ORIGINAL ARTICLE

Regional differences in determining cardiovascular diseases as the cause of death in Poland: time for change

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Abstract

Background: Data regarding deaths in many countries is a reliable source of information on population health status, due to the legal obligation to register the fact of a death and its cause. Such data is widely used to analyse regional health differences, changes in health over time, and to pursue and monitor the effects of health policies. Therefore, it is extremely important that the data is reliable and comparable across the country.

Aim: To analyse death rates from cardiovascular diseases in 2007–2009 among residents of large Polish cities, where medical universities are located, in order to assess the magnitude of differences in mortality in those populations.

Methods: The information on deaths was collected from a routine death registration system run by the Central Statistical Office. We analysed mortality by accessing individual death records of the residents of the following cities: Bialystok, Bydgoszcz, Gdansk, Katowice, Krakow, Lublin, Lodz, Poznan, Szczecin, Warsaw and Wroclaw. The following causes of death were taken into account: diseases of the circulatory system in total (ICD-10: I00–I99); ischaemic heart disease (I20–I25) including myocardial infarction (I21–I22); pulmonary heart disease and other heart diseases (I26–I51) including cardiac arrest (I46); heart failure (I50); complications and ill-defined descriptions of heart disease (I51); cerebrovascular diseases (I60–I69); and atherosclerosis (I70). The death rates were age-standardised by the direct method, taking as a standard the so-called 'European age structure'.

Results: Comparison of mortality rates in the studied cities revealed substantial and unjustified differences in the values of the rates for individual groups of diseases. The death rate from myocardial infarction in Katowice was nearly three times higher than those in Wroclaw and Krakow (74.8/100,000 against 25.2 and 25.7/100,000). Mortality rates from pulmonary heart disease and other heart diseases in Warsaw, Lodz, Bydgoszcz, and Szczecin were in the range of 12–19/100,000, while in the other cities it was lower than 1/100,000 residents. The death rates from atherosclerosis in Wroclaw and Krakow were several (6–9) times higher than in Bialystok, Katowice, Warsaw and Szczecin.

Conclusions: As one of the main reasons that may be responsible for such substantial regional differences in death rates, the authors assume that different criteria are used to determine the causes of death, perhaps resulting from insufficient training of health professionals in this field. Therefore actions to develop and implement uniform rules for determining causes of death, appropriate training of doctors responsible for completing death certificates, and adequate education in this area during medical studies must be urgently undertaken.

Key words: cardiovascular diseases, causes of death, death certificate, mortality, regional differences in health

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INTRODUCTION

Data on mortality rates and causes of deaths in a population is in many countries the most easily accessible and reliable indicator of population health, due to the legal obligation to register the fact of a death and its cause. This legal situation also applies in Poland. Data regarding deaths and their causes is widely used to analyse the health status of the Polish population, its regional differences and changes over time, and to monitor the effects of health policies, including the effects of the implementation of the National Health Programme and the National Programme for Prevention and Treatment of Cardiovascular Diseases (POLKARD) [1, 2]. Therefore, it is extremely important to collect data on causes of death in a reliable and uniform manner across the country. Only then can a true picture of important health problems and the severity of their occurrence emerge. This will assist the selection of optimal health care programmes.

A number of previously conducted studies concerning major causes of death, including cardiovascular diseases (CVD), have indicated a significant diversity in the distribution of the Polish population mortality rates between provinces [3].

It seems extremely important and well justified to pose the question as to whether regional differences in mortality rates from CVD result from true regional differences in the prevalence or severity of these diseases, or are caused by different approaches among doctors determining the cause of death. If the former, it would be necessary to adapt health policy programmes aimed at reducing disparities in the health status of the population; if the latter were the case, it would point to an urgent need to train medical personnel in order to standardise the rules for determining the cause of death, as only this can provide a true assessment of public health and appropriate formulation of health policy.

The aim of this study was to analyse mortality from CVD in 2007–2009 among residents of large Polish cities, in which medical universities are situated. This choice of the population surveyed was dictated by the need to ensure a similar accessibility to modern medical care and diagnostics.

METHODS

Information on deaths of Polish citizens is collected in a routine death registration system run by the Central Statistical Office (GUS) using a special 'Statistical certificate for the notification of death', which is a part of the Death Certificate (Pu-M67). This form is filled out by the doctor or another person authorised by the Provincial Physician to issue death certificates (e.g. paramedic, midwife, nurse). Currently, virtually all (99.6%) death certificates in Poland are completed by doctors.

When a doctor completes a death certificate, he or she describes the underlying, direct and secondary causes of death. However, according to the Communication from the Minister of Health and Social Welfare on 28 October 1996, doctors should not enter the code of the International Statistical Classification of Diseases and Related Health Problems (ICD-10), since this is done centrally at the provincial level by specially trained physicians who are called coders [4]. The coders verify the diagnosis of cause of death, taking into consideration the World Health Organisation (WHO) guidelines [5], and assign a four-digit ICD-10 code signifying the underlying cause of death [6]. The reason for introducing such a two--stage procedure was the need to improve the quality of cause of death statistics and ensure their better comparability across the country. Causes of death statistics are stratified according to the underlying cause of death and the permanent residence of the deceased.

The presented analysis was based on individual death records from a nationwide mortality database maintained by GUS available for scientific research for the National Institute of Public Health — National Institute of Hygiene. We analysed mortality in the following cities: Bialystok, Bydgoszcz, Gdansk, Katowice, Krakow, Lublin, Lodz, Poznan, Szczecin, Warsaw and Wroclaw. The causes of death taken into account were as follows: CVD in total (ICD-10: I00-I99); ischaemic heart disease (IHD) (I20-I25) including myocardial infarction (MI) (I21-I22); cardiopulmonary syndrome and other heart diseases (I26-I51) including cardiac arrest (I46), heart failure (HF) (I50), complications and ill-defined descriptions of heart disease (I51); cerebrovascular diseases (I60-I69); and atherosclerosis (I70).

The level of the total mortality rate due to a given cause of death depends on mortality rates in particular age groups and on the population's age structure. In order to properly compare the total mortality due to the causes of death in the analysed populations of the cities, it was necessary to eliminate the effect of different age structures of those populations. For this purpose, the death rates were age-standardised by the direct method, taking as a standard the so-called 'European age structure' which is used by, among others, the WHO Regional Office for Europe and Eurostat (European Statistical Office). To reduce the impact of random fluctuations in mortality rates on the results of the analysis, the average annual rate for each cause of death was calculated for the period 2007 to 2009 inclusive.

RESULTS

Diseases of the circulatory system (I00-I99)

In the years 2007–2009, deaths from CVD accounted for 43.1% of all deaths in the population of analysed cities; the percentage ranged from 36.4% in Gdansk to 48.4% in Bydgoszcz (in the general population in Poland it was 45.8%). During this period, the lowest standardised CVD mortality rate, of 247/100,000 of residents, was found in Bialystok, and the highest one, exceeding Bialystok by 45%, was (358/ /100,000) in Katowice.
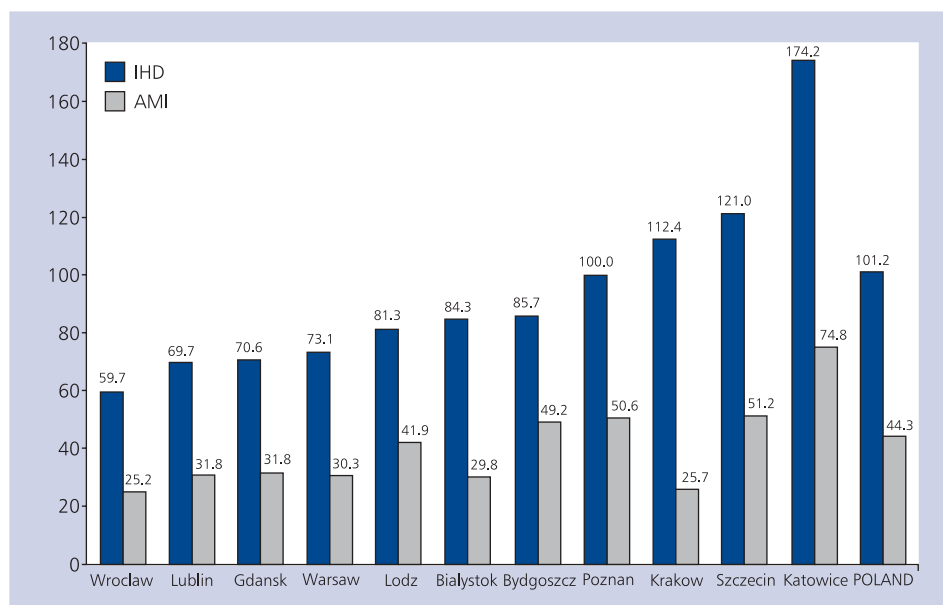
Figure 1. Age-standardised death rates from ischaemic heart disease (IHD) (I20-I25) and acute myocardial infarction (AMI) (I21-I22) in analysed cities, 2007–2009 (per 100,000 population)

Ischaemic heart disease (I20-I25)

The IHD was responsible for 30% of deaths from CVD in analysed cities (from 19% in Wroclaw up to 50% in Katowice); the standardised mortality rate in Katowice was almost three times (2.92) higher than that in Wroclaw (Fig. 1).

Deaths due to MI in the analysed populations represented 39% of deaths due to IHD (generally in the country 43%), but in the case of Krakow it was only 22%, while in Bydgoszcz more than half (52%) of deaths due to IHD were attributed to MI. During the studied period, the death rate from MI in Katowice was nearly three times higher than in Wroclaw and Krakow (respectively 74.8/100,000 and 25.2 and 25.7/100,000) (Fig. 1).

Pulmonary heart disease and other heart diseases (I26-I51)

Even greater differences were found between the analysed cities in the cases of deaths coded as pulmonary heart disease and other heart diseases (I26-I51). These diseases were identified as the cause of death in 28% of all CVD deaths; the percentage ranged from just 6% in Krakow to 38% in Warsaw. Mortality rates were several times lower in Krakow than in other cities (approximately six-fold lower than in Warsaw, Lodz, Bydgoszcz and Szczecin) — in Krakow, practically no deaths were attributed to cardiac arrest (I46) and HF (I50) (Fig. 2).

Similarly in Wroclaw, there were practically no deaths attributed to cardiac arrest. In Bialystok, Poznan and Katowice, HF as the cause of death was reported much less frequently than in other cities (except of course, Krakow) and in Wroclaw and Bydgoszcz, the death rate was 2.5 times higher than in Poznan and Bialystok. The relatively high mortality from 'other heart diseases' (codes from the I30-I51) with the exclusion of cardiac arrest and HF in Poznan, Lodz, Katowice and Bialystok, was the result of mortality rates from complications and ill-defined descriptions of heart disease (I51) that were much higher than in other cities. The level of mortality rates in these four cities ranged between 12–19/100,000, while in the others except Warsaw it was lower than 1/100,000 residents (in Warsaw it was 3.3). It should be noted that in Lodz, more than half of deaths coded as I51 took place in hospital.

Cerebrovascular diseases (I60-I69)

Smaller differences between cities were observed in the case of cerebrovascular diseases, although the high mortality level due to them in Lodz is worthy of attention (Fig. 3).

It should also be noted that while in Bialystok, Poznan, Krakow and Warsaw, the cause of death identified as undetermined stroke (I64) was assigned to less than 20% of all deaths due to stroke (in Bialystok it was as low as less than 1%), it exceeded 40% in Lodz and Lublin, even though 80% of these deaths occurred in hospitals.

Atherosclerosis (I70)

The largest discrepancies of all between the studied cities occurred in the period 2007–2009 in the case of deaths coded as atherosclerosis. Death rates due to atherosclerosis in
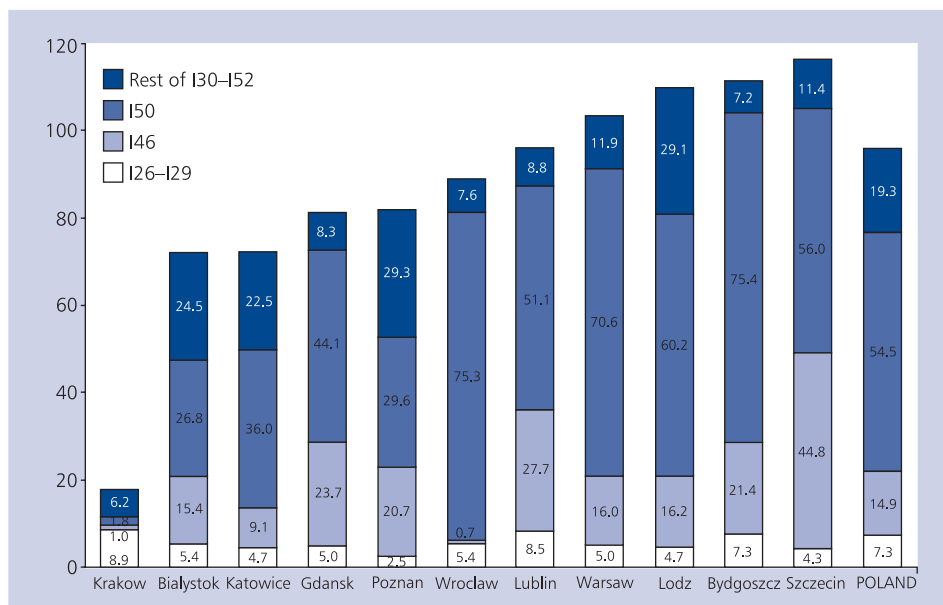
Figure 2. Age-standardised death rates from pulmonary heart disease (I26–I29) and other heart diseases (I30–I52) including cardiac arrest (I46) and heart failure (I50) in analysed cities, 2007–2009 (per 100,000 population)
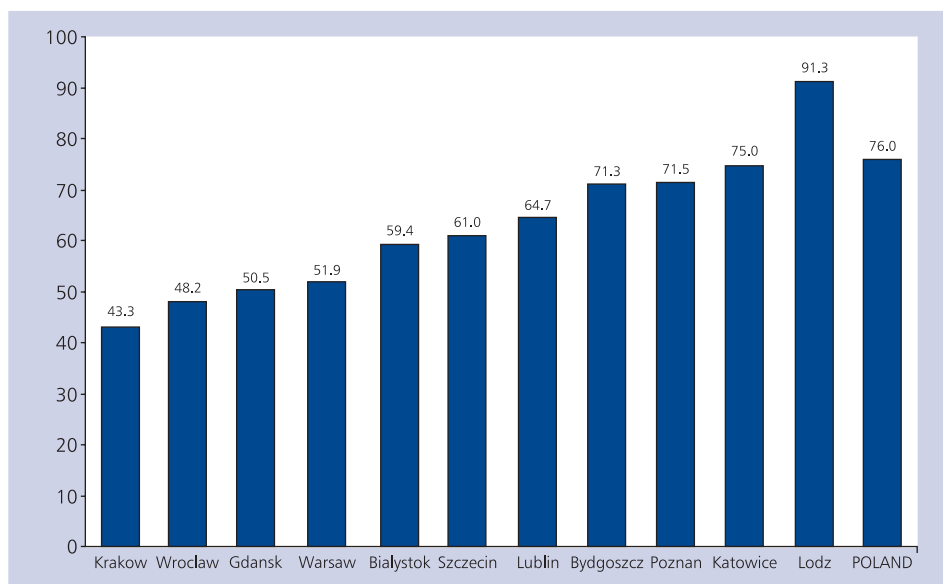

Figure 3. Age-standardised death rates from cerebrovascular diseases (I60-I69) in analysed cities, 2007–2009 (per 100,000 population)

Wroclaw and Krakow were 6–9 times higher than in Bialystok, Katowice, Warsaw and Szczecin (Fig. 4).

DISCUSSION

According to a relatively recent evaluation of the quality of mortality data supplied by countries to WHO, prepared by Mathers et al. [7], few countries should be satisfied with the quality of their data. Poland was listed among the countries where the data quality was low. The main reason for such an unfavourable assessment was the high percentage of deaths coded to ill-defined codes, including ill-defined cardiovascular causes. Variations in coding practices of IHD across countries were pointed out by Lozano et al. [8], who found a strong negative relation between IHD mortality and
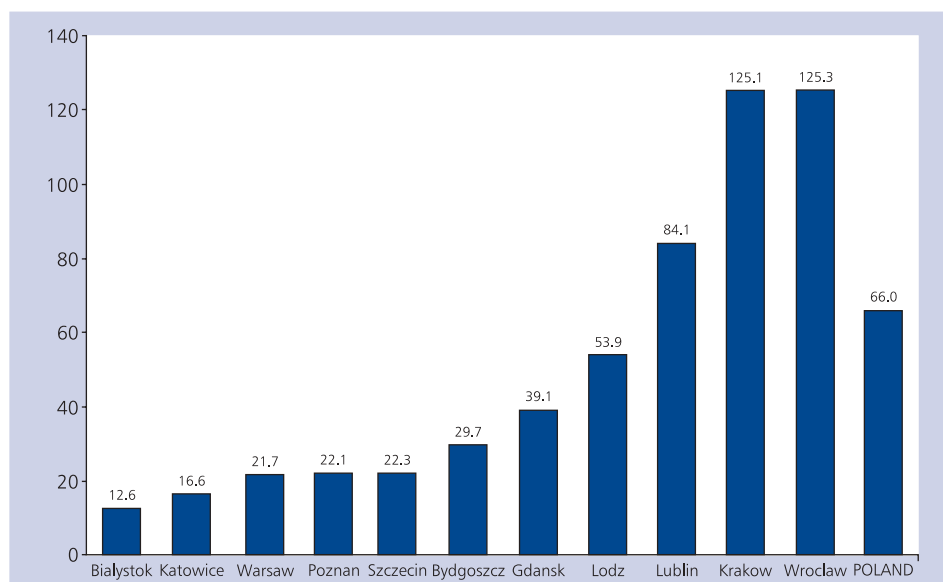
Figure 4. Age-standardised death rates from atherosclerosis (I70) in analysed cities, 2007–2009 (per 100,000 population)

that from the ill-defined CVD codes, which according to the authors include HF, ventricular dysrhythmias, generalised atherosclerosis and ill-defined descriptions and complications of heart disease.

While most of the analyses have concentrated on problems regarding comparisons of mortality across countries or over time, little has been said about difficulties regarding comparisons within countries. However, a study of four communities in the Atherosclerosis Risk in Communities Study (ARIC) in the USA by Coady et al. [9] found that the death certificate overestimation of IHD mortality exhibited considerable variation among communities.

The regional differences revealed by us in mortality from certain CVD, arising from the information obtained from death certificates, particularly for IHD, HF and cardiac arrests, as well as atherosclerosis, are surprising. The mortality data collection system is uniform across the whole of Poland. The changes in the system introduced in 1997 should have made coding of the causes of deaths more reliable and more consistent throughout the country [10].

We must emphasise that the analysis presented above applies to mortality of the inhabitants of large cities, in which academic medical centres are located, meaning that access to modern diagnostics and treatment should not differ substantially.

It can be assumed that, among the elements affecting levels of mortality, and specifically morbidity and case fatality, the latter should be at a similar level in analysed cities. On the other hand, it is hard to imagine that the populations of analysed cities have experienced the very different morbidity levels of diseases included in our analysis. It therefore seems entirely justified to assume that the large diffe-

rences in mortality have resulted from the application of different, non-uniform, rules for assigning the causes of death in each region.

It should be emphasised that the proportion of deaths due to all CVD which took place in hospital in the years 2007––2009, was similar in all studied cities, averaging 52% and ranging from 47% in Warsaw to 64% in Lublin. In the case of death recognised as due to atherosclerosis (I70), the percentage of deaths in hospital in Krakow and Wroclaw was 39% which was the same as the average for all analysed cities. Without a doubt, such a high recognition rate of deaths due to atherosclerosis in these two cities brought about a lower number of deaths from specific CVD such as IHD (I21-25) or cerebrovascular diseases (I60-69). This probably resulted in the fact that, for example, cerebrovascular diseases were relatively rarely indicated as the cause of death in Krakow and Wroclaw, as well as IHD in Wroclaw.

It is also worth noting that according to unpublished studies conducted in the National Institute of Public Health, National Institute of Hygiene (by B. Wojtyniak), the standardised death rates due to atherosclerosis in countries such as Austria, Denmark, Finland, France, the Netherlands, Germany, Sweden, the UK and USA in recent years ranged between 0.6–8.6/100,000, and as such were many times lower than those in the Polish cities.

In the analysed material, the lack of coding of HF (I50) as the cause of death in Krakow warrants attention. This is even more puzzling because in 1999–2001, the standardised death rate due to HF in Krakow was 41.2/100,000. This was only slightly lower than the nationwide level (47.1/100,000) and higher than in Warsaw (36.8/100,000). In the intervening time in Warsaw, the death rate due to HF had doubled,

while in Krakow it had more than halved (in absolute numbers there were 57 deaths in Krakow and 6,023 deaths in Warsaw during 2007–2009). It is difficult to explain why the change in the rates in these cities went in opposite directions.

The magnitude of regional differences in mortality rates calculated on the basis of information obtained from the Death Certificates, as described and discussed above, raises profound concerns. These differences are strikingly large. They cannot be explained by objective factors that may affect the health of the population. At the same time, these very death rates represent a key source of information for assessing the health situation of the Polish population and for monitoring the effects of health policy, both at the national and regional level.

It seems that among the main reasons that may be responsible for the significant regional differences in the values of the death rates are different rules applied to assigning causes of death, perhaps resulting from insufficient training of health professionals in this field. As already mentioned, the cause of death coding system in Poland is a two-step one. At the first stage, a doctor certifying death is required to enter the underlying, secondary and direct causes of death (in narrative form). In the second stage, a trained physician, called a coder, enters a proper four-digit code from ICD-10. According to information obtained directly from physician-practitioners, the ultimate cause of death code, which should be written on the Death Certificate by the coder, in some hospitals is still filled in by the doctor issuing the certificate, which also may contribute to the observed differences. Perhaps it may be necessary to verify the uniformity and standards of the work of doctors and coders.

CONCLUSIONS

It is urgent for the health authorities and the relevant scientific societies, and above all the Polish Cardiac Society and the Central Statistical Office (GUS), which is the institution responsible for data collection on deaths in the Polish population, to act to clarify and implement uniform rules for determining the cause of death. Training of doctors who are required to complete the Death Certificates, and the introduction of appropriate education in this area during medical studies, should be ensured.

Conflict of interest: none declared

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Regionalne różnice w określaniu przyczyny zgonu z powodu schorzeń układu sercowo--naczyniowego w Polsce: czas na zmiany

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Streszczenie

Wstęp: Dane dotyczące zgonów są w wielu krajach łatwo dostępnym i wiarygodnym źródłem informacji na temat stanu zdrowia populacji, ze względu na prawny obowiązek rejestracji zgonów i ich przyczyn. Dane te są powszechnie wykorzystywane do analizy regionalnych różnic w stanie zdrowia populacji, jego zmian w czasie, a także do prowadzenia i monitorowania polityki zdrowotnej. Dlatego niezwykle ważne jest, aby informacje te były wiarygodne i porównywalne w skali kraju.

Cel: Celem pracy była analiza i porównanie umieralności z powodu chorób układu sercowo-naczyniowego (CVD) w latach 2007–2009 wśród mieszkańców dużych polskich miast, w których znajdują się uniwersytety medyczne.

Metody: Wykorzystano informacje o zgonach zbierane w ramach rutynowego systemu rejestracji zgonów, prowadzonego przez Główny Urząd Statystyczny. Dokonano analizy umieralności wśród mieszkańców następujących miast: Białystok, Bydgoszcz, Gdańsk, Katowice, Kraków, Lublin, Łódź, Poznań, Szczecin, Warszawa i Wrocław. Pod uwagę wzięto następujące przyczyny zgonów: CVD ogółem (ICD-10: I00–I99), chorobę niedokrwienną serca (I20–I25), w tym zawał serca (I21–I22), zespół sercowo-płucny i choroby krążenia płucnego oraz inne choroby serca (I26–I51), w tym zatrzymanie krążenia (I46), niewydolność serca (I50), choroby serca niedokładnie określone i powikłania chorób serca (I51), choroby naczyń mózgowych (I60–I69) oraz miażdżycę (I70). Zastosowano standaryzację współczynników metodą bezpośrednią, przyjmując jako standardową tzw. europejską strukturę wieku, stosowaną m.in. przez Światową Organizację Zdrowia.

Wyniki: Porównanie współczynników umieralności w analizowanych 11 miastach wykazało wielokrotne różnice regionalne w wartościach współczynników dla poszczególnych grup schorzeń. Umieralność z powodu zawału serca w Katowicach była prawie 3-krotnie wyższa niż we Wrocławiu i Krakowie (odpowiednio 74,8/100 000 i 25,2 i 25,7/100 000 mieszkańców). Umieralność z powodu zespołu sercowo-płucnego i innych chorób serca w Warszawie, Łodzi, Bydgoszczy, Szczecinie zawierała się w zakresie 12–19/100 000 mieszkańców, podczas gdy w pozostałych miastach wskaźnik zgonów był niższy niż 1/100 000 mieszkańców. Wskaźnik zgonów z powodu miażdżycy we Wrocławiu i Krakowie był kilka (6–9) razy wyższy niż w Białymstoku, Katowicach, Warszawie i Szczecinie.

Wnioski: Za jedną z zasadniczych przyczyn, mogących wpływać na znaczące regionalne różnice w wartościach współczynników zgonów, autorzy uznali niejednakowe zasady stosowane do orzekania przyczyn zgonów, prawdopodobnie wynikające z niedostatecznego przeszkolenia kadry medycznej w tym zakresie. Konieczne jest zatem jak najszybsze podjęcie działań mających na celu wypracowanie i wdrożenie jednolitych zasad określania przyczyn zgonu i odpowiedniego przeszkolenia lekarzy w wypełnianiu kart zgonów oraz wprowadzenie odpowiedniego nauczania w tym zakresie w czasie studiów medycznych.

Słowa kluczowe: choroby układu sercowo-naczyniowego, przyczyny zgonów, karta zgonu, śmiertelność, różnice regionalne stanu zdrowia

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