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Changes in mortality and the demographic structure of the population in Poland as a challenge for social and economic security

Zmiany w umieralności i strukturze demograficznej ludności w Polsce jako wyzwanie dla bezpieczeństwa społecznego i gospodarczego

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Abstract:

Research objectives and hypothesis/research questions

The research problem was outlined in the article: how do changes in mortality and the demographic structure of the population in Poland, differentiated by region, age, and spatial distribution (urban–rural), affect the demographic and social security of the country and its economic functioning? The research hypothesis put forward in the study emphasized that the progressive aging of the population, the high concentration of deaths in the oldest age groups, and regional variations in mortality reduce demographic and social security of Poland. However, the negative effects of those processes can be partially mitigated by migration and effective health and social policy measures.

Research methods

The source analysis research method was used in the research, accompanied by analogy and inference techniques. The research tools used were SI Statistica and an Excel spreadsheet.

Main results

Research has shown that a key factor shaping the contemporary demographic situation in Poland is the progressive and persistent aging of the population, leading to a concentration of deaths in the oldest age groups, especially those aged 85 and over. Analysis of data from 1980-2024 confirmed that the COVID-19 pandemic caused a sharp increase in mortality, and the number of deaths (Kozicki, Sowa,

Grabowska et al., 2022) did not return to pre-2020 levels after the pandemic subsided, indicating a persistent deterioration in the demographic and health structure of the population.
Implications for theory and practice
Theoretical implications extend and deepen the concept of security (Kozicki, 2022) to include demographic and health dimensions, while practical implications point to the need to build a long-term, integrated, and regionally differentiated social security policy. Research findings clearly demonstrate that ignoring demographic processes leads to an increase in structural risk, while the continuous management of them is a key condition for the stability and development of the country.

Keywords:
demographic security, mortality, aging society, social security, migrations

Abstrakt:
Cel badań i hipotezy/pytania badawcze
W artykule sformułowano problem badawczy: jak zmiany umieralności oraz struktury demograficznej ludności w Polsce, zróżnicowane regionalnie, wiekowo i przestrzennie (miasto–wieś), wpływają na poziom bezpieczeństwa demograficznego i społecznego państwa oraz jego funkcjonowanie gospodarcze? W opracowaniu postawiono hipotezę badawczą: przypuszcza się, że postępujące starzenie się ludności, duża koncentracja zgonów w najstarszych grupach wiekowych oraz regionalne zróżnicowanie umieralności obniżają poziom bezpieczeństwa demograficznego i społecznego Polski, jednak negatywne skutki tych procesów mogą być częściowo łagodzone przez migracje oraz skuteczne działania w zakresie polityki zdrowotnej i społecznej.
Metody badawcze
W opracowaniu zastosowano metodę badawczą w postaci analizy źródłowej, a w niej techniki badawcze w postaci analogii i wnioskowania. Narzędziami badawczymi były: SI Statistica i arkusz kalkulacyjny Excel.
Główne wyniki
Przeprowadzone badania wykazały, że kluczowym czynnikiem kształtującym współczesną sytuację demograficzną Polski jest postępujące i trwałe starzenie się społeczeństwa, prowadzące do koncentracji zgonów w najstarszych grupach wiekowych, zwłaszcza w przedziale 85 lat i więcej. Analiza danych z lat 1980-2024 potwierdziła, że pandemia COVID-19 spowodowała gwałtowny wzrost umieralności (Kozicki, Sowa, Grabowska et al., 2022), a poziom liczby zgonów po jej ustąpieniu nie powrócił do wartości sprzed 2020 roku, co świadczy o trwałym pogorszeniu struktury demograficznej i zdrowotnej ludności.
Implikacje dla teorii i praktyki
Implikacje dla teorii polegają na rozszerzeniu i pogłębieniu koncepcji bezpieczeństwa (Kozicki, 2022) o wymiar demograficzno-zdrowotny, natomiast implikacje dla praktyki wskazują na potrzebę budowy długofalowej, zintegrowanej i regionalnie zróżnicowanej polityki bezpieczeństwa społecznego. Wyniki badań jednoznacznie dowodzą, że ignorowanie procesów demograficznych prowadzi do narastania ryzyka strukturalnego, natomiast świadome zarządzanie nimi stanowi jeden z kluczowych warunków stabilności i rozwoju państwa.

Słowa kluczowe:
bezpieczeństwo demograficzne, umieralność, starzejące się społeczeństwo, bezpieczeństwo społeczne, migracje

Introduction

Demographic security (Bankier.pl, 2026) is fundamental to the functioning of Poland and its economy, as it directly impacts social stability, the development capacity of the state and the resilience of public systems. The age structure of the population, mortality rates, fertility rates, and migration determine how many people work, pay taxes, and finance social security systems, and how many benefit

from them. With a rapidly aging society and low fertility, Poland is experiencing a gradual decline in its labour force, leading to staff shortages, rising employment costs, and a decline in the competitiveness of the economy. These phenomena are already visible in key sectors such as industry, services, construction, and healthcare.

Demographic security (Kozicki, Mitkow, 2021; Mitkow, Kozicki, Mizura, 2020) also determines the stability of public finances. The growing number of people of post-working age results in higher expenditures on pensions, healthcare, and care services, while the number of taxpayers declines. If the process is not balanced by productivity growth, migration, or effective healthcare policy, it leads to increased budgetary pressure and reduced investment opportunities for the state. In the long term, it weakens the ability of the economy to grow and respond to crises.

Another important aspect of demographic security is its impact on social cohesion and regional development. Depopulation and population aging in some voivodeships deepen territorial inequalities, reduce the investment attractiveness of regions, and increase the risk of social marginalization. At the same time, migration, particularly after 2022, has demonstrated that population inflows can temporarily mitigate negative trends, strengthening the labour market and budget revenues, provided migrants are effectively socially and economically integrated (Kozicki, Kalwasiński, 2021).

In a wider context, demographic security influences the innovation, entrepreneurship, and development potential of the country. A society with a balanced age structure is more flexible, capable of technological adaptation and international competition. Therefore, demography is not merely a backdrop to economic processes, but one of their key determinants. Ultimately, the level of demographic security determines whether Poland will be able to maintain stable economic growth, social cohesion, and long-term national security.

1. Analysis of the literature on the subject of research

Two external factors have had a particularly strong impact on demographics of Poland in recent years: the COVID-19 pandemic and the Russian-Ukrainian war (Rynkun-Werner, Kozicki, Zelkowski et al., 2023). The pandemic caused an unprecedented increase in deaths, especially in 2020 and 2021, significantly disrupting previous mortality trends. The initial phase of the pandemic was dominated by uncertainty: lack of vaccinations, limited knowledge about the disease, an overloaded healthcare system (Pacjent.gov.pl, 2026), and the suspension of diagnostics for other conditions. That led to so-called excess deaths, not only directly due to COVID-19 but also due to delayed treatment of chronic diseases. Global pharmaceutical companies, manufacturers of medical equipment and tests, and parts of the IT and e-commerce sectors profited primarily from the pandemic (Dąbek, 2023). Today, the pandemic is much less discussed because the disease has been "integrated" into the normal epidemiological

picture, the population has acquired post-vaccination and post-infection immunity, and countries, also for political and economic reasons, have stopped maintaining the crisis narrative.

The second breakthrough event was the war in Ukraine, which has triggered the largest migration wave in Poland since World War II (Waluszko, 2025). The influx of migrants, primarily women and children, had a profound impact on the social and economic situation. Demand for housing rental quickly increased, particularly in large cities, leading to rising rent prices and putting pressure on the housing market. Simultaneously, migrants began entering the Polish labour market, both in low-wage sectors (services, trade, logistics) and in skilled professions, partially alleviating labour shortages resulting from the aging of the Polish society (Business Insider, 2025; Losik, 2026).

Migration also had a significant educational dimension. Refugee children were integrated into Polish preschools, primary schools, and secondary schools, and adolescents and adults into the higher education system (CEO, 2026). It presented a significant organizational challenge, but also provided a developmental impetus for the education system, which had to quickly adapt to multiculturalism and language barriers. From an economic perspective, migrants began paying taxes and dues, which resulted in increased state budget revenues and partially mitigated the effects of unfavorable demographic trends.

In terms of public health, analyses clearly show that the most common causes of death in Poland remain circulatory system diseases and cancer, and the pandemic has only temporarily altered the structure of statistics (Książkowski, 2025). High mortality in those groups results from lifestyle, delayed diagnosis, inequalities in access to services, and an aging population. The Polish healthcare system is relatively well-developed in terms of infrastructure, but it is underfunded, overburdened, and unevenly distributed across regions. Staff shortages, long waiting lists, and limited access to geriatric care pose a significant threat to health security, especially given the rapidly growing number of seniors.

Demographics in Poland are changing faster and more rapidly than, for example, Germany, primarily due to the confluence of structural and crisis processes (Rudke, 2026). The COVID-19 pandemic has increased mortality and exposed weaknesses in the healthcare system, while the war in Ukraine, despite its enormous challenges, has partially mitigated negative demographic trends through the influx of migrants and their professional activation. In the long term, the ability of the state to integrate migrants, reform healthcare, and consciously manage the aging of its population will be crucial for the social and demographic security of Poland.

The analyzed demographic and social processes clearly demonstrate that the demographic and social security of Poland is currently under increasing structural pressure. That is not a sudden collapse, but rather the long-term, cumulative impact of several powerful factors: an aging population, a high concentration of deaths in

the oldest age groups, low fertility, the experience of the COVID-19 pandemic, and the mass influx of migrants following the outbreak of the war in Ukraine (Latosiewicz, Kozicki, Tomaszewski, 2025). Their combined effect is rendering existing mechanisms of social and demographic stabilization increasingly inadequate.

Demographic security of Poland is systematically weakening as the age structure changes faster than the ability of the country to adapt. The high number of deaths among those aged 75+, and especially those aged 85+, represents not only the natural consequences of population aging but also a growing risk of destabilizing pension, health, and welfare systems. The COVID-19 pandemic (Polish History Museum, 2022) was a critical point in the process. It led to excess deaths, shortened life expectancy, and a temporary disruption of healthcare continuity. Although the pandemic no longer dominates public debate, its demographic effects are lasting and continue to impact the population structure and citizens' sense of health security.

At the same time, the war between Russia and Ukraine triggered a migration process unprecedented in the recent history of Poland. From a demographic perspective, the migration partially mitigated negative trends, increasing the number of people of working and reproductive age. From a social security perspective, however, the situation was ambivalent. In the short term, pressure on the housing market, the education system, and public services increased, which reinforced a sense of insecurity among some parts of society. In the long term, migrants became an important element of the labour market, filling labour shortages in the economy, stabilizing the social security system, and increasing budget revenues through taxes and dues. It means that migration, properly managed, can strengthen social security, but left without an integration strategy, it can become a source of tension (Falkowski, 2025).

The condition of the healthcare system remains a key area impacting social security. The most common causes of deaths in Poland, namely cardiovascular disease and cancer, are strongly linked to lifestyle, preventive care, and access to treatment (Medexpress.pl, 2024). The healthcare system is relatively well-developed in terms of infrastructure, but chronically underfunded, overburdened, and uneven across regions. With a rapidly aging society, those weaknesses pose a real threat to social security, leading to the deepening of the health inequalities between urban and rural areas and between regions.

The conclusions indicate that the current level of demographic and social security of Poland is sufficient only in the short term. The state has demonstrated the ability to respond to crises, but those responses have been primarily ad hoc. There is no coherent, long-term strategy that would address demography, public health, and migration as elements of a single security system. Unless current trends are addressed through investments in healthcare, effective integration policies, and effective support for families and seniors, demographic pressure will deepen, leading to increased social costs and the weakening of the resilience of the state.

In the long term, the security of Poland will increasingly depend not on its ability to respond to respective crises, but on its ability to manage demographic processes. Population aging, migration, and public health are becoming key factors of social stability and ignoring them means shifting the burden of threats from the future to the present.

2. Multidimensional analysis of human deaths in Poland in a dynamic approach

The first stage of the research was to compile data on deaths in Poland in respective months in selected years: 1980, 1990, 2000, 2010, 2020 and 2024 in Figure 1.

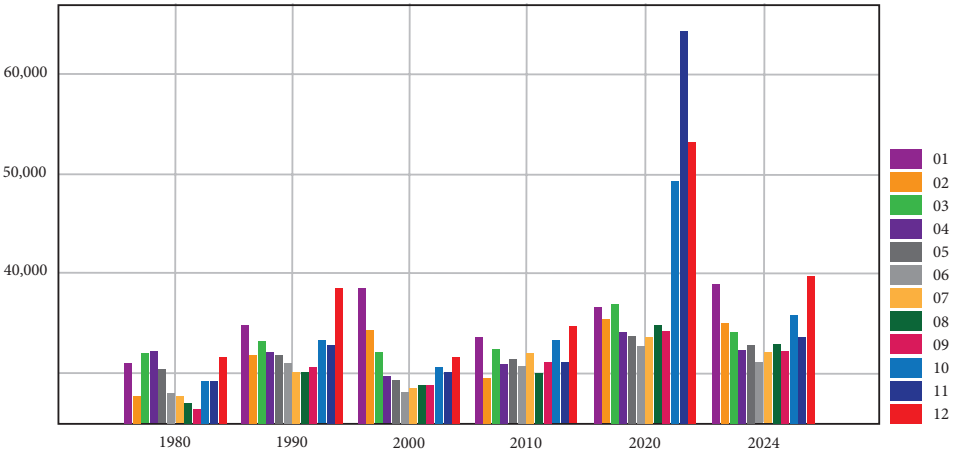

Fig. 1. Bar chart of data on deaths in Poland by month in selected years: 1980, 1990, 2000, 2010, 2020, and 2024

Source: own study based on data obtained from: GUS, 2026

Figure 1 presents data on the number of deaths in Poland by month for six selected years: 1980, 1990, 2000, 2010, 2020, and 2024. Each group of bars corresponds to a single year, while the colors and patterns represent subsequent months from January (1) to December (12). The vertical axis represents the number of deaths and the horizontal axis represents the analyzed years.

The most important feature of the chart is the recurring seasonality of mortality, visible across all analyzed years. In each period, the highest values occur in the winter months, particularly January, February, November, and December, while the lowest values occur in the summer months, primarily July and August. That pattern confirms the strong influence of climatic and health conditions on the number of deaths. The risk of respiratory and circulatory system diseases increases in winter, while a relative "relief" of the population's health burden is observed in summer.

A comparison of years also reveals a long-term increase in the number of deaths, which is particularly evident when comparing 1980 with 2010-2024. In 1980 and 1990, monthly figures are significantly lower and more even, reflecting the younger demographic structure of society. In 2000 and 2010, a gradual increase is visible, especially in the winter months, associated with the progressive aging of the population.

The biggest outlier is definitely 2020, with figures for the autumn and winter months, especially November and December, reaching extremely high values, significantly exceeding other years. It is a direct result of the COVID-19 pandemic, which caused an increase in both direct deaths and excess deaths resulting from limited access to healthcare. The spring months of 2020 are also characterized by elevated levels compared to previous decades.

2024 shows a return to a more typical seasonal pattern, but death rates remain higher than in the pre-pandemic years. A winter peak and summer decline remain clearly visible, demonstrating the persistence of seasonality, coupled with the impact of long-term demographic changes.

The research highlights three key phenomena: the seasonality of deaths throughout the year, a long-term increase in mortality, and the strong, one-off impact of the COVID-19 pandemic in 2020. The data highlight the importance of both climate and health factors, as well as structural demographic processes, in shaping mortality rates in Poland.

Next, Figure 2 presents data on the number of deaths in Poland in 2024 in respective voivodeships, by age group, from 0-4 to over 85.

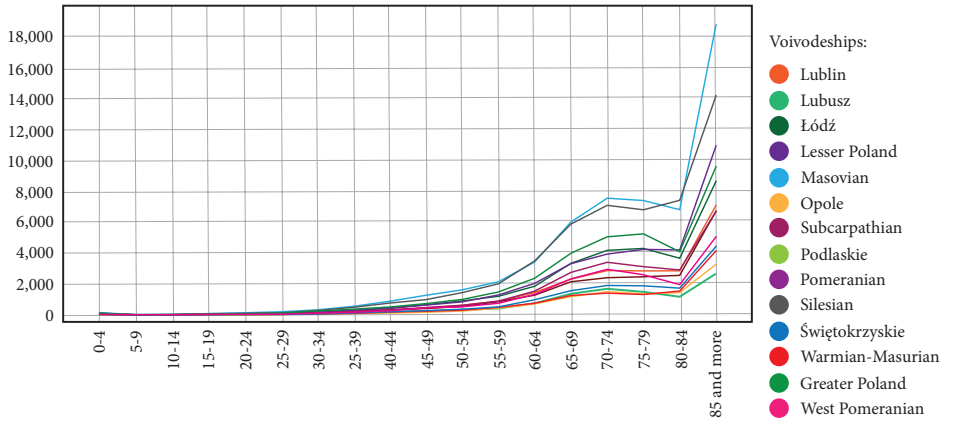

Fig. 2. Categorized line chart of the number of deaths in Poland in 2024 in respective voivodeships, arranged by age group from 0-4 years to over 85 years

Source: own study based on data obtained from: GUS, 2026

The data presented in the figure shows the number of deaths in Poland in 2024, broken down by voivodeship and by age group, from 0-4 to 85 and older. The table clearly demonstrates both the strong correlation between mortality and age and the significant regional variations, resulting primarily from population size, demographic structure, and the degree of urbanization of respective voivodeships.

In all voivodeships, the number of deaths in the youngest age groups (0-4, 5-9, 10-14) is visibly low. Those figures range from a dozen to several dozen cases per year, confirming the low mortality rate among children and adolescents and the small regional differences within those groups. Slightly higher, but still relatively low numbers occur in the 15-29 age group, where deaths are most often caused by unforeseen events, accidents, or acute illnesses.

A clear and systematic increase in the number of deaths begins in the 30-34 age group and increases with age. In the 40-44 and 45-49 age groups, the figures increase several-fold compared to younger groups, which is associated with the beginning of chronic diseases, especially cardiovascular diseases and cancer. From 50-54 and 55-59, the increase becomes very dynamic, and the curves on the chart begin to diverge significantly between voivodeships.

The highest concentration of deaths occurs in the 65-69, 70-74, 75-79, 80-84, and, above all, 85+ age groups. It is within those age groups that the greatest regional differences become apparent. The Masovian Voivodeship records the highest numbers in each of the oldest age groups, reaching nearly 18 800 deaths in the 85+ age category. Very high numbers are also observed in the Silesian, Lesser Poland, Greater Poland, and Lower Silesian Voivodeships, which is directly related to the large number of inhabitants and a significant share of elderly people.

Smaller voivodeships, such as Lubusz, Opole, and Podlaskie, are characterized by lower absolute death rates in each age group, although the age distribution is very similar. That indicates that the mechanism of mortality growth with age is common across the country, with differences primarily related to the scale of the phenomenon, not its structure.

The group aged 85 and over is particularly significant, accounting for the highest number of deaths in all voivodeships. It confirms the advanced process of population aging, which weighs most heavily on regions with large urban agglomerations. Data from 2024 show that mortality in Poland is currently highly concentrated in the oldest age groups, and its regional variation is primarily the consequence of the size of the senior population.

The research clearly indicates that age is a key factor in determining the number of deaths, and that voivodeships differ primarily in the scale of the phenomenon, not its course. Those results highlight the growing importance of health and social policies focused on older adults, especially in the most populated regions of the country.

The next stage of the research involved analyzing the number of deaths in Poland in 2024 in respective voivodeships, grouped by age group, from 0-4 to over 85 (men only).

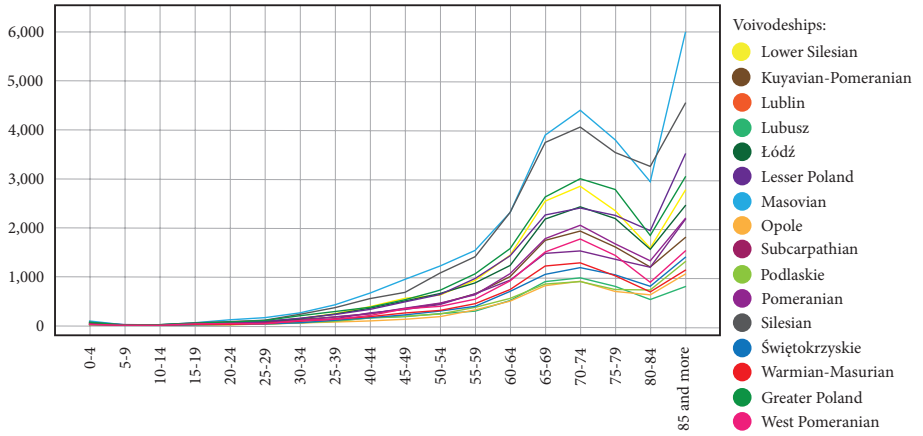

Fig. 3. Categorized line chart of the number of deaths in Poland in 2024 in respective voivodeships, arranged by age group from 0-4 to over 85, for men only

Source: own study based on data obtained from: GUS, 2026

The data presented above shows the number of male deaths in Poland in 2024, broken down by voivodeship and age group from 0-4 to 85 and older. It is clear that male mortality increases significantly with age, while there are significant regional differences, primarily due to population size, age structure, and the degree of urbanization of respective voivodeships.

In the youngest age groups (0-4, 5-9, and 10-14), the number of male deaths is very low across all voivodeships, typically ranging from a few to several dozen cases per year. Regional differences within those ranges are small and absolutely marginal compared to the values observed in older age groups. In the 15-19 and 20-24 age groups, the number of deaths increases slightly, which is related to factors such as traffic accidents, injuries, and other external causes, but it remains relatively low.

A clear and systematic increase in male mortality begins in the 30-34 age group and becomes increasingly dynamic in subsequent age groups. In the 40-44 and 45-49 age groups, death rates are already several times higher than in younger age groups, reflecting the growing impact of chronic diseases, particularly cardiovascular disease and cancer, which often manifest earlier in men than in women.

The highest death rates are observed in the age groups 60-64, 65-69, 70-74, and 75-79, with a peak in those aged 85 and over. In the oldest age group, the differences between voivodeships are most visible. The highest rates are recorded in the Masovian Voivodeship (approximately 6000 deaths of men aged 85+), which

is due to its large population and high concentration of elderly people. Very high numbers are also observed in the Silesian, Lesser Poland, Greater Poland, and Lower Silesian Voivodeships, regions with large urban agglomerations and noticeable senior populations.

Voivodeships with smaller populations, such as the Lubusz, Opole, and Podlaskie Voivodeships, are characterized by significantly lower absolute numbers of male deaths in each age group. At the same time, the curves in the chart are very similar across all regions, indicating that the mechanism of mortality growth with age is common across the country, with differences primarily related to the scale of the phenomenon, not its structure.

It is particularly significant to note that high rates of male deaths appear already in the 55-59 and 60-64 age groups, confirming the poorer health situation of this population in pre-retirement and early old age. Data from 2024 clearly indicates that male mortality in Poland is entirely concentrated in older age groups, and its regional variations primarily reflect the population distribution and demographic structure of the voivodeships.

Next, data on the number of deaths in Poland in 2024 were analyzed in respective voivodeships, grouped by age range from 0-4 to over 85 for women only.

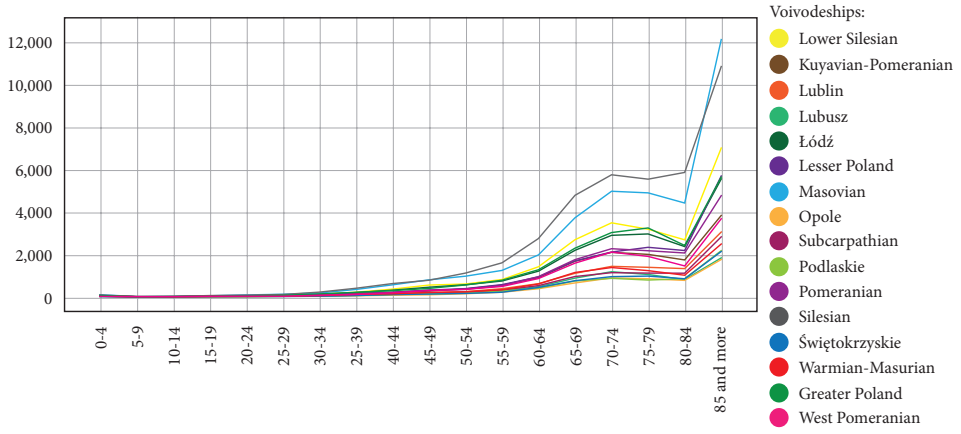

Fig. 4. Categorized line chart of the number of deaths in Poland in 2024 in respective voivodeships, arranged by age group from 0-4 to over 85, for women only

Source: own study based on data obtained from: GUS, 2026

The above-mentioned data and chart show the number of female deaths in Poland in 2024, broken down by voivodeship and by age group, from 0-4 to 85 and older. The analysis clearly indicates that female mortality, as in the general population, is strongly age-dependent, and its regional variations result primarily from the population size and demographic structure of respective voivodeships.

In the youngest age groups (0-4, 5-9, 10-14), the number of female deaths is very low in all regions, typically occurring in the low teens or even a few dozen cases per year. Differences between voivodeships are small and marginal in those age groups. A similar situation occurs in the 15-19 and 20-24 age groups, where deaths are uncommon and primarily related to rare diseases or unforeseen events.

The gradual increase in deaths begins in the 30-34 age group and is more pronounced in the 40-44 and 45-49 age groups. In those groups, chronic diseases, including cancer, are increasingly prevalent, as they often manifest in middle age in women. From 50-54 and 55-59, a clear, systematic increase in deaths is observed in all voivodeships.

The highest concentration of female deaths occurs in the age groups 65-69, 70-74, 75-79, 80-84, and, above all, 85 years and older. Regional differences become most apparent in those age groups. The highest rates are recorded in the Masovian Voivodeship, where the number of deaths among women in the 85+ age group exceeds 12 800. Very high numbers are also found in the Silesian, Lesser Poland, Greater Poland, and Lower Silesian Voivodeships. Those are regions with large populations and a significant proportion of older people, particularly women, who statistically live longer than men.

Less populated voivodeships, such as Lubusz, Opole, and Podlaskie, are characterized by lower absolute numbers of female deaths in every age group. Despite that, the curves in the chart are very similar across all regions, indicating that the aging process and the increase in mortality with age are universal, and the differences are primarily related to the scale of the phenomenon, not its structure.

Of particular significance is the presence of the 85-and-over age group, which accounts for the highest number of female deaths in each voivodeship. It stems from longer life expectancy of women and their numerical predominance in the oldest age groups. Data from 2024 clearly shows that female mortality in Poland is entirely concentrated in old age, and its regional variations primarily reflect the distribution of the senior population.

It can be concluded that age is a key factor determining the number of deaths among women, and voivodeships differ primarily in the number and structure of the elderly population. Those results highlight the growing importance of health and care issues related to advanced age, especially in the most populated regions of the country.

Figure 5 presents data on the number of deaths in Poland, only in cities, in 2024, in respective voivodeships, grouped by age group, from 0-4 to over 85.

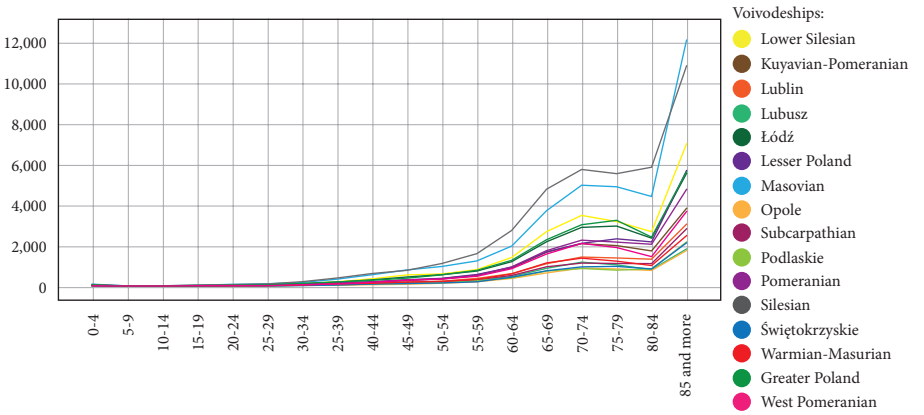

Fig. 5. Categorized line chart of the number of deaths in Poland, only in cities, in 2024 in respective voivodeships, arranged by age group from 0-4 to over 85

Source: own study based on data obtained from: GUS, 2026

The data in the figure above shows the number of deaths in Poland in 2024, exclusively in cities, broken down by voivodeship and age groups from 0-4 to 85 and older. The data clearly demonstrates both the strong age-dependent mortality rate and regional variations, resulting primarily from the number of urban residents, the degree of urbanization, and the demographic structure of respective regions.

In all voivodeships, the number of deaths in the youngest age groups (0-4, 5-9, and 10-14 years) is very low, ranging from a few to several dozen cases per year. Differences between voivodeships in those ranges are small and have no significant impact on the overall picture of urban mortality. Similarly, in the 15-19 and 20–24 age groups, the numbers remain relatively low, although a gradual increase is already visible, related to accidents and other external causes, more common in the urban environment.

A clear and systematic increase in the number of deaths begins in the 30-34 age group and intensifies in subsequent age groups. In the 40-44 and 45-49 age groups, the figures are already several times higher than in younger age groups, which is related to the increase in chronic diseases, particularly cardiovascular diseases and cancer, which are more common with age in urban populations. From 50-54 and 55-59, the increase becomes very dynamic, and the curves on the chart diverge significantly, revealing differences in scale between voivodeships.

The highest concentration of deaths in cities occurs in the age groups 65-69, 70-74, 75-79, 80-84, and, above all, 85 and older. It is in those oldest age groups that regional differences are most pronounced. The highest rates are recorded in the Masovian Voivodeship, where over 12,000 people in the 85+ age group died in cities,

a consequence of the large urban population and the concentration of seniors in the Warsaw metropolitan area. Very high numbers are also observed in the Silesian, Greater Poland, Lower Silesian, and Lesser Poland Voivodeships – highly urbanized regions with large cities and aging populations.

In contrast, voivodeships with a smaller share of urban populations, such as the Lubusz, Opole, Podlaskie, and Świętokrzyskie Voivodeships, are characterized by significantly lower absolute death rates in all age groups. Despite that, the age distribution is very similar across all regions, indicating that the process of increasing mortality with age is universal, and differences primarily relate to the scale of the phenomenon, not its structure.

Of particular significance is the presence of the 85-year-old and older age group, which accounts for the highest number of deaths in each urban voivodeship. The data clearly confirms the advanced aging of Polish urban population and the growing importance of health and caregiving issues among the oldest groups. In 2024, mortality in cities is therefore clearly concentrated in old age, and its regional variations reflect primarily the distribution and size of the urban senior population.

The next stage of the research involved analyzing the number of deaths in Poland, only in rural areas, in 2024 in respective voivodeships, grouped by age group from 0-4 years to over 85 years.

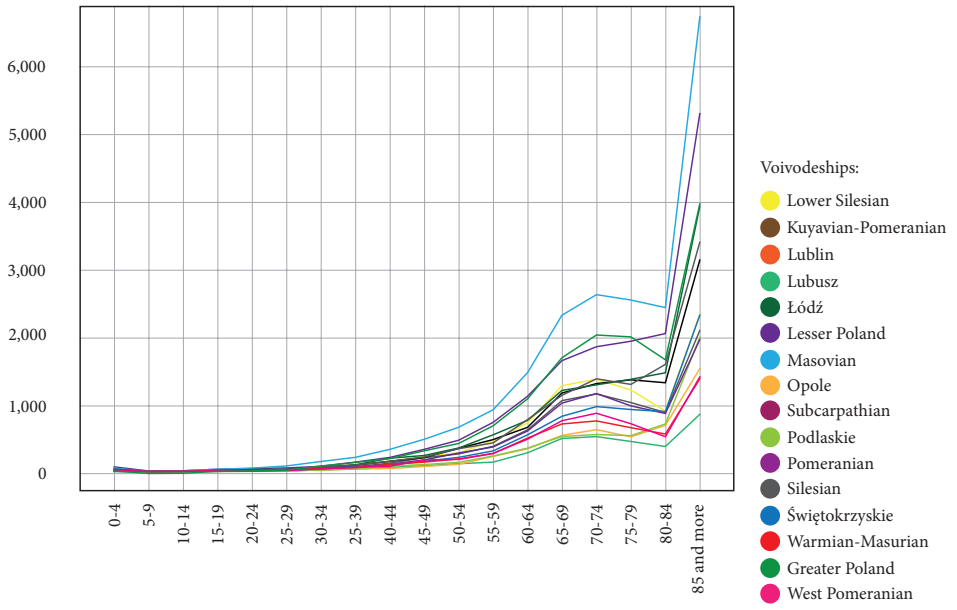

Fig. 6. Categorized line chart of the number of deaths in Poland, only in rural areas, in 2024 in respective voivodeships, arranged by age group from 0-4 to over 85

Source: own study based on data obtained from: GUS, 2026

The data in Figure 6 presents the number of deaths in Poland in 2024, exclusively in rural areas, broken down by voivodeship and age group from 0-4 to 85 and older. The comparison allows us to evaluate the specificity of mortality in rural areas, which differs from urban areas, and at the same time demonstrates the very strong influence of age and the demographic structure of regions on the scope of the phenomenon.

In all voivodeships, the number of deaths in rural areas among the youngest age groups (0-4, 5-9, and 10-14) is very low, typically limited to a few to several dozen cases per year. Regional differences within those groups are small and have little impact on the overall mortality picture. Similarly, death rates in the 15-19 and 20-24 age groups remain relatively low, although some voivodeships show slightly higher rates than urban areas, which may be related to road accidents, manual labour, and limited access to healthcare.

A significant increase in the number of deaths in rural areas begins in the 30-34 age group and systematically increases with age. In the 40-44 and 45-49 age groups, the figures increase several-fold, which is related to the severity of chronic diseases, often diagnosed later in rural areas. From the ages of 50-54 and 55-59, a dynamic increase in the number of deaths is observed in all voivodeships, with the curves becoming increasingly steep.

The highest concentration of deaths in rural areas occurs in the age groups 65-69, 70-74, 75-79, 80-84, and especially those aged 85 and over. It is in the oldest age groups that the greatest regional differences are evident. The highest rates are recorded in voivodeships with a large share of rural and aging populations, such as the Masovian, Lesser Poland, Lublin, Greater Poland, and Łódź Voivodeships. In those 85+ age groups, deaths reach several thousand annually, clearly outnumbering those in younger age groups.

Voivodeships with smaller rural populations, such as the Lubusz, Opole, and West Pomeranian Voivodeships, are characterized by lower absolute death rates in all age groups. Despite that, the age distribution remains very similar across all regions, indicating that the process of increasing mortality with age in rural areas is universal, with differences stemming primarily from the population size and its advanced aging.

Of particular significance is the presence of the 85-year-old and older age group, which in each voivodeship accounts for the highest number of deaths in rural areas. The data clearly confirms that Polish rural population in 2024 is heavily burdened by the effects of aging, with mortality concentrated in old age. Combined with the poorer access to healthcare and care services in rural areas, it constitutes one of the key demographic and social challenges facing contemporary Poland.

Next, the data covering the number of deaths in Poland was analyzed only in urban areas in selected years: 1980, 1990, 2000, 2010, 2020, and 2024.

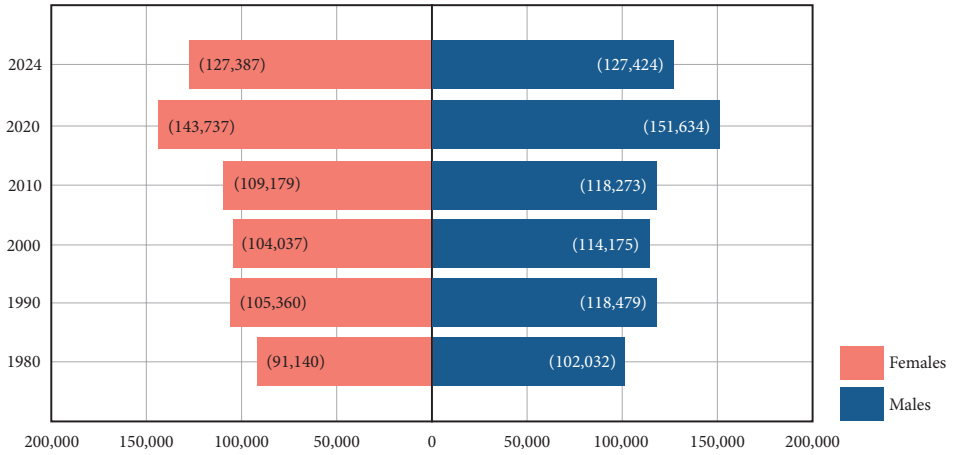

Fig. 7. Pyramid chart of the number of deaths in Poland, only in cities, in selected years: 1980, 1990, 2000, 2010, 2020, and 2024

Source: own study based on data obtained from: GUS, 2026

Figure 7 presents the number of deaths in Poland, exclusively in cities, in selected years: 1980, 1990, 2000, 2010, 2020, and 2024, with a distinction made between women and men. The layout of the chart allows for comparison of changes over time and differences between the sexes.

Throughout the analyzed period, a significant increase in the number of deaths in cities was observed, reflecting long-term demographic changes, primarily the aging of the urban population. In 1980, the number of deaths was lowest, totaling just over 190,000, with men significantly outnumbering women. In the following decades, a gradual increase in deaths was observed among both women and men, with slight fluctuations in 1990 and 2000, when the pace of change was moderate.

In 2010, the number of deaths in cities had already reached a significantly higher level than in previous decades, reflecting the growing input of elderly people in the urban population. The sharpest deviation from this trend was seen in 2020, when a sharp increase in deaths occurred, particularly among men. It was a direct result of the COVID-19 pandemic, which hit urban areas hardest, characterized by high population density and intense social contact.

In 2024, a decline in deaths was visible compared to 2020, but the level remains significantly higher than before the pandemic. It represents a return to a more "normal" mortality pattern, but at a permanently elevated level resulting from the continued aging of urban populations. In the years analyzed, male deaths outnumbered female deaths, confirming the persistent gender gap in mortality, particularly evident in cities.

Research shows that mortality in Polish cities has been steadily rising since 1980, with a significant, extraordinary spike in 2020. Data from 2024 confirms that, despite the absence of pandemic factors, urban death rates remain high, a consequence of long-term demographic and health processes.

The final stage of the research was an analysis of rural deaths in Poland in 2024, covering selected years: 1980, 1990, 2000, 2010, 2020, and 2024.

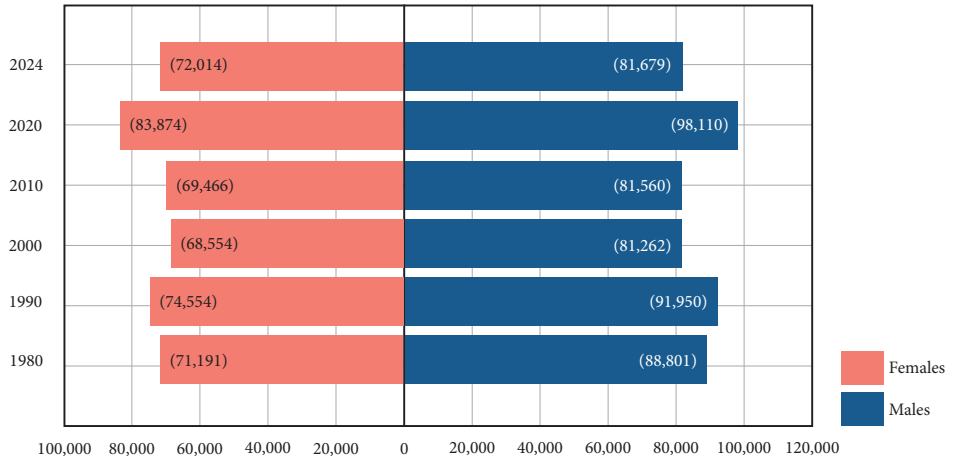

Fig. 8. Pyramid chart of human deaths in Poland, only in rural areas, in 2024, in selected years: 1980, 1990, 2000, 2010, 2020, and 2024

Source: own study based on data obtained from: GUS, 2026

Figure 8 summarizes the number of deaths in Poland, exclusively in rural areas, in selected years: 1980, 1990, 2000, 2010, 2020, and 2024, broken down by men and women. It allows for evaluation of long-term changes in mortality in rural areas and a comparison of gender differences.

A general increase in the number of deaths in rural areas is visible throughout the analyzed period, although the process is not uniform. In 1980, the number of deaths was the lowest, approximately 160,000 in total, with male deaths significantly exceeding female deaths. In 1990, there was an increase in mortality, particularly among men, which may be related to the unfavorable health and social conditions during the transition period.

Between 2000 and 2010, the number of deaths in rural areas remained relatively stable, with minor fluctuations. During that time, a significant predominance of male deaths over female deaths continued to be observed, confirming the persistent gender gap in mortality rates in rural areas.

The most visible deviation from the previous trend was observed in 2020, when there was a sharp increase in deaths among both women and men. That was

a direct result of the COVID-19 pandemic, which also severely affected rural areas, particularly the elderly and populations with limited access to healthcare.

In 2024, a decline in the number of deaths was visible compared to 2020, but the level remains significantly higher than in previous decades. It represents a return to a more typical mortality rate, but with the remaining long-term effect of aging in the rural population. In each of the years analyzed, male deaths outnumber females, although the difference is gradually narrowing, which may be related to the longer lifespan of women and changes in the age structure.

In summary, mortality in rural areas in Poland has been steadily increasing since 1980, with a significant, exceptional increase in 2020. Data from 2024 confirms that, despite the absence of pandemic factors, death rates in rural areas remain elevated, a consequence of population aging, poorer access to healthcare, and persistent health disparities between urban and rural areas.

Conclusions

The analyses and evaluation of deaths in Poland, both long-term and spatial, including breakdowns by urban and rural areas, voivodeships, age groups, and gender, provide a coherent and multidimensional picture of demographic changes that increasingly determine the level of social and demographic security of the country. Data from 2024, placed in a comparative context with 1980-2020, clearly indicate that Poland is in an advanced phase of population aging, a process that is persistent, structural, and uneven across regions.

The most important conclusion from the analyses is the concentration of mortality in the oldest age groups, particularly those aged 85 and over, which in all voivodeships generates the highest number of deaths in both urban and rural areas. It means that the primary factor shaping contemporary mortality rates is not random events or short-term crises, but rather long-term changes in the age structure of the population. The COVID-19 pandemic in 2020 served as a catalyst, rapidly revealing the scale of health threats. However, data from 2024 show that after the extraordinary factors disappeared, death rates did not return to pre-pandemic levels. It indicates a persistent increase in demographic and health risks, particularly among urban populations.

From the perspective of social security, the spatial variation in mortality is particularly significant. Highly urbanized voivodeships, such as the Masovian, Silesian, Greater Poland, and Lesser Poland Voivodeships, experience the highest absolute number of deaths, due to their large populations and the high proportion of elderly people living in cities. Regions with a larger rural population, on the other hand, are characterized by a smaller scale of the phenomenon but are often more susceptible to risks stemming from limited access to healthcare and long-term care. It means that threats to social security are not uniform and require differentiated, regionally tailored interventions.

Another important element of the analyses is the gender gap in mortality. In all years analyzed and across all types of areas, men died more often than women, especially in the working age and early old age. The phenomenon has significant social and economic implications, leading to a weakening of labour market potential, destabilization of family structures, and increased demand for social benefits. At the same time, longer lifespan of women lead to their predominance in the oldest age groups, which results in a growing demand for care and medical services in the very old age.

From the perspective of demographic security, the results of analyses indicate a progressive decline in the development potential of the country. The high concentration of deaths in older age groups, coupled with low fertility rates, leads to an increased demographic burden and a reduction in the self-reproductive capacity of social systems. It is particularly disturbing in voivodeships of key economic importance, where population aging may undermine regional and national competitiveness in the long term.

Research findings clearly demonstrate that demographic processes should be treated as non-military threats to national security, comparable to economic or energy threats. Population aging, high mortality among seniors, and persistent health disparities between urban and rural areas require the incorporation of demographic issues into national, regional, and local security strategies. It necessitates the strengthening of the healthcare system, the development of long-term care, and preventive healthcare targeted at middle-aged men, as well as the building of resilient local communities capable of responding to the effects of an aging population.

The contribution of the presented analyses to security sciences lies primarily in the empirical demonstration that mortality and the age structure of the population are key indices of a social resilience of the state. The research expands the traditional understanding of security, pointing to the need to integrate demographic, health, and territorial perspectives in threat analysis. It also proves that social and demographic security are long-term and cumulative, and negligence in that area can lead to difficult-to-reverse consequences in the future.

In summary, the presented analyses show that Poland is entering a phase of profound demographic transformations that will increasingly shape the level of social, regional, and national security. Understanding those processes and their consequences is not only a research challenge but also a fundamental prerequisite for effective public policy planning and building long-term national resilience.

The contribution of the presented research to security science lies in its empirical consolidation of demographic and social security with hard statistical data and in demonstrating that mortality and age structure are key determinants of state resilience. From a theoretical perspective, the research broadens the scope of security sciences in terms of demographic and health perspectives, while from a practical view, it provides tools and arguments for long-term, integrated social security management in Poland.

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