

# Sławomir Kurek

---

## The population ageing process against vital statistical changes in Polish towns

---

Bulletin of Geography. Socio-Economic Series nr 3, 83-95

---

2004

Artykuł został opracowany do udostępnienia w internecie przez Muzeum Historii Polski w ramach prac podejmowanych na rzecz zapewnienia otwartego, powszechnego i trwałego dostępu do polskiego dorobku naukowego i kulturalnego. Artykuł jest umieszczony w kolekcji cyfrowej [bazhum.muzhp.pl](http://bazhum.muzhp.pl), gromadzącej zawartość polskich czasopism humanistycznych i społecznych.

Tekst jest udostępniony do wykorzystania w ramach dozwolonego użytku.

ŚLAWOMIR KUREK

---

PEDAGOGICAL UNIVERSITY IN CRACOW

## THE POPULATION AGEING PROCESS AGAINST VITAL STATISTICAL CHANGES IN POLISH TOWNS

**ABSTRACT.** The article aims at the presentation of population ageing process in Polish large towns (over 100,000 inhabitants) on the background of changes in vital statistics (birth, death and natural increase rates) with reference to medium and small towns. The period of research comprises years 1988, 1995 and 2001. Shares of population have been analysed, as well as their changes in four age groups (0–19, 20–39, 40–59 and above 60). On the basis of analysed issues of population age structure and vital statistics correlation coefficients between mentioned variables were calculated.

**KEY WORDS:** age structure, population ageing, Polish large towns, vital statistics

The age structure of the population, while being a significant factor conditioning the intensity of demographic processes, is on the other hand a synthetic image of past processes. Changes in the age structure resulting in the population's ageing or rejuvenation are conditioned by several demographic and socio-economic factors. Direct factors include the birth rate, death rate and population migration (Rosset, 1959; 1967, Legare, 1993; Betts, 1998; Kinsella, 2000).

As concerns the natural dynamics, the intensification of births has the most direct impact on the level and dynamics of population ageing (Keyfitz, 1968, Frątczak et al. 1987). The increase in the number of births results in the increased share of children, and thus leads to a fall in the share of the oldest population group. In turn, the fall in the number of births leads to a decreased share of the youngest age groups, and thus to the ageing of the population through the increased share of the oldest group, while the impact of the mortality rate (with a stable ratio of infant mortality) has not been clearly defined (Stokowski, 1968;

Caselli, 1990). Depending on the intensity of deaths in particular age groups, the changes in mortality may either hinder or trigger the population's ageing process. If infant mortality is reduced, the share of the younger age group becomes larger. A drop in the mortality rate for this age group, therefore, causes a decrease in the share of the oldest population group. A decrease in mortality in older age groups, however, results in the increased share of the oldest population, which leads to the ageing of the population.

This article aims to present the population ageing process in large towns against changes in vital statistics (births, deaths and natural growth) with reference to medium and small towns. The period of research comprises the years 1988, 1995 and 2001. Large towns included units with over 100,000 inhabitants, medium towns 20,000 to 100,000 inhabitants and small towns populations below 20,000 (according to statistics of 31.12.2001). The administrative division binding at that time was accepted for each investigated year.

As regards age structure, Polish towns in the period 1988–2001 were characterised by a decrease in the fraction of the population aged 0–19 from 31.9 to 24.6 percent and the increase of the percentage of population aged 60 and over from 13.1 to 16.6 percent, which proves the ongoing process of demographic ageing. A reflection of the changes in relations between those extreme population age groups is the dependency ratio and if in 1988 there were 41 people aged 60 and over to every 100 people aged 0–19, then in 2001 the value of this ratio increased to 66 persons. Also the population group in productive age grew older. Assuming as the younger productive group the fraction of the population aged 20–39, a decrease from 32.4 to 29 percent was observed in this group, while the older productive group (aged 40–59) increased from 22.6 to 22.9 percent. The changes in all groups mentioned above are best illustrated by the Wsd index (Długosz, 1998), which, in the two investigated periods of 1988–1995 and 1995–2001 had positive values (changes concerning population ageing). Nonetheless, the index decreased in value from 11.5 to 10 points, which can be interpreted as insignificant slowing down of the pace of population ageing in towns.

Taking into consideration the trends in the vital statistics in towns in general, what is noticeable is the decrease in birth rate from 13.9 to 8.6 percent in the period being studied. A similar decrease is shown by the natural growth index, which in 1988 amounted to 4.6 percent and in 2001 recorded a negative value (-0.4 percent). The death rate, however, recorded little decrease from 9.3 to 9.0 percent, remaining at a stabilised level during the investigated periods. What should be stressed, nevertheless, is the slowing down in the pace of the decrease in fertility in 1995–2001 (from -4.2 to -1.1 promille points) and the slowing down of natural loss (from -4.2 to -0.8 promille points).

In 1988 towns of over 100,000 residents, against medium and small towns, were characterised by the lowest fraction of youth (aged 0–19), the lowest birth rate and natural growth, the highest level of deaths and the highest fraction of

the old and the older productive population (Tab. 1 and 2). In the case of the younger productive population, its percentage was as high as in medium towns and higher than in small towns, which was connected with the immigration of the young labour force to larger centres at that time. The elderly-youth dependency ratio in large towns was 14 points higher than in medium towns and 12 points higher than in small towns. Medium and small towns were then characterised by a similar level of age indexes and vital statistics, having had a younger and demographically more dynamic population.

Table 1. The population age structure in Polish towns

TYPE OF TOWNS	0-19			20-39			40-59			60+		
	1988	1995	2001	1988	1995	2001	1988	1995	2001	1988	1995	2001
Large	29.4	27.2	22.7	32.5	28.8	29.0	23.9	27.7	30.3	14.2	16.4	18.1
Medium	34.1	31.7	26.4	32.5	29.1	29.1	21.7	26.2	29.7	11.6	13.1	14.9
Small	34.9	32.5	27.6	31.8	29.1	29.0	20.7	24.7	28.5	12.6	13.8	14.9
Towns total	31.9	29.6	24.6	32.4	28.9	29.0	22.6	26.6	29.9	13.1	14.8	16.6

Source: GUS, Warszawa

Table 2. The state of population ageing and vital statistics in Polish towns

TYPE OF TOWNS	THE AGEING INDEX			THE BIRTH RATE			THE DEATH RATE			NATURAL GROWTH RATE		
	1988	1995	2001	1988	1995	2001	1988	1995	2001	1988	1995	2001
Large	48.3	60.2	79.7	12.3	8.7	8.0	9.7	9.9	9.6	2.6	-1.2	-1.6
Medium	34.1	41.4	56.2	14.9	10.5	8.9	8.4	8.7	8.3	6.5	1.8	0.6
Small	36.1	42.4	54.2	15.4	11.1	9.7	8.7	9.0	8.9	6.7	2.0	0.9
Towns total	41.0	50.0	66.0	13.9	9.7	8.6	9.3	9.4	9.0	4.6	0.4	-0.4

Source: GUS, Warszawa

In 1995 large towns still had a low percentage of youth and high percentage of older population. The elderly-youth dependency ratio increased to 60 persons, exceeding the values for other categories of towns by nearly 20 points. Small differences were observed in the case of the younger productive population; however, large towns recorded the lowest percentage. A large drop in births led to negative natural growth in large towns, while in other towns this growth was positive. The analysis of changes of the indexes mentioned above in 1988-1995 showed the fastest progress of the population ageing process measured

by the Wsd index while the pace of birth and natural growth decrease was lower than in medium and small towns (Tab. 3). The death rate recorded an insignificant increase in all categories of towns but the lowest increase was recorded in large towns.

Table 3. The changes in population ageing and vital statistics in Polish towns

TYPE OF TOWNS	1988–1995				1995–2001			
	WSD	U	Z	PN	WSD	U	Z	PN
Large	12.0	-3.6	0.2	-3.8	8.6	-0.8	-0.3	-0.4
Medium	11.8	-4.5	0.3	-4.7	10.6	-1.5	-0.4	-1.2
Small	10.3	-4.3	0.3	-4.6	10.0	-1.3	-0.2	-1.2
Towns total	11.5	-4.2	0.1	-4.2	10.0	-1.1	-0.3	-0.8

Source: GUS, Warszawa

In 2001 the level of the demographic ageing of towns with over 100,000 residents was still the highest, while the elderly-youth dependency ratio amounted to nearly 80 persons exceeding other units by 25 points. The population aged 20–39 was characterised by an almost identical percentage in all categories of towns. The level of population ageing in medium and small towns was still similar while if in 1988 and 1995 the elderly-youth dependency ratio in small towns was higher than in medium ones, this situation was reversed in the last period under study. It is also indicated by the Wsd index that the highest value in the period of 1995–2001 was just recorded in medium towns. In large towns, however, the slowing down of the pace of population ageing was observed, which is manifested by the lowest Wsd index level. In the case of vital statistics, large towns were distinguished by natural loss of the population but the differences in the level of births and the natural growth rate decreased. A small decrease in the intensity of deaths occurred in all types of towns.

Taking into account particular towns with at least 100,000 inhabitants the decrease of the population number in the periods under study should be noted. If in the period 1988–1995 the increase in population was observed in 27 large towns, then only 12 such towns were noted in the period dating 1995–2001 (Tab. 4). In the first period the highest increase was recorded in Rzeszów, Płock, Koszalin, Olsztyn, Białystok (over 5 percent) and the population decline was characterised by large centres (Warsaw, Łódź, Krakow, Poznań, Gdańsk) and the towns of Upper Silesia.

## THE POPULATION AGEING PROCESS AGAINST VITAL STATISTICAL CHANGES...

Table 4. The population growth in large towns

TOWNS	THE POPULATION NUMBER			THE DYNAMICS INDEX	
	1988	1995	2001	1988-1995	1995-2001
Białystok	264,309	278,489	286,365	105.4	102.8
Bielsko-Biała	178,392	180,397	179,016	101.1	99.2
Bydgoszcz	377,855	386,056	383,213	102.2	99.3
Bytom	227,917	226,810	200,244	99.5	88.3
Chorzów	134,138	125,226	119,543	93.4	95.5
Częstochowa	255,577	259,135	254,348	101.4	98.2
Dąbrowa Górnicza	134,236	130,448	129,748	97.2	99.5
Elbląg	123,932	128,605	130,081	103.8	101.1
Gdańsk	464,058	463,019	455,464	99.8	98.4
Gdynia	249,866	251,631	255,393	100.7	101.5
Gliwice	223,403	213,392	208,439	95.5	97.7
Gorzów Wielkopolski	121,609	124,779	126,336	102.6	101.2
Grudziądz	99,826	102,997	101,866	103.2	98.9
Jastrzębie-Zdrój	102,514	103,309	101,012	100.8	97.8
Kalisz	105,700	106,706	107,673	101.0	100.9
Katowice	366,793	351,521	338,017	95.8	96.2
Kielce	210,966	213,777	210,266	101.3	98.4
Koszalin	105,541	111,480	111,301	105.6	99.8
Kraków	746,440	744,987	740,737	99.8	99.4
Legnica	103,070	107,935	108,911	104.7	100.9
Lublin	340,257	354,552	354,026	104.2	99.9
Łódź	854,003	823,215	786,526	96.4	95.5
Olsztyn	159,051	167,898	174,080	105.6	103.7
Opole	126,452	130,219	128,591	103.0	98.7
Płock	120,396	127,174	130,609	105.6	102.7
Poznań	588,286	581,171	571,985	98.8	98.4
Radom	225,920	232,649	230,836	103.0	99.2
Ruda Śląska	168,467	165,873	152,987	98.5	92.2
Rybnik	140,545	144,578	145,015	102.9	100.3
Rzeszów	148,691	160,271	162,153	107.8	101.2
Słupsk	98,503	102,596	101,894	104.2	99.3
Sosnowiec	258,607	247,499	239,816	95.7	96.9
Szczecin	410,296	418,156	415,576	101.9	99.4
Tarnów	118,863	121,926	121,091	102.6	99.3
Toruń	199,556	204,660	205,397	102.6	100.4
Tychy	187,674	133,760	130,416	71.3	97.5
Wałbrzych	141,033	139,219	133,713	98.7	96.0
Warszawa	1,655,021	1,635,112	1,609,780	98.8	98.5
Wrocław	119,677	123,134	122,886	102.9	99.8
Wrocław	639,138	641,974	634,047	100.4	98.8
Zabrze	201,900	201,302	196,465	99.7	97.6
Zielona Góra	112,024	116,329	119,152	103.8	102.4
Large towns total	11,612,490	11,585,961	11,417,015	99.8	98.5

Source: GUS, Warszawa

The highest decrease (almost by 30 percent) occurred in Tychy but it was mainly connected with administrative changes. In the second period the highest population growth was observed in Olsztyn, Białystok, Płock and Zielona Góra but the increase was lower (from 2 to 4 percent). The highest drop concerned Upper Silesian towns, Wałbrzych and the largest centres.

The level of demographic ageing in 1988 measured with the elderly to youth dependency ratio varied significantly in large towns and ranged from 12.6 in Jastrzębie-Zdrój to 76.7 in Łódź (Tab. 5). High values were also represented by other large towns (Warsaw, Poznań, Wrocław, Krakow) and Chorzów. In turn the low dependency of youth was characterised by industrial centres developing at that time (Jastrzębie-Zdrój, Tychy, Rybnik), towns located in demographically young western and northern parts of Poland (Koszalin, Gorzów Wielkopolski, Olsztyn, Zielona Góra) and Płock and Rzeszów. In 1995 the spatial layout of the elderly to youth dependency ratio did not change but its level increased and ranged from 23.9 in Jastrzębie-Zdrój to 89.6 in Warsaw and Łódź. In 2001 in the latter two towns the number of people aged 60 and over exceeded the number of children and youth aged 0–19 (values of the ratio over 100 persons). Wałbrzych (84.4) also joined the group of towns with a high ageing level while Koszalin and Zielona Góra left the group with the lowest values of the ratio. In all the towns analysed the values of the ratio recorded considerable increase.

Against this background in 1988 the highest birth rates (over 15 percent) were recorded in Rybnik, Radom, Jastrzębie-Zdrój, Białystok, Tarnów, Tychy – towns characterised by a low level of demographic ageing (Tab. 6). The lowest fertility level (below 11 percent) was represented by units, which were simultaneously distinguished by a high elderly to youth dependency level (Wrocław, Łódź, Warsaw and Dąbrowa Górnicza). In 1995 the birth rate ranged from 7.1 to 12.7 percent. Only in nine towns the fertility level exceeded 10 percent and the lowest level was observed in Wrocław, Łódź and Warsaw. In 2001 already the birth rate did not exceed 10 percent in any of the towns under study and the highest rate occurred in Radom, Jastrzębie-Zdrój, Elbląg, Toruń, Grudziądz and Ruda Śląska. The lowest values were observed in Katowice (6.9 percent), Łódź, Sosnowiec, Warsaw and Wrocław.

The death level in 1988 showed a large degree of differentiation and ranged from 4.3 percent in Jastrzębie Zdrój to 14.6 percent in Chorzów. The high intensification of deaths was characteristic for large centres (Łódź, Warsaw, Poznań) and central towns of the Upper Silesia conurbation (Katowice, Chorzów, Bytom, Ruda Śląska). Low death rates were also distinguished in towns located in northern Poland (Koszalin, Gorzów Wielkopolski, Olsztyn) and Tychy, Rzeszów and Płock. In 1995 and 2001 the values of the rate did not change significantly but the group of towns with high death rates was joined by Kalisz and Wałbrzych and the highest mortality rate occurred in Łódź (13.8 percent).

## THE POPULATION AGEING PROCESS AGAINST VITAL STATISTICAL CHANGES...

Table 5. The state and dynamics of population ageing in large towns

TOWNS	THE AGEING INDEX			WSD INDEX	
	1988	1995	2001	88-95	95-01
Białystok	36.8	45.2	60.6	9.9	9.9
Bielsko-Biała	41.1	50.9	70.0	13.9	8.5
Bydgoszcz	46.5	56.3	73.8	11.0	8.2
Bytom	40.5	49.3	69.8	7.9	9.7
Chorzów	60.7	71.2	88.8	6.7	4.0
Częstochowa	51.0	59.9	76.5	10.7	9.3
Dąbrowa Górnicza	43.2	51.0	69.2	17.2	10.3
Elbląg	35.0	44.6	57.4	13.6	10.1
Gdańsk	46.5	60.6	81.2	13.4	7.5
Gdynia	45.7	59.6	80.4	13.0	7.3
Gliwice	39.1	47.8	69.4	11.9	11.1
Gorzów Wielkopolski	30.9	41.5	58.1	16.2	10.3
Grudziądz	40.5	49.1	63.8	10.4	10.4
Jastrzębie-Zdrój	12.6	23.9	43.3	15.6	8.0
Kalisz	49.2	57.6	71.3	9.8	6.2
Katowice	52.1	61.2	83.6	9.7	9.6
Kielce	33.5	45.5	67.2	14.7	10.7
Koszalin	30.6	45.8	69.3	16.2	10.9
Kraków	52.8	66.8	85.5	10.4	7.3
Legnica	38.2	48.3	63.6	13.7	10.1
Lublin	40.8	51.3	69.0	12.1	8.2
Łódź	76.7	89.6	108.7	11.4	7.3
Olsztyn	33.7	43.4	59.9	15.3	10.2
Opole	37.1	49.1	70.8	12.9	10.1
Płock	29.9	38.0	54.6	13.9	9.1
Poznań	55.9	65.7	83.0	10.9	6.4
Radom	35.7	44.1	57.3	10.1	9.4
Ruda Śląska	37.9	45.0	61.9	10.6	10.4
Rybnik	32.3	37.9	54.0	10.9	11.5
Rzeszów	31.0	40.8	56.8	12.1	10.8
Słupsk	33.9	43.7	61.0	13.4	10.8
Sosnowiec	43.6	54.9	78.8	17.2	10.1
Szczecin	46.1	61.5	80.9	13.1	8.6
Tarnów	35.3	43.5	61.2	9.4	9.8
Toruń	37.2	45.7	61.8	13.7	9.3
Tychy	24.9	35.7	53.8	16.2	14.3
Wałbrzych	47.0	62.6	84.4	12.6	12.4
Warszawa	72.0	89.6	115.3	12.0	7.2
Wrocław	36.3	44.4	59.6	13.0	9.6
Wrocław	52.3	69.9	93.0	13.8	8.4
Zabrze	37.8	46.7	67.3	7.6	12.3
Zielona Góra	33.9	47.5	67.9	14.9	9.2

Source: GUS, Warszawa



Table 6. Population vital statistics in large towns

TOWNS	THE BIRTH RATE			THE DEATH RATE			THE NATURAL GROWTH RATE		
	1988	1995	2001	1988	1995	2001	1988	1995	2001
Białystok	15.7	9.9	8.3	7.6	8.0	7.5	8.1	1.9	0.8
Bielsko-Biała	12.1	9.4	8.7	8.6	8.9	8.5	3.4	0.5	0.2
Bydgoszcz	12.9	9.5	8.3	9.7	9.4	8.9	3.2	0.1	-0.6
Bytom	13.7	9.5	8.2	10.8	10.0	10.3	2.9	-0.4	-2.1
Chorzów	13.0	9.6	8.4	14.6	13.6	12.7	-1.7	-4.0	-4.3
Częstochowa	13.1	9.1	8.1	10.4	10.6	10.5	2.7	-1.5	-2.4
Dąbrowa Górnicza	9.8	8.0	7.6	9.8	9.7	10.3	0.0	-1.6	-2.7
Elbląg	14.1	10.8	9.2	8.3	8.6	8.7	5.8	2.2	0.5
Gdańsk	12.3	9.2	8.7	8.8	9.1	9.0	3.5	0.1	-0.3
Gdynia	12.5	9.2	8.3	9.4	9.5	8.5	3.1	-0.3	-0.2
Gliwice	11.9	8.7	7.5	8.7	8.5	8.9	3.2	0.3	-1.3
Gorzów Wielkopolski	13.9	9.6	8.4	7.4	7.9	7.6	6.5	1.7	0.9
Grudziądz	14.3	10.2	9.1	10.3	10.0	10.2	4.0	0.2	-1.1
Jastrzębie-Zdrój	16.1	12.7	9.3	4.3	5.7	6.3	11.8	7.0	3.0
Kalisz	12.7	10.9	8.9	9.9	11.3	11.1	2.8	-0.4	-2.2
Katowice	12.7	8.7	6.9	11.2	10.7	10.3	1.5	-2.1	-3.4
Kielce	13.8	9.1	8.3	7.6	8.2	7.6	6.2	1.0	0.6
Koszalin	12.7	8.9	7.3	6.3	6.9	7.4	6.4	2.0	-0.1
Kraków	12.1	8.4	7.8	9.4	9.8	9.3	2.7	-1.4	-1.5
Legnica	12.9	9.8	8.2	8.7	9.0	9.1	4.2	0.8	-0.9
Lublin	13.4	9.3	8.8	8.6	8.5	8.6	4.8	0.9	0.2
Łódź	10.0	7.5	7.1	12.9	14.0	13.8	-2.9	-6.6	-6.7
Olsztyn	12.2	8.9	8.4	6.6	7.2	7.0	5.6	1.7	1.4
Opole	12.5	8.0	7.4	8.0	8.4	7.4	4.5	-0.4	-0.1
Płock	13.4	10.5	8.5	7.5	7.5	7.4	5.9	3.0	1.1
Poznań	12.1	8.5	8.2	11.2	10.9	10.1	0.9	-2.4	-1.9
Radom	16.1	11.5	9.9	8.9	8.7	8.6	7.2	2.8	1.2
Ruda Śląska	12.8	9.3	9.0	10.7	9.9	10.4	2.1	-0.6	-1.4
Rybnik	16.3	10.9	8.8	8.1	7.7	7.9	8.2	3.2	0.9
Rzeszów	14.6	9.0	8.1	6.8	7.2	6.8	7.8	1.8	1.4
Słupsk	14.6	9.7	8.0	7.9	8.4	8.3	6.7	1.3	-0.3
Sosnowiec	11.3	7.7	7.2	9.6	9.9	10.2	1.7	-2.2	-3.0
Szczecin	11.7	8.6	7.6	8.6	9.5	9.3	3.1	-0.8	-1.7
Tarnów	15.7	10.2	8.8	9.0	8.3	8.4	6.6	1.9	0.4
Toruń	13.0	9.9	9.2	8.3	8.5	8.1	4.8	1.5	1.1
Tychy	15.1	9.2	8.5	6.3	6.9	7.8	8.7	2.4	0.7
Wałbrzych	13.8	8.9	7.8	9.8	11.0	10.6	3.9	-2.1	-2.9
Warszawa	10.0	7.1	7.2	11.2	11.4	10.7	-1.2	-4.4	-3.6
Włocławek	13.7	10.3	8.7	9.9	10.0	8.5	3.7	0.3	0.2
Wrocław	10.9	7.6	7.2	8.8	9.6	9.2	2.2	-2.0	-1.9
Zabrze	14.1	9.3	8.5	10.1	9.4	8.8	3.9	0.0	-0.2
Zielona Góra	13.4	9.4	7.7	8.1	8.3	7.8	5.2	1.1	0.0

Source: GUS, Warszawa

In three cities the natural growth rate in 1988 had negative values (in Łódź, Chorzów and Warsaw) while the highest natural growth was recorded in demographically young, developing centres (Jastrzębie-Zdrój, Tychy, Rybnik). In the next period of investigation already 17 large cities were distinguished by the natural decline of population, and the lowest values of the rate were observed again in Łódź (-6.6 percent), Warsaw (-4.4 percent) and Chorzów (-4.0 percent). The largest natural growth still occurred in Jastrzębie-Zdrój (7.0 percent). In 2001 the natural decline of the population occurred in 25 researched units but minimum values as well as centres representing them did not change significantly. The highest natural growth (over 1 percent) occurred the following period in Jastrzębie-Zdrój, Olsztyn, Rzeszów, Radom, Toruń and Płock.

Considering the changes in the level of demographic ageing measured with the Wsd index in 1988–1995, it should be stated that high dynamics of population ageing were observed in towns previously recognised as demographically young. This primarily concerned Dąbrowa Górnicza, Sosnowiec, Tychy, Koszalin, Gorzów Wielkopolski, Jastrzębie-Zdrój and Olsztyn (Wsd index over 15 points).

In all investigated towns the Wsd index values were positive, which manifests the ongoing population ageing process. Nonetheless, low dynamics of the investigated phenomena were distinguished in centres of Upper Silesia (Chorzów, Zabrze, Bytom), where the level of ageing had already been far advanced. In 1995–2001 the Wsd index values, despite the fact that they were still positive, recorded a decrease, thus the pace of changes to the population's ageing process slowed down. The highest dynamics were characterised by Upper Silesian towns (Tychy, Zabrze, Gliwice, Rybnik) as well as Wałbrzych, Koszalin and Słupsk. The group of towns with the lowest Wsd index values included Chorzów and Kalisz and the largest centres (Poznań, Warsaw, Krakow, Łódź) in which the dynamics of changes recorded a significant decrease.

The first period of socio-economic transformation was marked in the sphere of demographic changes by a significant decrease in the intensity of births, which concerned all investigated towns. The highest decrease in 1988–1995 (over 5 percentage points) was observed in Rybnik, Tychy and Tarnów, Rzeszów and Białystok (Tab. 7). The changes were least perceptible in Dąbrowa Górnicza, Kalisz, Łódź, Bielsko-Biała, Płock and Warsaw (below 3 percentage points). In the second investigated period in Warsaw even a minimal increase of fertility level was recorded (by 0.1 percentage points) and in other towns the changes were not so significant. A small fall in births was observed in the remaining large centres (Poznań, Wrocław, Łódź, Gdańsk, Krakow). The highest decrease (below 2 percentage points) occurred in Płock, Kalisz, Rybnik and Jastrzębie-Zdrój.

Table 7. The dynamics of population vital statistics in large towns

TOWNS	THE CHANGES IN BIRTH RATES		THE CHANGES IN DEATH RATES		THE CHANGES IN NATURAL GROWTH RATES	
	1988–1995	1995–2001	1988–1995	1995–2001	1988–1995	1995–2001
Białystok	-5.8	-1.6	0.3	-0.4	-6.2	-1.1
Bielsko-Biała	-2.7	-0.7	0.2	-0.4	-2.9	-0.3
Bydgoszcz	-3.4	-1.2	-0.3	-0.5	-3.1	-0.7
Bytom	-4.2	-1.3	-0.8	0.3	-3.4	-1.6
Chorzów	-3.4	-1.2	-1.1	-0.8	-2.3	-0.4
Częstochowa	-4.0	-1.0	0.1	-0.1	-4.2	-0.9
Dąbrowa Górnicza	-1.7	-0.4	-0.1	0.6	-1.6	-1.0
Elbląg	-3.3	-1.6	0.3	0.1	-3.6	-1.7
Gdańsk	-3.0	-0.5	0.3	-0.1	-3.3	-0.5
Gdynia	-3.3	-0.8	0.1	-1.0	-3.4	0.1
Gliwice	-3.2	-1.2	-0.3	0.4	-2.9	-1.6
Gorzów Wielkopolski	-4.3	-1.2	0.4	-0.3	-4.7	-0.9
Grudziądz	-4.1	-1.1	-0.3	0.2	-3.8	-1.2
Jastrzębie-Zdrój	-3.4	-3.4	1.5	0.6	-4.9	-4.0
Kalisz	-1.8	-2.0	1.4	-0.2	-3.1	-1.9
Katowice	-4.0	-1.8	-0.4	-0.4	-3.6	-1.3
Kielce	-4.7	-0.9	0.6	-0.5	-5.3	-0.3
Koszalin	-3.8	-1.6	0.6	0.5	-4.4	-2.1
Kraków	-3.7	-0.6	0.4	-0.4	-4.0	-0.1
Legnica	-3.1	-1.6	0.3	0.1	-3.4	-1.7
Lublin	-4.0	-0.5	-0.1	0.2	-3.9	-0.7
Łódź	-2.6	-0.4	1.1	-0.2	-3.7	-0.2
Olsztyn	-3.3	-0.5	0.6	-0.2	-3.9	-0.3
Opole	-4.5	-0.7	0.4	-1.0	-4.9	0.3
Płock	-2.9	-2.0	-0.1	-0.1	-2.9	-1.9
Poznań	-3.6	-0.3	-0.3	-0.8	-3.3	0.5
Radom	-4.7	-1.6	-0.3	0.0	-4.4	-1.6
Ruda Śląska	-3.6	-0.3	-0.8	0.5	-2.8	-0.8
Rybnik	-5.4	-2.1	-0.4	0.2	-5.0	-2.3
Rzeszów	-5.6	-0.9	0.4	-0.4	-6.0	-0.4
Stupsk	-4.9	-1.7	0.6	-0.1	-5.4	-1.6
Sosnowiec	-3.6	-0.6	0.3	0.3	-3.9	-0.8
Szczecin	-3.1	-1.0	0.9	-0.2	-3.9	-0.9
Tarnów	-5.5	-1.4	-0.7	0.0	-4.8	-1.5
Toruń	-3.1	-0.8	0.2	-0.4	-3.3	-0.4
Tychy	-5.8	-0.8	0.5	0.9	-6.4	-1.7
Wałbrzych	-4.8	-1.2	1.2	-0.4	-6.0	-0.8
Warszawa	-2.9	0.1	0.2	-0.7	-3.2	0.8
Włocławek	-3.4	-1.6	0.1	-1.5	-3.4	-0.1
Wrocław	-3.3	-0.4	0.8	-0.4	-4.2	0.0
Zabrze	-4.8	-0.8	-0.8	-0.6	-4.0	-0.2
Zielona Góra	-4.0	-1.7	0.2	-0.6	-4.2	-1.1

Source: GUS, Warszawa

Changes in the intensity of deaths in 1988–1995 did not exceed 1.5 promille points in relation to zero. An increase in the intensity of deaths was observed in 27 centres under study, the highest of which occurred in Jastrzębie-Zdrój, Kalisz, Wałbrzych and Łódź. The highest fall in mortality was recorded in Upper Silesia Industrial Centre (GOP – Górnośląski Okręg Przemysłowy) in Chorzów, Bytom, Zabrze and Ruda Śląska. In the second investigated period the changes were also small and 16 towns were characterised by increased death rates.

The dynamics of natural growth rate were negative in all towns in the first period and the biggest falls in the rate (over 6 percentage points) was recorded in Rzeszów, Wałbrzych, Białystok and Tychy. In 1995–2001 in five cities (Warsaw, Poznań, Opole, Gdynia, Wrocław) an increase in the natural growth rate was observed. The highest decreases occurred in Jastrzębie-Zdrój, Rybnik and Koszalin while in remaining towns it was, small not exceeding two promille points.

On the basis of the analysed issues of population age structure and vital statistics, correlation coefficients between the mentioned variables were calculated (Tab. 8). The highest negative correlation dependence was stated between the level of demographic ageing and natural growth and the highest value of the correlation coefficient was recorded in 1995 (-0.915). Very high correlation was also observed between the intensity of deaths and demographic ageing and, similarly as in the case of natural growth, the highest interdependence occurred in the middle investigated period of time (0.842). A high negative dependence was also determined between the intensity of births and the level of the elderly to youth dependency ratio, however, it had a decreasing trend (from -0.687 to -0.648). A high dependency in the dynamics of the investigated variables was not determined. Only in the case of the dynamics of deaths and the Wsd index, the correlation coefficient accepted medium values.

Table 8. The correlations between population ageing and vital statistics in large towns

VARIABLES	THE AGEING INDEX			WSD INDEX	
	1988	1995	2001	1988–1995	1995–2001
The birth rate	-0.687	-0.683	-0.648	-0.126	0.001
The death rate	0.826	0.842	0.719	-0.495	-0.438
The natural growth rate	-0.898	-0.915	-0.833	0.291	0.362
The changes in birth rate	0.409	0.400	0.574	0.192	-0.079
The changes in death rate	-0.059	0.056	-0.360	0.553	0.407
The changes in natural growth rate	0.418	0.632	0.624	-0.130	-0.285

Source: own study on the base of GUS data

Towns over 100,000 residents are characterised by a demographic specificity, which distinguishes them from remaining settlements units.

The urban model of living, large spatial mobility and economic development of these centres influenced high levels of demographic ageing and led to a negative natural growth of population inhabiting them. The population ageing process and the decline of births occurred earliest in large towns but spread to medium and smaller centres over the course of time. Therefore, in the second period under study, the population ageing dynamics in large towns were smaller than in the remaining investigated units. A similar situation occurred in the case of population natural growth where the decrease of the intensity of its components was smaller than in medium or small towns.

The analysis of the demographic processes mentioned above showed the highest level of population ageing in large centres where taking over the western style of living and the outflow of the young population to the suburban areas became best evident and also in some towns in Upper and Lower Silesia where the difficult situation on the labour market hampered the inflow of young labour force.

These centres were characterised by the lowest intensity of births, high mortality and the negative natural growth of population. As concerns the dynamics of the analysed phenomena, however, in the largest towns and some centres in the Upper Silesian conurbation, the slowing down of the pace of population ageing occurred along with small changes in the values of natural growth against other large towns in the second investigated period.

The very high level of interdependence shown between the state of population ageing and the level of natural growth indicates a considerable relation of these demographic processes. The low level of fertility leads to the growth in the fraction of the elderly in the population structure, conditioning the increase of the probability of death, which, as a result, contributes to a natural decrease in population. The lack of correlation stated in the case of dynamics of the investigated variables should be explained by a delayed interaction of demographic events and a series of other non-demographic factors.

## REFERENCES

- Betts, K.** 1998: Fertility, migration, and the ageing of the population – an analysis of the official projections, *People And Place* 6(4), pp. 33–37.
- Casseli, G.** 1990: Mortality and population ageing, *European Journal of Population* 6, pp. 1–25.
- Długosz, Z.** 1998: Próba określenia zmian starości demograficznej Polski w ujęciu przestrzennym, *Wiadomości Statystyczne* 3, pp. 15–25.

- Frątczak, E., Guraj-Kaczmarek, K., Zarzycka, Z., Bartczak, S., Czajkowski, A. and Suchecka, J.** 1987: Wybrane uwarunkowania i konsekwencje procesu starzenia się ludności Polski, Warszawa: Instytut Statystyki i Demografii SGPiS.
- Kinsella, K.** 2000: Demographic dimensions of global aging, *Journal of Family Issues* 21(5), pp. 541–558.
- Keyfitz, N.** 1968: Changing Vital Rates and Age Distributions, *Population Studies* 22(2), pp. 235–251.
- Legare, J.** 1993: Demographic aspects of the ageing process – past and future trends. In Legare, J., Myers, G. C. and Tabah, L., editors, *Synthesis of national monographs on population ageing*, International Institute on Aging, Valletta, Malta, pp. 15–28.
- Rosset, E.** 1959: *Proces starzenia się ludności. Studium Demograficzne*, Warszawa: PWN.
- Rosset, E.** 1967: *Ludzie starzy. Studium demograficzne*, Warszawa: PWE.
- Stokowski, F.** 1968: Umieralność a proces starzenia się ludności, *Wiadomości Statystyczne* 12, pp. 6–9.

**CORRESPONDENCE TO:**

Sławomir Kurek  
Geography Institute, Pedagogical University  
Podchorążych 2, 30–084 Cracow, Poland  
[e-mail: [sgkurek@ap.krakow.pl](mailto:sgkurek@ap.krakow.pl)]