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Multidimensional analysis of population in Poland and Germany between 2024-2050

Wielowymiarowa analiza populacji ludzi w Polsce i w Niemczech w latach 2024-2050

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Abstract.

Research objectives and hypothesis/research questions

The following research problem was outlined in the article: how will the population of pensioners (aged 65 and over) change in 2050 compared to 2024 in Poland and Germany? The aim of the research is to attempt to conduct a multidimensional comparative analysis of data on the population in Poland and Germany between 2024 and 2050. The following research hypothesis was put forward in the study: it is assumed that the number of people in the 65+ group in 2050 in Poland and Germany will increase by at least 7 percentage points compared to 2024.

Research methods

The following research methods were used in the study: analysis, comparison and inference.

Main results

Research results indicate that in Germany in 2050 the number of people over 65 years of age will increase by 7.3 percentage points of population, i.e. by 5,1 million people, and in Poland there will be an increase of 12.2 percentage points, i.e. by approximately 3,3 million people.

Implications for theory and practice

In Poland, the population in 2050 compared to 2024 will decrease by 5 846 235 people, including 2 709 078 men and 3 137 157 women. However, in Germany, in the same period, the number of people will decrease by 4 342 493 people, including 2 220 941 men and 2 121 552 women. Children will constitute 10 588 299, i.e. 13% of the population, the group of working people will constitute 4 430 975 – 56% of the population, and pensioners will constitute 24 878 557, 31% of the population – the increase will be 7.3 percentage points of the population, i.e. by 5,1 million people.

Keywords: human population, migration, security, employment, human birth

Abstrakt.**Cel badań i hipotezy/pytania badawcze**

W artykule sformułowano następujący problem badawczy: jak zmieni się populacja emerytów (od 65. roku życia) w roku 2050 w porównaniu do roku 2024 w Polsce i w Niemczech? Celem badań jest próba wykonania wielowymiarowej analizy porównawczej danych dotyczących populacji ludzi w Polsce i w Niemczech między rokiem 2024 a rokiem 2050. W publikacji postawiono następującą hipotezę badawczą: przypuszcza się, że liczba ludzi w grupie od 65+ w 2050 r. w Polsce i w Niemczech wzrośnie w porównaniu do 2024 r. o co najmniej 7 punktów procentowych.

Metody badawcze

W opracowaniu zastosowano następujące metody badawcze: analiza, porównanie i wnioskowanie.

Główne wyniki

Wyniki badań wskazują, że w Niemczech w roku 2050 wzrost liczby ludzi powyżej 65. roku życia nastąpi o 7,3 pp. populacji, czyli o 5,1 miliona osób, a w Polsce obserwowany będzie wzrost o 12,2 pp., czyli o około 3,3 miliona osób.

Implikacje dla teorii i praktyki

W Polsce populacja ludzi w roku 2050 w porównaniu do roku 2024 spadnie o 5 846 235 osób, w tym o 2 709 078 mężczyzn i o 3 137 157 kobiet. Z kolei w Niemczech w jednoimiennym okresie spadnie o 4 342 493 osoby, w tym o 2 220 941 mężczyzn i o 2 121 552 kobiety. Dzieci będą stanowiły 10 588 299, czyli 13% populacji, grupa osób pracujących 4 430 975, co stanowić będzie 56% populacji, a emeryci 24 878 557, to jest 31% populacji – wzrost nastąpi o 7,3 pp. populacji, czyli o 5,1 miliona ludzi.

Słowa kluczowe: populacja ludzi, migracja, bezpieczeństwo, zatrudnienie, narodziny ludzi

Introduction

The following research problem was outlined in the article: how will the population of pensioners (aged 65 and over) change in 2050 compared to 2024 in Poland and Germany? The aim of the research is to attempt to conduct a multidimensional comparative analysis of data on the population in Poland and Germany between 2024 and 2050. The following research hypothesis was put forward in the study: it is assumed that the number of people in the 65+ group in 2050 in Poland and Germany will increase by at least 7 percentage points compared to 2024.

The following research methods were used in the study: analysis, comparison and inference.

1. Analysis of the literature on the subject of research

The human population and, thus, an appropriate level of security (Kozicki, 2022) in Poland and Germany are influenced by many demographic, social and economic factors (Latosiewicz, Kozicki, Tomaszewski, 2025).

One of the factors influencing the population size is the birth rate (GUS, 2024). In Poland, it is relatively low, amounting to 2,1 children per woman, which results in a decline in the population (Sobolewski, 2024; Ditrich, 2024; Nowakowska, 2024; Bankier.pl, 2024; Polskie Radio Jedynka, 2024). Women are giving birth to fewer and fewer children – their number is below the replacement level.

Factors such as economic uncertainty, lack of appropriate family policies and higher costs of living influence the decision to have children. In the case of the German population, this index is below 2,1 (Widzyk, 2024; Business Insider, 2024; Nabiałek, 2024). However, German pro-family policy, including child benefits and work flexibility, tries to support families. In Germany, migration can partially compensate for the low birth rate.

Another important factor is the phenomenon of migration. Poland records migration at the level of emigration (an increase in the number of Poles going abroad) and immigration (GUS, 2021). Since 2014, Poland has also become a destination for migration from other countries, primarily from Ukraine (especially from February 2022) (Dobroczek, Puzynkiewicz, Chmielewska, 2016; Chmielewska-Kalińska, Dudek, Strzelecki, 2023), Belarus and other Eastern European countries. Those people contribute to the labor market, but do not always compensate for population decline caused by emigration.

Germany is one of the leaders in Europe in terms of accepting immigrants, which has a significant impact on demographic stability. Migrants, especially from non-EU countries, can contribute more children and younger people to the population, which in some cases mitigates the effects of an aging population.

Population size is undoubtedly influenced by human mortality and life expectancy. In Poland, the average life expectancy is lower than in Germany, which is due to, among others, the lower quality of health care (Mirska, 2024), higher mortality from chronic diseases and lower standard of living in some regions. Changes in the quality of health care, lifestyle and health education can reduce mortality. In Germany, access to healthcare is very wide (medinwestycje.pl, 2019). It includes various services, such as care from general practitioners, consultations with specialists, hospital treatment, rehabilitation, medicines and other long-term services. The health insurance system provides universal coverage. It is based on public (90% of the population) and private insurance. The availability of services may vary depending on the type of insurance, and waiting times to consult specialists may be longer for people with public insurance.

Another important factor influencing the population of people in Poland and Germany is pro-family policy. In Poland, several programs were introduced with the aim of increasing the birth rate, e.g. 500+, 800+ (ZUS, 2024; Serwis Rzeczypospolitej Polskiej, 2024). However, the effects are limited and still insufficient to stop population decline. There is also a need for further support for families in terms of childcare and facilities for working parents.

Germany has introduced more different forms of family support than Poland, including: (parental) maternity and paternity benefits (All-Tax, 2023), parental leave and assistance in organizing childcare. Parental benefit is one of the most important elements of pro-family policy in Germany. This is a financial benefit paid to parents who take parental leave to care for their child.

The benefit ranges from 65% to 100% of the parent's income before the child's birth, depending on the amount. The minimum amount is 300 euros per month and the maximum is 1 800 euros per month (Datev, 2021). That benefit is paid for a period of 12 to 14 months, depending on whether both parents take parental leave. If both parents take the leave, the support period may be extended to 14 months.

Another benefit is the so-called *kindergeld*, i.e. a financial benefit for families with children, which aims to support the family in covering the costs of raising children (holandia.org, 2021). It ranges from 250 to 350 euros per month for each child, depending on the number of children in the family. It is paid throughout the entire period of child upbringing, up to the age of 18, and if the child continues education, until the age of 25.

In Germany, children's education is financially supported. The German government subsidizes access to kindergartens and, in some districts, offers free education in public kindergartens. In recent years, especially in western Germany, the positive effects of such a policy have been visible.

The human population is also affected by the phenomenon of population aging. It should be emphasized that the aging of society in Poland is progressing, and forecasts indicate an increasing percentage of older people in the population (Mizura, Mitkow, Kozicki, 2023; Skrabacz, Kozicki, Jaśkiewicz, 2024). The decline in the number of younger people combined with the growing number of older people may lead to a burden on pension and health systems.

Germany has been struggling with the growing percentage of older people in society for many years. It is expected that in 2050, every third German citizen will be over 65 years old (Rynek Zdrowia, 2012). The long-term challenges of caring for seniors are similar to those in Poland, but Germany has a stronger health and social care system.

Another important factor influencing the human population is the economy (Jurgilewicz, Malec, Piwowarski, Kozicki, 2021) and employment (Kozicki, Kalwański, 2021). Economic stability has a major impact on decisions to migrate and approaches to parenting, especially among young people. When economic growth is low, people often decide to emigrate or postpone the decision to start a family. What is more, a higher standard of living helps support more children. The German economy is still one of the strongest ones in Europe, and the standard of living, quality of health care and economic stability are visibly higher than in Poland. That causes an influx of migrants and makes it easier to make decisions about starting families. Germany is also one of the countries that is actively developing policies to support an aging society.

The study attempts to conduct a multidimensional comparative analysis of the human population in Poland and Germany dynamically.

2. Multidimensional analysis and forecasting of the population of Poland and Germany for 2050

The research began with the presentation of data on the human population in Germany and Poland from 1950 to 2050 in Figure 1.

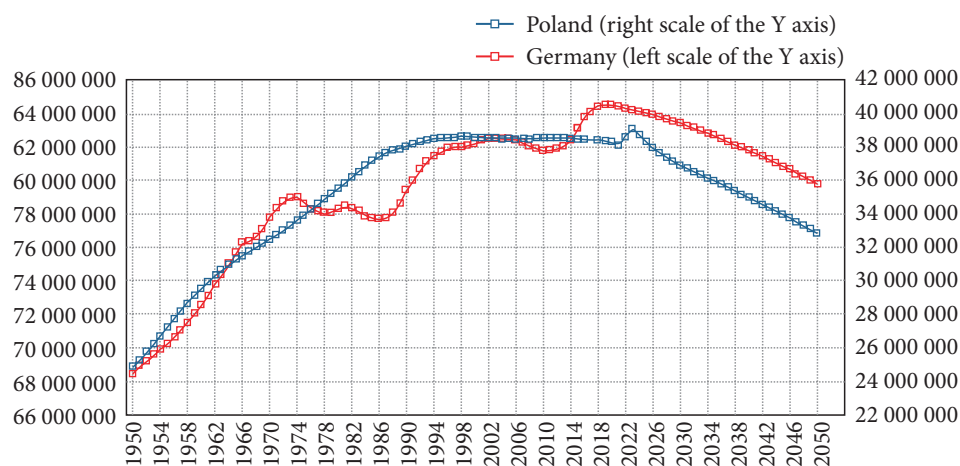


Fig. 1. Line chart of human population in Germany and Poland from 1950 to 2050
Source: own study based on: United States Census, 2024

Observations show that the population of people in Germany in 2024 is twice as large as in Poland. The populations of Germany and Poland between 1950–2050 have undergone and continue to undergo changes caused by various factors, such as wars, political changes, migrations, as well as the phenomenon of aging societies.

After World War II, Germany was divided into East Germany and West Germany. In the 1950s and 1960s, there was a visible trend of increasing population, thanks to the baby boom. In 1950, the population of West Germany was around 50 million and that of East Germany was 16 million.

In the 1970s and 1980s, the population in Germany grew, mainly as a result of immigration, especially from Turkey, as well as other countries as part of the so-called *Gastarbeiter* (guest workers). In the early 21st century, population growth slowed down, and in 2000, population of Germany was approximately 82 million people.

Since 2010, Germany has begun to struggle with slowing population growth, mainly caused by an aging society.

In 2050, population of Germany may decline to around 75-80 million. Germany will struggle with challenges related to pensions, health care and the need for a sustainable inflow of immigrants.

In 1950, the population in Poland was approximately 24 million. Until 1972, there was a significant increase in population, and then until 1990 there was a decline as a result of emigration and the economic and political crisis. In 1990, the population was approximately 38 million.

After the overthrow of communism in 1989, Poland began to undergo profound political, economic and social changes. As a result, an increase in emigration was observed, especially after 2004, i.e. Polish accession to the European Union.

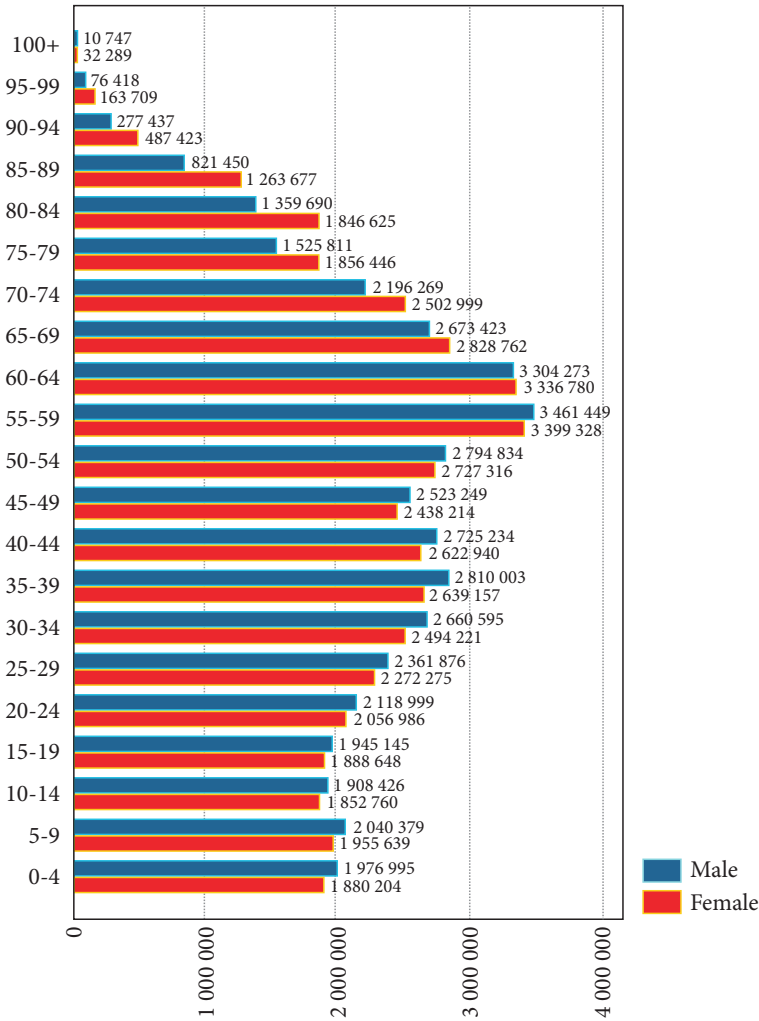


Fig. 2. Pyramid chart of the human population in Germany divided into men and women in 2024

Source: own study based on: United States Census, 2024

In 2000, the population of Poland increased to 38,5 million, and in 2020 it decreased to approximately 38 million.

Forecasts show that the population of people in Poland in 2050 may drop to approximately 32 million.

The next stage of the research was to compile data on the population in Germany in 2024 divided into men and women in age groups every five years.

The analyzes conducted show that the population of Germany in 2024 is approximately 84 119 100 people. It is worth noting that population of Germany is relatively stable, although it is starting to decline as a result of an aging process. In Germany, as in many developed countries, women make up a slightly larger percentage of the population because they live longer. Women in Germany make up approximately 50.6% of the total population, with men making up the remaining 49.4%.

Approximately 13.8% of the total human population in Germany, which is 11,6 million people, are children and adolescents aged 0-14.

People of working age, i.e. those aged 15-64, constitute approximately 52,6 million people, which makes 62.5% of the total population. The remaining 19,9 million people, so 23.7% of the total human population in Germany, are the elderly.

The population of children and young people remains relatively stable but is lower compared to the number of older people, pointing to further demographic challenges, such as maintaining balance in the labour market and pension systems.

Then, for research purposes, data on the population of people in Poland in 2024 was compiled, divided into men and women in age groups every five years.

Population of Poland in 2024 is approximately 38 million people. Like many other European countries, it is characterized by an aging society and falling birth rate. The number of men in Poland in 2024 is 18,4 million, so 48% of the total population, while the number of women is 20,3 million, which is the remaining 52% of the total population.

It can be stated that, similarly to Germany, in Poland women constitute a slightly larger percentage of the population, mainly due to the longer life expectancy of women compared to men.

Considering the age structure of the human population in Poland in 2024, it can be observed that children and adolescents aged 0 to 14 constitute approximately 5,5 million people, so 14.2% of the total population. The number of children and adolescents in Poland is smaller compared to older age groups, which is due to the low birth rate and will result in a decline in the total population of people in Poland in the future.

People of working age, i.e. those aged 15 to 64, constitute 25,5 million people, so 66% of the total population of people in Poland. That age group, although relatively the largest one, is gradually decreasing as the working-aged population begins to shrink due to low birth rate and emigration.

The last age group are older people: from 65 years and older. There are 7,7 million of them in Poland, which makes 19.8% of the total population. There is a visible increase in the number of people in that group, which is the result of an aging society. The number of people aged 65+ grows every year, and women predominate significantly.

Analyzing data on gender in various age groups in Poland, it can be observed that in the group of children and adolescents (0-14 years old), men constitute 2,8 million and women 2,7 million.

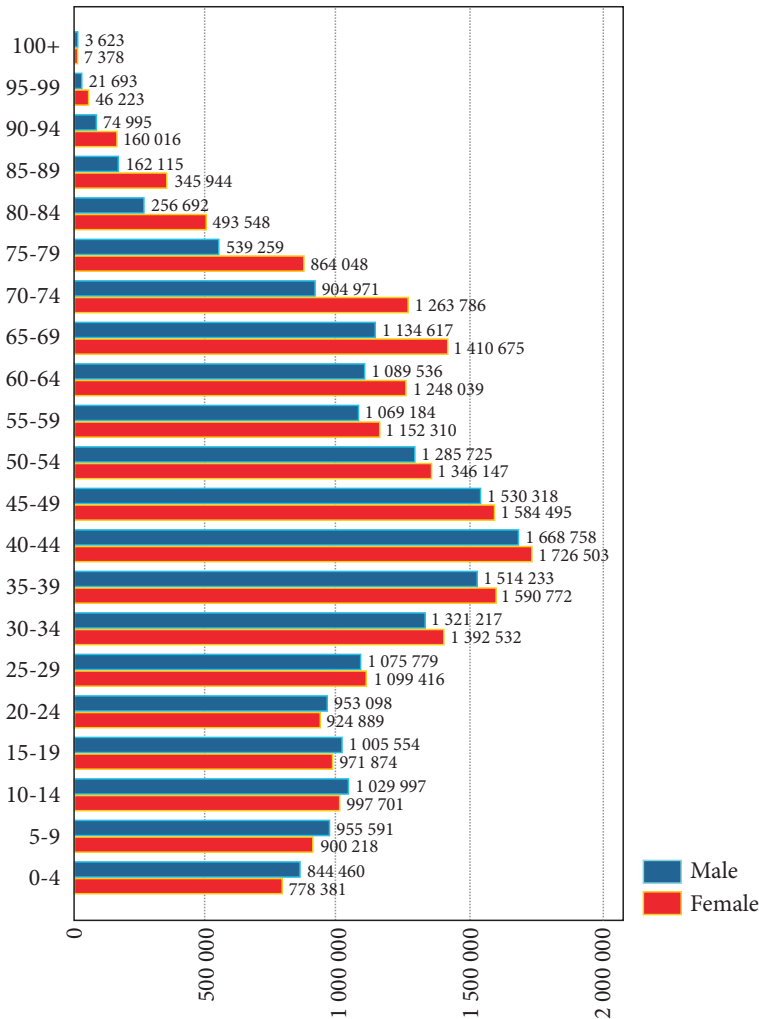


Fig. 3. Pyramid chart of the human population in Poland divided into men and women in 2024
Source: own study based on: United States Census, 2024

Analyzing data on gender in various age groups in Poland, it can be observed that in the group of children and adolescents (0-14 years old), men constitute 2,8 million and women 2,7 million.

What is more, among people of working age (15-64 years), there are 12,5 million men and 13 million women.

Analyzing older people (65 years and over): there are 3,1 million men and 4,6 million women.

Poland faces the challenge of the aging society, which involves the need to adapt pension systems, health care and migration policy.

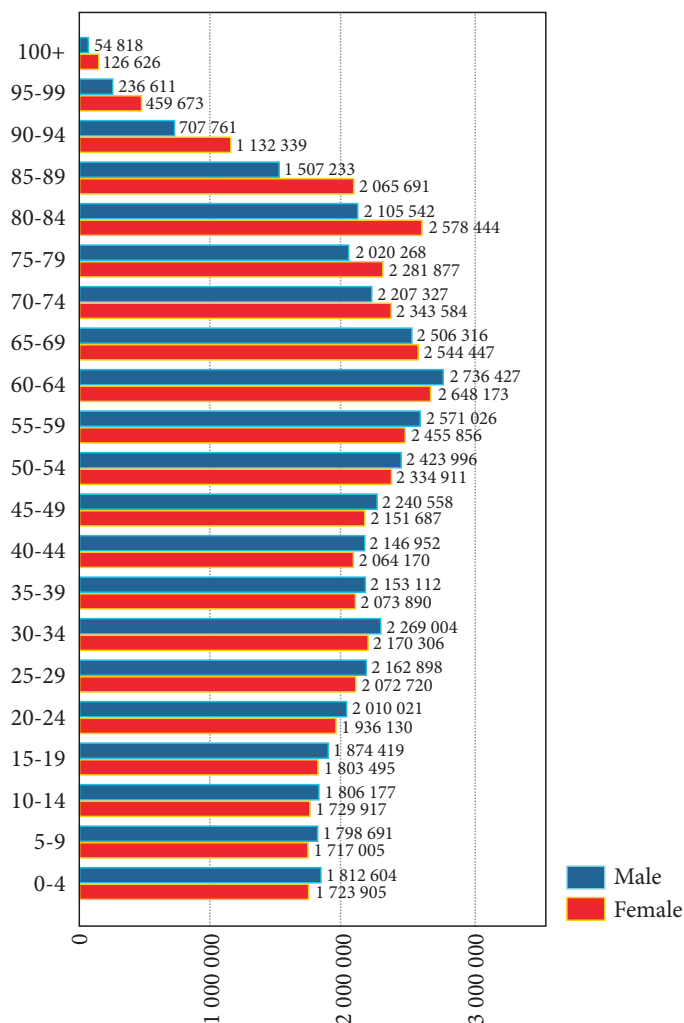


Fig. 4. Pyramid chart of the human population in Germany divided into men and women in 2050

Source: own study based on: United States Census, 2024

The next stage of the research was to draw a pyramid chart of the population in Germany divided into men and women in 2050 in Figure 4.

In 2050, population of Germany will likely continue to age due to lower birth rates and longer life expectancy. The gender distribution in Germany tends to be almost equal, with a slight predominance of women, especially in the older age groups.

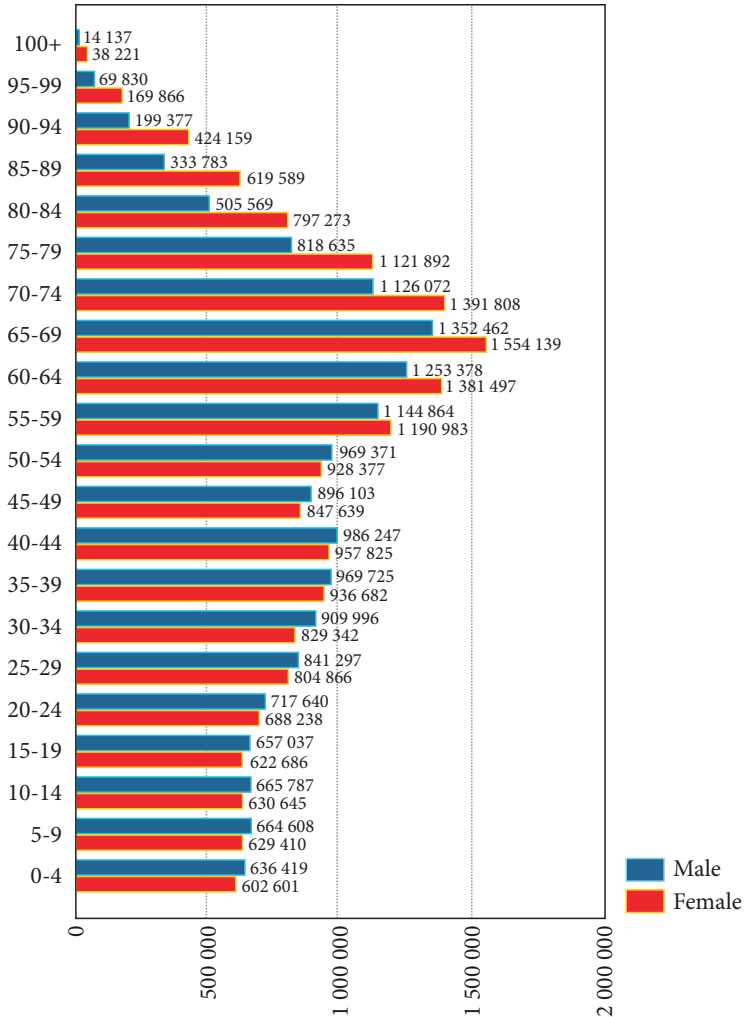


Fig. 5. Pyramid chart of the human population in Poland divided into men and women in 2050

Source: own study based on: United States Census, 2024

It is estimated that the human population in Germany in 2050 will be approximately 79 776 607 people. There will be 39 351 761 men and 40 424 846 women.

Women will outnumber men, especially in older age groups, due to their higher life expectancy. Men will continue to outnumber women in younger age groups, but as the population ages, women will make up a larger share, especially in the 70+ demographic group.

Children will constitute 10 588 299, i.e. 13% of the population, the group of working people will constitute 4 430 975, i.e. 56% of the population, and pensioners will constitute 24 878 557, i.e. 31% of the population.

Then, Figure 5 shows a pyramid chart of the population of people in Poland divided into men and women in 2050.

It is estimated that the population of Poland in 2050 will decrease to 32,9 million people. There will be 15 732 337 men and 17 167 738 women.

The number of children and adolescents aged 0 to 14 will amount to 3 829 470 people, which will constitute approximately 12% of the total population.

What is more, the group of people working from 15 to 64 years old will include 18 533 793 people, i.e. 56% of the total population.

The number of people over 64 years of age will be 10 536 812, or approximately 32% of the population.

Then, for research and illustrative purposes, Figure 6 presents the population of people in Germany and Poland in 2024 and 2050, divided into men and women in 2024 and in age groups every five years.

Research indicates that the human population in Poland in 2050 compared to 2024 **will decrease by 5 846 235 people, including 2 709 078 men and 3 137 157 women.** On the other hand, in Germany, in the same period, the number of people **will decrease by 4 342 493, including 2 220 941 men and 2 121 552 women.**

In case of Poland, the declines will occur in the age ranges from 0 to 54 years. In Germany, however, from 0 to 69 years of age.

Then, for illustrative purposes, Figure 7 presents differences in the human population in Germany and Poland between 2024 and 2050, divided into men and women in age groups every five years.

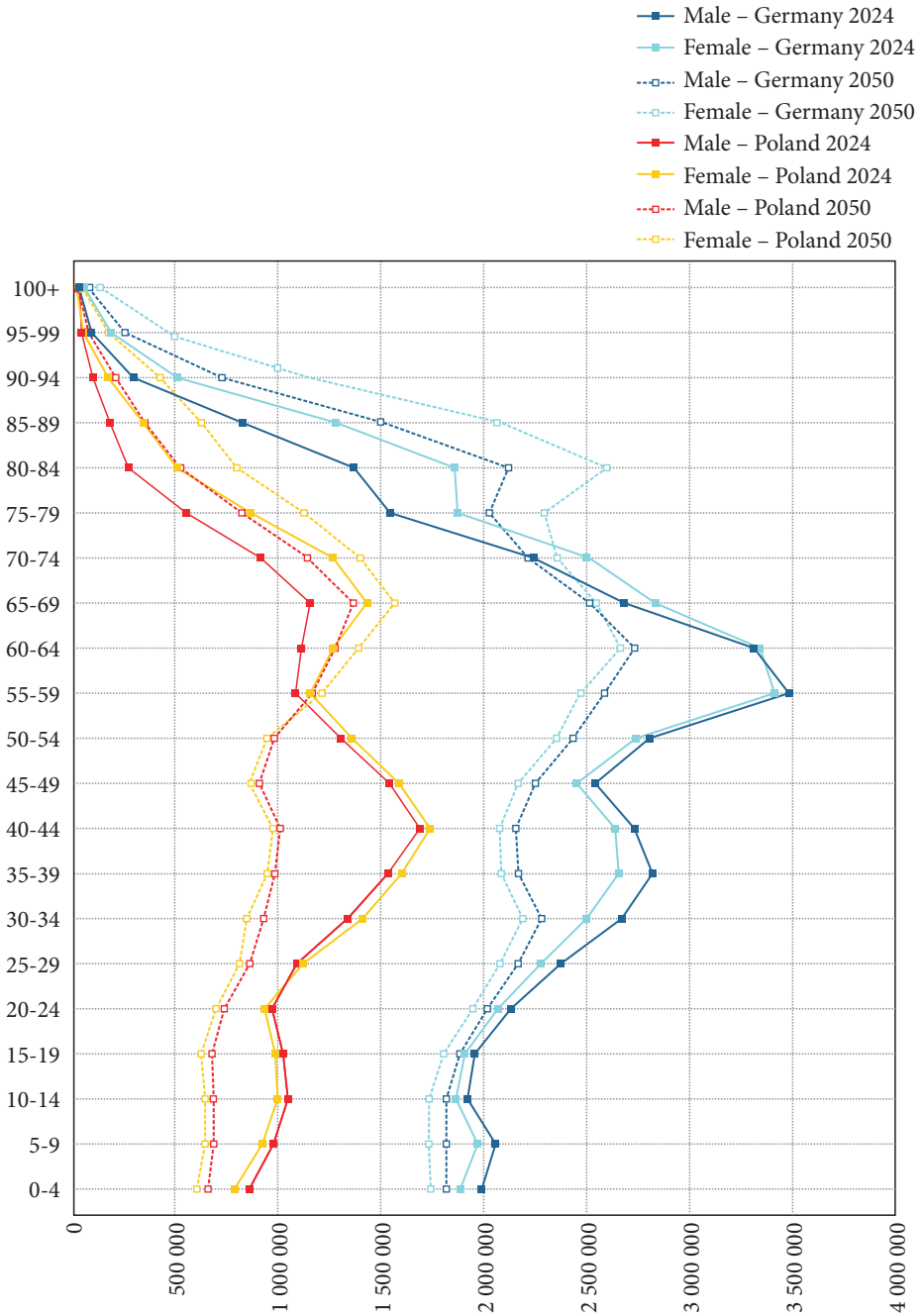


Fig. 6. Line chart of the human population in Germany and Poland in 2024 and 2050 divided into men and women in 2024 in age groups every five years

Source: own study based on: United States Census, 2024

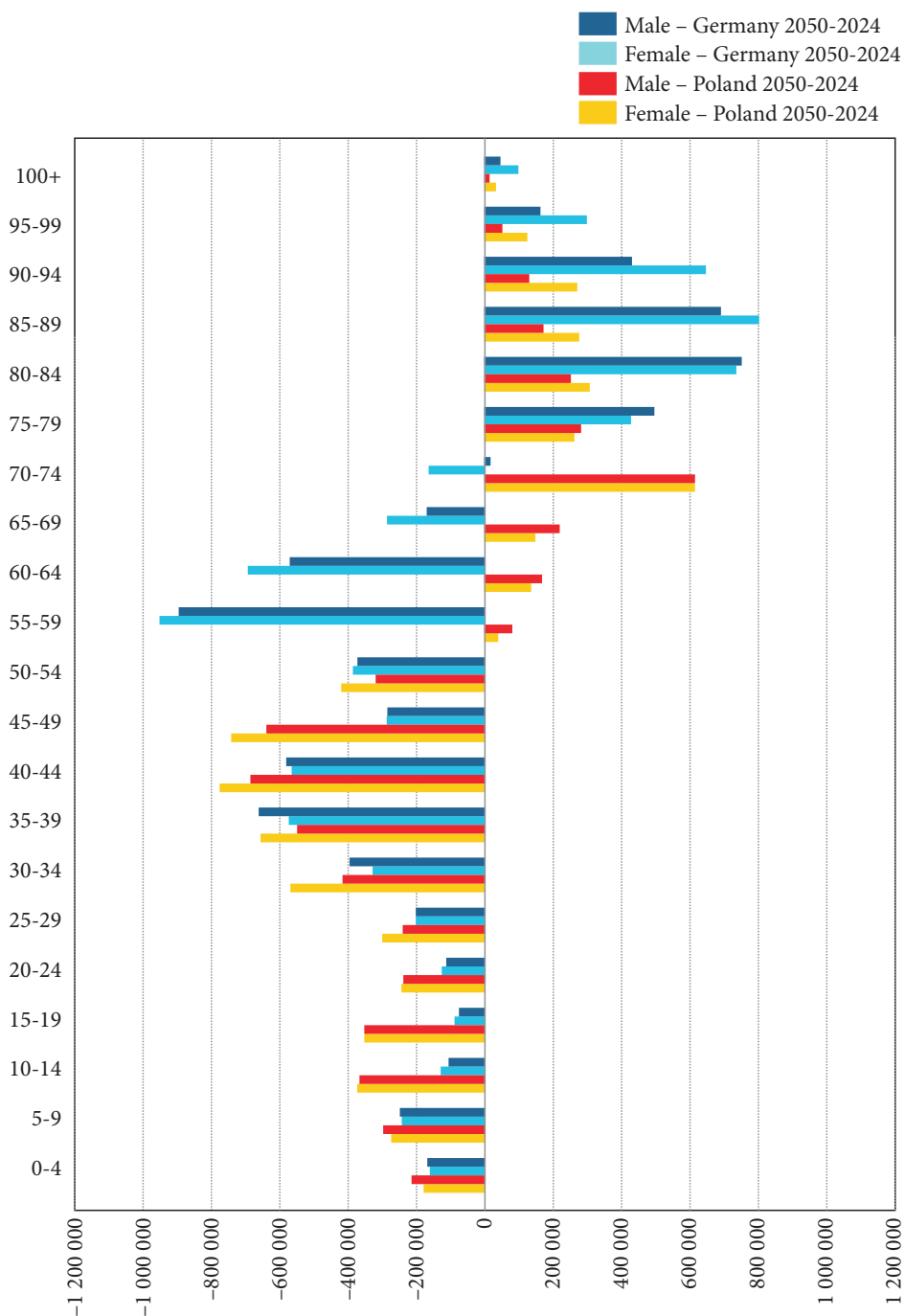


Fig. 7. Categorized bar chart of the human population difference in Germany and Poland between 2024 and 2050, broken down by men and women by age group every five years

Source: own study based on: United States Census, 2024

Observations show that in the age group **from 0 to 69** in Germany, the number of people in 2050 compared to 2024 **will decrease by 9 908 712 people, including 4 792 679 men and 5 116 033 women**. For people **aged 70 and over**, their number **will increase by 5 406 804, including 2 571 738 men and 2 835 066 women**. That will result in a decrease in the potential labour force and an increase in the number of pensioners.

In case of Poland, considering the same period (the difference between 2024 and 2050), as **in Germany, there will be a decrease in the number of people aged 0 to 54: by 9 105 117, including 4 270 500 men and 4 834 617 women**. In the age group **over 55, there will be an increase of 3 258 882 people, including 1 561 422 men and 1 697 460 women**. As in the case of Germany, Poland will also see a decrease in the number of people constituting the working group and an increase in the number of pensioners.

Conclusions

In the period after World War II, a large population increase was observed in Poland (until 1990) and Germany (until 1974). After 1990, Poland saw a decline in population due to emigration and a decline in total fertility rate. Further forecasts indicate that the decreasing trend of the human population in Poland will continue.

In Germany, the population has generally been growing in recent decades, mainly due to immigration and a higher standard of living. However, forecasts, as in the case of Poland, indicate a decreasing trend in the number of people.

In 2024, approximately 13.8% of the total human population in Germany, so 11,6 million people, will be children and adolescents aged 0-14. What is more, people of working age, i.e. those aged 15-64, constitute approximately 52,6 million people in Germany, which is 62.5% of the total population. The remaining 19,9 million people, so 23.7% of the total population, are the elderly.

On the other hand, in Poland in 2024, there will be approximately 5,5 million people in the group of children and youth aged 0 to 14, i.e. 14.2% of the total population. People of working age, i.e. those aged 15 to 64, constitute 25,5 million people, so 66% of the total population of people in Poland. Older people, aged 65 and over, constitute 7,7 million people, which is 19.8% of the total population.

It is estimated that the human population in Germany in 2050 will be approximately 79 776 607 people. There will be 39 351 761 men and 40 424 846 women. However, it is assumed that the population of Poland in 2050 will drop to 32,9 million people. There will be 15 732 337 men and 17 167 738 women.

In Poland, the population in 2050 compared to 2024 will decrease by 5 846 235 people, including 2 709 078 men and 3 137 157 women. However, in Germany, in the same period, the number of people will decrease by 4 342 493, including 2 220 941 men and 2 121 552 women. Children will constitute 10 588 299, i.e. 13% of the population, the group of working people will constitute 4 430 975 – 56% of the population, and pensioners will constitute 24 878 557, 31% of the population – **the increase will be 7.3 percentage points of the population, i.e. by 5,1 million people.**

Children and adolescents aged 0 to 14 will constitute approximately 12% of the total population. The group of working people aged 15 to 64 is 56% of the total population, and pensioners make up the remaining 32% of the population, **the increase will be by 12.2 percentage points, i.e. by approximately 3,3 million people.**

One of the significant factors influencing the population decline in Poland and Germany is, above all, the increasingly lower child birth rate. It is also worth mentioning the factors that cause young people to decide not to have children. Those include: large financial resources needed to raise children, inequality in child care, poor access to care facilities, concerns about the loss of quality of life, infertility and poor support from the state.

The process of maintaining the appropriate size of human population in specific countries requires many activities in such an area. One of them is the financial support for families, improving the availability of housing, developing gender equality policies, education about families, reforming the health care and infertility treatment systems, and supporting the life stability of young people. The key is to create an environment that encourages starting families and provides a sense of economic and health security.

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