.7 thousand sick notes were issued due to this disease entity, of which 115.6 thousand (44.2%) were issued to men and 146.1 thousand (55.8%) to women. The number of sick absence days related to these sick notes was 1,390.9 thousand (the average duration was more than 5 days).

In March (after the COVID-19 disease entity was entered in the Classification), 401.8 thousand sick notes were issued due to acute upper respiratory infections of multiple and unspecified sites (J06) – 53.5% more than in February. Men received 172.7 thousand sick notes (compared to February, it was 49.4% more) and women – 229.1 thousand of sick notes (i.e. 56.8% more than in February). The number of days of incapacity for work due to acute upper respiratory infections of multiple and unspecified sites (J06) was nearly twice higher than in February. In the case of women, it was 1,667.0 thousand days, an increase compared to February by 119.2%; in the group of men – 1 256.1 thousand days – an increase compared to February by 99.3%.

In the period **March-June 2020**, 19.1 thousand sick notes issued due to COVID-19 for a total of 242.6 thousand sick absence days were registered. And the number of sick notes, including those related to quarantine (*excluding data on isolation ordered by sanitary services)*, was 46.3 thousand, accounting for 553.9 thousand sick absence days.

7. The sickness absence is a significant financial challenge. A total of PLN 19.7 billion was spent for this purpose from the social insurance system, of which PLN 12.2 billion was financed from the Social Insurance Fund (sickness allowances) and the remaining amount was financed by employment establishments and the Guaranteed Employee Benefits Fund (FGŚP).

10. ANALYSES OF LARGE LABORATORY DATA SETS IN POPULATION HEALTH ASSESSMENT

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Under the research projects funded by the National Health Programme and coordinated by the National Institute of Public Health – National Institute of Hygiene, teams of specialists in relevant fields of medicine, with the assistance of IT practitioners, carried out the analyses of *big data* sets for the results of laboratory tests performed by one of the key players in the market for clinical laboratory tests in Poland – *Diagnostyka* sp. z o.o. The analyses were aimed at testing a new area of research in the field of epidemiology, public health, and clinical medicine. Achieving satisfactory results was to lay the foundation for regarding the development of elaborate strategies for the use of data from clinical laboratory tests in the promotion, prevention, diagnosis, and treatment of diseases for which specific tests are performed. At the same time, applying analytic tools with the use of such data was aimed at enabling the researchers to achieve an unprecedented level of precision in their observation of selected clinical parameters, determined by the precision at the level of laboratory test results.

What remained unknown during the study was the extent to which the population covered by the analysis was representative of the entire population of the country. This is because tests are ordered in various ways, mostly due to the onset of specific clinical conditions. However, physicians ordering laboratory tests use different criteria. What is more, the detailed health profile of the people concerned is unknown. Therefore, it was necessary to define the characteristics of the studied population based on the presence of the clinical laboratory tests alone, as well as the obtained results. The population of patients who use all types of tests offered within the *Diagnostyka* chain has become the *reference population* for individual coefficients calculated on the basis of available data.

The analysis entailed examination of answers to the following research questions:

- What is the representativeness of the research population in relation to the population of the entire country and its particular regions?
- How often are specific types of tests ordered and ran in the populations of particular regions (*pattern of care*)?
- For patients fulfilling the criteria of longitudinal observation: in which direction and to what extent (pace, scale) have the results for a given laboratory parameter changed?
- Which tests and what kind of results may indicate a specific disease?

Furthermore, conclusions were formulated regarding the formalisation of recording clinical laboratory test data, including the following:

- Insufficient use of formalised nomenclature of diagnostic laboratory tests.
- Even though in Poland there is the Classification of Clinical Laboratory Tests, which was developed in the 1990s and published as part of the Polish edition of ICD-9-CM[104], it is used to a limited extent. The classification is not updated frequently enough, and therefore, it fails to entail a sufficient number of current laboratory tests. As a result, individual laboratories are forced to define and name the tests used in clinical practice on their own.
- There are no common standards for how to determine laboratory test results. The above-mentioned Classification does not include the form of recording the test results. The traditional, more or less codified record-keeping forms of writing are not applied consistently, and, in many cases, different units of measurement and recording forms are used.

In the case of electronic referrals, there is considerable potential for making the process automated; however, the standardisation of the content transferred via an electronic referral would be a prerequisite. In the absence of such standardisation, an electronic referral will require human interpretation at every processing step.

[104] Kozierkiewicz A. (ed.), Międzynarodowa Klasyfikacji Procedur Medycznych, wraz z aneksem Klasyfikacja Badań Laboratoryjnych (International Classification of Diseases, the 9th Revision, with the appendix Classification of Clinical Laboratory Tests), Kraków: “Vesalius” Medical Publishing House, 1999.

Sources of data and methodology

Research was carried out using the database of Diagnostyka Ltd. chain laboratories, which provide end-to-end laboratory services from collection, transportation and testing of biological material to the delivery of diagnostic results. The company performs diagnostic tests ordered by several customer groups, including:

- doctors of network companies offering subscription-based healthcare;
- doctors in outpatient healthcare facilities operating in the public system, i.e. financed by the National Health Fund;
- hospitals running hospital laboratories in the form of outsourcing.

The collected data covered the period from 2014 until mid-2019. During the entire observation period, 403,861,728 records were logged, of which 230 million were ordered by outpatient care doctors, 111 million were performed as part of a hospital stay, and 61 million were ordered by patients.

Individual patients were identified with a unique ID, which allowed to combine the records associated with a given patient. At the same time, neither the patient's ID nor their other data (year of birth, sex) could be attributed to an identifiable patient.

The number of (unique) patients was 16,516,824. The numbers in particular years are shown in the table below (**Błąd! Nie można odnaleźć źródła odwołania.**).

Table 10.1. Number of (unique) patients for whom data were recorded, by year

Year	Number
2014	4,643,188
2015	5,355,614
2016	6,101,287
2017	6,531,499
2018	6,973,443
2019	4,655,781

A total of 2,076 different so-called procedures were identified in the database, with 5,075 different parameters identified within the procedures. Throughout the entire research period, the researchers were able to identify a total of 6,494 different tests recorded as coded items, the designation of which was a combination of the names of the procedure and the parameter.

The above numbers are not exact, because the nomenclature of procedures and their constituent parameters is not entirely consistent. Despite the use of codes to denote procedures and their parameters, which are partly based on the Classification of Clinical Laboratory Tests[1], the researchers did not manage to unambiguously identify procedures or parameters using the codes. As a result, in view of the above-shown numbers of procedure and parameter names, the database contains 3,742 unique procedure codes and 10,712 unique parameter codes.

The test results were provided in numerical or text form. The lion's share of the numerical parameters was accompanied by a range of reference values defined for a given laboratory and frequently, for a particular device. The reference values were typically entered into the IT system manually by laboratory staff.

Apart from test parameters, the data contained in a single record of the study data also include parameters that allow for the determination of patient identifiable data items such as age, sex and place of residence (determined based on the point of sample collection). These attributes were ascribed to the patients during the process of importing data to the databases of an analytical company and implemented along with the pseudonymisation process.

Some of the patients remain under continued care (e.g. primary healthcare facilities or subscription companies), while others use incidental healthcare services. There is no guarantee as to whether all (subsequent and previous) laboratory tests for a given patient have been included in the observation (database). In the course of the analysis, it was necessary to select patients with potential longitudinal observation vs. patients with interrupted/incidental observation.

Due to the set compilation method utilised, the data cannot be treated as directly representative for the Polish population. However, the multi-year observation and its scale make it possible to formulate certain conclusions about the relative incidence of abnormal results concerning individual tests, the dynamics of test changes, and the coexistence of abnormal results within various parameters.

The original data records collected and maintained in the IT systems of *Diagnostyka* Ltd. were divided into relational database tables with the data describing tests, patients, procedures, sample collection points and laboratories, respectively, and the TERYT database containing 4-character codes (county level).

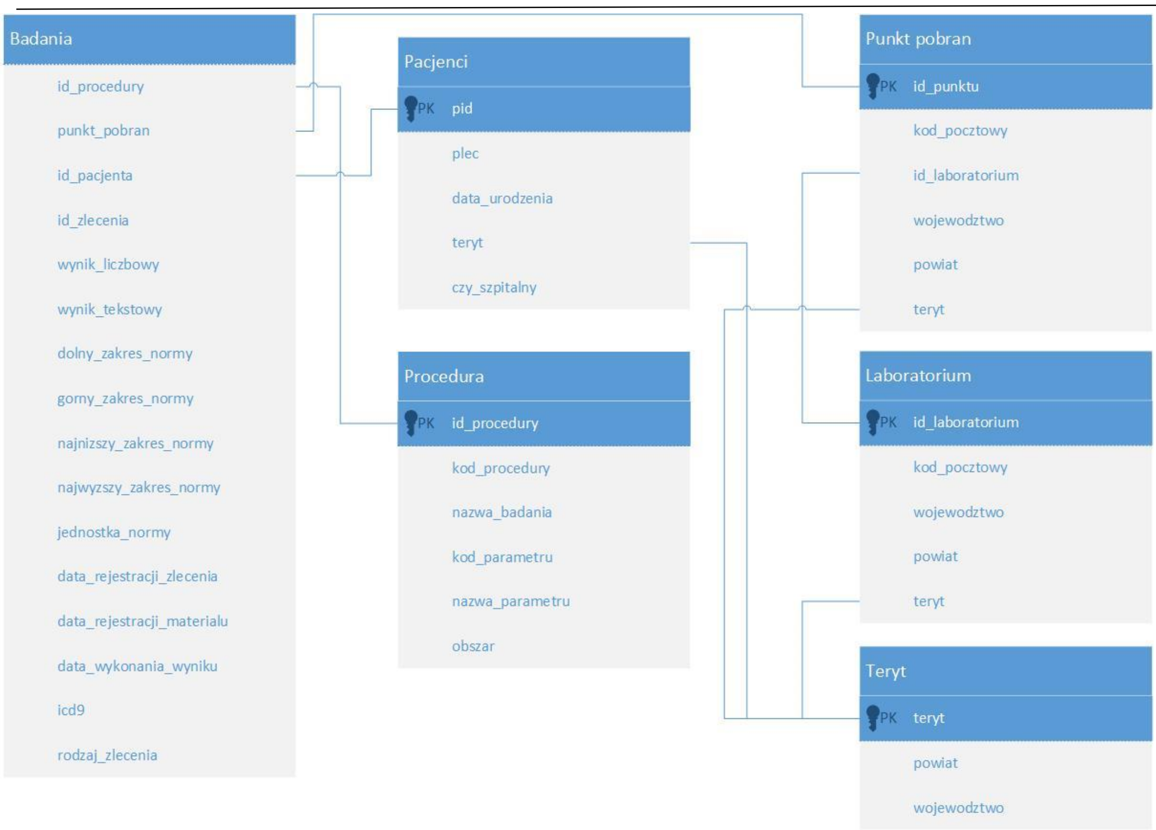

Fig. 10.1. Entity Relationship (ER) diagram of the diagnostic database

The *Tests* table is the most extensive in terms of the number of fields. It presents the tests in the manner in which they were ordered by customers and then accepted by laboratories. In particular, the table includes panel tests composed of various parameters. The *Procedure* table contains several items, including *procedure code* and *procedure name* assigned in the laboratories, as well as *parameter code* and *parameter name*, i.e. the basic components of the procedure. The total number of lines in the *Procedure* table is approximately 12,000. However, this is not the number of unique parameters for laboratory tests, because many parameters and so-called tests in the *Tests* table keep recurring, and their names are either similar or different. Hence, the first step in the data gathering process was to identify the names and codes of individual parameters which the research teams had decided to analyse.

The *Patients* table contains data of persons identified with pseudonymised unique codes (the PESEL number in the original databases), and also parameters such as: sex, year of birth and the 4-character TERYT code of a patient's place of residence. The patient's place of residence is tantamount to the location of the collection facility where the patient's sample (or the majority of samples) was taken. Whenever the sample to be tested was collected only in a hospital, the TERYT code is limited to 2 characters (voivodship level).

A query into a relational database, formulated in SQL, made it possible to select data in the following tables:

1) *tests* (file: *badania_czy_w_normie*) includes the number of tests of a given type (glossary list, table1), sex, year of the test, age category (pre-defined), place (voivodship) of residence, and information whether the result is within or outside the norm;
2) *patients* (file: *pacjenci_poza_norma*) includes the number of patients, gender, year of the test, age category (pre-defined), place (voivodship) of residence, and the information which patients in a given year had at least one test done with results within or outside the norm;

Below, preliminary observations and conclusions are presented concerning several types of tests, and a description of the analysis method as well as the possibilities and limitations of the conclusions.

Observations

Markers of myocardial injury

According to the statistics of Statistics Poland (SP), cardiovascular diseases are the leading cause of death in Poland. For decades, they have been causing nearly half of all deaths in the country. Similarly as in the rest of Europe, the most typical heart conditions in Poland, responsible for the highest number of deaths, are ischemic heart diseases (ICD-10-CM Codes I20-I25). In 2013, they led to 41,000 (23%) cardiovascular deaths, of which 15,000 (9%) were due to myocardial infarction (MI)[105].

Cardiac troponins T and I *(cTnT, cardiac troponin I, cTnI, high selectivity cardiac troponin I, hs cTnI)* are a key element in the diagnosis of acute coronary syndromes[106]. Troponins are almost undetectable in the peripheral blood of a healthy person. An increased concentration of troponins is observed approximately 4-5 hours after the onset of myocardial pain. Troponins I are moderately early markers for necrosis, with a maximum concentration averaging between the 12th and the 24th hour, and normalised concentrations after an average

[105] Wojtyniak B, Goryński P (ed.), Sytuacja zdrowotna ludności Polski i jej uwarunkowania, Narodowy Instytut Zdrowia Publicznego – Państwowy Zakład Higieny (Health situation of the Polish population and its determinants, National Institute of Public Health – National Institute of Hygiene), Warsaw 2018.
[106] offi M, Patrono C, Collet JP, Mueller C, Valgimigli M, Andreotti F, Bax JJ, Borger MA, Brotons C, Chew DP, Gencer B, Hasenfuss G, Kjeldsen K, Lancellotti P, Landmesser U, Mehilli J, Mukherjee D, Storey RF, Windecker S, ESC Scientific Document Group. 2015 ESC Guidelines for the management of acute coronary syndromes in patients presenting without persistent ST-segment elevation, Task Force for the Management of Acute Coronary Syndromes in Patients Presenting without Persistent ST-Segment Elevation of the European Society of Cardiology (ESC). Eur Heart J. 2016; 37: 267-315.

of 7 days[3]. Elevated troponin levels are also symptoms of other ailments, including severe pulmonary embolism and associated right ventricular overload, atrial fibrillation and other arrhythmias, pericarditis, myocarditis, acute and severe congestive heart failure, sepsis, shock, use of cardiotoxic drugs (e.g. Adriamycin, doxorubicin, and 5-fluorouracil), as well as cardiac trauma (e.g. during cardiac surgery, coronary angioplasty, ablation and cardioversion), chronic renal failure, severe burns, acute respiratory failure, and extreme physical exertion[107, 108]. A slight elevation of troponin levels in the general population, well below the diagnostic threshold, is also prognostically associated with the development of cardiovascular disease and may play a vital role in assessing the risk of CVD among the general population[4, 5].

When analysing the laboratory test results on troponins, on the one hand, the researchers managed to establish the universal reference values (to be used as benchmarks for the results of individual patients, and, on the other, they identified the occurrence of *reference ranges* provided by individual laboratories.

) to be used as benchmarks for the results of individual patients, and, on the other, they identified the occurrence of *reference ranges* provided by individual laboratories.

Table 10.2. Universal reference values for troponins

Code	Meaning	Troponins I (O59)	hs troponins I (hs059)	Troponins T (061)
		ng/l	ng/l	ng/l
0	Other values, errors, etc.	%	%	%
1	Below the diagnostic threshold	<12		<9
2	Normal range	12-40	<40	9–13
3	Above normal	>40	>=40	14-100
4	Much above normal			>100

[107]Ford I, Shah AS, Zhang R, McAllister DA, Strachan FE, Caslake M, Newby DE, Packard CJ, Mills NL, High-sensitivity cardiac troponin, statin therapy, and risk of coronary heart disease. J Am Coll Cardiol. 2016; 68: 2719-2728.
[108] Willeit P, Welsh P, Evans JDW, Tschiderer L, Boachie C, Jukema JW, Ford I, Trompet S, Stott DJ, Kearney PM, Mooijaart SP, Kiechl S, Di Angelantonio E, Sattar N, High-sensitivity cardiac troponin concentration and risk of firstever cardiovascular outcomes in 154,052 participants. J Am Coll Cardiol. 2017; 70: 558-568.

Number of tests in the population

Troponin I (cTnI) level tests are performed very rarely in laboratories run by the *Diagnostyka* Ltd. In the studied period, the total number of cTnI tests amounted to 16,000 in 2014 and 9,000 in 2018, which means it almost halved in 4 years. On the other hand, testing for the level of hs troponin I (hs cTnI) was more and more frequent; in the analysed period, the number of such tests rose from 4,500 in 2014 up to 15,000 in 2018. Troponin T (cTnT) tests are the most popular. The total number of such tests within the analysed time-frame increased from 73,000 in 2014 to 148,000 in 2018. The relative frequency slightly increased from 0.02 to 0.026 test per person from the reference population.

In 2 voivodships, the company's laboratories perform almost no cTn tests at all, and the frequency of such tests in other voivodships varies significantly. These differences may stem from the location of the laboratories; the ones located in hospitals and handling hospital orders run cTn level tests relatively often, while the ones focused on performing tests ordered by clinics do so much less frequently. This observation and the characteristics of indications for cTn diagnostic tests show that it would be unwarranted to infer conclusions on the health status of a wide population based on such tests. However, conclusions can be drawn on the clinical practice and the degree of myocardial damage in patients referred for tests.

Proportion of tests with abnormal results as compared to universal reference values

Out of approx. 110,000 registered tests, as many as 65,000 in the *results* field contained uninterpretable data; hence, only 40% of the results could be interpreted. Among these tests, the proportion of cTnI test results that were above the normal range in relation to the universal reference values amounted to a total of approx. 27%. The multiple and significant differences between the voivodships and the years in which the tests were carried out could be partly attributed to the small sample size in some of the voivodships. Additionally, unlike in the case of cTnT, there are many cTnI assay methods available. However, they are not standardised, and as a result, significant differences can be observed between the results of tests performed with different methods (1).

In the sample of hs cTnI tests, the percentage of abnormal results in relation to the reference ranges recognised as universal amounted to a total of approx. 35%. The overall proportion of these results in the sample of cTnT tests was 80-90%. The results obtained in individual voivodships were exceptionally even, with the differences amounting to only approx. 10 percentage points. Only about 10% of the tests results eluded classification.

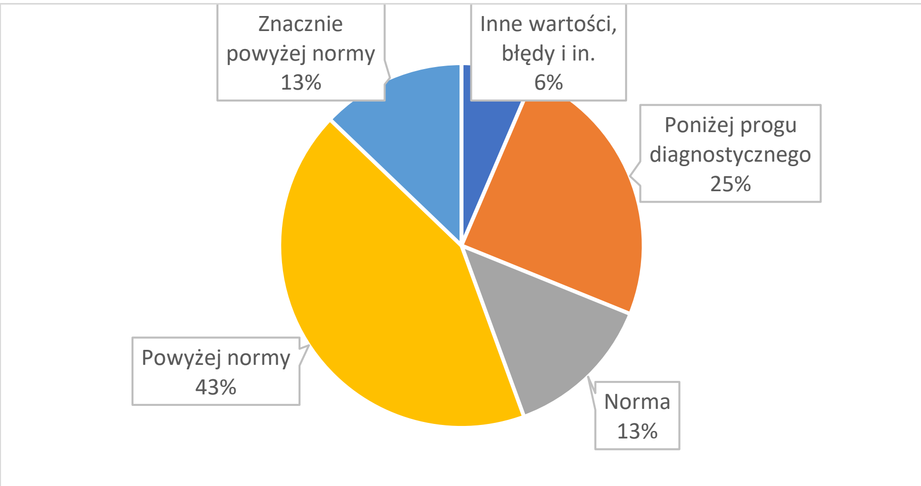

Fig. 10.2. Distribution of troponin T test results (061)

The distribution of cTnT test results compared to universal reference values is presented in **Błąd! Nie można odnaleźć źródła odwołania.**. The results within the universal reference range were obtained in the case of approx. 13% of the total number of tests. As much as 56% of the results were above the cap of the reference values, including 13% classified as significantly abnormal. At the same time, as much as 25% of the results were below the lower limit of the reference values. These results should be interpreted similarly to the results within the reference range, thus, the overall proportion of correct results is approximately 38%.

Proportion of tests with abnormal results as compared to laboratory reference ranges

The lack of testing standardisation for *cTnI* and *hs cTnI* was revealed in the form of discrepancies between the reference values inherited from the literature (so-called universal reference values) and the reference values provided by laboratories with test results. In the case of *cTnI*, approximately 64% of the records containing interpretable data had laboratory reference values indicated. Nevertheless, these values were very different from so-called universal reference ranges, which undermines the credibility of the observations based on them. The situation was similar for *hs cTnI* – 71% of interpretable results were provided with laboratory reference values. The situation was different for *cTnT* ; out of 75% of results with laboratory reference values, only less than 1% were different from the universal values.

Hence, it was decided that in the case of *cTnI* and *hs cTnI*, an analysis would be performed using the given laboratory reference values. For cTnT, such additional analyses were not necessary.

As a result of this repeated analysis, it was observed that the percentage of above normal results in the sample of cTnI tests was approx. 25% in total, while during the analysed years, the average percentage amounted to 24% for women and 27% for men. The differences between voivodships and the years in which the tests were performed, however, were still quite significant. Out of approx. 70,000 registered tests, there were between 22.3% and 34.2% of the results above normal observed in women, and between 20.2% and 34.8% in men.

As for the *hs cTnI* tests, the proportion of abnormal results totalled approx. 48%, i.e. a half more than in the case of the reference ranges considered as universal (see above). During the observation years, about 50% of the results on average were abnormal in women and about 10-15 percentage points less in men.

Proportion of individuals with abnormal results

The proportion of people who had troponin levels tested in a given year and obtained an abnormal result was calculated in relation to the laboratory reference values for *cTnI* and *hs cTnI* and to the universal values for cTnT.

In the case of *cTnI*, this percentage averaged between 20% and 35% over the considered period. In particular voivodships, this percentage varied considerably, but it was mainly due to a very small number of observed tests and hence, their considerable range.

In the case of *hs cTnI*, tests with provided laboratory reference values were recorded only in 2 voivodships. In the analysed period, the proportion of patients with abnormal results in these voivodships was strongly diversified: in the Małopolskie Voivodship, 70% of the women's results were abnormal, while in the Wielkopolskie Voivodship – only 30-40%. In the Małopolskie Voivodship, 40-46% of the results were abnormal in men, and in the Wielkopolskie Voivodship – they were between 18% and 30%.

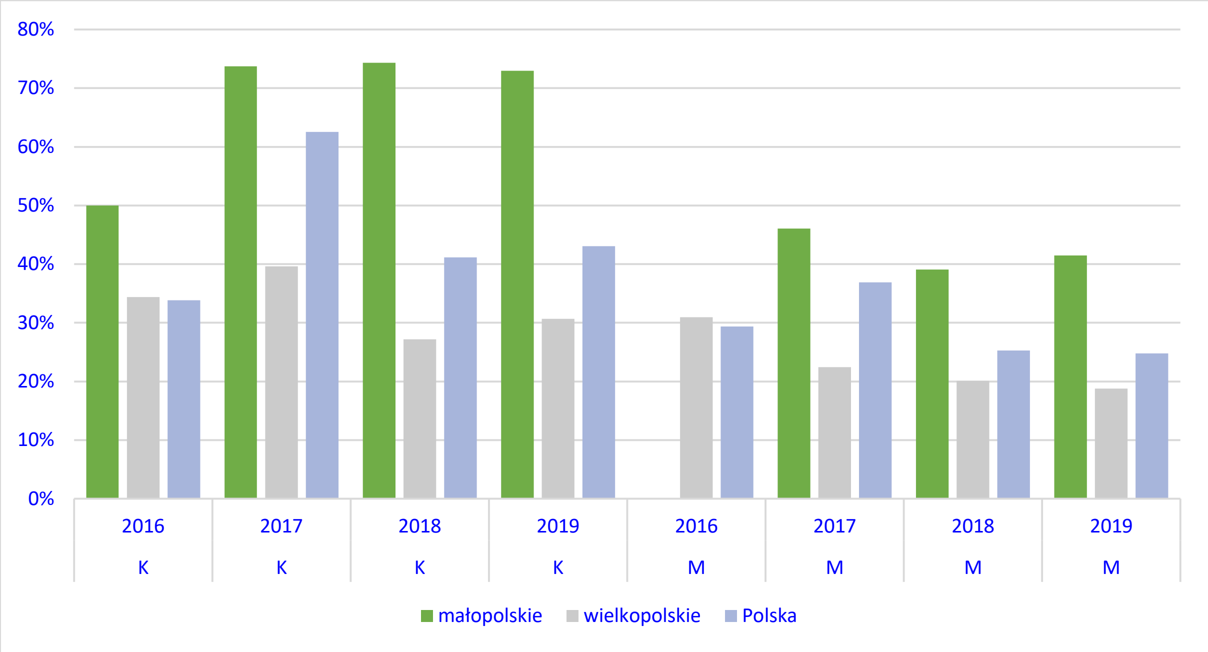

Fig. 10.3 Proportion of patients undergoing hs troponin I (hs O59) testing with abnormal results according to laboratory reference values

Tests measuring the concentration of troponin T (*cTnT*) were the most frequently used tests and, at the same time, the most standardised ones both in terms of testing techniques and the range of reference values. The percentage of people nationwide who obtained an abnormal result in this test at least once a year averaged 85-86% during the analysed period (**Błąd! Nie można odnaleźć źródła odwołania.**). What is worth noticing are the surprisingly insignificant differences between voivodships and the individual years analysed in the same voivodship. Slightly larger differences and values fluctuating year after year were observed only in those voivodships where the number of tests and tested patients was counted in dozens, as opposed to those where these values were counted in hundreds and thousands of tests per year.

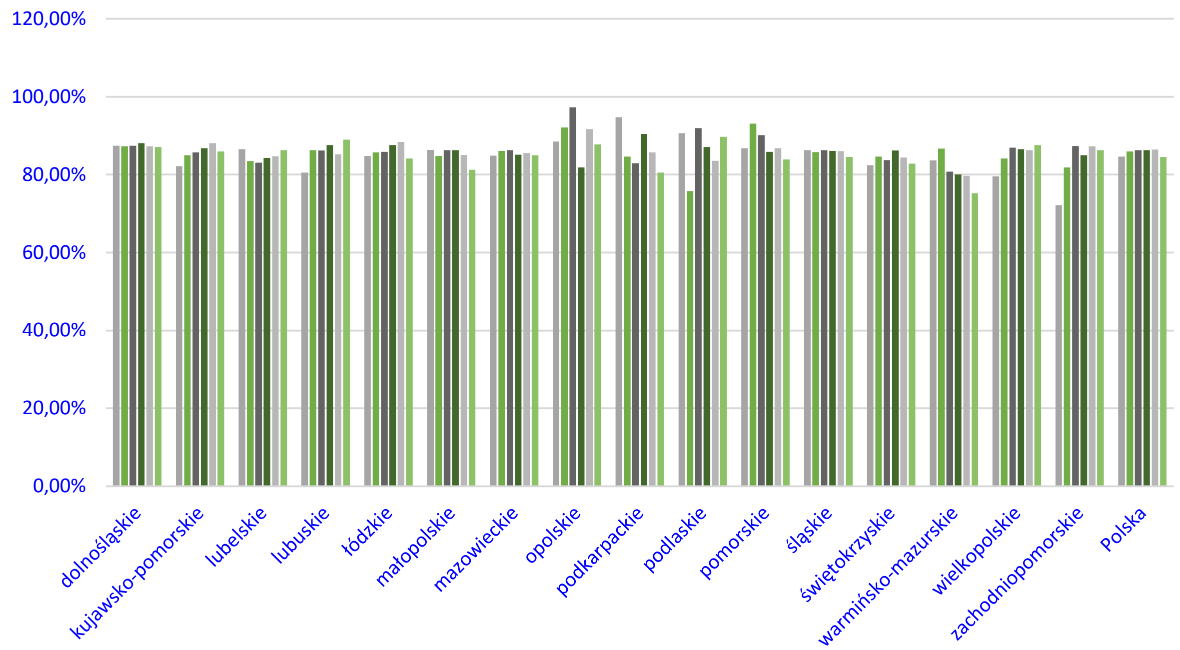

Fig. 10.4. Proportion of patients with an abnormal troponin T test (code O61)

Conclusions

In the report, cardiac troponins (cTnI, cTnT) were assessed as the currently most specific and, at the same time, the most frequently tested biochemical markers of myocardial injury. The laboratories of the *Diagnostyka* Ltd. rarely performed tests of cTnI levels. Moreover, the observed decrease in cTnI tests with a simultaneous increase in high-sensitivity cardiac troponin (hs cTnI) tests may suggest that the former method is being displaced by the latter. In 2018, cTnT concentrations were assayed about 5 times more often that the concentrations of cTnI, and the number of such assays doubled in 2018 compared to 2014.

At the same time, there is a significant difference in the percentage of abnormal results – it is 2-3 times greater for cTnT compared to cTnI in the analysed population. In the available literature, no increase in cTnI levels due to an injury to tissues other than the heart is mentioned[109]. In the case of cTnT, the biochemical data indicate that there is an expression of proteins in the skeletal muscles that are detected with a cTnT assay, which leads to certain

[109] Rittoo D, Jones A, Lecky B, et al., Elevation of cardiac troponin T, but not cardiac troponin I, in patients with neuromuscular diseases: implications for the diagnosis of myocardial infarction. J Am Coll Cardiol. 2014; 63 (22): 2411-2420. 11.

situations where it is skeletal muscles that bring about elevated levels of cTnT[6, 110, 111, 112, 113, 114, 115]. This may be the reason for the observed differences in the frequency of abnormal results regarding troponins I and T. According to the current guidelines, cTnI and cTnT are the preferred bio-markers for the examination of myocardial injury[12, 116], and high-sensitivity assays for cTn (hs-cTn) are recommended to be used routinely in clinical practice[13]. In this analysis, a significant percentage of tests entails troponins still tested with the traditional method, which may indicate suboptimal clinical practice.

In our analysis, troponin results classified as abnormal were observed significantly more often in women. This is in line with the results of studies conducted so far in which the value of the 99th percentile of hs-cTnI was observed to be over two times higher in men compared to women. Furthermore, men had a higher median concentration of hs-cTnI (2.7 vs. 1.8 ng/L, p<0.0001). In the work by Collinson et al., the values of the 99th percentile were 14.8 ng/L for the entire population and 18.1 ng/L and 8.6 ng/L for men and women, respectively[117]. Moreover, one gender-independent value of the 99th percentile was determined for hs-cTnI – 13.5 ng/L[118], [119]. The gender-specific cut-off values are recommended in the Fourth Universal Definition of Myocardial Infarction, but this concept requires further clinical research[13, 15].

In the material under scrutiny, significant differences were found between the voivodships in terms of the number of both troponin I and T tests. What should be investigated in more detail is the relationship between the frequency of these tests and the following factors:

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110 Wens SCA, Schaaf GJ, Michels M, et al., Elevated plasma cardiac troponin t levels caused by skeletal muscle damage in pompe disease. Circ Cardiovasc Genet. 2016; 9 (1): 6-13.
111 Mair J, Lindahl B, Müller C, et al., What to do when you question cardiac troponin values. Eur Heart J Acute Cardiovasc Care. 2018; 7 (6): 577-586.
112 Mair J, Lindahl B, Hammarsten O, et al., European Society of Cardiology (ESC) Study Group on Biomarkers in Cardiology of the Acute Cardiovascular Care Association (ACCA). How is cardiac troponin released from injured myocardium? Eur Heart J Acute Cardiovasc Care. 2018; 7 (6): 553-560.
113 Vestergaard KR, Jespersen CB, Arnadottir A, et al., Prevalence and significance of troponin elevations in patients without acute coronary disease. Int J Cardiol. 2016; 222: 819-825.
114 Schmid J, Liesinger L, Birner-Gruenberger R, et al., Elevated Cardiac Troponin T in Patients With Skeletal Myopathies. J Am Coll Cardiol. 2018; 71 (14): 1540-1549.
115 Apple FS, Jaffe AS, Collinson P, et al., International Federation of Clinical Chemistry (IFCC) Task Force on Clinical Applications of Cardiac Bio-Markers. IFCC educational materials on selected analytical and clinical applications of high sensitivity cardiac troponin assays, Clin Biochem. 2015; 48 (4-5): 201-203.
116 Thygesen T, Alpert JS, Jaffe AS, Chaitman BR, Bax JJ, Morrow DA, White HD, Czwarta uniwersalna definicja zawału serca (Fourth Universal Definition of Myocardial Infarction). Kardiologia Polska 2018; 76, 10: 1383-1415.
117 Collinson PO, Gaze D, Goodacre S, The clinical and diagnostic performance characteristics of the high sensitivity Abbott cardiac troponin I assay, Clin Biochem 2015; 48: 275-81.
118 Abbott ARCHITECT STAT High Sensitive Troponin-I. Brochure 2013. G1-0139/R02.
119 Giannitsis E1, Kurz K, Hallermayer K, Jarausch J, Jaffe AS, Katus HA, Analytical validation of a high-sensitivity cardiac troponin T assay. Clin Chem 2010;56:254-61. Cardiac troponin I appears to be a more specific marker of risk of composite cardiovascular disease and coronary heart disease, whereas cardiac troponin T is more strongly associated with risk of non-cardiovascular disease death. Circulation. 2019; 139: 2754-2764.

a) location of in-hospital laboratories, b) the handling of hospital orders, and c) the frequency of myocardial infarctions in individual voivodships. What was also observed were differences between voivodships in the proportions of patients with abnormal cTnI and hs-cTnI results. It cannot be ruled out that this stems from variations in the frequency of hospital stays due to myocardial infarction in particular voivodships. The least number of MI-induced hospital treatments was observed in the Podlaskie Voivodship – in 2009-2012, it was by a quarter below the national average in men and by nearly a third below the national average in women. The Wielkopolskie Voivodship, on the other hand, saw the highest frequency of MI-induced hospital stays, with the levels exceeding the frequency recorded in Podlaskie in the 2 final years of the observation by nearly 50% in men and by over 80% in women[120].

The results obtained in individual voivodships for cTnT are much more homogeneous than for cTnI, with the differences amounting to approx. 10 percentage points. cTnT is assayed much more often; hence, the quality of test validation is perhaps better. The analytical sensitivity (detection limit) of the individual cTnI and cTnT assays differs by a factor of 10[121]. Since the tests are not standardised, the values obtained with one method cannot be directly compared with the values obtained with a different method and can vary from test generation to test generation[122], even when the same reagents are used on different instruments[123]. It is recommended that cTn values be recorded as integers in nanograms per litre in order to avoid interpretation issues caused by multiple zeros and decimals, which are often the source of inaccuracies[13]. In our material, we have observed different values of troponin results used in laboratories. In the analyses of cTnT values, the percentage of results outside the reference range displays high consistency. In these tests, the results indicate that between 70-90% of the results are abnormal, i.e. the indications to have the test done were accurately identified by the referring doctor. A greater contribution of cTnT can be considered not only as a marker of myocardial infarction but also as a prognostic marker in the population.

[120] Gierlotka M, Zdrojewski T, Wojtyniak B, Poloński L, Stokwiszewski J, Gąsior M , Kozierkiewicz A , Kalarus Z , Wierucki Ł, Chlebus K , Zembala M , Wysocki M, Opolski G, Incidence, treatment, in-hospital mortality and one-year outcomes of acute myocardial infarction in Poland in 2009-2012 – nationwide AMI-PL database. Kardiologia Polska 2015; 73, 3: 142-158.

[121] Apple FS, Sandoval Y, Jaffe AS, et al., IFCC Task Force on Clinical Applications of Cardiac Bio-Markers. Cardiac Troponin Assays: Guide to Understanding Analytical Characteristics and Their Impact on Clinical Care. Clin Chem. 2017; 63 (1): 73-81.

[122] Giannitsis E, Kurz K, Hallermayer K, et al., Analytical validation of a high-sensitivity cardiac troponin T assay. Clin Chem. 2010; 56 (2): 254-261.

[123] Frankenstein L, Wu AHB, Hallermayer K, et al., Biological variation and reference change value of high-sensitivity troponin T in healthy individuals during short and intermediate follow-up periods. Clin Chem. 2011; 57 (7): 1068-1071.

B-type natriuretic peptides

The main diagnostic application of BNP *(B-type natriuretic peptide)* and NT-proBNP (N-terminal B-type natriuretic propeptide) testing is to diagnose left ventricular dysfunction (congestive heart failure, CHF) in patients with symptoms of heart failure[124].

Heart failure typically occurs above the age of 60, but it can be observed in people of all ages, including children and adolescents[125], [126]. B-type natriuretic peptides are involved in the regulation of the sodium balance and the maintenance of cardiovascular homeostasis. They are secreted in the heart ventricles under the influence of volume overload and increased stress on the ventricular wall. Both cardiac natriuretic peptides – BNP and NT-proBNP – reach their maximum secretion due to the cardiomyocytes of an excessively stressed wall of the left ventricle in the course of ventricular dysfunction, which leads to heart failure[127], [128]. Assaying the concentration of natriuretic peptides is helpful in the differentiation of cardiac and non-cardiac causes of dyspnoea, constitutes a prognostic factor for the development of heart failure, and facilitates the monitoring of treatment for this condition. Normal B-type natriuretic peptide levels do not rule out heart disease entirely, but normal or low levels in untreated patients do not include heart failure.

Under physiological conditions, the concentration of B-type natriuretic peptides is higher in women than in men, and increases with age, regardless of sex. Lower values are found in obese individuals. An increased concentration is observed in myocardial infarction, pulmonary embolism, arterial hypertension, renal failure, primary hyperaldosteronism,

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[124] Ponikowski P, Voors AA, Anker SD, Bueno H, Cleland JGF, Coats AJS, Falk V, González-Juanatey JR, Harjola VP, Jankowska EA, Jessup M, Linde C, Nihoyannopoulos P, Parissis JT, Pieske B, Riley JP, Rosano GMC, Ruilope LM, Ruschitzka F, Rutten FH, van der Meer P, ESC Scientific Document Group. 2016 ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure, The Task Force for the diagnosis and treatment of acute and chronic heart failure of the European Society of Cardiology (ESC) Developed with the special contribution of the Heart Failure Association (HFA) of the ESC. Eur Heart J. 2016; 37 (27): 2129-2200.

[125] Niewydolność serca w Polsce – raport 2016 (Heart failure in Poland – 2016 Report). Information materials of the Heart Failure Section of the Polish Cardiac Society.

[126] Balsam P, Tyminska A, Kaplon-Cieslicka A, et al., Predictors of one-year outcome in patients hospitalized for heart failure: results from the Polish part of the Heart Failure Pilot Survey of the European Society of Cardiology. Kardiologia Polska 2015.

[127] Maries L, Manitiu I, Diagnostic and prognostic values of B-type natriuretic peptides (BNP) and N-terminal fragment brain natriuretic peptides (NT-pro-BNP). Cardiovasc J Afr. 2013; 24 (7): 286-9. doi: 10.5830/CVJA-2013-055.

[128] Senni M, Paulus WJ, Gavazzi A, Fraser AG, Díez J, Solomon SD, Smiseth OA, Guazzi M, Lam CS, Maggioni AP, Tschöpe C, Metra M, Hummel SL, Edelmann F, Ambrosio G, Stewart Coats AJ, Filippatos GS, Gheorghiade M, Anker SD, Levy D, Pfeffer MA, Stough WG, Pieske BM, New strategies for heart failure with preserved ejection fraction: the importance of targeted therapies for heart failure phenotypes. Eur Heart J. 2014 Oct 21;35(40):2797-815. doi: 10.1093/eurheartj/ehu204. Epub 2014 Aug 7, PMID: 25104786; PMCID: PMC4204003.

hypoxemia, liver cirrhosis, severe neurological conditions, sepsis, infections, and diseases with concomitant increased cardiac muscle tone[25, 129]. The diagnostic utility of such peptides is believed to be similar, despite the differences in their half-life and clearance mechanisms. NT-proBNP has a longer half-life, more stable levels, and reaches higher concentrations in the blood circulation system. This is a premise for greater reliability of NT-proBNP assays. The concentration range of NT-proBNP used as decision-making values is wider than that of BNP, which may make it difficult to interpret the results of NT-proBNP tests. At the same time, however, NT-proBNP exhibits higher stability and durability in an *in vitro* sample, which is important from an analytical point of view[23, 24, 25, 26].

Number of tests in the population

BNP tests are performed very rarely. The overall number of BNP tests performed in the *Diagnostyka* Ltd. laboratories during the analysed period amounted to 1,300 in 2014 and 6,700 in 2018. NT-proBNP tests are performed several times more often, but they are still rare. In the studied period, the total number of these tests was 3,700 in 2014 and 28,000 in 2018. In the laboratories run by *Diagnostyka Ltd.*, the NT-proBNP tests are performed slightly more often in several voivodships (Zachodniopomorskie, Mazowieckie and Wielkopolskie). In other voivodships, the number of tests is lower, but all of them have seen a noticeable increase in the last few years.

In 2018, which was the year with the highest number of NT-proBNP tests (8,700), the frequency distribution of such tests was analysed by patient age. As was to be expected, the vast majority of tests were performed in seniors aged 60-80. This type of test was also relatively frequent in children; a total of 10% of all tests in 2018 were performed in patients aged 0 to 18. The NT-proBNP test frequency is presented in the chart below **Błąd! Nie można odnaleźć źródła odwołania.**).

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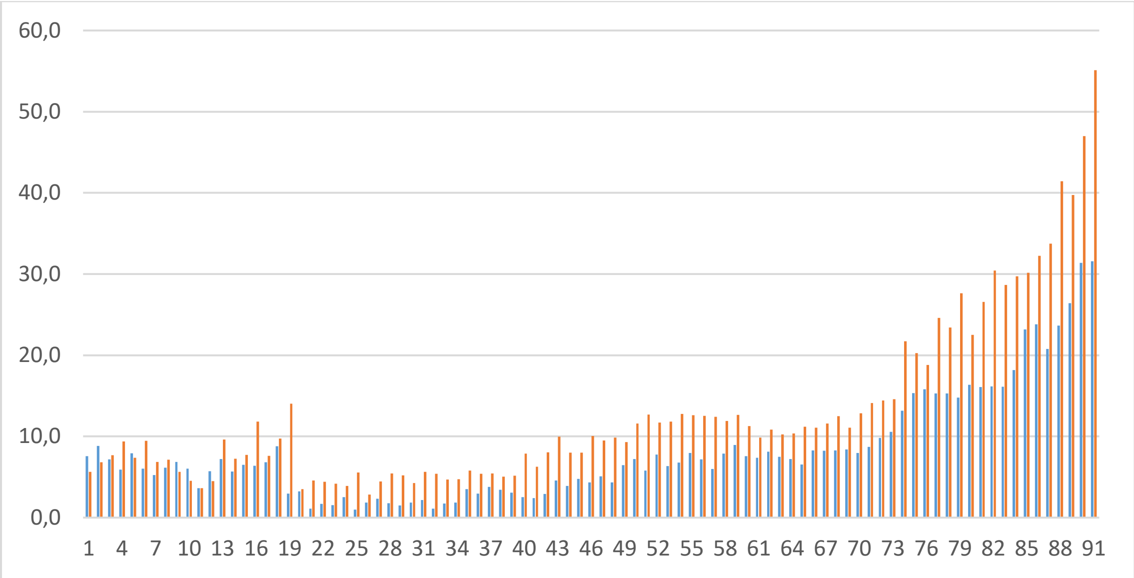


Fig. 10.5. NT-proBNP test frequency rate by age and sex (N24), 2018

In the population of children, this rate fluctuates around 6-7/10^3, and then quickly drops over the age of 20. The frequency rate is the lowest in the population of young people aged 21 to 40, and then it goes up, with the fastest rise starting with the 7^{th} decade of life onwards, only to reach 23.1/10^3 in women and 36.8/10^3 in men (

). Data for the population aged above 90 is lacking due to the insignificant number of people of this age registered in the database.

Table 10.3. NT-proBNP test frequency rate by age and sex (N24), 2018

Age	F (n/10^3)	M (n/10^3)
0-20	6.0	7.3
21-40	2.2	5.1
41-60	6.1	10.8
61-70	7.9	11.6
71-80	14.2	21.5
81-90	23.1	36.8

Proportion of tests with abnormal results

Laboratory reference values were indicated for 61% of the records having BNP test results, with the upper limit of the reference range set at 100 pg/ml. The percentage of abnormal results in the sample of BNP concentration tests in the voivodships with the highest frequency of such tests amounted to 60-65%. The results obtained in these voivodships are rather homogeneous, with the differences reaching only approx. 10 percentage points.

Table 10.4. NT-proBNP (N24) level

Code	Meaning	pg/ml
0	Other values, errors, etc.	%
1	Normal range	<125
2	Above normal	125-220
3	Significantly above normal	221-660
4	Extremely above normal	>660

Source: own materials based on the ECS.

In the case of NT-proBNP tests, which were performed many times more often than BNP tests, 97% of the records had the upper reference value of 125 pg/ml. After being applied, the percentage of abnormal results in the sample of NT-proBNP tests was approximately 80%; in individual voivodships and years, this proportion ranged from 50% to 90%, with lower values being observed in voivodships with less tests (Podlaskie, Podkarpackie, and Opolskie Voivodships).

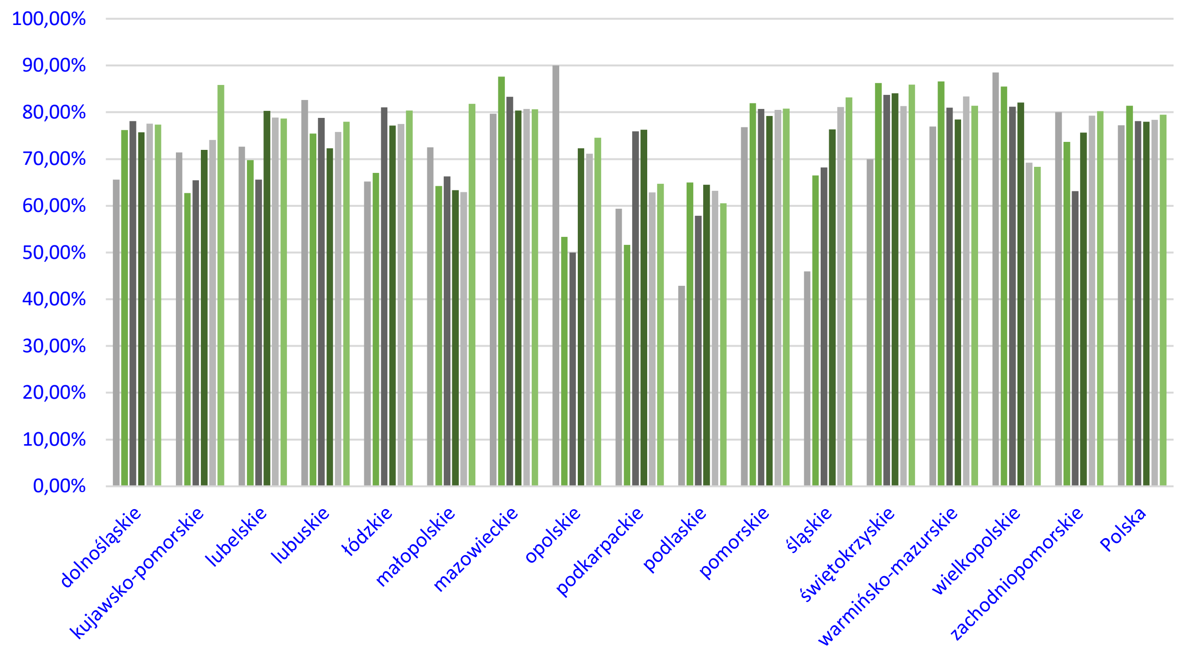


Fig. 10.6. Percentage of NT-proBNP level tests with results outside the norm (N24)

Out of the total number of NT-proBNP tests performed in the laboratories of *Diagnostyka*, approx. 20% of the results remained within the normal range (<125 pg/ml), while the rest were above normal. About 9% were slightly above normal (125-220 pg/ml), another 18% are the results significantly deviating from the normal range (221-660 pg/ml), and more than half are extremely elevated (>660 pg/ml) (**Błąd! Nie można odnaleźć źródła odwołania.**).

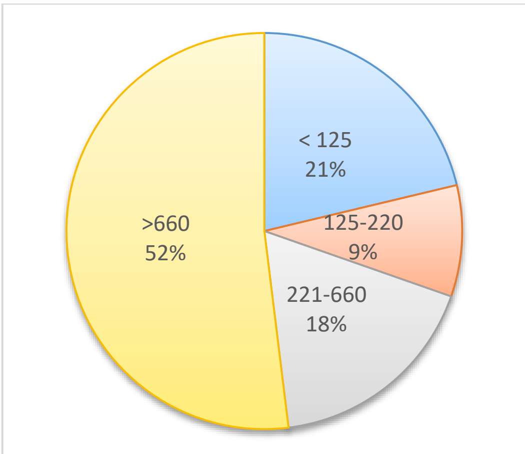


Fig. 10.7. Distribution of NT-proBNP (N24) test results for 2014-2019

Correlation of NT-proBNP results with age and sex

We have analysed the correlations between the *average result category* (ARC) (see: Proportion of tests with abnormal results

Laboratory reference values were indicated for 61% of the records having BNP test results, with the upper limit of the reference range set at 100 pg/ml. The percentage of abnormal results in the sample of BNP concentration tests in the voivodships with the highest frequency of such tests amounted to 60-65%. The results obtained in these voivodships are rather homogeneous, with the differences reaching only approx. 10 percentage points.

) and the age of the subjects. The distributions of ARC values and age are shown in **Błąd! Nie można odnaleźć źródła odwołania.**, below. As can be observed, the values of ARC increase with age within the age range from 20 to 100. In fact, there were a few people over 100 years old in the study group. In patients aged 0-20, there is an inverse correlation; ARC values decrease with age.

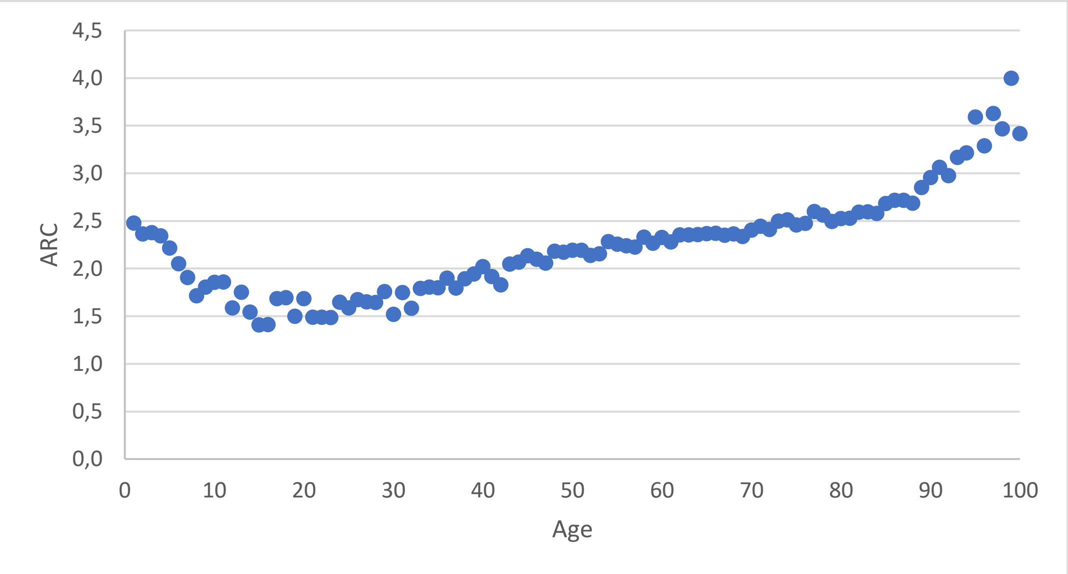


Fig. 10.8. Correlation of ARC and age of a person subjected to NT-proBNP level test (N24)

Pearson's linear correlation coefficient was calculated, determining the level of linear dependence between the mean values (ARC) of the NT-proBNP test result, on a scale from 1 to 4, and age separately for the age ranges 0-20 and 20-100. The coefficient calculated for a narrowed age range from 20 to 100 amounts to 0.94. The coefficient calculated in this age group, separately for men and women, yields the results of 0.94 and 0.93, respectively.

The above coefficient calculated for both sexes in the age group 1-20 yields a negative result (-0.88), which also indicates a strong negative correlation; in this age group, the mean value of the result decreases with age.

Proportion of individuals with abnormal test results

The percentage of people subjected to the NT-proBNP level test nationwide, and obtained an abnormal result at least once a year, averaged 80% during the analysed period. The differences between voivodships amount to 50 percentage points, but they seem to dwindle with time. The lowest percentage of abnormal test results was recorded in the Podlaskie Voivodship, while the highest – in the Świętokrzyskie Voivodship.

Conclusions

Natriuretic peptide tests are still rare and do not have the characteristics of a screening test. Such tests could reveal a potential number of people suffering from the symptoms suggestive of heart failure, because they are now usually ordered for patients with clinical signs of heart failure. However, taking into account the reference population, the percentage of people subjected to natriuretic peptide testing (approx. 0.1%) is low compared to the estimated (approx. 2%) morbidity of heart failure. The reasons why BNP and NT-proBNP tests are so rare include, for instance, the fact that they are not reimbursed and not typically ordered by GPs. Even hospitals still impose certain limitations due to the cost of such tests.

A large percentage of abnormal B-type natriuretic peptide results (80%) of the performed tests may indicate the accurate identification of indications for such tests. NT-proBNP tests are much more common than BNP testing (28,000 compared to 6,700, respectively, in 2018), which may be related to the longer half-life and greater stability of NT-proBNP. The frequency of NT-proBNP testing is also dynamically increasing, while that of BNP tests is deteriorating, which should be considered a positive trend in clinical practice.

There is a differentiation observed between the voivodships, of which the Małopolskie, Opolskie and Śląskie Voivodships predominantly test BNP, while the Zachodniopomorskie and Mazowieckie Voivodships mostly test NT-proBNP. In the Wielkopolskie Voivodship, both BNP and NT-proBNP are tested. In other voivodships, the number of tests is lower, but all of them have experienced a noticeable increase in the last few years.

The highest frequency of NT-proBNP testing has been found in the oldest age groups, which is consistent with the higher incidence of heart failure in the elderly. In the 0-20 age range, the average value of the result decreases with the age of the analysed population, while in the range aged 20 to 100, it increases, which is an interesting observation. In the tests run for healthy patients, the level of BNP is related to sex and age: it increases with age and is higher in women than men[130].

In the years 2014-2018, around 0.1% and 0.1-0.35% of people, respectively, were annually tested nationwide for BNP and for NT-proBNP, respectively, men (by almost 50%) more often than women in both cases. This is consistent with the international analyses that show a lower incidence of heart failure in women than in men of all ages[131].

Red blood cell (RBC) count and haemoglobin (Hb) concentration

The RBC test tells us the number of red blood cells per unit of blood volume. The RBC test is one of the most frequently performed tests in laboratory diagnostics. In most cases, the test is run without any specific indications as part of a routine blood panel. In the analysed sample of laboratory data, there were 20.97 million data records with RBC results.

Similarly to RBC, testing the level of haemoglobin, a protein contained in the erythrocyte, is one of the basic parameters assayed in blood counts. This test shows the amount (weight) of haemoglobin in a unit of peripheral blood volume. In the analysed sample of laboratory data, there were even more haemoglobin test results than the RBC results, i.e. 21 million.

Deviations from the norm in both types of tests may be due to numerous reasons/ These are typically temporary reasons such as dehydration, chronic hypoxia (smoking or staying at high altitudes), hyper-hydration, major bleeding (e.g. heavy menstrual bleeding), pregnancy, and anaemia. On the other hand, the results may be a harbinger of rare and serious diseases, e.g. chronic respiratory failure, and in the case of RBC – also polycythemia vera or bone marrow damage.

Table 10.5. Peripheral blood erythrocyte count (RBC) and haemoglobin concentration, universal reference values

[130] Redfield MM, Rodeheffer RJ, Jacobsen SJ, Mahoney DW, Bailey KR, Burnett JC, Plasma brain natriuretic peptide concentration: impact of age and gender. JACC 2002; 40 (5): 976-982.
[131] Mehta PA, Cowie MR, Gender and heart failure: a population perspective. Heart. 2006; 92 Suppl 3 (Suppl 3): iii14-8. doi: 10.1136/hrt.2005.070342.

		RBC (count/μl)	Hb (g/dl)	Hb (Mmol/l)
	MEN	4,200,000-5,400,000	14-18	8.7-11.2
	WOMEN	3,500,000-5,200,000	12-16	6.9-8.8

Number of tests in the population

The total number of RBC (*red blood count*) tests almost doubled over the analysed time-frame from 2.2 million in 2014 to 4.3 million in 2018. The frequency of these tests in relation to the reference population was high and increased year by year, reaching 0.6 per person nationwide in 2014 and 0.8 per person nationwide in 2018. At the same time, there were significant differences in the test frequency rate (even by a factor of 5) between the voivodships. In the Lubuskie and Opolskie Voivodships, there were 0.1-0.3 of a test per person per year, while the Łódzkie, Kujawsko-pomorskie, and Mazowieckie Voivodships saw 0.9-1.2 tests per person.

Over the time period observed, the number of blood haemoglobin tests was very similar to that of the RBC, ranging from 2.2 to 4.3 million. In the following years 2014-2018, this number grew dynamically. (Nationwide, it was 0.6-0.8 per person.) As in the case of RBC, what is particularly noteworthy are the differences between voivodships (even by a factor of 4 or 5).

The similarities in the frequency of both types of tests derive mainly from the fact that they are usually ordered together in the blood count panel, without distinguishing between indications. The inter-voivodship differences in the frequency rate may, in turn, be caused by the structure of facilities cooperating with the diagnostic company, as well as regional differences in the clinical practice of referring doctors. The number of both types of tests performed in women is almost twice as high as among men. However, this is a trend for all types of tests, hence the frequency rate in the reference population is similar.

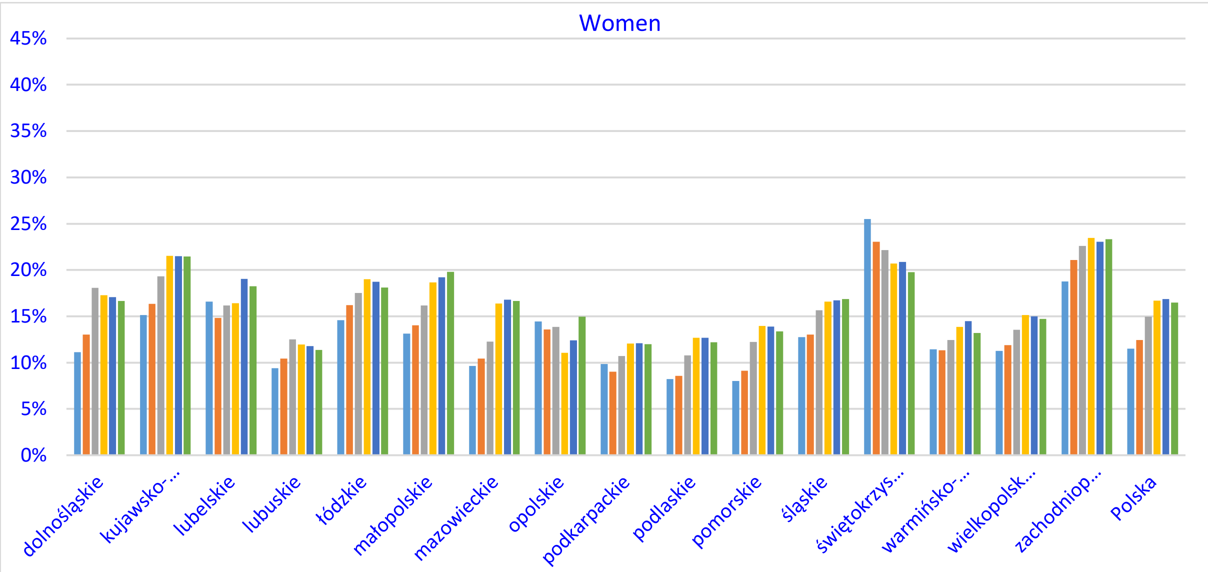
Proportion of tests with abnormal results

When comparing the test results to the universal reference values in the analysed period, it can be observed that the percentage of abnormal RBC results (below or above normal) within the sample remains on average at a constant level of 29%, with a slight decrease in women (from 32% to 30%) and a slight increase in men (from 25% to 27%). The vast majority of abnormal results were below normal.

In the case of haemoglobin concentration, the proportion of abnormal test results was approx. 21% among women and 38% among men. The vast majority of abnormal results were below normal (97% on average among women, 98% on average among men).

There is a large discrepancy between the reference values provided by laboratories and those presented as universal (**Błąd! Nie można odnaleźć źródła odwołania.**). For both RBC and haemoglobin concentrations, nearly all (over 99%) data records had laboratory reference values. Therefore, a more accurate picture of deviations from the norm can be obtained by comparing the results of individual tests to these values. For both types of tests, approx. 60 different sets of reference values in the form of lower and upper values of the laboratory norm were registered. The proportion of deviations from the norm was calculated against these 60 (x2) values.

RBC test results compared to laboratory reference values are substantially different from RBC test results compared to the universal values. Overall nationwide in 2014-2018, abnormal results in women were recorded on average in 12.4% to 16.5% of tests. A similar although faster increase was recorded in men, who, during the same years, saw an increase in the proportion of abnormal results from 16.6% to 28.2% (**Błąd! Nie można odnaleźć źródła odwołania.**).



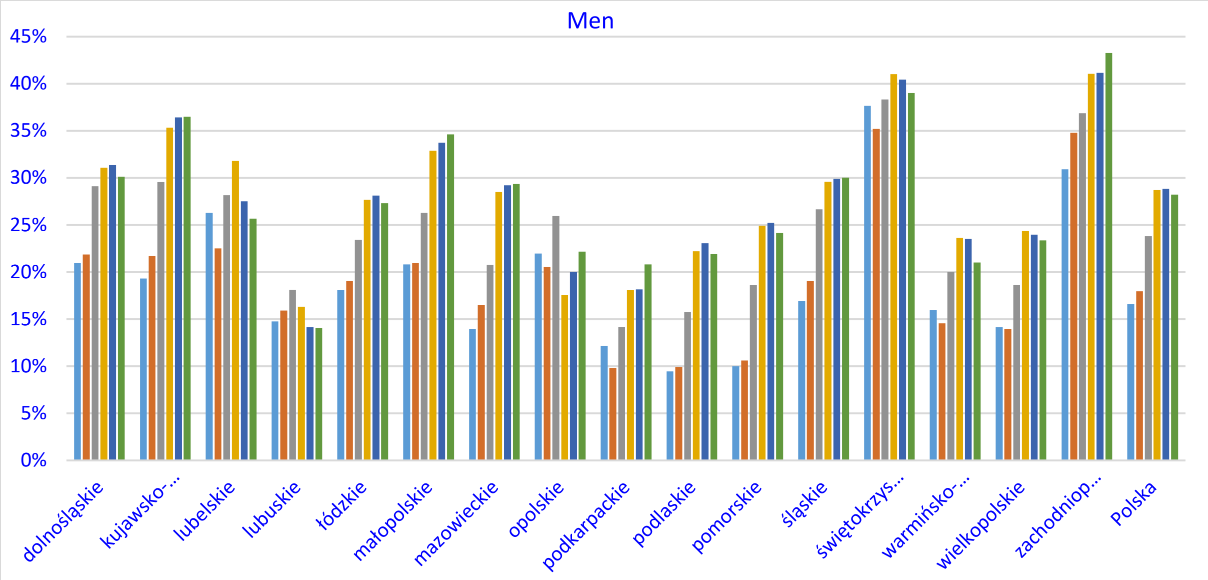


Fig. 10.9. Percentage of abnormal results in the RBC test, in women and men, in 2014-2019

The results differed significantly between the voivodships. Due to the sample size of tens and hundreds of thousands of people, it is difficult to conclude whether these differences stem from random selection of patients or not.

In the case of blood haemoglobin, the trends are different from those concerning RBC. The overall percentage of abnormal results in 2014-2018 dwindled; from about 20% to 12% in women and from about 25% to 23% in men.

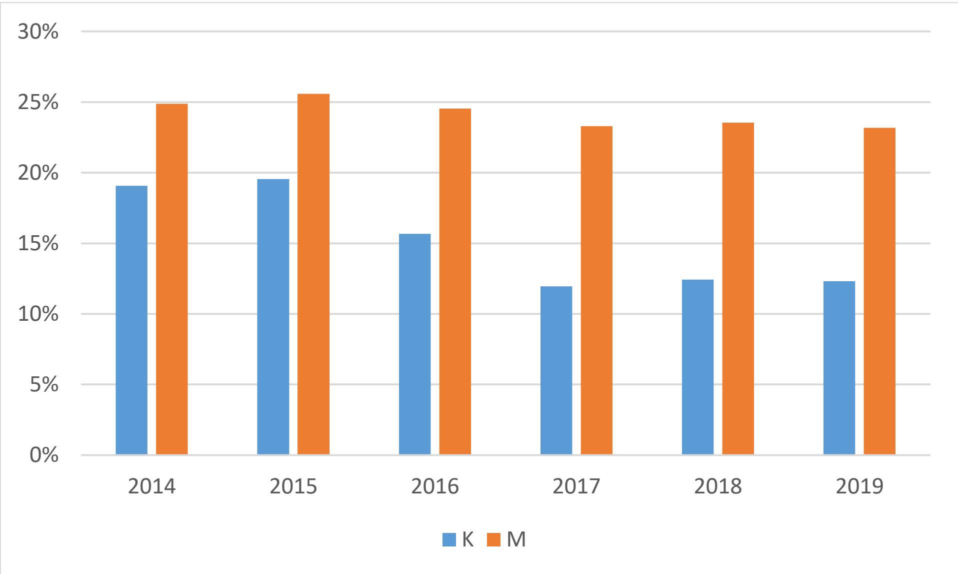


Fig. 10.10. Percentage of abnormal results in the haemoglobin concentration test, in women and men, in Poland, in 2014-2019

Proportion of individuals tested annually

In the analysed period, the total number of patients who underwent RBC tests almost doubled, from 1.5 million in 2014 to 2.8 million in 2018 (from 957,000 to 1.7 million in women and from 628,000 to 1.1 million in men). The proportion of individuals tested on RBC in the so-called reference population was similar among men and women and soared from 42% in 2014 to 50% in 2018. At the same time, very significant differences can be observed between the voivodships in terms of the percentage of individuals tested from this population. In the Lubuskie Voivodship, for instance, it was 10-20%, and in Podlaskie – 75-85%. It should be mentioned that the size of the sample in all voivodships is reliable, and on average there are 1.5 such tests per patient.

Proportion of individuals with abnormal results

The percentage of RBC patients with at least one abnormal result during the studied time period rose from 2014 to 2018: from 10.4% to 14.4% in women and from 11.2% to 22.6% in men. On average, the highest percentage was recorded in the Zachodniopomorskie Voivodship (20% in women and 32% in men), and the lowest in the Lubuskie Voivodship (less than 10% in women and approx. 11% in men).

As for the concentration of haemoglobin in blood, the trend was reversed; the proportion of individuals who obtained an abnormal result at least once a year dropped from approx. 15% to 10% in women and from approx. 19% to 17% in men.

Conclusions

RBC and haemoglobin concentration tests are one of the most prevalent diagnostics, and both the number of tested patients and the test frequency rate in a population per year increased (from 0.6 to 0.8 per person), with twice as many tests run in women as in men. At the same time, large differences were observed between the voivodships, which may suggest regional differences in the clinical practice of doctors or in the structure of facilities cooperating with the diagnostic company.

The dominant portion of the records concerning these two types of tests included laboratory reference values which differed from the universal reference values and encompassed several dozen different upper and lower limits of the reference range. The abnormal results of these two tests were seen more often in men than in women, which may indicate that men are tested more frequently once they show clinical symptoms. With regard to laboratory norms, during the follow-up period there was an increase in the percentage of patients with at least one abnormal RBC result in both sexes, with significant differences between the voivodships, and a decrease in this percentage in the case of haemoglobin testing.

Due to the common and unspecific indications for these two tests and the lack of clinical data, the test results derived from the analysed set cannot be used to infer any conclusions about the health of the population, but it is possible to conclude about the large differences in routine clinical practice between the Polish voivodships and the likely differences in indications for ordering these tests in individual regions.

Lipid profile

Various cholesterol fractions and triglycerides are fatty substances necessary for the proper functioning of the human body. They are produced in the liver (endogenous) or supplied with food (exogenous). Cholesterol and triglycerides exist in the body in free form and bound to proteins as lipoproteins: HDL (high-density lipoproteins), LDL (low-density lipoproteins), VLDL (very-low-density lipoproteins), IDL (intermediate-density lipoproteins), and chylomicrons. Non-HDL cholesterol, calculated as the difference between total cholesterol and HDL cholesterol, is the fraction representing all atherogenic lipoproteins in the body (chylomicrons, VLDL, IDL, and LDL), which also contain triglycerides, with the largest proportion found in chylomicrons (even as much as 85-90%).

The term ‘triglycerides’ in laboratory diagnostics means esters formed from glycerol and fatty acids, which are the basic building block of adipose tissue. The level of triglycerides is most often tested as part of the lipid panel test (lipid profile), and elevated triglyceride levels (above 150 mg/dl) are a risk factor in cardiovascular diseases.

Cholesterol is one of the sterols, i.e. lipid compounds, the fundamental role of which is associated with the production of sex and adrenal hormones, vitamin D3, and bile acids. Cholesterol elevations can be detrimental, as they may lead to the development of atherosclerosis and later to an increased risk of cardiovascular diseases (myocardial infarction, ischemic stroke). In clinical practice, however, its role is limited primarily to risk assessment on the SCORE scale. It may also play a vital role in the diagnosis, monitoring, and prediction of heart and vascular diseases in the absence of LDL cholesterol testing. Results of two of the above parameters: triglycerides and total cholesterol (TC) are presented below.

Number of tests in the population

The overall number of blood triglyceride tests in the analysed period ranged from 1.2 million to 2.0 million in 2014 and 2018, respectively. The frequency of these tests was quite high and gradually increased, mainly in men; across Poland, the number of tests amounted to

0.3-0.4 per person per year. There were very significant differences between individual voivodships. In the Podlaskie Voivodship, women saw about 0.5 test per person per year, while men – about 0.6 test per person per year. What was a significant deviation from the average values was the frequency of triglyceride tests among women and men in the Zachodniopomorskie Voivodship, which did not exceed 0.1 test per person per year.

The total number of TC tests in the period under scrutiny was from 1.5 million to 2.4 million in 2014 and 2018, respectively, which suggests that some of the tests must have been performed outside the lipid panel with triglycerides. The frequency of TC tests is relatively high (although still deviating from the guidelines for the adult population, i.e. once a year); nationwide and in relation to the reference population, the number of tests was 0.4 test per person per year and remained on average at the same level. There were also significant differences between individual voivodships. In the extreme case, the figures differ by a factor of 6; in the Podlaskie, these values reached 0.6 per person per year, while in the Zachodniopomorskie Voivodship – mere 0.1 per person per year.

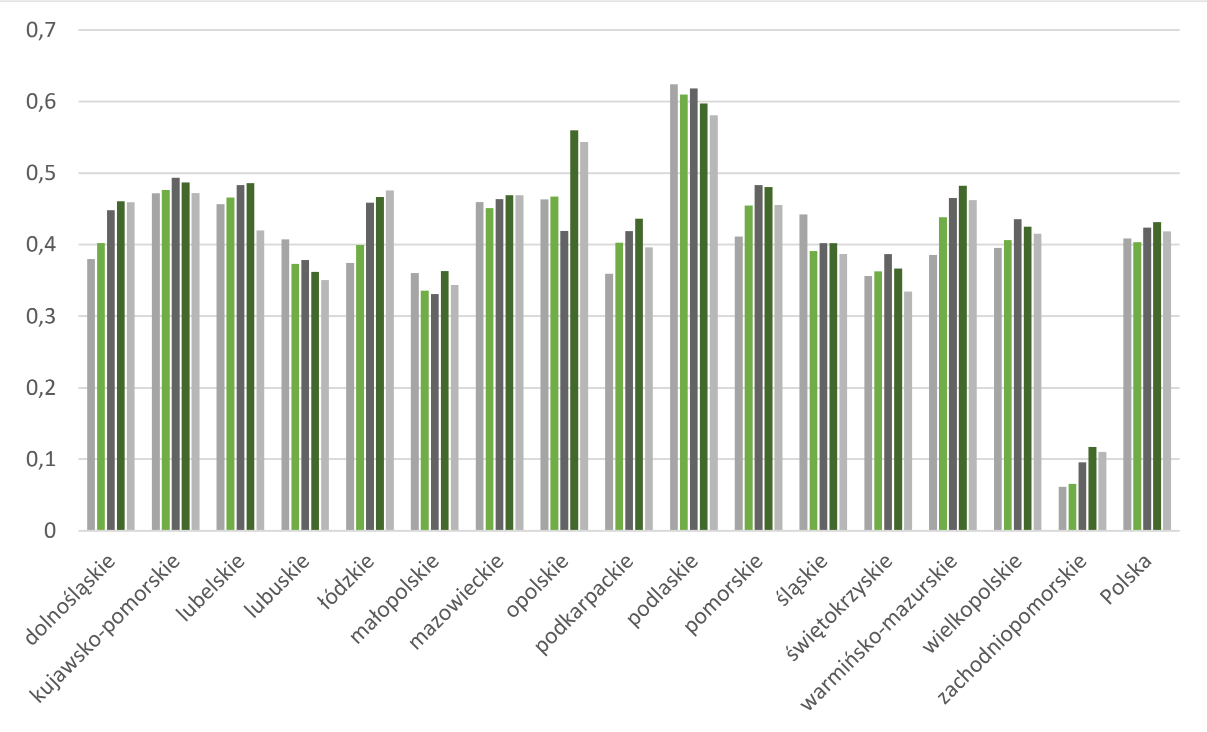


Fig. 10.11. The frequency of total cholesterol testing (code I99), in 2014-2018, per person per year

The frequency of TC tests in the reference population in women was about 10% lower than in men.

Comparing the results to reference values

In the case of triglycerides, the limit of 150 mg/dl (or 1.7 mmol/l) was taken as the universal reference value. The percentage of abnormal results (above normal) according to the universal values remained at a very stable level of about 25% in women and 35% in men. The differences between the regions were scarce; only the Mazowieckie Voivodship recorded the differences of 5 percentage points (pp) below the average. In several voivodships, the rates evolved during the observation period, but this shift did not exceed 5 pp either.

For total cholesterol (TC), the universal reference range was between 114 and 190 ml/dl (3-4.9 mmol/l). The proportion of abnormal results (below or above normal) according to this value in the entire sample of tests was about 60%, which corroborates the previous observations that only a small percentage of individuals in Poland have normal cholesterol results[132, 133]. Out of the tests with abnormal results, approximately 15% were below normal (this group would require a detailed examination of the secondary causes or congenital diseases), and the remaining 85% were above normal. In individual voivodships, this percentage remained at a similar level, with exceptions in the form of high percentages in the Małopolskie and Podkarpackie Voivodships (approx. 95% and 80%). In the remaining regions, the percentage of abnormal results was astonishingly similar and ranged between 55-60%. What is surprising in terms of other available analyses, abnormal results of the tests performed in women were on average 3-5 percentage points more frequent than in men[134].

Of all the triglyceride tests, less than 60% of all the results were provided with laboratory reference ranges to serve as a benchmark for interpretations. This percentage varied across the voivodships; in such voivodships as Opolskie, Wielkopolskie, and Podlaskie, almost 100% of the tests were equipped with the reference ranges. In contrast, in the Podkarpackie and Świętokrzyskie Voivodships it was close to zero, and in many regions it did not exceed 20%. This fact influences the evaluation of the data on the proportion of abnormal results in relation to laboratory normal ranges (see below), because the number of tests that could be compared to the reference values was very small.

[132] NCD-RisC, „NCD Risk Factor Collaboration (NCD-RisC). National trends in total cholesterol obscure heterogeneous changes in HDL and non-HDL cholesterol and total-to-HDL cholesterol ratio (...),” *Int J Epidemiol,* pp. 173-192, 2020.
[133] Ray KK, Molemans B, Schoonen WM, et al., , „DA VINCI study, EU-Wide Cross-Sectional Observational Study of Lipid-Modifying Therapy Use in Secondary and Primary Care: the DA VINCI study„” *European Journal of Preventive Cardiology* , 2020.
[134] NCD Risk Factor Collaboration (NCD-RisC)., „ Repositioning of the global epicentre of non-optimal cholesterol.,” *Nature.,* 2020 Jun;582(7810):73-77. doi: 10.1038/s41586-020-2338-1.

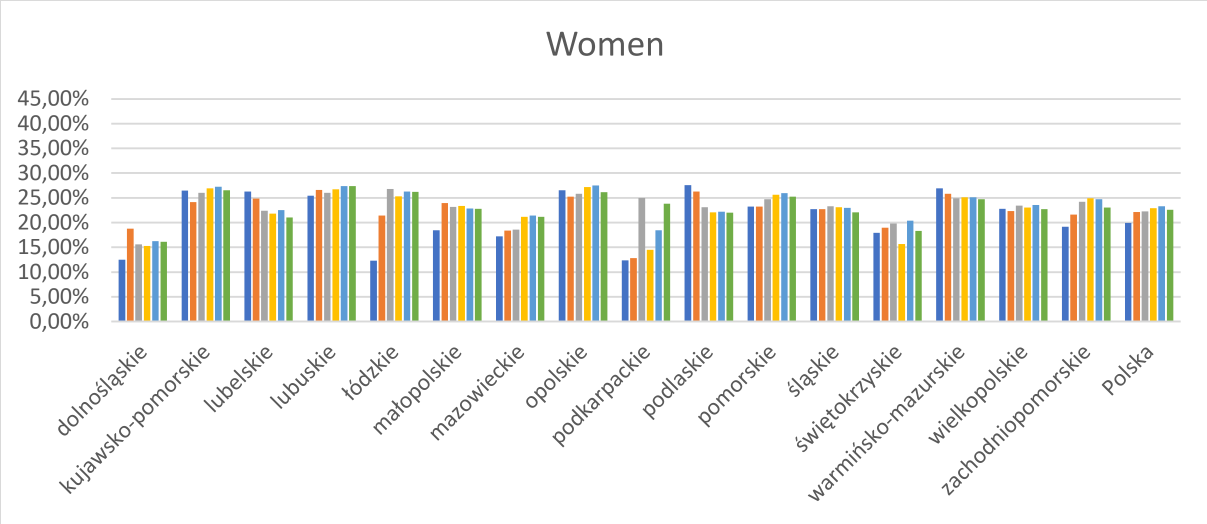
In the case of total cholesterol tests, more than 93% of all the results were provided with laboratory reference ranges. This percentage was homogeneous in individual voivodships; in many of them, it was close to 100%. Only in the Śląskie and Zachodniopomorskie Voivodships this percentage was consistently lower; between 65% and 80%.

Proportion of tests with abnormal results as compared with the laboratory reference ranges

In the case of triglycerides, the percentage of results above normal according to laboratory reference ranges was much less stable than the one compared to the universal reference ranges. Nationwide, it approximately averaged 20% in women and 33% in men, which is higher than in the NATPOL2011 study in terms of the number of patients with hypertriglyceridemia; 14.5% and 27.7%, respectively [135]. The regional differences were significant. Additionally, some voivodships recorded sudden jumps in the value year by year (e.g. in Podkarpackie).

It should be emphasised that in some voivodships, e.g. Podkarpackie, Świętokrzyskie, or Zachodniopomorskie, the number of test results containing laboratory reference values within the record is very insignificant, which may lead to a significant fluctuation of the results (**Błąd! Nie można odnaleźć źródła odwołania.**).

[135] Zdrojewski T, Solnica B, Cybulska B, Bandosz P, Rutkowski M, Stokwiszewski J, Gaciong Z, Banach M, Wojtyniak B, Pencina M, Wyrzykowski B. , “Prevalence of lipid abnormalities in Poland. The NATPOL 2011 survey.” *Kardiol Pol. 2016;74(3):,* pp. 213-23.



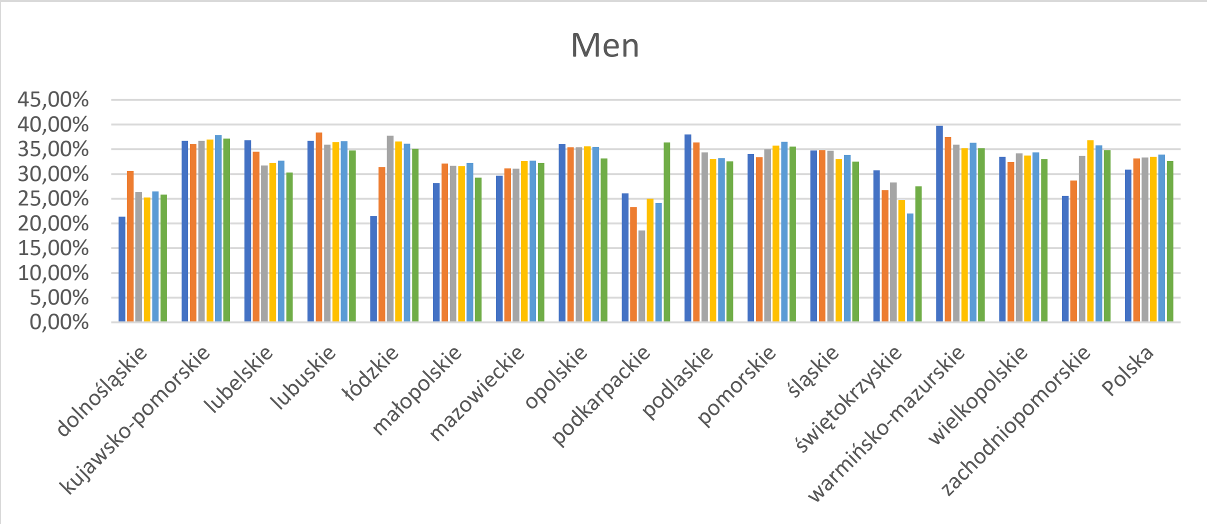


Fig. 10.12. Percentage of triglyceride tests with results above the norm, according to laboratory reference ranges, in 2014-2019, in women and men

In the case of total cholesterol testing, the proportion of results above normal according to laboratory reference ranges in the entire sample of tests decreased from approximately 57% in 2014 to 53.5% in 2019. In individual voivodships, this percentage remained at a similar level. Abnormal results of the tests performed in women were on average 4-5 percentage points more frequent than in men (**Błąd! Nie można odnaleźć źródła odwołania.**).

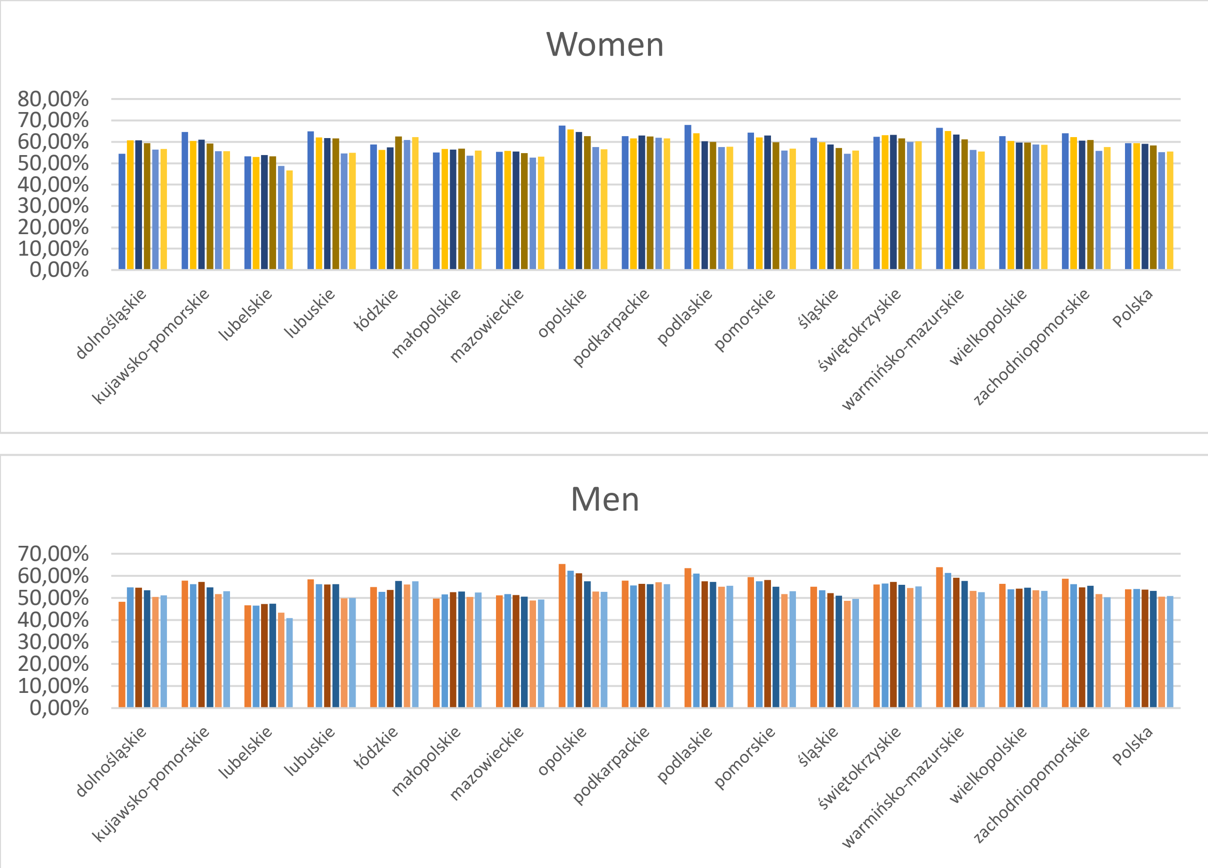


Fig. 10.13. Percentage of TC tests with results outside the norm (code I99), according to laboratory reference ranges, in women and men

Proportion of individuals with abnormal test results

The proportion of individuals who obtained at least one abnormal result per year in triglyceride tests (according to laboratory reference ranges) was approximately 22-23% in women and 32-33% in men. The difference in relation to the percentage of abnormal results interpreted according to the universal reference values was about 2-3 pp on average. The differences between the voivodships reached 5 percentage points (pp).

On the other hand, the percentage of patients with an abnormal TC test result (according to laboratory reference ranges) at least once a year nationwide was between 59% and 54.5% on average, i.e. it was by 2-4 pp. above a similar percentage concerning the tests (not people). In a given voivodship and year, this percentage in women was usually higher by 4 pp than in men. Nationwide and in most voivodships, the percentage of individuals with an abnormal TC result in the subsequent years 2014-2019 gradually decreased, even by nearly 15 pp in certain regions (Opolskie Voivodship).

The reasons for this situation remain unknown; it is possible that there was a gradual improvement in the TC results of the tested individuals (through educational initiatives, lowering the target values according to the guidelines, and more effective treatment); however, it is also possible that there was a change in the structure of the reference population in terms of age and social affiliation (company employees).

Conclusions

Lipid disorders are the most common cardiovascular risk factor; it is estimated that up to 20 million Poles aged above 18 may be suffering from lipid disorders. Large meta-analyses indicate that a difference in total cholesterol of 1 mmol/l is associated with an increased risk of death from ischemic heart disease by 120% in individuals aged 40-49, by 75% in those aged 50-59, by 47% in those aged 60-69, by 27% in those aged 70-79, and by 18% in those aged 80-89[29].

The lipid panel has the characteristics of a screening test[136]. The test is often performed without specific indications, only due to the patient's age and the theoretical risk of cardiovascular diseases. In this context, the observed values may indicate the severity of lipid disorders. Based on the results of the NATPOL study, it was concluded that in Poland hypertriglyceridaemia occurs in 30% of the respondents, more often in men than in women (38% vs. 23%)[30]. In the WOBASZ study, TG elevations were observed in 31% of men and 20% of women[31]. The results of the LIPIDOGRAM 2015 study indicate the occurrence of elevated concentrations of total cholesterol of >190 mg/dl (4.9 mmol/l) in 58% of active primary care patients aged >18 and elevated TG levels of >150 mg/dl (1.7 mmol/l) in 33% of patients[32].

In our analysis, the observed values of TC of >190 mg/dl in the population (59-54.5% in 2016-2018) and TG >150 mg/dl, approx. 25% in women and 35% in men, are extremely consistent with the values presented in the literature [32, 29, 31, 30]. Nationwide and in most voivodships, the percentage of individuals with an abnormal TC result in the subsequent years 2014-2019 gradually decreased (according to laboratory reference ranges in the entire sample of tests it dropped from approx. 57% in 2014 to 53.5% in 2019), even by nearly 15 pp in certain regions. This may be due to the initiatives implemented nationwide for the prevention of cardiovascular diseases as well as the educational campaigns for healthcare employees in the field of effective treatment of lipid disorders.

[136] Solnica B, Sygitowicz G, Sitkiewicz D, Cybulska B, Jóźwiak J, Odrowąż-Sypniewska G, Banach M. , "Guidelines of the Polish Society of Laboratory Diagnostics (PSLD) and the Polish Lipid Association (PoLA) on laboratory diagnostics of lipid metabolism disorders," *Arch Med Sci*, pp. 237-252, 2 Mar 2020 .

Immunoglobulin E

In the field of allergy tests, the number of tests in the database covering the years 2014-2019 (mid-year) was 10.5 million; the number of these tests performed annually rose from 0.8 million in 2014 to 2.6 million in 2018. The number of registered types of tests in the field of allergology alone is over two thousand, of which about a thousand are related to tests on specific antibodies in the IgE class. Some of the available types of tests overlap, because they are carried out within various allergy panels and are assigned different code markings.

The number of patients tested in the Diagnostyka laboratories increased each year, from approx. 156,000 in 2014 to 250,000 in 2018. A significant number – 47% of all patients subjected to allergological testing – included children aged 0-9, and another 12% were children and adolescents aged 10-19. Cumulative data on the specific IgE tests administered to approx. 347,000 individuals in the years 2024-2019 indicate that also children and adolescents have mostly positive results (**Błąd! Nie można odnaleźć źródła odwołania.**).

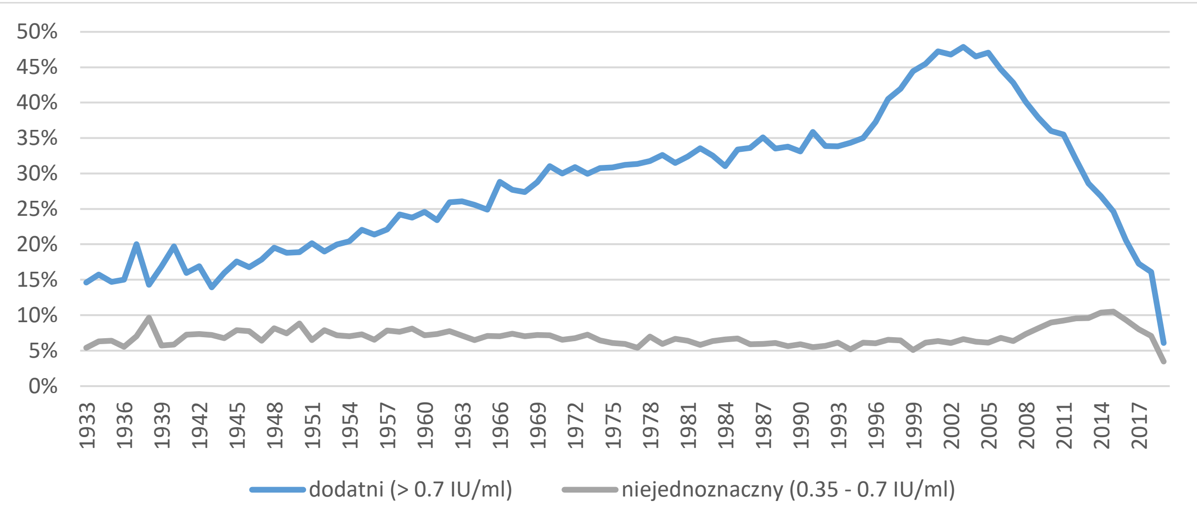


Fig. 10.14. Percentage of people with at least one equivocal test result (0.35 - 0.7 IU / ml) or a positive result (> 0.7 IU / ml) for specific IgE antibodies by year of birth (n = 346.865) (data from 2015-2019)

Within individual age groups, it is possible to trace the frequency of an allergic reaction to specific factors. One such example is the specific IgE testing for *Dermatophagoides pteronyssinus*, which is one of the allergens in the popular 21-allergen test. In this particular case, positive results are more often observed in the male population, especially within the age ranges of 10-17 and 18-24 (**Błąd! Nie można odnaleźć źródła odwołania.**).

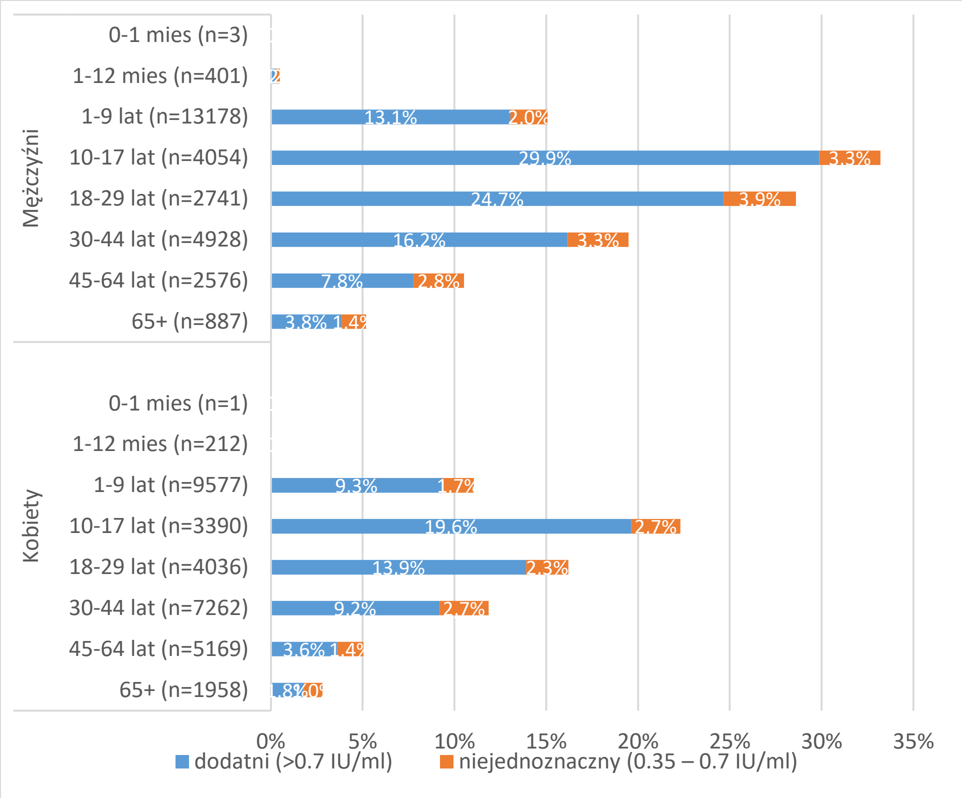


Fig. 10.15. Percentage of positive (> 0.7 IU / ml) and equivocal (0.35 - 0.7 IU / ml) results for specific IgE Dermatophagoides pteronyssinus determinations (in the respiratory panel – 21 allergens) by gender and age (data from 2015-2019)

The scale of readings for total IgE results is presented in the table below (**Błąd! Nie można odnaleźć źródła odwołania.**). The analysis of the results of this test suggests that some patients have very high total IgE levels, which indicates that they probably have serious chronic diseases that are outside the scope of allergology, e.g. systemic conditions or cancer.

Table 10.6. The value of total IgE determinations in age and sex groups (n = 330,890) in Poland in 2015-2019

Sex	Age	N	Mean	Median	SD	min	max
M	0-1 month(s)	80	92.7	83.6	97.0	0.1	562.0
M	1-12 month(s)	10,426	39.4	11.5	154.0	0	5,196.9
M	1-9 yrs	71,002	213.7	54.2	696.9	0.1	38,767.0
M	10-17	16,619	376.7	111.3	1,246.5	0.1	48,687.0
M	18-29	12,324	307.9	75.2	1,603.8	0.1	67,803.0
M	30-44	21,697	217.3	64.0	921.0	0.1	41,930.0
M	45-64	16,126	303.4	75.1	1,249.9	0.1	43,694.0
M	65+	6,983	343.2	78.3	1,455.9	0.1	49,145.0
F	0-1 month(s)	25	36.4	12.0	101.6	0.1	510.1
F	1-12 month(s)	6,504	28.3	10.0	154.7	0.1	6,168.0
F	1-9 yrs	54,670	153.5	34.4	813.7	0.1	72,277.0
F	10-17	16,516	316.9	79.6	1,001.2	0.1	44,074.0
F	18-29	19,985	193.6	50.3	751.6	0.1	37,047.0
F	30-44	34,704	135.7	42.6	410.6	0.1	22,562.0
F	45-64	29,795	178.3	48.4	675.8	0.1	36,253.0
F	65+	13,434	188.4	47.6	700.4	0.1	36,830.0

In the same population (n=346.865) broken down by place of residence, the percentage of individuals with at least one positive result in total IgE tests was calculated. In view of the generally fairly homogeneous proportions of such patients (23-27%), some voivodships stand out unfavourably (Wielkopolskie: 42.7%), and some favourably (Pomorskie, Podlaskie, and Lubuskie) (**Błąd! Nie można odnaleźć źródła odwołania.**). Interpretation of the figures presented is not unambiguous, because the denominator (number of and criteria for test referrals) may not be identical. This issue calls for further research; luckily, the data currently available already provides certain basics.

The obtained results clearly prove that a weakly positive test (range 0.35-0.74 kU/l) for specific IgE is non-diagnostic, which should be factored in when establishing the criteria for the diagnosis of different allergies.

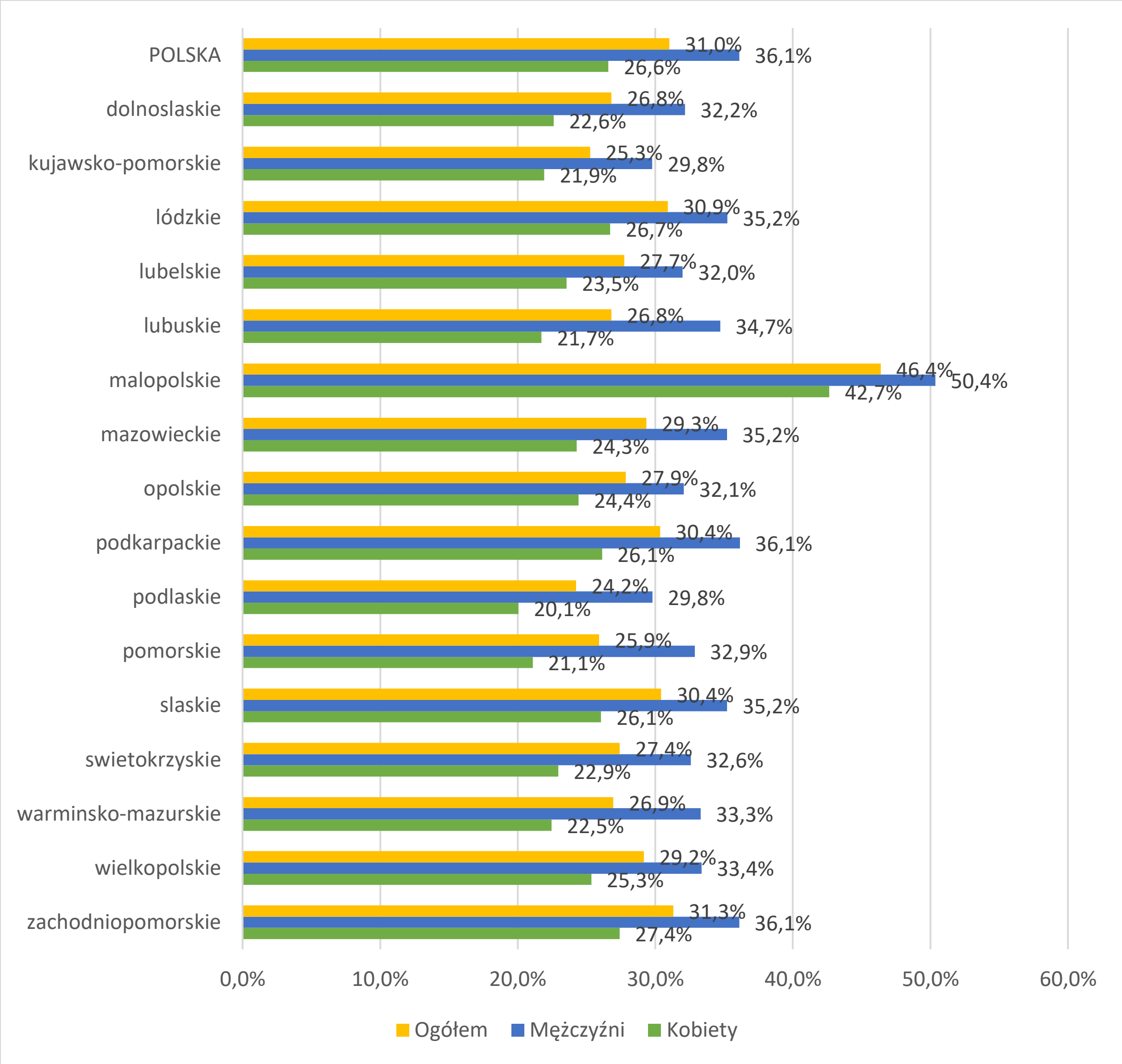


Fig. 10.16. Percentage of people with at least one positive test result (> 0.7 IU / ml) for specific IgE antibodies by place of residence (n = 346.865) (data from 2015-2019

The basic and very important value of the analysed material is the possibility of calculating the frequency of sensitisation to individual allergens; specific ranking of allergens in terms of the incidence of various allergies (**Błąd! Nie można odnaleźć źródła odwołania.**). This type of comparison makes it possible to determine their clinical significance in the population of the entire country, with potential differentiation between individual regions. With such fundamentals, it is possible to build a financing strategy for immunotherapies, evaluate immunotherapy demand, and build diagnostic algorithms in allergy sufferers, taking into account the probability of allergy to individual allergens. What is more, the obtained results make it possible to compare the frequency of specific types of allergies in Poland with those in other countries. This is the basis for potential conclusions about the composition of diagnostic tests and anti-allergic vaccines.

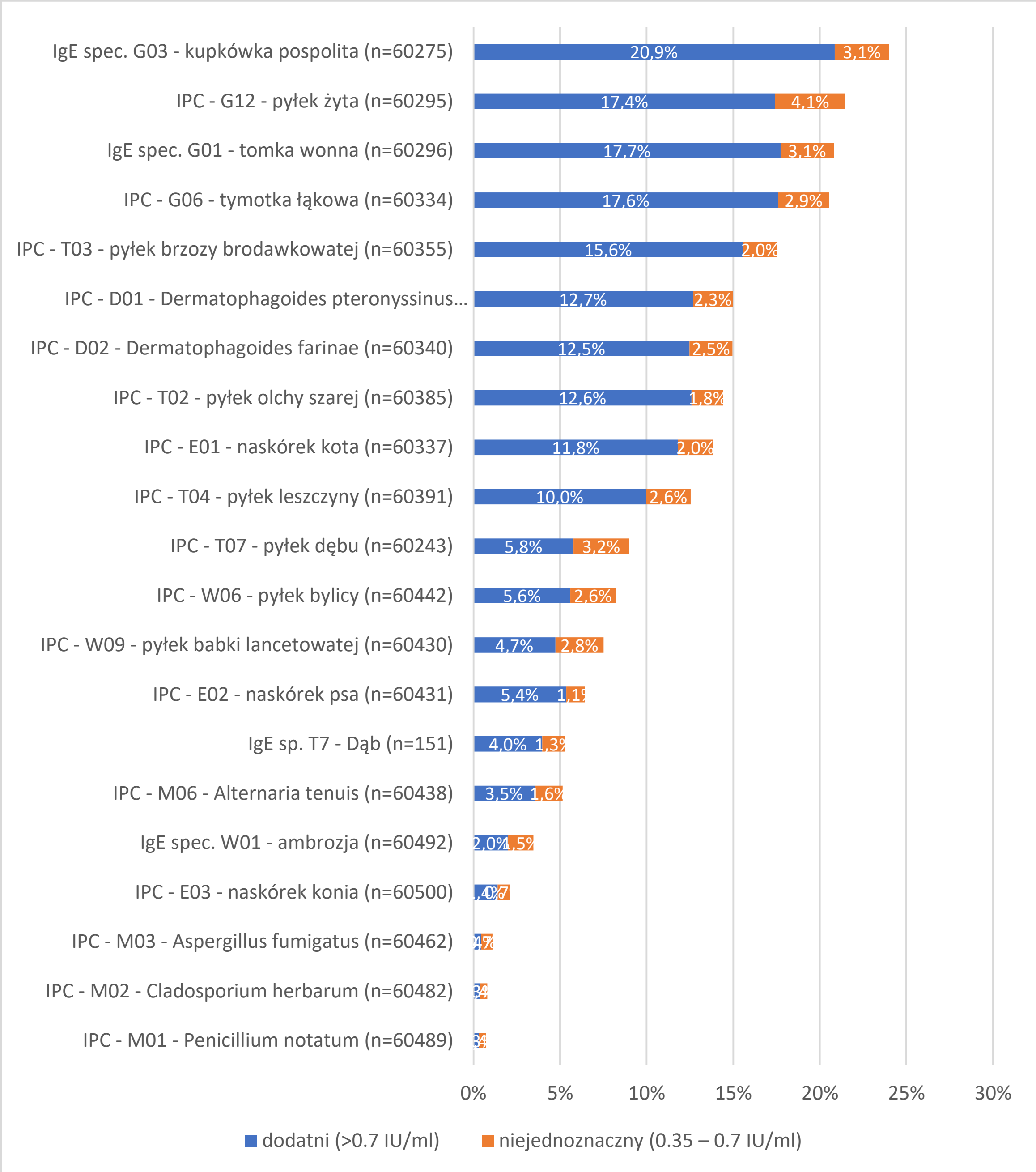


Fig. 10.17. Percentage of positive (> 0.7 IU / ml) and equivocal (0.35 - 0.7 IU / ml) results for individual specific IgE determinations in the respiratory panel (21 allergens) (data from 2015-2019)

Conclusions

The analysed data carry a unique analytical value. They enable the observation of very large groups belonging to the general population. Data is obtained directly from the IT systems of diagnostic laboratories, which reduces errors related to data acquisition and re-entry.

The amount of information available constitutes a significant analytical challenge. The number of registered types of tests in the field of allergology alone is over two thousand, of which about a thousand are related to tests on specific antibodies in the IgE class. Some of the available types of tests overlap, because they are carried out within various allergy panels and are assigned different code markings. In the future, it is necessary to make attempts at standardising the coding method so that it is possible to identify the same allergens within different allergy panels.

The analysis of the ranges of total IgE results suggests that some patients are probably suffering from serious chronic diseases outside the scope of allergology (systemic or oncological). There is an urgent need for systemic solutions that would enable the use of allergological data in the prevention and early diagnosis of diseases assigned to other fields of medicine. One should also consider placing the relevant information in the on-line patient accounts (red flag).

The basic and very important value of the analysed material is the possibility of calculating the frequency of sensitisation to individual allergens (allergen ranking in terms of the frequency of sensitisation) and thus determining their clinical significance throughout the country, with differentiation between individual regions. With such fundamentals, it is possible to build a financing strategy for immunotherapies, evaluate immunotherapy demand, and build diagnostic algorithms in allergy sufferers, taking into account the probability of allergy to individual allergens.

The obtained results make it possible to compare the frequency of specific types of allergies in Poland with those in other countries. This is the basis for potential conclusions about the composition of diagnostic tests and anti-allergic vaccines. What is particularly valuable in the analysed material is the epidemiology of allergies to individual molecules (in the part of molecular diagnostics, so only in some panels). For Poland, this is unique data which has not been recorded so far, especially on such a scale.

The obtained results clearly prove that weakly positive tests (range 0.35-0.74 kU/l) for specific IgE are non-diagnostic, which should be factored in when establishing the criteria for the diagnosis of different allergies.

SUMMARY

The observations presented above are a part of the work carried out under the NIZP-PZH project involving a comprehensive publication on the health situation of the Polish population. The area of laboratory tests has been included in this publication for the first time and on a pilot basis, and serves mainly to explore and test the possibilities of presenting public health phenomena from the perspective of laboratory assays.

As can be seen from the examples discussed above, the primary limitation of the use of laboratory tests to assess population phenomena is the uncertainty about the population to which the data refer. The present study utilises the data of the largest diagnostic company in Poland, which ran tests for approximately 16 million representatives of the Polish population throughout merely 5 years. This number is colossal, and so is the analytical potential behind it, but the basic hindrance is the selection of people for the pool of the population which is neither screening nor randomised. Thus, the tested population is strongly biased, with the trends of this bias being unknown and ambiguous. These trends may differ in time (subsequent years) and regionally (depending on the market served by local laboratories). In this situation, deliberations on most of the cases must adopt a narrow perspective and focus on the phenomena occurring in the population *referred to specific tests,* and not in the general population. The most representative results come from the most common tests performed routinely, often without significant clinical indications, such as blood counts. On the other extreme, there are rare tests with very specific indications, such as natriutetic peptides tests. In this case, it can be safely said that the tests were performed in a population of a specific profile (here: suspected heart failure) and apply only to this population.

To a large extent, data in the field of laboratory diagnostics can inform about the routine clinical practices and differences between such practices occurring in time and between regions. Such analyses and considerations may be useful from the point of view of managing the healthcare system, shaping the method of financing healthcare services, and monitoring the quality of healthcare services both in the public and private system.

The observations presented above are of a preliminary nature, and in the coming months their in-depth and extended versions will be the subject of scientific publications. They substantiate the analytical potential of diagnostic laboratory tests, but also indicate a certain specificity and the need to adapt the analytical apparatus to specific fields and domains.

In the context of e-referral plans, there is a possibility of access to analytical data not limited to the set of one single healthcare company. For this purpose, however, a far-reaching effort should be made to standardise the testing nomenclature, define research methods, and agree on how to present the results in terms of units of measurement (if any) and ranges of reference values. Even within a single company, there were significant problems in this regard, mostly due to the fact that individual laboratories joined the chain at different times and with their own work methodology.

11. SELECTED LIFESTYLE-RELATED HEALTH RISK FACTORS

Anna Poznańska, Daniel Rabczenko, Bogdan Wojtyniak

A number of elements defining our lifestyle, like nutrition, smoking, drinking alcohol or insufficient physical activity, constitute potential health risk factors, which can significantly affect the incidence and course of diseases, and consequently life expectancy. As early as in 1950s, the results of the British Doctors' Study proved an adverse impact of tobacco smoking on the mortality from lung cancer and coronary thrombosis[137]. Further epidemiological studies, conducted in numerous countries, contributed to extending the knowledge of the significance of improper diet, low physical activity or high body weight. It is worth stressing the role of the American Framingham Heart Study, commenced in 1984, in which behavioural risk factors contributing to cardiovascular diseases were identified[138].

Lifestyle is considered to be a factor of greater importance than biological or environmental conditions, or factors related to the operation of the health care system. In 1995 the share of the lifestyle factor in mortality rates was estimated at 54% for cardiovascular diseases, 37% for cancer, and 50% for total mortality[139]. In contrast, the share of biological factors was assessed at 25%, 29% and 20% respectively, environmental/social factor at 9%, 24% and 20%, and the health care system at 12%, 10% and 10% respectively.

The most recent analyses, for 2019, performed as part of the GBD2019 study, point to a similar level of significance of behavioural risk factors, accounting for 49% of deaths from cardiovascular diseases, 37% deaths from cancer, and 38% of all-cause mortality[140]. As regards Poland, the share is higher, and amounts to 52%, 42% and 44% respectively. According to the aforementioned source, risk factors posing the most serious threat to our lives include hypertension, accounting for 22.3% of deaths, tobacco (20.4%, active smoking – 19.1%) and

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[137] *Doll R, Hill AB (1954). The mortality of doctors in relation to their smoking habits. BMJ 328 (7455): 1529-33; doi:10.1136/bmj.328.7455.1529*

[138] *Syed S Mahmood et al. (2014).* ***The Framingham Heart Study and the epidemiology of cardiovascular disease: a historical perspective. The Lancet 383 (9921):999-1008; https://doi.org/10.1016/S0140-6736(13)61752-3***

[139] Badura B. (1995). What is and What Determines Health. (in:) Scientific Foundations for Public Health Policy in Europe. Eds.: Laaser U., de Leeuw E., Stock Ch., Juventa Verlag, Munchen

[140] Institute for Health Metrics and Evaluation, GBD Result Tool, http://ghdx.healthdata.org/gbd-results-tool, accessed on: 16.10.2020

unhealthy diet (20.0%). Behavioural factors, which can be subject to modifications, account for 43.5% of deaths in total, and for 35.8% of disability-adjusted life years (DALY).

In the European Health Report 2018, the World Health Organisation identified tobacco use, alcohol consumption, and behaviour patterns leading to overweight and obesity as major public health problems in the WHO European Region, stressing their importance as major factors contributing to premature mortality from the most frequent non-communicable diseases (cardiovascular diseases, cancer, diabetes, and chronic respiratory diseases)[141].

Bearing in mind the significance of lifestyle for good health, as early as 2004, WHO adopted its Global Strategy on Diet, Physical Activity and Health -— a document outlining recommendations for WHO Member States, concerning measures in the said spheres, chiefly aimed at the prevention of non-communicable diseases[142]. In the following years, a number of detailed plans, guidelines and recommendations were developed concerning, i.e., physical activity[143,144], smoking tobacco[145], the consumption of selected products[146,147,148], or their availability for children[149]. However, the results of the measures which have been undertaken so far are insufficient - the list of the urgent challenges to public health for the next decade, published by the WHO in January 2020, includes protecting people from dangerous products, such as food rich in sugar, saturated fats and salt, tobacco or e-cigarettes[150].

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[141] WHO, Regional Office for Europe (2018). European health report 2018: More than numbers - evidence for all, https://www.euro.who.int/en/data-and-evidence/european-health-report/european-health-report-2018/european-health-report-2018.-more-than-numbers-evidence-for-all-2018, accessed on: 17.10.2020

[142] WHO (2004). Global Strategy on Diet, Physical Activity and Health, Geneva

[143] WHO (2010). Global recommendations on physical activity for health, https://apps.who.int/iris/handle /10665/44399

[144] WHO (2018). Global action plan on physical activity 2018–2030: more active people for a healthier world, Geneva, Licence: CCBY-NC-SA3.0IGO

[145] WHO (2019). WHO report on the Global Tobacco Epidemic, Offering help to quit tobacco use, Geneva

[146] WHO (2010). Global strategy to reduce the harmful use of alcohol

[147] WHO (2016). Fiscal policies for diet and the prevention of noncommunicable diseases

[148] WHO (2016). SHAKE the salt habit. The SHAKE technical package for salt reduction

[149] WHO (2012). A framework for implementing the set of recommendations on the marketing of foods and non-alcoholic beverages to children

[150] WHO (2020). Urgent health challenges for the next decade, https://www.who.int/news-room/photo-story/photo-story-detail/urgent-health-challenges-for-the-next-decade, accessed on: 17.10.2020

In addition to the data from international WHO databases, and the results of surveys conducted by GUS (Statistics Poland), PARPA (the State Agency for the Prevention of Alcohol-Related Problems), and IMiD (the Institute of Mother and Child), the following analysis is largely based on the results of a telephone survey (CATI) on the prevalence of lifestyle-related risk factors of chronic diseases among the inhabitants of Poland. The survey covered a representative random sample of 2,000 people aged over 20. The assumptions behind sample selection were as follows:

1. Maintaining the proportion of persons in each Voivodship in relation to the population of each Voivodship;
2. Maintaining sex and age proportions (20-39, 40-59, 60+) in each Voivodship
3. Maintaining, at the country level, the proportion of inhabitants of rural and urban areas, by gender and age (20-39, 50-59, 60+).

11.1. Smoking tobacco and using electronic nicotine products

In 2019, smoking was the second most important risk factor globally (following high arterial blood pressure)[151]. At a global scale, it accounted for 7.9% (95% CI (confidence interval): 7.2-8.6) of disability-adjusted life years (DALY). In Poland, smoking is the most important risk factor[152], and accounts for 2,060 thousand (95% CI: 1740-2430 thousand) of disability-adjusted life years, which corresponds to 16.3% (14.8-17.9)[153] of the total DALY value.

According to the WHO estimates available in the HFA-DB[154] for 2018, the percentage of smoking men in Poland is slightly higher than the European Union mean, while it is slightly below the average for smoking women (Fig. 11.1, Fig. 11.2). The values amounted to 30.9% for men and 20.2% for women, while the average values for the EU countries were 28.1% and 20.8% respectively, and a range was from 18.5% (Denmark) to 49.1% (Cyprus) for men, and 13.8% (Romania) and 30.0% (Croatia) for women.

[151] Global burden of 87 risk factors in 204 countries and territories, 1990–2019: a systematic analysis for the Global Burden of Disease Study 2019; GBD 2019 Risk Factors Collaborators; Lancet 2020; 396: 1223–49

[152] http://www.healthdata.org/poland , accessed on 09.11.2020

[153] Supplement to: GBD 2019 Risk Factors Collaborators. Global burden of 87 risk factors in 204 countries and territories, 1990–2019: a systematic analysis for the Global Burden of Disease Study 2019. Lancet 2020; 396: 1223–49

[154] https://gateway.euro.who.int/en/datasets/european-health-for-all-database/#life-styles- , accessed on 09.11.2020

Fig. 11.1. Age-standardised prevalence of current tobacco smoking among people aged 15 and over, WHO estimates (%), men (HFA database)

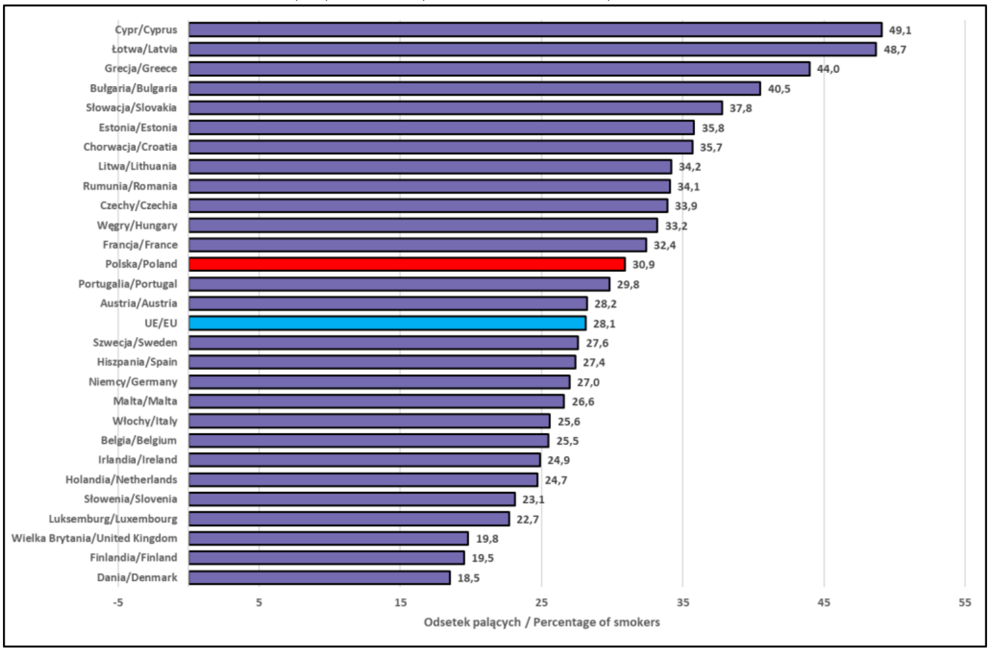
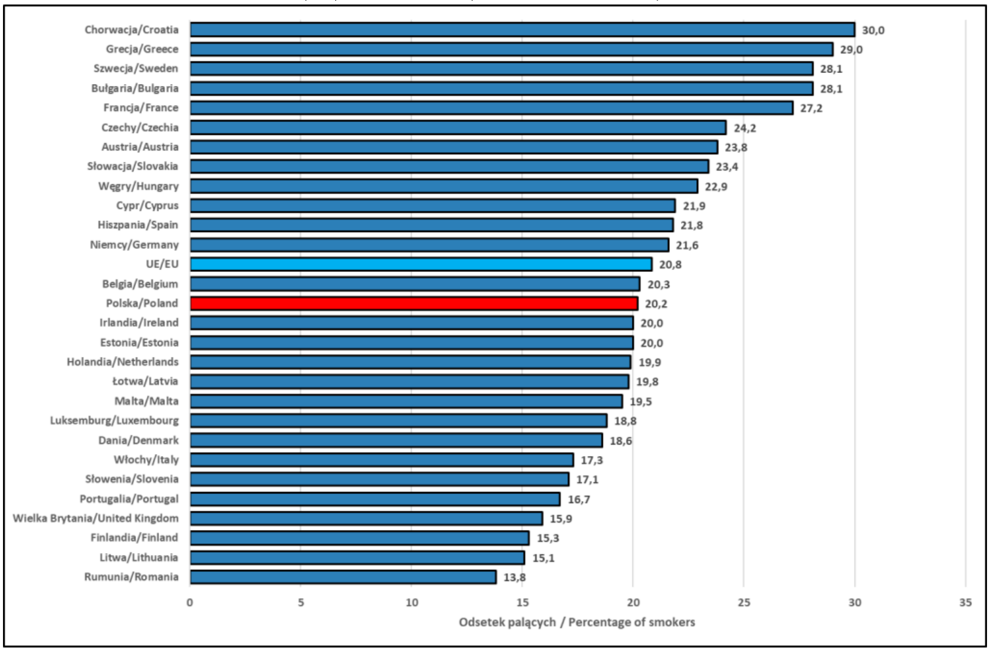


Fig. 11.2. Age-standardised prevalence of current tobacco smoking among people aged 15 and older, WHO estimates (%), women (HFA database)



Despite the fact the tobacco smoking is a well-known serious risk factor, the availability of information on its prevalence in population and its dynamics is substantially limited. Surveys carried out by NIZP-PZH in 2018 and 2020 provided some information in this respect. The surveys differed in methodology, since the telephone interview method was applied in the 2020 survey due to the COVID-19 epidemic, but the cohesion of questions was maintained, which allows the comparison of changes over time. In addition to the forced change to the survey methodology, the COVID-19 epidemic, affecting numerous facets of life, also those related to the prevalence of behavioural risk factors, was surely a factor which could directly impact on the results obtained.

According to the 2020 survey, favourable changes in the prevalence of regular smoking could be observed. The use of traditional tobacco products at least once a day was declared by 23.1% of men, and 14.9% of women, as compared with the values of 27.8% and 23.1% obtained in 2018. It is noteworthy, however, that occasional smoking of tobacco products was declared by 24.5% of men and 21.5% of women. At the same time, a large group of the respondents used electronic substitutes - 10.8% of men, and 7.1% of women. They account for 7.0% and 4.1% of non-smoking men and women, as well as 16.5% and 9.5% of occasional smokers.

The comparison of changes in the prevalence of smoking by age in the male population showed a decline in the frequency of regular smokers of tobacco products in all age groups, except the oldest population (over 70) (Fig. 11.3). In addition, a smaller number of the respondents combined smoking tobacco with electronic substitutes. In all age groups (except those over 70) the percentage of persons using electronic substitutes for tobacco products significantly increased. Changes in the prevalence of smoking among women (Fig. 11.4) had similar characteristics, although it should be noted that almost no changes were found in the group of women aged 50-59, while the share of smoking women aged over 70 has grown substantially.

Fig. 11.3. Change in the prevalence of use of products containing nicotine in Poland by age, NIZP-PZH surveys, men

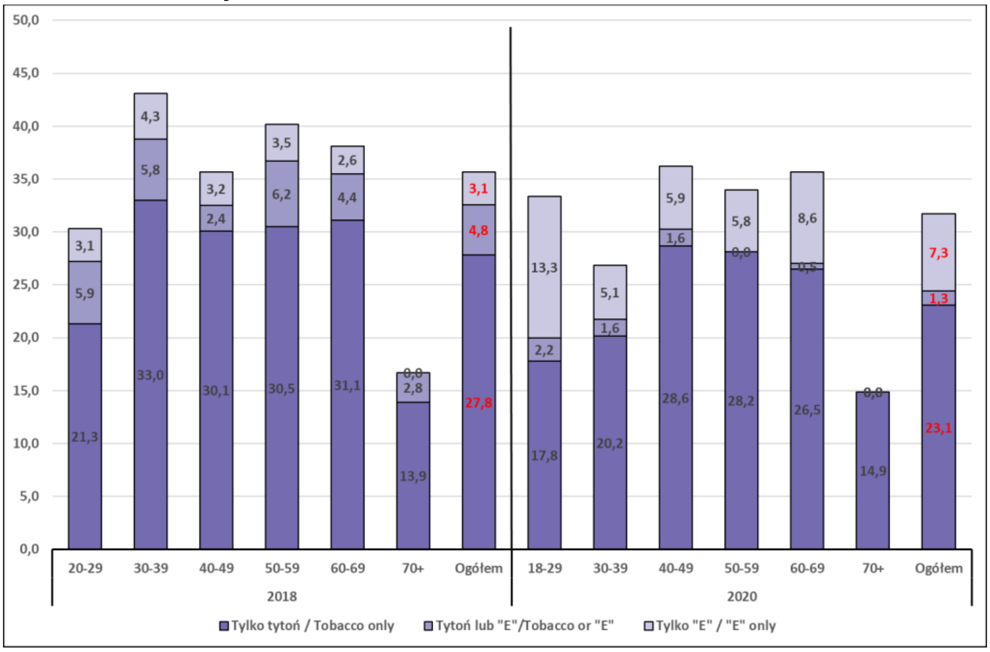
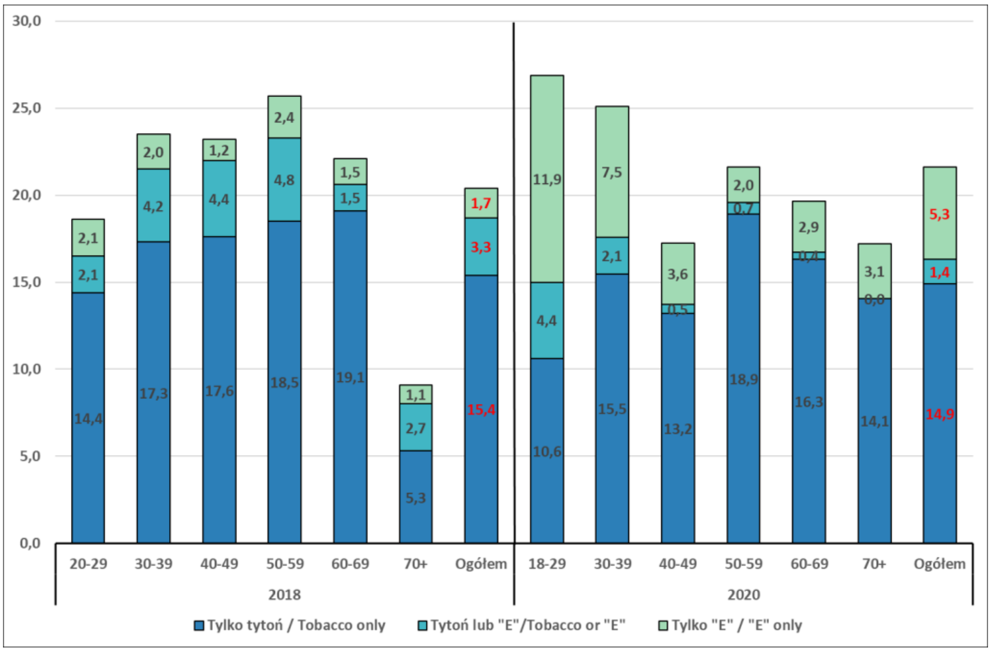
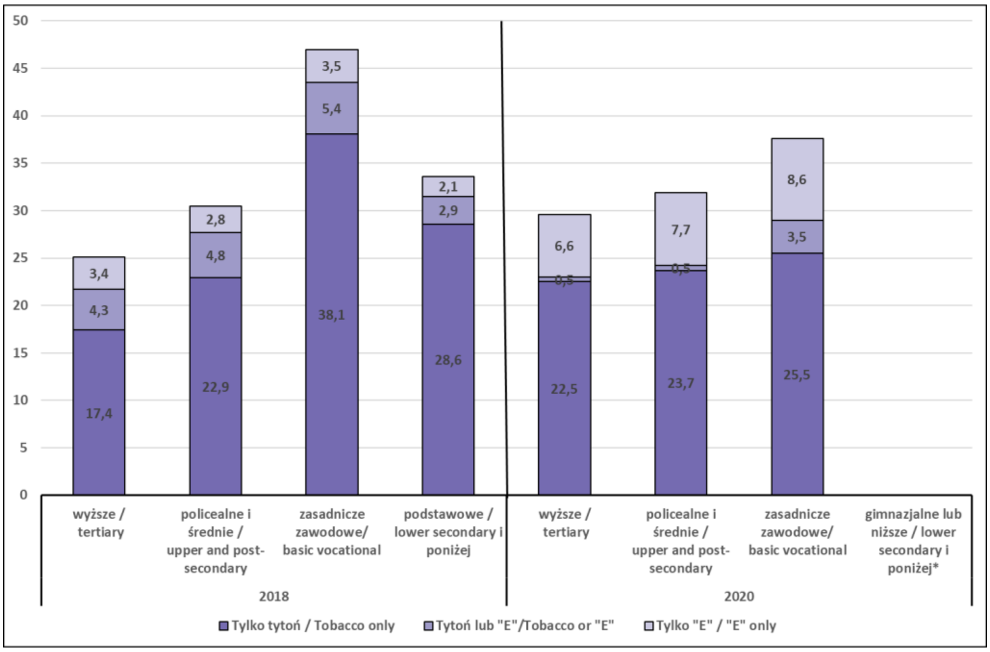


Fig. 11.4. Change in the prevalence of use of products containing nicotine in Poland by age, NIZP-PZH surveys, women



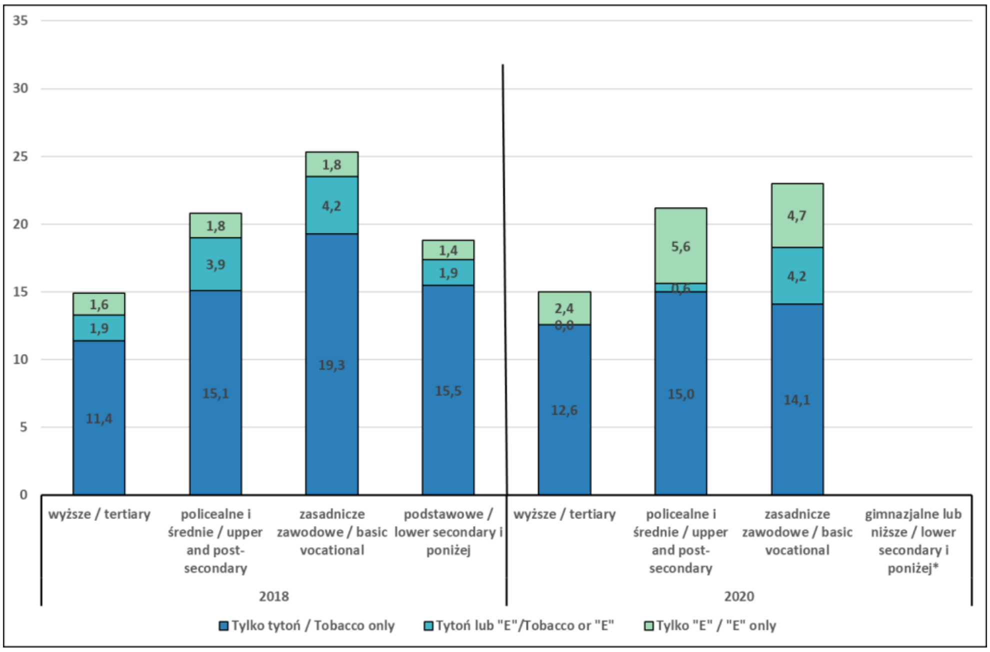
Changes in the prevalence of tobacco smoking in the groups formed by education level were observed. As regards the male population (Fig. 11.5), the age-standardised share of regular tobacco smokers is similar across all education level groups. In relation to 2018 data, the percentage of smokers significantly dropped among persons with basic vocational education, while an increase was recorded in a group of respondents with higher education. As regards the female population (Fig. 11.6), the percentage of smokers in a group of persons with basic vocational education declined, similarly as in the case of men. The changes observed, both for men and women, should be approached with caution due to the differences in methodology between the two surveys concerned.

Fig. 11.5. The use of products containing nicotine in male population, by level of education, NIZP-PZH survey



* values not presented because of a substantial error of estimation

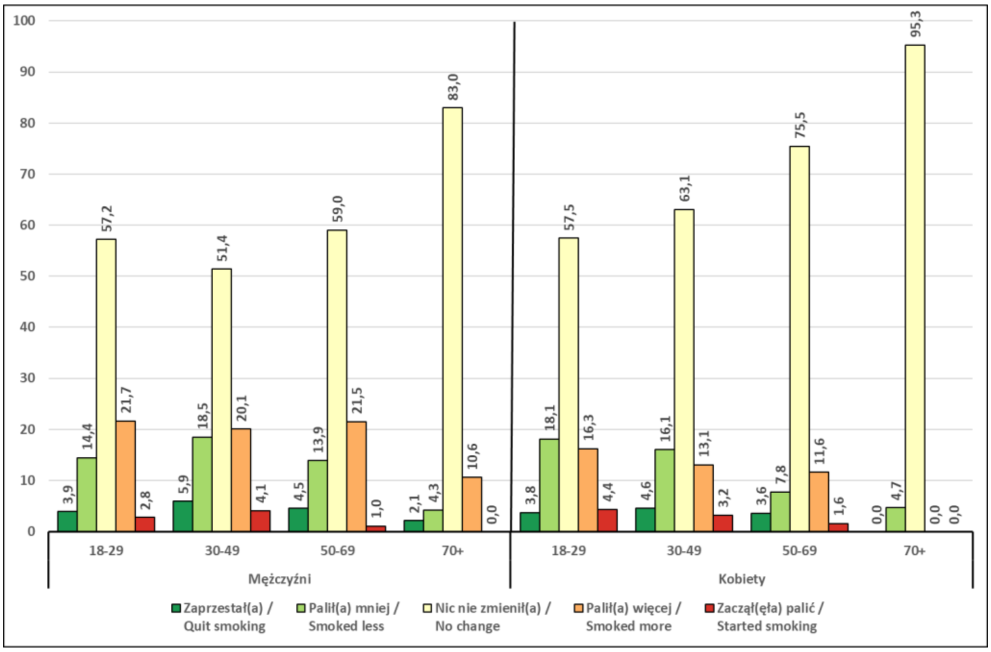
Fig. 11.6. The use of products containing nicotine in female population, by level of education, NIZP-PZH survey



* values not presented because of a substantial error of estimation

The analysis of changes in the frequency of tobacco smoking during the COVID-19 epidemic (Fig. 11.7) shows that men, irrespective of the age group, were more often inclined to make unfavourable decisions (on starting or intensifying smoking) than favourable decisions (on quitting or reducing smoking). Among the female population, these trends were not so strong. It is worth noting that the changes to the habits, regardless of whether favourable or not, were declared by a substantial proportion of men - over 40%, except persons aged over 70. Among women, the share was slightly lower, while a clear trend towards changes can be observed, from the biggest one in the youngest group (43.5%) to nearly no change in the oldest group (4.7%).

Fig. 11.7. Changes in smoking habits during the COVID-19 epidemic in Poland, by age and sex

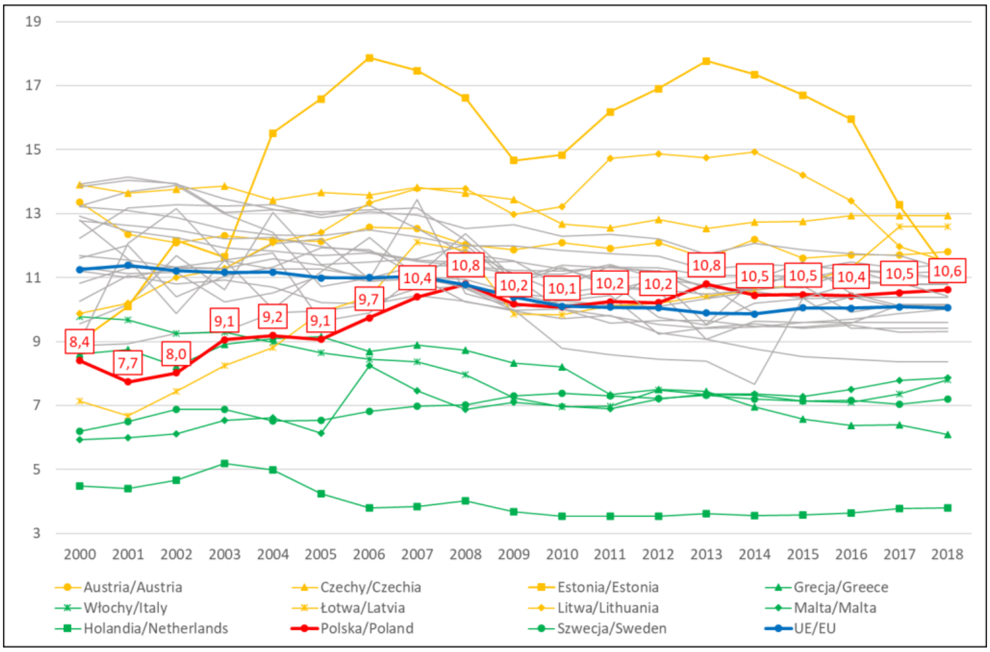


11.2. Alcohol consumption

In 2019, alcohol consumption was globally the ninth most important health risk factor, accounting for 3.7% (95% CI: 3.3 - 4.1) of disability-adjusted life years[151]. In Poland, this risk factor is ranked sixth, accounting for 1,030 thousand (95% CI: 829-1260) DALY, which corresponds to 8.16% (7.07-9.39)[153] of the total DALY value. According to the estimates of the WHO Global Health Observatory, alcohol consumption by persons aged over 15 in Poland amounted to 10.6 litres of pure alcohol per person in 2018, and practically has not changed since 2014[155]. Alcohol consumption is by 0.5 litre higher than the mean consumption for the European Union (10.1) and higher than the values recorded in 11 countries (Fig. 11.8). Countries with similar alcohol consumption value include Hungary and Germany (10.8 litres per person), and Spain and Portugal (10.4 litres per person).

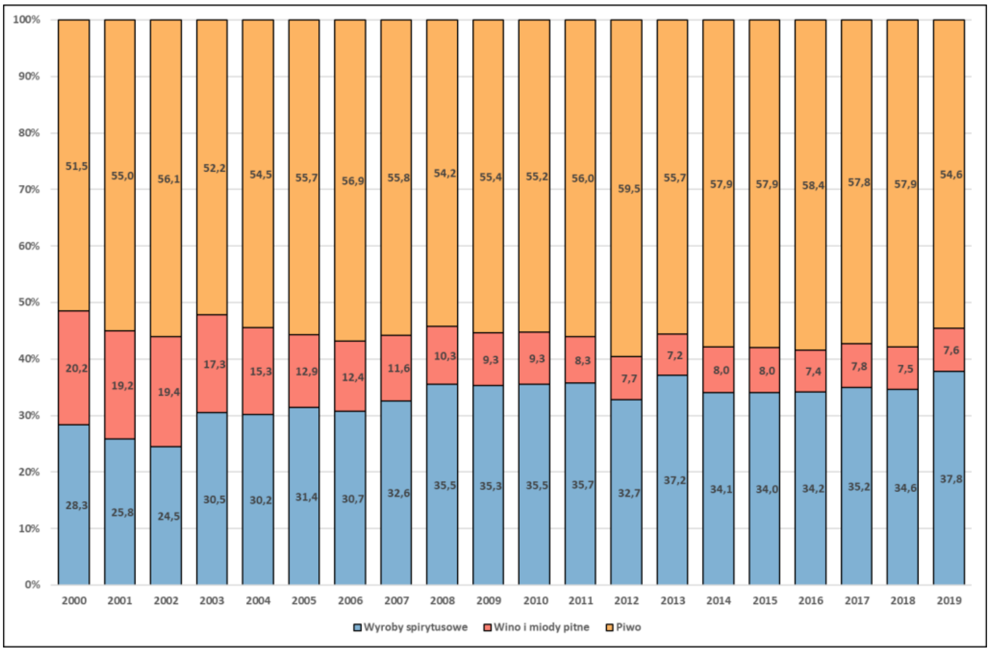
[155] WHO Global Health Observatory, https://www.who.int/data/gho/data/indicators, accessed on: 9.11.2020

Fig. 11.8. Trends in alcohol consumption in Poland and European Union countries (WHO Global Health Observatory data)



According to the data published by the State Agency for the Prevention of Alcohol-Related Problems in 2018, 54.6% of alcohol was consumed in the form of beer, 37.8% in the form of spirits, and 7.6% in wine (Fig. 11.9). The increase of the share of spirits in the total alcohol consumption is noteworthy.

Fig. 11.9. Changes of alcohol consumption structure in Poland in 2000-2019 (The State Agency for the Prevention of Alcohol-Related Problems data)



Surveys carried out by our Institute in 2018 and 2020 are sources of knowledge of problems related to alcohol abuse. The respondents provided answers to questions about the frequency of thoughts related to excessive alcohol consumption, the frequency of criticism from family and close friends related to alcohol abuse, and the occurrence of guilt caused by alcohol abuse, which might indicate hazardous alcohol consumption. Tab. 11.1 shows the frequency of positive answers to at least one of the questions, depending on the demographic characteristics of the respondents taking part in both surveys. As regards the male population, answers which could indicate hazardous alcohol consumption were provided by 21.4% of men in 2018, and by 19.3% of men in 2020. In 2020, the percentage was lower in the female population than in the male population, and amounted to 8.9% It increased slightly in relation to 2018. Both among men and women, the problem is manifested (at various levels) in the greatest extent in groups aged 50-59 and 60-69. In 2020, the problem was more prevalent in a group of men with basic vocational education, and women with tertiary education. The differences between the inhabitants of rural and urban areas were not significant, but it should be stressed that the intensity of hazardous alcohol consumption was higher in urban areas in 2018, in contrast to the 2020 data, which indicated that the intensity was higher in rural areas, both in the male and female populations.

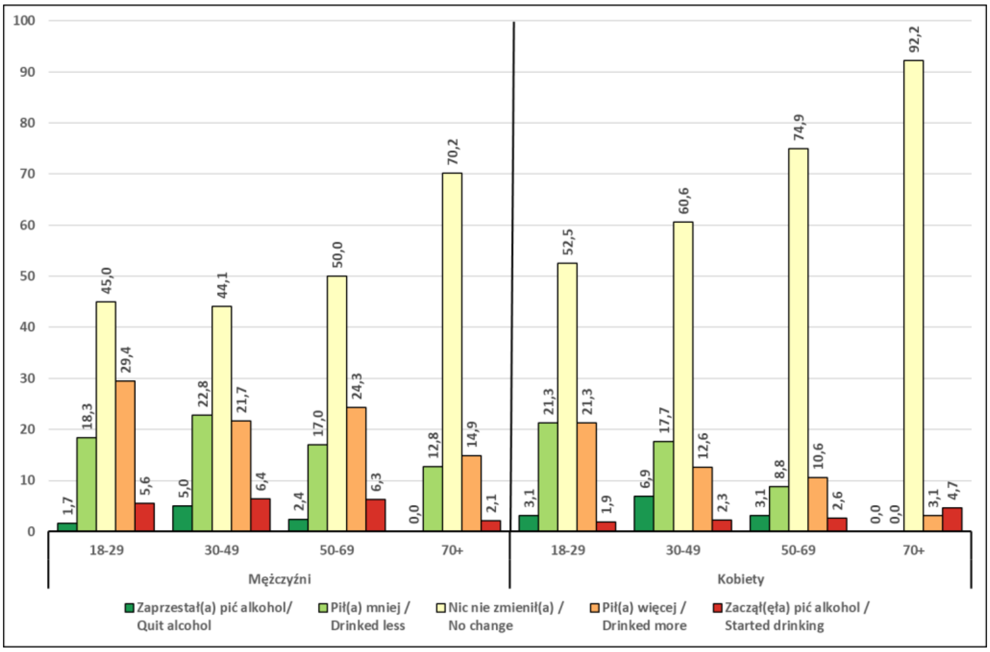
Tab. Self-assessment of drinking problems, by sex, age, education and place of residence (data: NIZP-PZH)

		Men		Women	
		2018	2020	2018	2020
Total		21.4%	19.3%	6.1%	8.9%
Age	18-29	17.7%	13.4%	9.9%	7.9%
	30-39	24.8%	12.5%	5.6%	8.6%
	40–49	21.3%	14.9%	5.6%	6.3%
	50-59	27.4%	22.3%	6.5%	11.3%
	60-69	17.5%	25.2%	5.7%	10.2%
	70+	17.4%	12.0%	3.8%	3.3%
Education	Primary or lower-secondary	20.0%	18.2%	4.8%	-*
	Vocational	24.6%	19.8%	4.9%	7.1%
	Secondary	20.2%	14.9%	6.8%	7.1%
	Tertiary	18.4%	18.2%	6.9%	9.2%
Place of residence	Rural areas	18.9%	18.0%	5.9%	10.9%
	Urban areas	23.2%	16.5%	6.3%	7.1%

* values not presented because of a substantial error of estimation

The pandemic period has brought an increase in the frequency of decisions on the change of habits related to alcohol consumption (Fig. 11.10). Across all the groups analysed a greater proportion of men decided to increase alcohol consumption, than to reduce it. No strong trends were recorded in the female population.

Fig. 11.10 Changes of alcohol consumption habits during COVID-19 epidemics in Poland, by age and sex



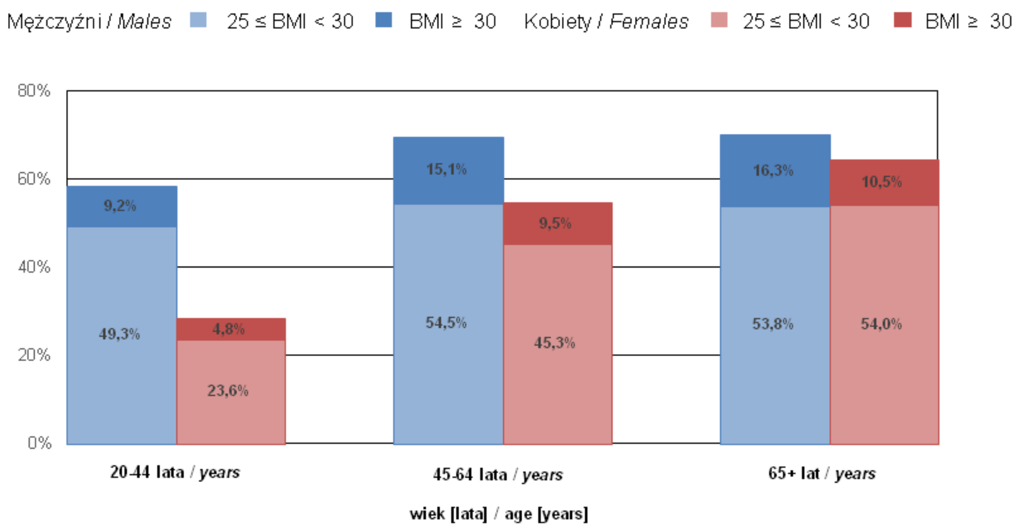
11.3. Overweight and obesity

Overweight constitutes one of the most serious lifestyle-related health problems in Poland. According to the results of the GBD2019[140] study it is the third most significant factor of the total disease burden, and accounts for 12.4% (for 12.1% in men, and for 12.6% in women) of disability-adjusted life years. As regards mortality, it is the fifth most significant risk factor, accounting for 14.2% of deaths (13.1% in the male population and 15.3% in the female population). The share has been growing systematically since 2011.

The most recent data on the prevalence of overweight in our country were provided in the results of the aforementioned survey conducted by NIZP-PZH in October 2020 on a random sample of 2000 Poles aged over 20. The aim of the questions was to estimate the prevalence of risk factors (including high body weight) at the beginning of 2020, and to examine potential changes which could take place in further months due to the COVID-19 pandemic. The results show that in the spring 2020, 54.5% of Polish population (64.2% of men and 45.5% of women) were overweight (BMI >25). High body weight affected men more frequently, and the effect is becoming stronger after taking into consideration the age structure differences between the male and female populations (women are generally older) - directly standardised rates amount to 64.6% and 44.4% respectively. The results are similar to those obtained by GUS (SP) as part of the EHIS study in 2014[156] (the results of the 2019 edition of the survey are yet to be revealed). At the time 62% of men and 46% of women were overweight. WHO Estimates, prepared on the basis of multiple sources (the most recent ones refer to data of 2016) are much higher than the above figures - the are 67% and 58% respectively[155]. The results of a survey carried out by NIZP-PZH in 2018 on a random representative sample of 3000 adult persons indicated overweight in 59% of men and 41% of women[157].

As regards persons aged 20-44, excessive body weight affects men over twice as often as women (58.5% versus 28.5%) - Figure 11.11. The disparities are smaller in the older age groups, but in all age categories the prevalence of overweight among men is noticeably higher than among the female population. Both for men and women, the share of persons with high body weight increases in groups aged 45 years or older, which is particularly significant among women. As regards middle-aged and older men, the share is at a similar level (approx. 70%).

Fig. 11.11. The prevalence of overweight and obesity among Polish population aged 20 years or older in 2020, by sex and age (source: NIZP-PZH)



Men living in urban areas are overweight slightly more often than men living in rural areas (65.6% versus 62.3%; age-standardised rates - 66.7% versus 62.3%). As regards the female population, a reverse correlation can be observed, as overweight affects women living

[156] GUS (2016). Stan Zdrowia Ludności Polski w 2014r. (The Health Status of Population in Poland in 2014), Warsaw

[157] NIZP-PZH (2018). Sytuacja zdrowotna ludności Polski i jej uwarunkowania (The Health Status of Polish Population and its Determinants) Eds. Wojtyniak B, Goryński P, Warsaw

in rural areas more often (47.3% versus 44.5%), and the difference is significantly higher if the percentage is expressed in age-standardised rates (49.5% versus 41.0%).

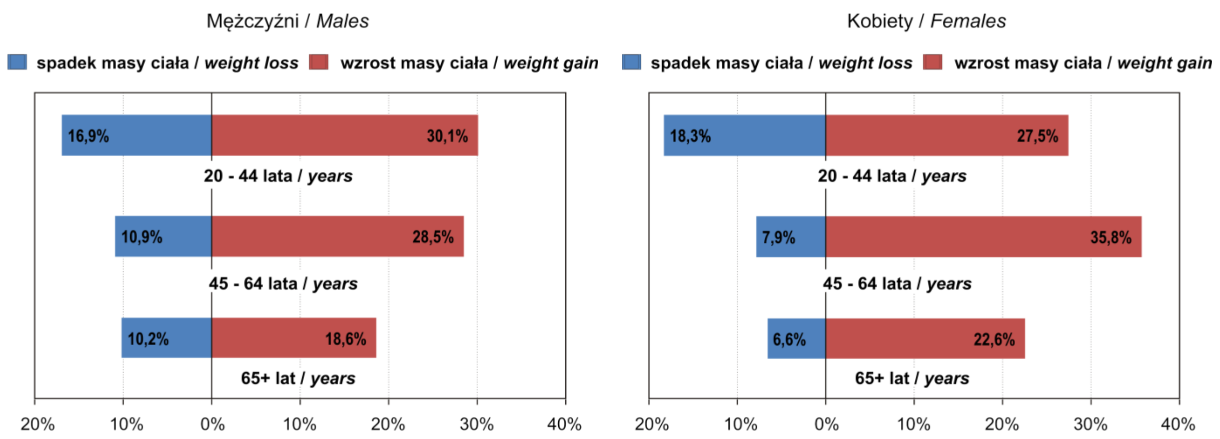
The prevalence of obesity in 2020 was estimated at 10.0% (12.3% among men and 7.8% among women). The values are lower than those obtained in the aforementioned surveys: NIZP-PZH (2018) - 11% for both sexes, EHIS (2014) – 18% of men 17% of women, WHO (2016) – 25% and 26% respectively.

It should be pointed out that in the 2020 survey the problem of obesity is significantly more intensified in men than in women, and after taking into consideration the age-structure differences between both sub-populations, the disparity becomes slightly larger (age-standardised rates are 12.7% and 7.6%, respectively). The differences refer to all age categories (Fig. 11.11). For both male and female populations, the percentage of obese persons increases with each subsequent age group.

The prevalence of obesity among men living in urban areas (12.3%) and rural areas (12.6%) is very similar, also after age-standardised rates are applied. (12.7% versus 12.3%). The difference is more profound in the female population - obesity affects women living in rural areas nearly twice as often as those living in urban areas (10.9% versus 6.1%, and after age-structure differences are taken into account - 11.4% versus 5.9%).

During the pandemic period, between spring and autumn 2020, 41.2% of Poles aged 20 or older noticed changes to their body weight, with 28.3% of the respondents reporting an increase in their body weight, and 12.9% reporting reduction. The values were similar for both men and women - 27.6% and 13.8% for the male population, while for women these were 28.9% and 12.2% respectively. This was observed for all age categories analysed in the survey (Fig. 11.12), whereas changes were reported most often among the youngest group, i.e. by 47.1% of men and 45.9% of women aged 20-44, while the oldest population (65 or older) was affected by the changes in the smallest extent - 28.8% and 29.2% respectively. In all age groups, more people gained weight than lost weight. Men aged 20-44 and women aged 45-64 gained weight most often, in contrast to persons aged 65 years or older who reported weight increase least often. Weight loss was most often reported by the respondents belonging to the youngest group, and least often by the eldest group of Poles.

Fig. 11.12. Changes in the body weight of Poles during the pandemic period (spring-autumn 2020) by sex and age (source: NIZP-PZH data)

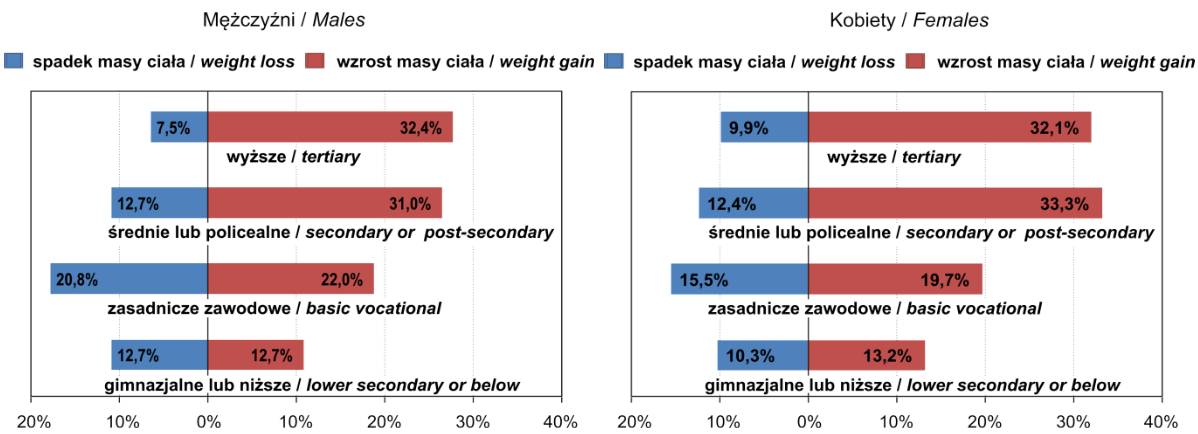


The change in body weight was strongly related to the level of education, and the dependencies were comparable for both men and women (Fig. 11.13). As for persons with primary and lower-secondary education, changes were reported by 25.4% of men and 23.5% of women, which is much less than in the remaining categories. This effect results from the differences in the age structure of the groups being compared (as persons with lower education on average belong to an older age group), and is much less conspicuous after age-standardised rates are applied. Their values for the male population are: 38.1% (primary and lower-secondary education), 42.8% (basic vocational education), 42.7% (secondary education), and 38.0% (tertiary education), while for women these are: 39.7%, 37.1%, 45.7% and 41.8%, respectively.

As regards the respondents with secondary/post-secondary and tertiary education, the increase in body weight was reported nearly 2.5 times more frequently as compared with persons having primary and lower-secondary education. The disparities substantially decrease after applying age-standardised rates only in the case of the male population. For women, the said effect is not caused by age-structure differences between the groups being compared, and the age-standardised rates amount to 10.3%, 19.7%, 33.3% and 32.3%, in the order of the growing education level. Weight loss was reported most frequently by persons with basic vocational education, for both men and women, while age-standardised rates point to women with primary and lower-secondary education.

Increase in body weigh during the pandemic among the male population was more frequently reported by the inhabitants of urban areas than by those from rural areas (29.7% versus 24.8%), contrary to the female population (27.8 versus 31.0%). The differences were also visible when the values were expressed as age-standardised rates.

Fig. 11.13. Changes in the body weight of Poles during the pandemic period (spring-autumn 2020) by education level *(source: NIZP-PZH data)*

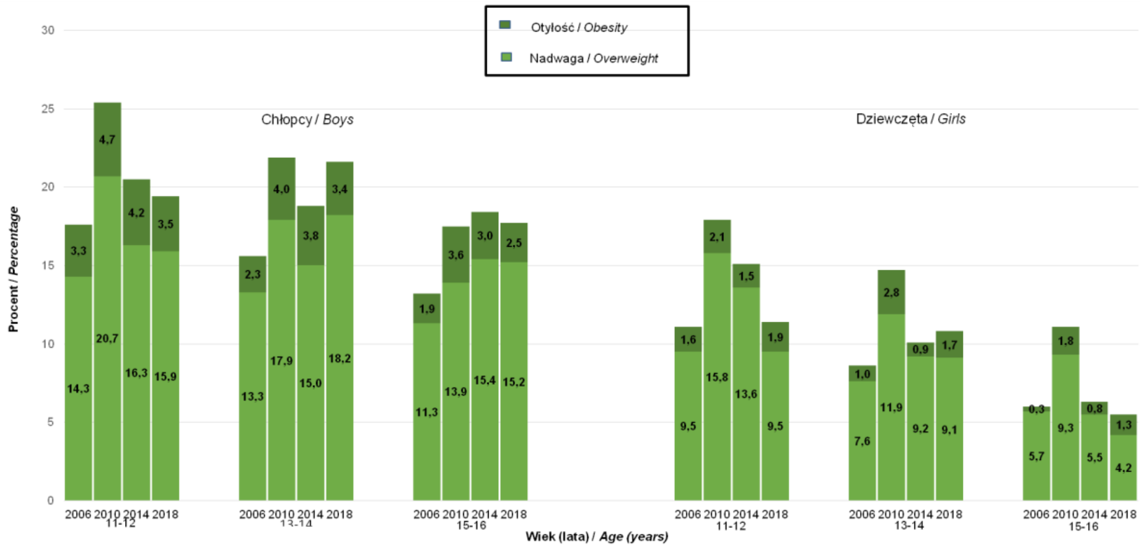


The problem of excessive body weight also affects teenagers - more often boys than girls. The results of subsequent editions of the HBSC study show that the current situation is clearly worse than the one in 2006, and the improvement reported in 2014 was not a sustainable one (Fig. 11.14)[158,159,160,161]. In 2018, the prevalence of excessive body weight among school-aged children (according to the criteria developed by the International Obesity Task Force) increased by nearly 2 percentage points (p.p.) in relation to 2014 - 16.5% versus 14.8%. The most substantial change (an increase of 6.4 p.p.) concerned boys aged 13-14. The prevalence of obesity in girls increased, interestingly enough, in all age categories. The percentage of overweight and obese school-aged children has risen to a greater extent in boys (by 3.4 p.p.) than in girls (0.4 p.p.). As regards school-aged children of both sexes, the prevalence of excessive body weight decreases with age, but taking into account individual years of birth, the situation does not necessarily need to improve - in 2014, the percentage of 11- and 12-year-old

[158] Institute of Mother and Child (2007) **Zdrowie subiektywne**, **styl życia i środowisko psychospołeczne młodzieży szkolnej w Polsce. Raport techniczny** z badań HBSC w Polsce w 2006 r. (Subjective health, Lifestyle and Psychosocial Environment of School-Aged Children in Poland. Technical report from the HBSC study in Poland) **Eds.: Mazur J, Woynarowska B**, **Kołoło H, Warsaw**
[159] Institute of Mother and Child (2011) Wyniki badań HBSC 2010. Raport techniczny (HBSC 2010 Results. Technical Report), Eds. Mazur J, Małkowska-Szkutnik A, Warsaw
[160] Institute of Mother and Child (2015) Z**drowie** i zachowania zdrowotne **młodzieży szkolnej w Polsce** na tle wybranych uwarunkowań socjodemograficznych. Wyniki badań **HBSC** 2014. (Health and Health Behaviour of School-aged Children in Poland against a Backdrop of Selected Sociodemographic Determinants. HBSC 2014 Results) Ed. Mazur J, Warsaw
[161] Institute of Mother and Child (2018) Zdrowie uczniów w 2018 roku na tle nowego modelu badań HBSC (Schoolchildren's Health in 2018 against a Backdrop of the New HBSC Study Model) Eds. Mazur J, Małkowska-Szkutnik A, Warsaw

children affected by the problem was 20.5%, and after four years, the share amounted to 20.2% for 15- and 16-year old teenagers (the only favourable change was a reduced share of obesity from 4.2% to 2.5%).

Fig. 11.14. The prevalence of overweight and obesity among schoolchildren aged 11-12, 13-14 and 15-16 in 2006, 2010,2014 and 2018 (source: *HBSC data*)

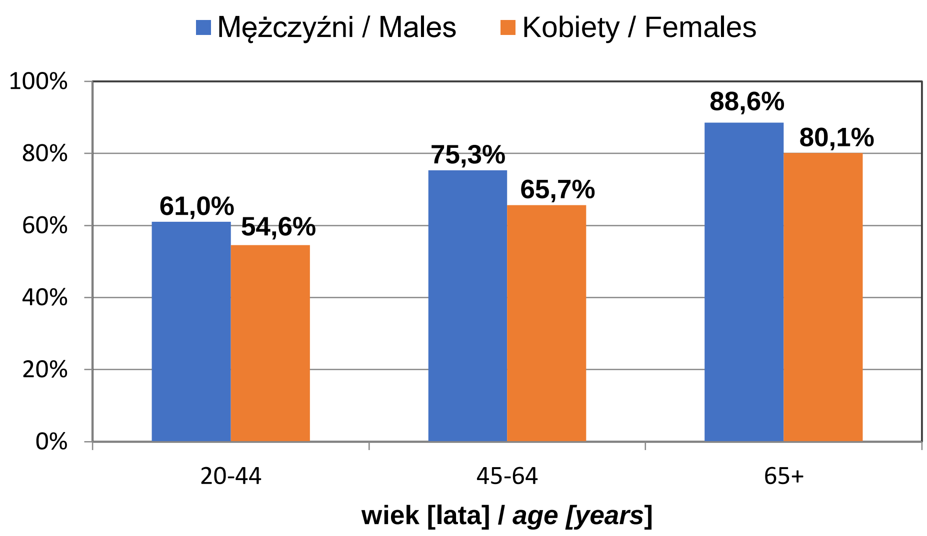


11.4. Physical activity

According to the results of the GBD study140 low physical activity accounts for 2.3% of deaths in Poland (1.4% among men and 3.2% among women) and for 1.1% of DALY (0.8% and 1.5% respectively).

Based on the results of the survey conducted by NIHP-PZH in 2020, only 32.8% of Poles aged 20 or over regularly take up a sport or recreational physical activity (cycling, swimming, fitness classes, walking) in the spring and summer season or in autumn. As many as 70.4% of men and 64.4% of women admitted not undertaking such activity. Taking the total population into account, men are less physically active than women, and the effect is becoming more pronounced after taking into consideration the age structure differences between the male and female populations (women are older on average) - directly standardised rates amount to 71.4% and 63.5% respectively. The percentage of inactive persons increases with age, but across all analysed groups the value is higher among men than it is among women (Fig. 11.15). It is a relatively new trend, for years men were doing sports and taking up recreational physical activities more often than women, but their advantage in this respect has been gradually decreasing. In the EHIS study of 2014, only young men (under 39) were more physically active than their female peers[156].

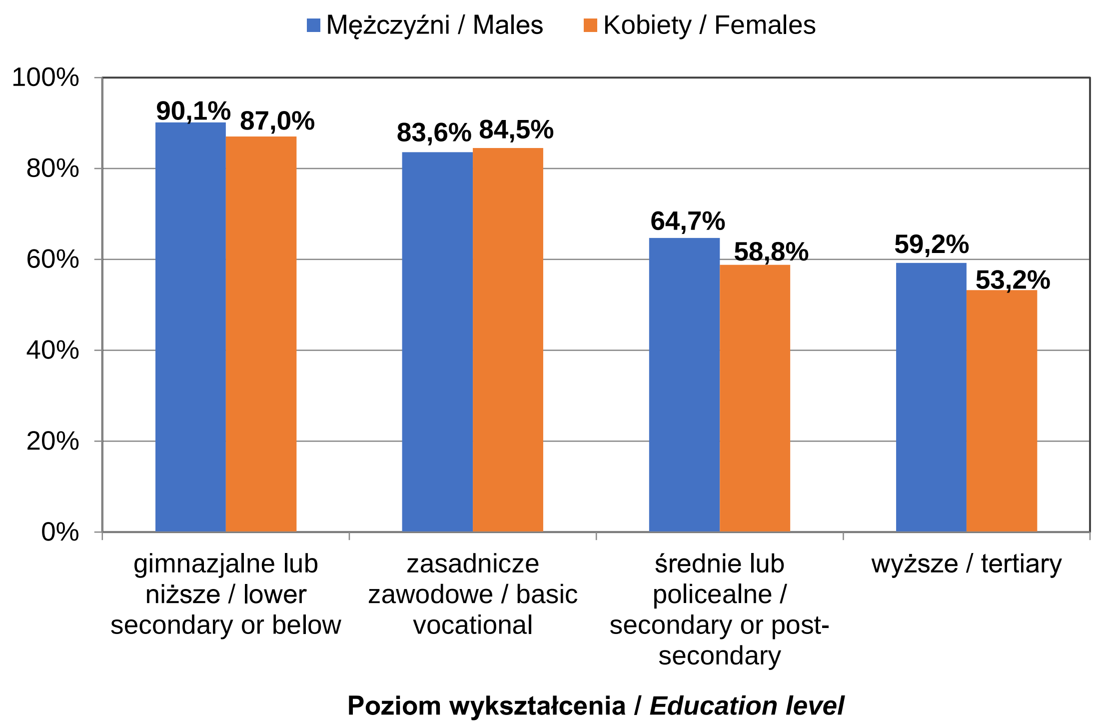
Fig. 11.15. The percentage of Poles aged 20 and older not engaging in any form of recreational physical activity in 2020 by sex and age (source: NIZP-PZH)



For both sexes, the level of physical activity is strongly dependent on education - less educated person exercise less frequently (Fig. 11.16). As regards the male population, the differences remain at the same level after applying age-standardised rates (for persons with primary and lower-secondary education - 95.8%, and for persons with tertiary education - 64.3%). In the case of women, age-standardised rated for these education categories amount to 72.5% and 54.6% respectively, which means that the found differences partly result from a different age structure of the groups being compared. In nearly all analysed categories, men failed to take up physical activity more often than women, except persons with basic vocational education.

The lack of recreational physical activity is characteristic to a greater extent for men living in urban areas than for men living in urban areas (73.7% versus 67.9%), while the disparity is smaller when age-standardised rates are applied (73.4% versus 69.6%). The percentage of physically inactive women is slightly higher in urban areas (64.9% versus 63.2%), but the correlation is changed after the age structure is taken into account (age-adjusted rates are 62.9% and 65.9% respectively).

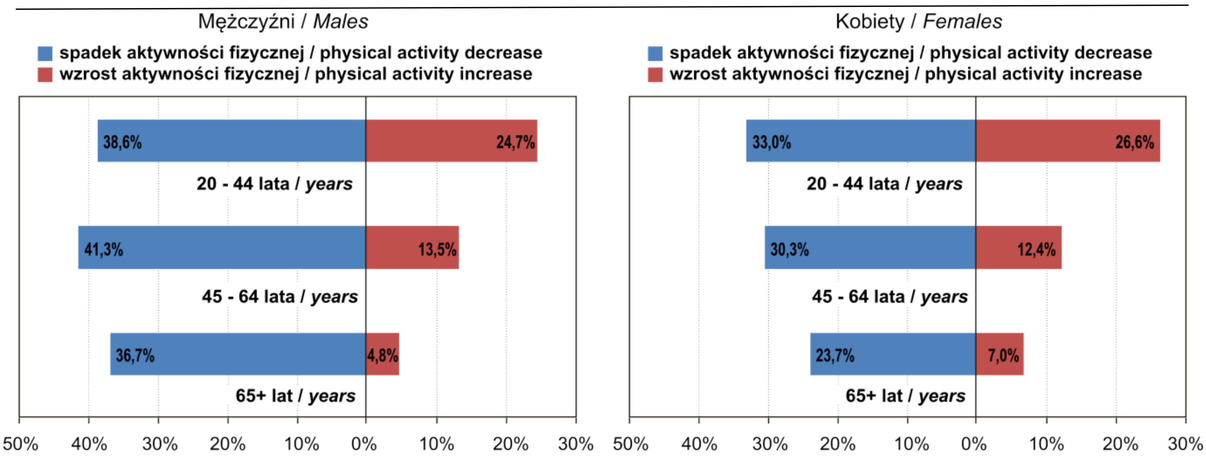
Fig. 11.16. The percentage of Poles aged 20 and older not engaging in any form of recreational physical activity in 2020 by sex and education (source: NIZP-PZH data)



During the pandemic, 34.3% of Poles (39.1% of men and 29.8% of women) reduced their physical activity, not only in respect of leisure exercise, but also everyday activities (work, house chores, mobility related to travelling between various locations). The significant disparity in the share of men and women does not result from age-structure differences between those sub-populations - after standardisation, the rates amount to 39.2% versus 31.3%. At the same time, 17.5% of Poles increased their physical activity (17.7% of men and 17.5% of women).

Changes to physical activity levels were observed in all age groups of subjects (Fig. 11.17) and they most frequently concerned persons aged 20-44 (63.3% of men and 59.6% of women), contrary to the group of oldest persons (over 65) - 41.5% and 30.7% respectively). The number of the respondents who reduced their physical activity was greater than that of those who intensified such activities, across all age groups. Men aged 45-64 and women aged 20-44 reduced physical activity most often, contrary to the oldest group of the respondents. Across all age categories, the percentage of men who reduced their physical activity was higher than the percentage of women who reported such change. The level of physical activity was raised most often by the youngest age group, and least often by the eldest Poles.

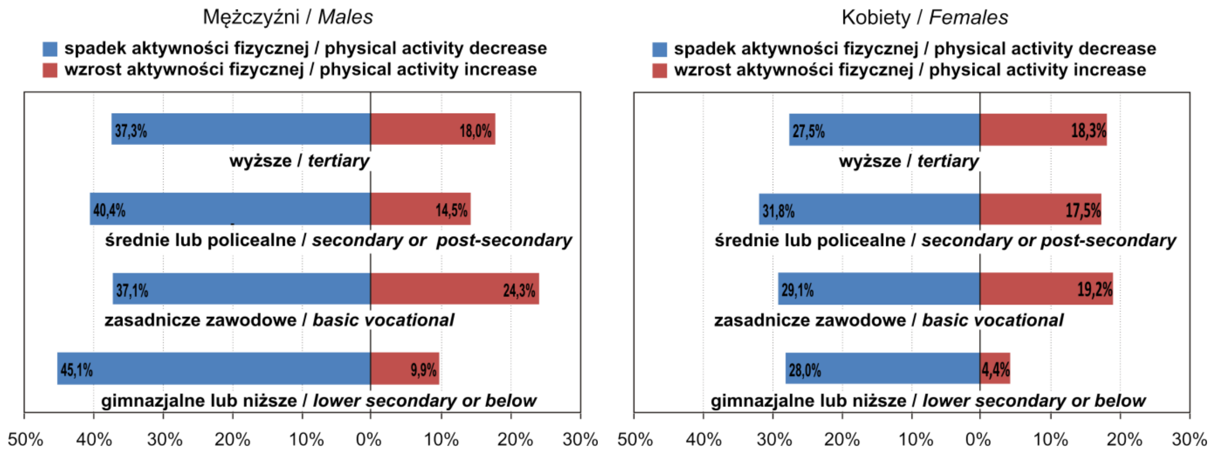
Fig. 11.17. Changes in the physical activity of Poles during the pandemic period (spring-autumn 2020) by sex and age (source: NIZP-PZH data)



Changes to the physical activity during the pandemic show interdependence with the level of education, which is more pronounced in men than in women (Fig. 11.18). The most numerous group of those who reported reduction of physical activity included men with primary or lower-secondary education. The disparity between the said group and the other categories increases after the age structure of the compared groups is taken into account - age-standardised rates are 50.7%, 36.4%, 40.9%, and 36.4%, in the order of the growing education level. The reduction of the physical activity by women depends on the education level in a smaller extent. The differences between the categories being compared become clearly visible only after age-standardised rates are applied - the reduction of physical activity was reported most often by persons with primary and lower-secondary education, while persons with tertiary education reduced their physical activity least often (the valued of age-standardised rates in the order of the growing education level are 43.3%, 30.5%, 31.7%, and 27.3%).

The level of physical activity was most often increased by persons with basic vocational education, both men and women, and this advantage is also maintained after age-standardised rates are applied. Physical activity was increased least frequently by Poles with primary or lower-secondary education, but after the age structure is taken into account, the differences in relation to the best educated group are much less pronounced in the case of men (the age-standardised rate amounts to 18.3% as compared to 16.3% among persons with higher education), while in the case of women they are significantly reduced (age-standardised rates - 11.9% and 16.4% respectively).

Fig. 11.18. Changes in the physical activity of Poles during the pandemic period (spring-autumn 2020) by education level (source: NIZP-PZH data)

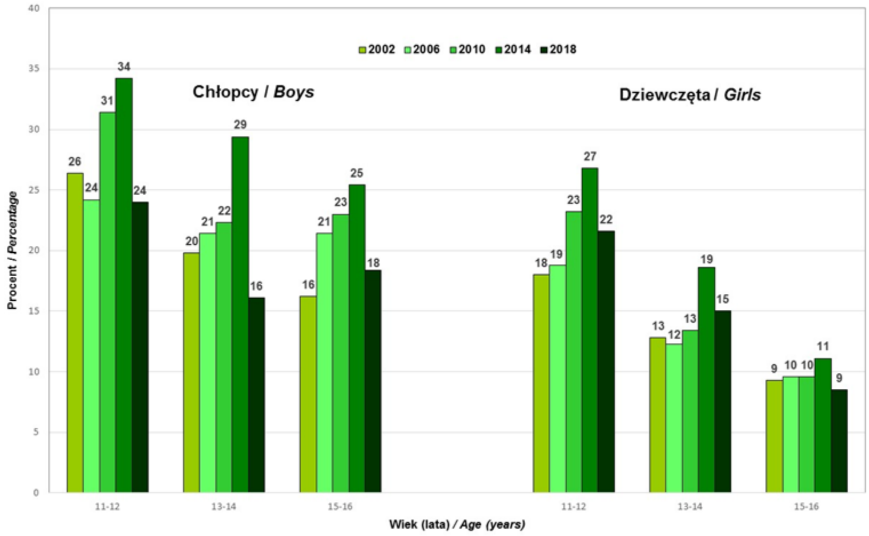


Physical activity was reduced more often by the inhabitants of urban areas than by those living in rural areas (among men - 40.0% versus 38.0%, and among women - 30.4% versus 28.9%). After applying the age-standardised rates, the disparities become more manifest, in particular in the case of women (40.7% versus 38.2%, and 31.3% versus 28.0%).

Information on the physical activity of Polish schoolchildren is provided by the Health-Behaviour of School-Aged Children studies[158,159,160,161]. In 2018, only 17.2% of schoolchildren (19.6% of boys and 14.8% of girls) maintained the level of physical activity recommended by the WHO for the proper development and health (i.e. 60 minutes of moderate- to vigorous-intensity physical activity daily). The result indicates not only a substantial reduction in relation to the preceding edition of the study of 2014, but also the reversal of a favourable long-term trend (Fig. 11.19). The effect was observed for both sexes in all age categories, in a greater extent among boys, in particular among those aged 13-14. In this group the percentage of schoolchildren reaching the standard is lower than among their older colleagues (15- and 16-year-old school-aged children). As regards girls, the share of persons taking up regular exercise decreases with age, reaching a very low level - 8.5% for the oldest 15- and 16-year-old girls).

For many years, boys were clearly more physically active than girls, whereas the differences were substantially reduced in the most recent edition of the study (regular exercise is taken up by 24.0% of boys and 21.6% of girls aged 11 and 12, while in the group of 13- and 14-year-old boys and girls the share is 16.1% and 15.0% respectively); unfortunately, this can be attributable to a considerable drop in the physical activity of boys. Their clear advantage over girls is maintained only among the oldest students (18.4% versus 8.5%).

Fig. 11.19. The percentage of school children fulfilling daily rates of physical activity in years 2002, 2006, 2010, 2014, and 2018 (source: HBSC data)



CONCLUSIONS

1. Smoking tobacco accounted for 2,060 thousand (16.3%) disability-adjusted life years in 2019. In 2020, the estimated share of men and women smoking tobacco was lower than in 2018. However, the share of persons using electronic substitutes has grown significantly. During the COVID-19 epidemic, a vast percentage of persons (both men and women) made a decision on changing their smoking habits. The percentage of persons who decided to make changes which are either favourable or unfavourable from the health-risk perspective was comparable.
2. In 2019, alcohol consumption accounted for 1030 thousand (8.16%) DALY. Alcohol consumption reached a level of 10.6 litres per person (aged 15 or older), and has remained at a similar level for around five years. Over a half of the alcohol was consumed in the form of beer, and over a third in the form of spirits. During the COVID-19 epidemic, a vast percentage of persons (both men and women) made a decision on changing their smoking habits. The changes could slightly impact on the increase in alcohol consumption by men.
3. Excessive body weight (BMI ≥25) accounts for 14.2% of deaths in our country (13.1% of men and 15.3% of women) and for 12.4% of disability-adjusted life years (12.1% and 12.6% respectively). In the spring 2020, 54% of Poles were overweight, more often men (64%) than women (46%). The prevalence of obesity (BMI≥30) was estimated at 10% (12% among men and 8% among women). As regards persons aged 20-44, excessive body weight affects men over twice as often as women (59% versus 29%), and the prevalence of obesity was 9% and 5% respectively. Both for men and women, the values rose in groups aged 45 years or older, which is particularly manifest among women. Disparities in the prevalence

of overweight between the inhabitants of urban and rural areas are not significant, but obesity is much more common in women living in rural areas than in women living in urban areas (11% versus 6%). The prevalence of excessive body weight among school-aged children and youth aged 11-16 has risen in recent years (by nearly 2 percentage points between 2014 and 2018 - 16.5% versus 14.8%), which is a trend stronger in boys (by 3.4 p.p.) than in girls (0.4 p.p.).

4. During the pandemic period, between spring and autumn 2020, 28% of Poles aged 20 or older (28% of men 29% of women) reported an increase in their body weight. Men aged 20-44 and women aged 45-64 gained weight most often. Well-educated persons gained weight more often than the representatives of the remaining groups, and, as regards men, the effect was largely caused by the differences in the age structure between the analysed groups. Body weight increase was more often observed among men living in urban areas than among those from rural areas (30% versus 25%), which is also true for women living in rural areas (31% versus 28%). At the same time, 13% of the population (14% of men and 12% of women) reduced their body weight. They were mostly persons aged under 45. Weight loss was most frequently observed in persons with basic vocational education.
5. Low physical activity accounts for 2.3% of deaths and 1.1% of DALY in Poland. Every third Polish national does sports or takes up leisure physical activity in the spring, summer or autumn season. As many as 70% of men and 64% of women admitted not undertaking such activity. For both male and female populations, the percentage of inactive persons increases with each subsequent age group. The physical activity level is strongly correlated to education levels, 89% of Poles with primary or lower secondary education and 56% of persons with tertiary education do not take up physical activity. Only 20% of boys and 15% of girls aged 11-16 maintain the physical activity level recommended by the WHO for proper development and health; in recent years a considerable reduction of physical activity among school-aged children could be observed.
6. During the pandemic, 34% of the residents of our country reduced their physical activity - men more often than women (39% versus 30%). Men aged 45-64 and women aged 20-44 reduced physical activity most often. Low education level was a factor contributing to the reduction of physical activity. At the same time 18% of men and 17% of women increased their physical activity, and the percentage was decreasing from 26% in the 20-44 age group to 6% in the group aged 65 or older. Both for men and women, the level of physical activity was increased most often by persons with basic vocational education.

7. In total, behavioural risk factors account for 35.8% of disability-adjusted life years in Poland (43.0% in men, and 27.1% in women).

12. DIETARY INTAKE AND NUTRITIONAL STATUS OF THE POLISH POPULATION

Katarzyna Stoś, Ewa Rychlik, Maciej Ołtarzewski

12.1. Introduction

Data concerning on the dietary intake and nutritional status of the population are an important aspect of the health status monitoring of the population in a given country, especially if they are collected regularly and include a group of people that is representative of the country. Data from household budget surveys conducted by Statistics Poland can provide the basis for such analyses, as such surveys are a valuable source of information on national food consumption. They can also be used to analyse trends in the consumption of various products and any potential changes in dietary intake. Surveys on individual food consumption, facilitating a more accurate assessment of consumption as compared to Dietary Reference Values (DRVs) and recommendations, also enable us to establish the characteristics of the dietary intake in the population. However, surveys assessing individual consumption are less frequently conducted on a group of people that is representative of the country. Therefore, the results of annual household budget surveys are a valuable source of data for monitoring purposes and an important addition to surveys on individual food consumption.

The characteristics of the dietary intake in the Polish population, as discussed in the further part of this chapter, was established based on the results of the household budget surveys carried out in 2017-2018. The changes in consumption recorded in 2010-2018 were also discussed. The characteristics was complemented by the results of surveys on individual food consumption conducted in Poland in recent years.

An assessment of the dietary intake is often accompanied by assessing the nutritional status, usually made under anthropometric data concerning body weight and height. The data allow us to define what portion of the surveyed population is characterised by proper body weight and what portion may be considered as underweight or overweight. The nutritional status as presented in this paper was assessed on the basis of the results of the survey carried out in the framework of EU-Menu project in 2016-2020 supported by the European Food Safety Authority (EFSA).

The results of the study on the dietary patterns and nutritional status allow us to recognise the most common dietary mistakes and, therefore, to assess the exposure of the population in a given country to the occurrence of chronic noncommunicable diseases, including cardiovascular diseases, certain types of cancers, type 2 diabetes, osteoporosis or diseases resulting from various nutrients deficiencies.

12.2. Analysis of consumption of food products in Poland

The analysis concerning the consumption of food products in Poland was conducted on the basis of the Statistics Poland data retrieved from household budget survey . The unique advantage of these surveys is the fact that they provide information on the quantities of food products purchased or otherwise obtained by households (from their own farms or garden plots, backyard gardens, individual enterprises, received as a gift, etc.)[162]. However, they do not include the food consumed in mass catering facilities.

The results concerning the consumption of food products in individual groups, expressed in kilograms, litres or pieces/person/month, in all households in 2010, 2017 and 2018, are given in Tab. 12.1.

In 2017-2018 differences in the consumption of most groups of products did not exceed 5%. The most significant differences were recorded in the analysis of consumption in 2018 as compared to 2010.

In the group of cereal products (bread, other bakery products, wheat flour and other types of flour, groats and flakes, rice, pasta and pasta products), it was found that between 2010 and 2018 the consumption of such products as bread and flour decreased by more than 30% (4.67 vs. 3.15 kg/person/month and 0.88 vs. 0.60 kg/person/month, respectively). As far as all other bakery products are concerned (crispy bread, rice waffles, biscuits and all types of pastry and dough manufactured by the food industry), their consumption increased by 36% (0.69 vs. 0.94 kg/person/month) between 2010 and 2018.

In 2010-2018 the consumption of potatoes and potato products was characterised by the downward trend equal to more than 35% (4.97 vs. 3.22 kg/person/month). It should be added that between 2017 and 2018 a 5% decrease in the consumption of products from this group was recorded (3.39 vs. 3.22 kg/person/month).

In the 8-year period under analysis, vegetables and vegetable products were characterised by a 6% decrease in their consumption (5.14 vs. 4.87 kg/person/month).

A 6% increase in the consumption of fruit and fruit products was recorded in 2018 (4.67 kg/person/month) as compared to 2010 (4.40 kg/person/month).

[162]Statistics Poland (GUS), Household budget surveys, Warsaw 2018.

Considering the recommendations of the World Health Organisation (WHO) [163] concerning the daily consumption of vegetables and fruit, which should be at least equal to 400 g, the total consumption of products from these groups, both in 2010 and in 2017-2018, was lower than provided in these recommendations, ranging 313-315 g/person/day.

The analysis of the average monthly consumption of meat, offal and meat products, considered in total, showed that between 2010 and 2018, the consumption of products from this group decreased by over 6% (5.56 vs. 5.20 kg/person/month). Considering the individual types of raw meat, a clear (over 30%) decrease in the consumption of beef and veal should be stressed (0.16 vs. 0.11 kg/person/meat). Moreover, in case of beef and veal, a 12% decrease in their consumption was recorded between 2017 and 2018 (0.12 vs. 0.11 kg/person/month). Although in 2010-2018 the consumption of meat products decreased by nearly 5% (2.35 vs. 2.24 kg/person/month), the consumption of processed red meat increased in that period by over 120% (0.66 vs. 1.49 kg/person/month).

According to the World Cancer Research Fund International/American Institute of Cancer Research (WCRF/AICR)[164], the consumption of red meat and processed meat should not be higher than 0.5 kg weekly (71 g/person/day). Considering the results of household budget surveys, the consumption of pork, beef and veal and all meat products in 2010-2018 ranged 120-129 g/person/day and thus significantly exceeded the recommendations.

In 2010-2018 the consumption of fish and fish products decreased by nearly 40% (0.45 vs. 0.28 kg/person/month), and between 2017 and 2018 a nearly 7% decrease was recorded (0.30 vs. 0.28 kg/person/month).

The comparative analysis of the consumption of visible fats (vegetable oils, margarine, butter, lard, and pork fat) showed a decrease of over 20% between 2010 and 2018 (1.35 vs. 1.06 kg/person/month). Considering certain types of fat products, the decrease in their consumption concerned, to the largest extent, animal fats excluding butter (0.15 vs. 0.07 kg/person/month) and was equal to 53.3%. The consumption of vegetable fats also decreased (0.93 vs. 0.74 kg/person/day) – by 20.4%. Changes in the consumption of butter were not recorded.

In the 8-year period under analysis (2010-2018), the amount of consumed milk decreased by over 20% (4.35 vs. 3.44 l/person/month). The decrease in cheese consumption

[163] World Health Organization (WHO), Fruit and Vegetable Promotion Initiative – report of the meeting, Geneva, 25–27 August 2003.
[164] World Cancer Research Fund International/American Institute of Cancer Research (WCRF/AICR), Limit red and processed meat, https://www.wcrf.org/dietandcancer/recommendations/limit-red-processed-meat.

was equal to 8.5% (0.94 vs. 0.86 kg/person/month), and in cream consumption to 7.9% (0.38 vs. 0.35 kg/person/month).

The number of eggs consumed in 2010 was equal to nearly 13 per person/month, and in 2018 the number decreased by two.

The amount of sugar consumed in 2018 was equal to 0.94 kg/person/month and was lower than the one recorded in 2010 by nearly 30% (1.30 kg/person/month), while the consumption of confectionery products increased in the analysed period by 20% (from 0.39 to 0.48 kg/person/month).

In 2017 and 2018 the analysis of the consumption of food products, carried out with the use of the household budgets methodology, was extended by analysing the differences in the consumption of individual groups of food products between urban and rural households (Tab. 12.2).

In the group of cereal products (bread, other bakery products, wheat flour and other types of flour, groats and flakes, rice, pasta and pasta products), it was found that in 2017 and 2018 the inhabitants of urban areas were characterised by lower consumption of such groups of cereal products like bread and flour (by 19% and 35%, respectively), but they consumed by 15% more other bakery products, among the others, dough and pastry.

In the group of potatoes and potato products, a higher consumption (by over 20%) was recorded among the inhabitants of rural areas (3.73-3.95 vs. 2.89-3.03 kg/person/month).

The consumption of vegetables and vegetable products in 2017 was not characterised by any significant differences between the inhabitants of urban and rural areas. However, in 2018 the consumption of vegetables and vegetable products was higher among the inhabitants of urban households than among the inhabitants of rural households by over 6% (5.00 vs. 4.69 kg/person/month).

The consumption of fruit and fruit products in 2017 was by nearly 30% higher among the inhabitants of urban areas (5.01 kg/person/month) than among the inhabitants of rural areas (3.86 kg/person/month). A year later the differences were slightly lower.

The analysis of the consumption of meat, offal and meat products showed that increased amounts of most meat types were consumed by the inhabitants of rural areas, both in 2017 and a year later. In the case of pork meat, the differences did not exceed 20%. The higher consumption of meat among the inhabitants of urban areas was recorded only in the group of beef and veal, and the differences between the households from urban and rural areas were equal to approx. 41% in 2018, and to 65% in 2017.

In the group of fish and fish products, higher values of consumption were recorded among the inhabitants of urban areas than among the inhabitants of rural areas, in particular, in 2018 – by over 10% (0.28 vs. 0.25 kg/person/month).

The total consumption of fat products, both in 2017 and 2018, was higher among the inhabitants of rural areas (by 10.1% and 9.6%, respectively). Considering individual types of visible fats, only the consumption of butter was higher among the inhabitants of urban areas (by over 20%).

In the group of dairy products, the consumption of milk and cream in 2017 and 2018 was higher among rural households. On average, these differences were equal to 11% for milk and 9% for cream. On the other hand, in the case of cheese, a higher consumption was recorded among urban households (in 2017 and 2018, respectively: 0.92-0.94 vs. 0.74-0.76 kg/person/month).

The consumption of eggs among urban households in 2017 and 2018 was equal to 11 per person/month. The consumption recorded in rural households in that period was by 1 higher.

The comparative analysis concerning the consumption of sugar in urban and rural households showed a higher consumption among the inhabitants of rural areas by nearly 40%, and as far as confectionery products are concerned, the consumption among urban households higher by 11% was recorded.

The presented data show that inhabitants of rural areas consumed higher amounts of most of the analysed food products, including in particular bread, flour, potatoes, meat and meat products, milk, eggs and sugar. Nonetheless, the products consumed in higher quantities by inhabitants of urban areas included fruit, the proper consumption of which, along with vegetables, is a very important element of the proper diet. Both the inhabitants of rural and urban areas failed to consume vegetables and fruit in amounts compliant with WHO recommendations; however, the diet of the inhabitants of urban areas varied from those recommendations to the lesser extent.

In turn, the consumption of most meat products in rural areas shows that the recommendations concerning the consumption limits of red meat and processed meat were, to a greater extent, poorly observed by the inhabitants of rural areas than by the inhabitants of urban areas. Nevertheless, the consumption of these products in both groups of the population significantly exceeded the recommendations.

Tab. 12.1. Average monthly food consumption[a] in households in 2017 and 2018 compared to 2010; per person

Food products	Unit	2010	2017	2018
Bread	kg	4.67	3.31	3.15
Other bakery products	kg	0.69	0.93	0.94
Wheat flour and other types of flour	kg	0.88	0.63	0.60
Groats and flakes, rice	kg	0.41	0.42	0.42
Pasta and pasta products	kg	0.36	0.38	0.38
Potatoes and potato products[b]	kg	4.97	3.39	3.22
Vegetables and vegetable products	kg	5.14	5.04	4.87
Fruit and fruit products	kg	4.40	4.54	4.67
Meat, offal and meat products	kg	5.56	5.30	5.20
including, meat	kg	3.09	3.01	2.96
including, pork	kg	1.41	1.32	1.32
beef and veal	kg	0.16	0.12	0.11
poultry	kg	1.52	1.56	1.53
meat products	kg	2.35	2.29	2.24
including, processed meat, excluding of poultry[c]	kg	0.66	1.53	1.49
Fish and fish products[d]	kg	0.45	0.30	0.28
Fats: in total	kg	1.35	1.11	1.06
animal fats (excluding butter)	kg	0.15	0.07	0.07
vegetable fats	kg	0.93	0.78	0.74
Butter	kg	0.27	0.26	0.25
Liquid milk and dairy drinks[e]	l	4.35	3.49	3.44
Cheese	kg	0.94	0.85	0.86
Cream	kg	0.38	0.36	0.35
Eggs	pcs.	12.81	11.42	11.09
Sugar	kg	1.30	0.93	0.94
Confectionery products	kg	0.39	0.47	0.48

[a] - excluding the consumption in mass catering facilities; [b] - including potato chips; [c] - high-quality processed meat: sirloin, ham, gammon and sausages; other processed meat; [d] - excluding canned food, salted herrings and other fish and seafood preparations; [e] - excluding desserts and diary drinks of the following types: kefir, buttermilk and yoghurt.

Tab. 12.2. Average monthly food consumption[a] in urban and rural households in 2017 and 2018; per person

Food products	Unit	2017		2018	
		Urban	Rural	Urban	Rural
Bread	kg	3.02	3.75	2.89	3.55
Other bakery products	kg	0.98	0.85	0.99	0.86
Wheat flour and other types of flour	kg	0.53	0.80	0.50	0.77
Groats and flakes, rice	kg	0.43	0.42	0.41	0.40
Pasta and pasta products	kg	0.37	0.38	0.38	0.38
Potatoes and potato products[b]	kg	3.03	3.95	2.89	3.73
Vegetables and vegetable products	kg	5.06	5.00	5.00	4.69
Fruit and fruit products	kg	5.01	3.86	5.04	4.13
Meat, offal and meat products	kg	4.99	5.76	4.92	5.62
including, meat	kg	2.80	3.33	2.77	3.25
including, pork	kg	1.19	1.53	1.20	1.52
beef and veal	kg	0.14	0.09	0.12	0.09
Poultry	kg	1.46	1.70	1.44	1.64
meat products	kg	2.19	2.43	2.15	2.37
including, processed meat, excluding of poultry[c]	kg	1.45	1.65	1.41	1.60
Fish and fish products[d]	kg	0.30	0.28	0.28	0.25
Fats: in total	kg	1.07	1.19	1.03	1.14
animal fats (excluding butter)	kg	0.07	0.09	0.06	0.08
vegetable fats	kg	0.72	0.87	0.69	0.84
butter	kg	0.28	0.23	0.28	0.22
Liquid milk and dairy drinks[e]	l	3.33	3.76	3.28	3.69
Cheese	kg	0.92	0.74	0.94	0.76
Cream	kg	0.34	0.38	0.34	0.37
Eggs	pcs.	10.93	12.19	10.82	11.52
Sugar	kg	0.77	1.20	0.76	1.21
Confectionery products	kg	0.49	0.44	0.49	0.44

[a]- excluding the consumption in mass catering facilities; [b] - including potato chips; [c] - high-quality processed meat: sirloin, ham, gammon and sausages; other processed meat; [d] - excluding canned food, salted herrings and other fish and seafood preparations; [e] - excluding desserts and diary drinks of the following types: kefir, buttermilk and yoghurt.

12.3. Energy and nutritional value of a diet

The energy value and content of nutrients were calculated based on the "Tables of food composition"[165] concerning individual groups of food by adjusting them to the list of food articles considered in the household budget surveys carried out by Statistics Poland. The calculations are based on the conversion rates established by the Institute of Food and Nutrition (IFN).

According to the results of these calculations (Tab. 12.3), the amount of energy from food consumed by the inhabitants of the households surveyed in 2018 was equal to 1,718 kcal per person daily. When analysing the data, it must be remembered that, due to the applied methodology, the household budget surveys do not include the food consumed outside households (mass catering facilities). Moreover, the energy value of alcohol beverages included in the diet is not considered.

The analyses carried out by the Institute of Food and Nutrition in 2016, based on Statistics Poland data, showed that the energy value of the food consumed outside households represented approximately 23% of energy from the daily diet[166].

The significant intake of energy by the inhabitants of households in 2018 came from the products of vegetable origin. Nearly one-third of the energy value came from the products of animal origin.

The household budget surveys have shown a downward trend in the energy intake in the Polish population in recent years. The intake in 2018 was by nearly 30 kcal lower than in 2017 and was far from the intake recorded in 2010 (accounting for 82.3% of that intake).

Among all macronutrients determining the energy value of the diet in 2010-2018, the content of carbohydrates decreased to the highest extent (their intake in 2018 accounted for 81.1% of intake in 2010). The lowest decrease was recorded for protein (the intake in 2018 accounted for 95.7% of the protein intake in the Polish population 8 years earlier).

When analysing the energy intake from individual macronutrients in 2018, a very high percentage of energy from fats was observed – 38.4%, exceeding the recommended 20-35%[167].

[165] Kunachowicz H., Nadolna I., Przygoda B., Iwanow K., Tabele składu i wartości odżywczej żywności (Tables of food composition), PZWL Wydawnictwo Lekarskie, Warsaw, 2005.
[166] Sekuła W., et al., Obliczenia Samodzielnej Pracowni Ekonomiki Żywności i Żywienia IŻŻ na podstawie niepublikowanych wyników badań budżetów gospodarstw domowych GUS (Calculations by the Independent Department for Food and Nutrition Economics of the Institute of Food and Nutrition based on unpublished results of household budget surveys carried out by Statistics Poland), 2016.
[167] Normy żywienia dla populacji Polski i ich zastosowanie (Dietary Reference Values for the Polish population and their application), [ed.] M. Jarosz, E. Rychlik, K. Stoś, J. Charzewska, the National Institute of Public Health – National Institute of Hygiene, Warsaw, 2020.

The energy intake from carbohydrates was relatively low – 47.8%. It was within the recommended limit of 45-65%[6], but close to the lower limit.

As far as fats are concerned, the structure of origin of these ingredients from animal and vegetable products was also disadvantageous. More than a half of total fats present in the diet was provided by products of animal origin, which was not compliant with the recommendations indicating that the consumption of animal fats and the products forming their significant source, such as fat meat or fat dairy products, should be limited[168].

The structure of consumption of fatty acids, deviating from the recommendations, was the result of the excessive amount of products being the source of animal fats in the diet. The diet of the Polish population was characterised by a high content of saturated fatty acids providing 14% of energy. It is recommended now to limit the intake of saturated fatty acids to the maximum level of 5-6% of energy (up to 10% among children under the age of 9); however, in the diet ensuring the proper nutritional value, their intake should be as low as possible[6]. On the other hand, the content of the polyunsaturated fatty acids represented only half of the saturated acids and their ratio (P:S) was equal to 0.48.

In 2010-2018 the lowered nutritional value was accompanied by the decrease in the content of fibre which resulted from the decrease in the consumption of certain cereal products (bread, flour and flour products), vegetables and potatoes in that period.

Changes in the consumption of food products also resulted in the lower content of other valuable dietary nutrients. Vitamin C, the intake of which corresponded in 2018 to 90.5% of the intake recorded 8 years earlier, is a good example. Information on the intake of folates in 2010 was not included in the analysed data; however, the decrease in the content of this vitamin in the diet is indicated by food balance sheet data[169].

Although the energy value of diet in 2010-2018 decreased, the increase in the intake of certain nutrients was observed. These included potassium and magnesium the intake of which

[168] Jarosz M., Rychlik E., Piramida Zdrowego Żywienia i Aktywności Fizycznej, [w:] Medycyna stylu życia (Healthy Nutrition and Physical Activity Pyramid, [in:] Lifestyle Medicine), [ed.] D. Śliż, A. Mamcarz, PZWL Wydawnictwo Lekarskie, Warsaw, 2018, pp. 103–117.

[169] Sekuła W., et al., Obliczenia Samodzielnej Pracowni Ekonomiki Żywności i Żywienia IŻŻ na podstawie danych bilansów żywnościowych GUS (Calculations of the Independent Department for Food and Nutrition Economics of the Institute of Food and Nutrition based on unpublished results of household budget surveys carried out by Statistics Poland), 2018.

increased by over 20%. This observation is particularly advantageous, considering the fact that these nutrients deficiencies were observed in the diet of the Polish population[170,171].

At the same time, no significant changes in the intake of calcium, iron or vitamins A, B_1 and B_2 were observed in the 8-year period under analysis.

The energy value of the diet of the inhabitants of rural areas was higher than among the inhabitants of urban areas, both in 2018 and a year earlier (Tab. 12.4). The differences were equal to nearly 200 kcal. The differences were mostly due to the higher consumption of food products in rural areas. However, they could be partially due to the higher consumption of products and dishes by the inhabitants of urban areas outside their households.

The proportion of energy from the products of animal origin was slightly higher in the diet of the inhabitants of urban areas (32.9%) than in the diet of the inhabitants of rural areas (31.0%). Differences concerning the proportion of energy from individual macronutrients were also observed. The diet of the inhabitants of urban areas was characterised by a higher proportion of energy from fats (39.1%) and a lower proportion of energy from carbohydrates (46.9%) than the diet of the inhabitants of rural areas (37.7% of energy from fats and 48.7% from carbohydrates). In both groups, the structure of the origin of energy from macronutrients deviated from the recommendations, but it was more advantageous in the diet of the inhabitants of rural areas.

The diet of the inhabitants of urban areas was characterised not only by the higher proportion of total energy from fats but also from saturated fatty acids (14.5%) as compared to the diet of the inhabitants of rural areas (13.4%). Although the percentage was lower in rural areas, it significantly exceeded the abovementioned recommendations[6].

The higher energy value of the diet of the inhabitants of rural areas was linked to the higher content of minerals in their food (sodium, potassium, phosphorous, magnesium, zinc and iodine) and some vitamins (A, E, niacin and folates). The content of copper, manganese, and vitamins D, B_1, B_2, B_6 and B_{12} was similar in the diets of both groups. The exceptions were calcium and vitamin C which higher intake was observed in the inhabitants of urban areas. This resulted from the higher consumption of cheese and fruit, and also vegetables in 2018, in this group.

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[170] Waśkiewicz A., Szcześniewska D., Szostak-Węgierek D., et al., Are dietary habits of the Polish population consistent with the recommendations for prevention of cardiovascular disease? – WOBASZ II project, Kardiol. Pol., 2016, 74, 9, pp. 969–977.
[171] Ilow R., Regulska-Ilow B., Różańska D., et al., Assessment of dietary intake in a sample of Polish population – baseline assessment from the prospective cohort 'PONS' study, Ann. Agric. Environ. Med., 2011, 18, 2, pp. 229–234.

As it was previously mentioned, household budget surveys may not include the entire food consumed by certain people. Moreover, the obtained data show the average consumption among all inhabitants of the surveyed households and do not reflect the differences depending on age and gender. Therefore, not all the data resulting from this methodology may correspond to the recommendations.

Data on individual consumption facilitate a more accurate assessment of the energy and nutritional value of the diet. However, the surveys covering a group of people representative of the country are conducted less often. The first survey representative of the population of Poland, covering adults, children and youth, was carried out in 2000 by the Institute of Food and Nutrition in collaboration with the Food and Agriculture Organization of the United Nations (FAO)[172]. The most recent available data concerning the individual consumption of food by the Polish adult population are retrieved from WOBASZ II (the 2nd Multi-centre National Population Health Examination Survey) which was conducted in 2013-2014 among adults aged 20 or more[9,173].

The average energy value of the diet of men participating in WOBASZ II was equal to 2,317 kcal, compared to 1,678 kcal among women[12]. In the case of men, the energy intake corresponded to the Polish DRVs, while in the case of women, that intake was on the lower level.

The percentage of energy from fats was high; in the diets of men, it was equal to 37.5% and in the diets of women – 35.1%[9]. Moreover, significant proportion of energy was derived by saturated fatty acids – 13.8% in the diets of men and 13.3% in the diets of women. On the other hand, the percentage of energy from carbohydrates was close to the lower limit of the recommended value and was equal to 47.1% and 49.8%, respectively. The data confirm irregularities in the diet of the Polish population observed in the analysis of the household budget surveys.

Moreover, low intake of fibre was observed in the Polish population. In the diet of men, its content was equal to 20.9 g, and it was even lower in the diet of women – 17.5 g. It was much less than the current DRVs for fibre (25 g for individuals at the age of 19-65)[6].

[172] Szponar L., Sekuła W., Rychlik E., et al., Badania indywidualnego spożycia żywności i stanu odżywienia w gospodarstwach domowych (Household food consumption and anthropometric survey), the Institute of Food and Nutrition, Warsaw, 2003.
[173] Różańska D., Waśkiewicz A., Regulska-Ilow B., et al., Relationship between the dietary glycaemic load of the adult Polish population and socio-demographic and lifestyle factors – results of the WOBASZ II study, Adv. Clin. Exp. Med., 2019, 28, 7, pp. 891–897.

The minerals intake often deviated from the Polish DRVs . The diets of men and women were characterised by a too low content of calcium – 81.8% of the diets of men and 81.1% of the diets of women, and a too low content of magnesium – 71.2% and 64.1% of the diets, respectively[9]. The food consumed by the surveyed persons did not cover the DRVs for potassium; however, the scale of this deficiency was overestimated due to the fact that currently the DRVs for this nutrient are lower[6].

The authors of WOBASZ II found that the intake of certain vitamins was lower than the Polish DRVs. . This applied mostly to folates[9]. 74.3% of the diets of men and 86.6% of the diets of women were characterised by a too low content of that vitamin. The intake of vitamin C often did not cover the requirement (among 56% of men and 43.6% of women), although the average value proved otherwise.

The intake of vitamin D was not discussed in the cited papers on the results of WOBASZ II. Nevertheless, the results of other studies carried out, i.e., among the inhabitants of Warsaw, showed that their diet did not cover the requirement for this vitamin[174,175]. The remaining amount of vitamin D should be derived by the skin synthesis which is often insufficient, and experts thus recommend its supplementation.

In 2016, the PITNUTS study was conducted, including infants and small children from all over the country[176]. The energy value of the diets (median) at the age of 13-36 months (infants were not included in the analysis) was equal to 1,105.2 kcal and exceeded the reference value for this age group; however, the diets of 36.6% of children did not cover the energy requirement. The percentage of energy from fats in the diet of children aged from 1 to 3 years should be higher than in the diet of adults (30-40%)[6], but in the food consumed by the surveyed persons, it was equal to 29.6%. Moreover, the diets of 58.7% of children were characterised by a too low content of fats. 55.5% of fats was derived by carbohydrates, which was compliant with the recommendations.

The results of the PITNUTS study also showed too low a intake of many nutrients necessary for the proper development of children, namely, fibre, vitamins D and E, calcium and potassium in the significant part of the surveyed group[15]. The excessive content of sodium in the diet was also mentioned.

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[174] Waśkiewicz A., Sygnowska E., Broda G., Chwojnowska Z., The use of vitamin supplements among adults in Warsaw: is there any nutritional benefit?, Rocz. Panstw. Zakl. Hig., 2014, 65, 2, pp. 119–126.

[175] Charzewska J., Chwojnowska Z., Chabros E., et al., Spożycie energii i składników odżywczych a stan odżywienia kobiet w wieku podeszłym (Energy and nutrient intake versus nutritional status of elderly women), Post. N. Med., 2011, 24, 9, pp. 732–738.

[176] Weker H., Barańska M., Riahi A., et al., Nutrition of infants and young children in Poland - Pitnuts 2016, Dev. Period. Med., 2017, 21, 1, pp. 13–28.

The literature published in recent years does not contain the results of studies on energy and nutritional value of the diet of older children and adolescents, which would be representative of the entire Poland. Nevertheless, the papers discussing studies conducted in various regions of the country are published. Their results point to the numerous dietary mistakes among older children and adolescents, similar to those observed among adults. The study carried out at the turn of 2009/2010 among children from Warsaw, aged 11-13, showed that their diets were characterised by a high proportion of energy from fats (35.1-35.3%), including saturated fatty acids (13.9-14.8%)[177], while 54.0-54.4% of energy was derived by carbohydrates.

In the abovementioned Warsaw studies, the average intake of the majority of the analysed vitamins and minerals, as compared to the DRVs, was proven to be too low. The highest deficiencies related to calcium, vitamin D, folates and iron. At the same time, the excessive sodium intake, of as compared to the Polish DRVs and WHO recommendations, was observed[6,178].

Tab. 12.3. Energy and selected nutrients average intake in households in 2017 and 2018 and in comparison to 2010; per person

Energy and nutrients	Unit	2010	2017	2018
Total energy	kcal	2,087	1,746	1,718
	kJ	8,738	7,312	7,196
Energy from products of animal origin	kcal	655	559	551
Energy from products of vegetable origin	kcal	1,432	1,187	1,167
Macronutrients:				
Protein: in total	g	62.8	61.2	60.1
of animal origin	g	41.0	40.0	39.3
of vegetable origin	g	21.8	21.2	20.7
Fats: in total	g	86.5	76.1	74.6
of animal origin	g	49.9	40.8	40.2
of vegetable origin	g	36.6	35.3	34.4
Digestible carbohydrates	g	249	204	202
Proportion of energy obtained from the intake of:				
Protein	%	12.0	14.2	14.2

[177] Wolnicka K., Jaczewska-Schuetz J., Taraszewska A., Ocena wartości odżywczej całodziennych racji pokarmowych dzieci uczęszczających do warszawskich szkół podstawowych (Evaluation of nutritive value of daily foodrations consumed by children attending to primary schools in Warsaw), Rocz. Panstw. Zakl. Hig., 2012, 63, 4, pp. 447–453.
[178] World Health Organization (WHO), Guideline: Sodium intake for adults and children, Geneva, 2012.

Fats	%	37.3	38.5	38.4
Digestible carbohydrates	%	47.7	47.6	47.8

Tab. 12.3. Energy and selected nutrients average intake in households in 2017 and 2018 and in comparison to 2010; per person (cont.)

Energy and nutrients	Unit	2010	2017	2018
Minerals:				
Sodium	mg	4,605	3,771	3,737
Potassium	mg	2,338	2,865	2,824
Calcium	mg	504	529	527
Phosphorous	mg	–	983	967
Magnesium	mg	226	282	279
Iron	mg	8.5	9.2	9.0
Zinc	mg	–	8.3	8.2
Copper	mg	–	1.3	1.2
Manganese	mg	–	3.4	3.3
Iodine	µg	–	156	155
Vitamins:				
Vitamin A	µg	942	977	933
Beta-carotene	µg	–	2,451	2,307
Vitamin D	µg	–	3.0	2.9
Vitamin E	mg	–	10.5	10.2
Vitamin B_1	mg	1.25	1.3	1.3
Vitamin B_2	mg	1.28	1.4	1.4
Niacin	mg	–	17.3	17.0
Vitamin B_6	mg	–	1.6	1.6
Folates	µg	–	205	200
Vitamin B_{12}	µg	–	3.2	3.1
Vitamin C	mg	86.7	79.4	78.5

Tab. 12.3. Energy and selected nutrients average intake in households in 2017 and 2018 and in comparison to 2010; per person (cont.)

Energy and nutrients	Unit	2010	2017	2018
Fatty acids:				
Saturated	g	28.3	27.1	26.7
Monounsaturated	g	37	31.1	30.5
Polyunsaturated	g	14.5	13.2	12.9
Proportion of energy from saturated fatty acids	%	12.2	14.0	14.0
Ratio of polyunsaturated and monounsaturated fatty acids (P:S)		0.51	0.49	0.48
Cholesterol	mg	300	237	232
Fibre	g	16.7	14.1	13.7

Tab. 12.4. Energy and selected nutrients average intake in urban and rural households in 2017 and 2018; per person

Energy and nutrients	Unit	2017		2018	
		Urban	Rural	Urban	Rural
Total energy	kcal	1,675	1,865	1,649	1,829
	kJ	7,013	7,811	6,904	7,660
Energy from products of animal origin	kcal	547	579	543	568
Energy from products of vegetable origin	kcal	1,128	1,286	1,106	1,261
Macronutrients:					
Protein: total	g	59.3	63.9	58.5	62.5
of animal origin	g	38.9	41.4	38.5	40.7
of vegetable origin	g	20.5	22.5	20.0	21.8
Fats: total	g	74.1	79.7	73.0	78.0
of animal origin	g	40.1	42.3	39.7	41.3
of vegetable origin	g	34.1	37.4	33.3	36.7
Digestible carbohydrates	g	193	223	190	219
Proportion of energy obtained from the intake of:					
Protein	%	14.4	13.9	14.4	13.9
Fats	%	39.2	37.8	39.1	37.7
Digestible carbohydrates	%	46.9	48.5	46.9	48.7

Tab. 12.4. Energy and selected nutrients average intake in urban and rural households in 2017 and 2018; per person (cont.)

Energy and nutrients	Unit	2017		2018	
		Urban	Rural	Urban	Rural
Minerals					
Sodium	mg	3,459	4,226	3,432	4,055
Potassium	mg	2,814	2,941	2,783	2,887
Calcium	mg	534	520	536	520
Phosphorous	mg	961	1,015	950	995
Magnesium	mg	276	292	273	286
Iron	mg	9.0	9.5	8.9	9.3
Zinc	mg	8.1	8.7	8.0	8.5
Copper	mg	1.3	1.2	1.2	1.2
Manganese	mg	3.3	3.5	3.3	3.4
Iodine	µg	141	178	141	170
Vitamins:					
Vitamin A	µg	947	1,003	923	958
Beta-carotene	µg	2,417	2,477	2,351	2,256
Vitamin D	µg	2.9	3.0	2.8	2.9
Vitamin E	mg	10.1	11.0	9.9	10.8
Vitamin B	mg	1.3	1.4	1.3	1.3
Vitamin B_2	mg	1.4	1.4	1.4	1.4
Niacin	mg	16.7	18.2	16.5	17.8
Vitamin B_6	mg	1.6	1.7	1.6	1.6
Folates	µg	201	211	197	204
Vitamin B_{12}	µg	3.1	3.2	3.1	3.2
Vitamin C	mg	81.9	75.3	80.9	74.5
Fatty acids:					
Saturated	g	26.9	27.7	26.6	27.1
Monounsaturated	g	30.2	32.9	29.7	32.2
Polyunsaturated	g	12.5	14.2	12.2	13.8
Proportion of energy from saturated fatty acids	%	14.5	13.4	14.5	13.4
Ratio of polyunsaturated and monounsaturated fatty acids (P:S)		0.47	0.51	0.46	0.51
Cholesterol	mg	230	246	228	239
Fibre	g	13.9	14.4	13.5	14.0

12.4. Nutritional status

The assessment of the nutritional status of adults was conducted on the basis of the results of a study carried out in the framework of the EU-Menu Project by the Institute of Food and Nutrition, which later, on 1 February 2020, was incorporated into the structures of the National Institute of Public Health – the National Institute of Hygiene (NIPH-NIH), in collaboration with the European Food Safety Authority. These are the most recent available data collected from July 2019 until February 2020. The analysis includes also the data of Statistics Poland, collected in 2014[179].

Data available in the literature were used to characterize the nutritional status of children and adolescents. These data came from: the PITNUTS study from 2016[15], study carried out in 2013 in the framework of the Swiss-Polish Cooperation Programme[180], and the HBSC study carried out in 2017-2018[181].

In the study conducted by IFN/NIPH-NIH, the measurements of height and weight were performed. They were then applied in calculations of the Body Mass Index (BMI) used to determine whether body weight was normal (BMI from 18.5 to 24.9), deficient (BMI below 18.5) or excessive (BMI equal to 30.0 or higher)[182]. It was also verified whether the surveyed population included people suffering from severe underweight (BMI below 16.0) or severe obesity also called morbid obesity (BMI equal to 40.0 or higher).

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[179] Statistics Poland (GUS), Stan zdrowia ludności Polski w 2014 r. (Health status of the population of Poland), Warsaw, 2016.

[180] Jarosz M., Charzewska J., Wolnicka K., et al., Stan odżywienia dzieci i młodzieży szkolnej w Polsce – badania w ramach projektu KIK/34 „Zachowaj Równowagę" realizowanego w Szwajcarsko-Polskim Programie Współpracy (Nutritional status of children and adolescents – preliminary results the programme KIK/34 "Preventing overweight and obesity" in Swiss-Polish Cooperation Programme), Żyw. Człow. Metab., 2016, 43, 4, pp. 231–238.

[181] Oblacińska A., Rozwój fizyczny i samoocena masy ciała, [w:] Zdrowie uczniów w 2018 roku na tle nowego modelu badań HBSC (Physical development and self-assessment of body weight, [in:] Health of students in 2018 on the background of the new model of HBSC studies), [ed.] J. Mazur, A. Małkowska-Szkutnik, Institute of Mother and Child, Warsaw, 2018, pp. 70–81.

[182] World Health Organization (WHO), Obesity. Preventing and managing the global epidemic. Report of a WHO Consultation on Obesity, Geneva, 3-5 June 1997, Geneva, 1998.

Tab. 12.5. The prevalence of underweight, normal body weight, overweight, obesity and severe obesity according to BMI criteria among the studied men and women aged 18 years and over (%)

Gender	Number of the surveyed persons	Underweight BMI < 18.5	Normal body weight BMI 18.5-24.9	Overweight BMI 25.0-29.9	Obesity BMI 30.0-39.9	Severe obesity BMI 40.0 and higher
Men	1,041	0.3	34.0	50.3	14.9	0.5
Women	1,044	2.1	52.1	30.7	14.8	0.4

The presented data on the nutritional status of adults (Tab. 12.5) show that the underweight was observed among 0.3%. It was more frequently observed among women and corresponded to 2.1% of the surveyed population.

Moreover, the data from the study show the very frequent occurrence of excessive body weight. It was observed among 65.7% of men and 45.9% of women. Obesity was found among 15.4% of men and 15.2% of women. Morbid obesity was also observed among some individuals (0.5% of men and 0.4% of women).

Due to overweight and obesity being very common among men, normal weight was observed only among 34.0% of the surveyed male population. The percentage was higher among women and equalled 52.1%.

Earlier data concerning the nutritional status of the Polish population were collected by Statistics Poland in 2014[18]. However, the interviewers did not take any anthropometric measurements but used the information obtained from respondents. According to the data, underweight corresponded to 1.2% of men and 4.3% of women. Excessive body weight was observed among 62.2% of men and 45.7% of women, while obesity corresponded to 18.1% of men and 15.6% of women.

Statistics Poland also compared the nutritional status among the inhabitants of urban and rural areas. No large differences were observed among men: underweight was observed in 1.4% of the surveyed male population from urban areas and in 0.9% from rural areas, while overweight or obesity was observed among 62.7% and 61.4%, respectively. The percentage of women from urban and rural areas with underweight was similar: 4.3% and 4.1%. On the other hand, overweight and obesity were a little bit less frequently observed in urban than in rural areas: among 44.6% and 47.4% of women, respectively.

Information on the nutritional status of infants and small children was obtained from the PITNUTS study conducted in 2016[15]. The nutritional status was determined on the basis of BMI in relation to body length/height. Underweight was observed among 14.5% of infants aged 5-12 months, and among 5.1% it was severe underweight. Overweight was observed among 2.9% and obesity among 1.3% of those infants. However, the potential risk of excessive body weight was present among 13.7% infants. Normal weight was observed among 67.6% of the surveyed infants of that age.

At the age of 1-3 years, underweight was present among 4.1%, and mong 1.8% it was severe underweight. Overweight children represented 6.9% and obese children 2.8%. The risk of excessive body weight was observed among 18.4% of children while children with normal weight represented 67.8% of the studied population.

In 2013, the assessment of the nutritional status among school students aged 11-16 was conducted in 16 voivodships under the Swiss-Polish Cooperation Programme[19]. The assessment was based on the BMI criteria established by Cole et al.[183,184]. Underweight was observed among 8.6% of students[12]. Excessive body weight was observed among 22.3%, including overweight among 17.8% and obesity among 4.5%. Excessive weight was more frequently observed among boys than among girls.

The assessment of the nutritional status was also one of the elements of the HBSC study carried out in the school year 2017/2018 among children and youth aged 11-15[20]. However, anthropometric measurements were not performed, and information on height and weight were provided by the surveyed children themselves. The assessment was based on the abovementioned criteria established by Cole at al.[22,23]. Underweight was observed among 8.8% of the surveyed boys and 16.2% of the surveyed girls. Excessive body weight was observed among 22.6% of the boys and 10.8% of the girls, while the incidence of obesity was equal to 3.1% and 1.6%, respectively[20].

Such a large difference among boys and girls could have resulted from the fact that girls more often reported their body weight as being lower than actually, and the percentage of persons with underweight could actually be lower in this group, while overweight or obesity could be observed more often.

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[183] Cole T.J., Flegal K.M., Nicholls D., Jackson A.A., Body mass index cut offs to define thinness in children and adolescents: international survey, BMJ, 2007, 335, 7612, p. 194.
[184] Cole T.J., Bellizzi M.C., Flegal K.M., et al., Establishing a standard definition for child overweight and obesity worldwide: international survey, BMJ, 2000, 320, 7244, pp. 1240–1243.

SUMMARY

1. The analysed data obtained from the household budget surveys show that the significant differences in the diet of the Polish population were observed in 2010-2018. In that period, the consumption of the majority of food products (cereal products, potatoes, vegetables, meat and meat products, fats, milk and dairy drinks, eggs and sugar) decreased which resulted in the decrease in the energy value of the diet and the intake of more important nutrients such as fibre and vitamin C.
2. Some differences in the diets of the inhabitants of urban and rural areas were observed. The inhabitants of rural areas consumed more bread, potatoes, meat products, milk and dairy drinks, eggs and sugar, which resulted in the higher energy value of their diets and the intake of certain nutrients, as compared to the diets of the inhabitants of urban areas. On the other hand, the consumption of vegetables, fruit and cheese was higher in urban areas, which translated in the higher intake of vitamin C and calcium.
3. Data from the household budget surveys facilitated the findings that in the abovementioned period the Polish population consumed too low quantities of vegetables and fruit, and too much red meat and processed meat, as compared to the recommendations. Moreover, the excessive proportion of energy from fats, including saturated fatty acids, and too little energy from carbohydrates were observed in their diets.
4. Data from the literature discussing the individual food consumption complemented the assessment of the diets of the Polish population, referring to Polish DRVs and recommendations. The results of these studies showed that the diet of some groups of people, especially women, did not cover the energy requirement. The structure of the origin of energy from macronutrients deviated from the recommendations; the amount of energy obtained from fats, especially from saturated fatty acids, was too high, and the amount of energy from carbohydrates was too low, especially in the diet of adults.
5. Deficiencies of certain minerals and vitamins, in particular, calcium, magnesium, potassium, vitamin C and D, and folates were found in the diets of the Polish adult population, and among children and youth – also the deficiency of iron was found. Moreover, the content of sodium in the diet was too high.
6. Data on consumption did not show that the energy value of the diets of the majority of Poles exceeded the recommendations; however, the high prevalence of overweight and obesity was a serious problem, confirmed by the assessment of the nutritional status based on the latest independent studies carried out in the framework of the EU-Menu Project supported by the European Food Safety Authority. Excessive body weight was observed mostly among

adults and was more frequent among men than women. However, the scale of this phenomenon was equally disturbing among the population of children. Underweight in adults was not frequent but it related to a significant group of children and youth, or even infants.

13. ENVIRONMENTAL RISKS – INEQUALITIES IN EXPOSURE TO PARTICULATE MATTER AMONG THE POLISH POPULATION

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13.1. Introduction, methodology, sources of data

The results of the published studies undoubtedly show that air pollutants, especially particulate matter, are the sources of numerous adverse health effects[185,186,187,188]. General health issues resulting from exposure to air polluted by particulate matter in Poland are discussed in the previous editions of NIPH-NIH's monographs[189,190].

The information presented in this chapter is complemented with the assessment of inequalities in exposure to particulate matter in Poland as compared to Europe and considering the health risk of exceeding limit values recommended by the World Health Organisation (WHO).

To assess the variability of the risk of air pollution by particulate matter in Poland and Europe, analyses were conducted using the most up-to-date and available data. Data from the CAMS service (Copernicus Atmosphere Monitoring Service), encompassing spatial distributions of the annual mean concentration of particulate matter (PM2.5 and PM10) for Europe in the year 2018, are the basis for the assessment of spatial variability of concentrations. To ensure comparability of results on the European scale and to avoid uncertainty resulting from the application of various tools (models), the analyses were performed using the integrated

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[185] *WHO Air quality guidelines for particulate matter, ozone, nitrogen dioxide and sulphur dioxide. Global update 2005. Summary of risk assessment. World Health Organization 2006.*

[186] *Environment and human health. Joint EEA-JRC report. EEA Report No 5/2013. European Environment Agency, 2013, European Union, 2013.*

[187] *Review of evidence on health aspects of air pollution – REVIHAAP Project. Technical Report. WHO Regional Office for Europe. World Health Organization 2013.*

[188] *Pyły drobne w atmosferze. Kompendium wiedzy o zanieczyszczeniu powietrza pyłem zawieszonym w Polsce (Fine ashes in the atmosphere. A compendium on air pollution by particle matter in Poland) [ed. K. Juda-Rezler. B. Toczko], Biblioteka Monitoringu Środowiska, Warsaw, 2016.*

[189] *Skotak K. et al.: Zagrożenia środowiskowe [w:] Sytuacja zdrowotna ludności Polski i jej uwarunkowania (Environmental risks [in]: Health status of the population of Poland and its determinants) [ed. Wojtyniak B. and Goryński P.], The National Institute of Public Health – The National Institute of Hygiene, Warsaw 2016.*

[190] *Skotak K: Zagrożenia środowiskowe [w:] Sytuacja zdrowotna ludności Polski i jej uwarunkowania (Environmental risks [in]: Health status of the population of Poland and its determinants) [ed. Wojtyniak B. and Goryński P.], The National Institute of Public Health – The National Institute of Hygiene, Warsaw 2018.*

ENSEMBLE model[191]. At present, the model is based on results obtained from the nine most advanced air quality models developed in Europe (CHIMERE, EMEP, EURAD-IM, LOTOS-EUROS, MATCH, MOCAGE, SILAM, DEHM and GEM-AQ), presenting the results in the form of the median value calculated from individual models in each grid cell (spatial range: 25°W-45°E, 30°N-70°N in a regular grid 0.1°)[192].

To assess the exposure of the population, the latest EUROSTAT data on the density of population are considered (available for GEOSTAT 2011 V2.0.1 of 23 November 2015). These data are provided on the grid with a resolution of 1 km^2, prepared according to the INSPIRE data specifications for the European grids. The grid encompasses not only the cells populated in the reference year – 2011. It should be pointed out that when providing the data, some of the countries applied the so-called disclosure control. It related to areas with a very low population density – depending on the country, the control encompassed grid cells from 1 to 10 inhabitants. In such cases, the population from the cells was generally added to the adjacent cells[193]. Population data were provided by European national statistics offices based on national sources of data and expert knowledge. For countries which were unable to provide data from their national sources (Cyprus, Iceland, Luxembourg, Bosnia and Herzegovina, Serbia, Montenegro, the former Yugoslav Republic of Macedonia, Andorra, Man Islands, Monaco, Vatican City State) the data were obtained using JRC (Joint Research Centre) and AIT (Austrian Institute of Technology GmbH) models. The detailed analysis for Poland was performed based on the country's administrative division into poviats, using data from the official statistics[194].

Data integration, analysis and visualisation were completed with the application of ArcGIS and MS Office tools (MS Access).

The exposure assessment was made for particulate matter: PM2.5 and PM10, considering the long-term (annual mean concentration) guideline values recommended by the WHO. To determine the health risk for particulate matter, the results are presented in the form of the population-weighted annual mean concentration and coefficient of variations in concentration in a given area (in the case of analyses for Europe – countries, and for Poland – poviats) as the relatively differentiated distribution of exposure. Additionally, analyses for Poland included the estimation of premature deaths resulting from P.M. exposure and the calculation of the share of premature deaths in the total number of deaths.

[191] https://www.regional.atmosphere.copernicus.eu/
[192] CAMS, 2019, Regional Production, updated documentation covering all regional operational systems and the ENSEMBLE.
[193] https://ec.europa.eu/eurostat/web/gisco/geodata/reference-data/population-distribution-demography/geostat.
[194] https://stat.gov.pl/.

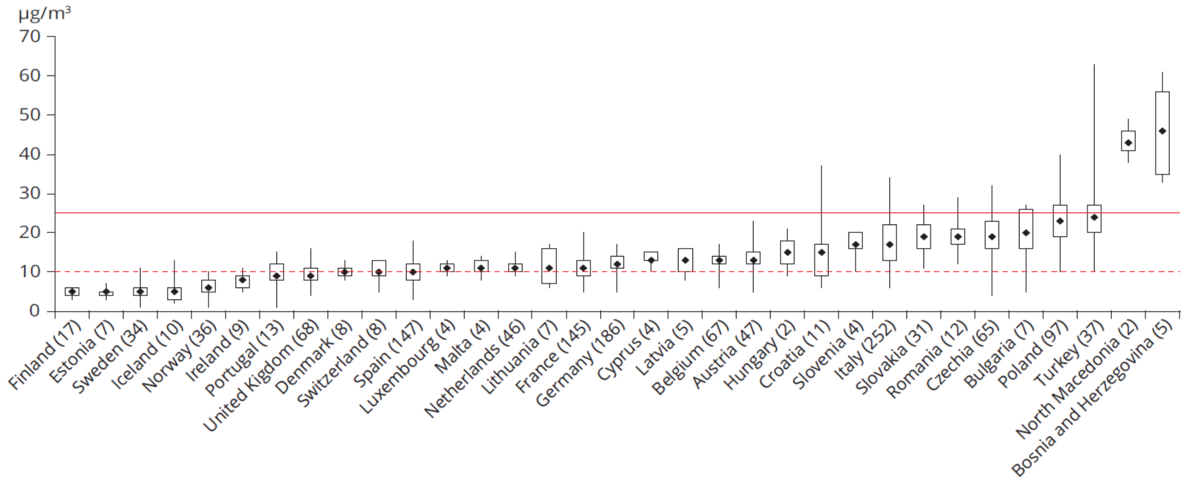
All analyses relate to the year 2018.

13.2. Assessment of variations in exposure in the European countries

EEA air quality reports present analyses performed based on measurements carried out using reference methods required by European Union law (air quality Directives) transposed to the applicable law of the Member States[195]. The results published in the latest available EEA report show significant differences in concentrations of particulate matter at individual monitoring stations operating in some countries[196] (mainly in Turkey, Poland, Bulgaria, the Czech Republic, Italy and Croatia (Fig. 13.1, 13.2).

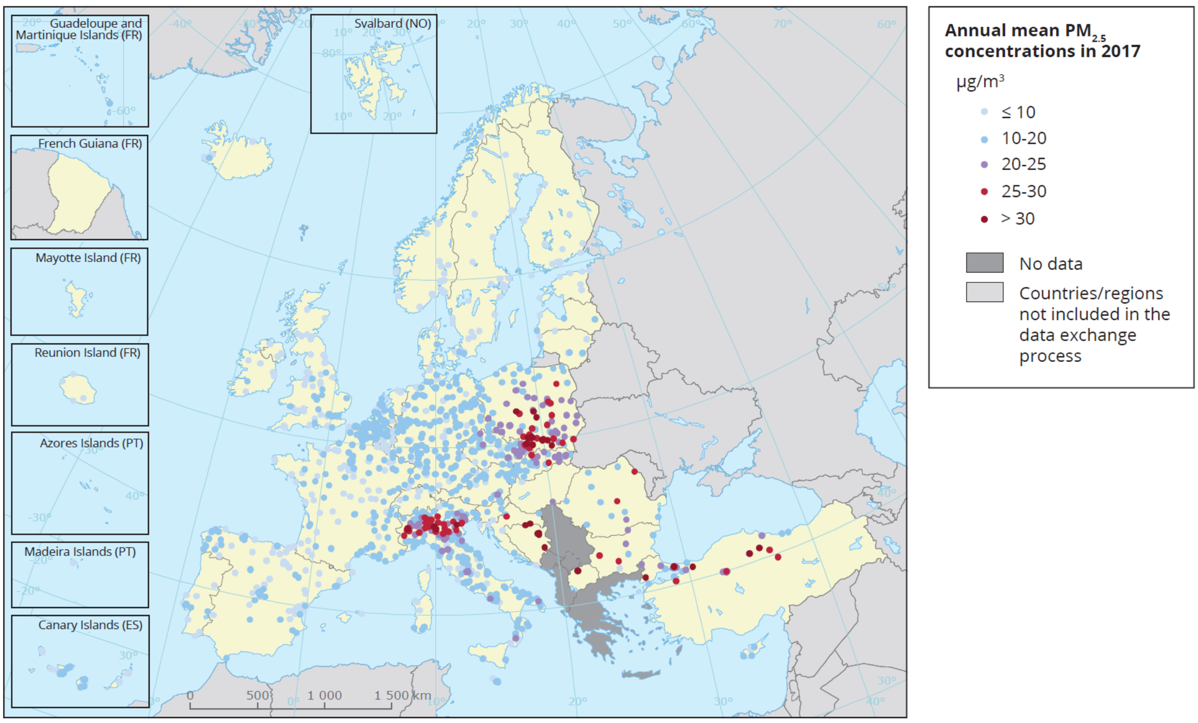
[195] *Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe (OJ L 152, 11.6.2008, pp. 1-44).*

[196] *Air quality in Europe - 2019 report. EEA Report No 10/2019. European Environment Agency, 2019.*



Ryc. 13.1. Stężenia średnie roczne pyłu PM2,5 w poszczególnych krajach Europy w roku 2017 obliczone na podstawie wyników pomiarów (źródło: raport EEA).
Opis wykresu: Dla każdego kraju podano liczbę rozważanych stacji (w nawiasach) oraz najniższe, najwyższe i średnie roczne (kropka) wartości (w µg/m^3) zarejestrowane na stacjach pomiarowych oraz 25 i 75 centyl (prostokąty). Wartość dopuszczalna UE oznaczona jest górną ciągłą linią, zaś zalecenia WHO – dolną przerywaną.

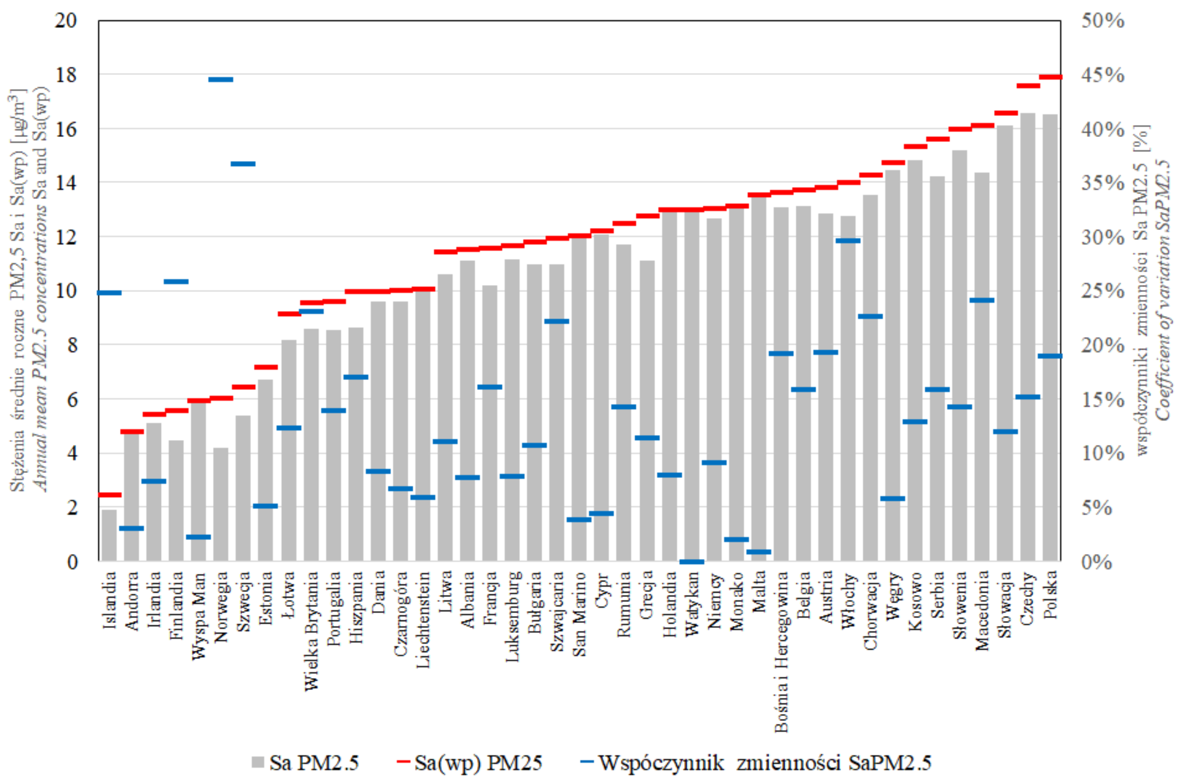
Fig. 13.1. Annual mean PM2.5 concentrations in individual European countries based on measurement results (source: EEA report).
Chart description: The number of stations considered (in brackets) and the lowest, highest and average values (in µg/m^3) recorded at stations are given for each country. The rectangles mark the 25th and 75th percentiles. The limit value set by EU legislation is marked by the upper continuous horizontal line. WHO recommendations are marked by the lower dashed horizontal line.



Ryc. 13.2. Stężenia średnie roczne pyłu PM2,5 na stacjach pomiarowych w roku (źródło: raport EEA)
Fig. 13.2. Annual mean PM2.5 concentrations in 2017 at measurement stations (source: EEA report).

The results for the annual mean presented in the EEA's report do not reflect the full exposure of population or the level of variation of health risk due to the fact that, to a large extent, they depend on the number and location of the considered monitoring stations, despite the applied scales of the spatial and population representativeness of measurement results. A more accurate assessment can be achieved with the analysis of spatial data using air quality mathematical models, calibrated with the measurements of monitoring station. The calculations were made on the basis of the available ENSEMBLE CAMS results (data for the year 2018) and spatial distributions of the density of population (EUROSTAT) for both the mean annual concentration and the population-weighted mean concentration, the latter providing a much more accurate picture of the health risks. These calculations show a slightly different picture than the one presented by analyses of measurement results.

The highest PM2.5 annual mean concentrations are observed in central Europe: the Czech Republic, Poland, Slovakia and Slovenia. Health risks exceeding the arithmetical mean are shown by population-weighted mean annual concentrations of PM2.5. The indicator calculated this way shows that the highest health risk levels are in Poland, the Czech Republic, Slovenia and Macedonia. It also demonstrates that the lowest health risk related to air pollution by PM2.5 does not concern Norway and Finland, where the lowest annual mean concentrations are observed. Lowest values population-weighted annual concentrations in Iceland, Andorra and Ireland are observed (Fig. 13.3).

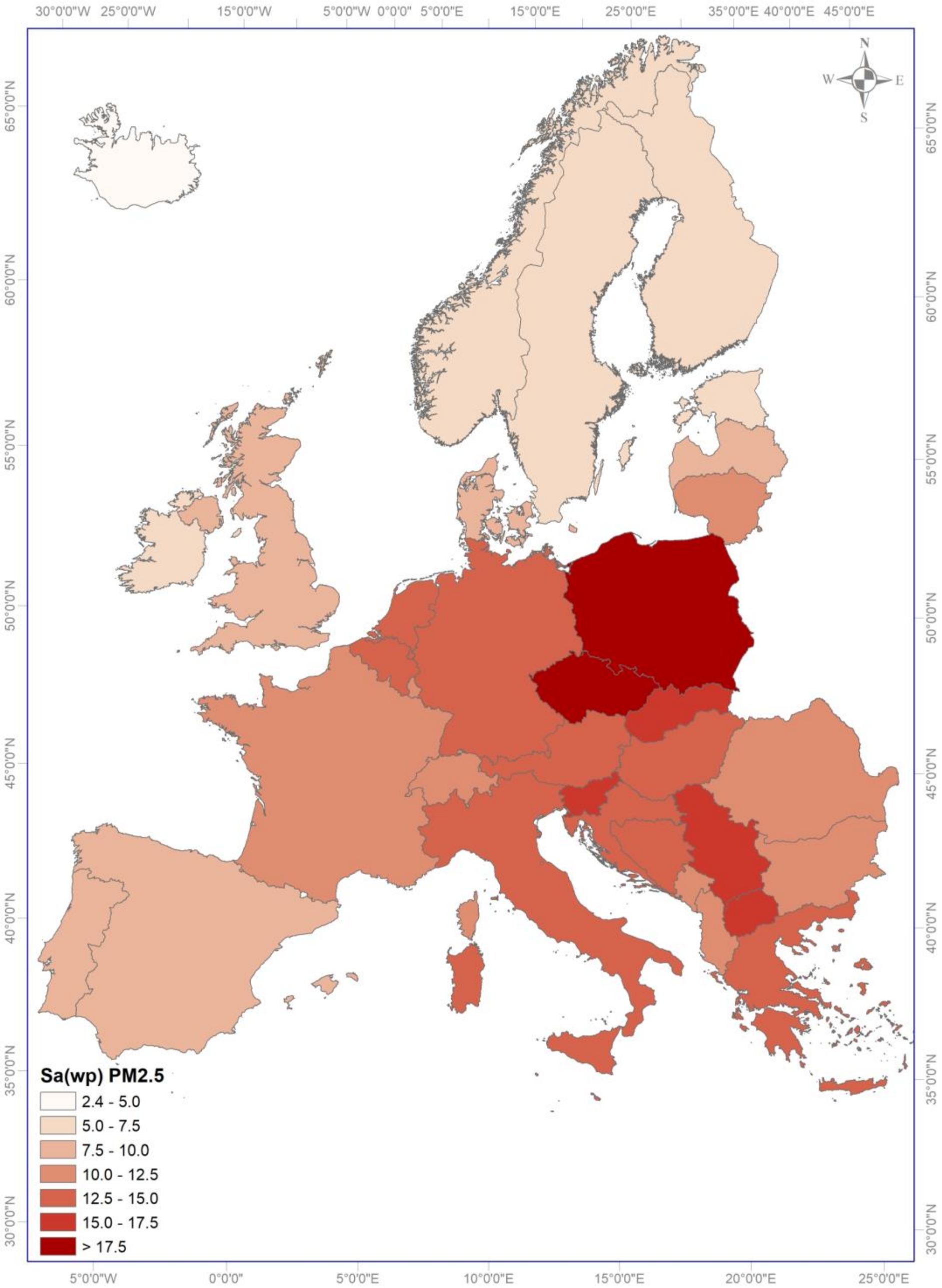


Ryc. 13.3. Stężenia pyłu PM2,5: średnie roczne pyłu (Sa) i średnie roczne ważone populacyjnie (Sa(wp)) oraz współczynniki zmienności stężeń średnich rocznych PM2,5 w poszczególnych krajach w roku 2018 (źródło danych: CAMS, EUROSTAT).

Fig. 13.3. PM2.5 concentrations: annual mean (Sa) and population-weighted annual mean (Sa(wp)) and coefficients of variation of annual mean PM2.5 concentrations in individual countries in 2018 (data source: CAMS, EUROSTAT).

This stems from the spatial distribution of pollutants in individual countries and higher concentrations observed in densely populated areas (Fig. 13.4).

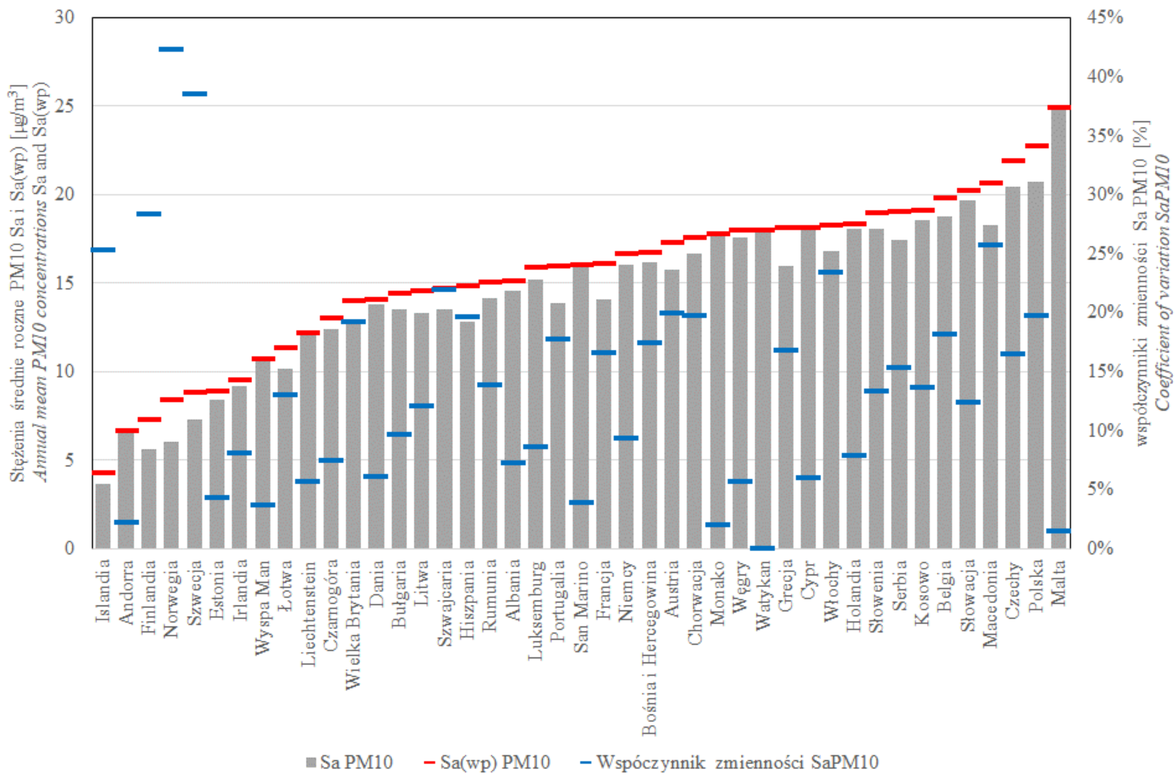
A significant factor in health risk is the spatial distribution of air quality and population density. Analyses of coefficients of variation of concentrations, defining differences between countries in terms of concentration gradients (higher coefficients show larger variations of concentration in a given country), pointed to significant differences in European countries, ranging from 0 to over 40%. The highest coefficients of variation were recorded in Norway and Sweden (over 40%), and the lowest in the Vatican City State and Malta (lower than 1%). With a coefficient of variation of nearly 19%, Poland ranks among countries with large differences in concentrations between areas, similar to those observed in Austria, Switzerland, Bosnia and Herzegovina, Spain and France. It should be noted that, apart from the level of pollutants, the obtained results are influenced by the size of the country, varied topography and its land management.



Ryc. 13.4. Stężenie średnie roczne ważone populacyjnie pyłu PM 2,5 (Sa(wp)) w poszczególnych krajach Europy w roku 2018 (źródło danych: CAMS, EUROSTAT).

Fig. 13.4. PM2.5 annual population-weighted mean concentration (Sa(wp)) in individual European countries in 2018 (data source: CAMS, EUROSTAT).

As far as particulate matter PM10 is concerned, the highest mean annual concentration was observed in Malta, the Czech Republic and Slovakia, and the lowest were recorded in Ireland and Finland. In terms of population-weighted mean concentrations, the situation is slightly different, with high values being found also for Macedonia and Belgium, and the lowest for Andorra. The coefficient of variations in the mean annual concentrations of PM10 in individual countries was very similar to the coefficient related to particulate matter PM2.5 (Fig. 13.5).

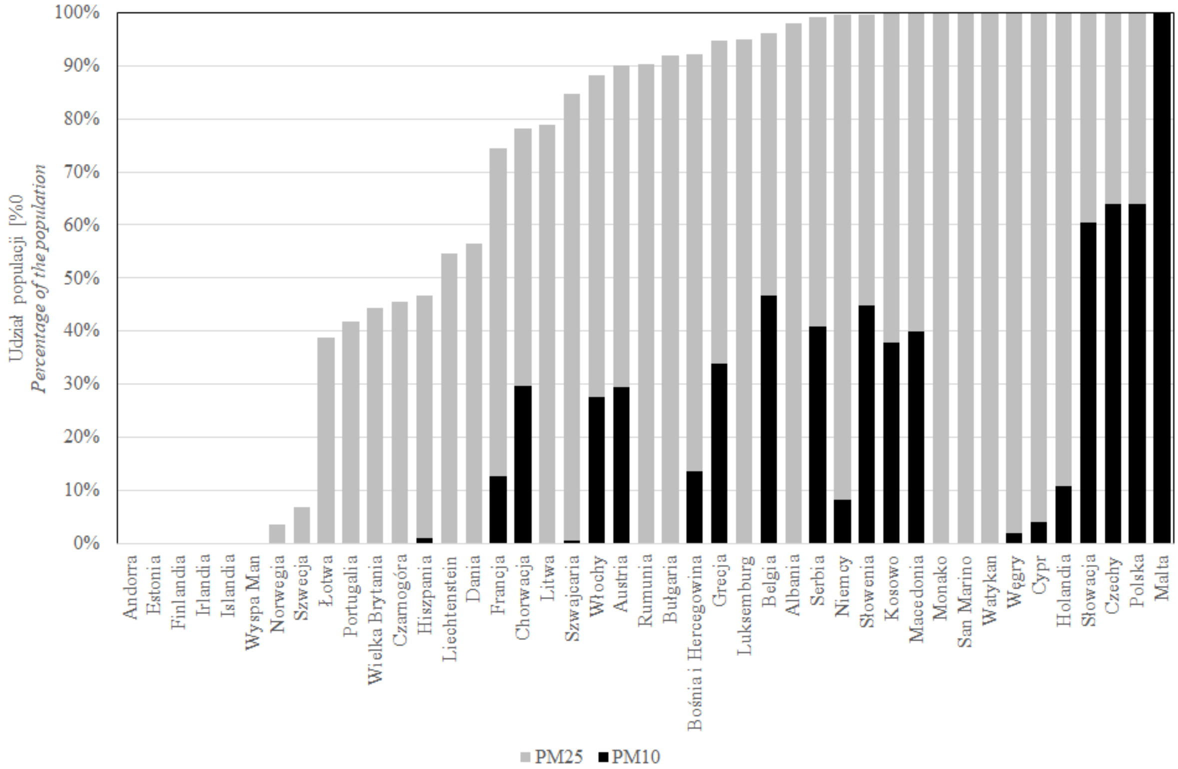


Ryc. 13.5. Stężenia PM10: średnie roczne pyłu (Sa) i średnie roczne ważone populacyjnie (Sa(wp)) oraz współczynniki zmienności stężeń średnich rocznych PM10 w poszczególnych krajach w roku 2018 (źródło danych: CAMS, EUROSTAT).

Fig. 13.5. PM10 concentrations: annual mean (Sa) and population-weighted mean (Sa(wp)) and coefficients of variation of annual mean PM10 concentrations in individual countries in 2018 (data source: CAMS, EUROSTAT).

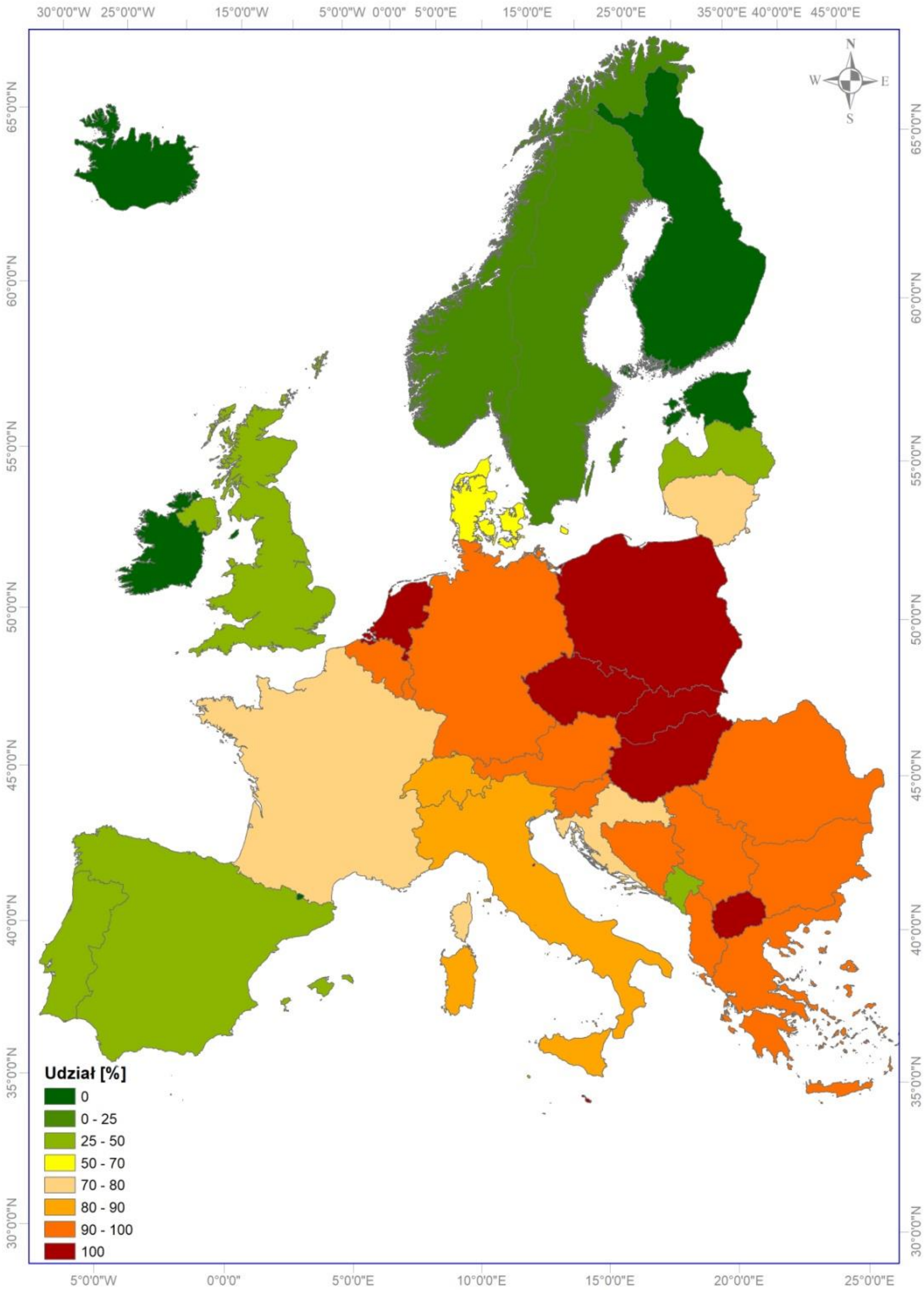
The conducted spatial and population analysis of areas exceeding the limit values for annual PM2.5 concentrations (10 μg/m^3) recommended by the World Health Organisation showed that in over one-third of European countries, including Poland, the population was exposed to concentrations deviating from WHO recommendations. High population indexes (over 50% of the population) in areas where exceedances limit values were found in 30 countries, mainly in central Europe (Fig. 13.6). The most favourable situation was observed in northern European countries, the British Isles, Iceland, Portugal and Spain, where the share of population living in areas characterised by concentration levels in excess of WHO recommendations did not exceed 50% (Fig. 13.7).

As far as PM10 is concerned, the situation was much better. Only four countries (Malta, Poland, the Czech Republic and Slovakia) were found to have over half of their population living in areas where the limit value of 20 μg/m^3, recommended by WHO, was exceeded. Malta was the only country in which WHO recommendations were not observed on its entire territory.



Ryc. 13.6. Udział populacji żyjącej na obszarach przekraczających zalecane wartości przez WHO dla stężeń średnich rocznych pyłu PM2,5 oraz PM10 w poszczególnych krajach w roku 2018 (źródło danych: CAMS, EUROSTAT).

Fig. 13.6. Percentage of the population living in areas exceeding WHO-recommended values for PM2.5 and PM10 annual mean concentrations in individual countries in 2018 (data source: CAMS, EUROSTAT).



Ryc. 13.7. Udział populacji żyjącej na obszarach przekraczających zalecane wartości przez WHO dla stężeń średnich rocznych pyłu PM2,5 w poszczególnych krajach w roku 2018 (źródło danych: CAMS, EUROSTAT, STAT).

Fig. 13.7. Percentage of the population living in areas exceeding WHO-recommended values for PM2.5 annual mean concentrations in individual countries in 2018 (data source: CAMS, EUROSTAT, STAT)

13.3. Assessment of variations in exposure in Poland

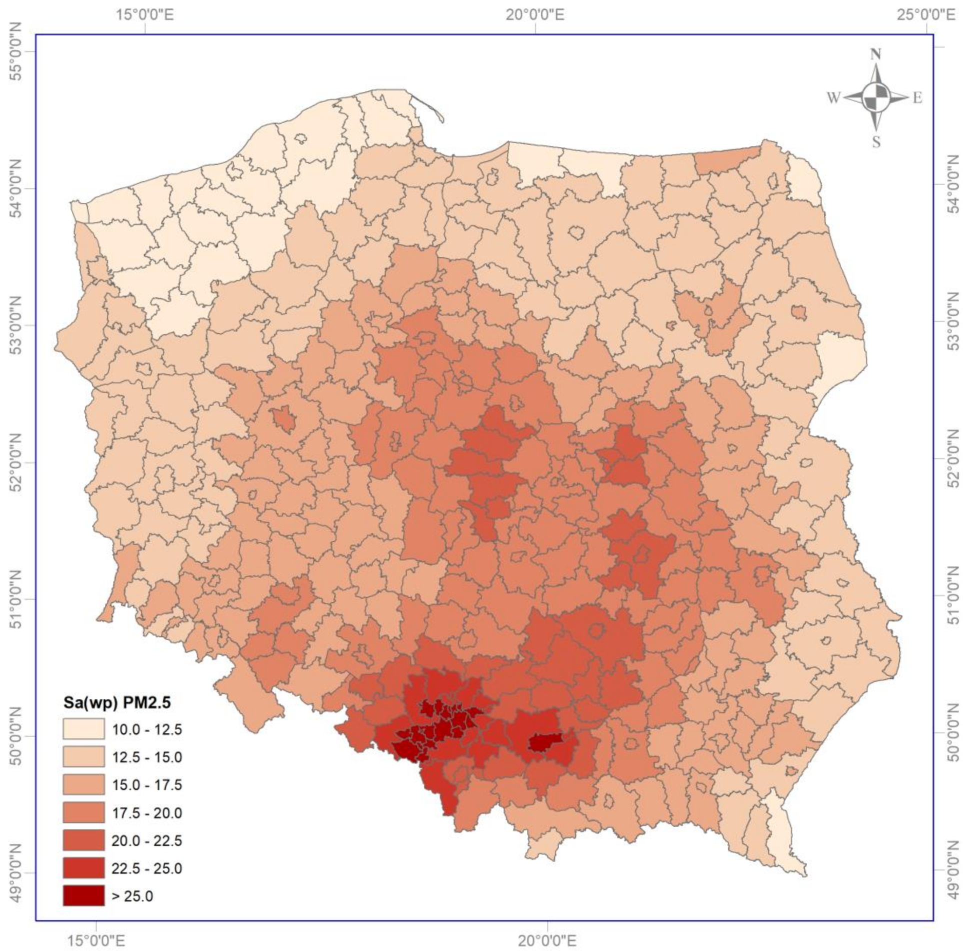
The analysis of variations in the level of PM2.5 exposure 5 performed in Poland in the year 2018, with the results being broken down into poviats, showed that the highest population-weighted annual mean concentrations (exceeding 26 μg/m^3) concern the following poviats: Wodzisławski and cities with poviat rights – Jastrzębie-Zdrój, Rybnik, Żory and Kraków (Tab. 13.1, Fig. 13.8). The coefficient of variations in mean annual concentrations of PM2.5 was not high, amounting nearly to 1.7%, except for Kraków (2.9%). The lowest level of exposure to particle matter PM2.5 (the population-weighted mean annual concentration did not exceed 11 μg/m^3) concerned the inhabitants of the following poviats: Sławieński, Kołobrzeski, Słupski and Lęborski. It should be noted that differences between the coefficients of variation in the mean annual concentrations of particulate matter PM2.5 in individual poviats ranged from 0 to 10%. The highest variation in concentrations (over 7%) was found for the following poviats: Cieszyński, Białostocki, Żywiecki, Wołomiński, Myślenicki, Głubczycki, Tatrzański and Nowotarski.

In 2018 in Poland there were no areas where annual mean PM2.5 concentration was lower than 10 μg/m^3, meaning that the entire population of Poland was exposed to the long-term risk associated with the inhalation of air which did not meet WHO recommendations.

Tab. 13.1. 25 poviats with the highest and lowest levels of exposure to PM2.5 in 2018 (data source: CAMS, EUROSTAT).

Poviat		Annual concentration		
NTS code	Name	Mean	Population-weighted mean	Coefficients of variation
		[μg/m^3]	[μg/m^3]	[%]
25 poviats with the highest level of exposure				
2415000	Wodzisławski	26.6	26.8	1.6
2467000	Jastrzębie-Zdrój city	26.4	26.4	1.4
2473000	Rybnik city	26.3	26.4	1.7
2479000	Żory city	26.2	26.2	1.7
1261000	Kraków city	25.7	26.1	2.9
2412000	Rybnicki	25.8	25.9	2.3
2463000	Chorzów city	25.3	25.7	3.3
2469000	Katowice city	25.6	25.6	0.6
2472000	Ruda Śląska city	25.6	25.6	1.9
2476000	Świętochłowice city	25.3	25.5	3.2
2408000	Mikołowski	25.4	25.4	0.9
2478000	Zabrze city	25.1	25.3	3.0
2466000	Gliwice city	25.0	25.3	2.5
2470000	Mysłowice city	25.1	25.2	1.5
2477000	Tychy city	25.3	25.2	0.9
2474000	Siemianowice Śląskie city	25.1	25.0	2.4
2475000	Sosnowiec city	24.8	25.0	1.9
2410000	Pszczyński	25.0	24.9	2.7
2411000	Raciborski	24.7	24.8	3.7
2414000	Bieruńsko-Lędziński	24.7	24.8	1.6
2401000	Będziński	23.4	24.6	6.5
2405000	Gliwicki	23.6	24.4	6.7
2468000	Jaworzno city	23.9	24.3	3.0
2465000	Dąbrowa Górnicza city	23.1	24.2	5.5
2462000	Bytom city	24.0	24.1	1.7

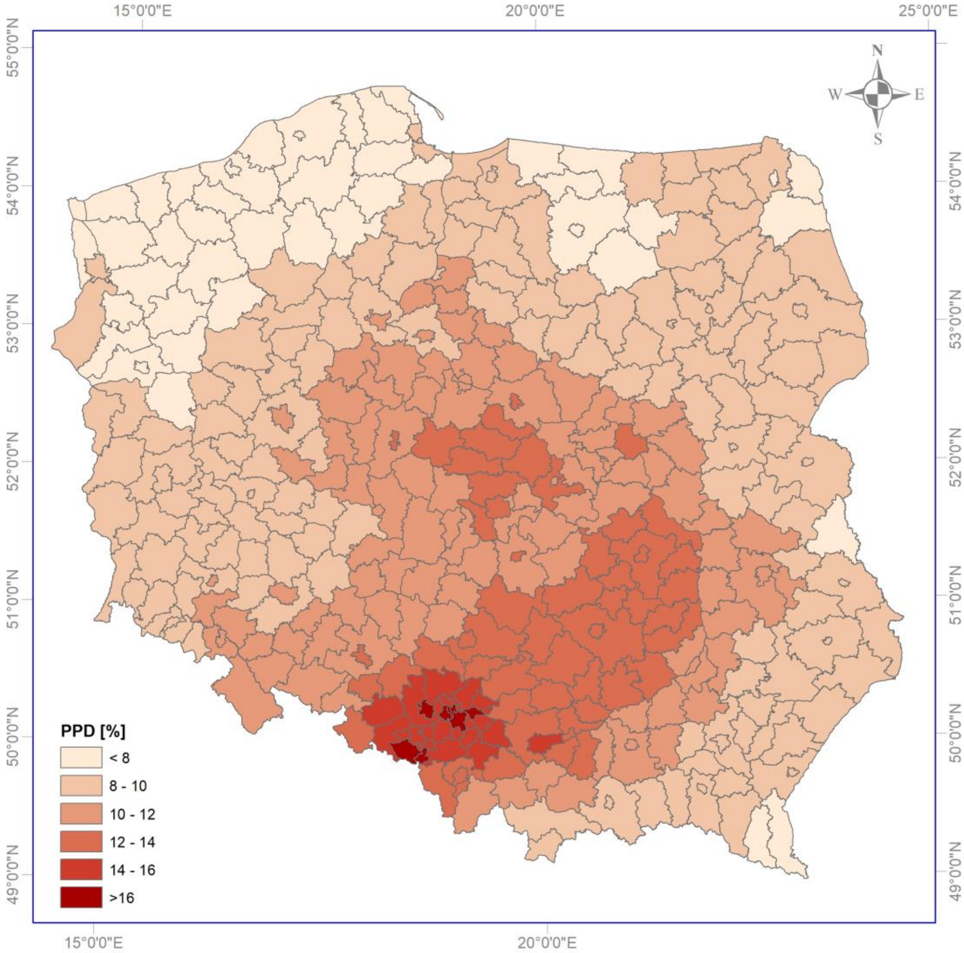
Poviat		Annual concentration		
NTS code	Name	Mean	Population-weighted mean	Coefficients of variation
		[μg/m^3]	[μg/m^3]	[%]
25 poviats with the lowest level of exposure				
2801000	Bartoszycki	12.5	12.4	0.9
2802000	Braniewski	12.5	12.4	1.2
1801000	Bieszczadzki	12.1	12.3	6.6
3202000	Choszczeński	12.2	12.2	1.8
2005000	Hajnowski	12.3	12.2	4.1
3204000	Goleniowski	12.0	12.0	2.9
3215000	Szczecinecki	11.9	12.0	2.2
2009000	Sejneński	11.9	11.9	2.1
2215000	Wejherowski	11.5	11.9	6.1
3203000	Drawski	11.8	11.9	1.1
2211000	Pucki	11.5	11.8	6.8
3263000	Świnoujście city	11.8	11.7	0.6
3218000	Łobeski	11.6	11.6	1.4
2201000	Bytowski	11.6	11.5	2.2
3207000	Kamieński	11.4	11.5	1.6
3216000	Świdwiński	11.4	11.4	1.7
3201000	Białogardzki	11.1	11.1	0.8
3209000	Koszaliński	11.1	11.1	2.0
3261000	Koszalin city	11.1	11.1	0.4
3205000	Gryficki	11.1	11.1	2.3
2263000	Słupsk city	11.1	11.1	0.0
2208000	Lęborski	10.9	10.9	4.0
2212000	Słupski	10.9	10.9	1.8
3208000	Kołobrzeski	10.9	10.8	0.9
3213000	Sławieński	10.8	10.8	1.2
Poland				
Min		10.8	10.8	0.0
Max		26.6	26.8	10.0
Average		16.9	16.9	2.7



Ryc. 13.8. Stężenie średnie roczne ważone populacyjnie pyłu PM2,5 w powiatach w roku 2018 (źródło danych: CAMS, EUROSTAT, STAT).

Fig. 13.8. Annual population-weighted mean concentration of PM2.5 in poviats in 2018 (data source: CAMS, EUROSTAT, STAT).

The estimated number of premature deaths related to long-term exposure to PM2.5 concentration, calculated based on the air quality maps from the ENSEMBLE model population density and the total number of deaths as recorded in the official statistics, was 45,827 people. The share of the number of total premature deaths in individual poviats so estimated ranged from 6% to 18% (Fig. 13.9). The highest shares, exceeding 15%, were found for cities with poviat rights: Chorzów, Świętochłowice, Jastrzębie-Zdrój, Sosnowiec, Gliwice, Ruda Śląska, Katowice, Żory, Rybnik and the Wodzisławski poviat. The lowest rates of premature deaths attributed to particulate matter PM2.5 were recorded for the following poviats: Słupski, Kołobrzeski, Lęborski, Koszaliński, Kartuski, Wejherowski, Gryficki, Sławieński, Pucki, Bytowski and Koszalin city.



Ryc. 13.9. Udział przedwczesnych zgonów w wyniku narażenia na pył PM2,5 w zgonach ogółem w powiatach w roku 2018 (źródło danych: CAMS, EUROSTAT, STAT).

Fig. 13.9. Share of premature deaths attributed to PM2.5 in total deaths in poviats in 2018 (data source: CAMS, EUROSTAT, STAT).

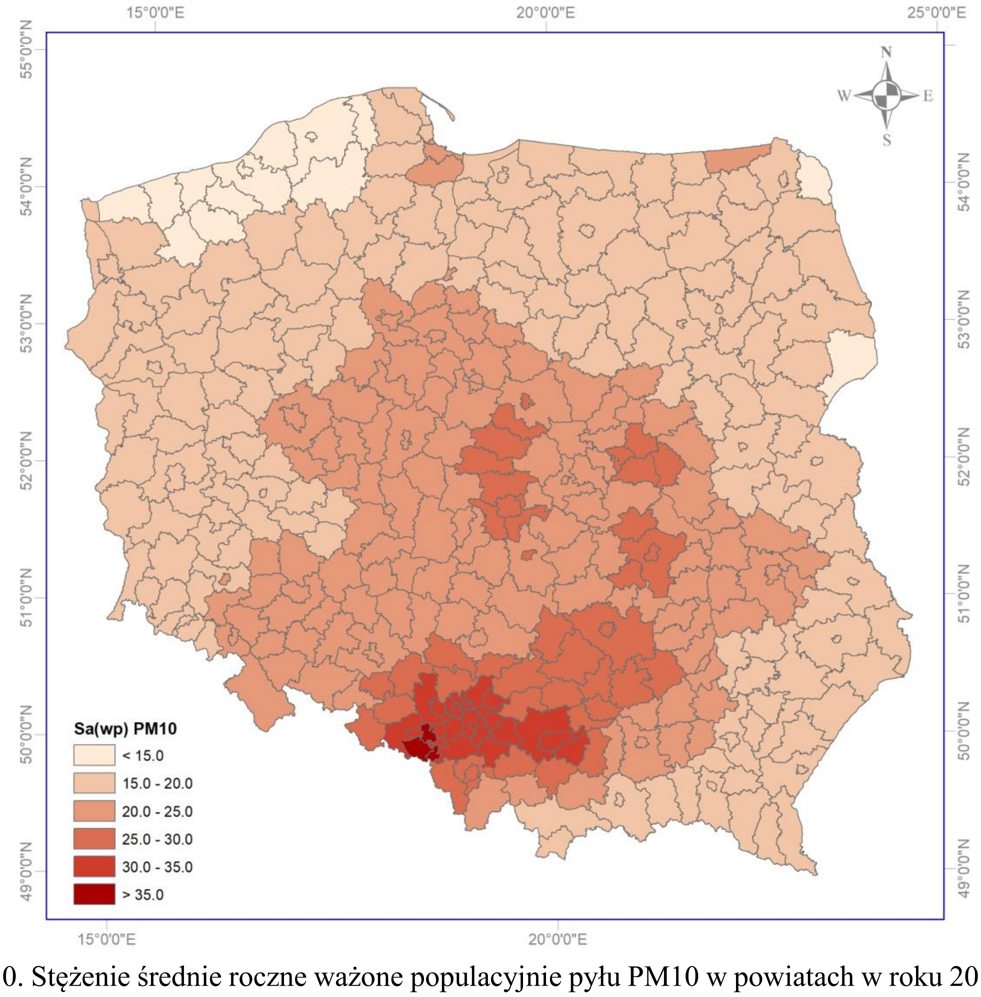
Variations in levels of exposure to PM10 were similar. The highest population-weighted annual mean concentration (exceeding 35 µg/m^3) was observed in the following poviats: Wodzisławski and in cities with poviat rights – Rybnik and Jastrzębie-Zdrój, with coefficients of variation in mean annual concentrations ranging from 1.5% to 2.5% (Tab. 13.2, Fig. 13.10). The lowest level of exposure to particle matter PM10 among the population (mean annual concentration below 14 µg/m^3) was observed in the following poviats: Sławieński, Słupski, Kołobrzeski, Lęborski, Gryficki, Koszaliński, Białogardzki and Koszalin and Słupsk cities.

Tab. 13.2 25 powiatów z największym i najmniejszym poziomem narażenia na pył PM10 w roku 2018 (źródło danych: CAMS, EUROSTAT).

Tab. 13.2. 25 poviats with the highest and lowest levels of exposure to PM10 in 2018 (data source: CAMS, EUROSTAT).

Poviat		Annual concentration		
NTS code	Name	Mean	Population-weighted mean	Coefficients of variation
		[µg/m³]	**[µg/m³]**	**[%]**
25 poviats with the highest level of exposure				
2415000	wodzisławski	35.2	35.5	2.5
2473000	m. Rybnik	35.2	35.3	1.5
2467000	m. Jastrzębie-Zdrój	35.0	35.0	1.5
2479000	m. Żory	34.8	34.8	1.8
2412000	rybnicki	34.3	34.5	2.8
2469000	m. Katowice	33.8	33.9	0.5
2463000	m. Chorzów	33.3	33.9	4.0
2472000	m. Ruda Śląska	33.8	33.8	2.4
1261000	m. Kraków	33.1	33.7	3.2
2408000	mikołowski	33.6	33.7	1.1
2476000	m. Świętochłowice	33.3	33.7	3.9
2466000	m. Gliwice	33.2	33.6	3.1
2478000	m. Zabrze	33.0	33.4	3.9
2470000	m. Mysłowice	32.9	33.2	2.3
2477000	m. Tychy	33.2	33.0	1.3
2474000	m. Siemianowice Śląskie	33.1	33.0	3.2
2475000	m. Sosnowiec	32.5	32.9	2.9
2410000	pszczyński	32.8	32.6	3.6
2401000	będziński	30.5	32.5	8.0
2405000	gliwicki	30.9	32.3	8.1
2414000	bieruńsko-lędziński	32.1	32.2	2.2
2411000	raciborski	32.1	32.2	4.3
2465000	m. Dąbrowa Górnicza	29.8	31.5	6.6
2468000	m. Jaworzno	30.9	31.5	3.7
2462000	m. Bytom	31.3	31.3	2.0
25 poviats with the lowest level of exposure				
2801000	Powiat bartoszycki	15.7	15.7	0.6
1821000	Powiat leski	15.4	15.7	4.7
2001000	augustowski	15.4	15.5	3.2
2011000	sokólski	15.6	15.5	3.6
3263000	m. Świnoujście	15.5	15.5	0.2
3204000	goleniowski	15.4	15.4	2.8
3202000	choszczeński	15.4	15.4	1.6
3215000	szczecinecki	15.2	15.3	1.9
1801000	bieszczadzki	15.0	15.3	7.0
3203000	drawski	15.1	15.1	0.8
3207000	kamieński	14.9	14.9	1.8
3218000	łobeski	14.9	14.9	1.1
2005000	hajnowski	15.0	14.8	4.4
2201000	bytowski	14.9	14.8	1.9
2009000	sejneński	14.7	14.7	2.5
3216000	świdwiński	14.7	14.6	1.5
2263000	m. Słupsk	14.4	14.4	0.0
3261000	m. Koszalin	14.4	14.4	0.7
3201000	białogardzki	14.4	14.4	0.6
3209000	koszaliński	14.4	14.4	1.4

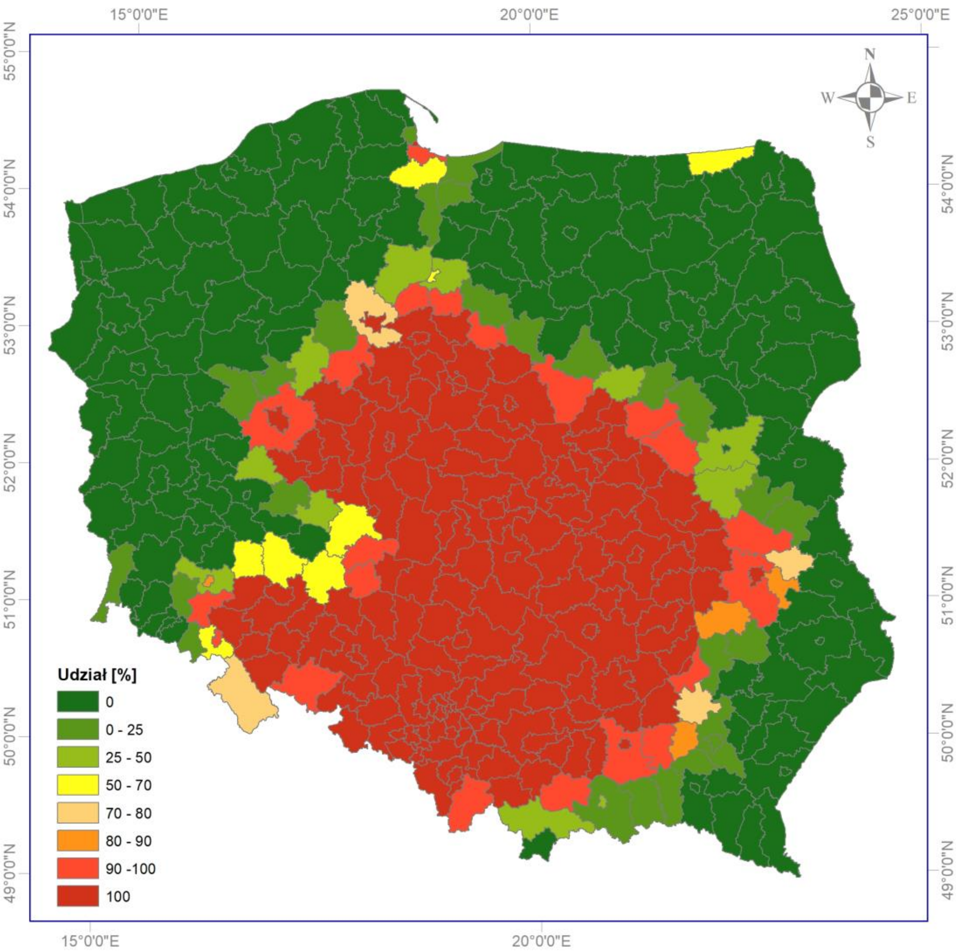
Poviat		Annual concentration		
NTS code	Name	Mean	Population-weighted mean	Coefficients of variation
		[µg/m³]	**[µg/m³]**	**[%]**
3205000	gryficki	14.4	14.4	1.5
2208000	lęborski	14.2	14.3	3.4
3208000	kołobrzeski	14.3	14.3	0.5
2212000	słupski	14.2	14.2	1.3
3213000	sławieński	14.1	14.1	0.7
Poland				
Min		14.1	14.1	0.0
Max		35.2	35.5	12.1
Average		21.3	21.4	3.0



Ryc. 13.10. Stężenie średnie roczne ważone populacyjnie pyłu PM10 w powiatach w roku 2018 (źródło danych: CAMS, EUROSTAT, STAT).

Fig. 13.10. Population-weighted annual mean concentration of PM10 in poviats in 2018 (data source: CAMS, EUROSTAT, STAT).

PM10 limit value recommended by WHO (20 µg/m^3), was exceeded in over half of poviats in Poland (196 poviats). The analysis showed that in the year 2018, over 24.6 million of people in Poland lived in areas where the recommendations of the World Health Organisation for long-term concentrations of PM10 were not met. Excessive long-term exposure of all inhabitants was recorded for 184 poviats, and in next 19 poviats the share of the exposed population exceeded 50%. It is worth noting that 141 poviats did not record exceeded levels of particulate matter PM10, as recommended by the WHO (Fig. 13.11).



Ryc. 13.11. Udział populacji żyjącej na obszarach przekraczających zalecane wartości przez WHO dla stężeń średnich rocznych pyłu PM10 w powiatach w roku 2018 (źródło danych: CAMS, EUROSTAT, STAT).

Fig. 13.11. Percentage of the population living in areas exceeding WHO-recommended values for PM10 annual mean concentrations in poviats in 2018 (data source: CAMS, EUROSTAT, STAT).

SUMMARY

1. The mean concentration based on measurement values from air quality monitoring stations might not fully reflect the level of health risk. The application of validated mathematic modelling allows more comprehensive health analyses.
2. The coefficient of population-weighted annual mean concentrations of particulate matter reflect health risk level much better than the commonly applied annual mean concentration.

The coefficient of variation in annual mean concentrations may be helpful in the interpretation of risk levels and the assessment of differences between given areas.

3. Europe show significant inequalities in exposure to particulate matter. Poland is one of the countries where these inequalities are considerable.
4. The particulate-matter limit values recommended by the WHO are exceeded in many European countries, especially for PM2.5, where in a third of the countries, including Poland, the entire population is exposed to concentrations not meeting WHO recommendations. There are an estimated 141 million people in Europe who live in areas not meeting WHO recommendations related to PM2.5 and 51 million people for PM10.
5. At present in Poland, the WHO recommended PM2.5 values is exceeded in the entire country. As far as WHO recommendations for PM10 are concerned, exceeded levels are observed in nearly half of Polish poviats. The estimated number of people living in Poland in areas with exceedances PM10 limit values recommended by the WHO, is 24.6 million.
6. The estimated number of premature deaths related to long-term exposure to PM2.5 in Poland, calculated with the use of European models results and statistical data, is close to the values provided in the EEA reports. The share of premature deaths in the total number of deaths in individual poviats ranges from 6% to 18%.

14. THE MAIN HEALTH ISSUES OF POLES IN THE CONTEXT OF THE LATEST RESULTS OF THE GLOBAL BURDEN OF DISEASE STUDY (GBD) 2019

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The most significant factor in restoring and maintaining the overall well-being of the population is to have reliable information on the current health indicators, disease risk factors and health interventions (prevention, early detection, organisation of care, drug and non-drug technologies), their parameters of effectiveness and effective application. A coherent and comparative description of the burden of diseases and injuries, as well as of the health determinants, is an important contribution to the decision-making process for planning effective health interventions. A full and comprehensive analysis of the disease burden based on a comparable and standardised tool has been performed for almost 30 years within the Global Burden of Disease project[197,198,199].

Following the efforts of close to 6 thousand experts and researchers from all over the world (including several dozen in Poland), in mid-October 2020 the team of the Institute for Health Metrics and Evaluation of the University of Washington, Seattle, USA, announced the results of the GBD 2019 edition. Similarly to previous years, the official announcement of estimates of the burden of diseases on the population was accompanied by the publication of a special edition of The Lancet journal devoted entirely to describing the results of this project. Through the cooperation of Polish institutions, i.e. the Agency for Health Technology Assessment and Tariffication, the Ministry of Health and the National Institute of Public Health - the National Institute of Hygiene together with the Institute for Health Metrics and Evaluation conducting the GBD study, it was possible to prepare estimates of the disease burden in Poland for the years 1990-2019 in relation to the levels of mortality, morbidity, prevalence and, the most importantly, to determine disability-adjusted life years with its components, for the first time at the voivodship level.

The DALY indicator is the sum of the number of years of life lost (YLL) due to premature death and the number of years of life lived with disability (YLD). According to the DALYs definition, the occurrence of a health event in a healthy person involves two possible consequences:

◦ **reduction of quality of life (disability of varying degrees depending on the disease),**

◦ **premature death (as a result of an existing disease).**

The DALY indicator (Fig. 14.1) combines information on the consequences of the disease (loss of health, death) and provides a deeper understanding of the determinants:

[197] GBD 2019 Demographics Collaborators. **Global age-sex-specific fertility, mortality, healthy life expectancy (HALE), and population estimates in 204 countries and territories, 1950–2019: a comprehensive demographic analysis for the Global Burden of Disease Study 2019.** *The Lancet.* 17 October 2020. doi:10.1016/S0140-6736(20)30977-6.

[198] GBD 2019 Diseases and Injuries Collaborators. **Global burden of 369 diseases and injuries, 1990–2019: a systematic analysis for the Global Burden of Disease Study 2019.** *The Lancet.* 17 October 2020. doi:10.1016/S0140-6736(20)30925-9..

[199] GBD 2019 Risk Factors Collaborators. **Global burden of 87 risk factors in 204 countries and territories, 1990–2019: a systematic analysis for the Global Burden of Disease Study 2019.** *The Lancet.* 17 October 2020. doi:10.1016/S0140-6736(20)30752-2.

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• through the DALY indicator, it is possible to estimate the burden (severity) of specific health issues and, consequently, the share of risk factors causing them, the total health benefits of reducing the incidence of the disease through prevention (reducing the prevalence of risk factors) or treatment, and, when converted into monetary values, the costs and benefits of individual interventions;

• one DALY can be considered as one year of lost life in perfect health.

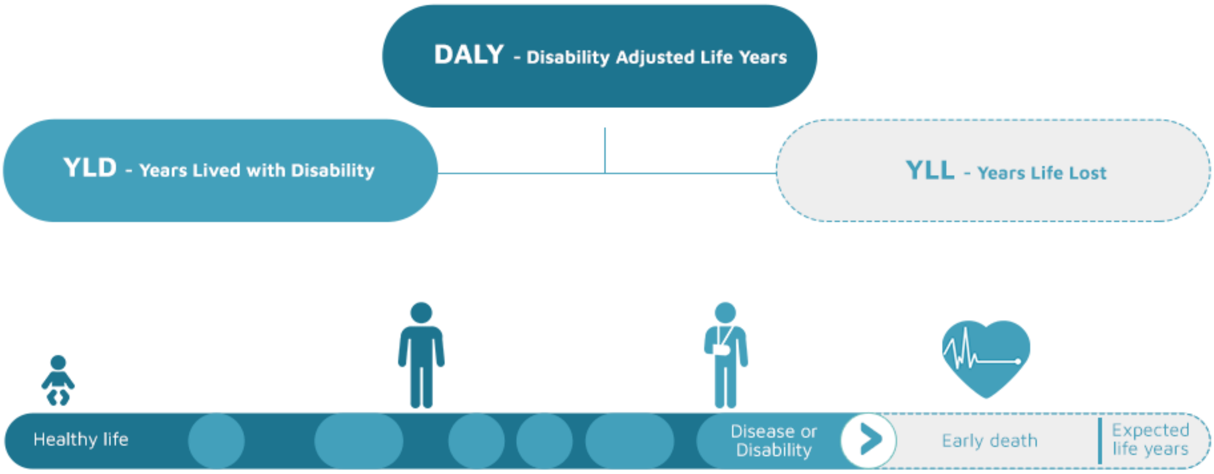


Fig. 14.1 The general concept of DALY
Source: own study of the Agency for Health Technology Assessment and Tariff System

An important element for the knowledge of health in Poland in the framework of the GBD 2019 study is, as mentioned above, the development of analyses at the regional (voivodship) level, which places Poland as the first country in Central and Eastern Europe to have standardised and globally comparable information on the health of the population with such a level of detail. The DALY indicator applied in the GBD enables us to consider the assessment of the burden of diseases and allows us to take further steps to improve the quality of the healthcare system in Poland. These activities are conducted by implementing this methodology in the updated Health Needs Maps prepared by the Ministry of Health's Department of Analysis and Strategy at the end of June this year. The work on further directions of application and implementation of conclusions from GBD analyses is coordinated by the GBD Scientific Centre established in the Agency for Health Technology Assessment and Tariff System, which cooperates with distinguished representatives and experts of the most important institutions of the healthcare sector. Their aim is to continue and strengthen international cooperation with the institution conducting the GBD project and to search for further directions of application of GBD data and methodology in the undertaken policy initiatives, in addition to research and scientific activities in the country.

14.1. GBD estimation methods

The analyses conducted under the GBD 2019 cover 369 diseases and injuries and 87 risk factors for 204 countries and territories in regional, age, sex differences and across the time. Apart from the substantive possibilities that these analyses enable, it represents an extraordinary technical and IT challenge. The estimation of health indicators on a global scale is possible, inter alia, with modern technologies, including artificial intelligence and mathematical models.

The use of mathematical estimation methods is essential for measuring the global disease burden, as raw national data are of varying quality. Mathematical models can help to detect patterns that are most likely to reflect the real health status of the population, amidst the noise of imperfect data (input). Small sample sizes, a variety of measurement methods and techniques, information gaps and miscoding may lead to uncertainties in the data and consequently present an erroneous state of actual disease burden. The model can help identify trends that would otherwise be difficult to detect. The GBD utilises the potential of statistical models to depict as accurately as possible the global health of the population. Due to the cooperation with a group of experts and international efforts of GBD's collaborators, it is possible to constantly introduce substantive and technical improvements aimed at increasing the quality of the presented data, as well as the strength and accuracy of the model. With each iterative update of the GBD study, all estimates are recalculated for time series, location, sex and causes of diseases and injuries [200].

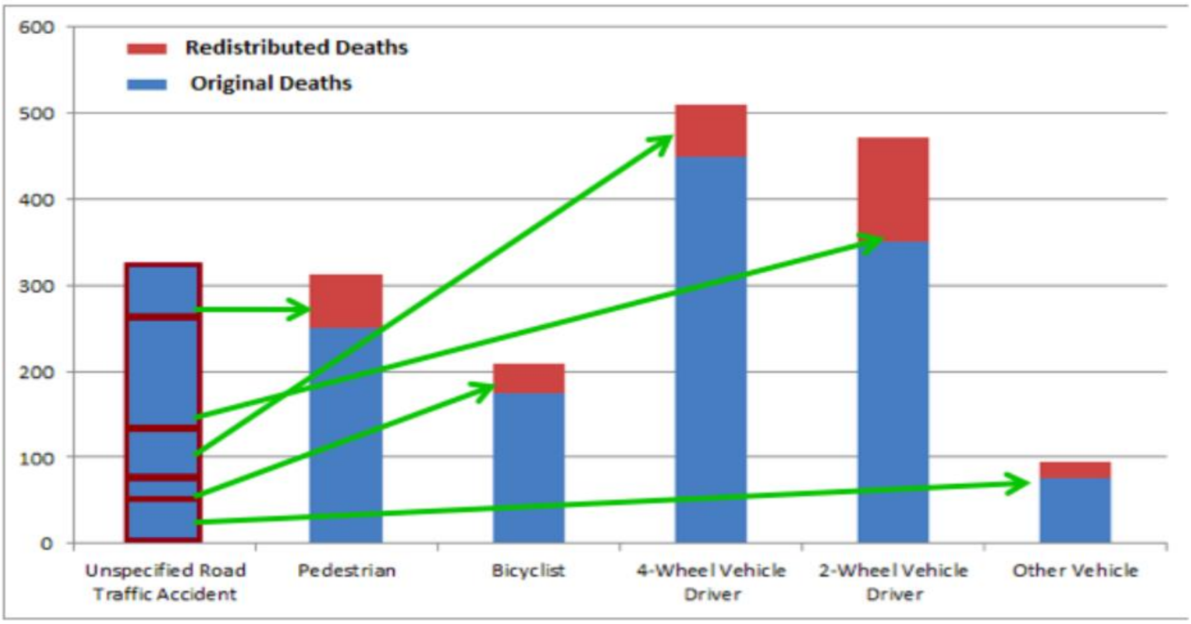
Further information on the detailed process of producing GBD estimates can be found using the Institute for Health Metrics and Evaluation published source materials describing the various stages of estimating causes of death, DALY, risk factors and other indicators (http://www.healthdata.org/gbd/gbd-2019-resources) and (http://ghdx.healthdata.org/gbd-2019/code). As part of the 2019 edition, GBD resources also include condensed 2-page reports on selected areas of health problems (http://www.healthdata.org/results/gbd_summaries/2019). The results, data sources and a description of the methods used, updates and improvements with

[200] Institute for Health Metrics and Evaluation, Acting on data, [http://www.healthdata.org/acting-data/power-models], (16.06.2020)

each edition of the survey are also published in the special edition of the journal Lancet (https://www.thelancet.com/gbd) in the form of extensive supplements [201].

14.2. Quality of data on death and GBD estimates

The most engaging part of the process of preparing data forming the GBD estimates is the process of redistributing causes of death. In many countries, the actual cause of death is difficult or impossible to determine sometimes due to lack of information or other conditions. This is due to the low quality of reporting systems, a weaker infrastructure of the healthcare system, varying levels of qualifications of medical staff, or other factors (e.g. the phenomenon of upcoding related to reporting or financial reporting systems). The problem of a significant percentage of miscoded deaths also applies to highly developed countries – including Poland – involving the assigning of incorrect causes, referred to as “garbage codes”. In the GBD analyses, in order to improve the quality of the data, the process of re-assignment of probable causes of death is applied based on statistical methods. They use information from literature, expert opinions, ICD guidelines and knowledge of the disease. The causes are redistributed by means of statistical models and algorithms, specifically defined for each group – 5-year age group – sex – location - year. The outcome of this process is that the estimates of the GBD models can generate results that are significantly different from the reporting data at the local level, while there is an increased possibility that these data reflect the actual causes of death and increase the comparability of data between countries, with different death coding quality.



[201] GBD cause and risk summaries, The Lancet [https://www.thelancet.com/gbd/summaries], (08.12.2020).

Fig. 14.2. Example of the reallocation of death causes for the non-specific road accidents diagnosis – the redistribution of garbage codes according to the GBD

14.3. The profile of Poland in the context of the survey – selected issues

In 2019, the total burden of diseases expressed as disability-adjusted life years (DALY) in Poland amounted to 12,656,432.58, of which 6,906,440.29 for men and 5,749,992.29 for women. The largest share of the disease burden can be attributed to cardiovascular diseases (22.87%), followed by cancer (21.34%) and musculoskeletal disorders (6.78%). In total, for both sexes, the highest percentage of DALY for the health issue groups was recorded for ischemic heart disease (11.61%), followed by strokes (6.4%) and lung cancer (5.61%). Tab. 14.1 presents the ranking of causes of diseases or death by the percentage share in the disease burden, including health issues, whose share in 2019 was greater than 2%.

Tab. 14.1. DALY values for individual diseases and health issues in Poland in 2019, both sexes, all ages, percentage of total DALYs.

Cause of disease or death	Share in the disease burden [DALY]
Ischemic heart disease	11.61%
Total strokes	6.40%
Cancer of the trachea, bronchus or lung	5.61%
Low back pain	4.52%
Diabetes mellitus	3.87%
Falls	3.16%
Colon cancer	2.78%
Road injuries	2.47%
Alcohol-related disorders	2.39%
Age-related and other hearing loss	2.22%
Alzheimer's disease and other dementias	2.18%
Self-harm injuries	2.17%
Cirrhosis and other chronic liver diseases	2.09%
Chronic obstructive pulmonary disease	2.08%
Headache disorders	2.07%

Source: GBD Compare, GBD 2019 Study, IHME, USA: 2020.

Between 1990 and 2019, the ranking of the severity of the disease burden expressed in DALY in Poland slightly changed, with one exception – ischemic heart disease remains the leading factor contributing to the disease burden of the Polish population expressed in DALY. The main causes of the disease burden presented below relate to values that have not been standardised in relation to age, so it is worth remembering that the increase in some causes may be partly due to the impact of an ageing population in addition to risk-attributable factors.

Compared to 1990, in Poland, the position in the disease burden changed considerably in relation to the most frequent 15 causes, partly due to the ageing of the population (Fig. 14.3):

- lung cancer (increase from position 3 in 1990 to position 2 in 2019),
- **diabetes type 2 (from position 9 to 5),**
- **colon cancer (from position 15 to 7),**
- **alcohol-related disorders (from position 13 to 8),**
- **age-related and other hearing loss (from position 17 to 9),**
- **Alzheimer's disease (from position 23 to 10),**

Further positions in the ranking, with an increase between 1990 and 2019, are as follows:

- breast cancer (from position 21 to 16),
- pancreatic cancer (from position 29 to 17),
- hypertensive heart disease (from position 37 to 21).

In Poland, in 2019, compared to 1990, the position in the ranking of the disease burden decreased for the following health issues (Fig. 14.3):

- ischemic stroke (decrease from position 2 in 1990 to position 4 in 2019),
- intracerebral haemorrhage (decrease from position 6 to 14),
- premature childbirth (decrease from position 8 to 40),
- injuries to pedestrians (decrease from position 11 to 42),
- asthma (decrease from position 13 to 30).

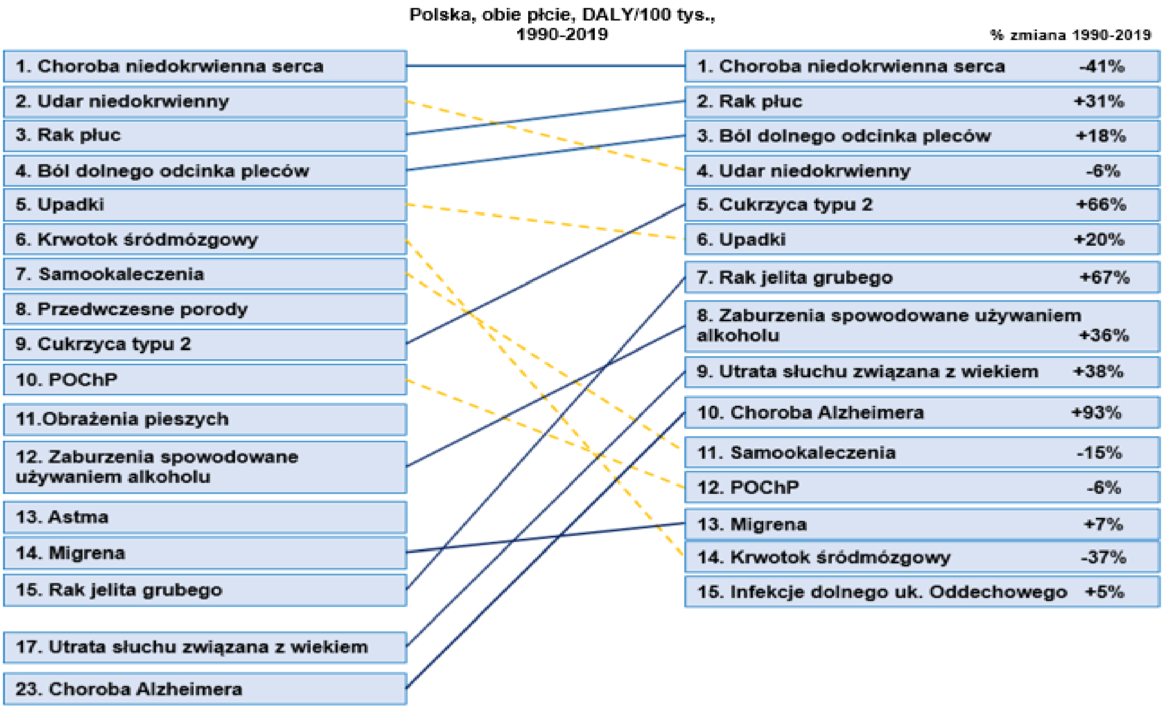


Fig. 14.3. Ranking of disease burden due to various health problems in both sexes in Poland in 1990 and 2019 based on raw DALY values per 100,000. population. Source: GBD Compare, GBD 2019 Study, IHME, USA: 2020.

In the years 1990-2019, the main causes of death in Poland were ischemic heart disease, ischemic stroke and lung cancer. Compared to 1990, there was an increase in the ranking of the most frequent causes of death including:

- Alzheimer’s disease and other dementias (from position 8 to 4),
- **hypertensive heart disease (from position 16 to 10),**
- pancreatic cancer (from position 17 to 13),
- **prostate cancer (from position 22 to 15).**

In Poland, in 2019, compared to 1990, there was a decrease in the ranking of the most frequent causes of death related to:

- intracerebral haemorrhage (decrease from position 4 to 8)
- **self-harm injuries (decrease from position 10 to 16),**
- falls (decrease from position 14 to 17),
- **pedestrian injuries (decrease from position 15 to 51)** (Fig. 14.4).

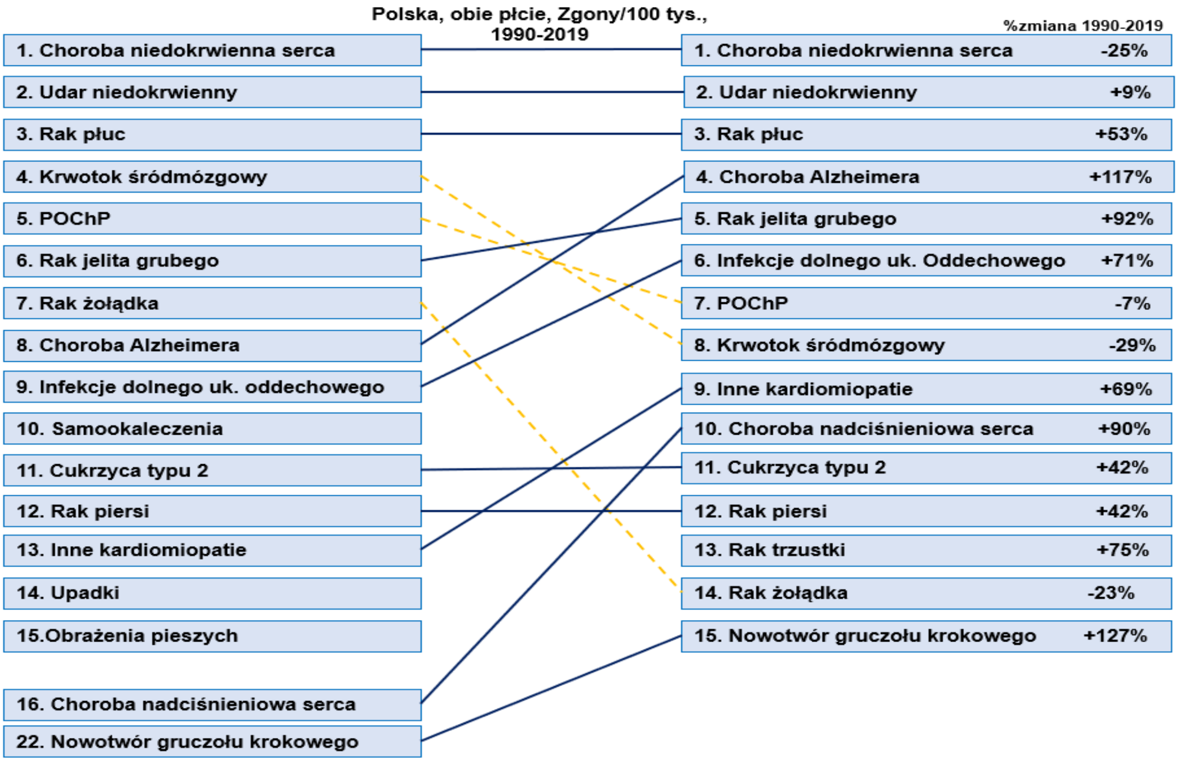


Fig. 14.4. Ranking of causes of death in 1990 and 2019 and relative change (%) in the raw death rate over the period. Source: GBD Compare, GBD 2019 Study, IHME, USA: 2020.

The main risk factor responsible for the disease burden expressed in DALY in Poland, both in 1990 and 2019, was tobacco smoking. The main risk factors in 2019 included high BMI (increase from 3rd position in 1990 to 2nd in 2019), high systolic blood pressure (decrease from 2nd to 3rd position), high fasting plasma glucose (increase from 5th to 4th position) and alcohol consumption (increase from 7th position in 1990 to 5th in 2019) (Fig. 14.5).

Among the risk factors ranked lower in 2019, the role of the following factors increased compared to 1990 (Fig. 14.5):

- **sodium-rich diet (increase from position 12 to 9),**
- **red-meat-rich diet (increase from position 15 to 11),**
- **drug use (increase from position 30 up to 18).**

The significance of those risk factors responsible for the total disease burden on Poles, which were ranked further down in 2019, decreased compared to 1990. This applies to (Fig. 14.5):

- low birth weight (decrease from position 9 to 12),
- short gestation (decrease from position 10 to 13),
- **household air pollution caused by the use of solid fuels (decrease from position 14 to 30).**

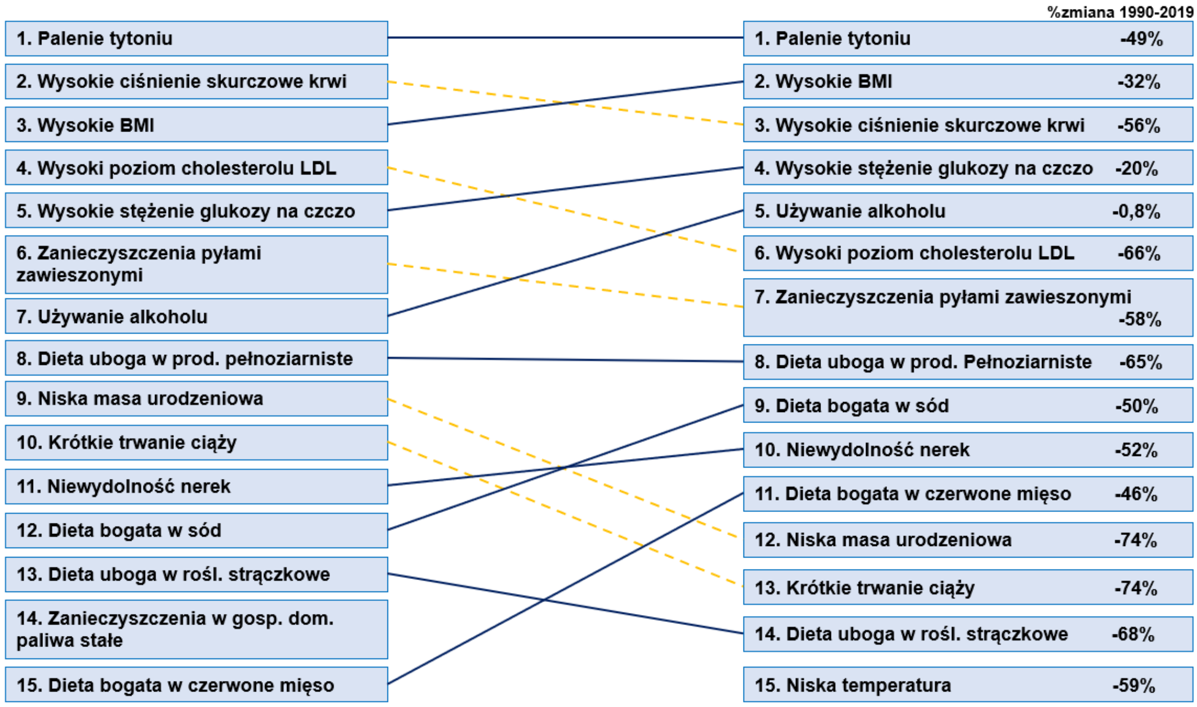


Fig. 14.5. Ranking of risk factors related to disease burden in Poland in both sexes in 1990 and 2019 based on the age-standardised DALYs rate per 100,000 population. Source: GBD Compare, GBD 2019 Study, IHME, USA: 2020.

In the case of death risk factors in Poland, the greatest importance, both in 1990 and 2019, was attributed to high systolic blood pressure, and then to tobacco smoking. Compared to 1990, high fasting glucose concentrations (moving from position 5 in 1990 to 3 in 2019), high BMI (without a position change in the ranking) and high LDL-cholesterol concentrations (moving from position 3 in 1990 to 5 in 2019) were also at the top of this ranking.

Among the risk factors listed further up the ranking in 2019, attention should be paid to the **increase in the importance of alcohol consumption as a death risk factor in Poland, which changed its position from 12 in 1990 to 6 in 2019.**

However, among the risk factors of death whose significance **in the analysed years decreased the most was household air pollution caused by the use of** solid fuels (**decrease from position 13 to 25**) (Fig. 14.6).

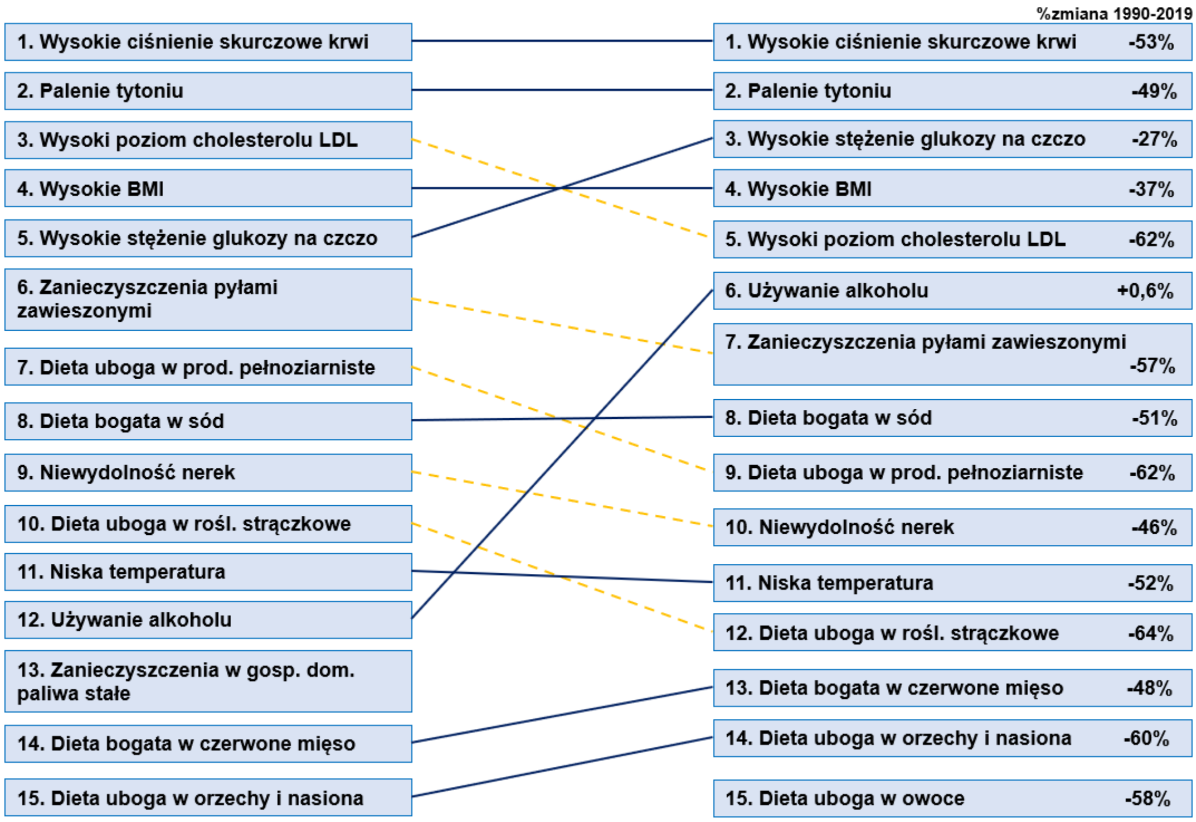


Fig. 14.6. Ranking of risk factors related to deaths in Poland in both sexes in 1990 and 2019 based on the age-standardized death rates. Source: GBD Compare, GBD 2019 Study, IHME, USA: 2020.

In the years 1990-2019 both the distribution of the most frequent causes of death and the values of death rates for these causes changed in Poland. Between 1990 and 2019, considering the ranking for all age groups in total, the decreasing share of ischemic heart disease in the main causes of death and, at the same time, the increasing share of other causes in mortality can be noticed. The mortality resulting from premature birth, which is the main cause of death in the youngest age group, decreased by about five times, and the death rate from congenital heart defects decreased approx. four times. In the 15-49 age group, a decrease in the ranking (from 1st to 3rd position among the most common causes of death) and a decrease in the death rate for ischemic heart disease were simultaneously observed, as well as cirrhosis and other alcohol-related liver diseases, infections of the lower respiratory tract and colon and rectal cancer recorded among the most common causes of death. In the age group of 50-69 years, mortality from cardiovascular diseases (ischemic heart disease, ischemic stroke and intracerebral haemorrhage) and a simultaneous increase in mortality from cancer (colorectal and rectal cancer, pancreatic cancer and stomach cancer) were reported. In the oldest age group

(70+), the most frequent causes of death remained unchanged, while their respective death rates decreased (Tab. 14.2).

Tab. 14.3 presents the burden of health issues expressed in DALY values per 100,000 population in 1990 and 2019. The disease burden due to ischemic heart disease decreased in all age groups, while the burden of cancer and diabetes type 2 increased. In the youngest age group (under 5) analysed, the burden of the most serious health problems in this age group decreased several times. In the age group 5-14, the burden of accidents (injuries to pedestrians on roads, drowning) was eliminated from the ranking. Ischemic heart disease, which in 1990 was the most important cause of the disease burden on Poles aged 15-49, was ranked 7th in 2019. In the population aged 50-69 and over 70, the disease burden expressed in DALYs significantly decreased.

Tab. 14.2. Death rates in Poland in 1990 and 2019 for 10 most common causes in the age groups mentioned, for both sexes in total

1990		**2019**	
Cause of death	**Deaths/ 100,000**	**Cause of death**	**Deaths/ 100,000**
All age groups			
1. Ischemic heart disease	336.95	1. Ischemic heart disease	252.87
2. Ischemic stroke	78.49	2. Ischemic stroke	85.78
3. Tracheal, bronchus, and lung cancer	53.08	3. Tracheal, bronchus, and lung cancer	81.19
4. Intracerebral haemorrhage	36.27	4. Alzheimer's disease and other dementias	48.05
5. Chronic obstructive pulmonary disease	28.62	5. Colorectal and rectal cancer	46.23
6. Colorectal and rectal cancer	24.06	6. Lower respiratory tract infections	30.99
7. Stomach cancer	22.82	7. Chronic obstructive pulmonary disease	26.69
8. Alzheimer's disease and other dementias	22.13	8. Intracerebral haemorrhage	25.74
9. Lower respiratory tract infections	18.12	9. Other cardiomyopathy	22.80
10. Self-harm	17.93	10. Hypertensive heart disease	22.52
<5 years of age			
1. Premature birth	101.56	1. Premature birth	20.22
2. Congenital heart defects	45.96	2. Congenital heart defects	10.10
3. Lower respiratory tract infections	24.95	3. Other congenital defects	6.52
4. Neonatal encephalopathy	23.26	4. Other chromosomal abnormalities	4.51
5. Other congenital malformations	20.68	5. Lower respiratory tract infections	3.41
6. Other neonatal disorders	14.10	6. Neonatal encephalopathy	3.25
7. Sepsis and other neonatal infections	12.39	7. Other neonatal disorders	2.57

8. Neural tube defects	9.75	8. Sepsis and other neonatal infections	2.41
9. Congenital defects of the digestive system	8.91	9. Neural tube defects	2.39
10. Pulmonary aspiration and foreign body in the airways	7.94	10. Congenital defects of the digestive system	2.26
5-14 years of age			
1. Traffic injuries to pedestrians	4.35	1. Cerebral and central nervous system cancer	1.06
2. Drowning	3.12	2. Traffic injuries	0.70
3. Cerebral and central nervous system cancer	1.82	3. Other malignant tumours	0.60
4. Other malignant tumours	1.16	4. Traffic injuries to pedestrians	0.52
5. Traffic injuries	1.09	5. Lower respiratory tract infections	0.52
6. Acute lymphoid leukaemia	0.99	6. Drowning	0.51
7. Congenital heart defects	0.99	7. Congenital heart defects	0.44
8. Lower respiratory tract infections	0.88	8. Self-harm	0.42
9. Self-harm	0.81	9. Acute lymphoid leukaemia	0.38
10. Other unintentional injuries	0.65	10. Other congenital defects	0.36
15-49 years of age			
1. Ischemic heart disease	34.58	1. Self-harm	18.45
2. Self-harm	22.97	2. Alcohol-related disorders	9.89
3. Traffic injuries to pedestrians	12.44	3. Ischemic heart disease	9.24
4. Traffic injuries	9.94	4. Traffic injuries	6.35
5. Alcohol-related disorders	8.84	5. Cancer of the trachea, bronchus or lung	4.89
6. Cancer of the trachea, bronchus or lung	8.35	6. Cirrhosis and other alcoholic liver diseases	4.51
7. Intracerebral haemorrhage	6.47	7. Falls	3.88
8. Drowning	5.60	8. Lower respiratory tract infections	3.52
9. Falls	5.26	9. Breast cancer	3.52
10. Breast cancer	4.85	10. Colorectal and rectal cancer	3.12
50-69 years of age			
1. Ischemic heart disease	505.86	1. Ischemic heart disease	178.78
2. Tracheal, bronchus, and lung cancer	177.75	2. Tracheal, bronchus, and lung cancer	167.63
3. Ischemic stroke	80.84	3. Colorectal and rectal cancer	62.44
4. Intracerebral haemorrhage	73.90	4. Ischemic stroke	41.87
5. Stomach cancer	53.76	5. Intracerebral haemorrhage	34.51
6. Colorectal and rectal cancer	53.62	6. Pancreatic cancer	32.52
7. Chronic obstructive pulmonary disease	52.91	7. Breast cancer	30.92
8. Breast cancer	34.52	8. Stomach cancer	26.97
9. Diabetes type 2	34.45	9. Chronic obstructive pulmonary disease	26.45
10. Rheumatic heart disease	28.65	10. Lower respiratory tract infections	24.78
≥70 years of age			
1. Ischemic heart disease	3546.76	1. Ischemic heart disease	1766.27
2. Ischemic stroke	979.68	2. Ischemic stroke	650.04

3. Alzheimer's disease and other dementias	327.33	3. Alzheimer's disease and other dementias	401.46
4. Intracerebral haemorrhage	300.18	4. Tracheal, bronchus, and lung cancer	310.07
5. Chronic obstructive pulmonary disease	285,49	5. Colorectal and rectal cancer	249.73
6. Tracheal, bronchus, and lung cancer	241.80	6. Lower respiratory tract infections	198.15
7. Colorectal and rectal cancer	194.85	7. Chronic obstructive pulmonary disease	170.68
8. Stomach cancer	171.59	8. Other cardiomyopathy	168.63
9. Lower respiratory tract infections	165.66	9. Hypertensive heart disease	159.55
10. Other cardiomyopathy	153.31	10. Intracerebral haemorrhage	133.96

Source: GBD Compare, GBD 2019 Study, IHME, USA: 2020.

Tab. 14.3. DALY values in Poland in 1990 and 2019 for 10 most common health issues in the mentioned age groups, for both sexes in total

1990		2019	
The disease	**DALY / 100,000**	**The disease**	**DALY / 100,000**
All age groups			
1. Ischemic heart disease	6482.61	1. Ischemic heart disease	3817.03
2. Ischemic stroke	1474.25	2. Tracheal, bronchus, and lung cancer	1845.10
3. Tracheal, bronchus, and lung cancer	1411.52	3. Low back pain	1492.87
4. Low back pain	1262.61	4. Ischemic stroke	1379.64
5. Falls	870.34	5. Diabetes type 2	1206.23
6. Intracerebral haemorrhage	855.88	6. Falls	1041.35
7. Self-harm	832.95	7. Colorectal and rectal cancer	912.77
8. Premature birth	775.45	8. Alcohol-related disorders	786.95
9. Diabetes type 2	728.38	9. Hearing loss (including age-related)	732.07
10. Chronic obstructive pulmonary disease	723.99	10. Alzheimer’s disease and other dementias	716.56
<5 years of age			
1. Premature birth	9149.85	1. Premature birth	1930.02
2. Congenital heart defects	4079.33	2. Congenital heart defects	909.49
3. Lower respiratory tract infections	2211.16	3. Other congenital defects	590.93
4. Neonatal encephalopathy	2097.67	4. Other chromosomal abnormalities	419.81
5. Other congenital defects	1837.05	5. Neonatal encephalopathy	322.61
6. Other neonatal disorders	1318.47	6. Dietary iron deficiency	312.49
7. Sepsis and other neonatal infections	1133.41	7. Lower respiratory tract infections	305.53
8. Neural tube defects	869.47	8. Other neonatal disorders	294.39
9. Congenital defects of the digestive system	824.28	9. Atopic dermatitis	288.45
10. Pulmonary aspiration and foreign body in the airways	702.05	10. Diarrhoeal diseases	242.70
5-14 years of age			
1. Traffic injuries to pedestrians	362.21	1. Behavioural disorders	291.94
2. Dietary iron deficiency	330.88	2. Asthma	244.21
3. Behavioural disorders	288.90	3. Low back pain	232.95
4. Drowning	247.41	4. Migraine	203.92
5. Low back pain	234.14	5. Dietary iron deficiency	186.39
6. Asthma	202.54	6. Anxiety disorders	183.10
7. Migraine	201.85	7. Atopic dermatitis	153.02
8. Endocrine, metabolic and other disorders	201.32	8. Diarrhoeal diseases	133.18
9. Anxiety disorders	181.50	9. Premature birth	132.47
10. Atopic dermatitis	168.22	10. Other exposure to mechanical forces	117.20
15-49 years of age			
1. Ischemic heart disease	1643.08	1. Low back pain	1321.82
2. Low back pain	1279.10	2. Self-harm	994.95
3. Self-harm	1271.52	3. Alcohol-related disorders	959.86
4. Alcohol-related disorders	854.35	4. Migraine	760.85
5. Traffic injuries to pedestrians	815.95	5. Falls	699.89

6. Traffic injuries	756.53	6. Traffic injuries	515.18
7. Migraine	741.70	7. Ischemic heart disease	433.96
8. Falls	730.33	8. Other exposure to mechanical forces	372.92
9. Other exposure to mechanical forces	486.99	9. Anxiety disorders	363.19
10. Other unintentional injuries	430.11	10. Diabetes type 2	319.15
50-69 years of age			
1. Ischemic heart disease	14583.44	1. Ischemic heart disease	5174.71
2. Tracheal, bronchus, and lung cancer	5201.04	2. Tracheal, bronchus, and lung cancer	4667.13
3. Ischemic stroke	2713.16	3. Diabetes type 2	2302.82
4. Low back pain	2248.43	4. Low back pain	2181.58
5. Intracerebral haemorrhage	2217.84	5. Colorectal and rectal cancer	1765.02
6. Diabetes type 2	2136.79	6. Ischemic stroke	1496.70
7. Chronic obstructive pulmonary disease	1865.00	7. Falls	1480.25
8. Colorectal and rectal cancer	1548.13	8. Alcohol-related disorders	1161.61
9. Stomach cancer	1545.59	9. Chronic obstructive pulmonary disease	1092.86
10. Falls	1379.49	10. Age-related hearing loss	1041.89
≥70 years of age			
1. Ischemic heart disease	45991.57	1. Ischemic heart disease	19848.37
2. Ischemic stroke	13677.92	2. Ischemic stroke	8190.43
3. Alzheimer’s disease and other dementias	5019.92	3. Alzheimer’s disease and other dementias	5563.81
4. Chronic obstructive pulmonary disease	4819.11	4. Tracheal, bronchus, and lung cancer	4662.82
5. Intracerebral haemorrhage	4109.06	5. Diabetes type 2	4010.98
6. Tracheal, bronchus, and lung cancer	3751.41	6. Colorectal and rectal cancer	3369.73
7. Diabetes type 2	3468.94	7. Chronic obstructive pulmonary disease	3068.27
8. Falls	3390.01	8. Hearing loss (including age-related)	2743.98
9. Colorectal and rectal cancer	2788.19	9. Falls	2737.11
10. Hearing loss (including age-related)	2730.61	10. Low back pain	2430.94

Source: GBD Compare, GBD 2019 Study, IHME, USA: 2020.

CONCLUSIONS

1. The estimation of the burden of diseases resulting from premature mortality and years of life with disability provides an opportunity to assess the health situation of the country and to identify priorities in terms of the health-related needs of society. The ability to compare results by location, sex, age and time enables an accurate representation of the currently most burdensome health issues.
2. The results of the GBD studies unequivocally indicate ischemic heart disease as the most important cause of health loss in Poland observed for years. Further places in the ranking are occupied by lung cancer, lower back pain and stroke.
3. The risk factor which, despite its declining importance, has for years been the most responsible for the disability-adjusted life years lost by Poles is tobacco smoking, followed by high BMI levels and hypertension.

15. THE CONSUMPTION OF DRUGS IN POLAND BASED ON THE NATIONAL HEALTH FUND DATA

Aneta Lichwierowicz, Filip Urbański, Dariusz Dziełak (National Health Fund)

Based on the National Health Fund data, it can be concluded that in 2019 Poles purchased 434.3 million packages of reimbursed drugs (including compounded drugs), foods for special medical purposes and prescribed medical devices sold in pharmacies, for a total amount of PLN 12.710 billion. 74% (PLN 9.457 billion) of that amount was reimbursed from public sources, and 26% (PLN 3.253 billion) was paid by the patients themselves[202].

Products included in the Notices of the Minister of Health regarding the list of reimbursed drugs, foods for special medical purposes and prescribed medical devices accounted for 98.7% of all packages of reimbursed drugs and prescribed medical devices sold in pharmacies. Of these, 94% were drugs, 1% were foods for special medical purposes, and 5% were prescribed medical devices. Drugs accounted for 91% of the sales value, and foods for special medical purposes and prescribed medical devices – for 3% and 6%, respectively (Fig. 15.1).

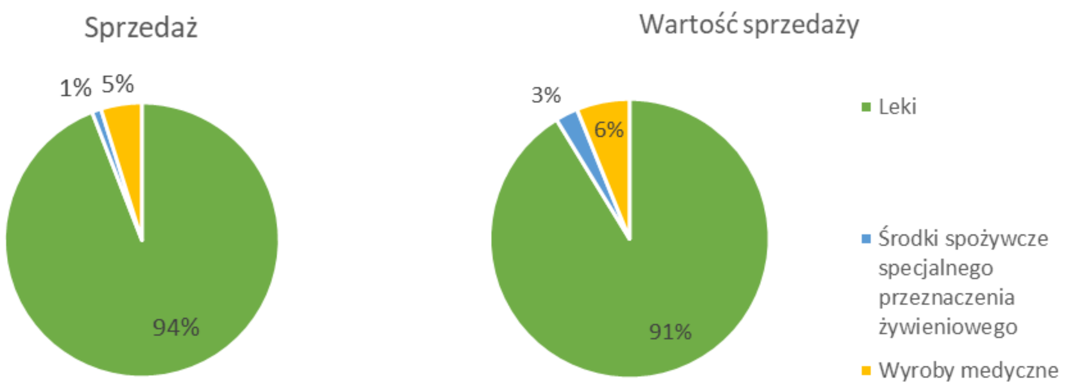


Fig. 15.1 Structure of sales and sales value by category of medicinal product

Other drugs included: compounded drugs – 3.708 million packages, drugs sold under Article 46 of the Act on Benefits – 1.899 million packages, drugs sold under Article 43(1)(2) and Article 7a(1) of the Act of 19 June 1997 (on asbestos-containing products) – 29 packages, and bearer prescription drugs – 40,500 packages. Their total value amounted to PLN 597.9

[202] This only concerns reimbursed drugs. The statistics do not cover payments made by patients for non-reimbursed drugs or for drugs included in reimbursement lists but sold against 100% payment.

million, of which PLN 555.9 million (93%) was covered from public sources and PLN 42 million (7%) by the patients themselves.

15.1. Drugs reimbursed under drug programmes and chemotherapy

In 2019, 4.0 million packages of drugs were administered to patients under drug programmes and chemotherapy, for a total amount of PLN 4.6 billion. Of these, 1.6 million packages of drugs, for a total amount of PLN 3.9 billion, were administered to patients under drug programmes, and 2.4 million of drugs, for a total amount of PLN 683.6 million, in the course of chemotherapy. Most of the reimbursed drug packages – 230,400, i.e. 5.7% of all packages of drugs administered under drug programmes and chemotherapy, contained *ondasetron* – a substance used for reducing nausea and vomiting caused by cytotoxic chemotherapy and radiotherapy, and for preventing and reducing post-operative nausea and vomiting. In turn, the highest amount of reimbursement concerned *trastuzumab* – a substance used in breast cancer treatment and in stomach cancer treatment at advanced stages – i.e. 86,000 packages for the amount of PLN 259.4 million, i.e. 5.6% of all reimbursements in this group of drugs.

In relation to 2018, the number of packages under drug programmes and chemotherapy increased by 7.2%, and the amount of reimbursement by 10.3%. The highest nominal growth in the number of packages[203] of reimbursed drugs, both in 2019 and 2018, was recorded for the drugs containing *nivolumab* (a growth in the number of packages by 32,000, i.e. 53%) – a substance used for treating skin cancer and mucosal melanoma, non-small cell lung cancer, kidney cancer, resistant and relapsed classical Hodgkin lymphoma, and squamous cell carcinoma of the head and neck. The highest nominal drop in the number of packages was recorded for the drugs containing *Immunoglobulinum humanum* (a drop of 11,000 packages, i.e. 26%) – a substance used for treating primary immunodeficiencies in children and adults, and in immunoglobulin transfusion in neurological disorders.

15.2. Drugs included in the list of reimbursed prescription drugs sold in pharmacies

In total, 403.3 million packages of ready-to-use reimbursed drugs included in the lists of reimbursed drugs, announced in the Notice of the Minister of Health, were sold in 2019. This corresponds to an average of 10.5 packages of drugs in Poland per capita. Most packages were reimbursed in the Mazowieckie Voivodship – 57.7 million, and the least in the Lubuskie

[203] Taking into consideration the coefficient adjusting the number of packages by the ratio of the number of all reimbursement periods in a year (6) to the number of the reimbursement periods during which the drug was actually reimbursed.

Voivodship – 9.7 million packages. When presented in voivodship terms per capita, most packages were sold in the Łódzkie Voivodship – 12 packages (per capita), and the least in the Podkarpackie Voivodeship – 9 packages.

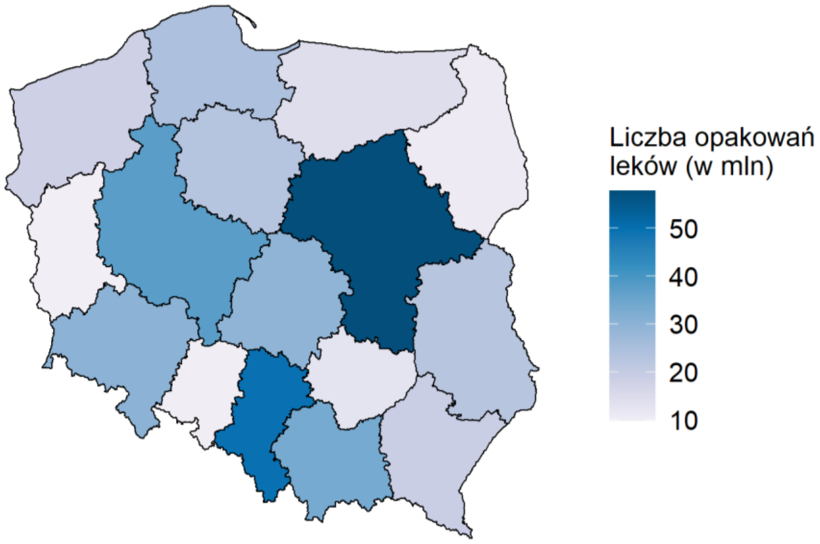


Fig. 15.2 Number of packages of reimbursed drugs in Poland.

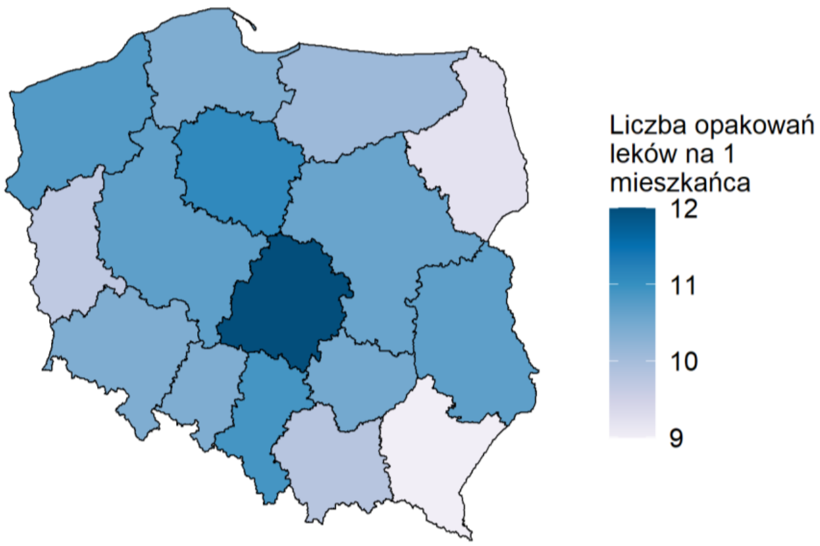


Fig. 15.3 Number of packages of reimbursed drugs in Poland per capita

An analysis of drugs in terms of the 3-digit ATC Classification System has revealed that almost 80% of the reimbursed drugs represented 15 ATC codes, while the remaining 20% were assigned other 45 ATC codes.

Tab. 15.2 The most frequently purchased drugs in Poland by ATC groups - by number of packages

ATC	Name	Number of packages in million	% of packages

C09	Agents acting on the renin-angiotensin system	61.7	15.3%
C10	Lipid modifying agents	39.9	9.9%
A10	Drugs used in diabetes	34.2	8.5%
C03	Diuretics	24.2	6.0%
C07	Beta blocking agents	23.6	5.8%
J01	Antiinfectives for systemic use	21.5	5.3%
A02	Drugs for acid related disorders	20.7	5.1%
R03	Drugs for obstructive airway diseases	18.5	4.6%
C08	Calcium channel blockers	17.1	4.2%
N06	Psychoanaleptics	12.6	3.1%
G04	Urologicals	12.3	3.0%
M01	Antiinflammatory and antirheumatic products	11.9	3.0%
N05	Psycholeptics	11.2	2.8%
H03	Thyroid therapy	10.7	2.7%
N03	Antileptics	10.1	2.5%
-	Other	73.2	18.2%

Agents acting on the renin-angiotensin system, including drugs used in hypertension, were the most frequently purchased reimbursed drugs in Poland[204] In 2019, these accounted for 15% of all ready-to-use reimbursed drugs. The second group in terms of the number of packages sold in 2019 was formed by C10 drugs – Lipid modifying agents, including drugs reducing cholesterol and triglyceride concentration in blood, and the third group by drugs used in diabetes[205].

The total sales value of reimbursed drugs included in reimbursement lists was PLN 11.053 billion. 14 most costly groups of drugs accounted for 75.5% of the total sales value of reimbursed drugs.

Tab. 15.3 The most expensive groups of drugs in Poland - by sales value

ATC	Name	Sales value in PLN million	% of sales value

[204] More information about drugs used in hypertension can be found on zdrowedane.nfz.gov.pl, https://zdrowedane.nfz.gov.pl/course/view.php?id=17
[205] More information about drugs used in diabetes can be found on zdrowedane.nfz.gov.pl, https://zdrowedane.nfz.gov.pl/course/view.php?id=45

A10	Drugs used in diabetes	1,277.3	11.6%
C09	Agents acting on the renin-angiotensin system	1,251.9	11.3%
R03	Drugs for obstructive airway diseases	1,250.9	11.3%
C10	Lipid modifying agents	672.6	6.1%
B01	Antithrombotic agents	653.1	5.9%
N05	Psycholeptics	580.3	5.2%
J01	Antiinfectives for systemic use	511.3	4.6%
G04	Urologicals	413.9	3.7%
N06	Psychoanaleptics	310.6	2.8%
A02	Drugs for acid related disorders	303.9	2.7%
N03	Antileptics	303.9	2.7%
N02	Analgesics	287.1	2.6%
C07	Beta blocking agents	283.4	2.6%
S01	Ophthalmologicals	243.7	2.2%
-	Other	2,709.3	24.5%

In terms of the sales value, the largest group was formed by A10 – Drugs used in diabetes, accounting for 11.6% of the value of all drugs, followed by C09 – Agents acting on the renin-angiotensin system – 11.3%, and by R03 – Drugs for obstructive airway disease – 11.3%, whose share in the number of sold packages was 4.6% (Tab. 15.2).

In 2019, patients spent PLN 2.97 billion on ready-to-use reimbursed drugs included in reimbursement lists. Overall, 80% of that sum was spend on financing drugs representing 15 ATC codes.

Tab. 15.4 The most costly groups of drugs - by patient payments

ATC	Name	Patient payments (in PLN million)	Payment per patient (in PLN)	% of payments
C09	Agents acting on the renin-angiotensin system	518.4	75	17.4%
A10	Drugs used in diabetes	290.3	104	9.8%
J01	Antiinfectives for systemic use	265.5	25	8.9%

C10	Lipid modifying agents	235.7	44	7.9%
R03	Drugs for obstructive airway diseases	171.6	62	5.8%
A02	Drugs for acid related disorders	170.5	37	5.7%
C07	Beta blocking agents	115.3	38	3.9%
N06	Psychoanaleptics	111.4	76	3.7%
M01	Antiinflammatory and antirheumatic products	105.3	20	3.5%
B01	Antithrombotic agents	101.7	61	3.4%
C03	Diuretics	80.1	27	2.7%
C08	Calcium channel blockers	78.8	36	2.7%
G04	Urologicals	71.3	56	2.4%
N03	Antileptics	58.9	85	2.0%
H03	Thyroid therapy	53.2	24	1.8%
	Other	545.7	43	18.3%

Over 17% of all patient payments were payments for C09 drugs – Agents acting on the renin-angiotensin system; Drugs used in diabetes accounted for 9.8%, and antiinfectives for systemic use for 8.9%.

As regards 10 ATC codes, patient payments accounted at least 50% of total drug costs. For other 50 ATC codes, the total share of patient payments did not exceed 50%.

Tab. 15.5 Drug groups with the highest share of patient payments in total costs

ATC	Name	percentage share of patient payments in total drug costs	Patient payments (in PLN million)	Payment per patient (in PLN)
B03	Antianemic preparations	70%	4.2	11
D07	Corticosteroids, dermatological preparations	59%	9.5	18
G01	Gynaecological antiinfectives and antiseptics	58%	1.8	10
M01	Antiinflammatory and antirheumatic products	57%	23.0	16
R01	Nasal preparations	57%	105.3	20
A02	Drugs for acid related disorders	56%	170.5	37

A11	Vitamins	55%	53.2	24
H03	Thyroid therapy	55%	3.1	20
J01	Antiinfectives for systemic use	52%	265.5	25
D01	Antifungals for dermatological use	50%	3.2	41

Patients covered over 70% of the costs of antianemic preparations, and this was the group in which the patients' share in drug costs was the highest. In turn, in the drug group with the highest sales value – A10 (drugs used in diabetes), 77% of the costs were covered from public sources. The cost structure depending on the payer – the patient or a public entity – for 10 groups with the highest total sales value is presented in Fig. 15.4.

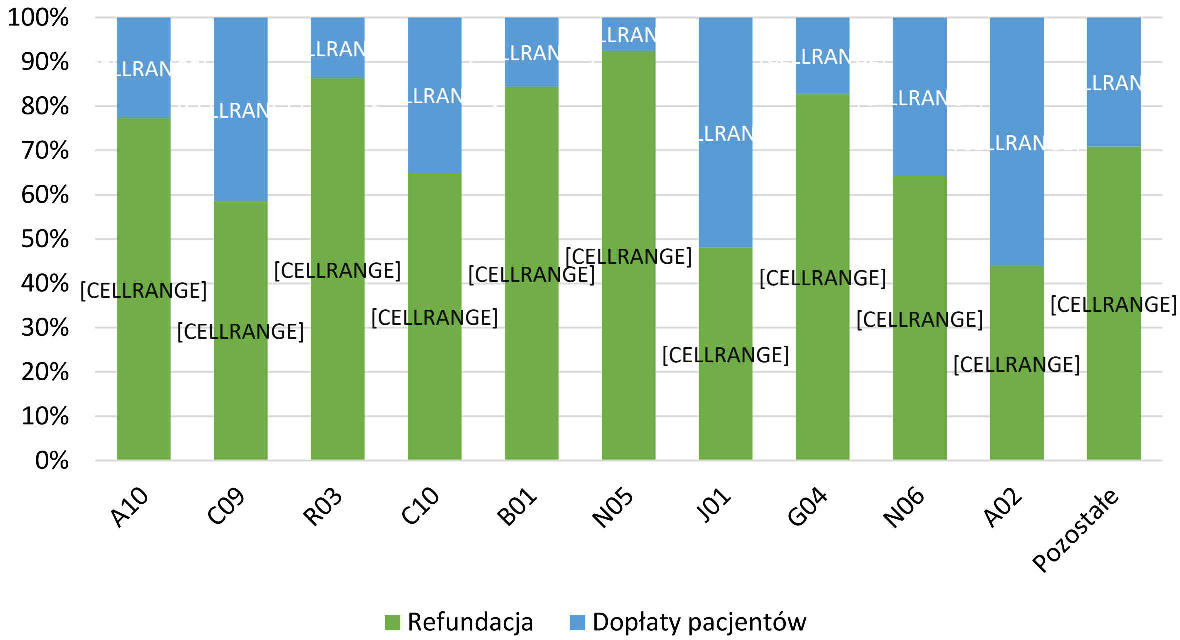


Fig. 15.4 Cost structure for the top 10 drug groups in 2019

In 2019, the highest patient payments, presented per capita, were recorded for H01 drugs – Pituary and hypothalamic hormones and analogues, amounting to PLN 254.00. In average terms, the patients also spent over PLN 100 in 2019 on the following drugs: B06 – Other haematological agents, A05 – Bile and liver therapy, L04 – Immunosupressants, N04 – Anti-Parkinson drugs, and A10 – Drugs used in diabetes. The lowest patient payments (in the drug groups involving patient payments) amounted to PLN 2.59 for antimycobacterials (J04). Drug groups involving the average patient payment exceeding PLN 70 are shown in Tab. 15.5.

Tab. 15.6. Drug groups for which the average patient payment exceeded PLN 70.

ATC code	Average annual patient payment
H01 Pituary and hypothalamic hormones and analogues	253.92
B06 Other haematological agents	170.10
A05 Bile and liver therapy	150.39
L04 Immunosupressants	112.77
N04 Anti-Parkinson drugs	105.59
A10 Drugs used in diabetes	104.10
N03 Antileptics	85.44
N06 Psychoanaleptics	75.80
D05 Antipsoriatics	75.16
C09 Agents acting on the renin-angiotensin system	75.10
A09 Digestives, incl. enzymes	73.94
L02 Endocrine therapy	73.86

In 2015-2019, the number of sold packages of reimbursed drugs grew by 4.9% and their sales value by 6.2%.

Tab. 15.7. Number of packages and sales value of reimbursed drugs in 2015-2019

Year	Number of packages (in million)	Sales value (in PLN million)
2015	385	10,408
2016	388	10,374
2017	397	10,665
2018	402	10,940
2019	403	11,053

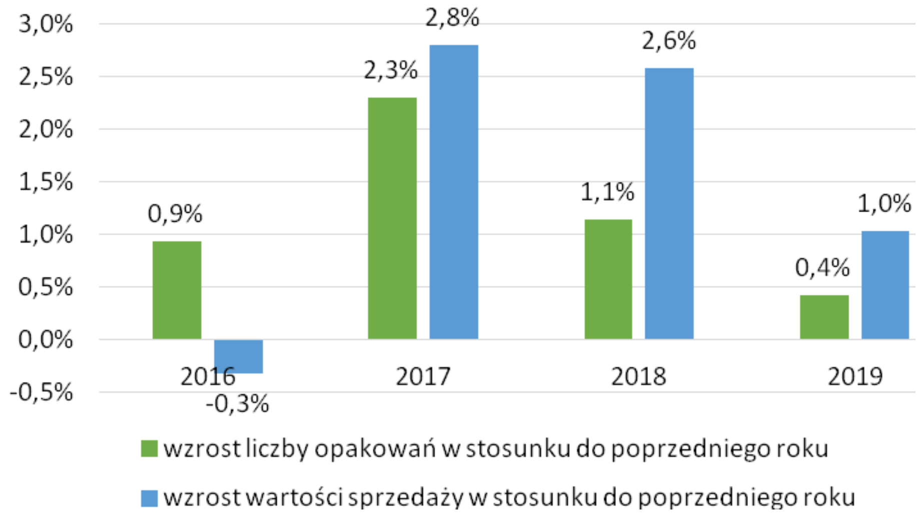


Fig. 15.2. Change in the number of packages and sale value compared to the previous year in 2016-2019

Among the drugs reimbursed in 2015-2019[206], the highest percentage increase in the number of packages was seen for D05 drugs – Antipsoriatics, i.e. a rise of 668% in 2019, in relation to 2015 (172,900 packages in 2019)[207]. An increase of over 100% was also observed in the following drug groups: A05 Bile and liver therapy (111,100 packages in 2019) – a rise of 421% in the number of packages, and R01 Nasal preparations (2.3 million packages in 2019) – a rise of 132%. The sharpest decrease in the number of packages in relation to 2015 (excluding the groups which ceased to be reimbursed) was recorded in the following groups: P02 Anthelmintics (222,400 packages in 2019) – a drop of 96% in the number of packages, A11 Vitamins (470,000 packages in 2019) – a drop of 71%, and N01 Anesthetics (7,500 packages in 2019) – a drop of 63%. Table 15.7 shows the drug groups in which at least a 20% increase was recorded.

[206] Reimbursed in all the years under analysis
[207] The number of packages in the drug groups which were not reimbursed in all the reimbursement periods in a given year was multiplied by the coefficient representing the quotient of the number of all reimbursement periods in a year (6) to the number of the reimbursement periods during which the drugs were actually reimbursed.

Tab. 15.8. Drug groups with at least a 20% increase in the number of packages in 2019 compared to 2015

ATC code	Number of packages in 2015 (in thousand)	Number of packages in 2019 (in thousand)	increase/ decrease
D05 Antipsoriatics	22.5	172.9	668%
A05 Bile and liver therapy	3.6*	111.1	421%
R01 Nasal preparations	970.3	2,253.6	132%
B06 Other haematological agents	2.3	4.3	84%
M04 Antigout preparations	4,388.4	7,672.4	75%
A09 Digestives, incl. enzymes	168.3	279.3	66%
V03 All other therapeutic products	0.4	0.6	45%
H03 Thyroid therapy	7,546.9	10,749.2	42%
N06 Psychoanaleptics	9,680.5	12,588.2	30%
B02 Antihemorrhagics	170.8	217.1	27%
H04 Pancreatic hormones	44.0	55.8	27%
G04 Urologicals	9,734.1	12,253.3	26%
N02 Analgesics	6,158.2	7,686.9	25%
N07 Other nervous system drugs	91.0	113.1	24%
C07 Beta blocking agents	19,235.7	23,559.0	22%
C10 Lipid modifying agents	33,260.9	39,850.4	20%

The % increase was calculated as follows: (111.1 thousand – 3.6 thousand (6/1)) / (3.6 thousand * (6/1)), because A05 drugs were reimbursed only in one of the 6 reimbursement periods in 2015.

For drugs with the highest total number of reimbursed packages sold in 2015-2019 (in total, 80% of all packages sold), changes in the number of packages, in relation to 2015, are shown in Tab. 15.8.

Tab. 15.9. Number of packages (in million) in 2015-2019, the percentage of packages and a decrease/increase in the number of packages in 2019 compared to 2015

ATC code	2015	2016	2017	2018	2019	increase/ decrease
C09 Agents acting on the renin-angiotensin system	55.7	55.9	57.5	59.3	61.7	11%

C10 Lipid modifying agents	33.3	35.0	37.5	39.1	39.9	20%
A10 Drugs used in diabetes	33.2	32.8	33.2	33.8	34.2	3%
C03 Diuretics	26.9	26.1	25.2	24.5	24.2	-10%
J01 Antiinfectives for systemic use	26.9	25.5	25.5	23.8	21.5	-20%
C07 Beta blocking agents	19.2	20.4	21.5	22.4	23.6	22%
A02 Drugs for acid related disorders	19.6	20.2	20.4	20.6	20.7	6%
R03 Drugs for obstructive airway diseases	17.1	18.0	18.5	18.6	18.5	8%
C08 Calcium channel blockers	16.8	16.7	16.8	16.8	17.1	2%
M01 Antiinflammatory and antirheumatic products	15.0	14.7	14.3	13.5	11.9	-21%
N05 Psycholeptics	11.1	11.3	11.3	11.3	11.2	1%
N06 Psychoanaleptics	9.7	10.4	11.1	11.7	12.6	30%
G04 Urologicals	9.7	10.4	11.1	11.6	12.3	26%
N03 Antileptics	9.5	9.7	9.8	9.9	10.1	5%
H03 Thyroid therapy	7.5	8.3	9.0	9.6	10.7	42%
Other	73.3	72.8	74.4	75.2	73.4	0.13%

15.3. The most common drug groups in Poland

15.3.1. Drugs acting on the renin-angiotensin system (C09)

In 2019, 6.9 million Poles took reimbursed drugs representing code C09. In relation to 2015, their number increased by 2.4%. The average annual growth in the number of patients, starting with 2015, amounted to 0.6%, of which in 2017-2019 the growth rates were as follows: 1.2%, 1.3% and 1.8%, respectively, and in 2016, a drop of 1.9% was observed in the number of patients.

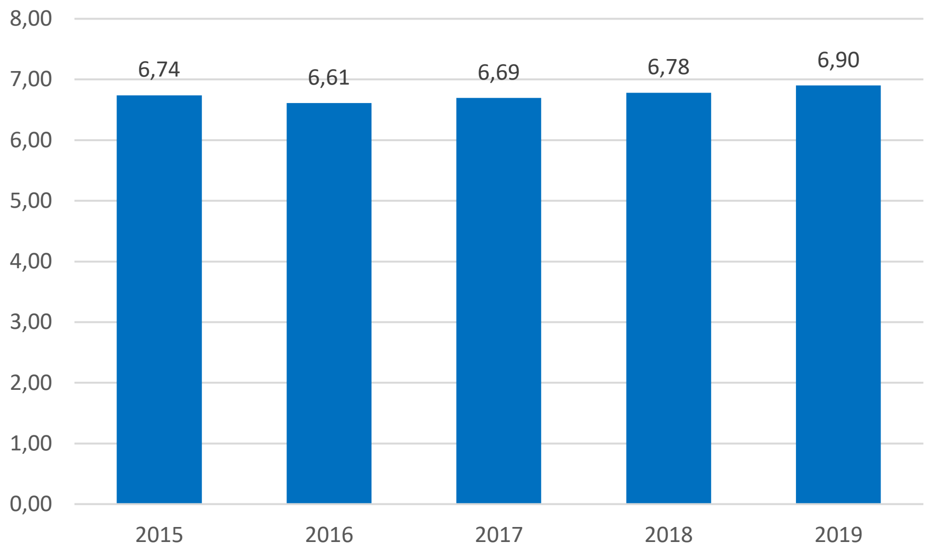


Fig. 15.3. Number of patients buying reimbursed drugs from group C09 in 2015-2019 (in million)

In 2019, in relation to 2015, the sales of drugs from this drug group grew by 11%, and the sales value by 12%. In national terms, the number of packages containing those drugs per capita amounted to 1.6 and was by 10% higher than in 2015. The drugs value in 2019 amounted to PLN 32.62 and was by 12% higher than in 2015.

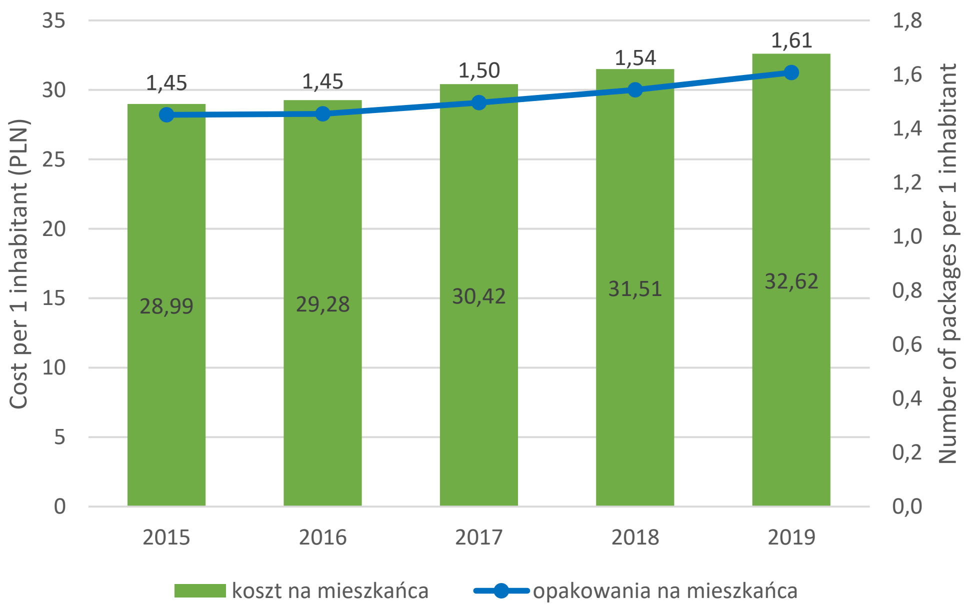


Fig. 15.4. Average cost and number of packages of C09 drugs per capita of Poland in 2015-2019

In 2019, 20.3 million, i.e. 33% of the packages of reimbursed C09 drugs contained *ramiprilum*. The sales value of that substance amounted to PLN 284.6 million, accounting for 23% of the total sales value in this drug group. Other most common substances, which altogether accounted for 75% of all packages of C09 drugs, are shown in Tab. 15.9.

Tab. 15.10. The most common substances from group C09

Active substance	Number of packages (in million)	Sales value (in PLN million)	% of packages
Ramiprilum	20.3	284.6	33%
Telmisartanum	6.2	164.5	10%
Valsartanum	4.1	98.4	7%
Perindoprilum argininum	4.0	101.5	6%
Telmisartanum + Hydrochlorothiazidum	3.1	98.8	5%
Valsartanum + Hydrochlorothiazidum	3.0	83.1	5%
Losartanum kalicum	2.2	42.7	4%
Ramiprilum + Amlodipinum	2.0	22.7	3%
Lisinoprilum	1.8	23.4	3%
Other	14.9	332.2	24%

15.3.1.1. Compliance among patients taking *ramiprilum*

In the context of drugs used in hypertension, it seems useful to refer to the notion of *compliance* – the extent to which the patient complies with the recommended treatment regime in terms of the dose and time of taking the drug[208]. Among patients taking *ramiprilum*, an average compliance was found to reach 62%[209]. That value was estimated on a group of 537,000 patients who were on *ramiprilum* in 2016 and did not take any other hypertension drugs throughout 2016-2018. On average, these patients took 0.65 tablets a day. For 57% of them, compliance was below 80%, and for 29% below 40%.

[208] Gaciong, Z., Kuna, P., 2008. Adherence, compliance, persistence – the preconditions of treatment success. Medycyna po Dyplomie 3,2–3.
[209] This is the product of the number of days for which the patients bought the tablets (assuming that, regardless of the purchased dose, the patient takes 1 tablet a day) to the number of days in the analysed period.

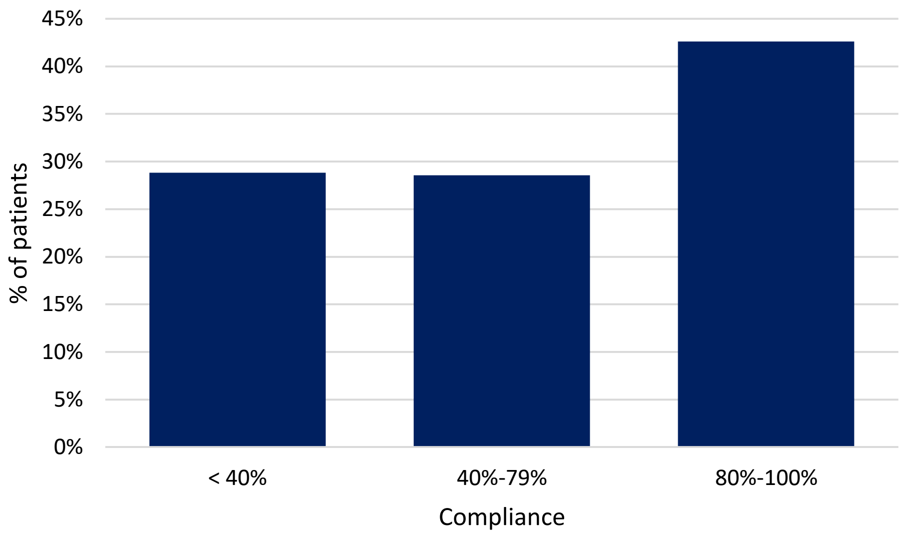


Fig. 15.5. Compliance among patients taking *ramiprilum*
Source: "NFZ on health. Hypertension", May 2019.

In addition, compliance has been found to improve with patient's age. Nearly half of the patients aged over 65 indicate a high level of compliance (over 80%), and approximately 20% show compliance below 40% (Fig. 15.9)[210]

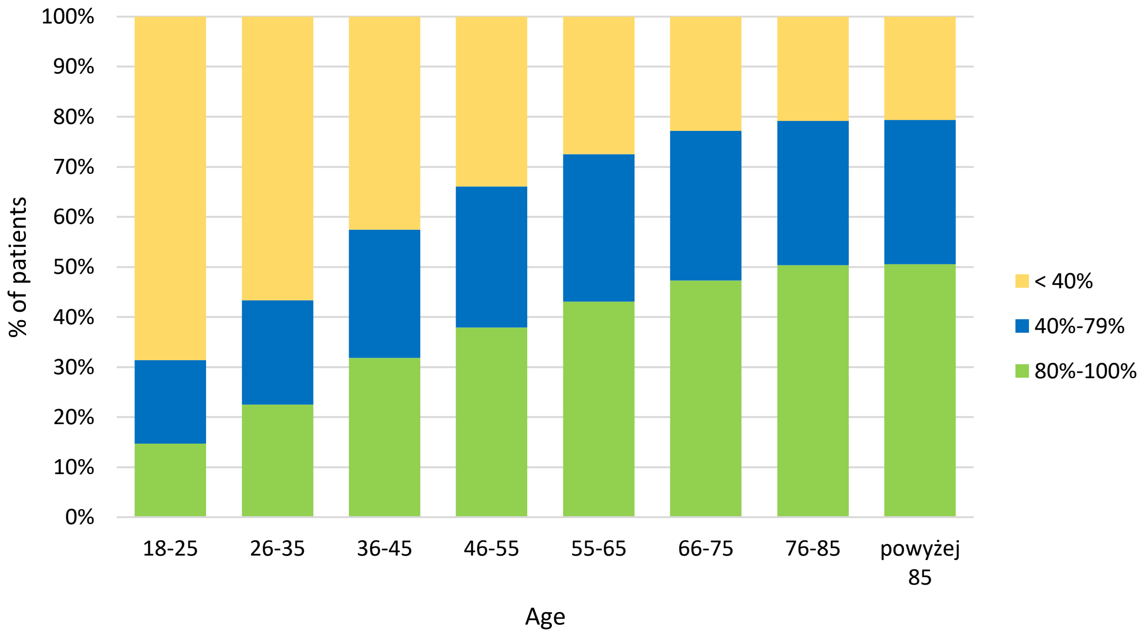


Fig. 15.6. Compliance among patients taking *ramiprilum* by age.
Source: "NFZ o zdrowiu. Nadciśnienie tętnicze" maj 2019 (NHF on health. Hypertension, May 2019).

[210] More information about compliance using the example of *ramiprilum* can be found in the "NFZ on health. Hypertension" report: https://zdrowedane.nfz.gov.pl/pluginfile.php/80/mod_resource/content/1/nadcisnienie-tetnicze-raport-nfz-2019-small.pdf

15.3.2. Lipid modifying agents (C10)

In 2019, 5.4 million Poles took reimbursed drugs representing code C10 and this number grew by 14% in relation to 2015. The average annual increase in the number of patients, starting with 2015, amounted to 3.4%, with the highest rise recorded in 2016 – 4.2% and the lowest in 2019 – 1.8%.

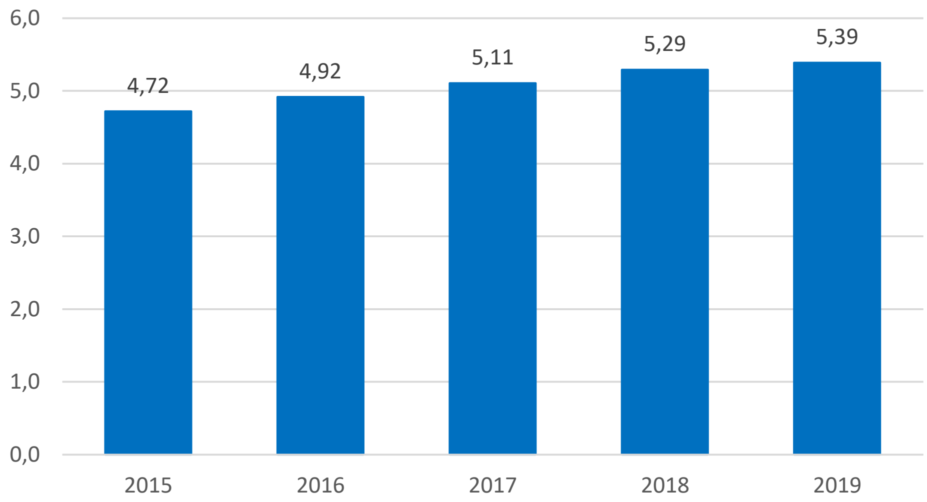


Fig. 15.7. Number of patients taking C10 drugs in 2015-2019 (in million)

In 2019, in relation to 2015, the sales of drugs from this drug group grew by 20%, and the sales value by 9%. In national terms, the number of packages containing those drugs per capita amounted to 1.04 and was by 20% higher than in 2015. The drug value in 2019 amounted to PLN 17.52 and was by 9% higher than in 2015.

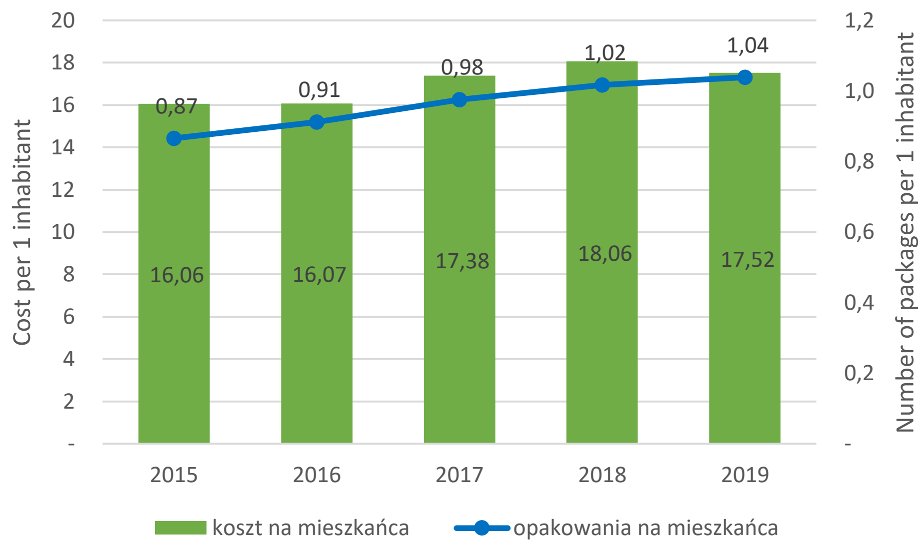


Fig. 15.8. Average cost and number of packages of C10 drugs per capita of Poland in 2015-2019

In 2019, 15.2 million, i.e. 38% of the packages of reimbursed C10 drugs contained *atorvastatinum*. The sales value of that substance amounted to PLN 285.2 million, accounting for 38% of the total sales value in this drug group. The most common substances, which altogether accounted for 99% of all packages of C10 drugs, are shown in Tab. 15.10.

Tab. 15.11. The most common substances from group C10

Active substance	Number of packages (in thousand)	Sales value (in PLN thousand)	% of packages
Metformini hydrochloridum	19,578	298,388	57.3%
Glimepiridum	3,740	49,623	11.0%
Gliclazidum	3,332	76,402	9.8%
Insulinum humanum	3,294	327,132	9.6%
Insulinum aspartum	1,533	206,034	4.5%
Acarbosum	993	12,111	2.9%
Insulinum lisprum	946	147,018	2.8%
Insulinum glarginum	364	107,234	1.1%
Other	377	53,399	1.1%

15.3.3. Drugs used in diabetes (A10)

In 2019, 2.8 million Poles took reimbursed drugs representing code A10, and this number grew by over 21% in relation to 2015. In each year, starting with 2015, the increase of patients compared to the previous year amounted to approximately 5%.

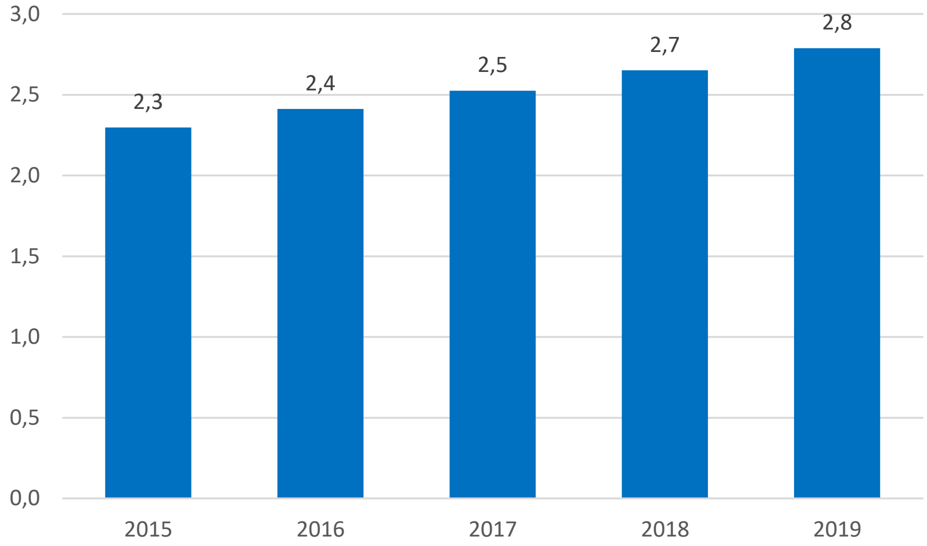


Fig. 15.9. Number of patients buying reimbursed drugs from group A10 in 2015-2019 (in million)

In 2019, in relation to 2015, the sales of drugs from this drug group grew by 3%, and the sales value by 10%. In national terms, the number of packages containing those drugs per capita amounted to 0.89 and was by 3% higher than in 2015. In turn, the drug value in 2019 per capita amounted to PLN 33.28 and was by 10% higher than in 2015.

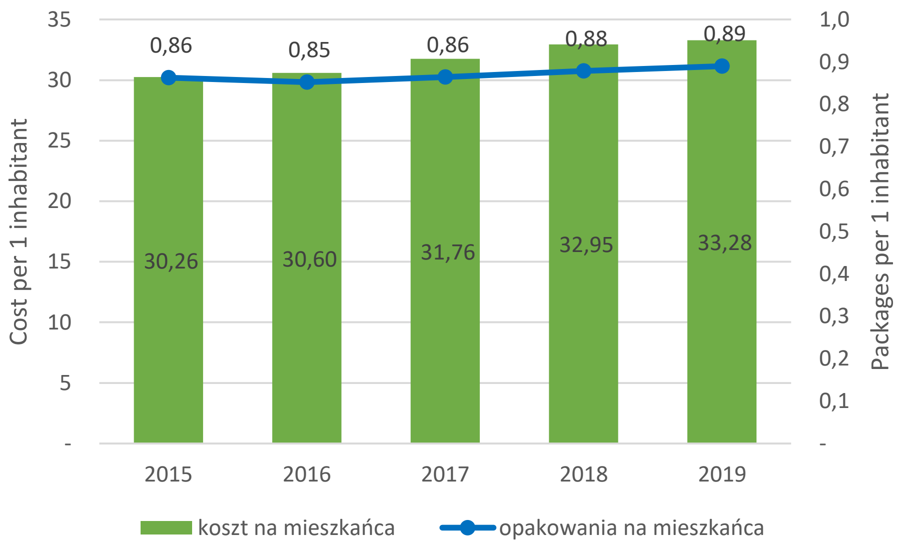


Fig. 15.10. *A*verage cost and number of packages of A10 drugs per capita of Poland in 2015-2019

In 2019, 19.6 million, i.e. 57% of the packages of reimbursed A10 drugs contained *metformini hydrochloridum*. The sales value of that substance amounted to PLN 298.4 million, accounting for 23% of the total sales value in this drug group. The most common substances, which altogether accounted for 99% of all packages of A10 drugs, are shown in Tab. 15.11.

Tab. 15.12. The most common substances from group A10

Active substance	Number of packages (in thousand)	Sales value (in PLN thousand)	% of packages
Metformini hydrochloridum	19,578	298,388	57.3%
Glimepiridum	3,740	49,623	11.0%
Gliclazidum	3,332	76,402	9.8%
Insulinum humanum	3,294	327,132	9.6%
Insulinum aspartum	1,533	206,034	4.5%
Acarbosum	993	12,111	2.9%
Insulinum lisprum	946	147,018	2.8%
Insulinum glarginum	364	107,234	1.1%
Other	377	53,399	1.1%

15.4. Polypharmacy based on the National Health Fund data

Polypharmacy is a phenomenon involving an excessive or improper taking of drugs. It is usually assumed that polypharmacy occurs when the patient takes 5 or more different drugs. This problem often concerns elderly people who, due to suffering from several diseases, take many drugs at the same time, and this process is frequently not supervised by their attending physician. It is estimated that even 33.8% of Poles aged 65 or more can be at risk of the adverse consequences of polypharmacy[211]. Based on the National Health Fund data, this phenomenon was estimated for the Polish population taking into account all the prescriptions for reimbursed drugs that were filled by Poles (excluding any drug groups not connected with chronic disease treatment). The analysis of the prescriptions that had been filled revealed that over 2 million people in a month purchased drugs containing 5 or more active substances, 89,300 (4.5%) of whom bought at least 10 substances. In a quarter, as many as 3.4 million people filled prescriptions for 5 or more active substances, 300,600 (8.9%) of whom bought at least 10 such substances; and in a 6-month period, as many as 4.5 million people bought 5 active substances or more, 614,000 (13.6%) of whom bought at least 10 such substances. Overall, 64%, i.e. 2.9

[211] Midão, L., Giardini, A., Menditto, E., Kardas, P.,Costa, E., 2018. Polypharmacy prevalence among older adults based on the survey of health, ageing and retirement in Europe. Archives of Gerontology and Geriatrics 78, 213– 220

million people purchasing at least 5 substances in a 6-month period were people aged 65 or more.

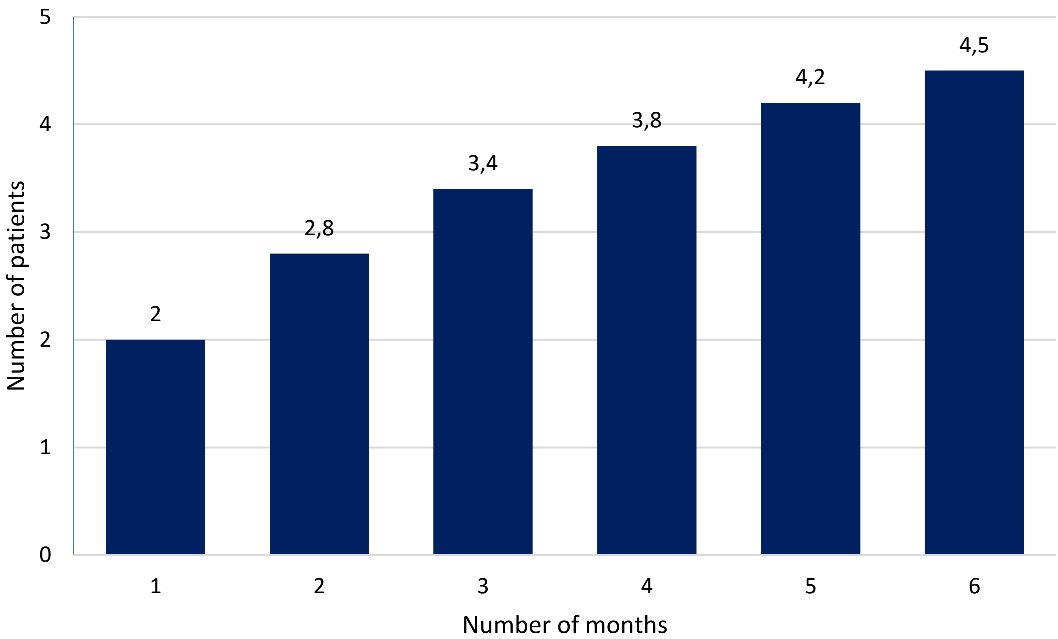


Fig. 25.14. Number of patients (million) taking 5 or more active substances by follow-up (months)
Source: “NFZ o zdrowiu. Polipragmazja, luty 2020” (NHF on health. Polypharmacy, February 2020)

The analysis of the doses of drugs purchased by patients buying the largest number of drugs revealed that, in 2018, there were 554,100 patients aged 65 or more with chronic polypharmacy[212]. It is worth noting that these included 380,000 people who took at least 5 active substances on at least 292 days in a year, and 251,100 people who took such drugs for nearly the whole year, i.e. more than 328 days[213].

[212] Chronic polypharmacy was defined as taking at least 5 active substances on at least 146 days in a 6-month period in 2018 (80% of days in a 6-month period).
[213] This was estimated based on the defined daily doses (DDD according to the WHO) specified in the packages of drugs purchased by patients.

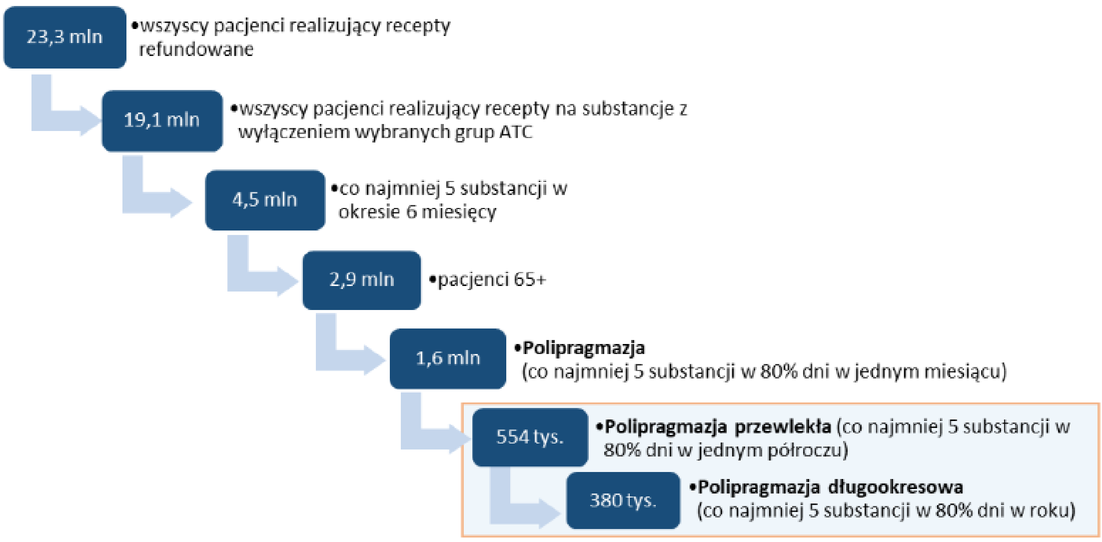


Fig. 35.15. The scheme for identifying patients with polypharmacy.
Source: “NFZ on health. Polypharmacy, February 2020”.

In 2018, patients with chronic polypharmacy filled prescriptions issued, on average, by 5 physicians in 3 different facilities providing healthcare services. In average terms, they visited physicians 15 times a year, collecting an average of 2 prescriptions each time – these values are exclusive of any visits during which no prescriptions were issued. 5,600 people filled prescriptions issued by other physicians or issuers, on average, once a month, and 5,700 patients received over 35 benefits a year for which prescriptions were issued. More than every second patient (50.3%) with chronic polypharmacy took *metformini hydrochloridum* – a substance used in diabetes, and nearly 47% took *atorvastatinum* – a substance used in hypertension.

The most commonly indicated threat connected with polypharmacy among elderly people is the occurrence of potentially dangerous interactions between drugs which can weaken the drug effect or bring serious health consequences. The largest number of people at risk of potential interactions was observed among patients taking non-steroidal anti-inflammatory drugs (NSAIDs), due to their proliferation, among which their combination with drugs used in hypertension was the most common – in 2018, nearly 1.6 million people purchased drugs from both groups at least once in the same month, and 173,000 people did so at least in 4 months in a year. Other selected interactions with NSAIDs are shown in Tab. 15.12.

Tab. 15.13 . Number of patients at risk of selected potential drug interactions by the number of months in which they purchased drug groups and the most frequent potential drug interactions

Number of months / Interaction	1-3 months	4-6 months	7-9 months	10-12 months	Total
Treatment for hypotension + NSAID	1,410,517	136,465	27,864	8,729	1,583,575
ARB/ACEI + Diuretics + NSAID	592,212	54,973	10,355	3,099	660,639
NSAID + NSAID	527,341	9,334	1,576	389	538,640
GKS + NSAID	200,087	10,836	2,087	494	213,504
SSRI/SNRI + NSAID	59,036	3,016	474	140	62,666
Warfarin/Acenocoumarol + NSAID	44,622	1,851	99	10	46,582
Antiplatelet drugs + NSAID	20,932	1,374	265	58	22,629

Source: "NFZ o zdrowiu. Polipragmazja, luty 2020" (NHF on health. Polypharmacy, February 2020)

SUMMARY

1. In 2019, expenditure on reimbursed drugs amounted to PLN 17.31 billion, PLN 12.71 billion of which were public resources and patient payments for reimbursed drugs, foods for special medical purposes and prescribed medical devices sold in pharmacies, and PLN 4.6 billion were public resources on drugs available under drug programmes and chemotherapy.
2. In 2019, the costs of 403.3 million packages of drugs included in the lists of reimbursed drugs announced in notices of the Minister of Health were reimbursed. The most packages of drugs per capita were reimbursed in the Łódzkie Voivodship – 12 packages, and the least in the Podkarpackie Voivodship – 9 packages.
3. The tree groups of drugs with the largest number of packages sold in 2019 by ATC codes include: C09 – Agents acting on the renin-angiotensin system, which comprise in particular drugs used in hypertension, C10 – Lipid modifying agents, i.e. drugs used in the prophylaxis of multiple sclerosis and in the treatment of excessive cholesterol concentration in blood, and A10 – Drugs used in diabetes.
4. C09 – Agents acting on the renin-angiotensin system constitute the drug group, by ATC code, with the largest number of packages reimbursed in 2019 – 61.7 million packages, which accounted for 15.3% of all packages of ready-to-use reimbursed drugs.

5. A10 – Drugs used in diabetes constitute the drug group, by ATC code, with the highest sales value in 2019 – PLN 1.3 billion in total, i.e. 11.6% of public funds and patient payments which were spent in 2019 on ready-to-use reimbursed drugs.
6. C09 – Agents acting on the renin-angiotensin system constitute the drug group, by ATC code, with the highest value of patient payments – PLN 518.4 million in total, which accounted for 17.4% of all patient payments for ready-to-use reimbursed drugs.
7. In relation to 2015, the number of sold packages of ready-to-use reimbursed drugs grew by 4.9% and their sales value by 6.2%.
8. In 2019, the number of people taking C09 drugs grew by 2.4% in relation to 2015, and amounted to 6.9 million patients. The most common substance in that group was *ramiprilum*.
9. Patients treated with *ramiprilum* indicated an average compliance of 62%. For 57% of them, compliance was below 80%, and for 27% below 40%.
10. In 2019, the number of people taking C10 drugs grew by 14% in relation to 2015, and amounted to 5.4 million patients. The most common substance in that group was *atorvastatinum*.
11. In 2019, the number of people taking A10 drugs grew by 21% in relation to 2015, and amounted to 2.8 million patients. The most common substance in that group was *metformini hydrochloridum*.
12. Based on the National Health Fund data, it is estimated that approximately 554,100 Poles aged 65 or more can be at risk of chronic polypharmacy, and 380,000 can be at risk of long-term polypharmacy.
13. The occurrence of interactions between drugs is indicated as an adverse consequence of polypharmacy, while the combination of non-steroidal anti-inflammatory drugs with other drugs is considered one of the most common interactions. The probable combination of such drugs with drugs used in hypertension occurred in nearly 1.6 million people.

16. EXPENDITURE ON HEALTHCARE AND INFRASTRUCTURE OF THE HEALTHCARE SYSTEM IN POLAND

Olga Partyka, Monika Pajewska, Aleksandra Czerw

The purpose of health system is to improve health, prolong life and prevent illness or disability. Appropriate allocation of resources enables us to create an effective system which meets the health needs of society. However, due to limited resources, whether financial, human or material, it is crucial to prioritize optimal funding in key areas of healthcare. The most important matter is to ensure the availability of healthcare services. The accessibility problem exists in numerous countries, including Poland. In 2018, more than half (65%) of the complaints to the National Health Fund regarding the performance of contracts concerned the availability of the services[214].

16.1. Expenditure on healthcare in Poland and other EU countries

In all OECD countries, a significant proportion of GDP is spent on protecting citizens' health. In 2018, the average health expenditure in OECD countries amounted to 8.8% of GDP[215]. The vast majority of expenditure is financed from public sources. This chapter will present the structure of healthcare expenditure, including public and private sources, as well as a comparison of the situation in Poland with other EU countries.

There are several different models of healthcare organisation in the European Union. Among them we may distinguish: insurance model, supply model and mixed models. In the supply model, taxes are the predominant source of financing for healthcare, and in the insurance model, there are contributions paid by insured persons. In practice, in most countries, financing derives partly from taxes, contributions and to some extent directly or indirectly from citizens (out of pocket payments or additional health insurance and subscriptions).

The financing characteristic of the insurance model prevails in Poland, dominated by public funding (about 70% of all expenditure is public sector expenditure). Around 60% of the funding resources are provided by the National Health Fund. Health insurance contributions from insured persons contribute to the National Health Fund budget, which acts as the system's payer. The health insurance contribution amounts to 9% of the basis of assessment for

[214] National Health Fund https://www.nfz.gov.pl/o-nfz/skargi-i-wnioski/ [accessed on 18.09.2020].
[215] Public funding of healthcare - Policy Brief, February 2020 [accessed on 17.09.2020]

employees, while slightly different rules apply to contributions for farmers and self-employed entrepreneurs.

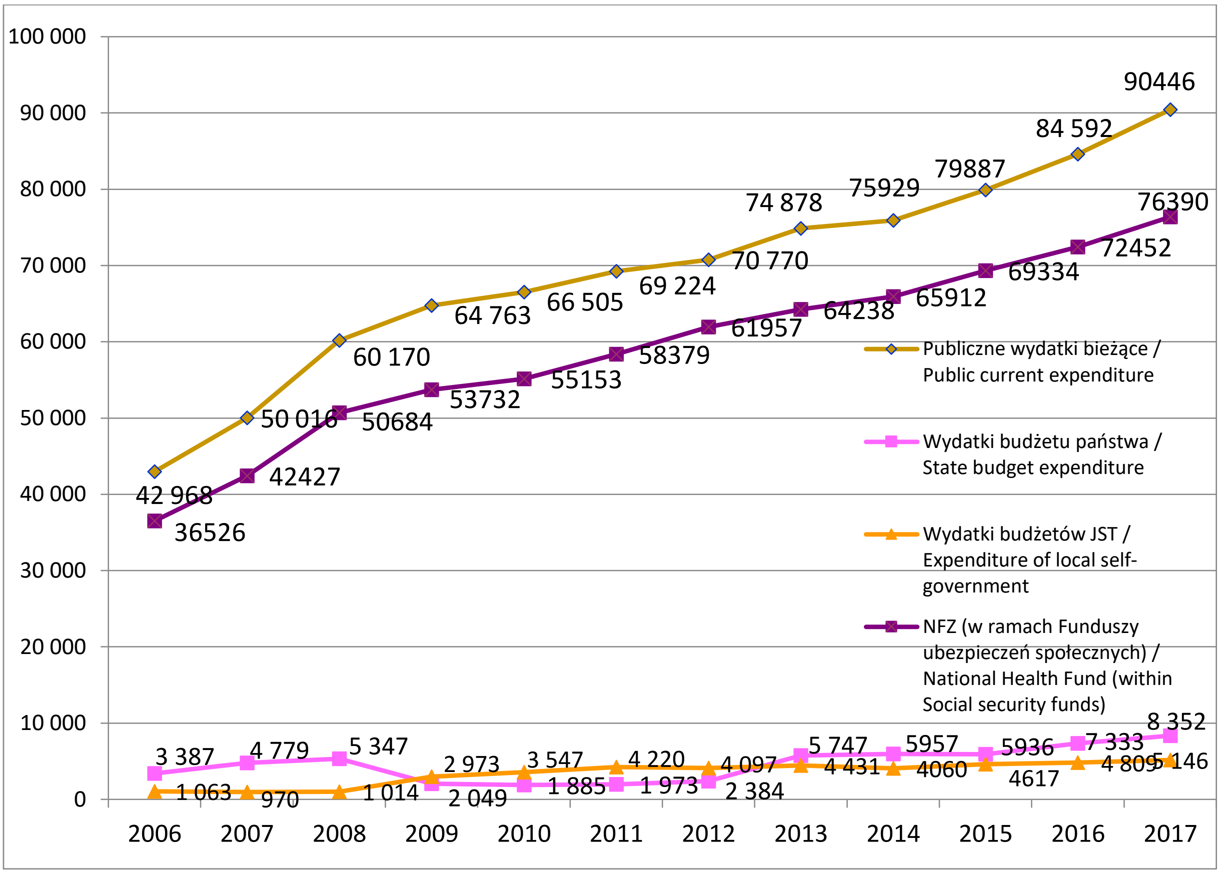


Fig. 16.1. Public expenditure on healthcare in 2006-2017 in million PLN, 2006-2017 (SP data)

According to the estimates made by Statistics Poland (SP), current expenditure on healthcare in 2017 amounted to PLN 130,140.4 billion and was higher than in 2016 by approximately PLN 8.4 billion (Fig. 16.1). This represented 6.54% of GDP, the same as in 2016. An increase in expenditure has been observed both in the case of public expenditure in general, and in the National Health Fund and budgetary expenditure. Current public spending on healthcare amounted to PLN 90.4 billion in 2017 and accounted for 4.55% of GDP (compared to 4.45% in 2016). The largest share of public funding is provided by the National Health Fund, whose budget increases annually. It should be emphasised that its size is influenced by several factors: the number of persons in employment (contributors), the level of the contribution and its collection. Nevertheless, despite the ever-increasing expenditure on healthcare, the availability of services for patients is a major challenge for the decision-makers in healthcare[216].

[216] Kanownik, G. Bezpieczeństwo pacjenta a dostępność do usług zdrowotnych. Finanse, Rynki Finansowe, Ubezpieczenia, 1 (85) 2017, p. 621–632

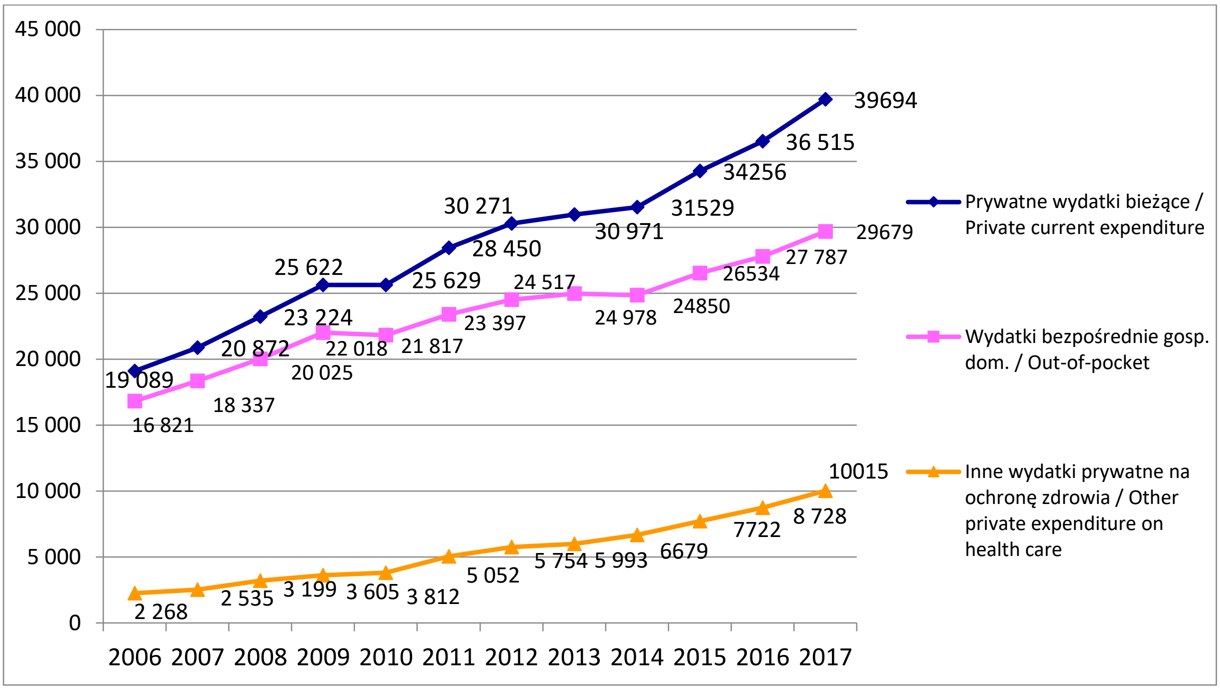


Fig. 16.2. Private expenditure on health in million PLN, 2006-2017 (SP data)

Following the state of the epidemic since March 2020, the level of funding for health protection is expected to change in the coming years. Comparing the currently available data for Q2 2020 to the same period in 2019, GDP decreased by 8.4%[217][218]. As a result of the dynamic epidemiological situation, at this stage, it is not possible to predict exactly what change in health expenditure will occur in the coming years, and the measures currently being taken at the central level will seriously affect the future situation. However, based on the available data, it can be assumed that both health expenditure and GDP will be significantly reduced.

217 Statistics Poland, Statistical Bulletin No 9/2020 https://stat.gov.pl/obszary-tematyczne/inne-opracowania/informacje-o-sytuacji-spoleczno-gospodarczej/biuletyn-statystyczny-nr-92020,4,104.html
218 Seasonally unadjusted GDP, constant annual average prices of the previous year

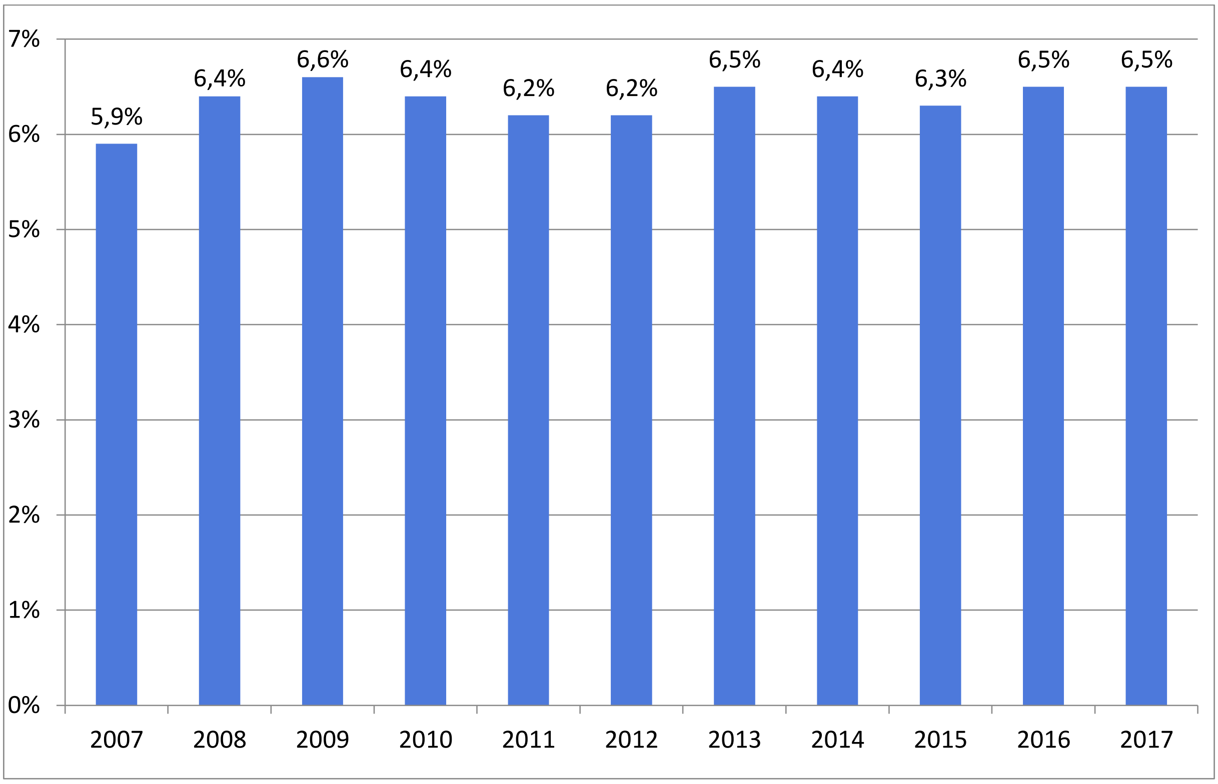


Fig. 16.3. Current expenditure on health as % of GDP, 2007-2017 (SP data)

Private expenditure on healthcare in Poland in 2006-2017 were constantly increasing (Fig. 16.2). In 2017 they reached PLN 39,694 billion. Private expenditure classified as other expenditure includes medical subscriptions and private health insurance. In most OECD countries, these are primarily dental services and medicines that are financed directly by patients, and to a lesser extent outpatient care services[219].

One of the basic measures of the health expenditure is the share of health expenditure in total GDP. The figure above (Fig. 16.3) contains data for Poland in 2007-2017. Over the years, the rate fluctuated slightly, with expenditure remaining relatively stable, to eventually reach 6.5% in 2017. In most European countries, health expenditures in relation to GDP are significantly higher. In 2016, the European Commission recognised that due to the unfavourable budgetary situation and the growing challenges associated with an ageing population, Poland faced an average level of risk of financial instability in the health sector[220]. Significantly lower expenditure on health compared to other countries also translates into an unfavourable assessment of the Polish healthcare system[221]. This poses a significant challenge for decision makers to ensure adequate funding for healthcare while controlling budgetary expenditure.

[219] Out of pocket spending: Access to care and financial protection, OECD 2019
[220] State of Health in the EU, Poland Country Health Profile 2017, OECD
[221] Euro Health Consumer Index 2018

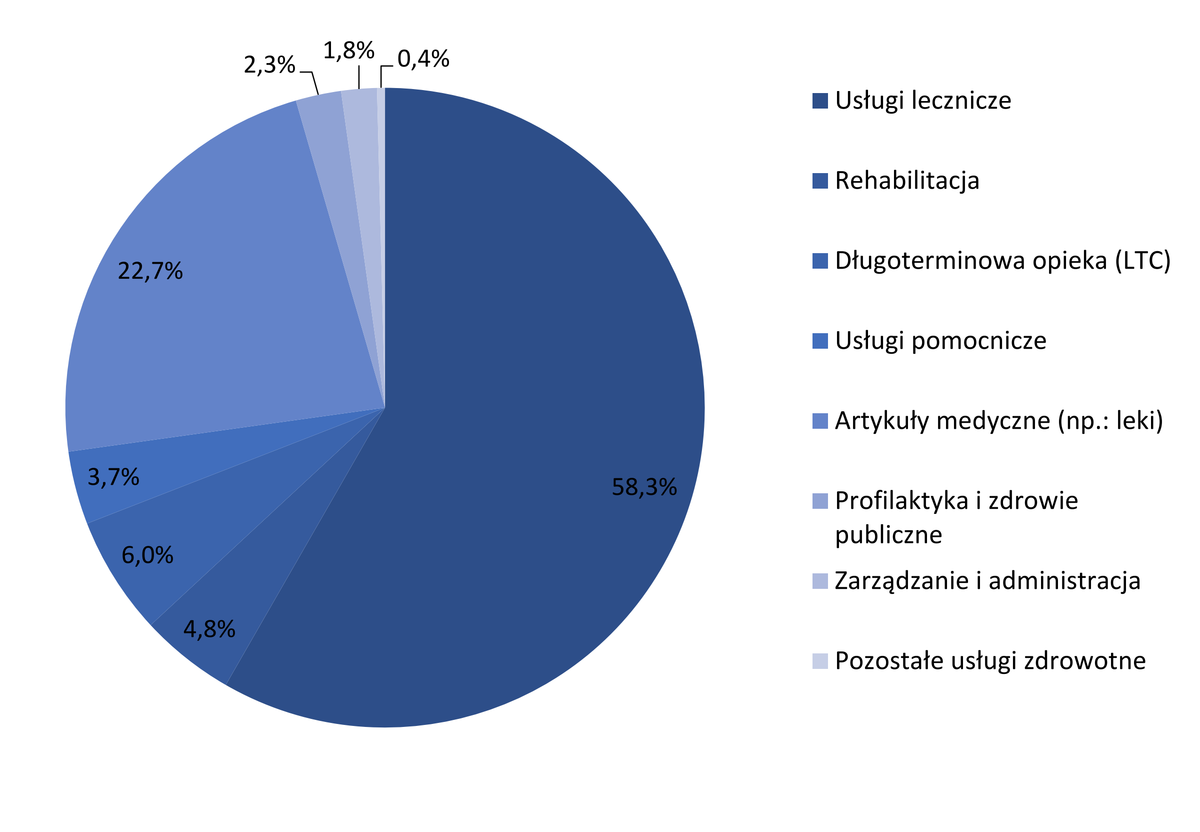


Fig. 16.4. Structure of expenditure on healthcare by its functions, 2017 (SP data)

The Polish healthcare system is dominated by expenditure on health services, primarily hospital treatment. In 2017, the vast majority of health expenditure was on medical services in general (almost 60%), with the lowest expenditure on prevention and public health measures (about 2.3%)[222]. Medical products (including medicines) accounted for 22.7% of total expenditure. Due to the ageing of the population, the demand for health services will continue to increase, which is a challenge for healthcare decision makers. The relative oversupply of hospitals and the undersupply of outpatient care, as well as the undersupply of long-term care impair the effectiveness of the allocation in the medium-term[223]. The above figure presents in detail the structure of expenditure in 2017 (Fig. 16.4).

[222] Health and healthcare in 2018, Statistics Poland, Warsaw, Cracow 2019
[223] State of Healthcare in the EU, Poland Country Health Profile 2017, OECD

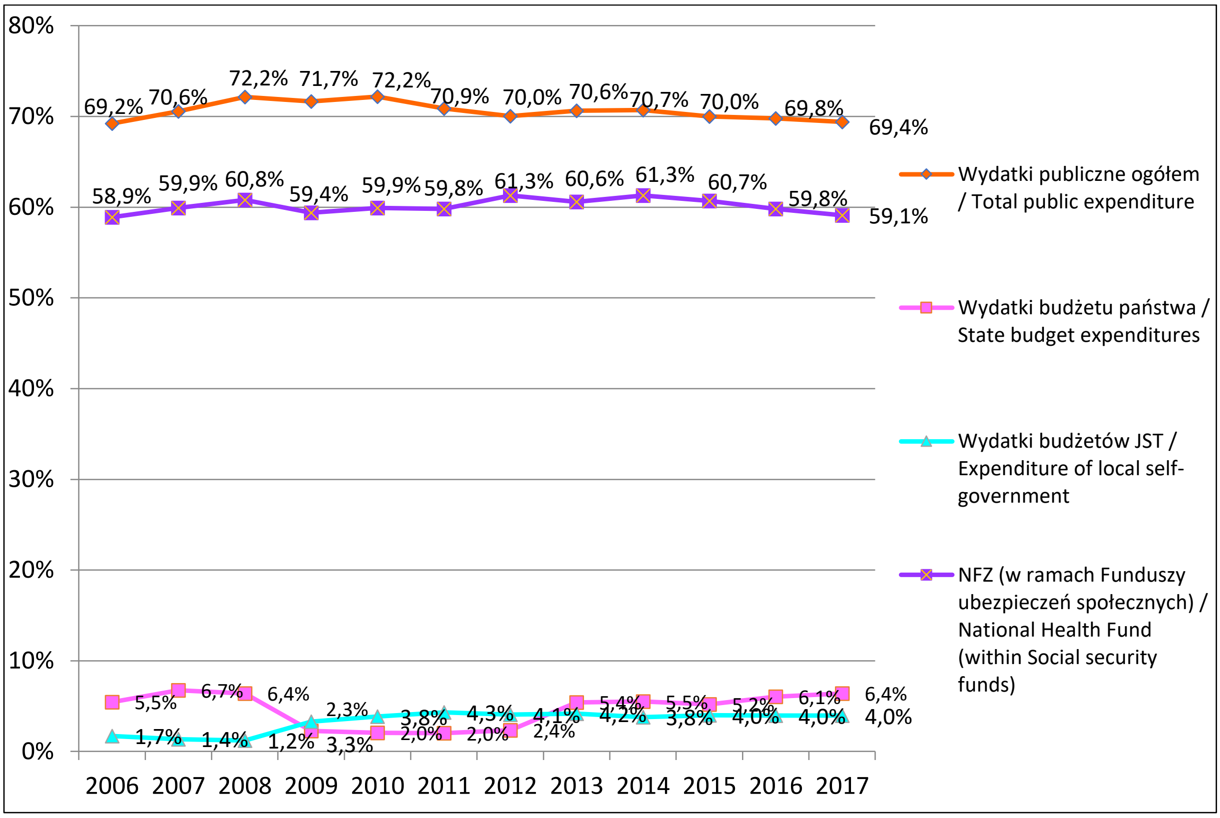


Fig. 16.5. Public expenditure on health as a share of total expenditure, 2006-2017 (SP data)

When analysing public expenditure on healthcare between 2006 and 2017, it can be noticed that total public expenditure remains relatively stable at around 70%. The largest expenditure was recorded by the National Health Fund – about 59% in 2017 (Fig. 16.5). Healthcare was financed to the least extent directly from the State budget (approx. 6.4% in 2017) and by local government units (4%). This results from the current financing model in Poland, in which services financed by the system's payer (the National Health Fund) dominate.

The State budget primarily finances highly specialised medical procedures, such as heart and lung transplants and congenital heart surgeries in infants[224], as well as benefits for uninsured patients. In turn, local government units finance mainly public health tasks. Local government authorities also act as founding bodies for the healthcare entities[225].

[224] Regulation of the Minister of Health of 12 November 2015 on guaranteed benefits in the field of highly specialised services and conditions for their provision; Official Gazette of 2015, item 1958
[225] Act of 15 April 2011 on therapeutic activity, Official Gazette of 2011 no. 112 item 654 as amended.

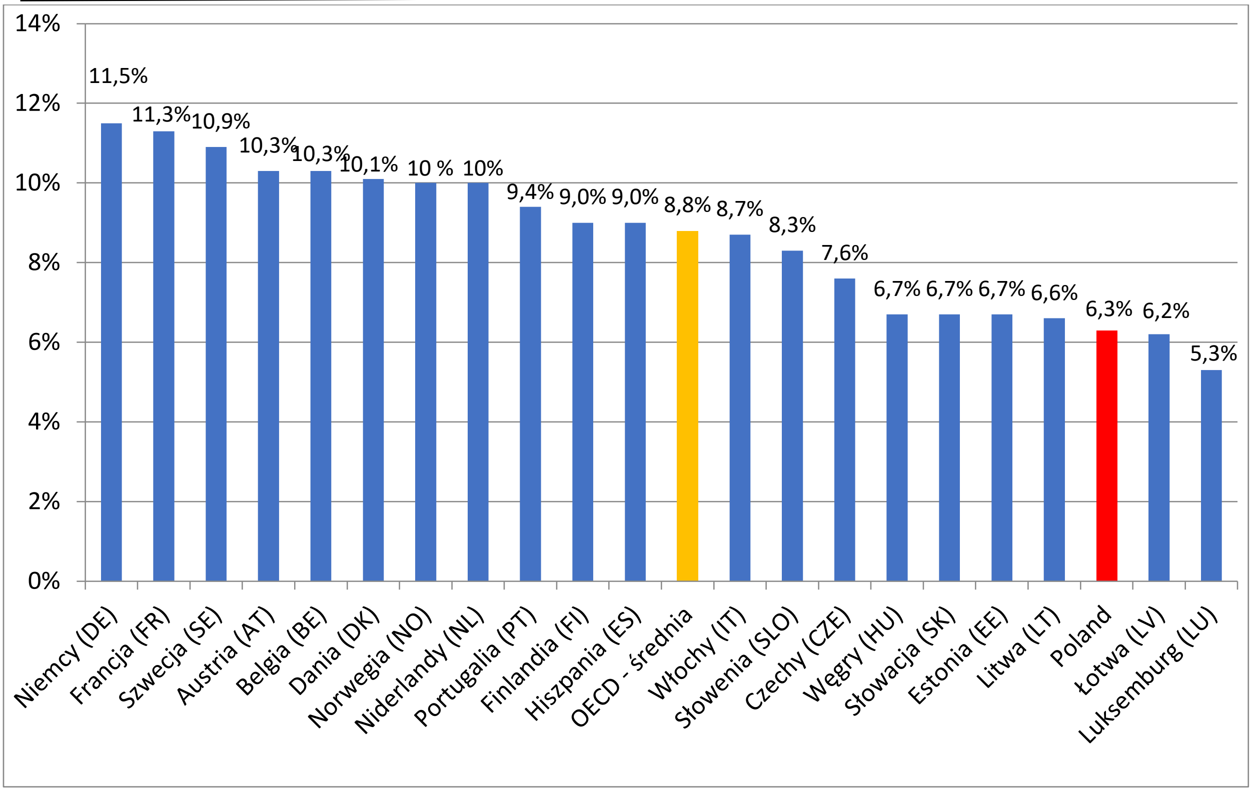


Fig. 16.6. Current expenditure on health as % of GDP (OECD data)

The figure above illustrates healthcare expenditure as a share of GDP in selected OECD countries. Differences in expenditure per capita between countries may be due to the difference in the price of health goods and services, and the demand for healthcare provision. Understanding these two factors may help decision-makers to identify the sources of differences and to take appropriate steps to ensure better service quality while controlling expenditure. When analysing expenditure on healthcare over the last decade, it can be concluded that the average share of GDP related to healthcare increased sharply in 2009. In the following years, the increase in health expenditure decelerated significantly – it fell to around zero between 2009 and 2011, mainly as a result of the economic crisis[226]. To prevent the effects of the crisis, a number of mechanisms have been activated to reduce public spending on health. Since 2011, the average growth rate of health expenditure has tended to follow closely the growth in the whole economy, largely maintaining the increased ratio of health expenditure to GDP at the current level of around 8.8%.

[226] Health at a Glance 2019, OECD

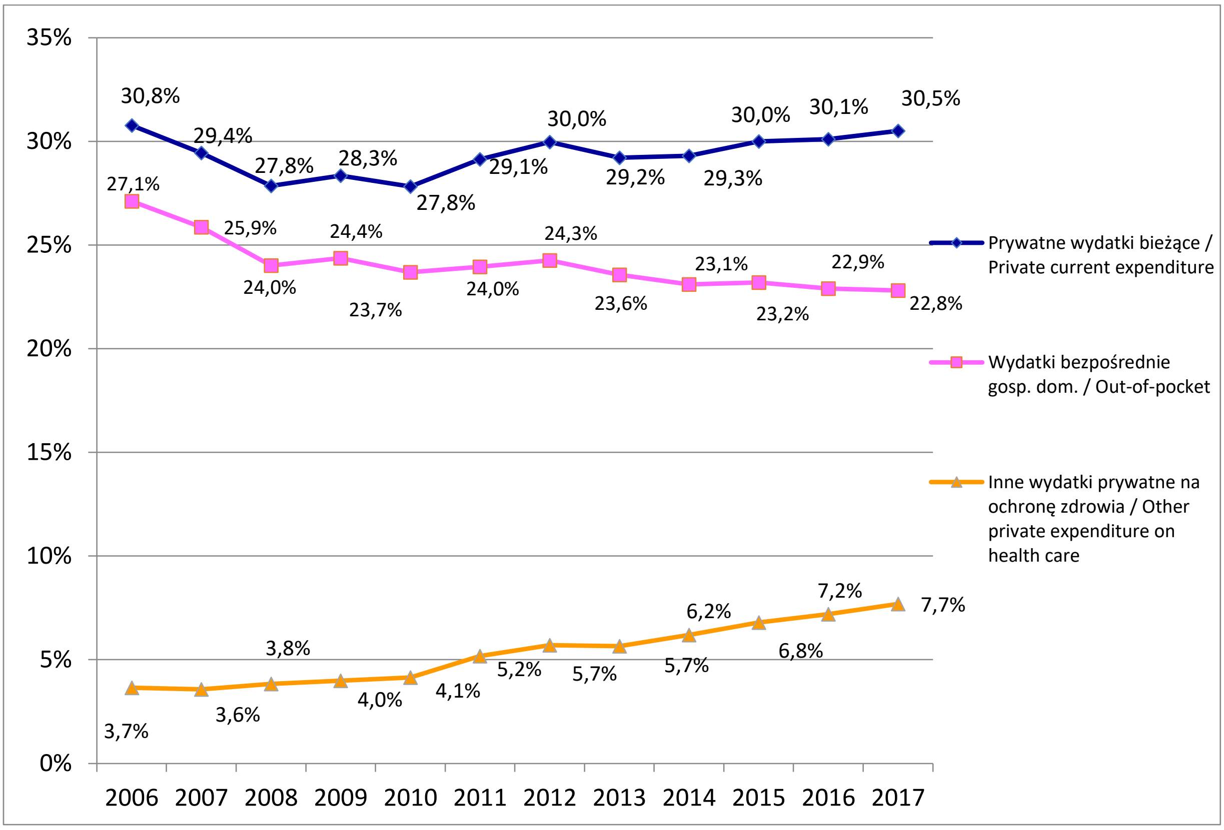


Fig. 16.7. Private expenditure on health as a share of total expenditure (SP data)

Private spending on healthcare is dominated by direct household spending – out of pocket expenses, which amounted to 22.8% in 2017. The above figure (Fig. 16.7) presents the structure of private expenditure on healthcare over the period of 2006-2017. Total private expenditure remained relatively stable (about 30%), whereas an increase in private expenditure classified as “other” was noted. These include the costs of medical subscriptions and health insurance. In the majority of OECD countries, direct household expenditure on health accounts for about 20% of total health expenditure[227]. The level of direct household expenditure may be an indicator demonstrating possible problems with the availability of services and the ability of patients to cover healthcare costs.

[227] Mueller, M. and D. Morgan (2018), “Deriving preliminary estimates of primary care spending under the SHA 2011 framework”; http://www.oecd.org/health/health-systems/ Preliminary-Estimates-of-Primary-Care-Spending-under- SHA-2011-Framework [accessed on 20.09.2020]

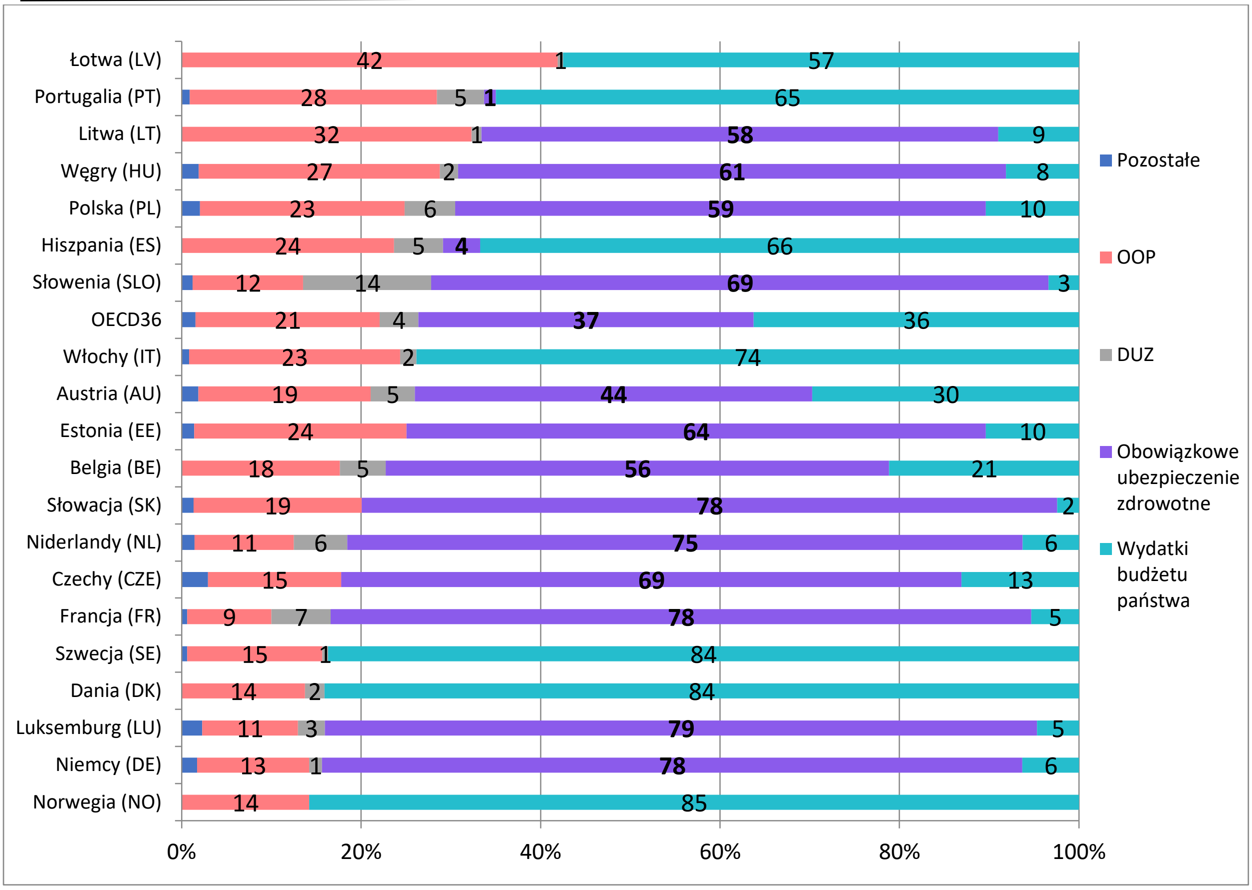


Fig. 16.8. Main sources of healthcare financing in EU countries in 2017 (OECD data)

There are different healthcare financing schemes in OECD countries. There are countries where the major source of funding for healthcare is public fund (e.g., Denmark 84% of budget funding, Norway – 85%) (Fig.16.8). Budgetary financing is mainly from taxation and is subsequently allocated through the budgetary procedure throughout the country at various levels. Many countries also maintain a system of compulsory health insurance, which is primarily funded by premium payers (e.g., Slovakia 78% of insurance funding, the Netherlands – 75%, and Germany – 78%). Individuals can also purchase private health insurance. Part of the insurance premium can be paid by the employer or subsidised by the State budget. Moreover, the citizens finance healthcare directly through payments for services or medicinal products. Other funding schemes include, for example, non-profit activities, international transfers, or private sector subsidies. On average, around 71% of healthcare expenditure in OECD countries is financed from public sources. The level of public funding for health depends on factors such as the type of the existing healthcare system, the demographic situation and government policies. Governments are responsible for the appropriate allocation of budgetary resources, not only in the health sector, but also in education and safety. Therefore, budgetary priorities change from year to year due to the general economic situation or social conditions. The investment expenditures in healthcare (e.g., investments in infrastructure or medical equipment) are also worth mentioning. They are subject to greater year-to-year fluctuations than current expenditure. Decisions on investment expenditure are, to a greater extent, affected by economic cycles, while system infrastructure and equipment are often the main areas of cost reduction.

16.2. Healthcare resources

Providing qualified medical personnel and infrastructure resources at a level enabling the healthcare system to operate is one of the challenges facing Poland and other developed countries. In addition to funding, infrastructure and medical personnel form the basis of any system that is necessary to provide health services, while maintaining their availability and quality. Limited financial resources, the ageing of society, the abandonment of the profession and economic migrations of medical personnel are the main challenges currently faced by the healthcare system in Poland. For this reason, it is particularly significant to undertake actions aimed at maintaining the potential of healthcare resources.

The preparation of the study included data from the National Centre for Healthcare Information Systems (CSIOZ), statistical databases of Statistics Poland, the Supreme Chamber of Physicians and Dentists, and the Supreme Chamber of Nurses and Midwives, as well as information from European (Eurostat) and global (OECD) statistics.

16.2.1 Medical personnel in the healthcare system

Medical professionals are the main resource of any health system. The core of the healthcare system is composed of doctors, together with nurses and midwives as well as other medical personnel. Due to the growing health needs and the significant proportion of older people in the population, it is essential to provide qualified medical personnel. The geographical distribution of doctors, nurses and other medical professions varies regionally. The greatest concentration occurs in voivodships with large specialist treatment centres and medical universities. When combined with the general shortage of medical staff, this translates into deterioration in access to healthcare services in selected regions of Poland.

According to data from the National Centre for Healthcare Information Systems, 149,134 doctors and 42,282 dentists were authorised to practice the profession in 2018. The largest number of physicians was in the Mazowieckie Voivodship (26,964) and in the Śląskie

Voivodship (17,969). The indicator of the number of practitioners with the licence to practice the profession per 10,000 inhabitants of Poland was 38.8 in 2018. Above the national average were 8 voivodships. The highest rate was recorded in the Mazowieckie Voivodship – 49.9, followed by the Łódzkie Voivodship with 47.2 doctors per 10,000 inhabitants. According to Statistics Poland data, the number of physicians working directly with a patient in 2018 was 89,532, which gave an indicator for the country at the level of 23.3 per 10,000 inhabitants. The highest level of doctors working directly with patients was recorded in the Mazowieckie Voivodship – 27.1[228].

The indicator of the number of practicing physicians per 1,000 inhabitants for OECD countries in 2017 was 3.5[229]. For Poland, the indicator was 2.4. In other European countries, such as Germany, the indicator of doctors per 1,000 inhabitants was 4.3, in France – 3.2, and in the Czech Republic – 3.7. The highest level among selected countries was in Austria - 5.2 (Fig. 16.9).

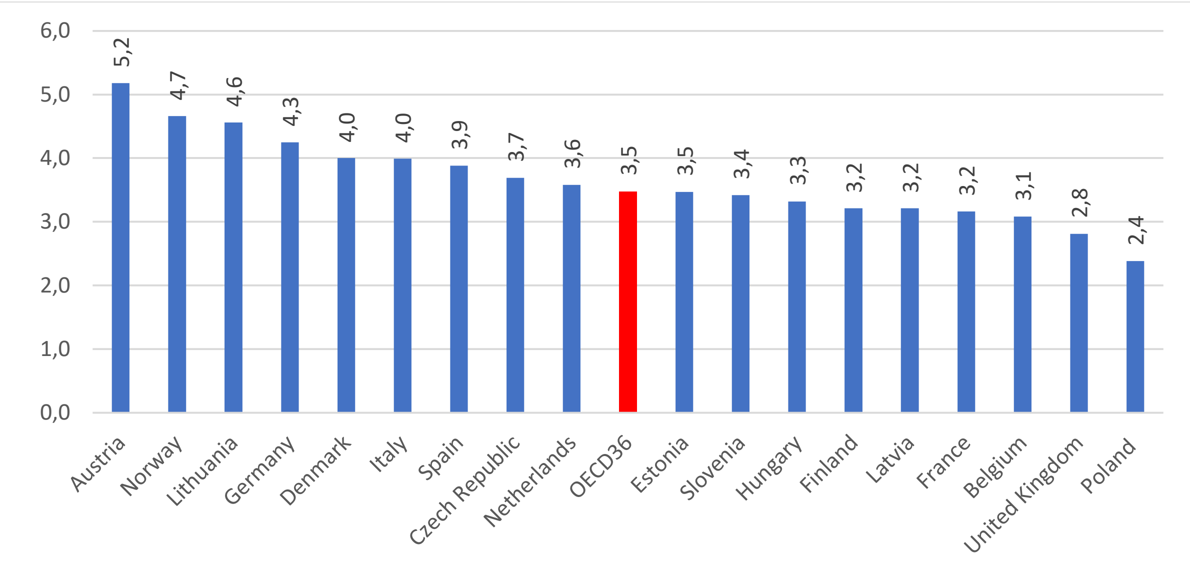


Fig. 16.9. Number of practising physicians per 1,000 inhabitants, 2017 (OECD data)

In 2018, according to the National Centre for Healthcare Information Systems, the number of specialists working in public healthcare reached 59,306 people. The most numerous group were specialists in family medicine – 6,706 doctors, internal diseases – 6,189 and surgery

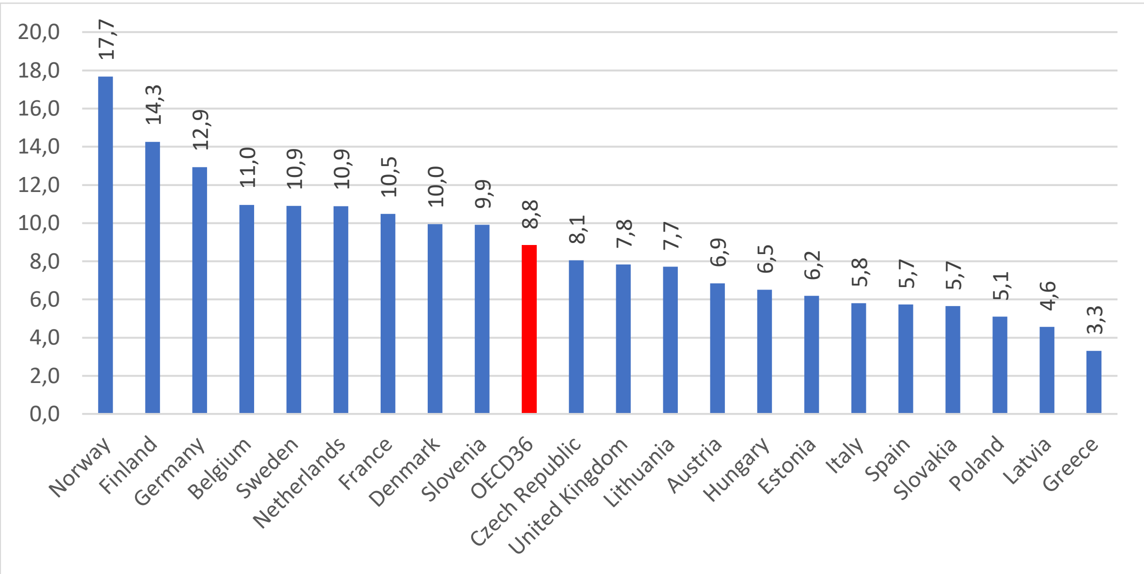
[228] SP: "The data on medical personnel working directly with the patient refer to those working in healthcare institutions, as well as in nurseries, children's clubs and social welfare homes - people for whom the reporting unit is the main workplace. From 2012, including the data on the institutions subordinate to the Ministries of National Defence and Interior".

[229] In addition to doctors working directly with patients in public institutions, the OECD also includes: 1) doctors whose primary place of employment is in the private sector, 2) working in social care institutions, including nursing homes.

– 6,092 (for all surgical fields in total). The indicator per 10,000 inhabitants was 1.7, 1.6 and 1.6, respectively. In other basic areas such as gynaecology and obstetrics, and paediatrics, a rate of fewer than 1 doctor per 10,000 inhabitants was reported.

The most numerous professional group of all medical staff are nurses. In 2018, according to the National Centre for Healthcare Information Systems, 295,464 persons were qualified and licensed to practise as nurses. In relation to the previous year, there were 3,600 new professionals. Regarding the number of nurses with the licence to practise this profession, the Mazowieckie Voivodship was in the first position (42,643 persons, the indicator of 78.9 per 10,000 inhabitants), while the highest level of nurses with the licence to practise was recorded in the Świętokrzyskie Voivodship – 89.1 and the Podkarpackie Voivodship – 87.2. According to Statistics Poland data, 192,964 of all nurses with professional qualifications worked directly with patients. In 2018, the indicator of nursing staff providing health services directly to patients was 50.2 per 10,000 inhabitants. The highest level of that indicator was observed in the Świętokrzyskie (60.4) and Podkarpackie (59.4) Voivodships[230].

Although nursing personnel represent the most numerous professional group, the shortage of workers is noticeable compared with other European countries. The indicator of the number of practising nurses per 1,000 inhabitants for the OECD countries in 2017 was 8.8; Poland was below this border with an indicator of 5.1. The highest value of the indicator was recorded in Norway – 17.7 (Fig. 16.10)[231].



[230] Ibidem
[231] In addition to the nurses working directly with the patient, the OECD takes into account: (1) nurses working in the private sector in view of their primary employment

Fig. 16.10. Number of practising nurses per 1,000 inhabitants, 2017 (OECD data)

Every year there is a growing interest among nursing personnel in obtaining specialisation. The Centre for Postgraduate Nurses and Midwives' Education, between 2002 and 2019, issued a total of 75,301 diplomas for persons holding the professional title of nurse and midwife. The largest number of persons obtained specialisation in anaesthesiologic and intensive care nursing – 10,908 and in surgical nursing – 10,184.

The low level of availability of medical personnel is strongly influenced, apart from economic factors, by the ageing of society, which also affects medical professionals. The reversal of the proportion of the youngest age group in relation to the oldest group is evident. The situation applies to all major medical professions, except for midwives, where the ratio of people under 35 compared to the oldest age group is higher (Fig. 16.11). The majority of medical professionals are between 45 and 54 years old. Another disturbing phenomenon is the significant, second largest, share of people aged 55-64. With a strong feminisation of all medical staff, this is a group of pre-retirement age. The most unfavourable age structure is seen among doctors, where 45% of all those with the licence to practise are of pre-retirement and retirement age.

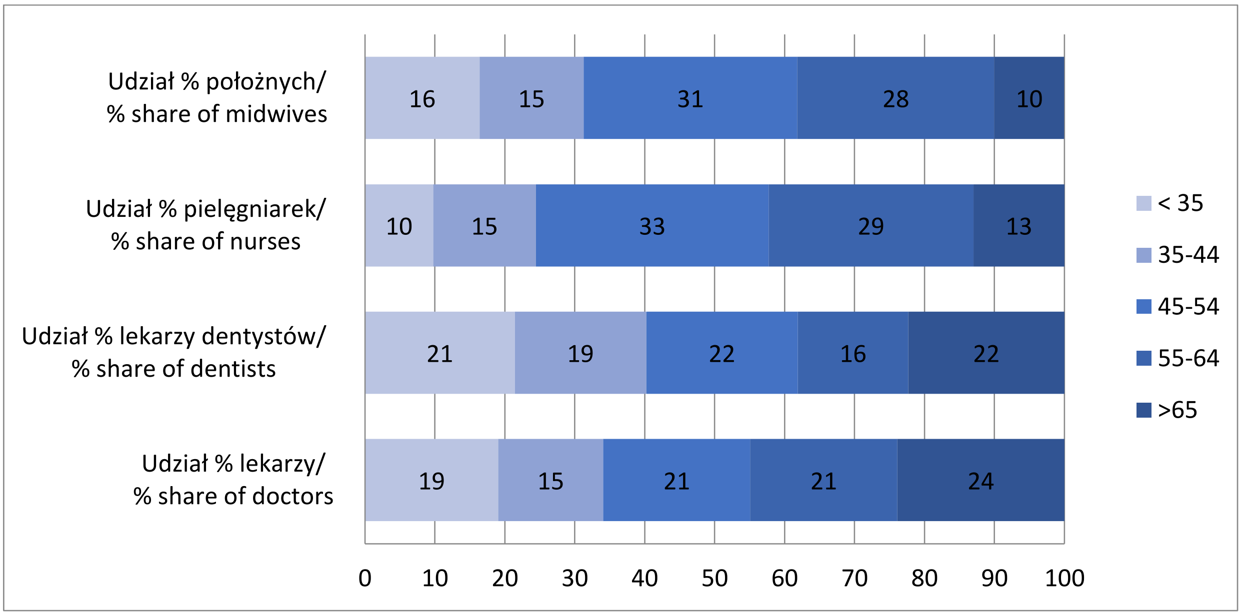


Fig. 16.11. Age structure of medical professions in Poland, 2018 (CSIOZ, CRPiP, NIL data)

The shortage of medical personnel is a major systemic challenge. One of the basic incentive mechanisms used to retain people in the profession is to increase their salaries. Another mechanism is to increase admissions to medical studies. The number of vacancies is governed by the applicable regulation of the Minister of Health. In the academic year

2017/2018[232], the number of places for the stationary medical training was 4,368, and in 2018/2019[233] – 4,591. The process of training a specialist doctor takes about 10 years. Due to the shortages in the number of doctors, changes were made to post-graduate education, e.g. through the introduction of a unified modular specialisation mode, which is expected to shorten the time needed for obtaining qualifications[234].

16.2.2. Primary healthcare and outpatient specialist care

Outpatient care is the foundation of any healthcare system. The aim of primary healthcare is to provide comprehensive healthcare at home, and primary healthcare is the first point of contact with the health system for most patients. The exact scope of guaranteed services is determined by the regulation of the Minister of Health[235]. The so-called “positive” basket includes services in the field of disease prevention, including preventive vaccinations, providing medical advice and services of a nurse and midwife[236]. The healthcare systems in developed countries seek to relieve the burden of hospital treatment and move patient treatment to the outpatient level. Most diseases that do not require highly specialised services should be treated as part of primary healthcare (POZ) and outpatient specialist care (AOS).

In healthcare, general practitioners are assigned the role of system *gatekeepers*. They are intended to function as a link between patients and the healthcare system. It is assumed that general practitioners are responsible for coordinating the patients’ treatment paths. This translates into greater control over the treatment process, a decreased abuse of medical services, especially highly specialised ones, and lower costs for the public payer. According to Eurostat data, the indicator of the number of general practitioners working at the level of outpatient care for the EU countries was 41.89 per 100,000 inhabitants in 2017 (Fig. 16.12).

[232] Ordinance of the Minister of Health of 22 June 2017 on the limit of admissions to medical and dental faculties (Official Gazette of 2017/1251)
[233] Regulation of the Minister of Health of 16 July 2018 on the limit of admissions to medical and dental faculties (Official Gazette of 2018, item 1381)
[234] Regulation of the Minister of Health of 29 March 2019 on specialisation of doctors and dentists (Official Gazette of 2019, item 602)
[235] Regulation of the Minister of Health of 8 July 2020 amending the Regulation on guaranteed benefits in the field of primary healthcare (Official Gazette of 2020, item 1255)
[236]National Health Fund, Information on services, Primary Health Care https://www.nfz.gov.pl/dla-pacjenta/informacje-o-swiadczeniach/podstawowa-opieka-zdrowotna/ (accessed on 14.09.2020)

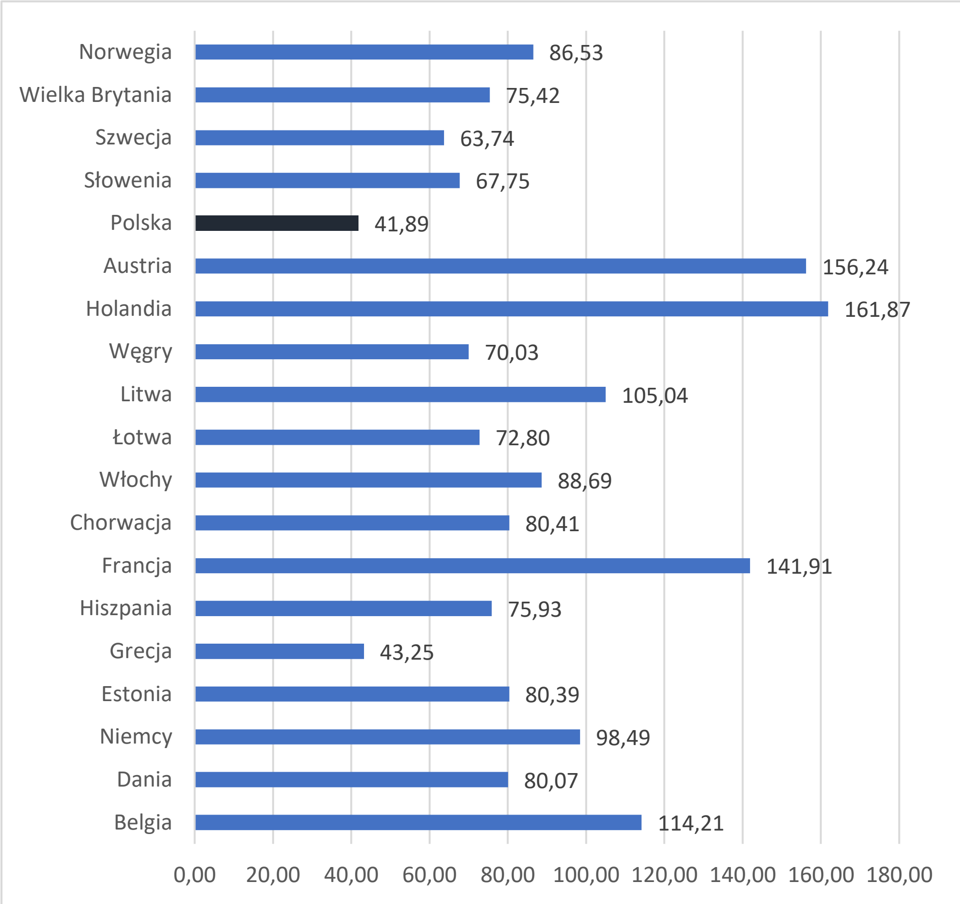


Fig. 16.12. General practitioners in the European Union in 2017 per 100,000 inhabitants (Eurostat)

In 2019, within the framework of outpatient healthcare, there were 21,839 outpatient clinics, 826 medical practices and 3,611 dental practices in Poland. Within these entities, 331.6 million outpatient consultations were provided, which corresponds to 8.6 per capita. Advice in primary healthcare was provided 173.7 million times, and in outpatient specialist care 117.6 million times. Both primary healthcare and specialist care services were more often received by women (primary healthcare – 56%, outpatient specialist care – 60%). A significant part of primary healthcare services was provided to the elderly; in 2019 patients over 65 years of age received 58.8 million medical consultations, which constituted 34% of the total number (Fig. 16.13).

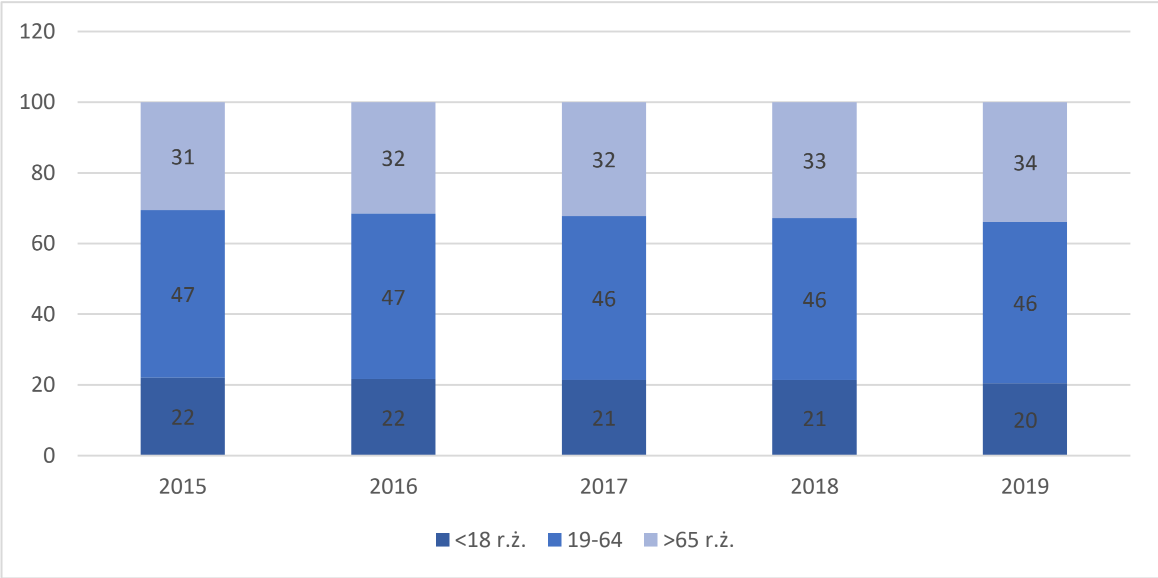
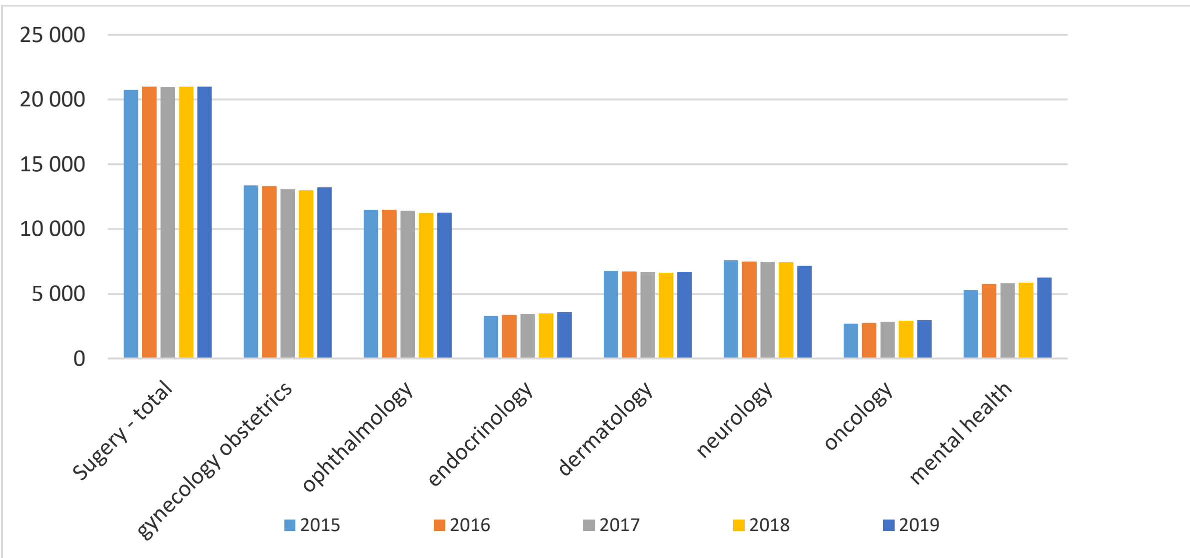


Fig. 16.13. Medical consultations provided as part of POZ by age group in 2015-2019, in % (SP data)

In outpatient specialist care, out of 117.6 million services provided in 2019, almost 30% (58.8 million) were addressed to the elderly, while patients under 18 years of age received 14.5 million consultations (12% of the total). The majority of specialist consultations was provided in the field of surgery[237] – 21 million. Gynaecologist and obstetrician consultations was ranked second – 13 million, followed by ophthalmologist advice – 11 million. Within dental care, out of the 34.3 million consultations provided within the framework of public healthcare, the highest number concerned conservative treatment – 28.7 million. In all areas, there is a systematic increase in the number of medical consultations, over five years the number of medical consultations has increased by almost 4 million (Fig. 16.14).



[237] For all surgical specialisations altogether

Fig. 16.14. Number of medical consultations provided in selected specializations, 2015-2019 (SP data)

16.2.3. 24-hour inpatient care

Hospital treatment, which is a form of 24-hour inpatient care, together with outpatient healthcare, forms the main component of the healthcare system. Highly specialised services provided by qualified staff generate a significant burden on system resources, and most countries are, therefore, seeking to shift the main core of healthcare to the outpatient level.

In 2018 there were 949 general hospitals in Poland[238]. Most hospitals were in the Śląskie Voivodship (157) and the Mazowieckie Voivodship (121). The number of hospitals is influenced by the ongoing process of transformation of medical entities, including merging entities. On the other hand, the differences at the voivodship level result, apart from demographic factors, also from the presence of highly specialised hospitals and medical personnel training centres in some of the voivodships, as well as the existence of widely developed hospital facilities in their territory, which were established before the period of systemic transformation, often related to industrial districts (Fig. 16.15).

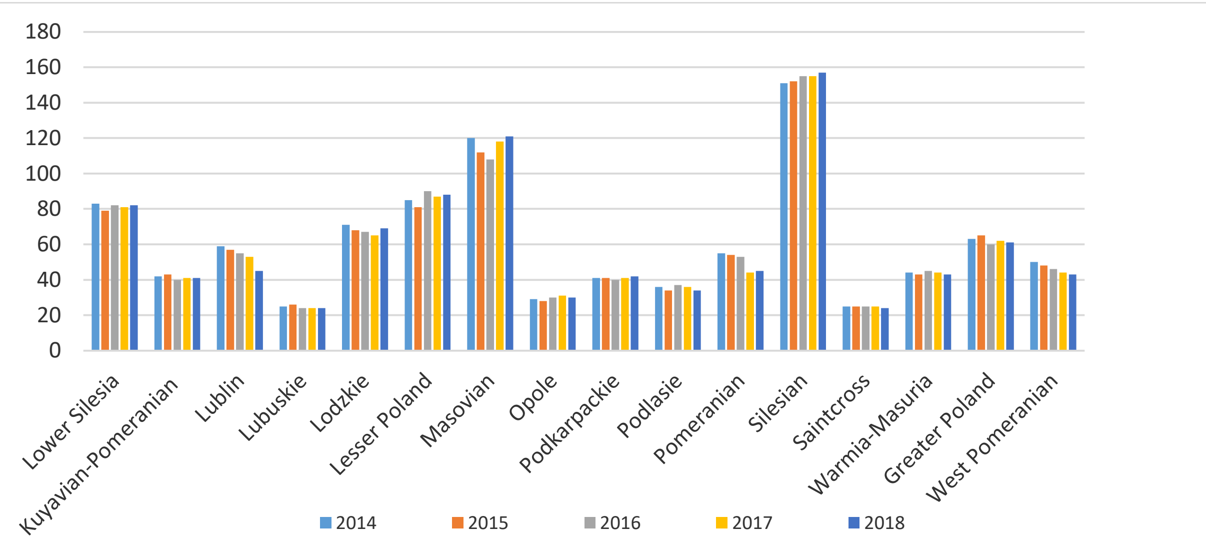


Fig. 16.15. Number of general hospitals by voivodship, 2014-2018 (SP data)

According to Statistics Poland, in 2018 approximately 8.3 million patients were treated in an inpatient mode[239]. The number of people treated remained at a similar level over the 5-

[238] SP, Inpatient healthcare in: Field Knowledge Base http://swaid.stat.gov.pl/ZdrowieOchronaZdrowia_dashboards/Raporty_predefiniowane/RAP_DBD_ZDR_3.aspx
[239] Including inter-ward traffic

year period under analysis. Most patients were hospitalized in the Mazowieckie Voivodship – 1.26 million, and this trend has not changed for years. The number of beds in general hospitals amounted to 181,732 (Fig. 16.16). Attention should be paid to the progressive decline in the number of hospital beds, which is due to the optimisation of inpatient care resources, as well as the transfer of treatment to outpatient care.

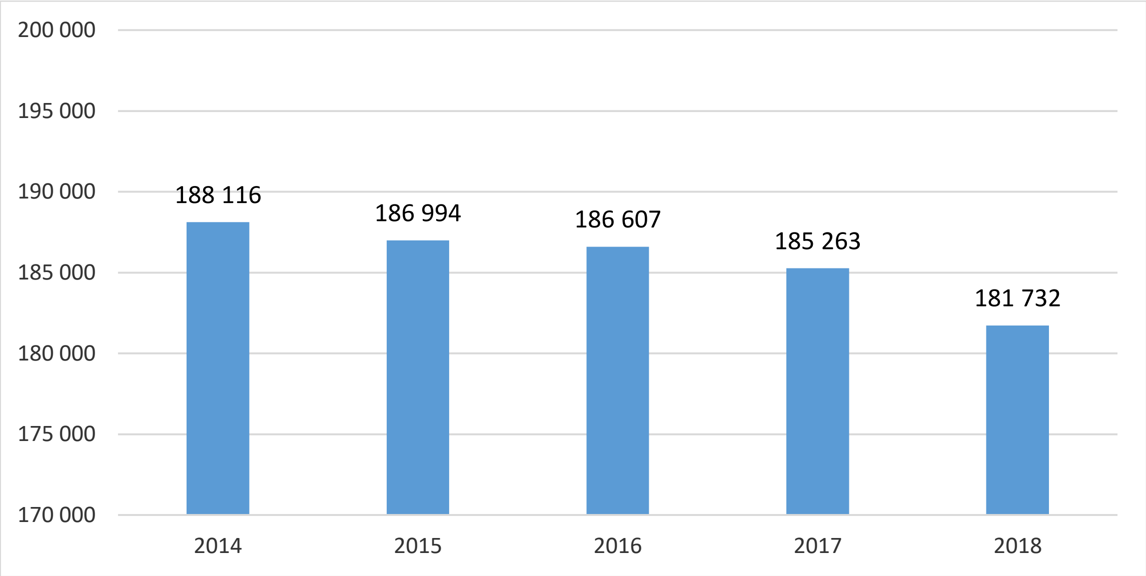


Fig. 16.16. Number of hospital beds in Poland, 2014-2018 (SP data)

According to the data from the National Centre for Healthcare Information Systems, which do not take into consideration the institutions subject to the Ministry of Interior and Administration and the Ministry of Health, the annual rate of the number of patients treated per one hospital bed was 45.6, with the average time of patient's stay of 5.3 days, while the rate of bed occupancy was at the level of 66.1%. When it comes to the division by ward, the largest number of beds was found in internal medicine wards – 22,548 and in surgical wards – 19,112.

Psychiatric hospitals are a particularly characteristic type of 24-hour treatment facilities. There were 48 such facilities in total, the largest number of which operated in the Mazowieckie Voivodship (9), and in the Dolnośląskie and Śląskie Voivodships (5 in each). In 2018, 17,524 beds were available in these hospitals, and the number of patients treated totalled 189,000. Psychiatric treatment is also provided in general hospitals with psychiatric wards. In 2018, there were 155 wards with 5,677 beds, and 66,813 patients were treated in these wards. The bed occupancy rate was the highest of all wards, on average 91.8%.

Other forms of inpatient healthcare include care and treatment facilities, nursing homes and hospices. The first two forms of care, according to the guidelines of the National Health

Fund, may be addressed to a person who has obtained 40 or fewer points on the Barthel scale; his or her health condition requires 24-hour treatment, care and rehabilitation services, whereas further hospitalisation is not necessary[240]. There were 47,806 people treated in 430 care and treatment facilities operating in 2018. The indicator of beds per 10,000 inhabitants was 6.9 (26,559 beds in total). Compared to 2014, the long-term care resources within the scope of care and treatment facilities increased by 42 entities (2014 – 388 care and treatment facilities) and 3,460 beds. However, the situation in nursing and care facilities remains stable. In 2018 health services were provided in 160 entities, with 7,565 beds (since 2014, the number of nursing and care facilities had increased by 5 units and 538 beds). The nursing and care services were provided to 14,796 patients. The last form of inpatient care for terminally ill patients with progressive and life-limiting diseases are hospices. The main aim of the hospice is to improve the quality of life of the patient. In 2018, 106 hospices with 2,027 beds operated as part of public healthcare. Hospice services were provided to 20,621 people (Tab. 16.1).

Tab. 16.1 Number of entities, beds, and patients in 24-hour inpatient long-term care facilities (care and treatment facilities, nursing and care facilities, and hospices) in 2014-2018 (SP data)

	Nursing and care facilities			Care and treatment facilities			Hospices		
	number of entities	number of beds	number of patients	number of entities	number of beds	number of patients	number of entities	number of beds	number of patients
2014	155	7,027	14,509	388	23,099	44,199	73	1,334	16,093
2015	152	6,706	14,183	408	24,872	47,624	82	1,550	17,963
2016	154	6,749	13,655	400	25,176	47,398	80	1,640	18,438
2017	161	7,528	14,821	415	25,615	46,720	95	1,809	18,962
2018	160	7,565	14,796	430	26,559	47,806	106	2,027	20,621

[240] Ordinance No. 60/2016/doz of the President of the National Health Fund of 29 June 2016 on defining the conditions for the conclusion and implementation of contracts for long-term care and nursing services https://www.nfz.gov.pl/zarzadzenia-prezesa/zarzadzenia-prezesa-nfz/zarzadzenie-nr-602016dsoz,6500.html (accessed on 15.09.2020)

16.2.4. Geriatric care

According to the World Health Organisation (WHO), old age starts when a person is over 60. The WHO divides old age into three basic periods: the age of 60-74 is referred to as early old age or youngest-old age, the age of 75-89 as older age or middle-old age, while the age over 90 as oldest-old age or longevity[241]. The process of the ageing of society is based on an increase in the number of elderly people and their share in the total population, while the number and share of children and young people is decreasing.

In 2019 the number of people aged over 60 was 9,703,745 – which constituted 25% of the total population of Poland[242]. According to a forecast prepared by Statistics Poland, the proportion of people of post-working age is steadily increasing and is expected to reach 40% in 2050. The ageing of society can be observed in all Member States of the European Union. This phenomenon is influenced by multiple factors. In the area of healthcare, life expectancy is significantly influenced by, among other things, preventive vaccination, new medical and drug technologies, improved healthcare standards and a greater public awareness of healthy lifestyles and prevention.

The ageing of society is one of the most serious challenges for the healthcare system. This process forces the system to modify its health policy in order to adapt its resources to the growing requirements of older people. Long-term care for the elderly should be based on specialised medical personnel, geriatric doctors, nurses and other medical professions such as physiotherapists and medical carers. According to the Supreme Chamber of Physicians and Dentists, in 2019 the number of physicians with geriatrics specialization was 502, of whom 488 were professionally active, compared to 2018, there were 66 new specialists[243]. Specialisation in geriatrics has been a priority area since 2004 and is on the list announced by the Minister of Health[244]. One of the possible ways of providing geriatric care to patients over 60 years of age, with this number of geriatric doctors, is to transfer part of the competence in geriatric care to general practitioners, especially family medicine specialists. Such a change would be in line with the Europe-wide trend to shift the coordination of treatment to the level of primary care.

[241] World Health Organization. Ageing and health https://www.who.int/news-room/fact-sheets/detail/ageing-and-health (accessed on: 10.09.2020)
[242] SP, Population by gender and age groups, median age, demographic dependency ratio http://swaid.stat.gov.pl/Demografia_dashboards/Raporty_predefiniowane/RAP_DBD_DEM_3.aspx (accessed on: 10.09.2020)
[243] Data as at 02.09.2020 https://nil.org.pl/uploaded_files/1599068221_za-sierpien-2020-zestawienie-nr-04.pdf
[244] Regulation of the Minister of Health of 30 June 2020 on the definition of priority areas of medicine (Official Gazette of 2020 item 1156)

It should be remembered that such a solution would have to be supported by an increase in the number of doctors specialising in family medicine, as well as amendments to the financing of treatment in primary healthcare institutions.

The second most numerous professional group that performs a key role in the provision of healthcare to the elderly is nursing personnel. In recent years there has been a growing interest in specialisation in geriatric nursing and long-term care. The number of nurses specialising in geriatrics in 2019 amounted to 2,552, the largest number of whom obtained the title of geriatric specialists in 2017 – 648 (in 2018 – 210 and in 2019 – 500 geriatric specialisation diplomas issued). Meanwhile, in the field of long-term care nursing, a total of 2,841 nurses completed specialisation courses since 2005.

Geriatric wards constitute the basis of healthcare infrastructure for the elderly. In 2018, there were 52 geriatric wards in Poland (Fig. 16.17).

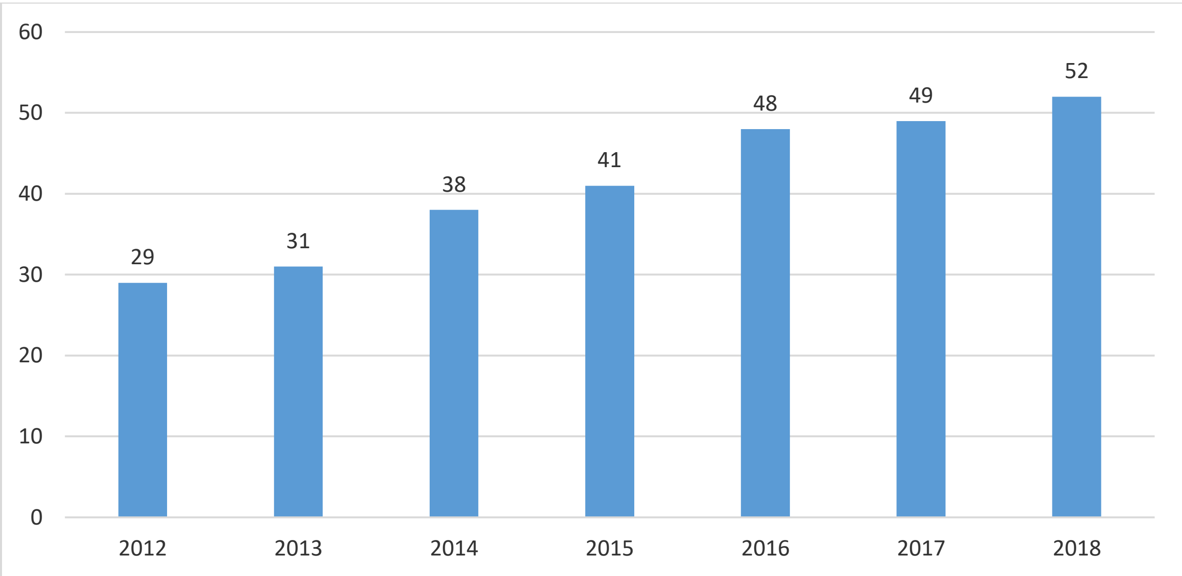


Fig. 16.17. Number of geriatric wards in Poland, 2012-2018 (SP data)

Since 2015, there has been at least one geriatric care ward in almost all voivodships, except for the Warmińsko-mazurskie Voivodship. Most of them are invariably located in the Śląskie Voivodship – 15 wards in 2018 and in the Mazowieckie Voivodship – 8. The number of wards providing comprehensive geriatric care is growing steadily, but due to the dynamic process of population ageing, infrastructure resources should be continuously increased (Tab. 16.2).

Tab. 16.2. Number of geriatric wards in general hospitals, 2012-2018 (SP data)

Voivodship	**Geriatric wards**						
	2012	2013	2014	2015	2016	2017	2018
POLAND	**29**	**31**	**38**	**41**	**48**	**49**	**52**
Dolnośląskie	2	2	4	4	4	5	5
Kujawsko-pomorskie	1	1	1	2	2	2	2
Lubelskie	3	4	4	3	3	3	3
Lubuskie	1	1	1	1	2	1	1
Łódzkie	2	2	2	2	2	3	3
Małopolskie	2	2	4	4	4	4	4
Mazowieckie	0	0	0	4	7	7	8
Opolskie	2	2	2	2	2	2	2
Podkarpackie	2	2	3	3	3	3	3
Podlaskie	1	1	1	1	1	1	1
Pomorskie	0	0	0	0	1	1	1
Śląskie	11	11	12	11	13	13	15
Świętokrzyskie	0	1	2	2	2	2	2
Wielkopolskie	1	1	1	1	1	1	1
Zachodniopomorskie	1	1	1	1	1	1	1

In 2018 there were 1,143 beds available in geriatric wards. Since 2012 their total number had almost doubled (2012 – 697 beds). The indicator of the number of geriatric beds per 10,000 inhabitants over 60 years of age was 1.1. In 2018 the number of people treated in these wards amounted to 31,881[245] and has remained relatively stable for three years. The bed occupancy rate has remained at around 64%. Due to the specificity of geriatric patients who most often suffer from several coexisting chronic diseases, e.g., hypertension, degenerative joint lesions or diabetes, the time of hospitalization in geriatric wards is longer than the patient's average hospital stay – the average time of hospitalization in Poland was 5.3 days, and in geriatric wards – 8.4 days[246].

Most geriatric patients are treated, for reasons of availability, in other hospital wards. According to the data of the National Health Fund, in 2018 the elderly were most often treated in internal medicine wards – 680,000 of hospitalizations, in oncology wards – 665,000, and in

[245] Including inter-ward traffic
[246] Centre of Health Information Systems, Statistical Bulletin 2019 https://cez.gov.pl/fileadmin/user_upload/Biuletyny_informacyjny/biuletyn_statystyczny_2019_5db016ddd0b8d.pdf (accessed on: 10.09.2020)

ophthalmic wards – 574,000. There were 29,800 patients of geriatric wards financed by the National Health Fund[247].

As part of outpatient healthcare, more than 93 million medical consultations were provided to persons aged over 65 in 2019. Most of these were provided within primary healthcare – 58.8 million, which was 1/3 of all consultations. In specialist care, the number of consultations for the elderly exceeded 34 million, 77,000 of which were geriatric care consultations (Fig. 16.18).

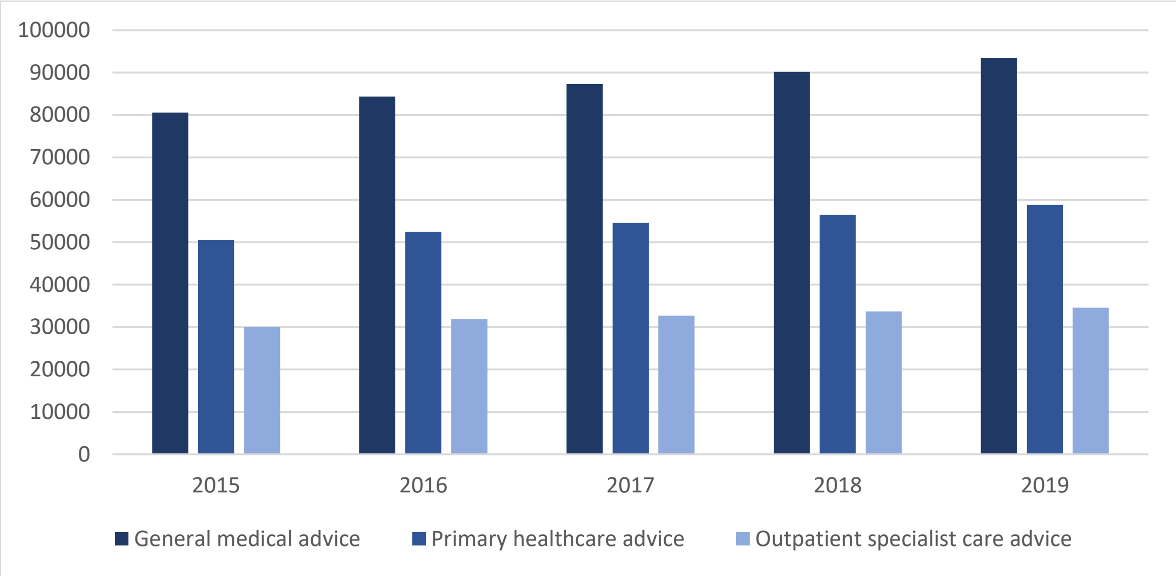


Fig. 16.18. Number of medical consultations provided to people aged over 65, 2015-2019 (SP data)

SUMMARY

1. Although there is an increase in nominal expenditure on healthcare, the expenditure in Poland is much lower than in other countries. In Poland in 2018, the expenditure on healthcare as a percentage of GDP was 6.3%, while the average for OECD countries was 8.8%. Considering the state of the epidemic since March 2020, the level of funding for healthcare is likely to change in the coming years. Comparing the currently available data for Q2 2020 to the same period in 2019, GDP decreased by 8.4%. As a result of the dynamic epidemiological situation, at this stage, it is not possible to predict exactly what change in health expenditure will occur in the coming years, and the actions currently being taken at the central level will have a significant impact on shaping the future

[247] SP, Situation of the elderly in Poland in 2018, Statistics Poland publishing press, 2020. https://stat.gov.pl/obszary-tematyczne/osoby-starsze/osoby-starsze/sytuacja-osob-starszych-w-polsce-w-2018-roku,2,1.html (accessed on 10.09.2020)

situation. However, based on the available data, it can be assumed that both health expenditure and GDP will be significantly reduced.

2. Public expenditure is the main source of healthcare financing in most European countries. Public expenditure also dominates in Poland, and in 2017 it accounted for around 70% of total expenditure, 59% of which came from the National Health Fund budget.
3. Private expenditure in 2017 in Poland accounted for 30% of total expenditure. Direct payments by households are prevalent. In particular, the costs of diagnostic tests, the purchase of medicinal products and medical devices are financed directly.
4. Expenditure on preventive measures should increase, especially in the context of the problem of the ageing of society. In 2016, it accounted for 3% of all spending, while expenditure on medical services accounted for 60%.
5. The number of doctors and nurses qualified for the profession has been growing steadily for years, but there is still the shortage of medical personnel. In 2018, the number of doctors totalled 149,134, of whom 89,532 worked directly with patients, and 42,282 were dentists. In the professional group of nursing personnel, 295,464 persons had qualifications and licences to practise the profession. Ensuring an adequate number of medical personnel and, in particular, balancing the shortage of doctors and nurses constitutes a significant challenge in the healthcare system.
6. The ageing of society also affects medical professions, which, with limited resources, translates into a problem of generation replacement. According to estimates, 45% of doctors and 33% of nurses are in the age group of 55 or more. If the current proportion of people under 35 is maintained, it will not be possible to ensure the replacement of generations of medical professionals in the near future.
7. Considering the rapid ageing of the Polish population, there is also a growing demand to ensure access to publicly financed long-term care services. Currently, the long-term care system in Poland is dispersed and does not provide comprehensive care to patients.
8. Significant disproportions in infrastructure at the voivodship level are noticeable. For years, the largest hospital and bed infrastructure has been located in the Mazowieckie and Śląskie Voivodships. In order to reduce the inequalities between regions, Health Needs Maps were introduced as a mechanism for monitoring and forecasting the health needs of the Polish population.

17. PRIMARY HEALTHCARE IN POLAND
- ITS ROLE IN THE SYSTEM AND THE AVAILABLE INFORMATION TOOL

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Primary healthcare (PH) is a socially undervalued foundation of the Polish healthcare system. Its perception is probably partially attributable to an insufficient understanding of its role; the *primary* term in the name suggests that it is in negative opposition to other types of providers and refers only to the diagnostic and therapeutic function. Simultaneously, it is believed that Polish patients often prefer the care of specialists rather than that of PH physicians, such as Primary Healthcare Physicians (PHP).

Paradoxically, for the whole healthcare system, the two other functions of PH, i.e. the coordination of treatment and prevention of diseases, are equally important as the diagnosis and treatment of widespread, common diseases. PH is the element of the healthcare system with which the average patient has the most frequent contact therefore PHP should act as a guide to the system. According to the legislation, PH acts as a hub connecting all components of the system, enabling a holistic observation of the patient's health and therapy in the long term. Furthermore, it is an important part of the system; influencing patients' health before it deteriorates, implementing programmes for disease prevention, early detection and health promotion. The efficient implementation of these three functions leads to:

- reducing the burden on other sections of the system by prevention as well as early detection of diseases (prophylactic function)
- reducing the workload and increasing the effectiveness of other elements of the system by adopting a holistic view during subsequent treatment qualifications, and reducing the risk of adverse therapeutic interactions (coordination function)

- reducing the burden on the remaining parts of the healthcare system through diagnosis and treatment to an extent that does not require specialist care (diagnostic and therapeutic function).

Numerous cost-intensive medical procedures originate from actions taken – or not taken – within the PH. Therefore, the health and cost effectiveness of the entire healthcare system derives from primary healthcare, and its proper functioning, in particular, the implementation of the preventive and coordination function, is an investment with returns in all other areas of the system.

It is a truism to state that the implementation of PH tasks may depend on the size of the population health needs served, the level and methods of its financing, the size of the available resources versus the imposed detailed obligations, the internal work organisation of PH clinics, as well as the organisation of cooperation of PH with other parts of the healthcare system. The "soft" aspect of primary healthcare, i.e. the level of motivation to perform its tasks, is also worth mentioning.

In other words, if the objectives pursued exceed the resources available in their specific organisational form, then the effectiveness of PH work decreases. It is possible to improve the efficiency to some extent by modifying (improving) the organisation of work, but there are evident limits to that kind of action. However, the problem is that we do not know what is the correlation between the size of the tasks, the available resources, the organisation of work and any measured effects of PH in Poland. We are missing the most basic data, and those available are not always comprehensive and reliable. According to the few data available, the PH is burdened with so many responsibilities that it is not able to successfully perform all the tasks imposed on it.

The diagnosis, preparation and implementation of system modifications together with counteracting negative side effects of reforms requires constant monitoring of the quality and effectiveness of PH work as well as introducing possible adjustments in the indicated mechanisms. However, primary healthcare is an area that has not been sufficiently researched. The reasons for this state of affairs are to be found in the adopted operating model of functioning (controlled, independent management within the capitation fee), which has so far focused on the control of the selected elements of the NHF basket of guaranteed services. The reporting tool designed to broaden the knowledge about PH included the periodical submission of forms to the Ministry of Health (such as MZ-11) containing summaries of services provided, which were, however, affected by implementation and interpretation errors.

The development of IT systems operating within PH clinics, but also within the National Health Fund and the Ministry of Health, as well as measures to implement compulsory digitalisation of medical records, has resulted in a leap in the number of data recorded and reported, also in the area of PH, establishing new fields for monitoring the area of primary healthcare. The implementation of e-prescriptions, e-referrals, and reporting appointments data to the National Health Fund has created a data set with multiple answers, which, however, requires the asking of appropriate questions.

As has been mentioned, the area of operation of PH is scarcely recognised, nevertheless, it should be emphasised again that the available data indicate that this is a very busy part of the system. Two parameters, the average appointment time and the number of patients admitted per day, suggest that the care provided by PH cannot be comprehensive. However, the reasons for this phenomenon is not clear: it certainly derives from the inadequacy of resources in relation to needs (also seasonally), but it also depends on the organisation and/or quality of the work of individual PH clinics. Furthermore, it can be suspected that the work of PH physicians is also unevenly distributed due to the significant diversity of the populations under care – in terms of socio-demography, epidemiology, wealth, education, lifestyle, as well as threats to public health resulting from environmental pollution.

The authors emphasise that in the forthcoming years the technical and computational possibilities of system analyses based on the acquired data will be ahead of interpretation possibilities. From the technical perspective, it will be possible to attempt to monitor the development parameters of such selected diseases in a population where relatively clear measures of change can be identified. The interpretation of this phenomenon in terms of achieving a health effect, for the reasons mentioned above, will be highly difficult, at least without taking into consideration the specific nature of the facility and population. Simultaneously, it will be possible and necessary to monitor the implementation of operating principles and guidelines by the PH.

Consequently, a parameterised system for describing, monitoring and, subsequently, evaluating the effectiveness of PH should be created. It should be based on characteristics and indicators relating to the tasks that the regulations imposed on this part of the system.

For instance, the following structure could be proposed for the analysis of Primary Healthcare according to monitoring areas:

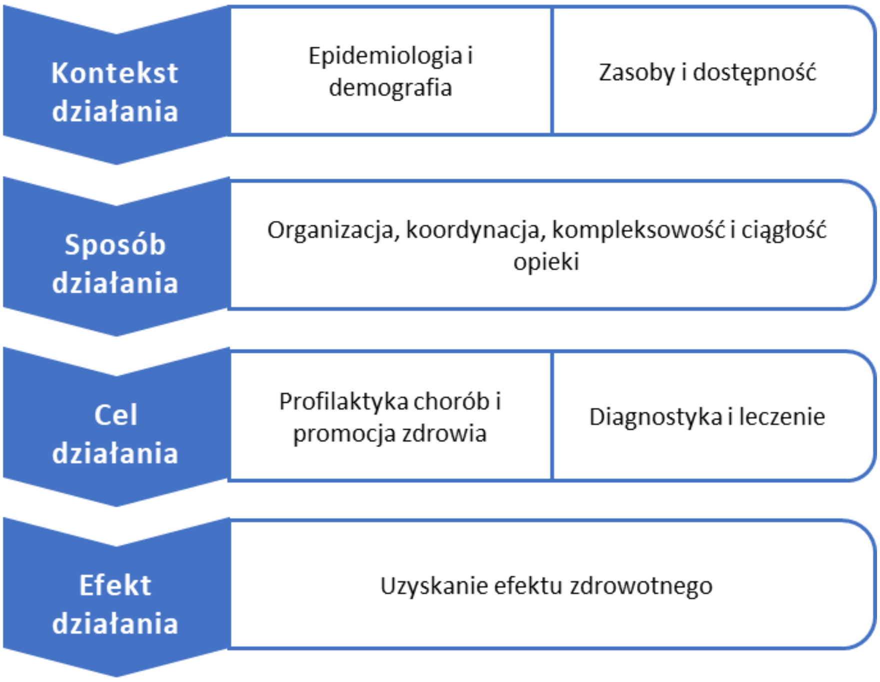


Fig. 17.1. Analysis of data from electronic medical records kept by PH entities in Poland

For the purposes of this publication, the data from 221 PH facilities from all over Poland were collected in a set derived from electronic documentation of PH patients under the contract with the National Health Fund in healthcare establishments. These data were collected and analysed by the National Institute of Public Health for the purposes of the "Health Needs Maps" project carried out by the Ministry of Health. The data presented below constitute a part of a larger whole, ordered according to the analytical structure proposed in the Introduction.

Considering the method of sample selection and its final structure in terms of geographical distribution, the size of the facility and the ownership structure of the facilities, indicators presented in this chapter cannot be recognised as representative for PH facilities in Poland – they are a form of a prototype calculation of the proposed indicators.
Furthermore, the Department of Analyses and Strategy of the Ministry of Health provided for the purposes of the project data concerning PH for 2019 from the National Health Fund (from the MZ-11 form, as at 31 December 2019).

The analyses presented in the report cover the period of 5 years, i.e. 2014-2018, while the analyses for one year present the most recent collected data, i.e. from 2018 (or 2019, depending on data availability).

The analyses and observations included in this chapter should therefore be considered with caution, as they are not representative of the general population of patients benefiting from the services of PH physicians throughout the country. The structure of the acquired datasets was an important constraint, which made it impossible to perform the full range of the required analyses. It contained only information related to individual patient appointments. An important obstacle, for example, was the limitation to information regarding the diseases contained in one ICD code assigned to the consultation. It was completely devoid of such important data as, for example, the results of the performed laboratory tests or the list of all chronic diseases affecting individual patients.

17.1. Demographic structure of the surveyed population

The most numerous group of PH patients were people aged 25-44 years (from 23 to 25% depending on the analysed year) and patients aged 45-64 years (23-25%). Patients aged 65-79 constituted 14-17%, school adolescents 13-14%, and children aged 0-6 about 12-13% of the total number of PH patients. The proportion of people from the oldest group of patients over 80 years old was about 5-6%. The age structure of PH patients in particular years does not differ from the results for the whole analysed period except for patients aged 65 to 79 years – an increase of 3 p.p. is observed here. However, the assessment of such changes requires an understanding of the demographic background of the local population, as these variations may result from the ageing of the population of the PH, the area concerned, or the population of the country as a whole.

grupa	2013	2014	2015	2016	2017	2018	**W latach 2013-2018**
0-6	13%	13%	12%	12%	12%	13%	**15%**
7-18	13%	14%	14%	14%	14%	13%	**15%**
19-24	5%	5%	5%	5%	5%	5%	**8%**
25-44	25%	24%	24%	25%	24%	23%	**32%**
45-64	25%	25%	24%	24%	24%	23%	**25%**
65-79	14%	14%	15%	15%	16%	17%	**14%**
80+	5%	5%	5%	6%	6%	6%	**5%**
W sumie	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

100% = pacjenci z deklaracją lekarską

Źródło: Próba placówek POZ pochodzących z bazy NIZP

Fig. 17.2. Age structure of patients registered for PH

In every age group of 18 years of age or above, the majority of patients benefiting from PH services are women, reaching the highest number in the oldest group of patients over 80 years of age. (68.5%). The most significant differences in this respect were visible in the age categories of 19-24 years (they oscillated around 12 p.p. compared to the younger age group).

In 2018, almost one in four patients benefiting from medical care in PH was aged 65 or older. The percentage of medical consultations in this group of patients was 34.3%, and the average number of consultations per year was 6.7. Over the monitored years, it is observed that the percentage of 65+ patients and the proportion of their medical consultations are increasing, while the average number of consultations per year is decreasing (a decrease of 0.4 compared to 2013).

On the other hand, only a slightly higher percentage and average number of nurse appointments/consultations in this age group of patients is observed. Data for 2018 suggest that 30.5% of patients receiving nursing care in PH were aged 65 or more, and the percentage of their appointments/consultations was 43.9%. On average, each patient received nursing care in PH about 4.8 times a year (0.7 less than in 2013).

17.2. Epidemiology

Among selected groups of chronic diseases treated in 2018 in primary healthcare units, the most common ones **in children and adolescents up to the age of 18** were chronic bronchitis and asthma (8.1%), congenital malformations of the circulatory system (5.5%) as well as diseases of the musculoskeletal system and connective tissue (2.2%).

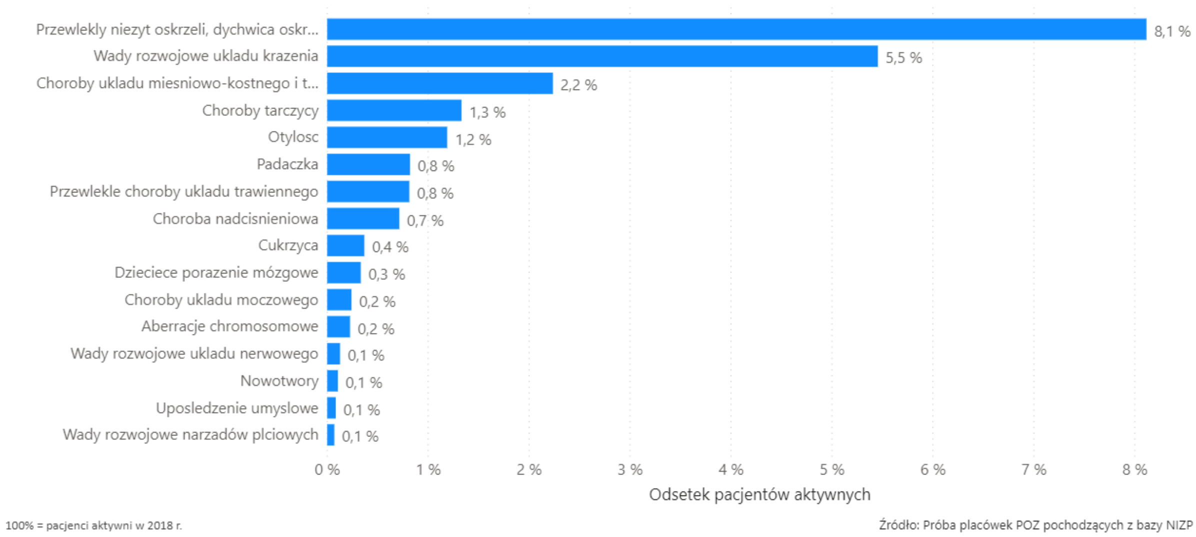


Fig. 17.3. Incidence of chronic diseases among active primary healthcare patients in 2018 in the 0-18 age group

Out of patients over **18 years of age**, the largest group treated in PH due to selected chronic diseases were patients aged 45-64 (36.5% of adults). The most frequent reason for adult patients to receive the care of a PH physician was hypertension (28.3%) and diseases of the musculoskeletal system and connective tissue (19.7%). This was followed by diabetes (5.8%) and the thyroid gland disease (4.7%), ischemic heart disease (4.3%) and chronic bronchitis and asthma (3.6%). Cancer constituted 2.5% of diagnoses in this age group.

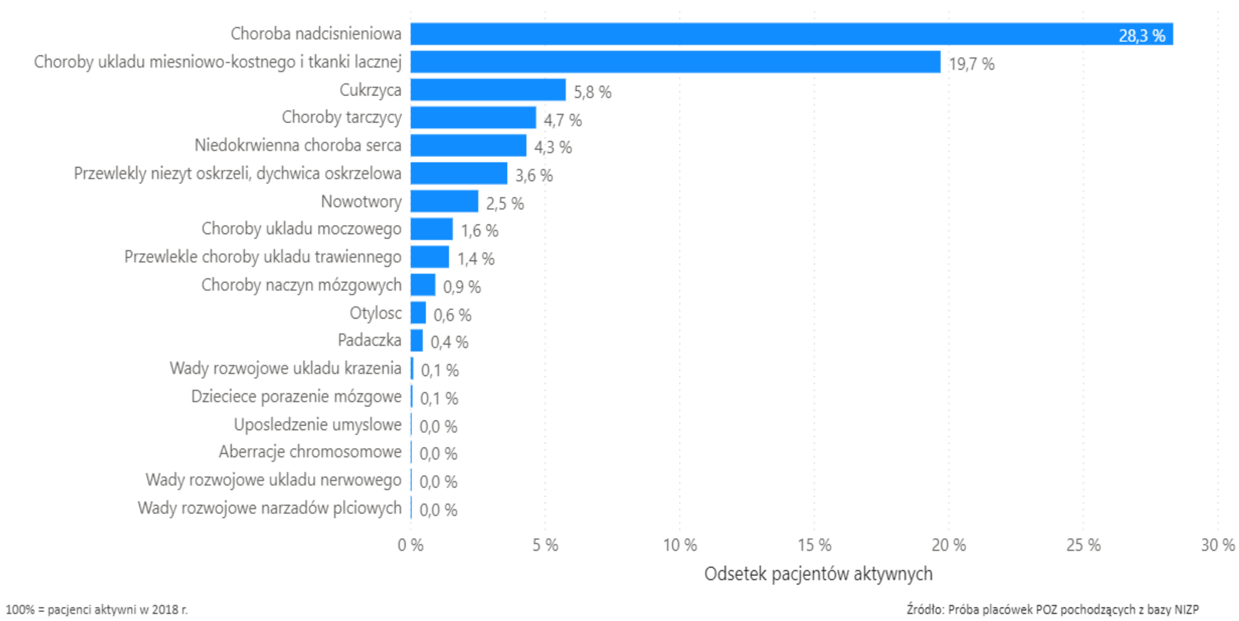


Fig. 17.4. Incidence of chronic diseases among active primary healthcare patients in 2018 in the 18+ age group

The below indicator demonstrates the frequency of new diagnoses for selected chronic diseases in the group of adult patients (i.e. over 18 years of age) based on data from the National Health Fund (form MZ-11). In this chapter, we only mention those people who require systematic medical control (active care) because of a chronic disease or exposure to harmful agents.

In the analysed year 2019, the most frequent new diagnosis in adult patients was cardiovascular disease (2.8% of patients). Second was the diagnosis of the diseases of the musculoskeletal system and connective tissue (2.3%), followed in the ranking by hypertension (1.7%) and chronic digestive system diseases (1.3%).

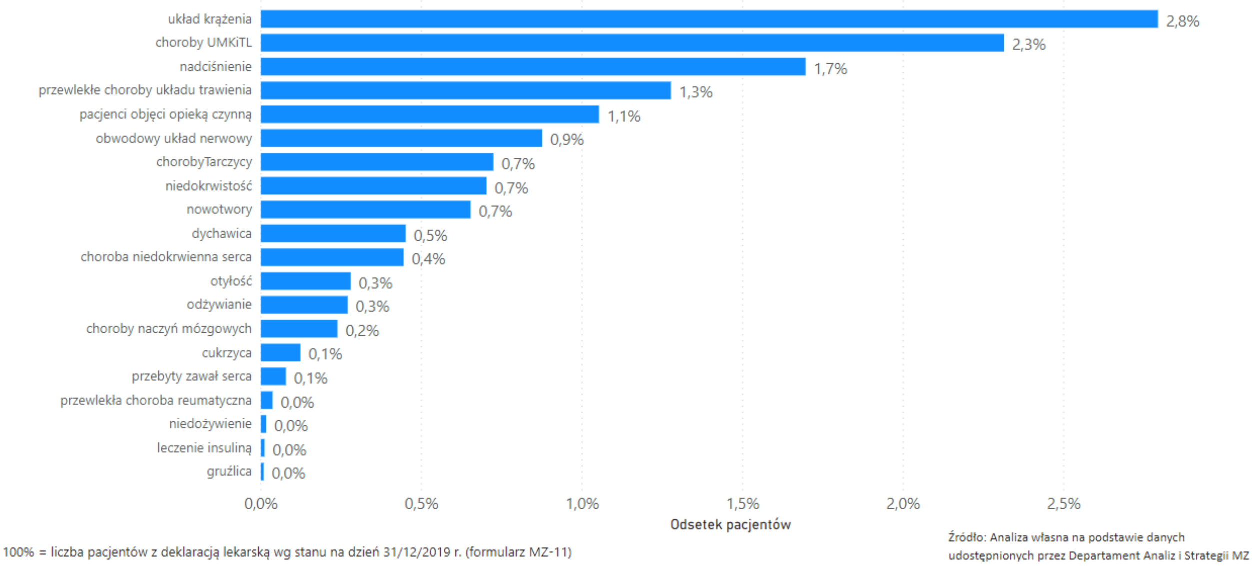


Fig. 17.5. Percentage of patients with new diagnosis in selected groups of diagnoses

One of the most important objectives of PH is the continuity and coordination of healthcare for people suffering from multiple chronic conditions or multiple morbidities (defined as the presence of at least two chronic conditions).

Altogether, in 2018, 32.5% of patients listed as active patients of PH facilities were affected by multiple morbidity, and half of all medical consultations was provided to this particular group of patients (50.2%). Inhabitants of cities (over 100,000 people), regardless of their age, benefited from the services of PH practitioners (34.2% of patients, 51.3% of consultations, respectively) to a greater extent than the examined population of PH in general. The lowest percentage of patients with multiple morbidities receiving treatment from PH in Poland is observed in towns (28.2%), and the lowest percentage of these patients' consultations in towns (45.6%) and in rural areas (46.2%).

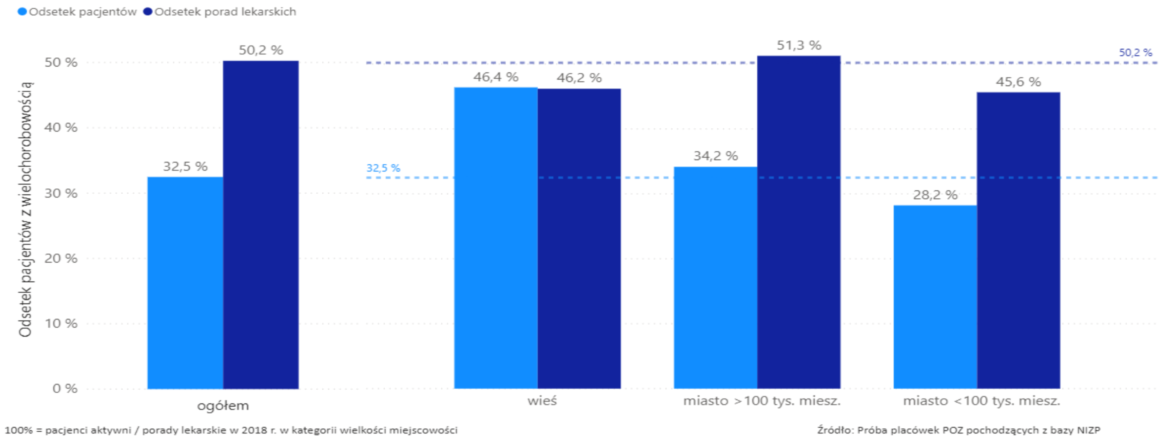


Fig. 17.6. Percentage of patients with multiple morbidities and their participation in medical consultations, broken down by the size of the locality

The multiple morbidity of patients is strongly linked to age. Almost 80% of patients in 2018 in the oldest age group (80+) were treated for several chronic diseases. There is a significant increase in the incidence of multiple morbidity among those aged more than 44 (it fluctuated around 24 p.p. compared to patients aged 25 to 44 years).

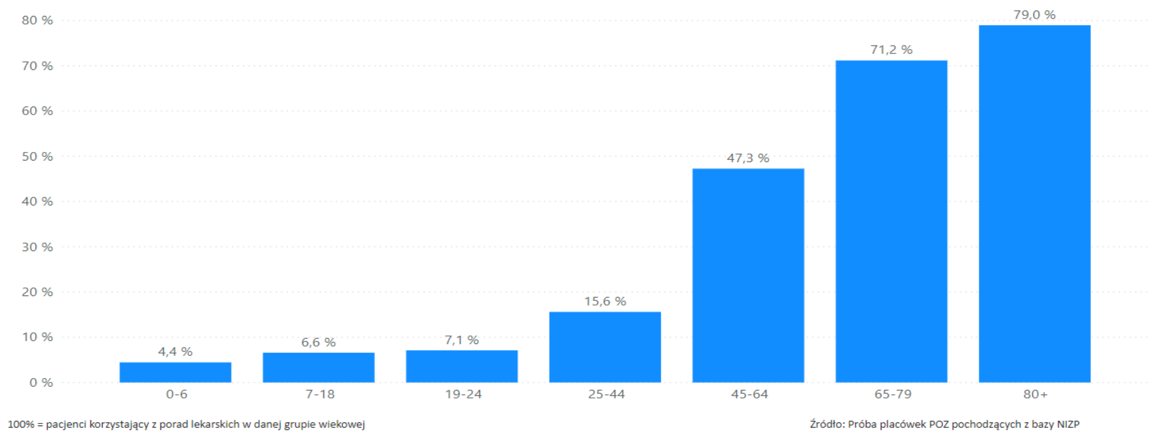


Fig. 17.7. Share of patients with multiple morbidities in particular age groups in 2018

17.3. The performance of diagnostic tests

During the five-year analysis period (2014 to 2018), there was a slight increase in the proportion of medical consultations for which at least one referral was issued for an imaging examination. At the beginning of the observation period, i.e. in 2014, this percentage was 5.3%, whereas in the last year it increased to 7.6% (an increase of 2.3 p.p.).

Patients from cities with more than 100,000 inhabitants were more frequently referred for such examinations (3 p.p. more than in towns; 8% vs. 5%).

The reference to laboratory tests was issued in 17.9% of medical consultations in PH in 2018, with almost twice as many patients from cities with more than 100,000 inhabitants (19.2% of consultations) as from towns (10.9% of consultations). Analysing the years from 2014 to 2018, it should be noted that the use of this type of diagnostic tests for PH patients varied slightly (an increase of 2.6 percentage points compared to 2014; 19.2% vs. 10.9%).

In 2018, 40.6% of patients were referred for laboratory tests. PH practitioners more often referred patients with the diagnosis of chronic diseases for these examinations - 46% of patients received them (an increase of 5.4 p.p.), they were issued during 27.9% of medical consultations (an increase of 20.7 p.p.). The detailed analysis revealed that every second patient with obesity (53.4% of consultations), with a diagnosed thyroid gland disease (55.8% of consultations) or with urinary tract diseases (48.6% of consultations) received a referral for at least one laboratory test in 2018. Every third medical consultation of a patient with hypertension resulted in such referrals, although they were received by 46.2% of patients.

The average number of laboratory tests referrals ranged from 1.0 to 1.4 per year depending on the disease group and was the highest among patients with diagnosed cancer (1.4) and thyroid gland diseases (1.4). Patients with a diagnosed chronic disease (one or multiple) were referred for, on average, 0.4 more examinations than the total number of PH patients (1.4).

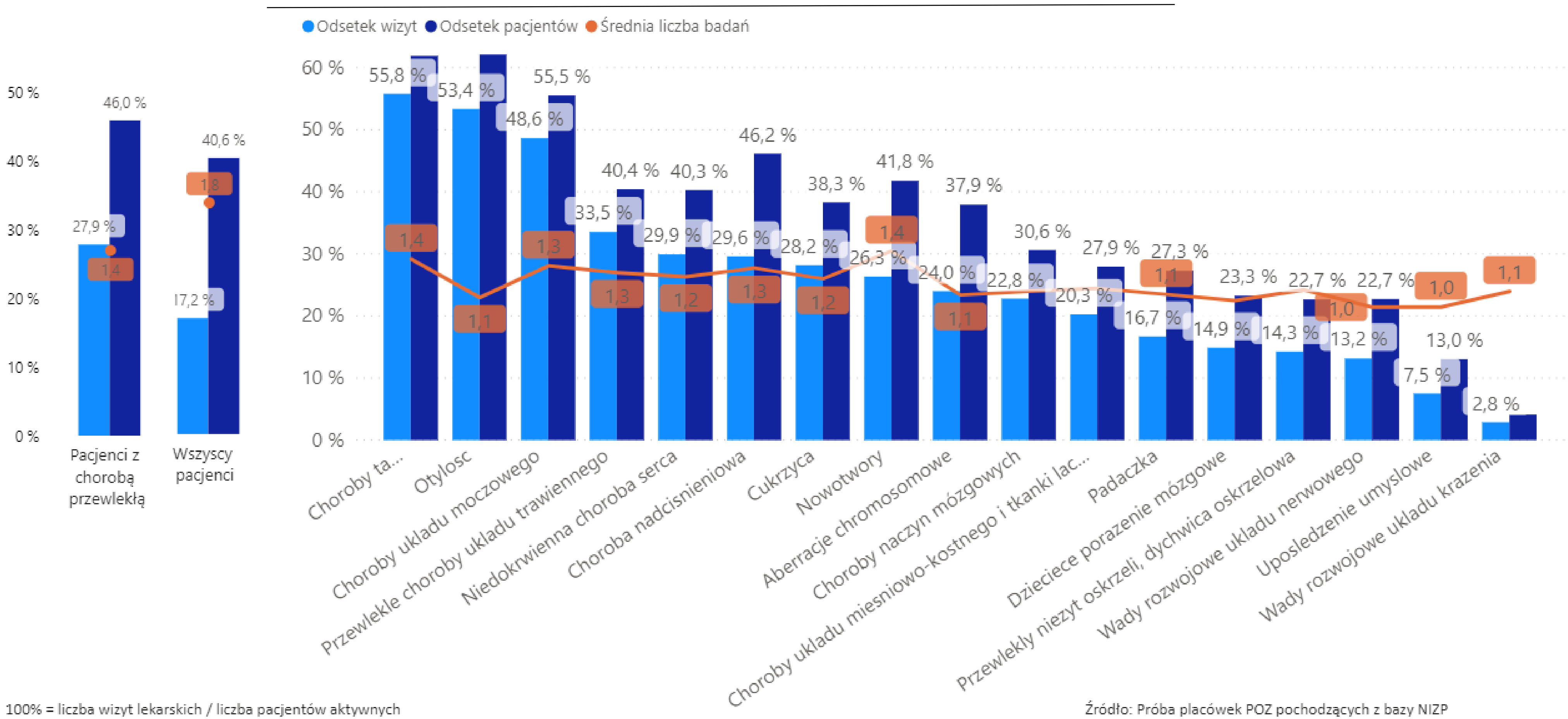


Fig. 17.8. Share of patients and the percentage of appointments with referrals for at least one analytical test among patients in individual groups of diagnoses in 2018; the average number of referrals for analytical tests in 2018

When analysing the years 2014 to 2018, it should be noted that the number of referrals for rehabilitation procedures for the population of PH patients changed slightly. At the beginning of the observation period, i.e. in 2014, the percentage of patients referred for such treatments was 0.31%, and during the last year it rose to 0.38%. It should be emphasised that less than 1% of the total number of active PH patients were referred for rehabilitation at least once in 5 years.

17.4. The diversification of the employment structure in PH

According to the data from the National Health Fund for 2019, the average number of nurses employed in PH facilities as at 31.12.2019 reached 4.9, which is much more than the average value (median) – 3.0. There was a large differentiation of the indicator between the centres – the standard deviation is 6.7 and the values range from 1 (min) to 141 (max) (within the sample limited to facilities reporting the employment of nurses).

The average number of midwives employed in PH establishments at 31.12.2019 reached 1.4, which is more than the average value (median) – 1.0. There was a moderate variation in the indicator between the establishments – the standard deviation is 1.1 and the values range from 1 (min) to 22 (max) (within the sample limited to centres reporting the employment of midwives).

On average, there were 1,198 patients per 1 nurse employed in PH centre as at 31.12.2019 and this value is approximate to the average value (median), which was 1,253. There was a large variation in the indicator between facilities – the standard deviation is as high as 1,571 and the values range from 175 (min) to 7,407 (max) (within the sample limited to centres reporting the employment of nurses, between the 5th and 95th percentile, without considering infants).

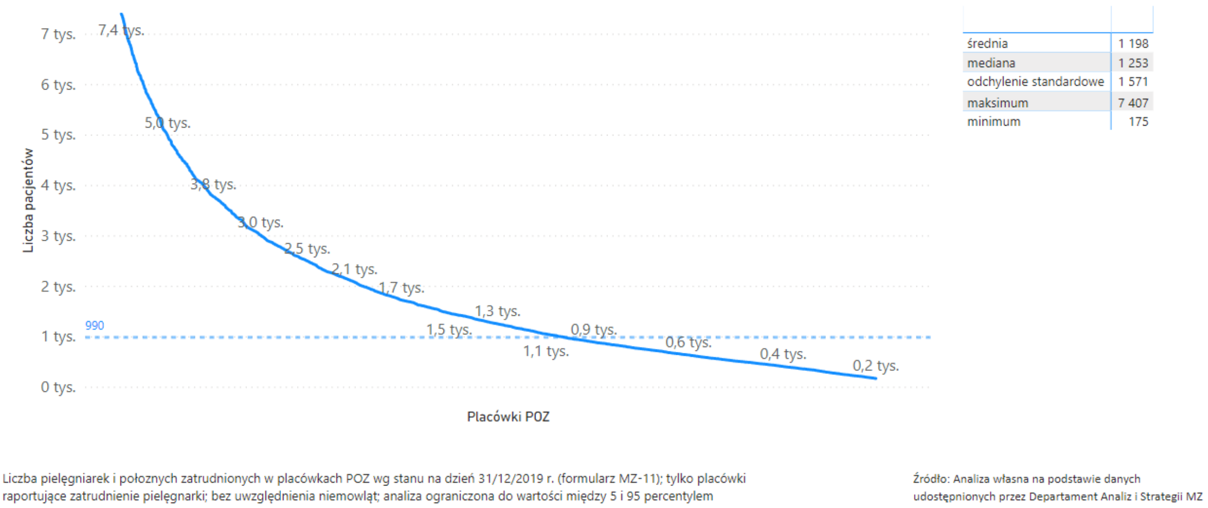


Fig. 17.9. Number of patients per 1 nurse

Both indicators presented above are sensitive to the issue of part-time employment – this form of employment is associated with overestimations in the reported number of employees. The solution to this problem would be to implement a conversion rate – the conversion of the number persons employed and their working hours into full-time equivalents. The development of an indicator is to be considered in order to take into account the number of nurses per physician employed in a facility – such an indicator would enable a comparison of the level of support for physicians by nursing staff.

In the healthcare system, including primary healthcare, the problem of overloading regular medical staff with administrative tasks is escalating.

Over the analysed years, an increase in the proportion of patients' appointments to renew a prescription (from 16.7% in 2013 to 24.1% in 2018) was observed, while other administrative appointments (from 1.7% in 2013 to 1.0% in 2018) and other appointments marked with the code "ICD-10.Z" decreased (from 17.6% in 2013 to 12.4 in 2018) as regards the total number of medical consultations in PH. This means that more than one third of PH patient appointments are of an administrative nature (i.e. prescription, examination and services for administrative purposes, issues related to employment and unemployment; with housing and economic conditions; or with the social environment).

17.5. Comprehensive medical care

The aim of primary healthcare is to provide comprehensive care for patients' health. This is the first point of contact with a PH practitioner and requires that the treatment of the patient be guided throughout the whole process of treating the disease, starting from the moment the disease is detected until the patient's return to normal functioning, as well as monitoring any possible relapse. These include additional diagnostic tests or referrals for specialist consultations which are necessary for the proper treatment.

Analysing the years 2014-2018, it should be observed that the level of referral to the services of specialist physicians by PH patients is decreasing. In the analysed sample of PH centres, the percentage of patients referred for specialist consultations in a given year was 16.2% in 2014 and dropped to 10.2% in 2018. Meanwhile, the percentage of medical consultations in 2018 which resulted in the issuance of at least one referral for specialist consultations was 3.4% (a decrease of 1.2 p.p. compared to 2013). Every fourth patient from towns up to 100,000 inhabitants and only every 12th patient from cities received a referral for specialist consultations in 2018.

The following two figures refer to **selected diseases in main medical diagnoses during medical consultations** for which a referral to a specialist was issued, but not the medical problem for which the referral was issued. The highest share in the structure of referrals issued, due to the above mentioned diseases in the main medical diagnoses, concerned hypertensive disease (19.1%). Second were musculoskeletal system and connective tissue diseases (6.7%), followed by diagnosed diabetes (2.7%), thyroid gland disease (2.1%) and ischemic heart disease (1.9%). The total proportion of selected chronic diseases in all referrals for specialist consultations was 36.2%.

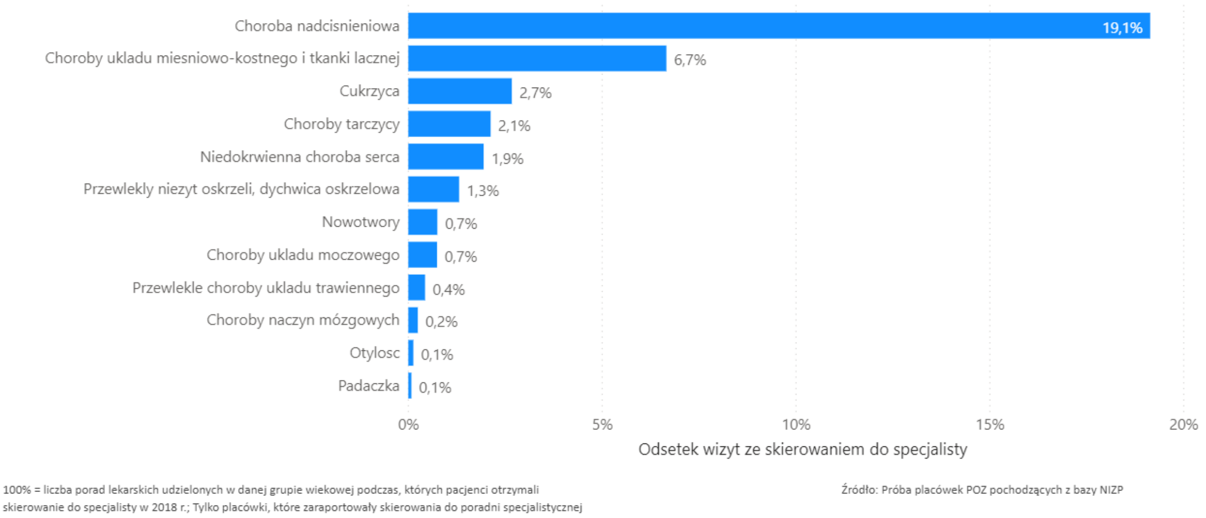


Fig. 17.10. Share of selected diseases in main medical diagnoses among appointments during which patients were referred to a specialist in the respective age groups in 2018 – patients over 18 years of age

For younger age groups, i.e. patients **under 18 years of age**, the total share of selected main diseases was 1.5%. Main diagnoses during medical consultations at which referrals for specialist consultations were made included chronic bronchitis, bronchial asthma (0.8%), diseases of the musculoskeletal system (0.2%), obesity (0.15%) and congenital malformations of the circulatory system (0.1%).

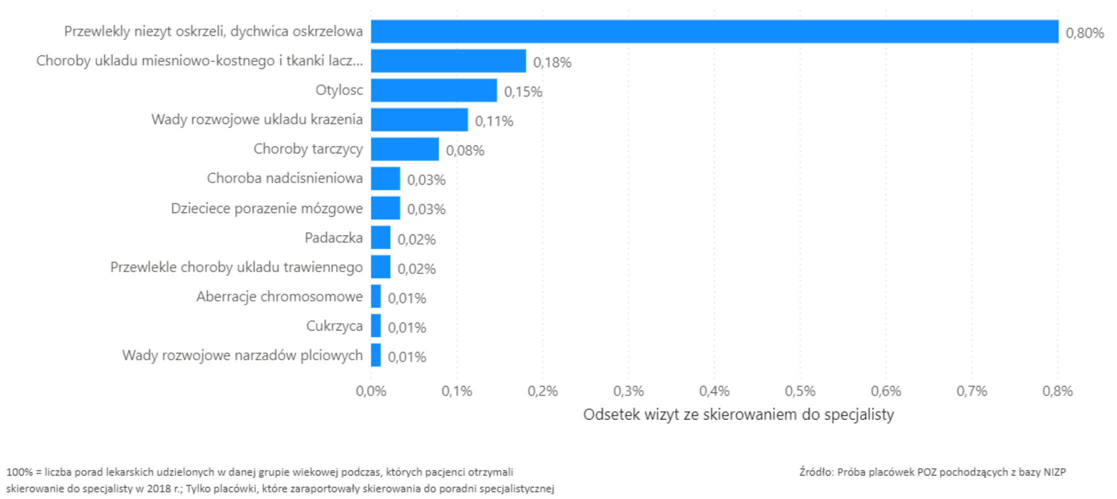


Fig. 17.11. Share of selected diseases in the main medical diagnoses among appointments during which patients were referred to a specialist in the respective age groups in 2018 – patients aged 0-18

The subsequent two diagrams relate to the main diagnosis made during the medical consultation during which a referral to a specialist physician was issued. In the analysed year 2018, the most frequent diagnosis in the group of patients over 18 years of age was primary hypertension (18.9%). Second was the diagnosis of type 2 diabetes (2.5%) and a prescription renewal (2.5%), followed by unspecified counselling (2.4%), acute laryngopharyngitis (2.3%) and spondylosis (2.1%). The total of 11.3% of referrals did not receive a diagnosis during the appointment, whereas the total share of the most frequent 15 diagnoses among appointments during which patients received a referral to a specialist amounted to 48.2%.

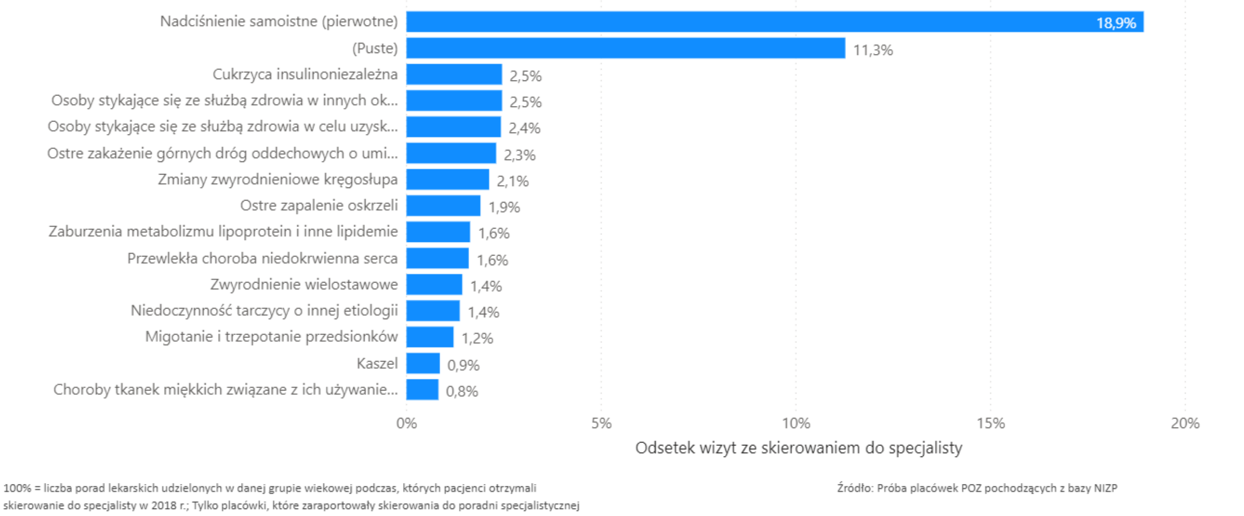


Fig. 17.12. The most common medical diagnoses in main diagnoses among appointments during which patients were referred to a specialist in 2018 – patients aged 18+

Among the most frequent medical diagnoses issued to persons up to the age of 18 in the analysed 2018, as many as 32.5% of referrals had no recorded medical diagnosis in medical records. Another 7.9% of patients were given “general medical examination and additional examinations of persons without complaints”, further 6.2% “the need for immunisation” and 5.7% “acute upper respiratory infections”. These were followed by the diagnosis of acute nasopharyngitis [common cold] (4.7%), acute bronchitis (4.0%) and routine general health check-up (3.7%). The total share of 15 most frequent diagnoses among the appointments during which patients received referrals to a specialist was 60.4%.

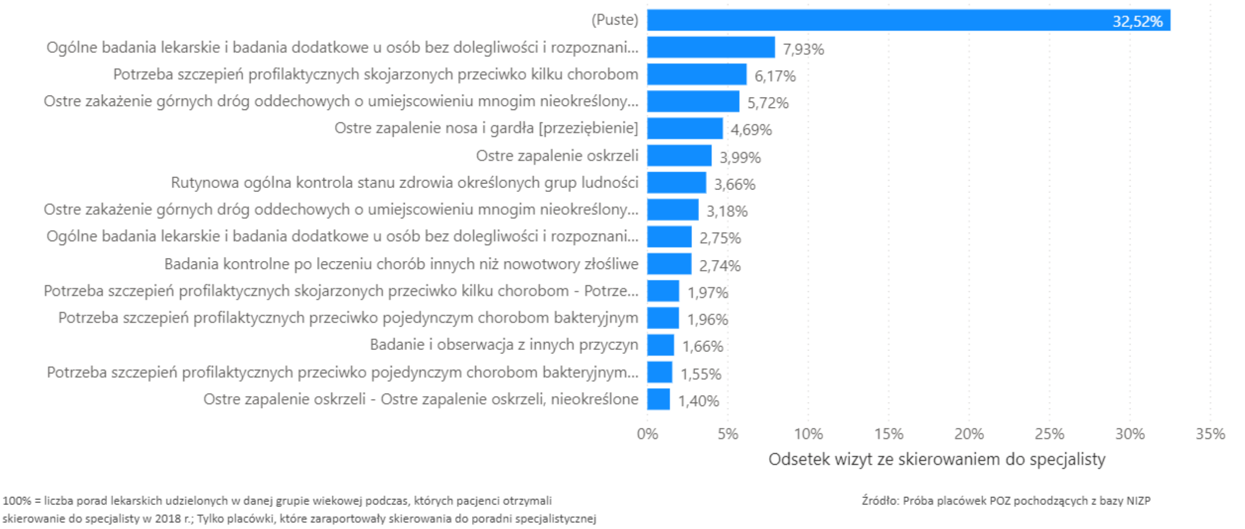


Fig. 17.13. The most common medical diagnoses in the main diagnoses among appointments during which patients were referred to a specialist in 2018 - patients aged 0-18

A referral for hospital treatment may be issued by any physician, including a practitioner who is not a health insurance physician. Such a referral is issued when the therapeutic objective cannot be achieved in an outpatient environment. In the analysed sample of PH facilities, the data on referrals for hospital treatment derived from manual entries absent from the classification. All records with a non-empty entry in the column indicating the name of the institution on a hospital referral were included in the analysis.

Out of 173,928 of all PH medical consultations provided in 2018, a total of 2,884 referrals for hospital treatment were issued, which is less than 2% (1.7%). The percentage of patients referred for hospital treatment did not differ significantly depending on the size of the locality and amounted to 1.6% for patients from cities and 1.7% each for patients from towns and rural areas.

17.6. The completeness and the quality of the data recorded

The reporting to the National Health Fund delivered by PH providers is based on the International Classification of Diseases (ICD-10). Its application is intended, among other things, to provide statistical data on the incidence of various diseases. By collecting such data in different parts of the world, it is possible to be more effective in protecting people's health, through the exchange of information that gains a global context.

The structure of the database obtained from PH entities included in the analyses in this report shows some limitations, as it obliges to report only one diagnosis code for a single service (medical consultation). Only selected electronic patient records systems allow more than one entry to be made during a single PH patient appointment.

Such a structure may cause limitations in the interpretation of the number of diagnoses. For example, during a single appointment to a medical clinic, there may be a patient for whom several ICD-10 codes should be reported, whereas in the summary of the appointment only one ICD-10 code appears as the cause. Furthermore, it PH practitioners do not always enter the diagnosis correctly in the patient's records, or do not enter it at all. There is also a considerable number of people who seek PH medical consultations without being registered for medical services at a given facility.

In the analysed sample of PH facilities, 84% of medical consultations provided in 2018 were marked with an ICD-10 code, which makes it possible to determine the main reason for the patient's appointment. Nearly 16% of cases did not contain such an annotation in the patient's medical records. Analysing the individual years, it should be concluded that the percentage of such incidents is increasing (in 2014 it was the lowest and amounted to 13.4%).

17.7. Children's healthcare

Children's routine health check is an in-depth medical examination of children undertaken regularly at appropriate intervals. These examinations are used to monitor the health of the child and to detect health problems at an early stage. The first routine health check of a new-born is helpful in determining whether or not the baby has a congenital disease. It also enables verification whether during pregnancy, birth and shortly after birth there are no factors that may affect the child's further normal development. According to the regulations of the Minister of Health, preventive medical examinations are guaranteed, and the PH physician is obliged to conduct children's routine health checks[1].

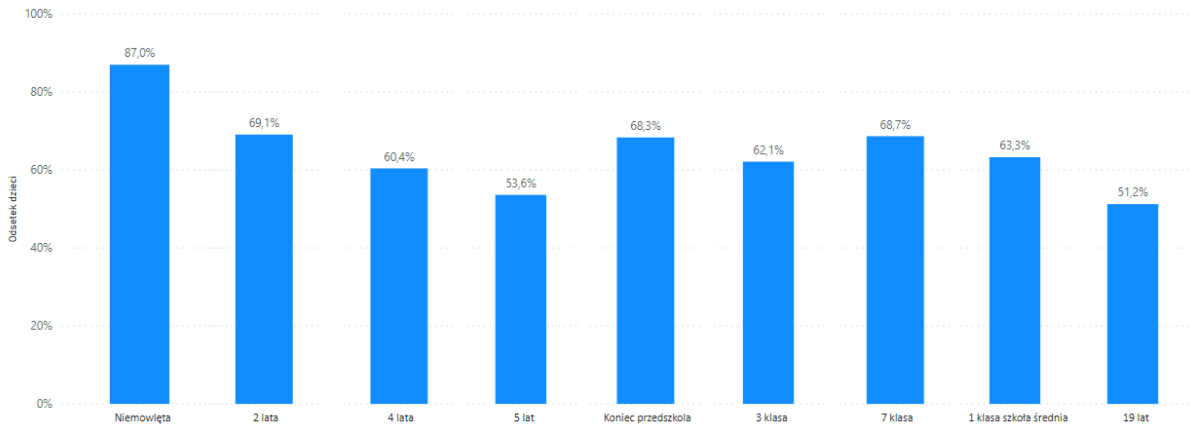
A detailed analysis of data from the National Health Fund (MZ-11 form) using quintiles demonstrates that 82.1% of PH facilities belong to the quintile with the highest routine health check performance rate in patients aged 1-4 weeks in 2018 (80-100% of examined patients). In 9.3% of PH facilities, the percentage of children examined preventively ranged from 60 to 80%, and the remaining 8.4% of facilities were characterised by a very low performance rate of these examinations.

Periodic health examinations of children in accordance with the applicable regulations include children from birth until the age of 18. They should be conducted by a paediatrician or family doctor at certain developmental stages. According to the regulation of the Minister of Health, such examinations should be performed at the age of 2, 4, 6, 10, 14, 16 and 18. It is during these consultations that the physician is able to accurately assess the physical and mental development of the child. During such an examination, the general developmental characteristics – vision, hearing, speech and motor performance – are assessed. These routine health checks can be conducted in the clinic where the child is treated, and it is performed by a family doctor in cooperation with a nurse.

According to the data provided by the National Health Fund in 2019, 87.0% of infants (up to the 4th week of life) had their routine health check, and that is the highest percentage among children subject to the examination as at 31.12.2019. The routine health checks of four-year-olds, as well as children starting school, are less frequent. Adolescents' routine health checks are rare, despite the fact that this is the period most critical for posture defects.

[1] The Act of 12 April 2019 on Healthcare for Students (the Journal of Laws of 2019, item 1078).

Only every second patient at the age of 19 (51.2%) and every second five-year-old (53.6%) participated in preventive health checks. This is particularly alarming because the routine health checks are the best method for detecting any diseases or disorders in the development of a child. In the remaining patient groups, this rate is slightly higher, ranging from 60.4% in the 4-year-olds group to 68.7% among 7-year-olds.



100% = liczba pacjentów podlegających badaniu wg stanu na dzień 31/12/2019 (formularz MZ-11) w określonych grupach wiekowych

Źródło: Analiza własna na podstawie danych udostępnionych przez Departament Analiz i Strategii MZ

Fig. 17.14. Percentage of examined children (routine health check) among children who should be tested at a certain age in 2019

Following the current recommendations, new-borns and infants up to the age of 6 months should be breastfed only, and then solid food should be introduced to their diet, in accordance with the infant nutrition model. According to the National Health Fund data for 2019, only 47.6% of women breastfed infants (from 2-6 months) or applied mixed feeding, and this value was near the average (median) of 50%. There was a large variation in the indicator between facilities – the standard deviation was 22.8%, with values ranging from 10.4% to 87.2% (within the sample limited to facilities between the 5th and 95th percentile).

The differences may result from the reporting method in facilities (the analyses were made only on a sample of facilities that reported the feeding method) and from individual contraindications and limitations of breastfeeding (e.g. problems with lactation, insufficient child feeding). Regardless of the direct cause, the indicator is low and does not differ from other reports published by Statistics Poland.

The data presented are derived from the MZ-11 form and relate to only breastfeeding and/or mixed feeding at 2-6 months of age, so this analysis does not list only breastfeeding and does not take into consideration the initiation of in-hospital breastfeeding as well as the continuation of breastfeeding during the year after birth. For this reason, it is difficult to compare them with other international data collected in accordance with the WHO guidelines, according to which important indicators of breastfeeding include the early start of breastfeeding in the first hour after birth, only breastfeeding before the age of 6 months and the continuation of breastfeeding until the child is 1 year old.

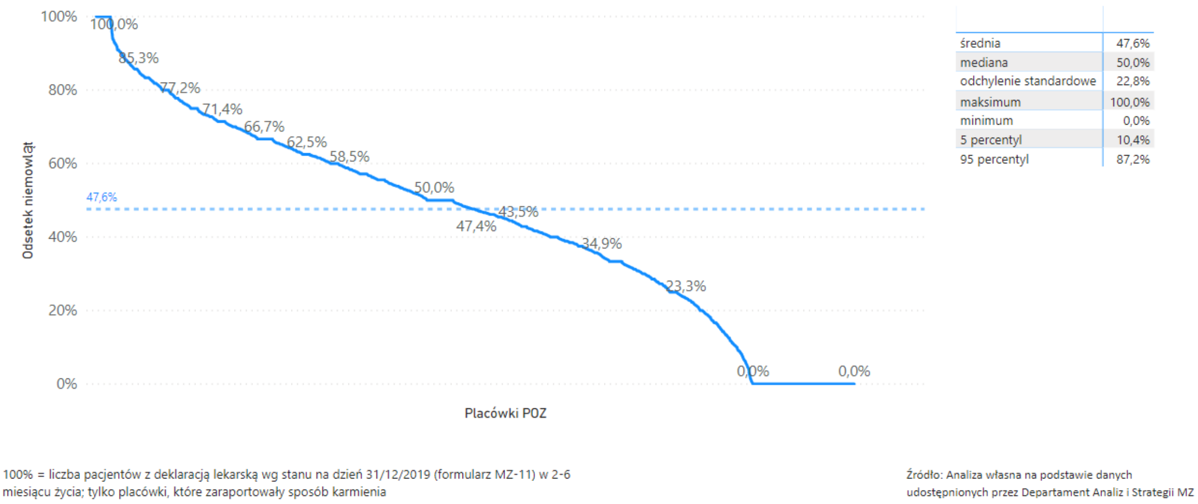


Fig. 17.15. Percentage of breastfed children at 2-6 months of age

17.8. Diagnosis of diseases that represent a significant public health burden

There are data available to describe the activity of PH physicians in referring patients for diagnostic tests. During the monitored years, among people **aged over 18**, a referral for at least one basic analytical test (i.e. blood count, ESR, blood glucose, or general urine test) was received by an average of every 20th patient (i.e. from 3.9% to 4.7% depending on the years analysed). As regards people **over 65**, the proportion of patients referred for at least one basic test was slightly higher, ranging from 5.3% (in 2014) to 7.2% (in 2015). In 2018, 5.6% of patients in this age group were referred for at least one basic diagnostic test (by 1.6 p.p.[2] more than in the group of patients over 18 years of age).

The **DiLO Card,** a card of oncological diagnosis and treatment, is one of the solutions of the so-called Fast Oncological Path, which was introduced on 1 January 2015 together with the oncological package, i.e. regulations which aim to improve the diagnosis and treatment of cancer in Poland. The card serves as a (priority) referral, and it is provided to a person in whom a malignant tumour is suspected, the diagnosis has been confirmed or the oncological therapy is already under way. The PH physician (family doctor) is entitled to issue a (green) DiLO Card

[2] pp. – percentage points

and refer the patient to the appropriate specialist if he or she suspects a malignant tumour on the basis of the patient's history and any preliminary examinations.

According to the 2019 data from the National Health Fund (form MZ-11), DiLO Cards were most often issued to patients between 65 and 79 years of age (0.8% of registered patients as at 31.12.2019 received them), to patients over 80 years of age (0.7%) and those between 45 and 65 years of age (0.3%). The lowest number of such cards was provided to patients from younger age groups.

The HbA1c value reflects the average blood glucose concentration during the last 3 months preceding the test. This parameter is of crucial importance for the diagnosis of the diabetes and is of key importance in determining the effectiveness of therapy and the levelling of glucose concentration in patients. Following the recommendations of the Polish Diabetological Society, in diabetic patients with a stable course of the disease it is recommended to conduct HbA1c measurements at least once a year. Nonetheless, for patients with unstable glycemia who have not achieved the recommended therapeutic goals or who have undergone a change in their treatment, the level of HbA1c glycated haemoglobin should be determined at least once every four months[3].

The indicator below presents the percentage of diabetic patients who have HbA1c test ordered once every 12 months. The analysis of the indicator value was performed for the latest data from 2018. The value of the indicator is expressed as a percentage. First, the number of all patients with a given disease/problem benefiting from healthcare in the analysed years was summed up (in which at least one diagnosis from the indicated ones was found: E10, E11, E13, E14 in the years between 2013 and 2017, and in the analysed year – i.e. 2018 – at least one medical consultation was provided to them). The analysis does not include patients whose first diagnosis was given in the year for which the index is calculated. In a second phase, the number of patients who met the conditions defined by a specific indicator is calculated.

In 2018, less than every third patient (29%) with diabetes had the HbA1c concentration test within the last 12 months. The percentage of HBA1c concentration tests in this group was the highest in towns up to 100,000 inhabitants and amounted to 47%, accompanied by a very low percentage of patients from rural areas – only 11% (i.e. 18 p.p. less than for the general

[3] Clinical recommendations for the management of diabetes patients 2018. The standpoint of the Polish Diabetological Society. Diabetologia Kliniczna. 2018;4(1):1-92.

population). This is far too few, considering the indications that patients maintaining HbA1c levels within the recommended limits are less likely to have complications from diabetes.

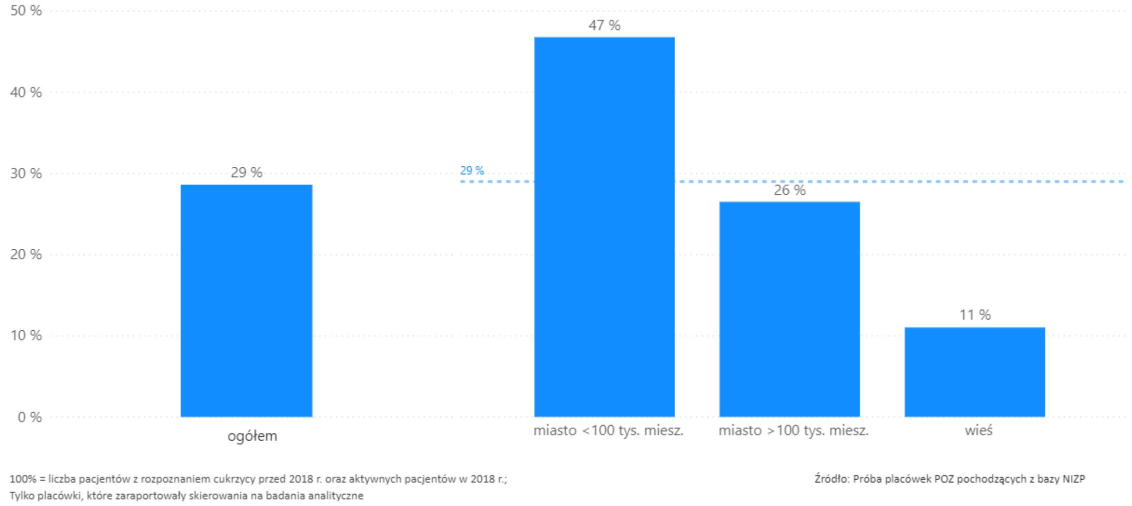


Fig. 17.16. Percentage of diabetic patients with HbA1c test in 2018

According to data from the National Health Fund, in 2019 the average number of antibiotics prescribed by PH physicians per year per registered patient was 0.38 package and was close to the average (median), which was 0.37 package. The number of packages of antibiotics prescribed by PH physicians was calculated on the basis of data on medical consultations provided within the PH practice framework and on reimbursed antibiotics bought by patients which were prescribed on the day the consultation took place. It can therefore be assumed that the values obtained are underestimated due to the omission of antibiotics bought at a full price (without reimbursement).

There was a large variation in the indicator between facilities – the standard deviation was 0.14 package, with values ranging from 0.12 to 0.77 package per year (within the sample limited to facilities between the 5th and 95th percentile).

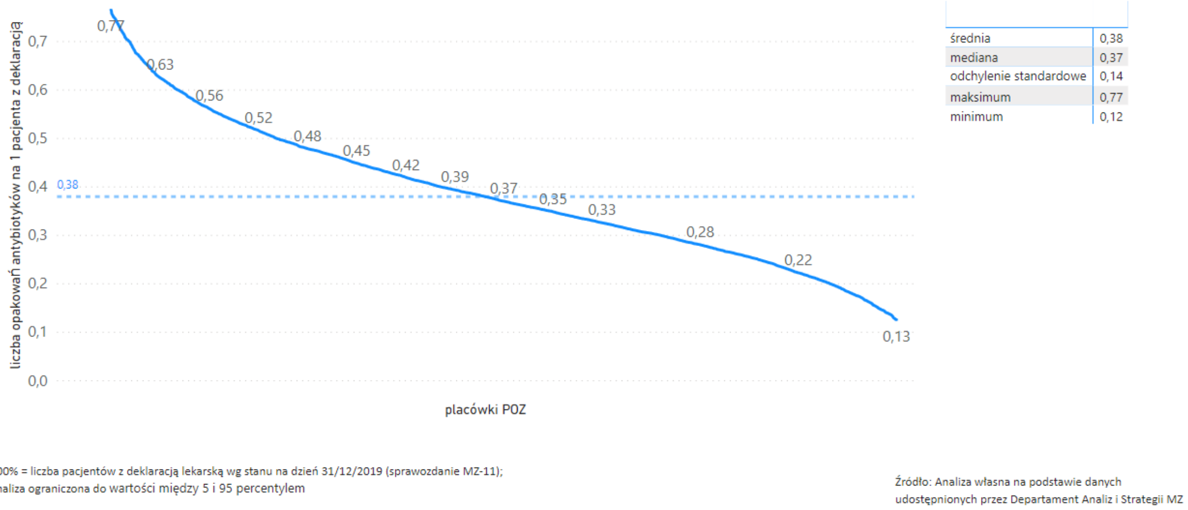


Fig. 17.17. Average number of antibiotic packages prescribed by GPs per year per registered patient admitted at least once in 2019

Note: There is a great diversity between PH facilities. Due to outliers, a method of rejecting the outliers/extreme values using the 5th and 95th percentile was adopted.

The differences may result from different therapeutic behaviours of physicians working in specific facilities, but it is also related to the age structure and the sex of patients registered in a given facility and the incidence of infections in the period in question. The last factor is included in the indicator described below, which takes into consideration the percentage of consultations during which an antibiotic was prescribed among consultations with the diagnosis of an upper respiratory tract infection. Differences in the structure of patients requires the standardisation of the population of patients according to the age and sex structure of registered patients in Poland.

On average, antibiotic therapy was administered during less than every second PH medical consultation provided in 2019 which diagnosed an upper respiratory tract infection (41.6%). The median for the aforementioned indicator was 42.6%. There was a large variation in the indicator between facilities – the standard deviation was 12%, with values ranging from 16.4% (min) to 66.5% (max) of consultations with diagnosed upper respiratory tract infections per year (within the sample limited to facilities between the 5th and 95th percentile).

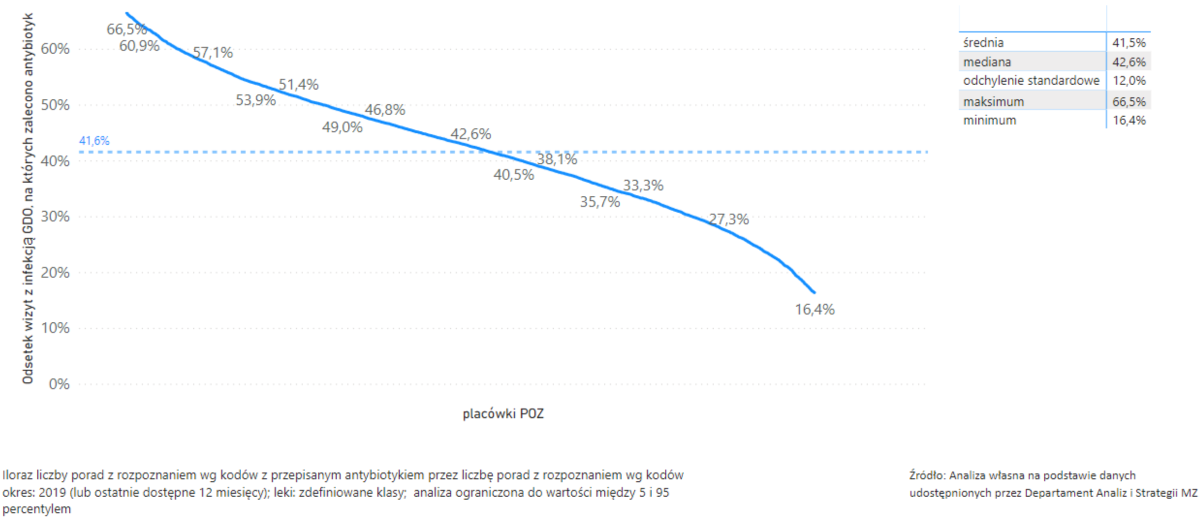


Fig. 17.18. Percentage of medical consultations during which an upper respiratory tract infection was diagnosed and antibiotic therapy was prescribed

Note: There is a great diversity between PH facilities. Due to outliers, a method of rejecting the outliers/extreme values using the 5th and 95th percentile was adopted.

17.9. Mortality

According to the statistics of the Ministry of Health, the percentage of deaths among patients registered for PH as at 31.12.2019 was 1.1% and was close to the average value (median), which was 1.2%.

There was a large variation in the indicator between facilities – the standard deviation is 0.4%, with average values ranging from 0.3% to 2.1% (within the sample limited to facilities between the 5th and 95th percentile). The diversity may be related to the age structure and the sex of patients registered in a given facility and their state of health in the period under review.

Differences in the value of the indicator between facilities is certainly a consequence of differences in the age and sex structure of the population covered by PH services in the respective facilities. In order to obtain an indicator without this effect, it is necessary to standardise it for the age and sex structure of all patients receiving PH care in Poland.

SUMMARY

Nearly 3% of patients aged 19-24, 2.0% aged 25-44, 1.5% aged 45-64 and 1.4% of children up to the age of 6 listed as active patients of PH facilities in 2018 were not registered in the given PH facility. Women prevailed in every age group.

1. Every third patient registered with a PH physician was between the age of 25 and 44, every fourth was between the age of 45 and 64, and every fifth was over 65. School children and adolescents up to the age of 18 accounted for 30% of patients registered with a PH physician, and only 8% were between 19 and 24 years old.

2. In every age group of 18 years of age or more, women prevailed among those using PH physician services, reaching the highest rate in the oldest group of patients over 80 years of age (68.5%). The greatest differences in this respect were visible in the age categories of 19-24 years (they oscillated around 12 p.p.) and over 80 years of age (about 8 p.p. compared to patients aged 65-79).

3. In 2018, almost one in four patients receiving healthcare services in PH facilities was aged 65 or more. The percentage of medical consultations in this group of patients was 34.3% and the average number of consultations per year was 6.7. The percentage of nursing appointments/consultations in this group of patients was 43.9% and the average number of appointments/consultations per year was 4.8.

4. Altogether, 71.9% of patients listed as active patients of PH facilities in 2017-2018 were provided with medical care in the same facility, and their appointments represented 82.3% of all medical consultations. The highest number of patients continuous registered as active was from towns (82.0%) and rural areas (81.2%), while in cities (over 100,000 inhabitants) this percentage was only 68.7%. The largest share in the total number of medical consultations provided in PH facilities was represented by appointments of continuous registered patients from towns below 100,000 inhabitants (87.7%), and the lowest by those from rural areas (79.6%).

5. In 2018, 84% of medical consultations provided were marked with the ICD-10 code which was assumed as the main reason for the patient’s appointment. The remaining 16% of cases did not have such an annotation in the patient’s medical records. The percentage of medical consultations without such an annotation increased by approx. 3 p.p. from 2013.

6. More than 27% of children up to the age of 6 registered with a PH physician did not receive any PH medical consultation in 2018.
7. In 2019 the breastfeeding indicator for infants up to 6 months of age was 47.6% (median 50%).
8. The most common chronic diseases in the group of patients aged 0-18 years were chronic bronchitis and asthma (8.1%), congenital malformations of the circulatory system (5.5%) and musculoskeletal and connective tissue diseases (2.2%). Among patients over 18 years of age, the hypertensive disease was the most common (28.3%), followed by musculoskeletal and connective tissue diseases (19.7%), diabetes (5.8%), thyroid gland diseases (4.7%) and ischemic heart disease (4.3%).
9. In 2019, the most frequent new diagnosis in the group of patients over 18 years of age (according to the National Health Fund data) were cardiovascular diseases (2.8% of patients). The second most common diagnosis was musculoskeletal system and connective tissue diseases (2.3%), followed by hypertension (1.7%) and chronic digestive system diseases (1.3%).
10. In general, in 2018, 32.5% of patients listed as active patients of PH facilities were affected by multiple morbidity and were provided with 50.2% of all medical consultations. Inhabitants of cities (over 100,000 people), used the services of a PH physician to a greater extent than the examined PH population in general (34.2% of patients, 51.3% of consultations, respectively). The lowest number of such patients was in towns (28.2%), and the least medical consultations were provided to patients with multiple morbidities in rural areas (46.2%) and towns (45.6%).
11. The multiple morbidity of patients is strongly linked to age. Almost 80% of patients in the oldest age group (80+) were treated for several chronic diseases. A significant increase is observed in the incidence of multiple morbidity in patients aged above 44 (it ranged around 24 p.p. compared to patients aged 25 to 44 years old).
12. The mortality rate of patients registered for PH as at 31.12.2019 was 1.1% and was similar to the average value (median), which was 1.2%.
13. A relatively low activity of PH physicians in terms of referring patients to diagnostic tests, analytical tests, specialist consultations, rehabilitation and hospital treatment is observed. Considering the years 2014 to 2018, it should be noted that there was a slight

variation in the availability of PH patients for this type of treatment. According to the data for 2018:

- On average in a year, every 20th patient aged over 18 and 5.6% of patients over 65 received a referral for at least one basic laboratory test (i.e. blood count, ESR, blood glucose test, or general urine test).
- The referral for at least one imaging examination was issued for only 7.6% of all medical consultations. Patients from cities were referred for such examinations more often (3.0% more often than in towns).
- Referrals for laboratory tests were issued for 17.9% of PH medical consultations, with almost twice as many patients from cities with more than 100,000 inhabitants (19.2% of appointments) than from towns (10.9% of appointments).
- The referral for laboratory tests was received by 40.6% of patients listed as active PH patients and 46.0% of patients with a chronic disease. This most frequently concerned patients with obesity (62.0% of patients, 53.4% of appointments), with a diagnosed thyroid gland disease (62.0% of patients, 55.8% of appointments) or with diseases of the urinary system (55.5% of patients, 48.6% of appointments). Only every third appointment of a patient with hypertension resulted in such referrals, although 46.2% of patients received them.
- The average number of referrals for laboratory tests ranged from 1.0 to 1.4 per year depending on the group of diseases and was the highest among patients with diagnosed cancer and thyroid gland diseases. In 2018, patients with any chronic disease received on average 1.8 referrals for analytical tests (0.4 more than the total number of PH patients).
- Overall, 1.7% of patients listed as active PH patients received referrals for hospital treatment.
- In total, only 0.38% of active patients were referred for rehabilitation procedures.

14. According to data from 2019 (the National Health Fund), 0.8% of patients aged 65 to 79 years, 0.7% of patients over 80 years of age (0.7%) and 0.3% of patients aged 45 to 65 years (0.3%) received DiLO cards (a card of oncological diagnosis and treatment).

15. The percentage of patients referred for specialist consultations in 2018 was 16.2% in 2014 and in 2018 decreased to 10.2%. Meanwhile, the percentage of medical consultations in 2018 that ended in the issuance of at least one referral for specialist consultation was 3.4% (a decrease of 1.2 p.p. compared to 2013). One in four patients from towns with up to 100,000 inhabitants and only one in twelve patients from cities received a referral for a specialist consultation in 2018.

16. In 2018, referrals for a specialist consultation were issued to patients over 18 years of age mainly due to the diagnosis of hypertension (19.1%), musculoskeletal and connective tissue diseases (6.7%), diabetes (2.7%), thyroid gland disease (2.1%) and ischemic heart disease (1.9%). The total proportion of selected diseases in the referrals for specialist consultations was 36.2%. In younger age groups, i.e. patients under 18 years of age, the total share of selected main diseases was 1.5%, mainly attributable to chronic bronchitis /asthma (0.8%), musculoskeletal system disorders (0.2%), obesity (0.1%) and congenital malformations of the circulatory system (0.11%).

17. The involvement of PH practitioners in the implementation of disease prevention activity is insufficient. In 2018:

    - On average, in 2018, 29% of patients with diagnosed diabetes had HbA1c concentration determined in the last 12 months, mostly in towns with less than 100,000 inhabitants (47%), the least in rural areas (11%).
    - On average, 47% of patients with a diagnosed coronary artery disease had a lipid profile performed in 2018, more often in towns with less than 100,000 inhabitants (63%), and less often in rural areas – only 15% of patients.
    - The percentage of children between 1 and 4 weeks of age under analysis as at 31.12.2019 who had a routine health check amounted to 87.0%; adolescents' routine health checks were irregular – only every second patient aged 19 (51.2%) and every second five-year-old (53.6%) took part in preventive health examinations. In the remaining patient groups, this rate was slightly higher, ranging from 60.4% in the 4-year-olds group to 68.7% in the 7-year-olds group.

18. There is a small share of patients in risk groups who were vaccinated against influenza. Between 1 August 2017 and 31 March 2018, referrals for influenza vaccinations were issued to:
    - On average 6.3% of patients with ischemic heart disease
    - On average 4.5% of patients with diabetes
    - On average 6.4% of patients with chronic obstructive pulmonary disease
    - On average, 4.4% of patients with stroke or transient ischemic attack (TIA).
19. According to the data from the National Health Fund, the average number of antibiotics prescribed by PH physicians per year per registered patient in 2019 was on average 0.38 package and was close to the average size (median), which was 0.37 package. On average, during less than every second PH medical consultation in 2019, which diagnosed an upper respiratory tract infection, antibiotic therapy was prescribed (41.6%). The median for the above-mentioned index was 42.6%.
20. There is a great diversity of PH centres in terms of human resources. As at 31.12.2019:
    - The average number of nurses employed in PH facilities was 4.9, which is much more than the average value (median) of 3.0. The standard deviation is 6.7 and the values are from 1 (min) to 141 (max).
    - The average number of midwives employed in PH centres was 1.4, i.e. more than the average value (median) of 1.0. The standard deviation is 1.1 and the values are from 1 (min) to 22 (max).
    - On average, there were 1,198 patients per 1 nurse employed in a PH facility, and this is close to the average (median) value of 1,253. The standard deviation is as high as 1,571 and the values range from 175 (min) to 7,407 (max).
21. There was an increase in the proportion of patient appointments to renew prescriptions (from 16.7% in 2013 to 24.1% in 2018), while other administrative appointments (from 1.7% in 2013 to 1.0% in 2018) and other appointments marked with the code “ICD-10.*Z*” decreased (from 17.6% in 2013 to 12.4 in 2018) in the total number of PH medical consultations. This means that more than one third of PH medical consultations are administrative in nature.

HEALTH STATUS OF POLISH POPULATION AND ITS DETERMINANTS 2020

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