

# Health inequalities among rural and urban inhabitants of Łódź Province, Poland

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Maniecka-Bryła I, Pikala M, Bryła M. Health inequalities among rural and urban inhabitants of Łódź Province, Poland. *Ann Agric Environ Med.* 2012; 19(4): 723-731.

## Abstract

**Introduction and objective.** The aim of the study was to compare the state of health of the inhabitants of the countryside and city dwellers in the Łódź province, measured with the real and standardized death rate and years of life lost, as well as the analysis of causes of deaths distinguishing these two populations.

**Materials and methods.** The study material included a database containing information gathered from 313,144 death certificates of the inhabitants of Łódź province who died between 1999-2008. Real and standardized death rates were determined. The standardization was carried out by a direct method. The Standard Expected Years of Life Lost (SEYLL method) was used to compute years of life lost. Analysis of time trends of death rates and life span in the Łódź province was conducted with jointpoint models. The intensity of mortality computed with standardized death rates in the province was higher in the countryside than in the city.

**Results.** In 2008, the standardized death rate in the countryside was 904.5 per 100,000 inhabitants, and in the city – 903.4 per 100,000 inhabitants. Inhabitants of the countryside more often died of cardiovascular diseases (SDR=418.7 vs. 367.9) and from external causes (SDR=90.2 vs. 63); those from the city and towns died from malignant neoplasms (SDR=204.5 vs. 195.6) and diseases of the alimentary tract (SDR=55.6 vs. 34.6). In 2008, SEYLL calculation for 1,000 people was 204 years for the inhabitants of the city and towns and 190 years for the inhabitants of the countryside.

**Conclusion.** It is necessary to introduce more effective prophylactic and health promoting activities in order to lessen the differences in the state of health state in the Łódź province and the rest of the country.

## Key words

inhabitants of the countryside, city dwellers, mortality, cause of deaths, health inequalities

## INTRODUCTION

The findings of epidemiological studies show that there are vast inequalities in the state of health among various social and age groups [1, 2, 3, 4, 5, 6, 7]. Another huge difference is the state of health in handicapped inhabitants of the countryside and the city [8, 9]. Self-evaluation of the health state of the studied inhabitants is extremely important [10, 11, 12, 13]. It should be stressed that gaining objective information on the state of health is difficult [14]. There are many studies which show that the inequalities are demonstrated in groups of diseases enumerated in the International Statistical Classification of Diseases and Related Problems (ICD-10), such as cardiovascular diseases [15, 16, 17, 18], malignant neoplasms [19, 20], diseases of the respiratory system [21, 22, 23, 24], and osteoarticular diseases [25, 26, 27, 28], or even in categories of diseases according to the same classification [29, 30, 31, 32]. Many authors emphasize risk factors and the role of prevention of diseases of the cardiovascular system [33, 34, 35] and neoplastic diseases [36, 37, 38].

Any variability and differences in the state of health between individuals and groups of people are considered health inequalities. More and more frequently, inequality resulting from insufficient access to health care and improper

working conditions [39, 40] are being discussed. They are treated as unjust, generally unacceptable and harmful. The World Health Organization (WHO) adopted the definition of health inequalities set forth by Margaret Whitehead. She claimed that 'health inequalities are not only unnecessary and avoidable, but also unfair and unjust' [41].

The basic factors responsible for the occurrence of health inequalities are of a social and economic nature and include: level of education, income, and professional activity. The risk of falling sick and dying is much higher in people from a lower social class, those with a lower income and low level of education [42, 43, 44, 45, 46, 47, 48, 49, 50]. Geographical distribution and place of residence are the most common criteria in making comparisons [51].

According to the WHO, health is defined as 'a state of complete physical, mental and social well-being, and not merely the absence of disease or infirmity'. It is therefore difficult to gather reliable data on the state of health defined in such a way in big populations [52]. Negative criteria are usually used in order to evaluate the state of health in big social groups. The most negative criterion, determined by various factors, is mortality. Further life expectancy directly depends on the ratio of mortality [53, 54].

The death rate in Poland has been systematically decreasing since 1991. However, it is still much higher than the death rate in the other European Union countries. Besides, the results of the analysis of mortality prove that, regarding further life expectancy, there are a huge local difference between various provinces and in a city-country cross-section. The

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Received: 6 April 2012; accepted: 24 October 2012

inhabitants of Łódź province die at the youngest age [55]. In 2009, the average life span for males was 69.2, and 78.9 for females [56]. In Poland, the average life span of males living in the city is now longer than of those living in the countryside, whereas the average life span is longer for women living in the countryside rather than in the city [57]. In the province, the average further life expectancy for males is slightly longer in the countryside – 69.3, and in the city – 69.2). Women live more than one year longer in the countryside than in the city (79.8 vs. 78.5).

At present, worldwide, organizations dealing with public health are striving to diminish local and social differences in the state of health. In May 1998, the World Health Declaration ‘Health for All in the 21<sup>st</sup> Century’ was adopted. Poland is one of its signatories. Twenty-one objectives include among others, a plan to reduce differences in the state of health between social and economic groups of all the EU member states by at least 25% by the year 2020. This objective could be realized by substantial health improvement of the underprivileged [58]. The National Health Programme 2007-2015, currently in use in Poland, is aimed at diminishing social and local differences in the state of health state, and is one of the strategic goals [59].

The aim of the presented study was to compare the intensity of mortality of inhabitants of the cities, towns and countryside in the Łódź province, as well as to describe the dynamics of this phenomenon in the period 1999-2008. The researchers analyzed years of life lost (SEYLL) in the specified period between males and females, as well as the inhabitants of the city and the countryside. Thanks to the analysis of death causes, it was possible to determine what diseases mostly contribute to years of life lost.

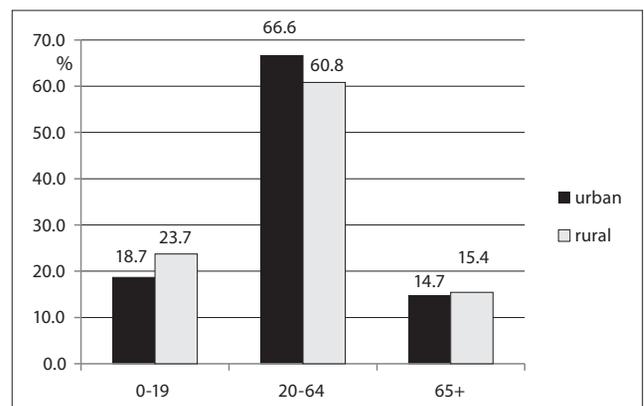
## MATERIALS AND METHODS

The study material included a database containing information gathered from 313,144 death certificates of the inhabitants of the Łódź province who died between 1999-2008. The analyzed variables were as follows: year of birth, year of death, gender, cause of death according to the International Statistical Classification of Diseases and Related Problems (ICD-10), and also the area code which identifies the former place of residence of the deceased person [60]. To compute the death rate, the researchers used data concerning the structure of the population inhabiting the Łódź province in the period when the study was being carried out, i.e. the structure extant on 30 June of the particular year was taken into account. The standardized death rates were calculated according to the standard European population to eliminate any possible influence of age on the value of the death rates, and also to compare them by taking the time period and former place of residence into consideration. The standardization procedure was conducted with a direct method. Jointpoint models and the Jointpoint Regression Programme were used to analyze time trends of the death rates and life span in the Łódź province [61]. This method, which uses straight broken-line regression, allows for determining ‘breakthrough points’ of the time trends. Also calculated were the annual percentage change (ACP) of death rates for each segment of the straight broken-lines, together with corresponding 95% confidence intervals. The SEYLL method was used to determine years of life lost [51].

## RESULTS

**Demographic structure of the inhabitants of the Łódź voivodeship.** The number of people inhabiting the Łódź province is systematically decreasing. In the period 1999-2010 it decreased by 103,000 and is now 2,534,357. The Main Statistical Office predicts that the number will continue to gradually decrease and by the year 2035 the population will have fallen by about 347,000, i.e. by almost 14% in comparison to the year 2010. The decrease in the number of inhabitants will mostly affect the city population. It should be emphasized that the population in the Łódź province is getting older more rapidly than in any other regions of the country. In 2009, a half of the inhabitants of the province were aged over 40 (median for Poland – 37) [62].

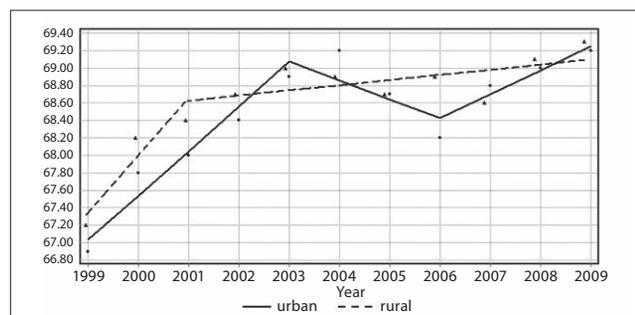
The Łódź province is quite strongly urbanized [63]. In 2010, the percentage of people living in urban areas was 64% (median for Poland – 60.9%). Since 1999, that percentage has been steadily decreasing by 0.1% each year. The city and countryside population differs in terms of age. In 2009, the median for city dwellers was 41 years, for the countryside – 37.9. Greater differences were visible in women. In the Łódź province, the age median was 44.4 for the city and towns, and 39.6 for the countryside, while for males – 37.6 for the city and towns, and 36.3 for the countryside. The social structure of the population also differed in urban and rural areas [64]. In the countryside, the percentage of population in pre-productive and post-productive age was higher than in urban areas (Fig. 1). Women distinctly outnumbered men in the city and towns, in comparison with rural areas. The feminization rate in 2008 was 115 in the city and 102 in the countryside.



**Figure 1.** Age structure of inhabitants of cities and towns, and countryside in the Łódź province in 2008

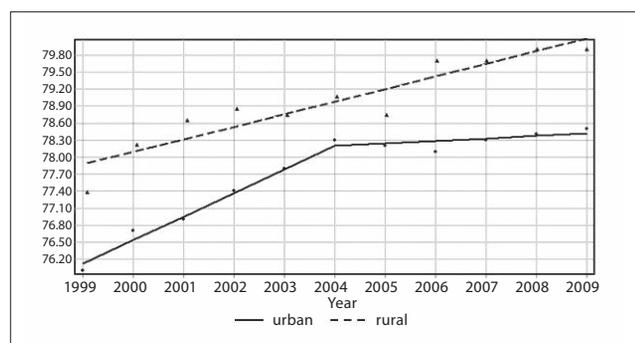
**Average life span.** Since 1991, life expectancy has been steadily growing in Poland [62, 65]. In 2009, the rate was 71.5 for males and 80.1 for females. Both men and women in the Łódź province die at the earliest age. In 2009, the average life span for men was 69.2 years and for women – 78.9. The life span in rural areas is longer than in the city. In the same year, the average life span for men living in the countryside was 69.3 and in the city – 69.2; the average life span of women living in the countryside was 79.8, and 78.5 for those from the city.

The growth rate of the average life span of males living in the city fluctuated (Fig. 2). Until 2003, the growth rate was quite rapid (0.8% per year). In 2003-2006, the life span



**Figure 2.** Further average life span of males according to place of residence in Łódź province in 1999-2009

dropped (-0.3% per year). The trend has again reversed and the growth rate is now increasing, but more slowly than before, i.e. by 0.4% each year. The growth rate of the life span of males from the countryside also fluctuated, but the fluctuations were not so marked. The growth rate of the further average life expectancy until 2001 was 1%. After 2001, it dropped and was 0.1%. As for women living in the countryside, their average life span was longer in the whole studied period than that of women coming from the city (Fig. 3). The further average life span of women from the



**Figure 3.** Further average life span of females according to place of residence in Łódź province in 1999-2009

city increased during 1999-2004 at the pace of 0.5% per year; after 2004, it was 0.1% per year. In the group of women from the countryside, the drop was steady, on average, 0.3% per year (Tab. 1). In Łódź, as in the whole country, an excess mortality of males is observed, which results in differences in the further average life span of men and women. These

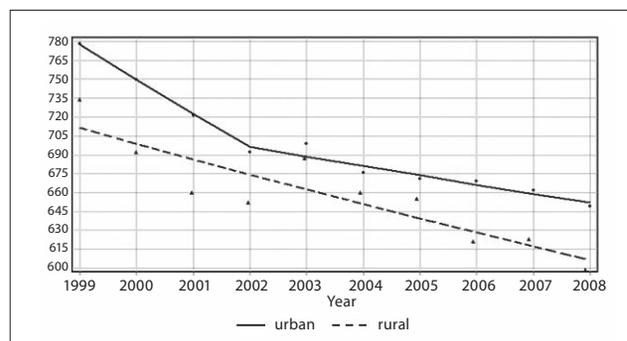
**Table 1.** Changes in life expectancy trends 1999-2009 in Łódź province (joinpoint regression analysis)

	No. of joinpoints	Year of joinpoint	Period	APC (Annual Percentage Change)	95% CI	
<b>Females</b>						
Urban	1	2004	1999-2004	0.5*	0.4	0.6
			2004-2009	0.1	0	0.2
Rural	0		1999-2009	0.3*	0.2	0.3
<b>Males</b>						
Urban	2	2003	1999-2003	0.8*	0.4	1.1
			2003-2006	-0.3	-1.5	0.9
			2006-2009	0.4	-0.2	1.0
Rural	1	2001	1999-2001	1.0	-0.1	2.1
			2001-2009	0.1	0	0.2

\* p<0.05

disproportions are more visible among the inhabitants of rural rather than urban areas. In 2009, the difference was 10.5 years in the countryside and 9.3 in the city.

**General mortality.** General mortality of the inhabitants of the Łódź province systematically decreased in the period 1999-2008. The pace of the fall depended on gender and place of residence. The standardized death rates for women over the whole studied decade were higher for those from the city. The difference in the mortality rate for women from urban and rural areas decreased until 2002; after that, it began to increase (Fig. 4). In 1999-2002, the average drop in the



**Figure 4.** Standardized death rates of females according to place of residence in Łódź province in 1999-2008 (per 100,000 females)

standardized death rates for women living in the city and towns was 3.62%, and after 2002 the drop was -1.1% per year (Tab. 2). The death rates for women living in the countryside

**Table 2.** Changes in mortality time trends 1999-2008 in Łódź region (joinpoint regression analysis)

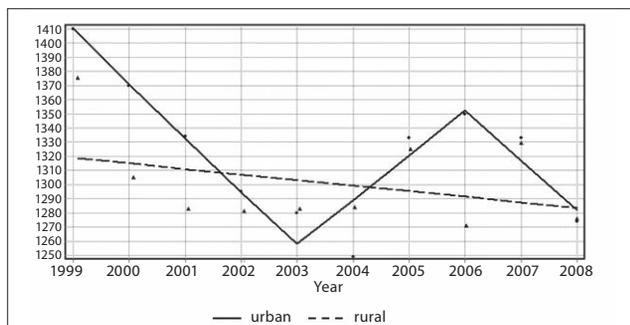
	No. of joinpoints	Year of joinpoint	Period	APC (Annual Percentage Change)	95% CI	
<b>Females</b>						
Urban	1	2002	1999-2002	-3.6 *	-5.0	-2.2
			2002-2008	-1.1 *	-1.6	-0.6
Rural	0		1999-2008	-1.7 *	-2.4	-1.0
<b>Males</b>						
Urban	2	2003	1999-2003	-2.8 *	-3.0	-2.6
			2003-2006	2.4 *	1.9	3.0
			2006-2008	-2.7 *	-3.2	-2.1
Rural	1		1999-2008	-0.3	-0.9	0.3

\* p<0.05

steadily decreased by -1.7% per year. As for males living in the city, the standardized death rates considerably fluctuated (Fig. 5). In 1999-2003, they rapidly decreased at the annual rate of -2.8%. After 2003, the rates started to increase at an average pace, i.e. 2.4% per year, and from 2006 onwards, they have decreased at the annual rate of -2.7% (Tab. 3). In the group of males from the countryside, the standardized death rate in 2008 was 1276 per 100,000 people, which was only slightly lower than the rate for 2001 (1,283 per 100,000 people). The average annual drop in 1999-2008 was only -0.3%. In 2008, the values of mortality rates for males from the countryside and the city were similar.

**Table 3.** Standardized death rates according to gender, place of residence and causes in 2008 in the Łódź province (per 100,000 inhabitants)

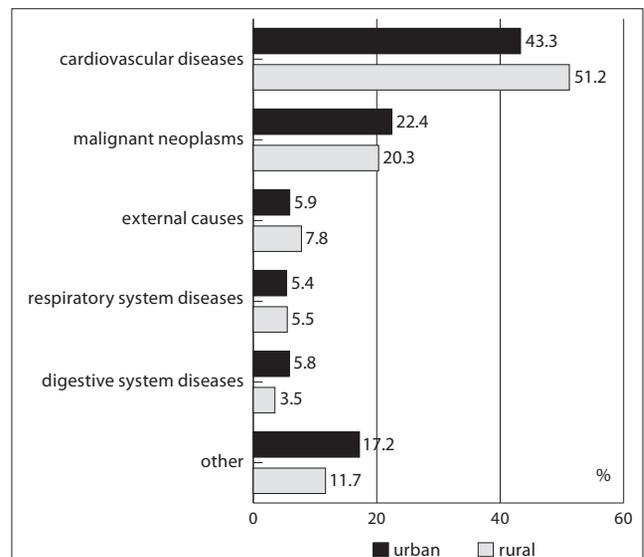
Causes of deaths according to ICD-10	Males		Females		Total	
	Urban area	Rural area	Urban area	Rural area	Urban area	Rural area
Total, including:	1274.4	1276.1	649.0	600.0	903.4	904.5
Infectious and parasitic diseases (A00-B99), including: tuberculosis (A15-A19)	9.0 4.2	9.6 6.7	3.6 1.0	3.3 0.9	5.8 2.4	6.3 3.6
Malignant neoplasms (C00-C97), including:	287.0	282.0	156.1	133.6	204.5	195.6
– stomach (C16)	17.7	19.7	6.3	5.0	10.6	11.3
– colon, anus and rectum (C18-C21)	32.2	27.0	15.6	15.7	21.6	20.5
– trachea, bronchia and lung (C33-C34)	91.9	91.3	24.8	13.5	50.5	47.6
– female nipple (C50)	–	–	22.0	15.6	–	–
– cervix uteri (C53-C55)	–	–	11.0	10.8	–	–
– prostate (C61)	21.2	22.0	–	–	–	–
Cardiovascular diseases (I00-I99), including:	492.4	539.5	285.7	324.2	367.9	418.7
– ischaemic heart disease (I20-I25), including: myocardial infarction (I21-I22)	123.2 72.1	120.5 72.1	53.0 27.8	50.7 25.6	80.5 45.1	81.0 46.4
– cerebrovascular diseases (I60-I69)	122.3	133.5	76.8	89.0	95.0	108.9
– atherosclerosis (I70)	78.3	107.5	60.8	84.4	67.9	94.1
Diseases of the respiratory system (J00-J99), including:	67.8	86.2	33.8	20.0	45.9	46.1
– pneumonia (J12-J18)	36.3	25.7	20.3	9.6	25.9	16.3
– chronic lower respiratory diseases (J40- J47)	28.4	56.0	11.7	8.7	17.8	26.8
Diseases of the digestive system (K00-K93), including:	80.9	49.7	36.0	20.4	55.6	34.6
– liver diseases (K70-K77)	45.3	24.7	16.8	7.1	29.6	15.8
External causes of morbidity and mortality (V01-Y98), including:	102.0	145.8	29.3	33.3	63.0	90.2
– transport accidents (V01-V99)	21.6	40.9	7.0	13.7	14.0	27.5
– intentional self-harm (X60-X84)	23.9	37.1	5.0	6.1	13.8	21.6

**Figure 5.** Standardized death rates of males according to place of residence in Łódź province in 1999-2008 (per 100,000 males)

**Causes of mortality.** The main causes of deaths in the analyzed period in the Łódź province were non-infectious diseases, called civilization diseases. They include: cardiovascular diseases, malignant neoplasms and external causes, i.e. accidents, injuries and intoxications. In 2008, altogether they contributed to 77.3% of female deaths and 71.8% of male deaths. Some other important causes of deaths include: diseases of the respiratory system (4.8% of female deaths and 5.9% of male deaths), diseases of the digestive system (4.4% of female deaths and 5.5% of male deaths). It should be emphasized that infectious diseases contributed to 0.4% of female deaths and 0.7% of male deaths.

The cause of deaths in urban and rural areas differed. Those living in the countryside more often died of cardiovascular diseases and from external causes. In the city, the inhabitants mostly died of malignant neoplasms and diseases of the digestive system (Fig. 6).

Table 3 presents the values of the standardized death rates where the criteria are causes of deaths; it also contains the major disease groups. If the disease contributed greatly to the death rate, the researchers also included a more detailed group division, as well as categories according to ICD-10.

**Figure 6.** Proportional mortality due to the most important causes according to place of residence in Łódź province in 2008

In 2008, the standardized death rate for deaths caused by cardiovascular diseases was 367.9 per 100,000 of city inhabitants and 418.7 per 100,000 of countryside inhabitants. Both in urban and rural areas these diseases pose a threat for men rather than for women. In 2008, the standardized death rate was 70% higher for males from the city, and around 66% higher for males from the countryside. Among cardiovascular diseases, the most common causes of deaths were diseases of the cerebral vessels, ischaemic heart disease (mainly acute myocardial infarction), as well as diseases of the arteries, arterioles and capillaries (mostly including atherosclerosis) (Tab. 3).

Malignant neoplasms, which are the second common causes of deaths, pose a more serious threat for the city inhabitants.

The threat is more visible in the case of women. In 2008, the standardized death rate for deaths caused by malignant neoplasms was 204.5 per 100,000 of city inhabitants and 195.6 per 100,000 of countryside inhabitants (Tab. 3). Both in urban and rural areas malignant neoplasms much more often affected men than women. In men, the most common causes of deaths were tracheal, bronchial and lung neoplasms. The standardized death rate of neoplasm-related deaths did not differ significantly in terms of place of residence: 91.9 per 100,000 males living in the city and 91.3 per 100,000 males living in the countryside. Prostate cancer was another cause of death and the standardized death rate was similar for the city and the countryside (21.2 and 22.0 per 100,000 males, respectively). The male inhabitants of the city rather than in the countryside were much more frequently affected by colon, anal and rectal neoplasms (32.2 vs. 27), whereas stomach neoplasm was a more common reason for death in the countryside than in the city (19.7 vs. 17.7). Among women, differences were more visible in the two places of residence. In the city, women died mostly of tracheal, bronchial and lung neoplasms. In the countryside, these neoplasms occurred only in the third position. The standardized death rate of neoplasm-related deaths in urban areas was 24.8 per 100,000 females, which was more than 83% higher than in the case of women living in the countryside. Also, nipple neoplasm was more common in the city although the difference was not so great. The standardized death rate in the city was 22 per 100,000 females, which was 41% higher than in the countryside. Colon, anal and rectal neoplasms, as well as cervix uteri almost equally often caused deaths in women living both in the city and the countryside.

External causes of deaths constituted the third most important causes and mostly affected males inhabiting rural areas. A huge difference was visible in traffic accidents. They occurred twice more often in rural areas. Suicidal attempts were also more common causes of deaths. The standardized death rate in the countryside was 1.5 times higher than in the city.

The difference in the frequency of deaths caused by respiratory diseases depended on the gender of the subjects. These diseases more often affected males in the countryside rather than in the city, and females from the city rather than from the countryside. The exception was pneumonia. Pneumonia-related mortality was higher in the city and towns, both in males and females.

The death rate for diseases of the alimentary tract was strikingly different in the inhabitants of rural and urban areas. These disease contributed to death much more often in the city. The most significant difference concerned liver disorders. Liver diseases caused deaths in males from the city almost twice more often and in females from the city – more than twice.

As for other causes of deaths, a difference in the frequency of tuberculosis-related deaths in males from urban and rural areas was noted. In 2008, the standardized death rate in the country and was 6.7 per 100,000 inhabitants, and was higher than in the city (4.2 per 100,000 inhabitants).

**Standard Expected Years of Life Lost.** For economic reasons the analysis of premature mortality is an important aspect of general mortality. Premature mortality refers to deaths which happened before the age of 65. In 2008, premature deaths constituted 33% of the total number of

deaths in the city and towns, and 28% of the total number of deaths in the countryside. The problem of premature death is more common for males than females. In the group of males inhabiting urban areas, premature deaths made up 45% of the total number of deaths, compared to 39% in rural areas. Determining which regions are mostly affected by premature deaths is highly important as only then will it be possible to create and implement prophylactic programmes and reasonably allocate money for medical care [66].

Certain methods are becoming more and more useful in evaluation of the state of health. Thanks to them it is possible to calculate premature death in years of time lost. Time lost due to premature death is a function of the death rate and years of life lost in the particular year of life [51]. There are various options for calculations, depending on the adopted life limit [67, 68]. In the Potential Years of Life Lost (PYLL) method the limit is between 60–85. There are hardly any restrictions regarding the choice of the limit, which makes the method not altogether reliable. Another drawback is not considering potential benefits connected with health care, especially aimed at the oldest social groups. The Period of Expected Years of Life Lost (PEYLL) method eliminates the drawbacks of the PYLL method by adopting a local period of expected years of life in each age as the time limit. Thus, it does not arbitrarily adopt an age limit above which deaths are not taken into account in calculations. The PEYLL method has its disadvantage as it cannot be used to make comparisons over a period of time and between populations of various life expectancy. This problem does not concern the Standard Expected Years of Life Lost (SEYLL) method, in which in order to calculate the years lost, expected years of life are adopted. This is accomplished according to the following formula:

$$SEYLL = \frac{\sum_{x=0}^l d_x e_x^*}{\sum_{x=0}^l n_x} \times 1000$$

where:

$d_x$  – the number of deaths at  $x$  age;

$e_x^*$  – expected years of life at each age in the standard population;

$n_x$  – the number of people at  $x$  age.

In the presented study, the years of life in the 15 countries of the former European Union in 2008 was adopted as a standard feature. It is not advisable to use life tables for all the 27 European Union countries since there are huge differences in the life span in particular countries [69]. For the member states of Eastern and Central Europe, the comparison of their life span with the average life span in the former 15 European Union countries may be a good idea as the new member states can become aware of the fact that the state of health in these countries is even worse. It also makes them strive to keep up with the standards of the 15 countries – the 'old' member states.

In 2008, the problem of years lost concerned males of the cities and towns in the Łódź province (Tab. 4). The absolute number was 192,505, which amounted to 253 years of life lost per 1,000 males. In the countryside, the number was 109,753, which amounted to 243 years of life lost per 1,000 males. In the female group, the differences between the inhabitants

**Table 4.** Standard expected years of life lost in 2008 in Łódź province (No. of years and rate per 1,000 inhabitants)

Causes of deaths	No. of years		Rate (per 1,000 inhabitants)	
	Urban area	Rural area	Urban area	Rural area
Men				
Total	192,505	109,753	252	243
Cardiovascular diseases	56,551	34,870	74	77
Malignant neoplasms	39,784	22,553	52	50
External causes	27,389	22,299	36	49
Women				
Total	140,983	63,545	161	138
Cardiovascular diseases	50,114	29,340	57	64
Malignant neoplasms	39,898	16,256	45	35
External causes	8,613	5,421	10	12

of the city and the countryside were bigger than in the male group. In 2008 the number of years of life lost was 140,983 in the city and 63,545 in the countryside. Per 1,000 females, the numbers were 161 and 138 years lost, respectively. Analysis of the SEYLL method proved there are three major groups of factors contributing to the greatest number of years lost. They are diseases of the cardiovascular system, malignant neoplasms and external causes (Tab. 5).

**Table 5.** The most important causes of death in total and potential years of life lost in 2008 in Łódź province

Causes of deaths	Urban area		Rural area	
	Death rates	Potential years of life lost	Death rates	Potential years of life lost
Men				
Cardiovascular diseases	37.8	29.4	43.1	31.8
Malignant neoplasms	23.1	20.7	22.1	20.5
External causes	8.2	14.2	11.0	20.3
Women				
Cardiovascular diseases	49.0	35.5	61.1	46.2
Malignant neoplasms	21.7	28.3	18.0	25.6
External causes	5.9	6.1	3.9	8.5

In the male group, the percentage of potential years of life lost due to diseases of the cardiovascular system was lower than the percentage of deaths caused by other diseases. The difference resulted from the fact that deaths due to cardiovascular diseases (except for acute myocardial infarction) occurred in elderly people. Therefore, the number of years of life lost was relatively small. The percentage of years of life lost due to external causes in comparison with the proportional mortality rate (PMR), also due to external causes, was much higher, especially in rural areas. In the female group, the percentage of potential years of life lost due to malignant neoplasms was much higher than the death rate.

The potential years of life lost indicate that the aim of medical care is to save life, prevent possible complications leading to death if the disease has already developed, and not allow progressing of a disease through early detection. From the economic point of view, prevention is the most effective way of reducing the number of deaths, which contributes to the greatest number of years of life lost.

## DISCUSSION

Different values of death rates show differences in the state of health of the inhabitants of rural and urban areas. The results of studies conducted worldwide are not unequivocal. Prosperity, the level of urbanization and industrialization in various countries influence the state of health of their inhabitants [70]. In Central and Eastern European countries the state of health of the inhabitants of the countryside is worse than that in the city [42, 45, 57, 71, 72]. In most western European countries, Scandinavia and the US there is an opposite trend – those living in the countryside enjoy good health. This mostly concerns the younger social groups [73, 74].

In the countries where rural environment is poor and does not satisfy basic needs, the inhabitants do not enjoy a sense of well-being as much as city inhabitants [75, 76]. An example is a study carried out in Sweden between 1995-1999 on a population of 2.6 million people. It proved there was a close relationship between environmental deprivation and incidence of cardiovascular diseases in males and females [56].

Poland is a country where there has always been a difference in the state of health between inhabitants of the city and the countryside. The latter has been at a disadvantage. Many authors claim the differences are blurring now thanks to access to modern technologies and the fact the lifestyle in the countryside is becoming similar to that in the city. The results of national studies conducted on the state of health of Poles by the Main Statistical Office in 2009 confirm the opinion [62]. One of the studied variables was self-evaluation of an individual's state of health. Many studies carried out worldwide show that the state of health is an important factor for the prediction of mortality, especially in groups of elderly people [77, 78, 79]. According to studies carried out by Main Statistical Office at the end of 2009, inhabitants of the city and the country equally often (34% in each population) claimed that their state of health was good. In a study conducted five years previously, almost 40% of country inhabitants and 38% of city inhabitants expressed such opinions. This proved that the disproportions in the subjective evaluation of the state of health between these two populations is decreasing. However, there are quite big differences in different age groups. Only young inhabitants of the countryside claim that their well-being is better than that of people of the same age living in a city. In the case of older people, city inhabitants rather than country inhabitants state that they feel healthier.

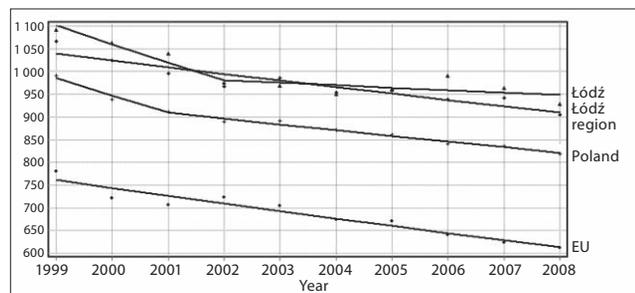
The inhabitants of the Łódź province state they feel worse than an average person from any other region in Poland. In the study carried out by Main Statistical Office, 37% of the respondents claimed their state of health was not satisfactory, and differences between city and country inhabitants are still visible. 36% of city inhabitants and 38.1% of the inhabitants of the countryside negatively evaluated their health state. However, only males contributed to this difference. As for females, there were no differences which might have been connected with a different place of residence. Men from the countryside (35.1%) more often claimed that their state of health state was worse than those living in the city (39.1%).

Analysis of the average life span and the standardized death rates in the Łódź province shows that the countryside is a much more favourable environment for women. In 1999-2009, the inhabitants of the countryside lived longer than

those from the city, with the growth rate being higher in the countryside than in the city. The standardized death rates for women inhabiting rural areas are lower than those inhabiting urban areas. Only cardiovascular diseases (especially cerebrovascular disease and atherosclerosis) and external causes of death are more common causes of death in the countryside than in the city.

In the group of males, the differences in the state of health between inhabitants of the city and country are not so unambiguous. Although the average life span of males living in the countryside in 2009 was slightly longer (by 0.1 year) than the average life span of males living in the city, the growth rate in the city increased higher after 2006. The standardized death rates of males from the countryside are generally higher and they drop only by a mere -0.3% per year). Only malignant neoplasms (especially colon, anal and rectal neoplasms, and to some extent tracheal, bronchial and lung neoplasms), as well as diseases of the digestive system (mostly liver diseases) are more common causes of death of males from the countryside.

Analysis of the rates for the Łódź province shows that women inhabiting rural areas are healthier. Moreover, there are no distinct differences between men from rural and urban areas in terms of state of health. Therefore, the questions arise: Is the Łódź province a more developed area where urban differences, if there are any, are diminishing? Or does the bad state of health of people living in cities, especially in Łódź, bring about such differences? One can find the answer to these questions by comparing the death rates for the city of Łódź with the death rates for the province, Poland, and the European Union (Fig. 7). In all the analyzed areas, a decreasing trend was noted; however, the values of the rates and the pace of that decrease differ greatly. The European Union enjoys the lowest values, whereas Łódź is characterized by the highest.



**Figure 7.** Trends of standardized death rates in the city of Łódź, Łódź province, Poland, and the European Union in 1999-2008 (per 100,000 inhabitants)

Needless to say, social and economic status has always influenced the state of health of an individual [80]. Some formal restrictions connected with financing medical care [81] and proper distribution of its supplies [82] also have an influence on the state of health. Studies conducted in developed countries [49, 83], countries with a centrally-planned economy and post-Communist countries [42, 50, 84, 85], both groups of these countries [86, 87], developing countries [88] or studies on these three types of countries [89, 90] demonstrate that the risk of morbidity and mortality is much higher in people from the lower economic classes, with lower income, and who are less educated.

While comparing the level of education of the city and country inhabitants of the Łódź province, as presented in

National Census of Population and Housing in 2002 [91], it can be concluded that almost half of the city inhabitants (49.5%) have at least secondary education, whereas in the countryside the percentage is only 24.1%. In cities, the number of university educated people was three times higher than in the countryside (almost 12.4%). Also, in the countryside, many of the inhabitants had only elementary education level (48.8%). Among the city inhabitants, only 29.7% of the inhabitants had elementary education.

An average monthly gross salary in Łódź 2011 was 3,143 PLN, which was higher than in the region (3,084 PLN). The fact that the inhabitants of Łódź are better educated and better paid does not correspond to their better state of health. One reason for this is a different lifestyle. Epidemiological studies prove that leading a healthy lifestyle, i.e. not smoking nicotine, following a proper diet and taking exercise result in many benefits [92, 93]. The findings of the Polish National Multi-Centre Health Survey, in which adult inhabitants of the Łódź province were included, indicate that women and inhabitants of villages and small towns lead a healthy lifestyle. The percentage is significantly high. The survey aimed at determining a so-called lifestyle index which included four pro-healthy ways of life: not smoking nicotine, watching weight, consuming a satisfactory amount of fruit and vegetables, and taking frequent exercise. Highly negative results were observed in men from big cities [94, 95, 96]. Potential health benefits which might result from a better education and higher income are overshadowed by a less healthy lifestyle led by men in cities.

## CONCLUSIONS

The inhabitants of rural areas in the Łódź province live slightly longer than the inhabitants of urban areas. This is a consequence of the bad state of health of the city and town populations, and poor state of health state of the inhabitants of the countryside.

People in the countryside more often die of cardiovascular diseases and from external causes, whereas in cities deaths are caused by malignant neoplasms and diseases of the digestive system. It should be emphasized that people in cities die of neoplasms more often than the inhabitants of the countryside. Men die of neoplasms of the colon, anus and rectum, as well as of the trachea, bronchi and lungs. Women, in turn, die of nipple neoplasm.

Analysis of standard expected years of life lost confirms that there are economic and social implications as a result of early deaths. The results obtained in the presented study should be the grounds for adopting some prophylactic procedures which would help to reduce the risk of death, especially in people under 65.

This project was supported by the Medical University of Lodz grant number 503/6-029-07/503-01.

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