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Short research communication

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Abstract

Background: Since winter 2020, excess deaths due to COVID-19 have been higher in Eastern Europe than most of Western Europe, partly because regulatory enforcement was poor.

Methods: This paper analysed data from 50 countries in the WHO European Region, in addition to data from USA and Canada. Excess mMortality and vaccination data were retrieved from "Our World In Data" and regulation implementation was assessed using standard methods. Multiple linear regression was used to assess the association between mortality and each covariate.

Results: Excess mortality increased by 4.1 per 100 000 (P = 0.038) for every percentage decrease in vaccination rate and with 6/100 000 (p=0.011) for every decreased unit in the regulatory implementation score a country achieved in the Rule of Law Index.

Conclusion: Degree of regulation enforcement, likely including public health measure

enforcement, may be an important factor in controlling COVID-19's deleterious health impacts.

Keywords: COVID-19, European Region, excess mortality, regulation enforcement, rule of law, vaccination coverage.

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Introduction

COVID-19 incidence and confirmed death rate are the most widely used epidemiological parameters to describe differences between countries in the level of risk and health outcomes during the pandemic (1). Both outcomes may be highly affected by the testing and data collection capacities of countries (2). Excess death rate is a more complex indicator, but it may show the true impact of the pandemic across a population, especially in the long-term (3). It may also serve as a better comparative measure across countries with differences in health system and surveillance resources (4).

In Eastern European countries, where extensive spread of COVID-19 started later than in the West, public health measures were very effective during the first half of 2020. Excess death rates in most of these countries were negligible at a time when most of Western Europe had exceeded expected rates by 15–35% (5). During the second wave in autumn/winter 2020, excess mortality in Eastern Europe was higher than in most parts of Western Europe and this difference continued throughout 2021 (6). Eastern European countries started vaccination within a similar timeframe with Western Europe, but the vaccination rates in Eastern Europe have been comparatively lower (7).

Comparing and quantifying cumulative COVID-19 impacts across country-level public health metrics can be challenging from an outcomes and a public health policy perspective. Efforts to measure the association between COVID-19 cases and vaccination rate (8) have indicated low efficacy of the vaccination programmes. Excess mortality may provide a better indicator of the measurement of long-term health impact differences across countries, especially in the context of different vaccination rates. Publications analysing differences in the effectiveness of government interventions exist (9), but they take for granted the full implementation of the measures in various countries. Differences in enforcement of measures between countries are a known challenge for the international analysis of country response measures to COVID-19 (10,11).

Government regulatory enforcement levels generally likely impact the intensity of public health measures enforcement and can thus serve as a proxy for this measurement. Regulatory enforcement is a component of the Rule of Law index, calculated every year by the World of Justice Project (WJP). It is a standardised estimate of how well government regulations are implemented for situations such as environmental restrictions, public health requirements, workplace safety conditions, business activities, etc (12). Regulatory enforcement may therefore be a potential factor in explaining country differences in pandemic outcomes.

The objective of this analysis was to assess the association between excess COVID-19 mortality, vaccination rate, and regulation enforcement, controlling for health care utilization. We hypothesized that higher excess mortality rates in Eastern European countries are associated with lower regulatory enforcement scores, which impact government non-pharmaceutical interventions and vaccination programmes. Thus, higher excess mortality can be explained by poorer implementation of public health measures and vaccination programmes.

Methods

This analysis included 50 countries in the WHO European Region, in addition to USA and Canada. Excess mortality was calculated as observed deaths minus expected deaths per 100 000 population. Expected deaths estimates were based on historical deaths data. Excess mortality was for the period 1 January 2020 to 2 January 2022. Excess mortality country estimates for this analysis were retrieved from Our World in Data (OWID) database (13), which uses data from WHO or verifiable government sources. The excess mortality estimates were originally calculated by The Economist and updated weekly on OWID.

The primary mortality data for countries included in this analysis were sourced from Eurostat and national statistical agencies. Not all countries reported mortality in the same way. Where there were delays in reporting, an estimate was used in the database for the period of delay.

For this analysis, we used the central estimate provided for 2 January 2022. In a separate analysis we also used excess mortality estimates as of 3 January 2021, before the mass vaccinations.

Vaccination rate was calculated as the percentage of the total population that had received at least two doses of vaccine as reported by national programmes. The rates for 10–15 January 2022 were retrieved from OWID (14).

The regulation implementation indicator was based on the Rule of Law Index estimations developed by WJP, a well-regarded index compiled from standardized surveys of the general public and local legal experts in 139 countries. It measures 9 dimensions of the rule of law, namely, limited government powers, absence of corruption, order and security, fundamental rights, open government, effective regulatory enforcement, access to civil justice, effective criminal justice, and informal justice (12). This analysis used the component, effective regulatory enforcement, as the index item that most closely relates to the mitigation of the pandemic. The values of the index are between 0 and 1, with 1 being the most effective regulation enforcement. In this analysis, scores were transformed into point percentage to allow for meaningful interpretation of linear regression, using the 2020 data from the WJP database (15).

Outpatient visits (per capita per year) were included in the analyses to control for different healthcare system utilization patterns. Data for the latest year were retrieved from WHO dataset (16) for countries in the WHO European Region. USA and Canada were included as the only 2 North American members of the Organization for Security and Cooperation in Europe (17).

We computed Pearson’s correlation coefficients, including P-values, between the pairs of variables. Multiple linear regression analysis was conducted to assess the association between explanatory variables and the outcome variable (excess death).

Results

Mean excess mortality rate on 2 January 2022 among 50 countries included in the analysis was about 326±222 deaths per 100 000 population; mean vaccination rate was about 59%±18%; mean regulation enforcement was about 65±15 points percentage; and mean outpatient visits (per capita/year) was 6.3±2.5.

Excess death rate was strongly inversely correlated with regulation enforcement (r= -0.69, P

No correlation was found between outpatient visits and each of the three other variables in the analyses: excess mortality (r= 0.31, P=0.031), regulation enforcement (r=-0.13, P=0.406), or vaccination rate (r=0.001, P=0.997). The correlation of excess mortality and vaccination coverage for different scores of regulation enforcement is presented in Figure 1 .

Excess mortality rate increased by 4.1 per 100 000 for every percentage decrease in vaccination rate, irrespective of regulation enforcement and health care utilization (Table 1). Excess mortality increased with 6 per 100 000 for every unit less in the regulatory implementation index score. Regulation enforcement, vaccination coverage, and outpatient visits accounted for about 62% of the variance of excess death (Table 1).

Discussion

This short report provides a global perspective on comparative COVID-19 outcomes and policy solutions as of January 2022. Regulation enforcement differences provide a richer understanding of the impact of the pandemic in the context of associated political and societal factors that can influence the management of the crises. Specifically, this study revealed that implementation of the not-always-popular government non-pharmaceutical interventions and, later, vaccination were more effective in more law-abiding societies.

This provides key insights for Eastern Europe, which is understudied on this critical policy and public health topic. The focus of most international research and the global media has often being primarily on outcomes of Western countries and associated factors – especially the resistance to vaccination and public health measures (18) – pandemic outcomes have been poorer in Eastern Europe than Western Europe. In the early phases of the pandemic, urgent short-term measures were effective in preventing deaths in Eastern Europe (19), but over the longer-term, other factors played a more important role in mitigating the pandemic.

The degree of enforcement of government regulations is independently correlated to the excess mortality observed during 2020 and 2021 pandemic years. Regulation enforcement may have affected mortality directly, because of less effectively implemented social distancing regulations and mask mandates. This may be especially true in the pre-COVID-19 vaccination period. In the second half of 2020, during the second wave of COVID-19 in Europe, when vaccination was not yet a factor, excess mortality in many Eastern European countries surpassed the numbers recorded in the countries where the pandemic first started (6). Regulation enforcement may also

have affected mortality through a less successful vaccination programme during 2021, as countries with a lower regulation implementation index had lower vaccination rates. Vaccine provision was centralized (20) and uniform for all European Union Member States, while Russia was one of the first countries in the world to produce a vaccine (21). Hence, the lower success of vaccination campaigns in many Eastern European countries cannot be explained by variations in supply.

Regulation implementation may be influenced by several underlying social factors, including community trust, population education, public patience, etc. Other more specific factors related to present or past models of government may also play a role. Most Eastern European countries have been governed by authoritarian regimes in recent history and many citizens there may be more suspicious towards government regulations or mandates (22).

We discuss here only major factors related to regulation enforcement and implementation of vaccination programmes. Other more complex factors may have been involved and the results of this ecological study at country level cannot be generalized for patients. However, we expect this short report to encourage more discussion and especially further research in this policy area of regulation enforcement during the COVID-19 pandemic. We recommend that implementation enforcement factors should be considered by governments when considering population-wide public health measures, and by experts when measuring real-world impact of the measures.

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Surmortalité due à la COVID-19 dans les pays d'Europe de l'Est en lien avec une mise en œuvre moins rigoureuse des réglementations et avec une couverture vaccinale plus faible

Résumé

Contexte : Depuis l'hiver 2020, la surmortalité due à la COVID-19 est plus élevée en Europe de l'Est que dans la plupart des pays d'Europe de l'Ouest, en partie du fait de la mise en œuvre insuffisante des réglementations.

Objectifs : Le présent article analyse des données fournies par 50 pays de la Région OMS de l'Europe, ainsi que des données provenant des États-Unis et du Canada.

Méthodes : Les données relatives à la surmortalité et à la vaccination ont été extraites du site Web « Our World In Data » et la mise en œuvre des réglementations a été évaluée à l'aide des méthodes standard. La régression linéaire multiple a été utilisée pour évaluer le lien entre la surmortalité et chaque covariable.

Résultats : La surmortalité a augmenté de 4,1 pour 100 000 (p = 0,038) pour chaque baisse en pourcentage du taux de vaccination et de 6 pour 100 000 (p = 0,011) pour chaque unité en moins dans le score de mise en œuvre des réglementations obtenu par un pays dans l'indice de l'état de droit.

Conclusion : La rigueur de l'application des réglementations, y compris l'application des mesures de santé publique, peut être un facteur important pour atténuer les effets négatifs de la COVID-19 sur la santé.

19-

2020 :

50 :

Our" World In Data" :

WHO EMRO | COVID-19 excess deaths in Eastern European countries associated with weaker regulation

: ارتفع معدل الزيادة في الوفيات بنسبة 4.1 لكل 100000 (القيمة الاحتمالية =النتائ **ج**
038.0) لكل نسبة مئوية من انخفاض معدل التطعيم، وبنسبة 6 لكل 100000 (القيمة الاحتمالية
= 0.011) لكل درجة انخفاض في تنفيذ اللوائح للبلد على مؤشر سيادة القانون .

: إن التمسك بإنفاذ اللوائح والحرص الشديد عليه، ومنها إنفاذ تدابير الصحةالاستنتاجات
العامة، ربما يكون عاملًا مهمًّا في التخفيف من الآثار الصحية السلبية لفيروس
كوفيد -19.

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