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Niwelowanie nierówności w zdrowiu w Polsce w okresie transformacji systemowej

Streszczenie

Cel. Celem pracy jest ocena zmian w umieralności i przeciętnym dalszym trwaniu życia w wieku 0 lat, jakie nastąpiły w wyniku transformacji społeczno-ekonomicznej w Polsce.

Materiał i metody. Dane o zgonach pochodzą z pełnych baz wyjściowych. jakie zostały utworzone dla 1991 i 2002 r. Dane na podstawie których przeprowadzono charakterystykę demograficzną badanej populacji zaczerpnięto z wyjściowych tablic wynikowych Głównego Urzędu Statystycznego w Warszawie i Wojewódzkiego Urzędu Statystycznego w Łodzi. Do oceny wpływu zmian natężenia zgonów w poszczególnych grupach wieku na zmiany $e_{(0)}$ zastosowano metodę J.H. Pollarda. Ponadto w analizie statystycznej posługiwano się wskaźnikami natężenia, struktury i dynamiki, standaryzacją bezpośrednią i testem u. Za punkt wyjścia badań przyjęto 1991 r., w którym odnotowano najbardziej niekorzystną sytuację epidemiologiczną, zwłaszcza w odniesieniu do najważniejszego problemu zdrowotnego, jakim są choroby układu krążenia.

Wyniki. W badanym okresie wskaźnik umieralności ogólnej obniżył się z 14,6 na 1000 osób do 13,0 i w dalszym ciągu był istotnie wyższy od wskaźnika w całym kraju ($p < 0,001$). Wskaźnik umieralności szczegółowej z powodu chorób układu krążenia obniżył się z 775,8 na 100 000 do 518,1. Łączne ryzyko zgonów zmniejszyło się w populacji Łodzi w 2002 r. w porównaniu do 1991 r. i wynosiło 0,892. $E_{(0)}$ zwiększyło się z 73,80 do 76,19 lat w populacji kobiet, a więc o 2,39 lat, a z tego aż 0,71 lat należy przypisać spadkowi umieralności w grupie 65-74 lata. W populacji mężczyzn $e_{(0)}$ wzrosło o 4,1 lat, z 63,96 do 68,06 lat, a 1,03 lat było skutkiem redukcji natężenia zgonów w grupie 55-64 lata.

Wnioski. Postępujący proces transformacji społeczno-ekonomicznej w Polsce sprzyja niwelowaniu różnic w stanie zdrowia. Redukcja umieralności przekłada się na przyrost $e_{(0)}$, w większym stopniu w grupie mężczyzn niż kobiet.

Słowa kluczowe: duże miasto, umieralność, przeciętne dalsze trwanie życia, Polska, transformacja systemowa.

Levelling out health inequalities in Poland during a systemic transition

Summary

Aim. The paper aims at evaluating trends in mortality and life expectancy at birth *(e_0)* which occurred in the consequence of the socio-economic transition in Poland.

Material and methods. The data on deaths come from complete original databases which were created for 1991 and 2002. The data used to calculate the demographic characteristics of the population under study were taken from tables provided by the Central Statistical Office in Warsaw and the Regional Statistical Office in Lodz. In order to assess the impact of mortality changes in each age cohort on e_0 developments, we applied the method proposed by J.H. Pollard. Moreover, in the statistical analysis, we used indices of intensity, structure and dynamics, direct standardisation and a u-test. Our point of departure was 1991, when the most unfavourable epidemiological situation was observed, in particular as far as the most important health problem, i.e. CVD, is concerned.

Results. In the period under study, the overall mortality rate decreased from 14.6 per 1000 population to 13.0, but continued to be significantly higher than the national average ($p < 0,001$). The specific mortality rate due to CVD decreased from 775.8 per 100,000 to 518.1. The total mortality risk declined in the Lodz population in 2002 compared to 1991 and amounted to 0.892. E_0 increased from 73.80 to 76.19 years among females, i.e. by 2.39 years, out of which as much as 0.71 years may be attributed to mortality reduction in the age cohort of 65-74. Among males, e_0 grew by 4.1 years, from 63.96 to 68.06 years, and 1.03 years was a result of mortality reduction among those aged 55-64.

Conclusion. The ongoing process of the socio-economic transition in Poland contributed to reducing disparities in the health situation. The reduction of mortality is reflected in e_0 growth, to a higher extent among males than females.

Key words: post-industrial city, mortality, life expectancy, Poland, systemic transition.

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INTRODUCTION

Data on mortality constitute important information about natural movement within populations as well as about their health situations. They are the most credible secondary data source used to analyse the health status of big populations. Changes in mortality have a long-term and gradual character. Therefore, in order to capture the direction of changes within the dynamics of this phenomenon, relatively long periods of time (of at least several years) should be taken into account. Thus it is justified to devote a special place to this indicator in our study aiming to evaluate the population health situation change during 11 years of a socio-economic transition in Poland.

Numerous studies point out that the health situation of the population of the Lodz region, and its capital Lodz in particular, is considerably worse compared to that of the entire Polish population [1-5]. That is why we will present comparisons with Poland while depicting mortality changes in Lodz.

MATERIAL AND METHODS

Data on mortality in Lodz come from complete electronic databases which were created for 1991, and 2002. The first database has 12,175 data entries, and the second one – 10,182 data entries. They are coded in MS Excel according to the following variables: sex, age, original death cause. The primary death cause was coded in 1991 according to the 9th Revision of the International Statistical Classification of Diseases and Health Problems. With the use of these databases, a series of output tables were constructed, some of which are presented in this paper.

Data on mortality in Poland were taken from the databases of the Central Statistical Office and from the WHO databases. The part of our research concerning the demographic characteristics of the population, in particular the ageing process, draws on the original data tables provided by the Regional Statistical Office in Lodz and the Central Statistical Office in Warsaw.

Our statistical analysis is made with the use of the following measures: overall and specific mortality rates in order to access the intensity of the studied phenomenon, proportional mortality rates according to analysed variables, dynamic indices, the u-test for two frequencies in order to verify hypotheses on differences and the direct standardisation method [6, 7].

The Pollard's method was applied to estimate the impact of mortality changes in various age groups on life expectancy at birth changes in the period 1991-2002.

The simplest formula showing the gain in lengthening life expectancy at birth e_0 in the period from t to $t+n$, due to the reduction of mortality among people aged x, proposed by J.H. Pollard, is as follows:

$$e_0^{t+n} - e_0^t = \int_0^{\infty} (\mu_x^t - \mu_x^{t+n}) m_x dx,$$

where:

μ_x – intensity of mortality at the age of x; m_x – weights equal to:

$$m_x = \frac{l_x^{t+n} e_x^t + l_x^t e_x^{t+n}}{200000},$$

where:

l_x – the number of persons surviving until for age of x.

Since the mean intensity of mortality is almost equal to the mortality rate, these indicators are used for separate age categories.

RESULTS

Lodz is a regional capital city situated in central Poland. Its surface is 204.4 km^2. It is divided into 5 districts. In the period 1991-2002, due to the city population decline, the population density measured by the number of inhabitants per 1 km^2 fell from 2836 to 2647. The number of Lodz inhabitants in 1991 amounted to 834,779 and in 2002 – 782,640. It is worth noting that the population of Poland in 2002 amounted to 38,232,201 and was smaller compared to 1991 by 0.20% (i.e. by 76,899 inhabitants). The dynamics of the decline of Lodz population was therefore over 30 times higher in the same period, as the number of city inhabitants decreased by 6.26% (i.e. by 52,239 people). These changes stemmed to large extent from the fall of live births.

The live birth rate in Lodz in 1990 was 9.0, whereas in 2002 only 7.0. As for Poland, it was respectively 14.3 and 9.3. The decline of live births is a consequence of fertility rates decline. In 2002 those rates were very low in Lodz, as the fertility rate per 1000 women aged 15-49 was 26.7 and the mean number of children born by 1 woman was 0.975. For the sake of comparison, these rates for Poland were respectively 35 and 1.249. According to several demographers, they became so low that never before in the history of our country had such a low level been recorded [8-10].

Due to the dynamic decline of the birth rate the natural growth rate fell both in Lodz and in Poland. The situation in this domain was the worst in Lodz, where the significant decline of birth rates was accompanied by high overall mortality rates, which resulted in a negative natural growth rate already in 1985 (-0.7 per 1000 inhabitants). The situation deteriorated until 1999 (-7.0). Then the process slowed down. In 2002 the natural growth rate amounted to (-6.3‰). In Poland as a whole, the negative natural growth rate (-0.1‰) was recorded in 2002 for the first time (Table 1).

The processes of decline of birth rates together with lengthening life expectancy caused changes in the age structure of the Lodz population. There was a notable decrease of the number of the youngest inhabitants, being 0 to 14 years old, from 151,932 (18.20%) in 1991 to 87,905 (12.52%) in 2002. It contributed to the increasing share of the oldest

TABLE 1. Natural growth rate in Lodz and in Poland in the period 1975-2003 (per 1000 population).

Place	1975	'80	'85	'90	'95	'96	'97	'98	'99	'00	'01	'02	'03
Lodz	+2.8	+2.0	-0.7	-4.8	-6.6	-6.5	-6.7	-7.1	-7.6	-7.0	-6.7	-6.3	-6.2
Poland	+10.2	+9.6	+7.9	+4.1	+1.2	+1.1	+0.9	+0.5	0.0	+0.3	+0.1	-0.1	-0.4

Source: data provided by the Regional Statistical Office in Lodz and the Central Statistical Office in Warsaw

category (65 years old and over) in the city population from 13.98% to 16.67%. Nevertheless, there was also another factor contributing to this phenomenon, namely the growth of this age cohort in absolute terms, from 116,716 in 1991 to 130,409 in 2002. The process of population ageing was more pronounced in Lodz than in the whole country [11-14], as the percentage share of people aged 65 and over in Poland in the years under study was respectively 10.3 and 12.8.

While studying population forecasts for Lodz and for Poland, it strikes that the ageing process will accelerate and in 2030 almost every third Lodz inhabitant (29.45%) and almost every fourth Pole (23.83%) will fall into the age category of 65 and over.

The dynamics of population ageing in Lodz is reflected in statistical indicators.

TABLE 2. The median value and the age quartiles of the population of Lodz and of Poland in the years under comparison.

Measures	1991			2002		
	Total	Men	Women	Total	Men	Women
			Lodz			
Me	38.43	36.52	40.16	42.47	39.21	45.14
Q_1	20.36	18.41	22.67	23.71	22.05	25.35
Q_3	55.99	51.92	58.99	57.05	53.73	60.35
			Poland			
Me	32.46	30.90	34.07	35.73	33.94	37.55
Q_1	15.30	14.55	15.17	19.10	18.32	19.92
Q_3	50.12	47.08	52.99	52.82	50.77	54.97

Source: own calculations

In 1991, the medium age was 38.45, whereas every fourth inhabitant was below 20 (Q_1 = 20.36) and a quarter of the population was over 55 (Q_3 = 55.99). Those measures were higher for males than for females by several points, which was connected to a higher female life expectancy and their overwhelming majority in the city population. In 2002.a half of Lodz inhabitants had already turned 42 (M_e = 42.47) and every fourth person was over 57 (Q_3 = 57.05).

The difference between the median age value for females (45.14) and males (39.21) increased. The comparison of the median values and age quartiles of Lodz inhabitants in two points of time with respective measures of age of the entire Polish population is unfavourable for our city both for males and for females. It is worth noting that in 1991, a half of the Polish population was younger than 32 (M_e = 32.46) and in 2002 below 35 (M_e = 35.73).

Having reviewed the changes in percentage shares of people aged 65 and over in the entire population as well as situation measures (the median value and quartiles) in the period under study, we carried out an in-depth analysis of the ageing process of the Lodz population. Therefore, we applied: the old-age index (the quotient of the number of inhabitants aged 65 and over to the number of inhabitants aged 15-64) and the demographic ageing index [15-18].

The demographic ageing index is expressed by the following formula:

$$I_{da} = \{S(0\text{-}14)_t - S(0\text{-}14)_{t+n}\} + S(\geq 65)_{t+n} - S(\geq 65)_t\}$$

where $S(0\text{-}14)_t$ – share of people aged 0-14 at the beginning of the period under study, $S(0\text{-}14)_{t+n}$ – share of people aged 0-14 at the end of the period under study, $S(\geq 65)_t$ – share of people aged 65 and over at the beginning of the period under study, $S(\geq 65)_{t+n}$ – share of people aged 65 and over at the end of the period under study.

The essence of this indicator is the fact that it takes into account simultaneously the direction of changes taking place in the youngest and in the oldest age categories. The balance of these changes determines the ultimate direction of population ageing. The higher the indicator, the more dynamic the ageing process of the population.

Having put actual figures into the formula [(8.20 – 12.520 + (16.67 – 13.98) = 5,68 + 2,69 = 8.37], we calculated this indicator and obtained a positive of 8.37, which means a dynamic ageing process in the population under study.

TABLE 3. The dynamics of the old-age index and the demographic burden index in Lodz in the period 1991-2030.

Year	Old-age index value		Demographic burden index	
	value	1991 = 100	value	1991 = 100
1991	76.82	100.00	20.62	100.00
2002	133.20	173.39	23.53	114.11
2010	160.81	209.33	24.45	118.57
2015	199.46	259.65	29.96	145.30
2020	248.70	323.74	38.58	187.10
2025	297.14	386.80	45.73	221.77
2030	335.95	436.80	47.68	231.23

Source: own calculations

Table 3 shows old-age and demographic burden indices in the period under study as well as those based on demographic forecasts for Lodz. Particular attention should be paid to the high value and dynamics of growth of the old-age index of our city population. For the sake of comparison, it is worth noting that the old-age index for the entire Polish population was almost twice as low as in Lodz and amounted to 41.34 in 1991 and 70.30 in 2002. The indices of burden imposed on the population aged 15-64 by the elderly are also characterised by a growing dynamics and take considerably higher values in Lodz than in Poland – respectively 20.62 and 23.53 in the year under study compared to 15.88 and 18.37 in Poland.

On the basis of our analysis, we may infer that the Lodz population is undergoing the first phase of ageing, which is characterised by a growing percentage share of elderly people, especially those belonging to the 'young old' category, i.e. being 65-74 years old. As we can easily notice on figure 2, this kind of situation will remain until 2020. Afterwards, there will happen the second stage of the ageing process, which is characterised by a further increase of the percentage share of the elderly, but particularly those subpopulations that are called the 'old old', i.e. being 75 years old and over. The reason for this phenomenon is a significant decrease of mortality among the elderly and the very old apart from the natural cohort factor [19, 20].

Since the socio-economic status determines to a large extent the health status, and one of its main indicators is in

our opinion the education level, it seems justified to conduct an analysis of the situation in this regard in the population under study. For the sake of methodological clarification, we need to point out that Polish routine demographic statistics do not contain data on the education level on an annual basis, but they are only collected during National Censuses [21]. This is why data presented in table 4 concern 1988 and 2002.

TABLE 4. The education level of the Lodz population aged 15 and over in 1988* and 2002.

Education level	1988		2002	
	thous.	%	thous.	%
tertiary	71.7	10.4	100.8	14.6
secondary	227.3	32.8	274.0	39.6
vocational	117.6	17.0	114.1	16.5
primary	247.0	35.6	164.6	23.8
primary non completed**	29.4	4.2	38.0	5.5
Total	693.0	100.0	691.5	100.0

* data from the National Census
** and without any education and with no determined level of education

Source: own calculations on the basis of (15)

In the entire adult population of Lodz inhabitants, a significant improvement of the education level was recorded in the period under study. We should notice that in 1988 only 10.4% of the city inhabitants had graduated from a university or another tertiary education institution and 32.8% had completed the secondary school, while in 2002 these shares grew respectively to 14.6% and 39.6%. The share of those having only a primary education decreased significantly from 35.6% to 23.8%. If we want to compare this situation to the entire country, the data are as follows: for 1988: 6.5% – tertiary education, 24.6% – secondary, 23.6% – vocational, 38.8% – primary and none; for 2002: 9.2% – higher, 31.0% – secondary, 29.0% – vocational, and 31.8% – primary and none.

Due to the ongoing socio-economic changes in the period under study in a typical industrial city as Lodz at that time, together with the introduction of market mechanisms into the economy, there appeared a serious problem of unemployment, which had an unfavourable influence on the situation of the inhabitants. In 1991, there were 72,647 unemployed people registered in Lodz. Their number attained 65,137 in 2002 with the unemployment rate of 18.8%. The unemployment rate is calculated as a quotient of the number of those unemployed who are registered in the offices to the number of those professionally active**.** It may be compared to the unemployment rate in the entire Lodz region (15.4% in 1991 and 20.7% in 2002) and in Poland (11.4% and 20.0%).

In 2002, 10,182 Lodz inhabitants died, i.e. fever by 1993 persons (16.37%) than in 1991, when there were 12,175 deaths. At the same time, the difference in the number of deaths in Poland amounted to 44,465, i.e. 11% (there were 403,951 deaths in 1991 and 359,486 in 2002).

Table 5 shows the dynamics of the overall mortality rate, which was 14.6 per 1000 inhabitants in 1991 and was the highest in the entire country. In 2002, this index was 13.0 per 1000 population and continued to be a national 'leader'.

TABLE 5. The dynamics of overall mortality in Lodz and in Poland in the period 1991-2002 rate per 1000.

Year	Lodz		Poland	
	rate per 1000	1991 = 100	rate per 1000	1991 = 100
1991	14.6	100.00	10.5	100.00
1992	14.3	97.95	10.3	98.10
1993	14.2	97.26	10.2	97.14
1994	14.2	97.26	10.0	95.24
1995	14.1	97.26	10.0	95.24
1996	13.9	96.57	10.0	95.24
1997	13.9	95.21	9.8	93.33
1998	13.9	95.21	9.7	92.38
1999	14.3	97.95	9.9	94.29
2000	13.8	94.52	9.6	91.43
2001	13.8	94.52	9.5	90.48
2002	13.0	89.04	9.4	89.52

Source: own calculations on the basis of the Regional Statistical Office in Lodz and the WHO database

The dynamics of the decline of this index was similar to that in Poland, although the latter was considerably lower and amounted to 10.5‰ and 9.4‰ in the years under study. The differential of 4.1‰ in 1991 between Lodz and Poland decreased to 3.6‰ in 2002.

For those aged 65 and over, there were 64.05% of all deaths in 1991 and 69.51% in 2002; among males, it was respectively 52.69% and 58.38%; among females – over 3/4 (76.31%) in 1991 and 4/5 (80.54%) in 2002.

Due to the more advanced ageing process of the Lodz population than of that of Poland, in order to assess the changes of overall mortality conditioned by the health status and not the demographic situation, we carried out direct standardisation. The standardised rates are much lower than the real ones in general population, among males and among females. The differential between Lodz and Poland fell from 1.2‰ in 1991 to 0.8‰ in 2002. However, overall mortality rates in Lodz continue to be higher than in Poland, in a statistically significant way at the level of $p < 0.001$, which was verified by a u-test.

It is evidence for our hypothesis that the health situation of Lodz inhabitants is worse than of Poles, as the mortality rates are its most negative measures.

We would like to observe that due to the epidemiological transition, the impact of infant mortality on overall mortality was negligible, as in 1991 only 110 children died in their first year of life in Lodz, which constituted 0.9% of all deaths (the infant mortality rate was 14.2 per 1000 live births), and in 2002 – 60, i.e. 0.6% of all deaths (the infant mortality rate was 11.0 per 1000 live births). In Poland, in the years under study, there were respectively 9.9 thousand infant deaths, which constituted 2.4% of all deaths, and 2.5 thousand, i.e. 0.75% [22].

It is common knowledge that non-communicable diseases are the main cause of mortality at present. In particular, CVD, cancer, accidents, injuries and intoxication are con-

sidered to be the most important health problems. This hierarchy also applies to our country and the city of Lodz, although in 2002 the external death causes in the general population of Lodz were slightly (by 0.15%) surpassed by respiratory system diseases and by the digestive system disease (by 0.6%).

To sum up the changes in overall mortality we calculated the changes of mortality risk in the period under study. These calculations reflect well the ongoing changes in mortality and are particularly useful if we want to compare the situation in two distant points of time [23]. If the obtained value was 1, it would mean that no changes have occurred; values below 1 indicate favourable evolution of the health situation assessed with the use of mortality rates, whereas values over 1 – such as we obtained for male mortality in the age categories 5-14 and 95 and over – inform us about unfavourable changes in this respect.

The total mortality risk decreased in the Lodz population in 2002 compared to 1991 and amounted to 0.892; to a greater degree among males (0.862) than females (0.925). The interpretation of the overall mortality risk in each age category (figure 1) confirms the positive changes in the health situation of Lodz inhabitants which occurred during 11 years of the socio-economic transition.

TABLE 6. The change of death risk in all age categories in Lodz from 1991 to 2002.

Age	Mortality risk			CVD mortality risk		
	Total	Men	Women	Total	Men	Women
0-4	0.782	0.814	0.744	x	x	x
5-14	0.852	1.031	0.545	x	x	x
15-24	0.644	0.583	0.791	0.432	0.290	0.864
25-34	0.614	0.625	0.538	0.569	0.784	0.136
35-44	0.722	0.725	0.708	0.460	0.439	0.519
45-54	0.774	0.767	0.810	0.537	0.497	0.668
55-64	0.723	0.685	0.767	0.511	0.502	0.505
65-74	0.788	0.818	0.775	0.575	0.594	0.569
75-84	0.705	0.724	0.693	0.506	0.516	0.501
84-94	0.930	0.880	0.944	0.679	0.589	0.710
95+	1.013	1.158	0.985	0.705	1.076	0.662
Total	0.892	0.862	0.925	0.668	0.632	0.699

Source: own calculations

In order to answer the question to what an extent the reduction of mortality in each age category contributed to the increase of life expectancy at birth in the population under study, we carried out some calculations based on the Pollard's method (Table 7)

As it may be noticed, out of the selected age categories, it is the female mortality decline at the age of 65-74 that had the greatest influence on the growth of the female life expectancy at birth. In the period 1991-2002, female e_0 increased from 73.80 to 76.19, i.e. by 2.39 years, out of which 0.71 years i.e. almost 30% is due to the fall of mortality in the age category 65-74. Among males, the mortality changes in this age group were not so beneficial, but they were considerable all the same. We can see that if we compare the

TABLE 7. The impact of mortality changes on e0 in Lodz in the period 1991-2002.

Age	e_0 increase	
	Men	Women
0	0.23	0.23
1-19	0.25	0.15
20-34	0.45	0.17
35-44	0.60	0.30
45-54	0.67	0.26
55-64	1.03	0.37
65-74	0.57	0.71
75+	0.30	0.21
Total	4.10	2.39

Source: own calculations on the basis of data provided by the Regional Statistical Office in Lodz.

life expectancy increases achieved thanks to the reduction of mortality in the age groups: 20-34 and 35-44 with that among 65-74 years old Lodz inhabitants. The male e_0 grew from 63.96 to 68.06, i.e. by 4.1 years out of which 0.57 years, i.e. almost 14% is the result of mortality changes in the age category 65-74. Nevertheless, the greatest impact on male e_0 growth was attributed to the decline of mortality among those who are 55-64 years old.

Despite positive trends in the health situation of the Lodz population in the analysed period of a socio-economic transformation, the inequalities in relation to the entire Polish population were not removed, which is expressed in life expectancy differentials. Bridging the gap in this regard with other European Union member states will require much more time (Figure 1).

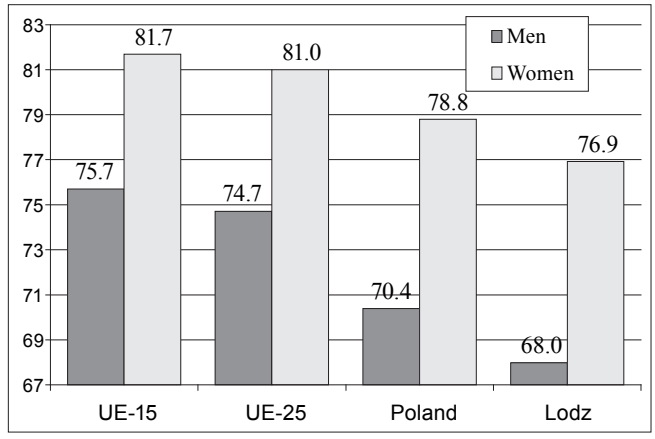

FIGURE 1. The comparison of life expectancy at birth in Europe, Poland and Lodz in 2002.
Source: own calculations

DISCUSSION

Health situation inequalities between East and West as well as between social groups within countries may be determined by the same factors. In their studies comparing mortality and life expectancy in various parts of Europe,

M. Bobak and M. Marmot [24, 25] underline that the changes of these important health measures were connected with gross domestic product and population income trends, although these conditions have a multifactor and complex character. During the recent 30 years, the growing divide between Central and Western Europe in mortality patterns was mainly due to chronic diseases of adults. For instance, in 1992, the differential in life expectancy at birth between Central and Eastern Europe and the rest of our continent was 6.06 years, out of which 3.28 years could be attributed to the higher share of deaths caused by CVD. It should be added that at that time, there was a differential of eight times in infant mortality between the worst-performing countries in the East and the best-performing countries in the West, but it accounted for only 15% of the life expectancy differential.

Forty three (43%) of this differential could be attributed to deaths at the age of 35-64, and 23% to those over 65. The cited authors emphasise that there is no simple explanation of the described differences in mortality between the countries of Eastern and Western Europe. High mortality rates due to CVD, especially the ischaemic heart disease, and to external causes, and low self-rated health indicate that such societies as Polish were suffering from serious socio-economic problems, which was reflected in the predominant lifestyle (diet, smoking). It was determined first of all by education, income, availability of consumption goods and health-care quality. Furthermore, some influence could be exerted by a lack of control over one's health, which was connected with the external locus of control in their social environment.

Another analysis of mortality patterns over 50 years in the most affluent world economies (Canada, France, Germany, Japan, USA, Italy and UK) shows that the resources devoted to reducing mortality rates are constantly growing, but the effectiveness of each additional unit of these resources diminishes [26]. One of the reasons is the fact that the death causes are becoming more and more complex. That is why it is impossible to achieve such effects as in the past, e.g. vaccination and the reduction of mortality due to communicable diseases. The epidemiological situation in those countries where the key role in mortality is played by CVD and cancer, gives rise to justified problems of forecasting life expectancy, which was lengthened considerably in the previous, 20th century.

The efforts to level out health situation inequalities should be focused both on promoting healthy lifestyles and on ameliorating socio-economic conditions [4]. An excellent example of the impact of the socio-economic situation on mortality and life expectancy has been the situation in Poland. It should be reminded that in the period 1931-1991 e_0 in Poland rose by 18.5 years among males and by 24.9 among females.

In the period 1950-1975, life expectancy increased very quickly among both genders (by 9 years among males and 11 years among females). In the eighties, there was a significant deterioration of male life expectancy and a stagnation for females. This unfavourable situation continued in the first years of economic reforms in our country, i.e. from 1989 to 1991. Then the male life expectancy fell to 66.1 years and was lower than at the beginning of 1970s and at the same level as during the economic crisis of 1980s. The female life expectancy in 1991 amounted to 75.3 years, which was similar to the beginning of 1980s. In the period 1992-1993, there started a quick recovery, which lasts until now. Until 1993, the biggest gain in life expectancy could be attributed to the reduction of infant mortality. It was 1.5 years for males and 1.3 years for females, whereas the age categories 1-4 and 5-9 brought about a gain of only 0-13 years. It should be emphasised that a considerable impact on female life expectancy growth by 0,5 years in the period 1971-1993. It is interesting that the impact of age categories 20-49 and 50-64 was insignificant in this period and amounted to 0.2 years only. For males, all age groups between the age of 20 and 80 had a negative impact on the life expectancy at birth. The highest number of life years lost was recorded in the age groups 50-64 and 20-49 and amounted to 1.1 and 1.8 years respectively in 1993. As a result, the differential between females and males grew from 6.8 years in 1970 to 8.5 years in 1993. It attained the maximal value of nearly 9 years in 1991 [5].

If we compare standardised mortality rates for 1989-1993 in the spatial dimension, we will notice that the Lodz region always had higher values than average, i.e. in the interval 11.9-13.2 deaths per 1000 males and 10.2-11.9 per 1000 females. For the sake of comparison, the mean standardised mortality rates in Western Europe at that time was at the order of 8 deaths per 1000 people. Since three groups of mortality determinants are usually distinguished, i.e. the socio-economic status, living and working conditions, and the lifestyle, we should look for explanations for the unfavourable health situation in the Lodz region compared to other Polish regions taking into consideration these factors. Unemployment, urbanisation and pollution of the environment, are positively correlated with mortality, but only 25% of the territorial variance of mortality in Poland could be ascribed to them in 1993. In our opinion, our research results may complement this analysis, because the application of the Pollard's method enabled an assessment of the impact of mortality changes on the life potential of a newborn. This allowed us to evaluate the situation taking into account mortality and life expectancy changes in Lodz in the period 1991-2002, when positive development in the health situation occurred.

We found out that relatively insignificant e_0 increases stemmed from the reduction of infant mortality. Among both genders, they were identical and amounted to 0.23 years. For a long time, it had been the decline of mortality among the youngest that had the greatest influence on life expectancy trend. Further reduction of mortality happens more and more slowly. However, the reserves in this regard are still considerable, which is visible in international comparisons of this important health situation indicator [15, 27]. It is crucial to realise that taking into account the ageing process of the population, one should look for these reserves to reduce mortality in the post-productive age cohorts, especially among the young old.

CONCLUSIONS

1. The ongoing process of the socio-economic transition in Poland contributes to eliminating health situation inequalities. It is evidenced by the favourable changes in mortality reduction which occurred from 1991 to 2002

in Lodz, which was an industrial city characterised by the worst health and demographic situation in the entire country.
2. We proved an important impact of the reduction of mortality in the young old subpopulation on $e_{(0)}$ increase.
3. The advancing process of population ageing gives rise to new challenges for public health policies, as the demand for certain types of medical services is bound to grow dramatically.

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