SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2023
ORGANIZATION AND MANAGEMENT SERIES NO. 186

DATA CONCERNING COVID-19 CASES IN POLAND AT THE END OF THE PANDEMIC

Aleksandra CZUPRYNA-NOWAK[1*], Arkadiusz BANASIK[2*], Michał BARTNICKI[3]

[1] Silesian University of Technology, Faculty of Organization and Management, Department of Economics and Informatics; aleksandra.nowak@polsl.pl, ORCID: 0000-0001-8565-1029
[2] Silesian University of Technology, Faculty of Applied Mathematics, Department of Mathematics Applications and Methods for Artificial Intelligence; arkadiusz.banasik@polsl.pl, ORCID: 0000-0002-4267-2783
[3] Silesian University of Technology, Faculty of Organization and Management, Department of Economics and Informatics; michal.bartnicki@polsl.pl, ORCID: 0000-0002-0998-4494
* Correspondence author

Purpose: The main purpose of this article is to analyze and understand trends in COVID-19 cases in Poland during what is considered the end of the pandemic.
Design/methodology/approach: The article uses data visualization methods to assess trends and identify key factors influencing the dynamics of the pandemic. The analysis included data on the pandemic in the period from 1 January, 2023 to 30 June, 2023. On 1 July, 2023, the state of epidemic threat in Poland was canceled.
Findings: Analysis of epidemiological data showed that the number of new COVID-19 cases in Poland showed a gradual decline during the period considered to be the end of the pandemic. This reduction in case numbers has been consistent across regions of the country, although some areas have seen periodic increases. The data clearly demonstrate the significant impact of vaccinations in reducing the number of new infections and severe disease outcomes. Regions with higher vaccination rates saw lower COVID-19-related hospitalizations and deaths.
Research limitations/implications: The surveys discussed in this article may contribute to further empirical studies, including but not limited to initiating works to improve the pandemic analysis.
Practical implications: The study provides important information that can be used by public health decision-makers to shape effective pandemic response strategies. The results highlight the importance of maintaining and adapting intervention measures, such as vaccination, to control the spread of the virus and reduce the number of severe cases.
Originality/value: This study stands out from other works on the COVID-19 pandemic by its unique focus on the final stage of the pandemic in Poland. While most studies focus on the early stages of the pandemic or its global impact, our study offers detailed insight into local aspects of pandemic management and its evolution in a specific country. We present a comprehensive analysis that combines epidemiological data, the impact of health policy, social behavior and vaccination effectiveness.

Keywords: pandemic, COVID-19, data analysis, Poland.

Category of the paper: General review, Research paper.

1. Introduction

The COVID-19 pandemic, caused by the SARS-CoV-2 virus, has significantly impacted people's lives (Kumar et al., 2021; Baloch et al., 2020). In Poland, as in other countries, the pandemic has caused significant challenges for the health care system, economy, and society (Grifoni et al., 2020; Ciotti et al., 2020). Although high numbers of infections and deaths characterized the first waves of the pandemic, later stages brought changes in the dynamics of virus transmission, partly due to the introduction of vaccination programs and other intervention measures. By 30 June 2023, 6,517,852 cases of COVID-19 infections and 119,626 deaths were registered in Poland.

The SARS-CoV-2 virus belongs to the coronavirus family that causes COVID-19. This virus is transmitted through droplets, i.e., through contact with an infected person who coughs or sneezes. It is recommended to follow basic hygiene rules to avoid infection, such as frequently washing hands with soap and water, wearing masks where it is impossible to maintain a safe distance, avoiding touching the face, and carrying social distance (Jelnov, 2020; Suryasa, 2021).

Our research aims to provide insight into how Poland dealt with the final phase of the pandemic, which may be valuable in planning future public health strategies and responding to potential future pandemic-like events. We also present conclusions that can help understand the effectiveness of current actions and pave the way for improvements in the future.

The analysis used data from the Ministry of Health, the Chief Sanitary Inspectorate, and other national and international sources. This data includes case numbers, hospitalizations, deaths, and information on vaccination rates. The article uses data visualization methods to assess trends and identify critical factors influencing the dynamics of the pandemic. The analysis included data on the pandemic from 1 January 2023 to 30 June 2023. On 1 July 2023, the state of epidemic threat in Poland was canceled by the government. In this introduction, we present the context and goals of our research, which aim to shed light on the current epidemic situation in Poland and its national and global implications (COVID, 2023).

The article consists of two parts. The first part concerns the history of the pandemic, especially the initial period. It describes the main decisions regarding restrictions introduced in Poland to limit the spread of the SARS-CoV-2 virus. The second part concerns data from 1 January 2023 to 30 June 2023. The article ends with conclusions. The study's findings have significant practical value for health policymakers, healthcare professionals, and researchers. They provide essential information that can help better understand the dynamics of the pandemic and shape more effective public health strategies. The analysis results can also serve as a basis for future research and analysis on managing the pandemic and its social and economic effects. The study makes a new contribution to the scientific discourse on COVID-19 by expanding the understanding of the pandemic through a detailed analysis of its later stages.

2. SARS Covid-19 pandemic in Poland – historical outline

The COVID-19 pandemic, caused by the SARS-CoV-2 virus, began in December 2019 in the Chinese city of Wuhan. It soon spread worldwide, becoming a global health, social and economic challenge (Abid et al., 2020). It became a pandemic in March 2020, when the World Health Organization (WHO) announced that COVID-19 infection was already affecting many countries worldwide (WHO, 2023; Khoo et al., 2020).

In Poland, research on the coronavirus began on 31 January 2020. They were carried out by the National Institute of Public Health - National Institute of Hygiene (NIZP-PZH). As of 29 February 2020, 307 tests were performed, and 28 were pending. The tests were conducted in two laboratories in Warsaw: NIZP-PZH and the Provincial Infectious Diseases Hospital in Warsaw. Centers in Olsztyn and Wrocław have been prepared for research. The remaining laboratories in Poland were preparing to start their tests. At the same time, in other countries, the number of samples tested (as of 29 February 2020) is France - 800, Austria - 350, and the USA - about 450. On 6 March 2020, there were already 13 laboratories in Poland, and the number of tests carried out increased to 900; five were positive. Patient Zero appeared in Poland on 6 March and was a person who came to Poland from Germany. From that moment on, restrictions on mass gatherings began to be introduced. On 8 March 2020, the Chief Sanitary Inspector recommended canceling all mass events organized indoors for over 1000 people.

On 10 March 2020, the Rector of the University of Warsaw canceled all lectures and classes for students, doctoral students, and listeners from 11 March to 14 April 2020, except for those held remotely. At the Jagiellonian University, the Rector canceled lectures for students, doctoral students, and physical education classes. The Rector of the Wrocław University of Science and Technology and the chairman of the College of Rectors of Universities in Wrocław and Opole announced that from 11 March 2020, "all forms of teaching" at 14 public universities in the Lower Silesian Voivodeship and the Opole Voivodeship will be suspended. Classes at the University of Warsaw were also suspended. Courses at the University of Adam Mickiewicz in Poznań from 11 March 2020 until further notice. On the same day, a meeting of the National Security Council on actions regarding COVID-19 was held. Prime Minister Mateusz Morawiecki canceled all mass events.

In Poznań, a decision was made that all schools, kindergartens, nurseries, and other city institutions will be closed as a preventive measure for two weeks (i.e., from 11 to 24 March 2020). On 11 March 2020, Prime Minister Mateusz Morawiecki and the ministers (respectively: health, national education, and higher education) Łukasz Szumowski, Dariusz Piontkowski, Jarosław Gowin announced the closure of educational institutions for two weeks (i.e., March 12-25, 2020) as a preventive measure. There were no classes from Thursday, 12 March 2020, but children could come to classes (if their parents could not take care of them), and only from

Monday was there a complete closure. The closure concerned, in particular, all schools (public and private), kindergartens, nurseries, secondary schools, and universities. Two days later, the Prime Minister announced that starting 15 March 2020, Poland's borders would be closed to air and rail traffic. Passport controls were also introduced at all land borders, and only Polish employees and citizens were allowed to enter the country. After crossing the border by land, there would be a 14-day quarantine, breaking, resulting in a fine of 5,000 zloties. A ban was introduced on public gatherings of more than 50 people, including state and religious gatherings. On 25 March 2020, the Minister of Interior and Administration, Mariusz Kamiński, announced at a press conference the decision to extend the border closure, based on international law, in connection with the development of the epidemic in Europe and around the world - by 20 days until 13 April 2020 (the previous period lasted ten days, March 15-25, 2020). Kamiński emphasized that the restrictions do not apply to the flow of goods, which will continue to flow freely. The first loosening of restrictions took place on 20 April 2020. Since then, restrictions have been slowly lifted, but you should still wear a nose and mouth cover and disinfect your hands in closed spaces, including public transport. Until July, there was a decline in the number of people infected with coronavirus - the number of fatalities decreased and the number of recoveries increased.

In total, six waves of the pandemic could be observed in Poland: 1st wave until August 2020, 2nd wave until November, 3rd wave until April 2021, 4th wave until December 2021, 5th wave in February 2022, and 6th wave in September 2022. The individual waves of the pandemic are presented in Figure 1.

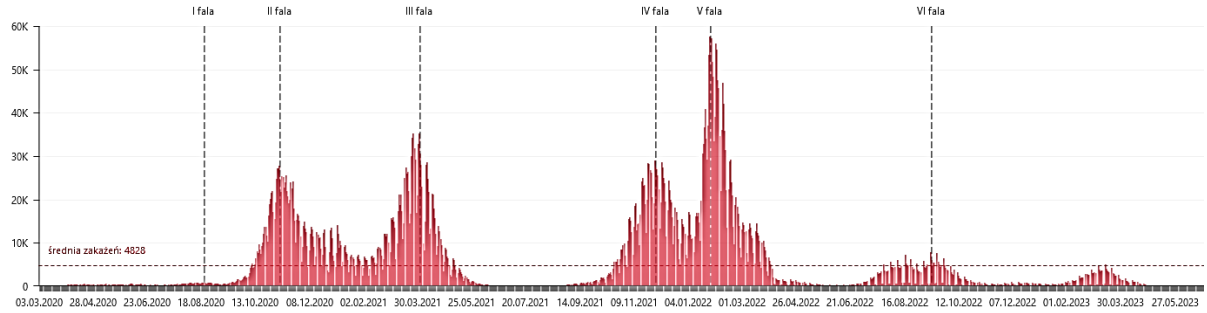

Figure 1. Number of confirmed SARS-CoVID-19 infections in Poland during the pandemic.
Source: https://koronawirusunas.pl/, 8/10/2023.

Figure 2 shows the number of deaths due to Covid-19 and comorbidities. The pandemic caused by the SARS-CoV-2 virus is a highly contagious virus. This virus is transmitted mainly through droplets, close contact with an infected person, and by touching surfaces on which viruses are found and then touching the face, nose, or mouth. A characteristic of SARS-CoV-2 is that infected people can transmit the virus even when they do not yet show symptoms, contributing to its high contagiousness. COVID-19 mortality rates varied by region, age group, availability of health care, and many other factors. Covid-!9 had a higher mortality rate than many other viral diseases.

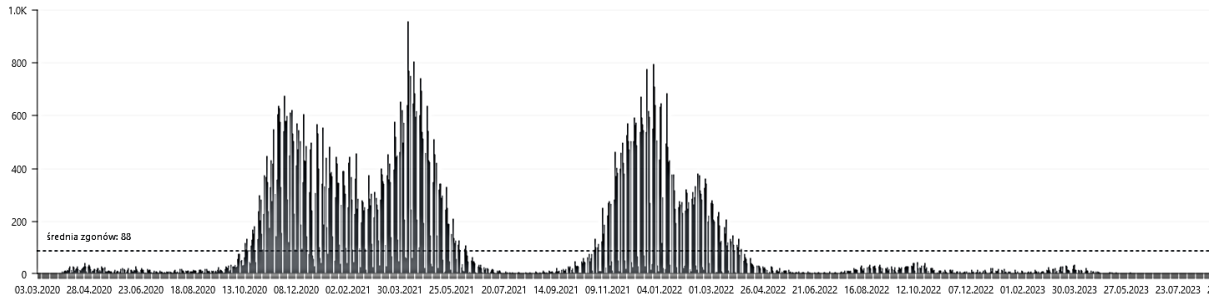

Figure 2. Number of deaths due to COVID-19 and comorbidities in Poland.

Source: https://koronawirusunas.pl/, 8/08/2023.

Wilson et al. (Wilson, 2020) estimated the risk of death of people suffering from COVID-19 at 3.5% in China and, on average, 4.2% in other 82 surveyed countries around the world. Jelnov (Jelov, 2020), based on panel studies on a sample of 156 countries around the world, showed that COVID-19 probably does not spread to more than a few percent of the population but leads to a relatively high mortality rate of approximately 10% on average. A similar situation also occurred in Poland. The COVID-19 mortality rate in Poland until 30 June 2023 was about 1.84%. It can be described as for every 100 people infected with the virus, approximately 1.84 died from the disease. It should be noted that the mortality rate in other countries was much higher. For example, in France, Finland, and Belgium, as of 14 June 2020, it was over 16%. However, in the case of Malta, Slovakia and Cyprus it was only 2%. Hungary and Finland, which have one of the lowest levels of coronavirus infection, have experienced very high COVID-19 mortality rates. In the case of Luxembourg, however, an inverse relationship can be observed, i.e., a very high level of COVID-19 infection in the population is associated with a relatively low mortality rate.

3. Covid-19 pandemic in Poland in 2023

In the first half of 2023, there was an epidemic threat in Poland related to the COVID-19 pandemic. This status was abolished on 1 July 2023. The epidemic threat was introduced in Poland on 16 May 2022; previously, the state of the epidemic was in force. Although the state of epidemic threat has been lifted, not all solutions and restrictions from the pandemic have been canceled. It was decided to introduce a state of epidemic threat due to the evaluation of the virus. The appearance of the Omicron variant in 2022 meant that, despite a similar number of cases, the number of people hospitalized and deaths decreased (Del Rio et al., 2022). Forecasts regarding the development of the pandemic in Poland in 2022 are presented in the following figures (from 3 to 5).

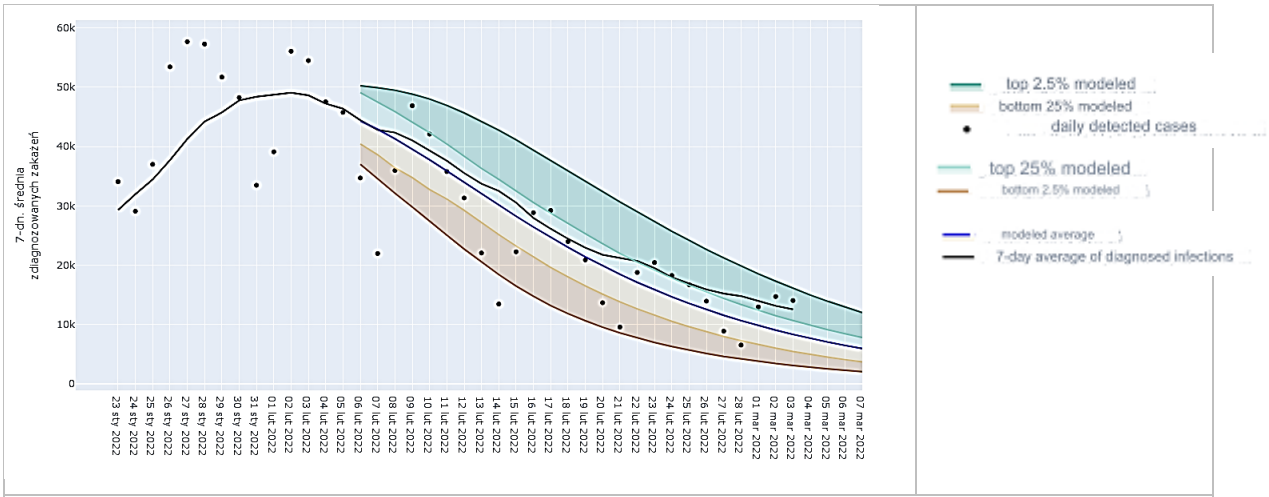

Figure 3. Short-term forecast of the development of the pandemic after 6 February 2022 - number of diagnosed cases.

Source: www.macos.pl, 15/06/2022.

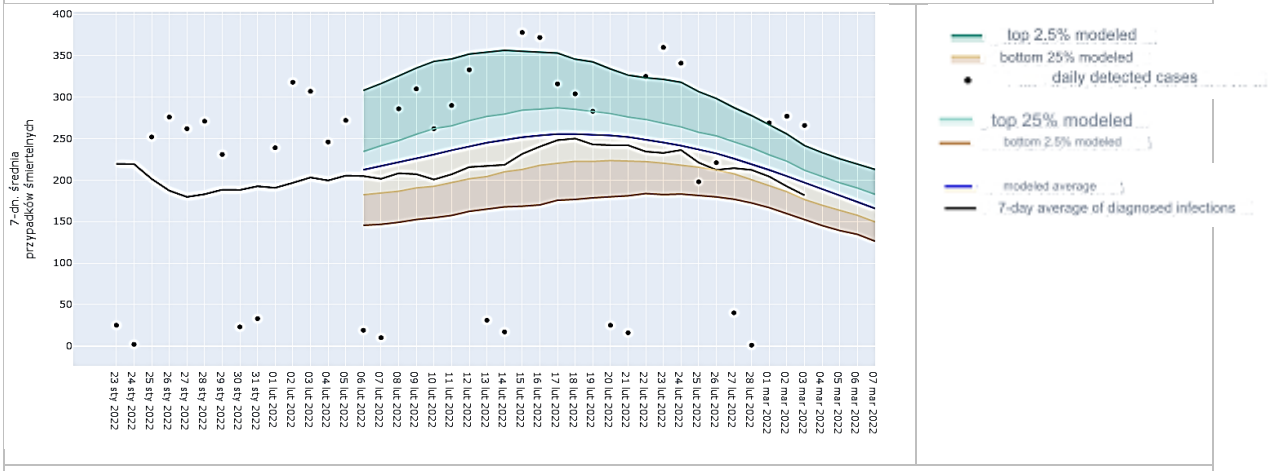

Figure 4. Short-term forecast of the development of the pandemic after 6 February 2022 - number of fatal cases.

Source: www.macos.pl, 15/06/2022.

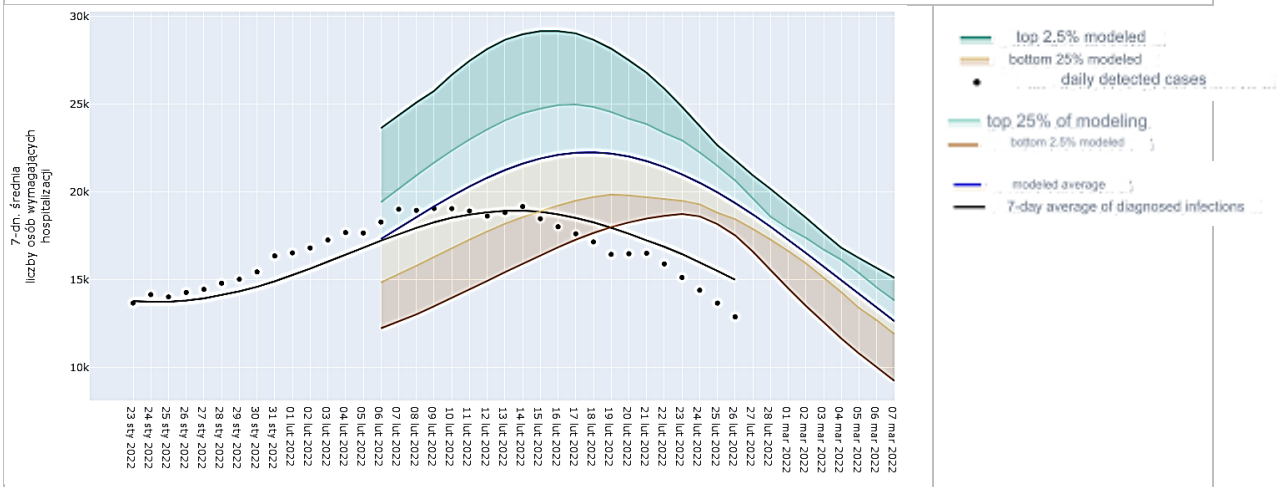

Figure 5. Short-term forecast of the development of the pandemic after 6 February 2022 - number of people requiring hospitalization.

Source: www.macos.pl, 15/06/2022.

The World Health Organization (WHO) has published a report predicting the future of pandemics and epidemics. With a short time horizon (3-5 years), this report was not a prediction of the future, but an invitation to consider the different directions that current and future pandemics may take. The report generally focused on the emergence of new pathogens, mutations of existing pathogens, global human mobility, climate change, antibiotic resistance, and social and economic inequality. Highlighting these risks in the WHO report was intended to increase awareness and prepare for various scenarios that may arise in the future in the context of infectious threats. These scenarios aimed to identify possible threats and solutions, discuss implications, and propose actions to prevent or mitigate the impact of current and future infectious threats.

The Institute for Health Metrics and Evaluation has developed a model for forecasting the trajectory of the COVID-19 pandemic until 2023, considering the possibility of the emergence of new virus variants and various intervention strategies. This model predicted additional infections, hospitalizations, and deaths based on multiple scenarios, such as the emergence of a new Omicron-like variant, a variant with a high ability to break immunity, and a scenario without the emergence of a new variant. Projections indicated different outcomes depending on the characteristics of future COVID-19 variants (COVID-19 Forecasting Team, 2022) {ioannidis, 2022).

Overall, forecasts for 2023 were varied and depended on many factors, including the emergence of new virus variants and the effectiveness of interventions such as vaccinations and personal protective equipment.

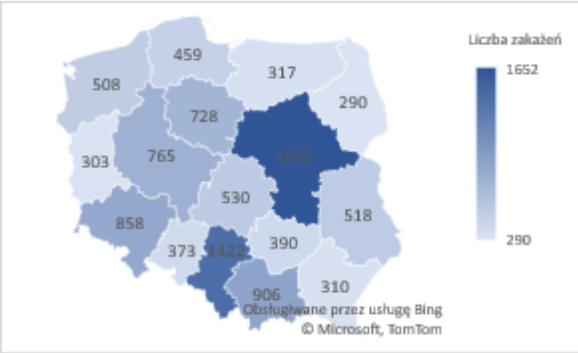

Figure 6. Number of new infections in individual voivodeships in January 2023.

Source: Own study.

Figure 7. Number of new infections in individual voivodeships in February 2023.

Source: Own study.

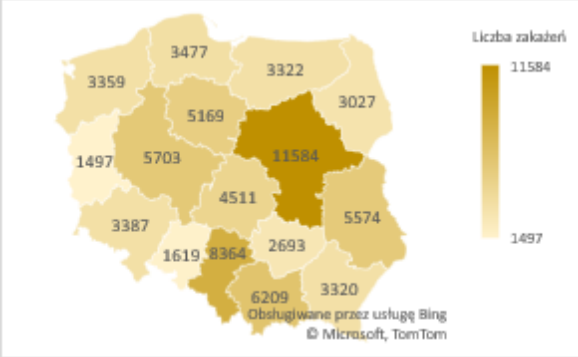

Figure 8. Number of new infections in individual voivodeships in March 2023.

Source: Own study.

Figure 9. Number of new infections in individual voivodeships in April 2023.

Source: Own study.

Figure 10. Number of new infections in individual voivodeships in May 2023.

Source: Own study.

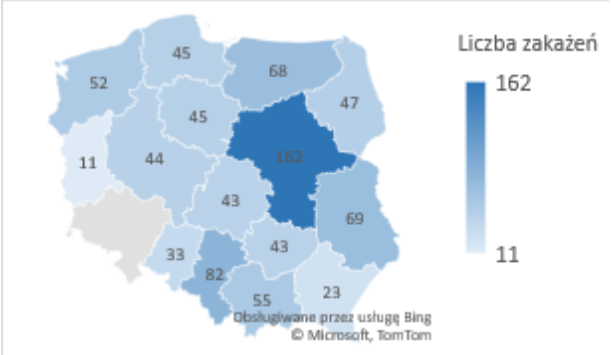

Figure 11. Number of new infections in individual voivodeships in June 2023.

Source: Own study.

In January 2023, the number of COVID-19 patients in Poland increased. The following figures (Figures 3 to 6) show the number of patients in individual voivodeships in subsequent months. 149419 people were infected with Covid-19 from 1 January to 30 June. The decreasing number of COVID-19 patients was mainly influenced by vaccinations offered from 2021 worldwide. Figure 11 shows the number of people vaccinated as of 10 January 2022. By 30 June 2023, 6,517,852 cases of COVID-19 infections and 119,626 deaths were registered in Poland.

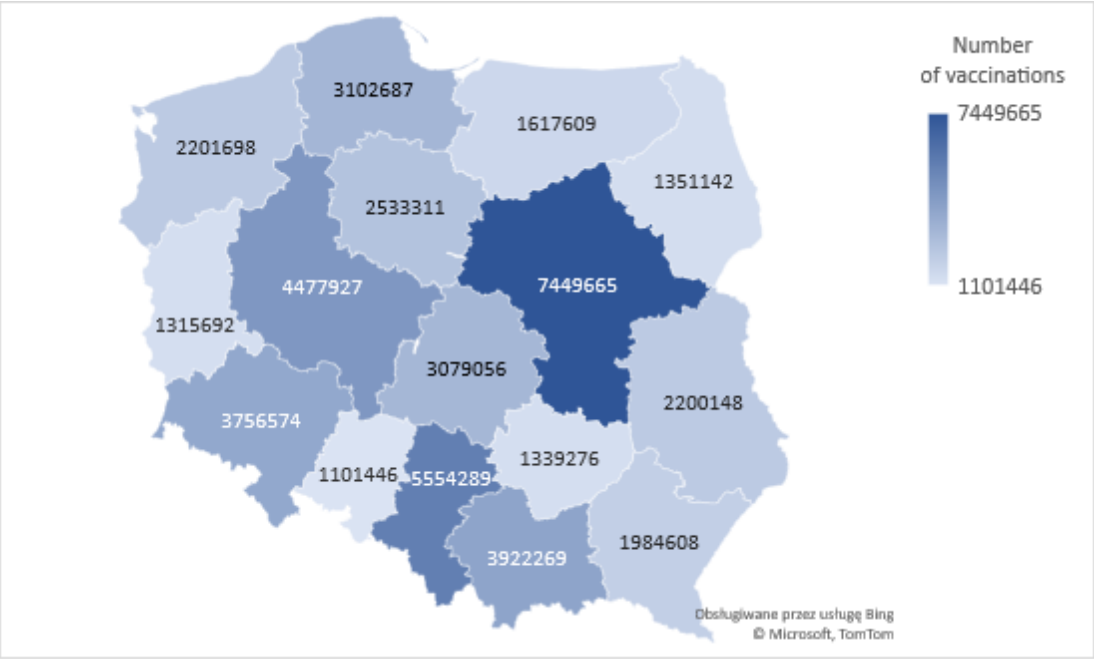

Figure 11. Number of vaccinations performed in individual voivodeships as of 10 January 2022. Source: Own study.

The analysis of data on COVID-19 cases in Poland in the period considered to be the end of the pandemic provides essential information on the dynamics of the virus and the effectiveness of the actions taken. We have observed a significant decrease in new cases, which can be interpreted as a positive effect of vaccinations and naturally acquired immunity in the population. However, although less numerous, persistent cases indicate the need to continue monitoring the situation and adapting public health strategies. The spread of new variants of the SARS-CoV-2 virus, including Omicron, had a significant impact on the dynamics of the pandemic. Although case numbers have been lower compared to earlier waves of the pandemic, the diversity of virus variants continues to pose a significant challenge to public health systems. The results highlight the importance of vaccinations as a critical tool in the fight against the pandemic. There is a clear correlation between high levels of immunization and lower numbers of hospitalizations and deaths. It indicates the effectiveness of vaccinations in preventing severe disease.

4. Conclusions

The COVID-19 pandemic has brought many lessons and conclusions that may be valuable for future emergencies and social, medical, and economic development. The pandemic has demonstrated the importance of planning and responding quickly and effectively to health crises. The preparedness of health systems, flexibility in decision-making, and global coordination are critical to effectively responding to the pandemic. The pandemic has

highlighted the need for international cooperation and solidarity between countries. Actions undertaken as part of international cooperation, such as sharing knowledge, medical resources, and vaccines, are crucial to limiting the spread of the virus and the pandemic's effects. The pandemic resulted in intense scientific and innovative development. The rapid growth of diagnostic tests, vaccines, and antiviral drugs are examples of scientific achievements in the fight against the pandemic. Continued investment in research is crucial to preventing future health threats. The COVID-19 pandemic has created a mental health crisis for many people around the world. It is necessary to increase awareness and support for people affected by stress, social isolation, and other psychological effects of the pandemic. Education and communication also turned out to be very important during this period. Effective communication and public education are essential in crises. Reliable information, clear messages, and public education are crucial to reducing panic, increasing awareness, and practical preventive actions. The pandemic ended in July 2023, but there is still a need to be vigilant about potential changes in the virus and to maintain readiness to respond to possible future health threats. With the knowledge and experience gained from this difficult time, societies can respond more effectively to future health challenges, moving towards a more resilient and flexible society.

In summary, data on COVID-19 cases in Poland at the end of the pandemic provide valuable clues about the effectiveness of current public health strategies and indicate areas requiring further monitoring and research. Our results highlight the importance of an integrated approach, combining medical, behavioral, and policy strategies, to effectively manage the pandemic and its effects.

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