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HOW HAS THE SELF-PERCEIVED HEALTH SHAPED THE COVID-19 CAUSALITIES IN THE VISEGRAD COUNTRIES?

Abstract. *Similar to many countries around the world, Visegrad countries (Poland, Czech Republic, Slovakia, and Hungary) have been hit hard by the COVID-19 pandemic after the second half of 2020. The outbreak was handled with both success and challenges, experiencing severe declines in economic activities. Despite a complex set of factors determining how the countries handled the pandemic in the hospitals, having a look for the period before the pandemic to analyze what were the change patterns among the citizens concerning the healthcare system poses an interesting analytical way to compare with the COVID-19 trends. By utilizing the Eurostat data on the self-perceiving health conditions, the graphical analysis of this paper suggests that Visegrad countries shared similar trends and dynamics in COVID-19 infection causalities, and also pre-pandemic health situations. Furthermore, the results of the calculated linear and exponential slopes of the infected and death cases identified that the countries with higher averages of self-perceived states have less steep functional reflections.*

Keywords*: COVID-19, Visegrad countries, self-perceived health*

Introduction. The novel coronavirus started to spread out in the December of 2019 changed everything among the countries. Due to the sudden and rapid spread of COVID-19, emergency response mechanisms, laboratory testing facilities, and

pharmaceutical interventions became the leading readiness indicators [1]. The pandemic changed various ways of how societies managed their life so far. For instance, telemedicine and other types of distant medical treatments became important due to the urgent need to reduce physical contact [2]. Birkmeyer et al. (2020) mentioned the most distinguishing fact about COVID19 – the falling hospital admission rates [3]. This was done to prevent the accumulation of infected patients by eliminating non-emergency medical cases and surgeries.

The outbreak of the COVID-19 pandemic is not only about how the healthcare system responded to the crises. It should be noted that the pandemic has brought new geopolitical challenges [4], green recovery difficulties [5], structural changes in the prices of the consumption goods (i.e. sugar) in relation to the financial market uncertainties [6], and migration concerns in the European Union [6]. Surely, the readiness levels determined the response speed and pace o the countries during the pandemic but what is the bigger picture?

Correia et al. (2020) suggest that early and quick state intervention tends to preserve health and economic efficiency [8]. However, does it mean that the pre-outbreak measures that aimed to improve healthcare possess lesser importance? Consequently, together with the physical endowments of the healthcare facilities, individual health perceptions that accumulated during the last years can show if the countries handled the health crisis well or not. To clarify it, individual health self-perception provides an expedient proxy to measure the preparedness of the population with the healthcare system. Consequently, if the pre-pandemic self-perception of the health of the individuals were worsening in one country compared to another country, we might have a glimpse of the new determinator of the COVID-19 infection and death dynamics.

The successful and efficient battle with the COVID-19 outbreak might depend on two perception types: individual health perception and public perception of the virus itself. While the former informs about the pre-pandemic conditions to evaluate the preparedness for the outbreak on the citizen level, the latter reflects how the public perceives the government's actions against this challenge. Also, Nemec (2021) argued that the regime type determines the success rate of the anti-pandemic

measures, meaning democratic regimes are more likely to be successful than non-democratic ones [9]. In this article, individual health perceptions and COVID-19 trends have been discussed, focusing on the V4 (Visegrad) countries to explore the differences and draw on the intensities of the cases.

The main objective of the current work is to clarify the pre-COVID19 health perception trends and to compare the COVID-19 confirmed cases, deaths, and vaccination rate. To do so the collected data were graphically analyzed and interpreted, then calculated slopes for the functional relationships were identified to create a common comparative ground. Because of the emphasis on the pre-COVID-19 health care conditions, this work contributes to the recent body of literature by actualizing a new path in pandemic studies related to the Visegrad countries. Therefore, the next section briefly outlines the main publications about the Visegrad countries in the case of the COVID-19 outbreak. The third section provides the data sources and the methodological aspects. The fourth section is the results, and the last section briefly concludes.

Literature Review. The outbreak of COVID-19 impacted the Visegrad countries in various ways. For example, Czech et al. (2020) found a negative correlation between the ongoing pandemic and the values of the national currencies of Hungary, the Czech Republic, Slovakia, and Poland by applying the TGARCH model [10]. This finding is in line with the global trends after the COVID-19 outbreak which mainly was downwards depending on the development level of the financial markets [11]. The tourism of the Visegrad countries also has been negatively impacted [12]. Astrov and Holzner (2021) reported increased transfers from the big European Union (EU) countries to the Visegrad economies [13]. All in all, Éltető (2020) defended the thesis that the manufacturing sector in the Visegrad countries will be impacted more than services but the dynamic nature of the economic development of the Visegrad economies might help to overcome the negative shocks of the pandemic [14].

Also, the perception of the government regulations for COVID-19 differed among the Visegrad countries. Urbanovics et al. (2021) documented that while Slovakians showed more of a cooperative attitude but in the Czech Republic few

critics have been observed on social media (limited to the Twitter platform) [15]. Similarly, social media contents from Poland and Hungary shed light on the fact that bias and reputation damage has occurred after the government regulations.

On the individual country level, there have been observed various responses to both the government actions against the pandemic and COVID-19 infection cases among the Visegrad countries. For instance, Wielechowski et al. (2020) confirmed that in Poland, social distancing, as well as public mobility lowered after the strict government regulations against COVID-19 [16]. The authors also found that different regions of Poland achieved different levels of declines in public mobility which poses a puzzle for policymakers. Moreover, social support packages were 14% of GDP in Poland and Hungary, being lower than Germany, yet supportive to the relaxed fiscal and monetary policies [13].

Socio-economic and transportation consequences of the COVID-19 also took a toll on the individual level. In Slovakia the car plants were closed [17]; Information Communication Technologies (ICT) were utilized to introduce the new measures in the Czech Republic [18]; Poland's marginalized spatial regions experienced COVID-19 to a more severe degree than other regions which mirror the fundamental economic realities [19], and Hungary's capital Budapest showed dramatic decreases in the demand for the public transportation but increase in the personal cars and biking [20].

Data and Methodology. This study used Eurostat's (2021) self-perceived health indicator which is a concept operationalized a question on how a person perceives his/her health, in general, using one of the answer categories very good/ good/ fair/ bad/ as the main measurement of the pre-COVID-19 situation among the Visegrad Countries [21]. The other variables are COVID-19 infection cases and vaccination rates (per hundred persons) provided by Kaggle.com (Novel Corona Virus 2019 Dataset) [22].

The main methodology of this paper is a graphical analysis of the main trends and patterns in self-perceived health and COVID-19 causalities. Then, exponential and linear slopes have been calculated to acquire a measurement that allows us to compare the functional forms of the Visegrad countries concerning COVID-19 causalities.

Results. The collected data on self-perceived health among the population of the Visegrad countries reflects interesting dynamics both among themselves and in relation to EU-27. Even if the Visegrad countries share several similarities, they still differ both among themselves and with EU averages. Starting from 2010, citizens who have thought that the health conditions of his/her are bad has been declining, excluding Slovakia (see Fig.1, panel *a*). In fact, the values such as 8.7% in Hungary and Czechia, 10.3% in Poland are historically the lowest. Meantime, who thought that their health conditions are fair, stayed stable in between 21.4% and 23.8% in the period of 2010–2019 in Slovakia and EU-27 countries in general, but there was a sharp jump in Hungary (from 27.6% in 2018 to 30% in 2019) and Slovakia [from 21.4% in 2018 to 22.4% in 2019 (see Fig.1, panel *b*)]. In other words, the categories of "bad" and "fair" showed a declining and stable trend excluding particular country examples.

Overall Figure 1, panel *c* demonstrates that the category of "Good" progressed in terms of EU-27 countries, but just before the COVID-19 outbreak, in Hungary, there was a 2.1 percentage points decrease which is noteworthy among the V4 countries. Similarly, the category of "very good or good" achieved its highs around 2017–2018 among the Visegrad countries but in 2019 there were declines in small extends (see Fig. 1, panel *d*). Hence, there were positive and upward trends in the categories of "good" and "good or very good", yet Slovakia and Hungary demonstrated sharp deviations from the upward trend during the 2018–2019 period.

A more interesting picture emerges in the graphical analysis of the "very good" category among the respondents who evaluated the self-perceived health conditions illustrated in Figure 2, panel *a*. Accordingly, Slovakia experiences gradual worsening since 2017 (from 23.2% in 2017, down to 20.7% in 2019), Czech Republic experiences a fluctuation (20.2% in 2017, 19.8% in 2018, and 19.9% in 2019), and Poland shows stabilized, yet downgraded trend (from 16.3% in 2017 down to 15.4% in both 2018 and 2019). Meanwhile, this category is experiencing serious deteriorations in the case of Hungary since 2015 with exception of 2019. All in all, EU-27 countries also performed poorly in 2019.

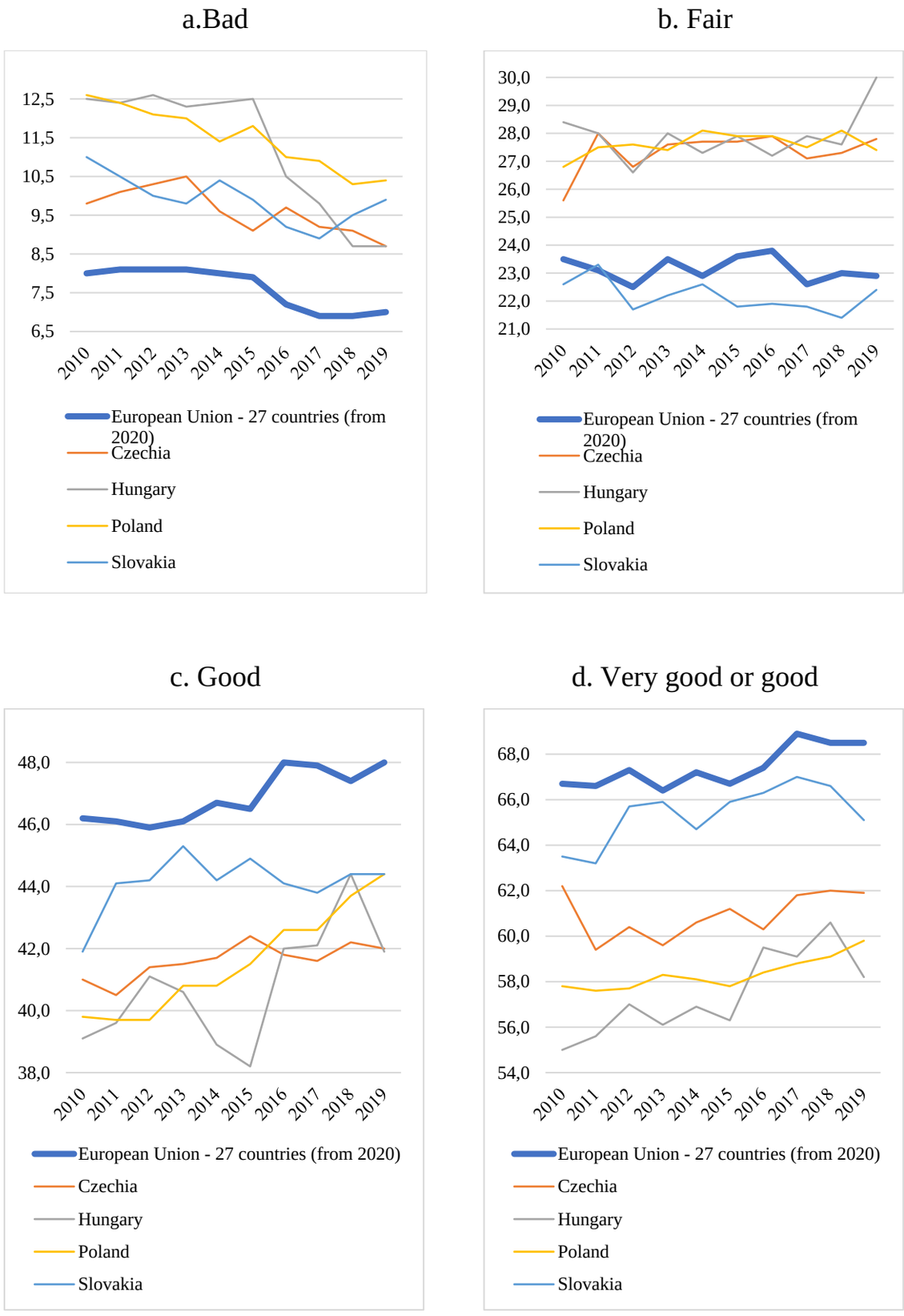
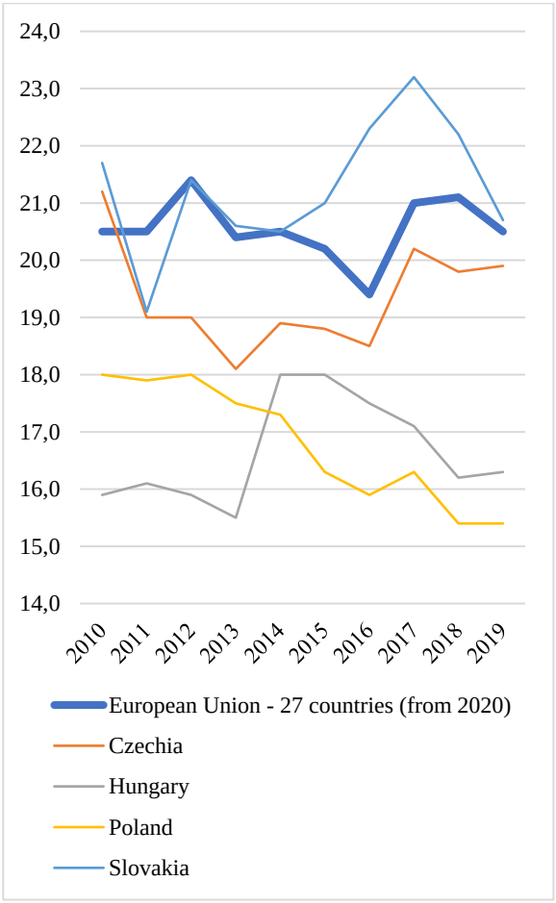


Fig. 1. **Self-perceived health among the Visegrad countries, in % of the pupulation, 2010–2019**

Source: Eurostat, online data code: HLTH_SILC_10; the data reflects the total quantile of the population over 16 from both genders

a.Very good



b. COVID-19 affected cases

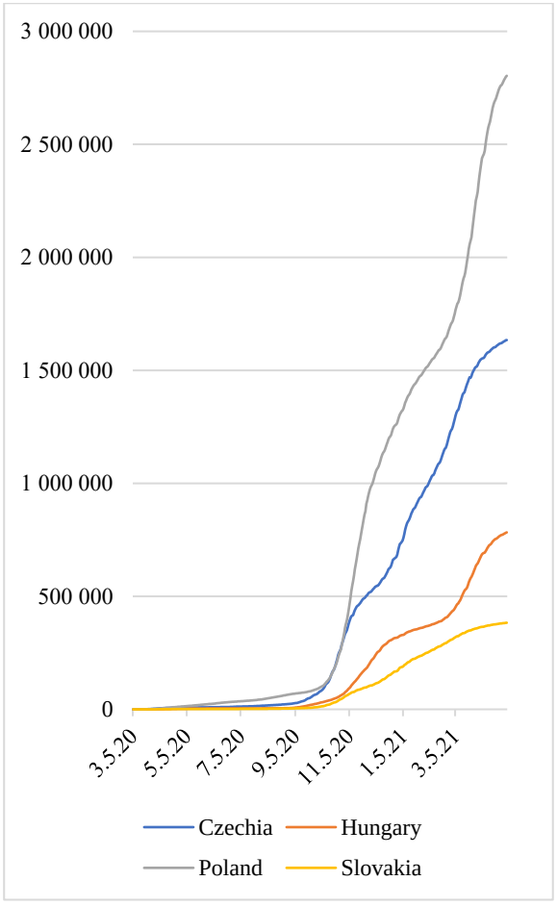


Fig. 2. **Self-perceived health among the Visegrad countries, in % of the pupulation, 2010–2019 and COVID-19 infection cases, January 2020–May 2021**

Source: Eurostat; online data code: HLTH_SILC_10; WHO – Johns Hopkins Github repository

Figure 2, panel b shows how the Visegrad countries experienced COVID-19 affected cases since May 2020. This indicator is sensitive to the size of the population of the case country. Poland retains the highest population among V4 countries, while Slovakia has the lowest population. Therefore, this is being reflected in the affected cases. However, despite Hungary and Czechia share similar demographic dynamics, the infection cases in Czechia's case were higher than in Hungary.

Table 1 demonstrates the calculated averages of the self-perceived health conditions and the slopes of the assumed functional relationships for infections and

deaths from the COVID-19 outbreak. Here we establish an assumed connection between the pre-COVID-19 healthcare conditions proxied by the self-perceived health conditions and infection and death dynamics. Stated alternatively, the high averages for "good" and "very good" categories reconcile with steeper functional relationships which indicate the severity of the infection cases.

To explain, in the case of the calculated exponential slopes, Hungary's ranking is the lowest, as the country's average is 40.79% and 16.65% for the "good" and "very good" criteria respectively, and has the highest slope which is 0.0211. Meanwhile, Poland and Czechia show lower, and similar indicators by 0.0199 and 0.0196 respectively. However, the linear slopes do not perfectly reconcile with the average self-perception health evaluations. Stated alternatively, despite Slovakia has the highest averages for both categories, and the lowest linear slope, Hungary's lowest averages in self-perceived health do not show steeper results than Poland and Czechia.

In the case of the deaths, Slovakia and Czechia possess the highest averages of the self-perceived health categories measured by the category of "very good" which also is accompanied by the lowest slopes (0.237 and 0.509 respectively). Although, Polan and Hungary shared similar averages of "very good" healthcare conditions, Poland's calculated slope (1.169) is steeper than Hungary (0.541).

On the other hand, COVID-19 is not limited only to infected cases. As Figure 2, panel *a* and *b* illustrates, vaccination rates (per hundred persons) and daily deaths (in persons) indicate another spectrum of the causalities. As the vaccination pick up a speed starting from the beginning of 2021, almost all Visegrad countries shared similar progress until the early days of March. Then, the Czech Republic lagged, but Poland, Slovakia, and Hungary followed steady improvements. However, Hungary achieved exponential growth in vaccination rate starting from the middle of March. Similarly, the Czech Republic boosted its vaccination rates from April, but Poland and Slovakia follow more of a stable speed in the vaccination.

Panel *b* of Figure 3 shows the death cases due to COVID-19 among the Visegrad countries, and it clearly shows how the second wave was more severe. According to data, from the last days of April and the early days of May, the death cases are slowing down.

Table 1

Exponential and linear slopes for the three Visegrad countries in relation to their average self-perception statuses.

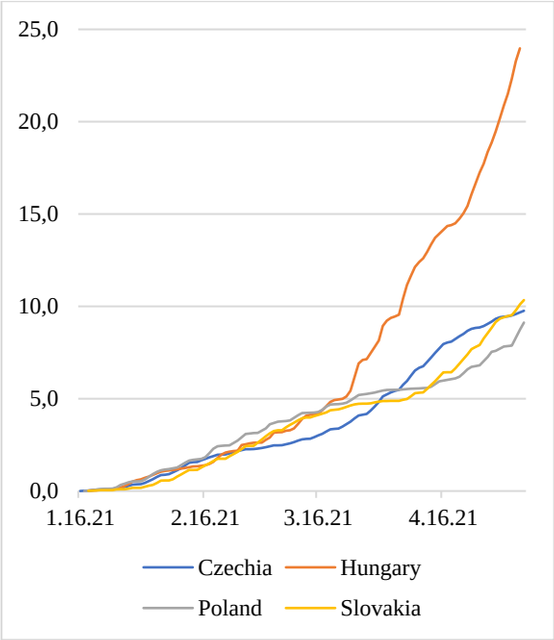
Country	Health Perception average		Exponential Slope	Linear Slope	
	Good	Very good			
Hungary	40.79	16.65	0.0211	1702.9	Infections
Poland	41.56	16.80	0.0199	6507.2	
Czechia	41.60	19.34	0.0196	4119.7	
Slovakia	44.13	21.27		990.45	
Hungary	40.79	16.65		0.541	Deaths
Poland	41.56	16.80		1.169	
Czechia	41.60	19.34		0.509	
Slovakia	44.13	21.27		0.237	

Source: Authors' own calculation.
Note: Exponential slope for the Slovakia's case was not possible due to the lack of the exponential relationhip.

Conclusion. In brief, the Visegrad countries demonstrate a close relationship in terms of self-perceived health among the citizens. Similar to other countries and regions, Visegrad countries also severely felt the negative shocks of the COVID-19 outbreak. Much research about these adverse impacts has been done in the case of V4 countries, but still, there are many rooms for improvements to grasp new aspects of the COVID-19 causalities. This paper aimed to provide the pre-pandemic dynamics of the self-perceived health among the Visegrad countries in comparison to the COVID-19 causalities.

The results indicate an interesting grouping of the trends. For instance, those who were highly satisfied with their health conditions (measured by the categories of "good", "good or very good", and "very good" of the self-perceived health conditions survey) are shrinking in their share, with noteworthy worsening in individual countries like Hungary and Slovakia. However, Slovakia has the highest averages of health perception values for the period 2010–2019, and the lowest COVID-19 affected cases. Meanwhile, Hungary is a leading country in terms of vaccination per hundred persons. Moreover, despite the geographical size and population of the country plays a significant role in the COVID-19 causalities, still, the lower averages of self-perceived health conditions in Poland and Czechia were accompanied by high infection and death cases.

a. Vaccinations per hundred



b. Daily deaths because of COVID-19

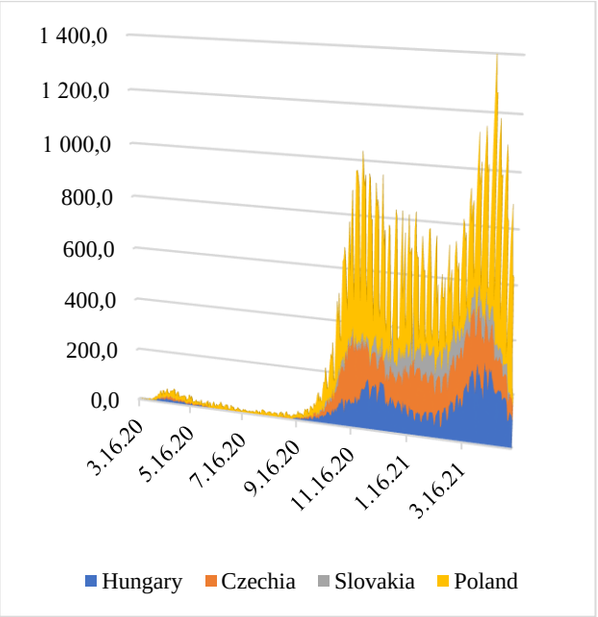


Fig. 3. **Vaccinations per hundred among the Visegrad countries, December 2020–May 2021, and daily death cases from COVID-19, in persons, March 2020–May 2021.**

Source: Opean source data sets on Kaggle.com.

The limitations of this study also must be mentioned. Firstly, the paper utilized the overall population's self-perceived healthcare indicators without any division based on age, gender, and income. This can be corrected in follow-up studies as the Eurostat allows to reach the mentioned distribution of the statistical data among the case countries. Secondly, the methodology is descriptive and explanatory which impeded clarifying cause and effect relationships. Thirdly, the benchmark region for V4 countries can be expanded, allowing to comparison to the other regions which share similar socio-economic features. All in all, this paper draws attention to the fact that not just the medical response rates are important, but also the prior trends and dynamics play a significant role.

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