Understanding excess mortality in Europe during the COVID-19 pandemic

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The COVID-19 pandemic had profound and wide-ranging consequences for countries and people as it swept over Europe and the rest of the world from early 2020 onwards.[1] The pandemic's impact was unprecedented since at least the 1918 influenza pandemic, but similarly were the direct and indirect consequences of the public health responses mounted by national governments, albeit implemented with different timing and rigor. Important questions remain as to differences in the impact of the pandemic, but also the optimal intervention strategies. Mortality remains a key measure of any new pandemic's severity, but also the effect of any interventions.

In this issue of the *Lancet Regional Health Europe*, Pizzato et al. analyzed differences in excess all-cause mortality in 29 countries across Europe during the first four years of the COVID-19 pandemic, 2020–2023, which they relate to socio-economic indicators, non-pharmaceutical interventions and COVID-19 vaccination uptake.[2] The authors used estimates of excess all-cause deaths to provide a more complete and unbiased measure of pandemic mortality than cause-specific deaths. Retrospective analyses such as this are critical to better understand how the pandemic impacted countries differently and to identify potential explanatory factors.

The authors estimate over 1.6 million excess deaths, or 8.0% above the expected, across the 29 countries over the 4-year period, with about half a million excess deaths occurring during each of the first three years of the pandemic (2020, 2021 and 2022), with only a small excess in 2023. The authors found the relative excess mortality over the entire period to be overall higher in countries in Eastern compared to Western, Northern and Southern Europe. When examining explanatory factors, they found that poverty was significantly associated with a higher excess mortality, whilst a higher gross domestic product (GDP) per capita, higher health expenditure and higher COVID-19 vaccine uptake were all associated with lower excess mortality. Interestingly, they detected no significant association either with the stringency of implemented non-pharmaceutical interventions or population density over the entire study period.

The author's findings add to the general picture of a surprisingly wide variation in mortality impact of the COVID-19 pandemic across Europe, even between countries of close proximity and similarity. This is likely attributable to multiple societal and population demographic factors, but also differences in health services capacity, and varied national responses to the pandemic. In 2020, before the availability of licensed COVID-19 vaccines, countries relied upon a range of non-pharmaceutical interventions to mitigate the health impact. It is somewhat surprising that no association with the stringency of implemented interventions was found, as also raised by the authors. Indeed, although the risk factor analysis was not stratified by year, there were clear differences in mortality impact by country in this first year. The authors' finding of strong association of COVID-19 vaccination with lower pandemic excess mortality is supported by another recent European-wide study about lives saved by COVID-19 vaccination, with similar findings of more deaths averted for countries that achieved high, early coverage of vaccination of vulnerable groups.[3]

In pandemic situations, excess all-cause mortality provides a more complete measure than cause-specific mortality, not limited by availability of diagnostic testing, applied testing strategies and quality of surveillance systems. All-cause mortality also better reflects both the direct and indirect effects of the pandemic related to temporal changes in epidemiology of other communicable and non-communicable diseases, consequences of inadequate health services, changes in health seeking behavior etc. In Europe, the weekly estimates of excess all-cause mortality provided throughout the COVID-19 pandemic in real time by organizations such as the European Mortality Monitoring Network (EuroMOMO) became a widely used tool for 'early warning', which informed both public understanding and the public health response.[4,5] However, one should also be aware of the methodological issues in estimating excess mortality, with different methods applied by different groups during the pandemic, sometimes leading to conflicting results.[6–8] These may stem from differences in data sources used and/or choices in modelling approaches, e.g. relating to the estimation of the expected level of deaths in a defined population.[9]

We will never know the true number of deaths caused by the COVID-19 pandemic; however, the

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country-specific excess mortality estimates presented by Pizzato et al. add further to existing global work[10] and to our understanding of the COVID-19 pandemic's impact across Europe, what worked to reduce it during the phases before and after the availability of effective vaccines, but also importantly, the role of underlying economic factors and health systems capacity. Such knowledge will help us prepare better for the pandemics of the future and to ensure more equity in the response to future global health emergencies. Nevertheless, given the methodological challenges, further retrospective analyses will be needed to fully understand the excess mortality from the COVID-19 pandemic and the effect of deployed interventions.

Contributors

LSV drafted the first version of this commentary, RGP provided feedback and input, and both authors approved the final version.

Declaration of interests

Authors declare no competing interests.

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