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Societal volunteering and COVID-19 mortality in high-income countries: a cross-sectional study

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ABSTRACT

Objectives This study aims to quantify the relationship between societal volunteering and the impact of COVID-19 in that society.

Design Cross-sectional study.

Setting, participants and outcome measure Data on societal volunteering were collected for 32 high-income countries (international analysis) and 50 US states (US analysis). Using regression analysis, the ability of this variable to explain COVID-19 mortality was compared with other variables put forward in the public debate (eg, vaccination rate, obesity, age). COVID-19 mortality was measured as the number of deaths due to COVID-19 per million inhabitants, from January 2020 until January 2022.

Results Societal volunteering explains 43% (resp. 34%) of observed variation in COVID-19 mortality (R^2) in the international (resp. US states) analysis. Compared with other variables, societal volunteering better explains the variation in COVID-19 mortality across countries and US states, with only the prevalence of smokers displaying a higher R^2 in the international analysis.

Conclusions Countries and states with more societal volunteering have been less impacted by COVID-19, even after accounting for differences in demographics, gross domestic product, healthcare investments and vaccination rates. Although this evidence is not causal, our findings suggest that factors beyond the public-private debate might impact the resilience of societies to a pandemic, with societal volunteering being one such factor.

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ Cross-sectional in design, this study describes associations. No firm conclusions about causal relationships can be drawn from the results of the study.
⇒ Statistics used to calculate the measure for societal volunteering were produced between 2010 and 2019, such that the main explanatory variable preceded the outcome variable (COVID-19 mortality in 2020 and 2021).
⇒ Several predictors of COVID-19 mortality were inserted in the model as covariates: for each predictor, data for the latest available year were collected. When data were available for 2020 or 2021, data were collected for 2019, to avoid interference with COVID-19 mortality.
⇒ Not all relevant predictors could be taken into account because of a lack of availability for all countries and US states considered in this study.
⇒ Several sensitivity analyses were conducted: (1) subgroup of countries for a more homogeneous definition of volunteering; (2) different definition of societal volunteering; (3) different source for the outcome COVID-19 mortality; (4) two time windows of the pandemic, that is, before and after the introduction of vaccines; (5) the share of private expenditure in total health expenditure as a potential confounder.

INTRODUCTION

Different countries responded differently to the COVID-19 pandemic in terms of timing and stringency of measures adopted.[1] Typically, policymakers tried to balance the capacity of healthcare systems to take care of the ill (as determined by ICU capacity, availability of nurses, etc), with safeguarding economic output (preventing total lockdown of the labour force, etc). Later on, also a broader array of considerations such as the impact on schooling or the need for social contact was taken into account to varying degrees.[2]

The broad and relatively fast availability of data on healthcare and economic output, together with the political estimate that these were the most critical determinants for maintaining societal structure and compliance with the measures taken, made them priorities for decision-making in many countries. What received far less attention, in part due to the difficulty of obtaining reliable data in a timely manner, was the opposite question: to what extent do societal structures—besides healthcare and economic systems—contribute to a country's resilience during catastrophes such as the pandemic? While it is commonly understood that the impact of a pandemic goes beyond its death count, perhaps the death count itself is impacted by the way societies are structured.

One example of such societal structure is the contribution of volunteers during the COVID-19 response. Volunteers may contribute to well-functioning societies in different ways, both through practical actions (eg, knitting face masks) as by strengthening societal cohesion (eg, encouraging fellow citizens to comply with measures). A rapid review of the literature about COVID-19 volunteering in the UK suggested social networks and connections, local knowledge and social trust as key dimensions associated with community organising and volunteering.[3] This review also suggested that there has been limited community engagement and collaboration with volunteering groups and other community-based organisations. A scoping review and stakeholders' mapping emphasised the need to recognise and engage community volunteers and community-based organisations in order to optimise the support of the community during any humanitarian disaster.[4] Confirmation of this finding was done by the Centre for Evidence-Based Medicine, stating that a potential way to boost well-being in a time of a crisis may be to increase people's sense of 'mattering', through volunteering.[5]

In this study, we focus on societal volunteering, defined as the share of adults that voluntarily contributed in the past 12 months to an organisation, community or group. To the best of our knowledge, there is no available literature on the association between COVID-19 and societal volunteering. However, there is a growing literature explaining the cross-country variation in the impact of COVID-19, including societal characteristics as explanatory variables.[6 7] We are aware of one study linking societal volunteering to different societal outcomes on civic engagement, empowerment, advocacy and community building—but not COVID-19 impact—in a quantitative manner.[8] Our study aims to fill this gap bringing both streams in the literature together by quantifying the association between COVID-19 mortality and societal volunteering, using the unique context of the COVID-19 crisis with its intensity, sudden onset and global spread.

METHODOLOGY

Study population

Two data sets were used: an international data set, to perform a between-country analysis and a data set of all 50 US states, to perform a within-country analysis. The international analysis was restricted to 'high-income' countries (at the time of writing, this cut-off stood at 12 696USD GNI per capita) and excluded smaller countries (less than 3 million inhabitants) to avoid including tax havens. Thirty-two countries (Australia, Austria, Belgium, Bulgaria, Canada, Croatia, Czechia, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Israel, Italy, Netherlands, New Zealand, Norway, Poland, Portugal, Romania, Russia, Saudi Arabia, Serbia, Slovakia, South Africa, Spain, Sweden, Switzerland, UK and USA) were retained based on availability of data on societal volunteering and other explanatory variables (see the section Data collection).

Patient and public involvement

The study did not involve patients. Study findings are being made publicly available to the general public through the production of study reports and open-access journal articles.

Data collection

The dependent variable of interest is COVID-19 mortality, measured as the number of deaths due to COVID-19 per million inhabitants, from January 2020 until January 2022. On average, 1808 people have died from COVID-19 per million inhabitants (SD=1120), with the average in US states at 2409 (SD=708). The explanatory variable of interest is the size of societal volunteering. Different measures were sought to enable consistent analysis between the international and US states comparison. However, only very limited data are available on volunteering. Moreover, available data is typically context dependent, with differing definitions, complicating comparisons across regions. Online supplemental table A1 lists the five options finally considered. The choice was made to define volunteering as 'organisation-based' volunteering, as per the definition of the International Labor Organization (ILO). The motivation for this choice is twofold. First, to the best of our knowledge, this definition of societal volunteering is the only standardised measure that can be readily embedded in national labour force surveys (for details on the data collection and definition of these indicators, see ILO's Volunteer Work Measurement Guide: https://www.ilo.org/wcmsp5/groups/public/—dgreports/—stat/documents/publication/wcms_789950.pdf). Second, this measure is—relative to other indicators—broadly and consistently adopted, making data comparable across countries and states. For example, the UN uses this definition as part of their *Satellite Account on Non-profit and Related Institutions and Volunteer Work*[9] and their *State of the World's Volunteerism Report*.[10] Eurostat is using a very similar measure for their reporting on *Social participation and integration statistics*, and the US Census Bureau surveys citizens on their volunteering activities within an organisation or association in their *Current Population Survey Volunteer Supplement*.

Societal volunteering is measured as 'organisation-based' volunteering, as per the ILO definition, expressed as the share of adults who voluntarily contributed to an organisation, community or group. Activities included can range from serving on the board of an organisation, to removing debris after a natural disaster (Appendix III of the ILO's Volunteer Work Measurement Guide details examples of common volunteer work activities coded according to ISCO-08). Variation in the reference period (1 week, 4 months or 12 months) across countries affects the reliability of estimates, complicating an international comparison. Country-level estimates were harmonised following the methodology described in Appendix B of the *State of the World's Volunteerism Report*.[10] Out of the 32 countries included here, 28 countries applied a 12-month reference period, while four others applied a 4-week reference period (Switzerland, New Zealand, Russia and Saudi Arabia). These four estimates were converted to 12 months, in order to make estimates comparable. For countries that applied both reference periods (in different years), we retained the years with the 12-month reference period. On average, over 20% of the working-age population has contributed to an organisation, community or group as a volunteer in the past 12 months (mean=20,5%, SD=14.2%), whereas in US states, almost one in three has contributed (mean=32.9%, SD=5.9%).

For both the international and US states comparison, data were collected for additional explanatory variables of COVID-19 mortality. The choice of variables included in this study is the result of three data availability considerations. First, the availability of (recent) data at country level and at state level for the USA, with comparable definitions, allowing to replicate our analyses using both between-country and within-country variation. Second, the availability of indicators on societal volunteering, allowing to test the hypothesised association between societal volunteering and COVID-19 mortality. Third, the availability of data on strong predictors of COVID-19 impact.[11] Variables with data for all selected countries and states include 'general' variables (gross domestic product per capita, population density), variables related to the healthcare policy (health expenditure per capita, number of hospital beds per capita), COVID-19 policy interventions (stringency of measures implemented, vaccination rate) and COVID-19-specific predictors of mortality (prevalence of obesity, prevalence of smoking, share of population over 65 years old). Depending on the variable, indicators and definitions can differ between the international analysis and the US analysis. An overview of the indicators, alongside data sources and links to the corresponding data sets, is presented in online supplemental table A2.

Statistical analysis

Societal volunteering as a predictor of COVID-19 mortality was analysed in two steps for both the international and US states comparison. First, using a simple linear regression. Second, using a multiple linear regression model. Each explanatory variable was used in a simple regression to explain the variation in COVID-19 mortality. In case this relationship was significant (p value <0.05), the variable was inserted in the multiple regression model (online supplemental table A3 lists the Pearson correlations between the outcome variable (COVID-19 mortality), the explanatory variable of interest (size of societal volunteering) and other explanatory variables). In addition, each control variable considered was compared with societal volunteering in its ability to predict COVID-19 mortality (R^2). All statistical analyses were performed using the software R (V.4.1.2).

Different assumptions were tested for both the simple and multiple models: (1) linearity; (2) normality of residuals; (3) multicollinearity (for the multiple regression only); (4) homoscedasticity and (5) uncorrelatedness of independent variables with the error term. All five assumptions were confirmed for both models, with the exception of (4) in the simple model for the international analysis. In the Results section, this model was, hence, estimated using a weighted linear regression to account for heteroscedasticity observed in the errors.

In order to strengthen the main results reported in this paper, additional analyses were added: (1) limiting the sample for the international analysis to EU countries, to limit inconsistencies in the national definitions of societal volunteering; (2) changing the definition of volunteering to 'direct' volunteering, helping people directly rather than through an organisation, community or group; (3) changing the definition of COVID-19 mortality by Johns Hopkins University to excess mortality estimates by The Economist; (4) adjusting the timeframe considered to estimate COVID-19 mortality, accounting for the introduction of the vaccine at the end of 2020: first, repeating the analyses when restricting the timeframe of COVID-19 deaths to the period between June 2021 (6 months after introduction of vaccines, to ensure broad adoption) and January 2022; second, restricting the timeframe to the period between January 2020 and January 2021, before the widespread introduction of vaccines.

RESULTS

Figure 1 displays the association between societal volunteering and COVID-19 mortality, for the international and US states comparison, respectively. For both data sets, a significantly negative correlation exists (p value <0.001), with societal volunteering explaining between 34% (US states) and 43% (international) of the observed variation in COVID-19 mortality (R^2). Figure 2 compares the explanatory power of different variables. This figure shows that—apart from prevalence of smokers only in the international but not US states comparison—societal volunteering explains most of the observed variation in COVID-19 mortality across countries and between US states.

Table 1 depicts the results for the simple regression model (without control variables) and for the multiple regression model (including significant control variables as described). The coefficient of societal volunteering is consistent in size between the simple and multiple regression models. In the multiple regression model, the coefficient equals −35.48 (international) and −73.56 (US states). Hence, for each percentage point increase in societal volunteering (% of population), the number of COVID-19 deaths per million inhabitants decreases with 35.48 and with 73.56, for the international and US states comparison, respectively. The significance of the coefficient in the multiple regression model is lower (p value=0.041) compared with the multiple regression

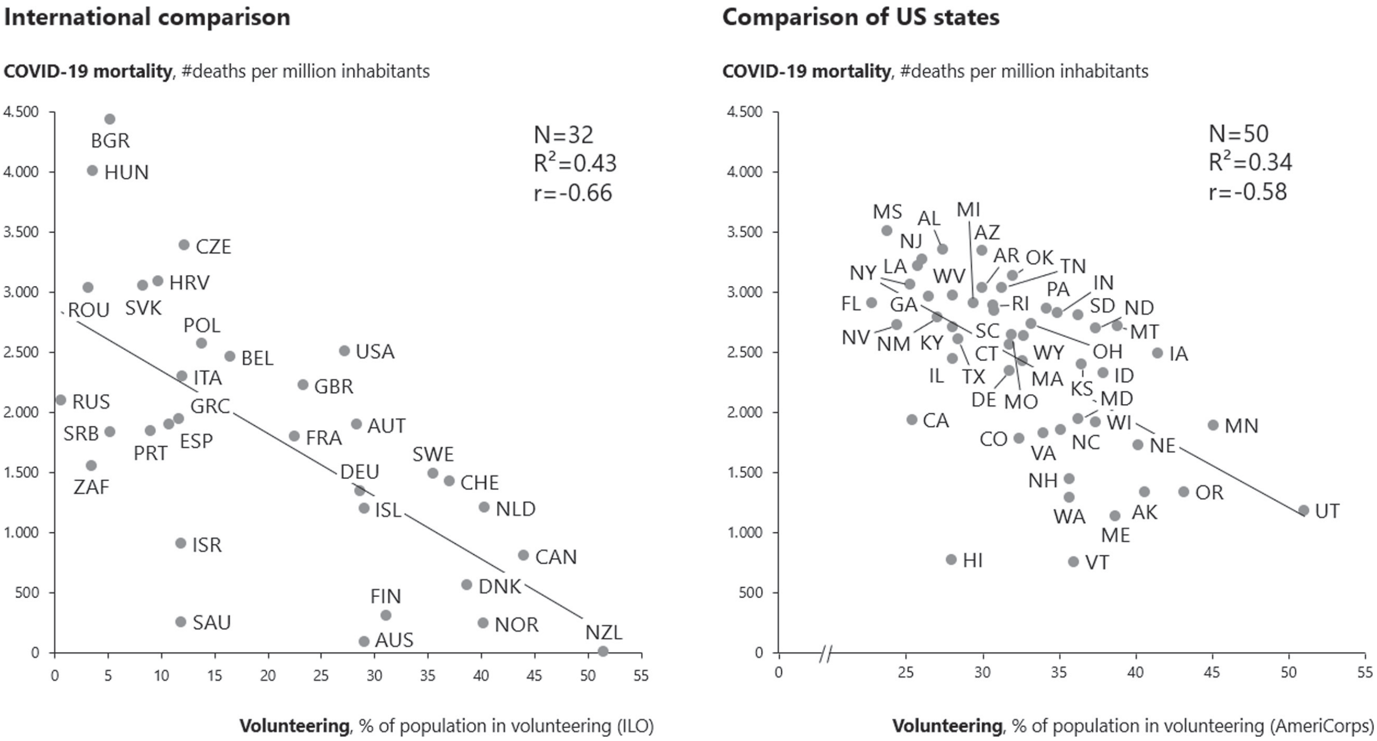

Figure 1 Societal volunteering and COVID-19 mortality. N=32 for international comparison and N=50 for comparison of US states; r = Pearson correlation coefficient. ILO, International Labor Organization. International comparison: AUS, Australia; AUT, Austria; BEL, Belgium; BGR, Bulgaria; CAN, Canada; HRV, Croatia; CZE, Czechia; DNK, Denmark; FIN, Finland; FRA, France; DEU, Germany; GRC, Greece; HUN, Hungary; ISL, Ireland; ISR, Israel; ITA, Italy; NLD, Netherlands; NZL, New Zealand; NOR, Norway; POL, Poland; PRT, Portugal; ROU, Romania; RUS, Russia; SAU, Saudi Arabia; SRB, Serbia; SVK, Slovakia; ZAF, South Africa; ESP, Spain; SWE, Sweden; CHE, Switzerland; GBR, United Kingdom; USA, United States; Comparison of US states: AK, Alaska; AL, Alabama; AR, Arkansas; AZ, Arizona; CA, California; CO, Colorado; CT, Connecticut; DE, Delaware; FL, Florida; GA, Georgia; HI, Hawaii; IA, Iowa; ID, Idaho; IL, Illinois; IN, Indiana; KS, Kansas; KY, Kentucky; LA, Louisiana; MA, Massachusetts; MD, Maryland; ME, Maine; MI, Michigan; MN, Minnesota; MO, Missouri; MS, Mississippi; MT, Montana; NC, North Carolina; ND, North Dakota; NE, Nebraska; NH, New Hampshire; NJ, New Jersey; NM, New Mexico; NV, Nevada; NY, New York; OH, Ohio; OK, Oklahoma; OR, Oregon; PA, Pennsylvania; RI, Rhode Island; SC, South Carolina; SD, South Dakota; TN, Tennessee; TX, Texas; UT, Utah; VA, Virginia; VT, Vermont; WA, Washington; WI, Wisconsin; WV, West Virginia; WY, Wyoming

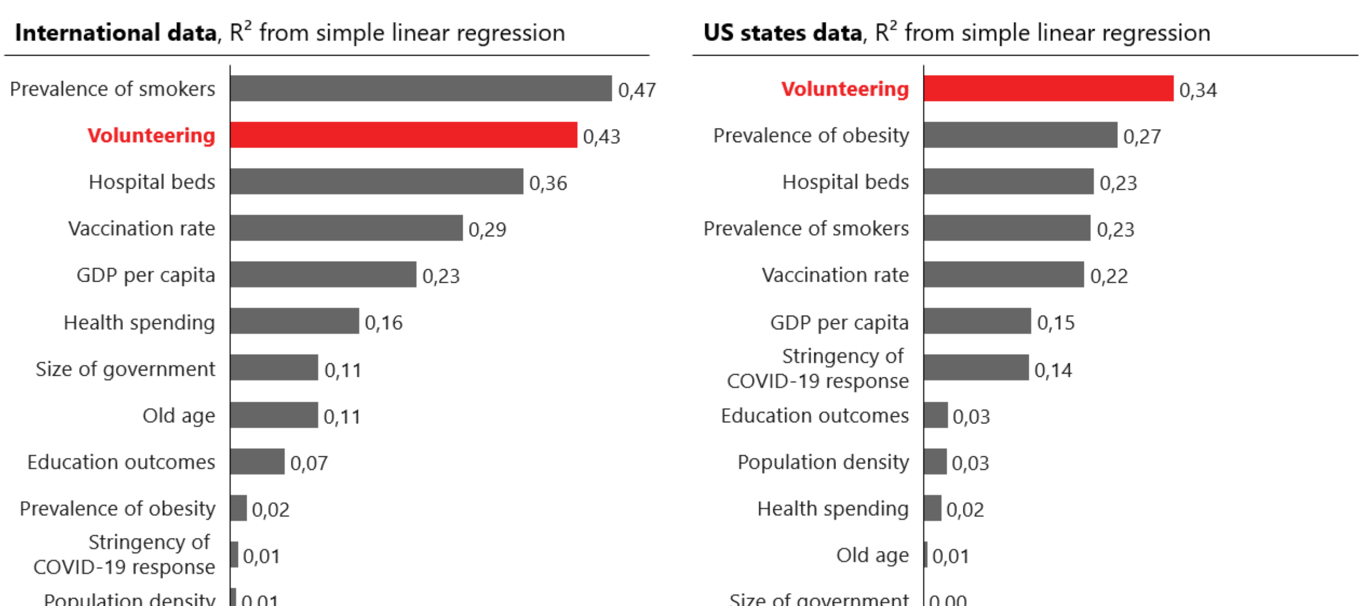

Figure 2 Per cent of variation in COVID-19 mortality explained by different variables. GDP, gross domestic product.

Table 1 Results of regression analysis with COVID-19 mortality as outcome variable

	International comparison		US states comparison	
	Simple	**Multiple**	**Simple**	**Multiple**
Coefficient on size of societal volunteering	–51.46	–35.48	–70.06	–73.56
SE	10.13	16.45	14.04	11.53
P-value	<0.001	0.041	<0.001	<0.001
R^2 (adjusted)	0.43	0.56	0.34	0.61
N	32	32	50	50

Control variables included in multiple regression model for: (1) International comparison: vaccination rate (%), hospital beds per 1000 inhabitants (#), spending on healthcare per capita (USD) (Given the selection of countries (high-income), the population coverage of health service is close to 100% for all countries. Moreover, most countries have a completely public health service (with Switzerland, the Netherlands and the USA as exceptions (see OECD Health Statistics 2021, available online: https://stat.link/q2ysgv)). Considering this limited variation, adding this factor to the regression will not be able to increase the explanatory power of the model. A back-of-the-envelope calculation indicates that COVID-19 mortality is not significantly different between both groups of countries (1715 deaths per million inhabitants (SD=700) for countries without complete public health service, compared with 1817 deaths per million inhabitants (SD=1164) for countries with complete public health service).), prevalence of smokers (%), GDP per capita (USD); (2) US states comparison: vaccination rate (%), hospital beds per 1000 inhabitants (#), obesity prevalence (%), prevalence of smokers (%), stringency index, GDP per capita (USD).
GDP, gross domestic product.

model for US states (p value <0.001). This difference in significance might be due to the lower number of observations in the international comparison (32 vs 50) or due to a stronger within-country effect (US states) compared with the between-country effect (international comparison). However, under the constraints of the available data, both effects cannot be disentangled. For both study populations, adding control variables (see table 1) extends the explanatory power of the model (R^2) to 0.56 (international comparison) and 0.61 (US states). In other words, more than half of the variation in COVID-19 mortality can be explained by the variation of the explanatory variables included in the model.

We repeated the analysis when retaining the most significant variables in order to ensure at least 10 observations per explanatory variable (ie, countries or US states).[12] Hence, we retained the three most significant variables for the international analysis (volunteering, hospital beds and smokers) and the five most significant variables for the US states analysis (volunteering, vaccination rate, hospital beds, obesity and stringency of the policy response). Regression results from this robustness check indicate a smaller coefficient for volunteering in the international analysis (–26.0) with equivalent significance as in the multiple model (p value=0.041), while the regression results for US states are equivalent to the multiple regression model both in size and significance of the coefficient on volunteering (–73.6, p value <0.001).

Online supplemental table A4 presents the results of the robustness checks when changing the definitions. The coefficients reported for the subset of EU countries are consistent (and more comparable to the US results) with the main results (table 1), suggesting the importance of consistent definitions. Replacing 'societal' by 'direct' volunteering reduces the coefficients, both in the simple and multiple model, suggesting that not all types of volunteering are equally strong predictors of COVID-19 mortality. Changing the definition of COVID-19 mortality to excess mortality estimates of The Economist does not significantly change the reported coefficients on societal volunteering (columns 6 and 7, online supplemental table A4).

Online supplemental tables A5 and A6 present the results of the robustness checks when changing the timeframe considered, with the former reporting coefficients when the time period is restricted between June 2021 and January 2022, and the latter restricting the period between January 2020 and January 202. Changing these timings yields consistent findings, with some variations in the size of coefficients, as the number of deaths is linked to the period considered. It should be noted that when recalculating COVID-19 mortality starting from June 2021 rather than the start of the pandemic, the vaccination rate outperforms societal volunteering in both the international and US states comparison. However, even when including vaccination rate as a control variable, societal volunteering remains a significant predictor (p value=0.04) of COVID-19 mortality in this period.

In order to further explore the association between COVID-19 mortality and the share of public versus private healthcare spending, we added an additional sensitivity check. Using World Bank data (limited to the international comparison) on the share of private expenditure in total health expenditure, we calculated the correlations between (1) COVID-19 mortality and the share of private expenditure in total health expenditure and (2) societal volunteering and the share of private expenditure in total health expenditure (online supplemental table A3). No significant correlations can be found, suggesting that the ratio of public versus private health expenditure is an unlikely confounder of the relationship between COVID-19 mortality and societal volunteering. To test this further, the share of private expenditure in total health expenditure was added as a covariate in the multiple regression model (online supplemental table A7). Two models were added: (1) multiple regression model including both the total health expenditure and the share of private expenditure in total health expenditure and (2) multiple regression model including only the share of private expenditure in total health expenditure. For both models, the coefficient of societal volunteering was not significantly different from the main model (table 1).

DISCUSSION

Our results show that societies with more societal volunteering are less severely affected by COVID-19. Although no causal conclusions can be drawn from our cross-sectional analysis, this effect is both statistically significant and clinically meaningful. If we would assume that the associations are causal and all countries and states perform at the 'best in class'-level of societal volunteering (New Zealand and Utah, respectively), the theoretical number of deaths avoided amounts to ~55% (or 1 250 000) of the total deaths for the high-income countries included here, and ~60% (or ~500 000) for the USA. Different robustness checks yield consistent findings. It is noteworthy that, apart from the prevalence of smokers (and this only in the international comparison), no variable better predicts COVID-19 mortality than societal volunteering. This includes key predictors such as 'high risk groups' (eg, people above 65 years old, obesity), expenditure on healthcare and population density.

Due in part to the COVID-19 crisis with its disruptions of supply chains and predatory price setting for critical goods, the role of the state, after decades of decline, is emphasised again. Whether in innovation (eg, vaccine development) or in strategic industries (eg, face masks, ventilators, etc), the public sector is strengthened vis-a-vis the private sector. Mintzberg[13] and Rajan[14] theorised that a society cannot successfully exist when it is not based on three balanced pillars: a respectable and respected government (that sets and enforces the rules), a dynamic private sector (that innovates to pursue commercial success within the rules set) and a 'third pillar' based on citizens who voluntarily band around wrongs or oversights not (yet) addressed by the government or the private sector.

Countries and US states that are characterised by more societal volunteering also have a larger third pillar. Using two different data sets on third pillar size,[15 16] a strong correlation between the size of societal volunteering and third pillar size was found (r=0.69 and r=0.64, respectively). The smaller coefficients when using 'direct' volunteering to explain COVID-19 mortality suggest that not volunteering per se matters, but rather the type of volunteering. The results presented here are consistent with recent evidence that interpersonal trust and trust in government are key predictors of the number of infections per capita[6] - a preliminary analysis indicates that countries or states with more volunteering are also places where interpersonal trust is highest (r=0.74 for countries; r=0.60 for US states), using data from the World Values Survey (international) and the General Social Survey (US states). Although the description of causal mechanisms is outside the scope of this study, it could be that a stronger third pillar enhances trust among citizens. More trusting citizens could then result in higher compliance with COVID-19 guidelines, strengthening the government's management of the pandemic. Hence, our findings suggest that the duality 'private versus public sector', often at the heart of the political debate, might oversimplify reality by ignoring the impact of the third pillar, thus confounding both analysis and potential effective solutions. In the absence of standardised data on compliance rates,[17] we included a stringency index, capturing the strictness of restrictions imposed, in our analyses, but this index is not informative of actual compliance. Further research will be needed to test this hypothesis.

When collecting data for this study, it was striking to observe the abundance of data available for the private and public sector (eg, Ease of Doing Business Index—World Bank, Digital Government Index—Organisation for Economic Co-operation and Development), whereas almost no standardised data are collected on the third pillar. The lack of comparable data limits studies such as ours to countries and states where standardised data are available on (a proxy of) third pillar size. As detailed in the Methodology section, available data are not always consistently collected, further complicating a reliable comparison of societal volunteering and third pillar size. The increased accuracy of the regression model for US states (N=50) versus international comparison (N=32) suggests the research potential when standardised data are more broadly available. In order to strengthen the empirical basis and expand to other proxies for third pillar size, it is necessary to (1) systematically use ILO definitions to measure societal volunteering and register participation in specific activities; (2) define international standards for other third pillar data; (3) systematically collect data on both.

Contributors PV conceived of the presented idea and supervised the work (conceptualisation, supervision). FS collected the data and performed the computations (methodology, formal analysis, writing—original draft), as the guarantor. HVR and HS verified the analytical methods (validation). All authors discussed the results and contributed to the final manuscript (writing—review and editing).

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Patient consent for publication Not applicable.

Ethics approval Not applicable.

Provenance and peer review Not commissioned; externally peer reviewed.

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