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The spatial distribution of population ageing in Poland in the years 1988-2001

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ABSTRACT. This article presents the direction of changes in the age structure of the Polish population in towns and communes. Shares of population have been analysed, as well as their changes in four age groups (0–19, 20–39, 40–59 and above 60). An index of changes in the age structure has been proposed (I_{as}), based on the changes in the share of the stated population age groups. The analysis points to spatial diversification of the ageing process of the Polish population and the high dynamics of ageing of the urban population.

KEY WORDS: age structure, population ageing, index of changes in the age structure, spatial distribution.

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. The changes in the age structure resulting in population ageing or rejuvenation are conditioned by several demographic and socio-economic factors. The direct factors include birth rate, death rate and population migration (Rosset, 1959; 1967; Caselli, 1990; Legare, 1993; Betts 1998). 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).

Migrations also form an important factor influencing the age level and the dynamics of population ageing (Strzelecki, Witkowski, 1991; Kinsella, 2000, The UN Population Division... 2000). The most significant are the internal mi-

grations, which due to the young age of the migrants may largely stimulate the demographic structure of the emigration and immigration areas, and thus may impact on the status and changes in population ageing.

The indirect factors affecting population ageing include the society well-off level, promoted family model, vocational activity of women, health-care and social welfare system level, population education, state social politics. The areas with population ageing undergo not only demographic changes but also economic and social ones. This results in changes in the structure of consumption, increase of demand for certain services (e.g. in the field of health care and social welfare), decrease in vocational activity, increase in costs incurred on means of living for growing post-production groups, change in labor force structure, family and households (Chesnais, 1990; Frątczak, 1992; Gonnot et al., 1995; Pinelli and Sabatello, 1995; von Weizsäcker, 1996; Kuciarska-Ciesielska, 1999; Johnson and Climo, 2000). All this forces the state to adjust the infrastructure and financial expenses to various areas of social and economic life.

Currently, the fastest ageing societies can be found in Central and Eastern Europe, where difficulties of the economic transformation period manifest themselves in a dramatic reduction of the natural growth rate (Kurek, 1998). In Poland, the process of population ageing became visible for the first time on the turn of 1950's and 1960's (Rosset, 1959; 1967). Significant factors affecting the scale and spatial differentiating of this phenomenon included post-war internal migrations and „shifting within the population pyramid of successive groups of population highs and lows and the „breaks" caused by the world wars' cataclysms. In the period of 1950–2001, the fraction of population of Poland aged 60 years and over increased twice, from 8.3% to 16.8%. At the same time the fraction of children and youth (0–19 years) decreased from 39.0% to 26.8%. These tendencies caused the elderly-youth dependency ratio to increase from 21.3 to 62.7.

The aim of this article is to present a spatial differentiation of the status and the dynamics of changes in the age structure of the Polish population, in the period between 1988 and 2001, and to show the pace of such transformations towards the population either ageing or becoming younger. As a basis for the analysis, four age groups have been adopted: 0–19 years (children and youth), 20–39 years (younger productive group), 40–59 years (older productive group) and 60 years and more (old population). An index of changes in age structure has been proposed [I_{as}], on the basis of changes in the percentage of the shares of the age groups in the population. This study covers 3056 spatial units, including 884 towns and 2172 rural areas, according to the administrative division of January 1, 1999.

The shares of the youngest age group analysed, from the age of 0–19, varied from 15.4% to 39.7% in 2001. The highest values were observed in rural areas, while the smallest percentage of young people was noted both in towns (including the largest centres such as Warsaw, Cracow, Łódź, Wrocław) and in

rural areas located in north-eastern Poland near the border. In the spatial layout, the largest share of children and youth was characteristic of northern, western and south-eastern Poland (Fig. 1). It must be assumed that the spatial diversification of the age structure was influenced by the demographic processes, related to the inhabiting of the western and northern lands after World War II. The lands were then occupied by young people, which was expressed through a higher birth rate. An echo of such processes is still visible through a high percentage of young people. In turn, the large shares of the population aged between 0 and 19 in the Małopolskie and Podkarpackie voivodeships (administrative regions of the 1st order) is related to the tradition of having many children, continued by the population inhabiting these largely mountainous areas.

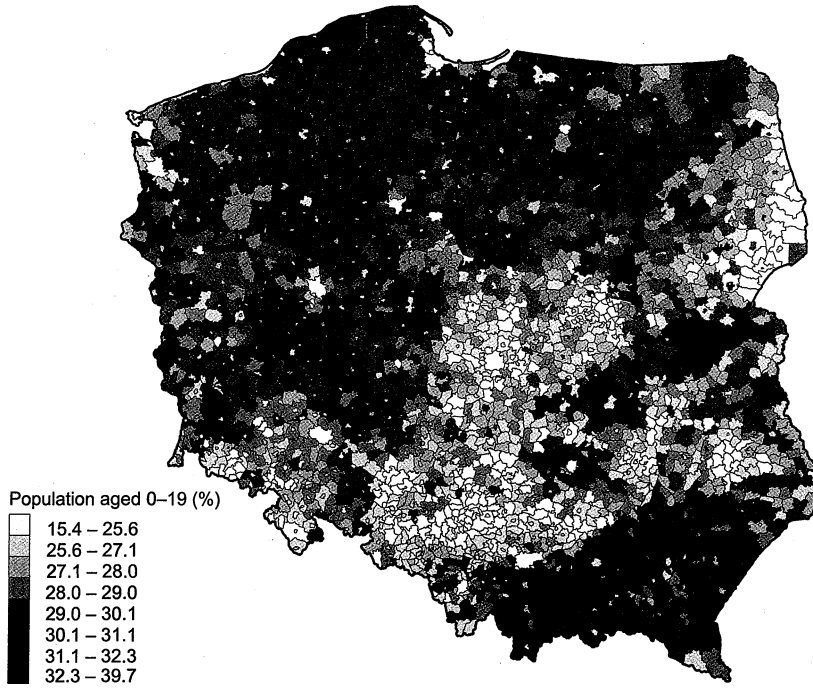

Fig. 1. The percentage of population aged 0–19 in 2001

The range of percentage shares of the younger productive group of the population (aged 20–39) in 2001 varied from 18.4 to 37.3%. The areas of concentration of a high percentage of this age group occurred in southern Poland (Opolskie, Małopolskie and Podkarpackie voivodeships) and in northern Poland (Pomorskie, Warmińsko-Mazurskie voivodships). Relatively large shares of this population group were also observed in the towns and communes of western Poland (Fig. 2).

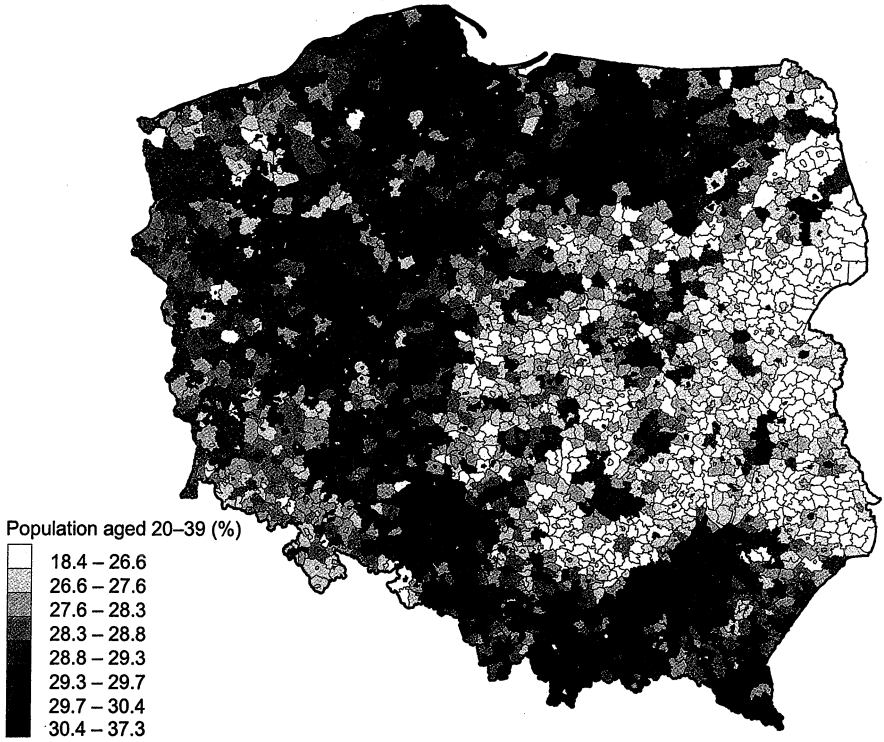

Fig. 2. The percentage of population aged 20–39 in 2001

The smallest number of young workers was characteristic of eastern Poland, near the border with Belarus and Ukraine, while central Poland was dominated by towns and communes with shares close to the national average (28.9%).

The spatial layout of population at the older productive age (40–59) was extremely varied, and ranged from 16.0 to 39.7%. The largest shares of these population groups occurred around the largest urban centres (Warsaw, Łódź, Cracow, Poznań, Wrocław, Katowice, Gdańsk, Szczecin). It is a result of the past migration to such cities, and the intense industrialisation in the 1960s and 1970s. Moreover, large shares of this age group were characteristic of the towns and communes of north-western Poland (Fig. 3). It is an area of depopulation, related to the liquidation of the coal mining industry. The smallest shares of population aged 40–59 occurred in the Podlaskie Voivodeship, situated in north-eastern Poland. It is an area with a low level of industrialisation and high unemployment. A small percentage of this age group was also observed in central and eastern Poland, which was characterised in the past by high migration to the large cities (Warsaw, Lublin), and in south-eastern Poland, from where people used to emigrate in search of employment to Upper Silesia, to Kraków, and also abroad.

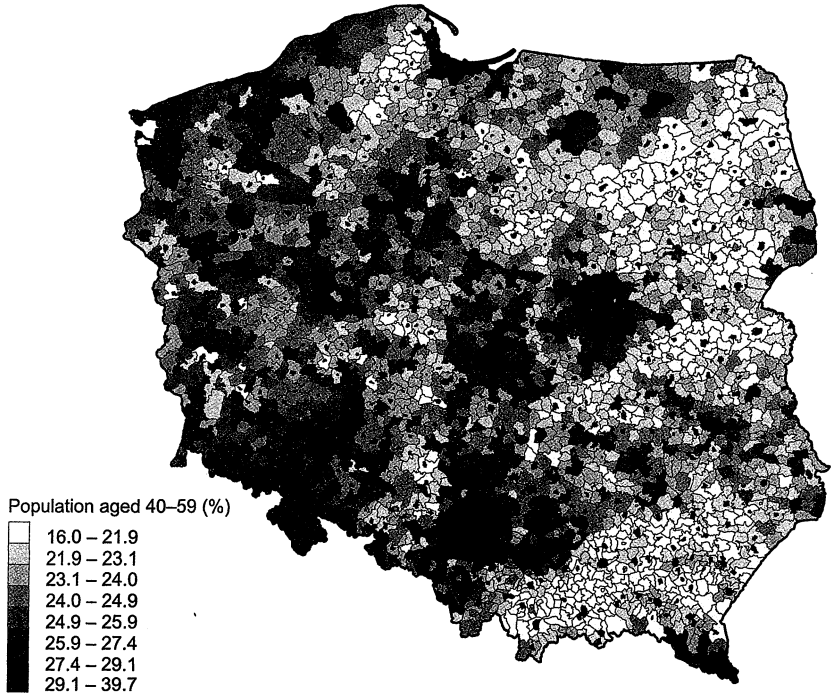

Fig. 3. The percentage of population aged 40–59 in 2001

The spatial layout of the population at the age of 60 and more in 2001 mirrored the share of children and youths (aged 0–19). The most advanced demographic ageing was characteristic of units located in central and eastern Poland (especially Podlaskie and Lubelskie voivodships, Fig. 4). However, the smallest shares of this oldest population group were observed in northern and western Poland, as a result of past immigration.

In order to present the changes in the age structure occurring in Poland on the micro scale, a synthetic index of changes in the age structure was proposed (I_{as}), which is a modified index of demographic ageing by Długosz (1998). The index is based on the changes in the shares of four age groups of the population, aged: 0–19, 20–39, 40–59 and 60 and more. It was assumed here that an ageing society is such, where the share of the population at the older productive age and at the post-productive age has increased in the analysed period of time t, while the share of children and youth and the younger productive age has decreased. As a result of the total of the differences of shares of these four age groups, we derive an index, the theoretical value of which may vary from <–200 to 200>. Positive value of the index of changes in the age structure informs of the ongoing process of ageing of the population in the given unit in the period ana-

lysed, and the higher the value of the index, the more advanced this process is. By analogy, the negative value of the index highlights the fact that the population is becoming younger.

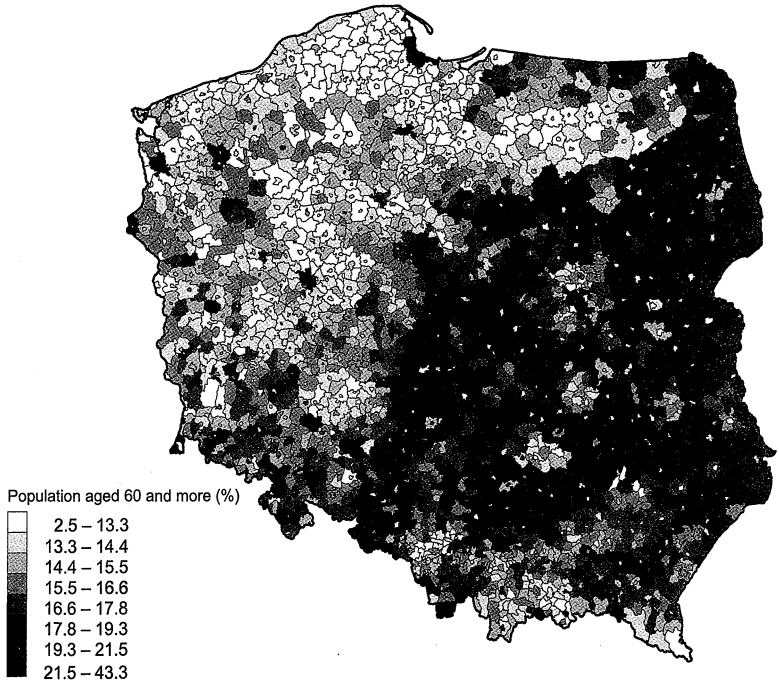

Fig. 4. The percentage of population aged 60 and more in 2001

$$I_{as} = [P_{(0-19)t} - P_{(0-19)t+n}] + [P_{(20-39)t} - P_{(20-39)t+n}] + [P_{(40-59)t+n} - P_{(40-59)t}] + [P_{(60+)t+n} - P_{(60+)t}]$$

where:

$P_{(0-19)}$ – the percentage of population aged 0–19 at the beginning (t) and at the end (t+n) of investigated period,

$P_{(20-39)}$ – the percentage of population aged 20–39 at the beginning (t) and at the end (t+n) of investigated period,

$P_{(40-59)}$ – the percentage of population aged 40–59 at the beginning (t) and at the end (t+n) of investigated period,

$P_{(60+)}$ – the percentage of population aged 60 and more at the beginning (t) and at the end (t+n) of investigated period.

In the years 1988–1995, the range of the values of the index of changes in the age structure for Polish towns and communes varied from –11.8 to 40.7 points. Only in 411 units analysed (13.4% of the total) did the age structure show that

the population was becoming younger (the value of the index was negative). However in the remaining 2,645 units, ageing of the population occurred. In the highest range of the index value (above 11.5), with the most advanced process of population ageing, towns prevailed (over one third of the total of all Polish towns). This group included the largest cities (Warsaw, Wrocław, Szczecin, Gdańsk), cities with a dominant industrial base, as well as average and small towns. In the spatial layout, positive values of the index of changes in the age structure were observed in the urbanised areas in Upper Silesia, the zone around Warsaw, Lower Silesia (Dolnośląskie voivodeship), and areas in northern and north-western Poland (Fig. 5). Among the units where the population was becoming younger, rural areas dominated, and only 14 towns were recorded in this category, most of which have a population level not exceeding 3,000 inhabitants. These units were concentrated in north-eastern, south-eastern and central Poland.

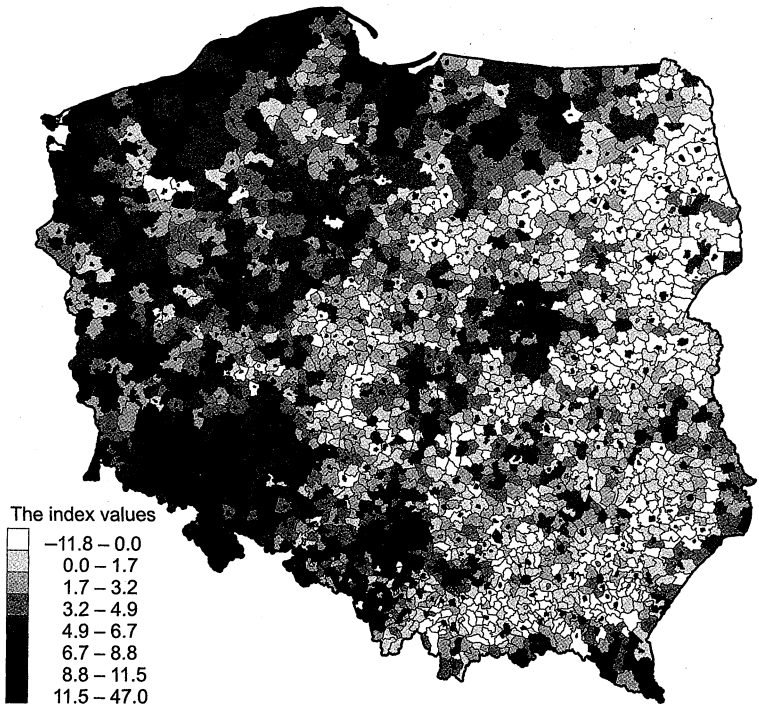

Fig. 5. The index of changes in the age structure (I_{as}) in 1988–1995

In the next period under study (1995–2001) the range of the values of the index decreased and varied from –4.9 to 36.2 points. The number of units with the population becoming younger dropped to 47, of which only 3 were towns. Again, in the highest range of the index value (above 10.7), the domination of towns was observed (three fourth of the total units and almost half of all Polish

towns). Among them, middle and small towns prevailed including industrial centres as Bełchatów, Lubin, Mielec, Stalowa Wola, Tarnobrzeg where restructuring industry resulted in difficulties in the labor force market. This group also included 9 previous voivodeship centers which lost their administrative functions in 1999. However, the largest Polish cities were not recorded in the highest class of the cartogram. The spatial distribution of the age structure index showed little changes (Fig. 6). The most advanced population ageing process was observed in Upper Silesia, the zone around Warsaw, Lower Silesia, areas in northern and north-western Poland and also in areas of Bieszczady mountains. The rejuvenating units were located in eastern and central Poland.

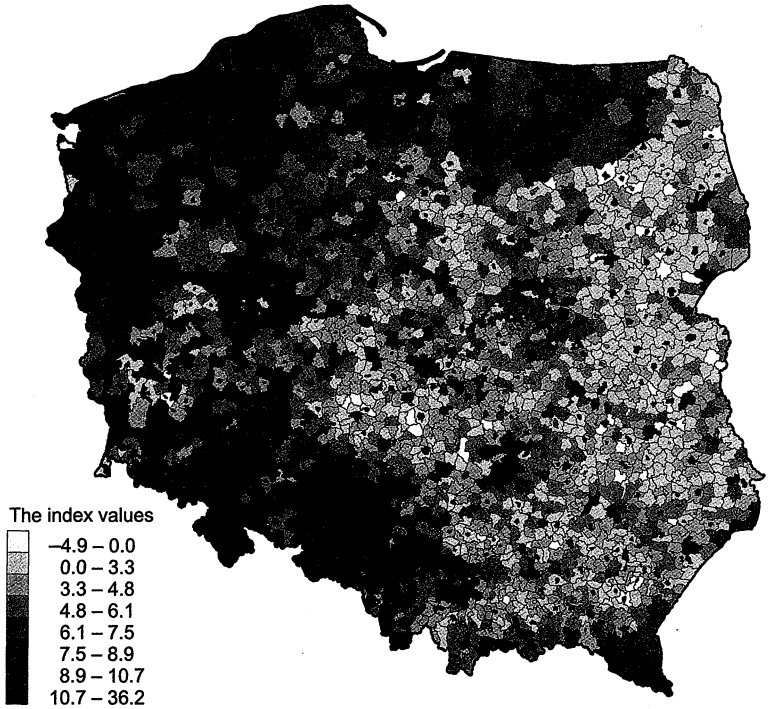

Fig. 6. The index of changes in the age structure (I_{as}) in 1995–2001

Taking into account the pace of changes in population age structure, the two analysed periods were compared and point changes of the index value were calculated. As a result, in 2,095 units the accelerating rate of changes of age structure was observed while in 961 units the pace of population ageing slowed down. The highest rate of changes was recorded in rural areas (78% rural communes of total units in the highest range) and in small towns mostly with a population level not exceeding 5,000 inhabitants. In the units where the pace of population ageing was hampered, urban areas prevailed (501 towns). This group

included the largest Polish cities (Cracow, Gdańsk, Łódź, Poznań, Szczecin, Warsaw, Wrocław) and they represented the lowest class of cartogram (with the values below –3). The spatial layout of the point changes of the index was more complex (Fig. 7). The highest concentration of the areas with accelerating rate of population ageing occurred in Podlaskie, Warmińsko-Mazurskie, Opolskie, Małopolskie and Podkarpackie voivodeship. The areas which underwent slowing down of population ageing occurred in central and western Poland.

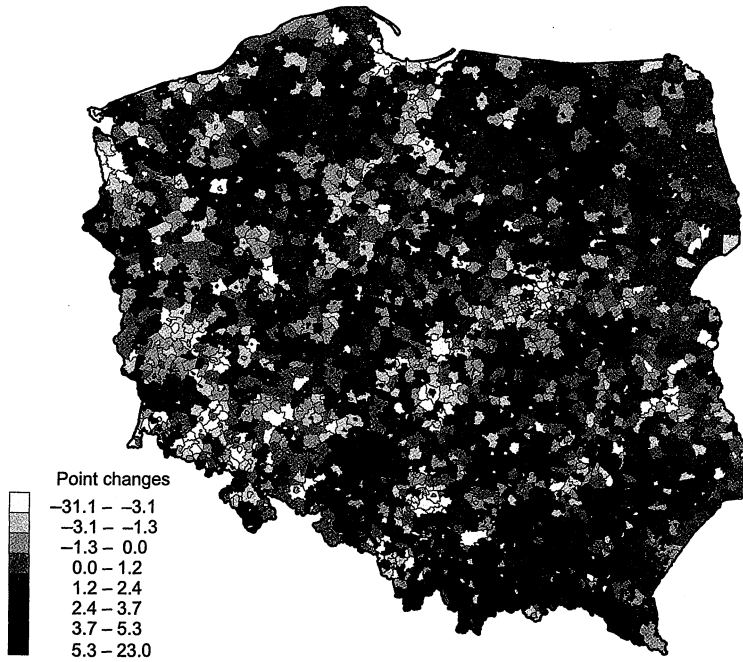

Fig. 7. The pace of changes in the index of age structure (I_{as}) in 1988–1995 and 1995–2001

The most common pattern of changes in the age structure in Poland during the years 1988–2001 was the drop in the share of children, youths and population in their young productive age and, on the other hand, the increase in the share of older productive age population as well as the oldest group of population. Those changes resulted in the advanced population ageing process. The highest dynamics of the process is observed in towns. This refers to large cities, towns with a dominating industrial base, as well as the smallest towns. It can be assumed that the changes are largely impacted on by the socio-economic situation in Poland. The economic crisis, high unemployment rate, and difficult situation on the housing market have resulted in the decrease in migrations of young population to towns, and the birth rate has significantly dropped in the

period studied. However, the pace of population ageing slowed down in towns, especially in the largest Polish agglomerations. In the spatial layout, the process of population ageing has been most remarkable in northern and western Poland, where the unemployment rate is the highest. Furthermore, unfavourable changes in the age structure characterise the areas with restructuring mining industry (Upper and Lower Silesia), and which are nowadays depopulated.

The presented index of changes in the age structure allows for synthetic illustration of the intensity and direction of such changes using one measure. It covers the entire population divided into four age groups, and allows one to state clearly whether the changes occurring, lead to an ageing of the population in the given unit or to the population's becoming younger.

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