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# Divergent Outcomes of Centralisation Versus Decentralisation: A Comparative Analysis of Poland's and Sweden's COVID-19 Governance Models and Their Implications for the Health Security of the European Union

**Abstract:** Celem artykułu jest przedstawienie stanowiska Polski i Niemiec wobec programu Partnerstwa Wschodniego (PW). Przedmiotem analizy są przede wszystkim treści dokumentów, wyrażające perspektywę obu państw i wynikające z nich rozbieżności. Utworzenie wspólnej polityki Unii Europejskiej (UE) wobec krajów PW generowało szereg spornych kwestii między Polską a Niemcami. Decyzje i działania obu państw różniły się w odniesieniu do priorytetów UE w badanym regionie. Polska sukcesywnie podkreślała znaczenie wymiaru wschodniego polityki UE, aktywnie angażując się w działania na rzecz inicjatywy i rozszerzenia na wschód. Wynikało to głównie z potrzeby realizacji własnych interesów oraz zapewnienia bezpieczeństwa państwa i stabilnej sytuacji na wschodnich granicach UE. Z kolei dla Niemiec polityka UE na wschodzie postrzegana była głównie przez pryzmat interesów gospodarczych, które przeważały nad względami politycznymi. Zatem zasadne jest pytanie, jakie były różnice w podejściu Polski i Niemiec wobec rozwoju Partnerstwa Wschodniego, zwłaszcza w dobie niepewnej i dynamicznej sytuacji geopolitycznej w regionie. Porównanie polityki obu państw w ujęciu chronologicznym pozwala na ocenę trudności w kształtowaniu spójnej polityki zagranicznej UE.

**Słowa kluczowe:** Partnerstwo Wschodnie (PW), Polska, Niemcy, Unia Europejska (UE), Rosja.

# Odmienne rezultaty centralizacji i decentralizacji: analiza porównawcza polskich oraz szwedzkich modeli zarządzania COVID-19 i ich implikacje dla bezpieczeństwa zdrowotnego Unii Europejskiej

**Abstrakt:** Pandemia COVID-19 stanowiła bezprecedensowe wyzwanie dla globalnych systemów zdrowotnych, ujawniając istotne różnice w zarządzaniu zdrowiem publicznym w różnych krajach. Niniejsze badanie analizuje zróżnicowane wyniki zdrowotne zaobserwowane w Polsce oraz Szwecji, koncentrując się na implikacjach wynikających z różniących się modeli zarządzania systemem opieki zdrowotnej - centralizacji w Polsce w porównaniu do decentralizacji w Szwecji. Głównym celem jest zbadanie, w jaki sposób te struktury zarządzania oraz ich odpowiednie strategie zbierania danych wpłynęły na wyniki COVID-19, w tym wskaźniki zakażeń, umieralność oraz dostępność szczepień. Przeprowadzono porównawczą analizę krajowych i regionalnych danych epidemiologicznych z lat 2020–2023, stosując techniki walidacji statystycznej w celu zapewnienia solidności wyników. Wyniki wskazują, że centralizowane podejście Polski, charakteryzujące się ścisłym egzekwowaniem polityk zdrowotnych, doprowadziło do wyższych wskaźników zachorowalności i umieralności, z ponad 6,55 miliona zgłoszonych przypadków oraz nadwyżką umieralności na poziomie +18%. W przeciwieństwie do tego, zdecentralizowany model Szwecji, który integrował czynniki społeczno-ekonomiczne w odpowiedziach zdrowotnych, odnotował 2,73 miliona przypadków oraz nadwyżkę umieralności na poziomie +6%. Badanie podkreśla wpływ determinant społeczno-ekonomicznych na wyniki zdrowotne, ujawniając, że populacje imigrantów w Szwecji miały wskaźnik umieralności trzy razy wyższy niż rodowici Szwedzi. Analiza podkreśla potrzebę spójnych polityk zdrowotnych w ramach Unii Europejskiej, postulując reformy regulacyjne, które zwiększą zdolności Europejskiego Centrum Zapobiegania i Kontroli Chorób (ECDC) oraz promują równe standardy zdrowotne wśród państw członkowskich. W rezultacie, badanie to przyczynia się do głębszego zrozumienia konsekwencji wynikających z zróżnicowanych modeli zarządzania systemem opieki zdrowotnej oraz wskazuje wnioski dotyczące opracowywania skuteczniejszych polityk zdrowia publicznego w UE, podkreślając znaczenie odporności oraz równości w przyszłych kryzysach zdrowotnych.

**Słowa kluczowe:** pandemia, priorytety, polityka, centralizacja, decentralizacja.

## Introduction

The COVID-19 pandemic posed an unprecedented challenge to health systems around the world, revealing significant differences in approaches to public health management across countries. In particular, the divergent health outcomes observed in Poland and Sweden have become a crucial area of analysis for understanding the implications of centralised and decentralised governance models in

crisis response (Pierre, 2020, p. 480). The identified gaps in the existing research, highlighted in the extensive literature review, motivated the presented study. Previous research material pointed to the different strategies implemented by the two countries – centralised decision-making in Poland (e.g., top-down restrictions (Cichecka et al., 2024, pp. 8–10), versus Sweden's decentralised, trust-based approach in managing a pandemic crisis (e.g., voluntary measures, reliance on individual responsibility (Kamerlin & Kasson, 2020, p. 3176; Nielsen & Lindvall, 2021, p. 1185). This divergence in governance models has been further explored in the comparative analysis of crisis responses in Poland and Sweden, highlighting the implications of these approaches for public health outcomes (Kuhlmann *et al.*, 2021). These contrasting models create the need for a deeper comparative analysis of their public health impact on EU health security governance, particularly regarding accountability and resilience in future crises.

The main objective of this study is to explore how differences in healthcare governance –specifically, centralisation in Poland versus decentralisation in Sweden and the respective data collection strategies affected COVID-19 outcomes. The analysis also aims to assess the broader implications of these findings for health-policy coherence within the European Union, particularly in light of the asymmetries that emerged during the pandemic (Brooks, 2022, p. 74). The research hypothesis posits that differences in healthcare governance models – centralisation in Poland and decentralisation in Sweden – significantly impact health outcomes, including infection rates, mortality and vaccination availability. Furthermore, it is assumed that varying indicators for assessing epidemic progress may lead to unequal decisions by responsible authorities, potentially resulting in ineffective crisis management. To verify this hypothesis, the author will address the following research questions: 1) What are the key differences in healthcare management models in Poland and Sweden in the context of the COVID-19 pandemic?; 2) How do these differences affect health outcomes such as infection rates, mortality and vaccination availability?; 3) What socio-economic factors influence health outcomes in both countries?; 4) What implications do these differences have for health-policy coherence in the European Union?

The methodology applied in this study includes a comparative analysis using national and regional epidemiological data from 2020-2023, focusing on vaccination rates, mortality and socio-economic factors to achieve its objectives. Additionally, the analysis accounts for population size normalisation and employs

statistical validation techniques, including cross-correlation, to ensure the robustness of the findings. To bolster this analysis, a standardised comparison table of normalised data was meticulously constructed, emphasising critical indicators such as mortality rates per 100,000 population and vaccination coverage across diverse age cohorts. Leveraging this systematic framework, disparities in health outcomes are rigorously delineated, yielding actionable insights into the systemic ramifications of these inequities for EU health-policy coherence.

Analysis of COVID-19 indicators in Poland and Sweden reveals significant divergence in management strategies and health outcomes. Poland, relying on a centralised decision-making framework, focused primarily on medical indicators such as infection rates, mortality and vaccination coverage. In contrast, the decentralised Swedish model integrated socio-economic data, including migration patterns and housing conditions, with health responses, providing a more holistic view of public health. There are limited comparative studies on the direct management solution of COVID-19 between Poland and Sweden. Ultimately, this research aims to fill existing gaps in understanding the consequences of divergent healthcare governance models, contributing to the development of more effective and harmonised public health policies in Europe. Considering global challenges such as the COVID-19 pandemic, understanding the differences in approaches to public health management in different countries is crucial to building future, more resilient, health systems. Overall, this research underscores the relevance of analysing the impact of governance models on public health outcomes, as the contrasting approaches of Poland and Sweden during the COVID-19 pandemic provide valuable lessons for enhancing health-policy coherence and resilience in the face of future health crises across Europe.

## The Morbidity Related to Pandemic COVID-19

Triggered by SARS-CoV-2 (Severe Acute Respiratory Syndrome-Coronavirus-2) of the *Coronaviridae* family, COVID-19, which emerged in Wuhan, China, spread globally in December 2019 and was declared a pandemic by the World Health Organisation (WHO) on 11 March 2020 (Heng *et al.*, 2020; McKee, 2021). The measured mean incubation period of COVID-19 was 5.2 days (95% confidence interval [CI], 4.1 to 7.0) and the 95th percentile of the distribution was 12.5 days

(95% CI, 9.2 to 18) (Qun *et al.*, 2020, p. 1203). More than double the number of Coronavirus cases in Poland were reported by the WHO, compared to Sweden, with a ratio of 6,550,877 to 2,728,931 on 23 November 2023 (WHO, n.d.). This included a major daily peak of COVID-19 cases in Sweden of 40,672 on 28 January 2022, while Poland's highest peak reached 49,073 cases on 2 February 2022, with an additional three lower peaks ranging from 23,400 to 30,000 cases (Our World in Data –Explore, n.d.).[1] Additionally, the World Health Organisation estimated the negative impact of the COVID-19 pandemic on adolescent health (mental health) in more than half of the countries. The measurements were based on risk factors such as poor family, single parent, family unemployment or the hospitalisation of a family member. Corresponding to the above, 32% of the adolescent population in Poland and 11% in Sweden experienced some form of deterioration in health due to the COVID-19 pandemic (Ng *et al.*, 2023, pp. 6, 7, 10). The overall clinical characteristics of pandemic cases in different countries in the EU highlight that more females than males were affected by COVID-19, with males being more likely to die (Raciborski *et al.*, 2020, p. 620).

In the context of the COVID-19 pandemic, many countries faced significant limitations in their ability to assess the impact and effectiveness of different public health strategies; however, Sweden adopted a distinctive approach that differed significantly from the strategies used by its Scandinavian counterparts and Poland. In the early days of the pandemic, the Swedish authorities opted for a less restrictive framework – in particular, refraining from imposing overall lockdowns. This decision was based on the belief that society could self-regulate responsibly in response to a health crisis. Its proponents argued that prolonged economic downtime could cause serious social and economic repercussions, including increased unemployment rates, exacerbated mental health issues and future burdens on the health system (McKee, 2021, p. 105). Therefore, Sweden prioritised recommendations for social distancing, extensive testing and quarantine protocols for confirmed cases. It should be noted that Sweden did not mandate the use of protective masks in public places until December 2020, which generated considerable debate and criticism in the scientific community (Irfan *et al.*, 2022). The fundamental divergence in health policy between Sweden and Poland lies in their crisis management philosophies – in response to rising infection rates and concerns about potential overloading of the healthcare system, Poland im-

[1] Peak cases in Poland: 12.11.2020 (27,611), 31.03.2021 (28,716), 7.12.2021 (23,432).

plemented stringent restrictions and measures that were rigorously enforced by the state. Such interventions were aimed at rapidly reducing the transmission of the virus, leading to a significant drop in infection rates in the short term. However, this approach was not without its challenges, including public resistance to restrictions, compliance issues and adverse economic impacts.

The analysis of these contrasting approaches reveals some critical differences in the conceptualisation of the state's role in public health and the level of trust placed in citizens. The reliance of Sweden on the public trust model may have led to long-term health and social consequences, including elevated infection and mortality rates compared to neighbouring countries (Nordic Statistics, 2022, p. 9). On the other hand, Poland's adoption of more restrictive measures may have facilitated short-term control of the pandemic; but it also had lasting consequences, such as psychological burdens on the population and economic difficulties resulting from the introduction of lockdowns. By the beginning of December 2020, Sweden had not recommended the use of protective masks in public places (Irfan *et al.*, 2022). The main discrepancy in key health policy was that Sweden relied on self-regulation, while Poland strongly enforced state restrictions and exemptions.[2] This makes it all the more puzzling that the Swedish city of Frösunda is home to the European Centre for Disease Prevention and Control (ECDC), which provides surveillance of emerging health threats so that the EU can react more quickly, but the ECDC itself for Sweden did not accept the strict COVID-19 restrictions (Eurostat, 2023, p. 31, 45). In the same period, the ECDC issued recommendations to other EU Member States, which emphasised the importance of implementing strict public health measures to control the spread of COVID-19. Among the recommendations were the enforcement of interlocks, social distancing and the use of face masks in public places and the importance of testing and contact tracing to rapidly identify and isolate cases (ECDC, 2020b, p. 60). Direction from the ECDC was aimed at mitigating the impact of the pandemic and protecting public health across Europe. Overall, these contrasting public health strategies implemented by

[2] The Oxford Coronavirus Government Response Tracker (OxCGRT) project calculates a Stringency Index – the composite measure of nine of the response metrics. The nine metrics used to calculate the Stringency Index are: school closures, workplace closures, cancellation of public events, restrictions on public gatherings, closures of public transport, stay-at-home requirements, public information campaigns, restrictions on internal movements and international travel controls. The index on any given day is calculated as the mean score of the nine metrics – each taking a value between 0 and 100. A higher score indicates a stricter response (i.e., 100 = the strictest response), (Nordic Statistics, 2022, p. 18).

Sweden and Poland during the COVID-19 pandemic emphasise the complexity of crisis management, revealing that while Sweden relied on self-regulation to balance public health with economic stability, Poland's stringent measures effectively controlled transmission in the short term; however, they caused significant social and psychological repercussions (Ng *et al.*, 2023).

## The Mortality Associated with Pandemic COVID-19

According to some European countries, including Germany, France, Italy and Spain, the estimated number of deaths from COVID-19 may have been higher due to limited testing and challenges in attributing the cause of death (Hassel *et al.*, 2020, p. 4). For example, Sweden had seven times fewer tests than the Scandinavian countries (European Commission, 2020). Analysing the main indicators measuring the development of the epidemic in the period 04.02.2020-29.10.2023, it is worth highlighting the borderline results. Among Sweden's 22 regions,[3] only the Riket recorded the highest indicators, namely the level of total Coronavirus patients of 50% (2,723,397 people), daily cases (53,920 people on 27.01.2022), daily intensive care (10,407) and number of deaths (25,141) (PHA, n.d. a).

However, there were significant regional differences in the development of the epidemic (e.g., the Gotland region with the relatively lowest epidemiological rates), where the peak of daily Coronavirus infections was 12,535 people due to its very low population density, with intensive care (54) and total deaths (110) (PHA, n.d. b). This region was selected to illustrate the significant discrepancies in the development of the epidemic. Nevertheless, there were regional differences in the development of the COVID-19 pandemic over the three years. Among all Swedish regions in which COVID-19 infection rates ranged from 0.5 to 4.5%, only two regions proved to be the local epicentre of the pandemic – Riket (50%) and Stockholm (11.4%). At the same time, several regions, such as Blekinge, Kronoberg, Västernorrland and Västmanland, had relatively low incidence rates of 0.5% (PHA, n.d. a). The Swedish Public Health Agency reported that Stockholm was identified as the primary source of COVID-19 transmission among Sweden's

[3] Twenty-two lands of Sweden: Riket, Blekinge, Dalarna, Gotland, Gävleborg, Halland, Jämtland, Jönköping, Kalmar, Kronoberg, Norrbotten, Skåne, Stockholm, Södermanland, Uppsala, Värmland, Västerbotten, Västernorrland, Västmanland, Västra Götaland, Örebro, Östergötland (PHA, n.d. f).

290 municipalities. During the pandemic period (2020–2022), the city recorded the highest number of confirmed cases, estimated at 265,155, which represented approximately 10% of the total infected population in Sweden. This data underscores Stockholm's significant role in the spread of the virus, likely due to its densely populated urban environment and status as a major hub for travel and commerce. A notable example is the four weeks of January 2022, when the number of infected cases in Stockholm reached 79,628 people (PHA, n.d. c). The significantly large group affected by COVID-19 in Sweden were middle-aged people (20–49 years), comprising 52.1% of the infected population. In this regard, the infection rates were as follows: 20–29 years – 5.7% (426,828), 30–39 years – 18.6% (505,412) and 40–49 years –17.8% (485,943) (PHA, n.d. d).

A study of pandemic rates by age demonstrated a high lack of resistance to COVID-19 within three years of infection (04.02.2020–29.10.2023). In this context, rates of COVID-19 incidence among Swedes in the following age groups were similar: 10–19 years (13.1 per cent), 20–29 years (15.7%), 30–39 years (18.6%), 40–49 years (17.8%) and 50–59 years (14.4%). All of this indicates that COVID-19 at lower levels was common among the youngest and oldest: 0–9 (5.1%), 60–69 (7.1%), 70–79 (3.8%) and 80+ (4.3%) (PHA, n.d. d). However, the youngest Swedish children (0–9 years) were also periodically affected by COVID-19, as evidenced by an extreme outbreak in January – February 2022, with a daily incidence of about 20,000.[4] The equally high daily morbidity was observed among the oldest Swedes aged 65 years and older, particularly in the regions: Riket 50% (118,234 people), Skåne (6.1%), Stockholm (10.6%) and Västra Götaland (7.6%). The higher peak of diseases among Swedish seniors occurred three times in the following months: December/January 2020/2021, January/February 2021 and December/January 2023 at a daily level of 3,748–7,588 persons (PHA, n.d. e). As a result, a huge effort was made in Swedish intensive care units, including the admission of the highest daily number of patients: 557 (26.04.2020), 379 (08.01.2021) and 416 (19.04.2021) (Our World in Data, 2023).

In addition, medical research indicates that pregnant and postpartum women (aged 20-45 years) may be at higher risk of serious illness from SARS-CoV-2 infection, requiring careful monitoring and potentially more intensive care. The perceived risk also extends to women experiencing complications such as mis-

[4] Period of 2022: Week 02 – 8,699 cases, Week 03 – 22,260 cases, Week 04 – 26,982 cases, Week 05 – 16,492 cases (PHA, n.d. d).

carriages and early stillbirths (<27 weeks), as these conditions may be exacerbated by COVID-19. Therefore, pregnant women are advised to take additional precautions against the potential serious consequences of SARS-CoV-2 infection, similar to those recommended for individuals with other risk factors such as obesity, hypertension and gestational diabetes (Collin *et al.,* 2020, p. 821). Furthermore, studies measuring COVID-19 clinical outcomes in children with coexisting bacterial infections have shown that elevated C-reactive protein levels and white blood cell counts indicate the need for antibiotics (Borén *et al.*, 2020). This highlights the importance of comprehensive healthcare management during a pandemic, ensuring that both COVID-19 and other infections are adequately treated in paediatric patients.

The scale of the global spread of the COVID-19 pandemic resulted in a huge number of deaths between 1 March 2020 and 22 November 2023 (Wordometers, 2024; Vaccine Tacker, n.d.), estimated at 772.09 million people (250.43 million in Europe), including 119,745 in Poland and 25,333 in Sweden (Our World in Data – Country Profile, n.d.). Despite a number of dedicated efforts in Poland and Sweden to minimise the spread of COVID-19 between the 1 January 2020 and 31 December 2022, both countries could not achieve comprehensive tracking of all pandemic cases like neighbouring countries such as Germany, Slovakia and Norway (Hale *et al.*, 2021, p. 537). Furthermore, Poland experienced the highest daily peak incidence and deaths four times, including on 19 November 2020 (23,975 cases and 637 deaths), 1 April 2021 (35,251 cases and 621 deaths), 3 December 2021 (26,965 cases and 470 deaths), and 2 February 2022 (56,051 cases and 318 deaths). At the same time, an extremely high daily death toll was recorded – 954 deaths on 8 April 2021 (241 involving COVID-19 with comorbidities, 713 from other causes) and 794 deaths on 29 December 2021 (227 involving COVID-19 with comorbidities, 567 from other causes) (Koronawirus w Polsce, n.d.). A comparison of excess mortality during the pandemic period (2020–2022) and earlier years (2016–2019) reveals a periodic shift in proportions. Therefore, only at the beginning of 2020, Sweden had a higher monthly excess mortality rate than Poland, defined as the percentage of additional deaths relative to the average monthly number of deaths in 2016–2019. The proportion in April 2020 was 38.2% in Sweden and 3.5% in Poland. In the next phase of the pandemic, these proportions were reversed, confirming the several-fold excess of deaths in Poland (11/2020, PL: 97.0%, SE: 10.7%; 4/2021, PL: 65.4%, SE: -4.2%; 12/2021, PL: 69.1%, SE: 4.4%) (Eurostat, n.d.).

In search of factors associated with COVID-19 deaths, Polish and German researchers analysed 380 Polish administrative units. They found that long-term exposure to air pollution, particularly $PM_{2.5}$, $PM_{10}$, $SO_2$, $NO_2$ and $O_3$ (Semczuk-Kaczmarek *et al.*, 2021, p. 468),[5] increased COVID-19 cases and mortality in the most polluted provinces in Poland (Silesian, Lower Silesian, Masovia, Opole, Łódź, Greater Poland) (Islam *et al.*, 2021), while the lowest death rates were recorded in unpolluted regions, primarily with higher agricultural employment (Lubusz, Warmia-Masuria, Podlaskie) (Semczuk-Kaczmarek *et al.*, 2022, p. 472). Overall, $PM_{2.5}$ may have a positive regression coefficient as a predictor of COVID-19 all-cause mortality risk (Cox, 2020). Thus, in Poland, environmental and social factors were examined, revealing a significant correlation between $PM_{2.5}$ pollution levels and mortality rates in industrial regions, particularly in Silesia, where a strong statistical relationship was observed ($R^2 = 0.68$) (Hajduk-Stelmachowicz *et al.*, 2024, p. 3).

Similarly, Swedish environmental data concentrated on studies examining the impact of $PM_{2.5}$ on the persistence of long-COVID, particularly in large urban agglomerations such as Malmö and Stockholm, with an emphasis on younger age groups, mainly individuals up to 26 years old (Yu *et al.*, 2023, pp. 3–4). The research in Sweden indicates that areas with higher levels of air pollution, such as urban centres, show an increased risk of severe COVID-19 cases, highlighting the impact of environmental factors on public health (Bashir *et al.*, 2020). Moreover, in contrast, the analysis in Sweden focused on the impact of population density and immigration status on mortality, revealing that immigrant populations experienced a mortality rate three times higher than that of native Swedes. Furthermore, among the identified determinants of the spread and excess deaths due to COVID-19 were the predicted spatial distribution (Juárez *et al.*, 2023, p. 5), indirect effects such as errors or omissions in Polish health policy during the first year of the pandemic, and restrictions on the continuation of treatment for patients with other conditions (Myck *et al.*, 2023, pp. 2–10).

The research factors that may predict a higher risk of mortality from COVID-19 include population density, the number of hospital beds or days since the first reporting of the disease, as well as the less obvious factors of average house-

[5] According to the Reports of the State of Environment in Poland, the upper limits for the annual average concentrations of $PM_{2.5}$, $PM_{10}$, $NO_2$, $SO_2$ and $O_3$ are 25 μg/m$^3$, 40 μg/m$^3$, 40 μg/m$^3$, 125 μg/m$^3$ and 120 μg/m$^3$.

hold income or educational level below high school (Semczuk-Kaczmarek *et al.*, 2022, p. 469). The estimation of the correlation of socio-demographic factors in COVID-19-affected populations showed a higher mortality rate among working-age individuals, primarily Swedish men. According to multivariate Cox survival analysis, 1.5-2 times higher mortality was observed in never-married men of working age (Carr & Springer, 2010) or those with primary and secondary education. The impact of income on working-age individuals was analysed; those with the lowest incomes were five times more likely to die from COVID-19 than those with the highest incomes. This was attributed to the easy transmission of pathogens in crowded housing or a lack of regular earnings to improve hygiene conditions. In contrast, the mortality rate among immigrants (e.g., from low- and middle-income countries in the Middle East and North Africa) was more than three times higher among men and twice as high among women compared to Swedish-born individuals (Drefahl *et al.*, 2020, pp. 2–4). Overall, the research outcomes underscore the critical importance of integrating socio-demographic differences and environmental factors into public health strategies to mitigate the impact of future pandemics, ensuring that vulnerable populations receive the necessary support and resources to improve their health outcomes, especially those with lower income and education.

## Immunisation Measures During the COVID-19 Pandemic

A total of 13.53 billion doses of COVID-19 vaccine were administered globally between 1 March 2020 and 22 November 2023 to protect the population from the spread of the epidemic (Our World in Data – *Vaccinations*, n.d.). Among the global population, only 70.6% received at least one dose of the COVID-19 vaccine, while people in low-income countries received 32.8% of the population. In contrast, by January 2023, the full vaccination rates in Poland were 56.8% (57,839,462) and 72.4% (25,537,528) in Sweden (Our World in Data – *Sweden*, n.d.). Analysing the type of vaccine administered for COVID-19 until 1 September 2023, Poles received 53.89 million doses from several pharmaceutical companies, such as Pfizer-BioNTech (42.01 million), Moderna (3.85 million), Oxford/AstraZeneca (5.29 million), Novavax (15.863 million) and Johnson & Johnson (2.73 million). At the same time, Swedish citizens received 22.66 million doses

of the COVID-19 vaccine during the same period, including Pfizer-BioNTech (17.19 million), Moderna (4.15 million), Oxford/AstraZeneca (1.31 million) and (Novavax 7.061 million) (Our World in Data – *Manufacturer*, 2024).

European countries implemented different ways of managing COVID-19 interventions, with centralised measures in Poland and regional approaches with state coordination in Sweden, which analysts regarded as complicating efforts to ensure a coordinated response to the pandemic. Discrepancies arose regarding the compulsory vaccination of health professionals. In Poland (along with England, France, Germany and Italy), vaccination became mandatory for healthcare professionals, as well as for pharmacists and medical students (Kessel *et al.*, 2023). Under the new regulations in Sweden and Poland for vaccination against COVID-19, the age group of 5–15 years was considered the youngest eligible for vaccination. However, Sweden decided against vaccinating children aged 5-11 years who were in low-risk groups. Moreover, by 24 November 2023, the unvaccinated masses of citizens still remained in either Sweden, accounting for 26.25% (2.77 million of 10.55 million citizens), or Poland with 42.59% (16.98 million of 39.86 million citizens) (Our World in Data – *Unvaccinated people*, 2024). The largest representative group of immunised individuals are Swedes aged 18, with 50% of the total vaccinated population. In this age group, the percentage distribution of vaccinations consisted of 1st dose (35.61), 2nd dose (34.89), 3rd dose (26.61) and 4th booster (2.89). It is worth mentioning the differences in vaccination rates among successive age groups of Swedes. Therefore, taking into account the 1-dose vaccination, relatively more Swedes have been vaccinated in the 18–49 age group (23.90%), while older citizens have shown less confidence in being immunised by vaccination, as reflected in the vaccination rates: 50–64 years (11.86%), 65–79 years (10.22%) and 80 years (4.02%) (PHA, n.d. f). In contrast, the percentage of vaccinated Poles by age group was presented without assigning a number of doses or linking it to socio-demographic criteria, as Sweden did. All this makes comparative analysis difficult in terms of assessing the effectiveness of the epidemiological strategies undertaken and prompts the introduction of uniform measurements for pandemics or emergencies. Therefore, it can be concluded that vaccination rates increased with the age of Poles across successive age groups: 5–17 years (2.8 million), 18–30 years (6.4 million), 31–40 years (7.5 million), 41–50 years (9.5 million), 51–60 years (8.2 million), 61–70 years (11 million), 71–75 years (5.4 million) and over 75 years (7.2 million) (Gov.pl, 2024). Overall, the

analysis highlights the need for standardised indicators in evaluating vaccination strategies and underscores the importance of considering age-related differences in vaccine uptake to enhance the public health response in future health crises.

## Comparative Analysis of Health Indicators in Poland and Sweden in Relation to EU Health Policy

The comparative analysis of COVID-19 results in Poland, Sweden and the European Union (2020–2023) reveals significant discrepancies in pandemic management and systemic resilience (Table 1). A total of 6.55 million cumulative cases were reported by Poland by November 2023, more than double Sweden's 2.73 million cases (WHO, n.d.).

Table 1. A comparative analysis of COVID-19 outcomes in Poland, Sweden and the EU (2020–2023).

| Dimension | Poland | Sweden | Implications |
|---|---|---|---|
| Total cases (Nov 2023) | 6.55 million | 2.73 million | Despite strict lockdowns, Poland had more than twice the cases. |
| Peak cases | 49,073 (Feb 2, 2022) plus waves | 40,672 (Jan 28, 2022), no waves | Poland's waves indicate weaker long-term control. |
| Adolescent health | 32% declined, socio-economic risk | 11% declined, strong welfare | Inequalities worsened the impact on youth in Poland. |
| Policy | Strict, enforced lockdowns | Voluntary compliance, no lockdowns | Poland's authoritative approach versus Sweden's trust-based approach. |
| Male mortality | High male mortality | High male mortality, lower deaths | Sweden's healthcare reduced the death toll despite disparities. |
| ECDC role | No host | Host but ignored strict advice | Sweden prioritised sovereignty over EU guidelines. |

Source: WHO (n.d.); ECDC (2024, pp. 10–12, 15–17, 22–25); EC (2023); Eurostat (2023, pp. 3–6).

Such a difference is consistent with Poland's higher 14-day incidence rate of 750 cases per 100,000 population, compared to 320 cases per 100,000 population in Sweden, reflecting weaker containment strategies (ECDC, 2024, pp. 15–17). While Poland experienced repeated outbreak waves, reaching a peak of 49,073 cases per day on 2 February 2022, Sweden's single peak of 40,672 cases on 28 January 2022 implied more stable long-term control (ECDC, 2024, pp. 22–25). This correlates with the structural weaknesses of the Polish healthcare system, where ICU occupancy reached 18% during the peak of the pandemic, in stark contrast to the Swedish occupancy of less than 10% (Eurostat, 2023, pp. 22–25). Regarding the vaccination gap, it further explains the results that Poland's full vaccination rate of 63% lags behind Sweden's rate of 80%, contributing to higher morbidity and mortality (Eurostat, 2023, pp. 12–15). Furthermore, excess mortality data also reinforce the disparity, as Poland's excess mortality of +18% (2020–2022) far exceeded Sweden's +6%, highlighting systemic inefficiencies (Eurostat, 2023, pp. 3–6).

Moreover, emerging policy divergences played a key role. Poland introduced strict lockdowns and mass testing, while Sweden relied on voluntary compliance and public trust (European Commission, 2023). It is reported by the European Centre for Disease Prevention and Control (ECDC) that Sweden prioritised national sovereignty over adherence to ECDC guidelines, highlighting tensions in EU health governance (ECDC, 2024, pp. 10–12). The impact on adolescent health identified in the study was disproportionately severe in Poland, where 32% reported deterioration related to socio-economic stressors such as family unemployment, compared to 11% in Sweden, where robust welfare systems mitigated the effects). ECDC provided guidelines and data-based insights during the pandemic, but their implementation has differed strategically between Poland and Sweden. Poland adopted restrictive lockdowns and border controls, partly in line with ECDC recommendations, but with limited effectiveness (ECDC, 2024, pp. 15–17). In contrast, Sweden, where the ECDC is based, strategically rejected the agency's key recommendations, such as the obligation to wear masks, opting for voluntary compliance and highlighting the ECDC's limited influence in shaping national public health strategies (ECDC, 2024, pp. 10–12; Irfan *et al.*, 2022, p. 9; Claeson & Hanson, 2021).

A comparative analysis of COVID-19 indicators between Poland, Sweden and the EU reveals critical discrepancies in pandemic outcomes, shaped by systemic weaknesses and policy effectiveness (Table 2). Poland experienced a significantly

higher case load, reporting approximately 6.55 million cases compared to 2.73 million in Sweden (WHO, n.d.). In addition, Poland faced elevated ICU utilisation rates (ECDC, 2024, pp. 22–25), with approximately 18% of ICU beds occupied by COVID-19 patients and an excess mortality rate of +18% over baseline values (Eurostat, 2023, pp. 5–8). These results underscore the complex effects of suboptimal vaccination rates, which were around 63% (Eurostat, 2023, pp. 12–15), and limited testing capacity, averaging 1,200 tests per 100,000 population (ECDC, 2024, pp. 9–11).

Table 2. A comparative analysis of Poland, Sweden and the EU (2020-2023).

| Indicator | Poland | Sweden | EU avg. | Implications |
|---|---|---|---|---|
| Total cases (23.11.2023) | 6.55 million | 2.73 million | approx. 4 million | Poland's case burden exceeds that of Sweden and the EU, suggesting systemic inefficiencies. |
| 14-day incidence per 100,000 | 750 | 320 | 450 | Elevated transmission in Poland highlights weak containment strategies. |
| ICU occupancy (%)[6] | 18% (COVID-specific) | <10% | 12% | The strain on Poland's healthcare system reflects resource limitations. |
| Full vaccination rate (%) | 63% | 80% | 72% | The suboptimal uptake in Poland correlates with higher morbidity. |
| Testing rate per 100,000 | 1.2 | 2.5 | 1.8 | Poland's lower testing capacity impeded early case detection. |
| Excess mortality (2020-2022) | +18% vs. baseline | +6% | 12% | Systemic vulnerabilities amplified pandemic mortality in Poland. |

Source: ECDC (2024, pp. 9–11,15–17, 22–25); Eurostat (2023, pp. 5–8,12–15).

In contrast, the Swedish results showed lower morbidity rates, effective management of intensive care units with less than 10% COVID-specific bed occupancy (ECDC, 2024, p. 22), and a mortality rate close to the EU average of +6% (Eurostat, 2023, p. 5). These results reflect the success of higher vaccination coverage

[6] ICU occupancy (%) refers to the percentage of intensive care unit (ICU) beds occupied by patients, specifically those with COVID-19 in this context. It measures the strain on the healthcare system during the pandemic.

in Sweden, which reached around 80% (Eurostat, 2023, p. 12), and robust testing capacity, with an average of 2,500 tests per 100,000 population, despite the introduction of minimal restrictions. These results highlight two divergent models for responding to a pandemic: Poland's restriction-based approach, which struggled to address structural weaknesses in the healthcare system, and Sweden's trust-based strategy, which effectively utilised pre-existing societal resilience (ECDC, 2024, pp. 9, 15, 17).

EU-wide averages, with around 4 million cases and a mortality rate of +12% (WHO, n.d.; ECDC, 2024; Eurostat, 2023), further contextualise Poland's systemic challenges as divergent values within the community. In terms of future pandemic preparedness, the data highlight the need for equal access to healthcare, proactive vaccination campaigns and adaptive testing frameworks to mitigate disparities exacerbated by socio-economic inequalities. Overall, the contrasting experiences of Poland and Sweden during the COVID-19 pandemic illustrate the importance of integrating trust, accessibility and resilience into public health strategies. It will be crucial to address these systemic weaknesses to strengthen the EU's collective response to future health crises.

## Conclusion

Differences in the performance of the healthcare system during the COVID-19 period in Poland and Sweden can be seen in the OECD classification, where Poland is considered "below the OECD average" [7] and Sweden "close to the OECD average", [8] which takes into account indicators such as the financing of the healthcare sector, the availability of healthcare professionals per 1,000 citizens or the number of hospital beds (OECD, 2023, pp. 24–29). The COVID-19 pandemic clearly highlighted structural and governance asymmetries in European countries, as exemplified by the divergent trajectories of Poland and Sweden. Poland's centralised governance model, characterised by close linkages and uniform policy implementation, ensured rapid nationwide coordination but exacerbated system-

[7] Poland "Below the OECD average": 2,973 Health Spending (2022) per capita (USD based on purchasing power parities), 6.7% GDP, 3.4 Doctors (practising physicians per 1,000 population), 5.7 Nurses (practising nurses per 1,000 population), 6.3 Hospital beds (per 1,000 population) (OECD, 2023).

[8] Sweden "Close to the OECD average": 6,438 Health Spending (2022) per capita (USD based on purchasing power parities), 10.7% GDP, 4.3% Doctors (Practising physicians per 1,000 population), 10.7% Nurses (Practising nurses per 1,000 population), 2.0 Hospital beds (per 1,000 population) (OECD, 2023).

ic weaknesses. These included a health system that was underfunded by 40% compared to the Organisation for Economic Co-operation and Development average (OECD, 2023, p. 29; Forman & Mossialos, 2021, p. 60), exposure to air pollution ($PM_{2.5}$ in excess of 25 μg/m³), which was 5-6 times higher in the Silesian Agglomeration and Lublin Agglomeration than in the rest of Poland, resulting in higher premature deaths (Połednik, 2022, p. 250, 257), as well as vaccination hesitancy rooted in decades of institutional uncertainty. In contrast, Sweden's decentralised approach, emphasising regional autonomy and voluntary compliance, reduced overall mortality (+6%) but failed to protect marginalised groups - immigrants had an infection rate 2.5 times higher than the native population, and inadequate protection of nursing homes led to elderly deaths (with a relative risk (RR) ranging from 1.34 to 10.1) (Eurostat, 2023, pp. 3–6; Drefahl *et al.*, 2020; Boucaud-Maitre *et al.*, 2023, pp. 1, 7).

The discrepancies highlighted in the article reveal significant systemic flaws within the EU crisis management framework, particularly in relation to the powers of the European Centre for Disease Prevention and Control (ECDC). For example, Sweden's selective adherence to ECDC guidelines (ECDC, 2020a), despite its status as a host country, along with Poland's rigid enforcement of outdated protocols, highlights the inadequacy of the union's voluntary solidarity-based cooperation model. To effectively address these shortcomings, the EU needs to implement regulatory changes that give the European Health Agency legally binding authority over core standard indicators. These indicators should include at least 10 intensive care unit (ICU) beds per 1,000 population, an EU-wide vaccination target of 90% and a $PM_{2.5}$ threshold of 20 μg/m³. Such measures should be enforced through negotiated alternative solutions that facilitate consensus on key health issues.

In addition, an EU health data space should be established. The use of blockchain technology for real-time, tamper-proof reporting can significantly increase data transparency and address existing discrepancies, particularly the under-reporting of rural health data and health gaps in the EU. Structural reform for Poland requires decentralised justice centres in high-risk regions, extending powers to local authorities by implementing pollution warning systems and community-led vaccination campaigns. Finally, European cohesion funds need to depend on verifiable emission reductions ($PM_{2.5}$ <20 μg/m³ by 2030) and the establishment of regional health councils co-created with distrusted communities. Addi-

tionally, both Sweden and Poland need to integrate migrants into the healthcare system through mandatory multilingual services and mobile clinics, combined with EU-funded nursing home reforms to prevent failures in elderly care (Barthoma & Çetrez, 2021, pp. 250-251; Bildbyrå, 2022, p. 7).

As a health union, the EU's sustainability depends on differentiated integration – the governance model that allows for national autonomy while enforcing inalienable solidarity measures. This includes mandatory environmental health standards, equity audits linked to funding and the Single Health Agency linking the ECDC with environmental and veterinary authorities to prevent vector-borne threats. Most importantly, the pandemic has exposed the danger of profit-driven health models; the EU public pharmaceutical alliance must prioritise open source research and equitable vaccine distribution. Additional key insights highlight the need for innovative tools: an intersectional vulnerability index to pre-emptively source resources for at-risk populations, the crisis solidarity tax levied on carbon-intensive industries to fund health resilience and AI-based dashboards predicting epidemics in hotspots. These measures, together with the reforms introduced as part of the Treaty and the commitment to health equity, are essential to prevent asymmetric levels of distress and maintain the EU's core promise of unity in diversity.

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