UNITED NATIONS UNIVERSITY
UNU-WIDER

WIDER Working Paper 2020/89

Healthcare equity and COVID-19

Assessing the relative effectiveness of egalitarian governance and healthcare system capacity on the COVID-19 pandemic

Krishna Chaitanya Vadlamannati,[1] Arusha Cooray,[2,3,*] and Indra de Soysa[4]

July 2020

United Nations University World Institute for Development Economics Research
wider.unu.edu

Abstract: Scholars of public health typically focus on societal equity for explaining public health outcomes. Indeed, the COVID-19 pandemic has led to a spate of studies showing a tight connection between inequitable access to healthcare, welfare services, and adverse outcomes from the pandemic. Others have argued that democratic governments have generally failed relative to more autocratic ones, simply because autocrats can make the hard choices required for stemming the spread of viruses. We address this question a bit differently by asking whether more 'egalitarian' forms of democracy matter, given that they should contain more equitable healthcare access *and* societal infrastructure, such as social capital and trust, for achieving a broader collective good. Our results suggest that more equitable access to healthcare does indeed increase testing rates and lower the death rate. Broader egalitarian processes, measured as egalitarian democracy, however, show the opposite effects, suggesting that factors associated with healthcare capacity to reach and treat matter more than broader societal factors associated with egalitarian governance.

Key words: COVID-19, egalitarian democracy, healthcare access, healthcare capacity

JEL classification: C26, I1, I14, I18

Acknowledgements: We thank Paul Walsh, Terje Eikemo, Sam Brazys, and Artur Tamazian for helpful comments.

[1] School of Politics & International Relations, University College Dublin, Ireland; [2] UNU-WIDER, Finland; [3] Centre for Poverty Analysis, Sri Lanka; [4] Department of Sociology & Political Science, Norwegian University of Science and Technology, Trondheim, Norway. * Corresponding author: arushacooray@hotmail.com.

This study has been prepared within the UNU-WIDER project on How do effective states emerge?

Information and requests: publications@wider.unu.edu

ISSN 1798-7237 ISBN 978-92-9256-846-7

https://doi.org/10.35188/UNU-WIDER/2020/846-7

Typescript prepared by Ayesha Chari.

The United Nations University World Institute for Development Economics Research provides economic analysis and policy advice with the aim of promoting sustainable and equitable development. The Institute began operations in 1985 in Helsinki, Finland, as the first research and training centre of the United Nations University. Today it is a unique blend of think tank, research institute, and UN agency—providing a range of services from policy advice to governments as well as freely available original research.

The Institute is funded through income from an endowment fund with additional contributions to its work programme from Finland, Sweden, and the United Kingdom as well as earmarked contributions for specific projects from a variety of donors.

Katajanokanlaituri 6 B, 00160 Helsinki, Finland

1 Introduction

Several studies suggest that disparities in access to healthcare affect the outcomes of pandemics (Garoon and Duggan 2008; Tricco et al. 2012; Quinn and Kumar 2014; Mamelund et al. 2019). The recent coronavirus outbreak originating in Wuhan, Hubei Province, China, in December 2019, was declared a pandemic by the World Health Organization (WHO) by the beginning of March, highlighting that disparities in access to healthcare influence the outcomes of pandemics (WHO 2020). In a provincial-level study of China, Ji et al. (2020) show that despite the higher number of COVID-19 cases in Zhejiang and Guangdong provinces, death rates remained low (Zhejiang: 0 deaths among 1,171 confirmed cases; Guangdong: four deaths among 1,322 cases, 0.3 per cent) because of greater access to healthcare facilities than in Hubei Province (1,772 deaths as of February 2020). Chen and Krieger (2020) in a study of the United States, similarly, show that the highest COVID-19 death rates were observed in the most disadvantaged counties in relation to poverty, 19.3 per 100,000 compared with 9.9 per 100,000 in other counties. Moreover, the death rate of the percentage of population of colour was 17.1 per 100,000 versus 2.9 per 100,000 for White Americans. Comparable findings have been documented for other countries. For example, in the United Kingdom, the Intensive Care National Audit and Research Centre observed that 35 per cent of approximately 2,000 patients were from non-White backgrounds with lower access to healthcare, although they comprise only 13 per cent of the total UK population (Booth 2020). There is a large body of literature relating social factors including poverty, race, ethnicity, marginalization, and physical environment to healthcare access and the spread of infectious diseases, such as influenza, malaria, tuberculosis, and Ebola (Farmer 1996; Quinn and Kumar 2014). This study examines broad arguments relating successful measures against epidemics and pandemics to broad social equity, separating healthcare sector capacity effects from 'egalitarian' societal effects. The question is not just theoretical; it contains large policy implications for what is required for fighting health-related crises.

A large amount of evidence suggests that countries with more equitable healthcare systems are more successful at containing disease (Kawachi and Kennedy 2002; Wilkinson and Pickett 2009). Unequal access to healthcare and the resulting unequal burden of the disease could very well signal deeper inequitable processes in a society. A government that facilitates equality of access to healthcare is likely to be a symptom of larger societal processes of equality and justice. Indeed, Eichengreen (2020), the economic historian, argues that the Black–White disparity in COVID-19-related deaths in the United States can be traced directly to differences in welfare policies, which in turn can be blamed on racism and societal injustice. His analysis is based on the well-established claims about the weakness of welfare states where ethnic differences are high and social capital and trust are low (Alesina et al. 2001; Rothstein 2001). Indeed, a number of public health scholars argue that the lack of inclusive, pro-poor governance is at the heart of the spread of many epidemics, such as obesity, drug abuse, and even homicide (Kawachi and Kennedy 2002; Marmot 2005; Wilkinson and Pickett 2009). This leads one to ask whether an 'egalitarian democracy',[1] which captures high degrees of societal inclusiveness and trust in politics and public life, is the real driver of favourable outcomes during crises, such as pandemics? Perhaps a solid healthcare system, which is a symptom of broader societal processes, is only a by-product, and not the real reason for

[1] An egalitarian democracy is one in which individuals from all social groups are equally capable of exercising their political rights and freedoms, have little disparities in terms of rights and resources, and where most people are capable of meaningfully influencing political and governing processes (Sigman and Lindberg 2019).

how societies can deal successfully with what some term 'neoliberal pandemics' (Schrecker and Bambra 2015).

Yet, take the case of Taiwan versus Sweden. Taiwan is hardly a Scandinavian-style democracy. However, in Taiwan, all citizens, and foreign residents (for at least six months), are entitled to a government insurance plan. This perhaps explains the country's success in containing the virus. Similarly, Australia, which has a relatively equitable healthcare system (Maizland and Felter 2020), has experienced a lower death rate than some other advanced countries. The idea that equality of access to healthcare reduces the impact of epidemics and pandemics is highly intuitive. A well-functioning healthcare system, which is accessible to most people, is likely to have high capacity in terms of reaching and treating people, thereby cauterizing the spread of disease and minimizing mortality. Nevertheless, these countries adopted *emergency* rules and *extraordinary* measures that were targeted at addressing the spread of the pandemic. These additional measures effected through broad governance are independent of access to the healthcare system.

Now, consider the case of Sweden, where it was argued that broad societal trust and social capital would be a critical factor in controlling the virus without resorting to extraordinary measures. Sweden's strategy is formulated on the basis of mutual trust between citizens and citizens and the state, where citizens are urged to use their own judgement and voluntarily follow directives without the strict government enforcement of lockdown. Apparently, Scandinavian-style welfare states could afford to fight neoliberal pandemics due to state–society dynamics associated with strong welfare states because of high social capital and generalizable trust. Such egalitarian values and infrastructure apparently help collective outcomes. Despite expectations, Sweden's strategy has not been successful. The numbers show that Sweden had 23,918 confirmed cases of the virus and 2,941 deaths in early May compared with its Nordic counterparts: Denmark 10,281 cases and 506 deaths; Norway 7,996 cases and 216 deaths; and Finland 5,573 cases and 252 deaths (Ellyatt 2020). The equality of access to healthcare, however, is similar across these countries. This comparison might indicate that access to healthcare matters not because of the broader societal implications of societal trust in an egalitarian democracy, but because access to healthcare simply captures organizational capacities of healthcare systems[2] to deal more effectively with a pandemic. In other words, access to healthcare proxies a narrower dimension of public health reach compared with a broader society-based explanation associated with inequalities, welfare states, and the outcomes of health pandemics. The governments of Vietnam, New Zealand, and South Korea, on the other hand, invested heavily in critical healthcare facilities, and perhaps, as a result, had the capability to respond effectively to the COVID-19 crisis purely from the perspective of capacity (Mazzucato and Quaggiotto 2020).

From the observations and arguments above, we derive the following hypothesis:

> HYPOTHESIS 1. *Equality in access to healthcare reduces the societal impact of health pandemics.*[3]

If capacity matters, then access to healthcare must show a greater impact on the fight against the COVID-19 pandemic than more broadly measured societal factors such as the egalitarian nature of the political and economic system. As many theories of public health suggest, countries with

[2] This includes medical staff, medication, hospitals, intensive care units, hospital beds, and other necessary infrastructure.

[3] Access to healthcare is defined according to the Varieties of Democracy (V-Dem) project as adequate healthcare for the poor that is comparable with the healthcare accessed by the rich. This variable is explained in greater detail in Section 2.

broad-based equitable systems show high levels of social capital and trust, making governance around collective objectives, such as fighting epidemics, easier (Bambra et al. 2020). Equality and justice are usually identified with democracies, but not all democracies are the same. However, how democracies might respond to health crises is not that clear. For example, the tough choices required to be made by public health experts for fighting disease may clash with other priorities of ordinary people, such as economic well-being and the freedom to travel. If Swedish public health experts could rely on the citizenry to trust their judgement, the same could not be said for many other industrialized democracies, such as the United States, where some armed citizens stormed government buildings demanding an end to lockdown. Populist leaders, such as President Jair Bolsanaro in Brazil and Vladimir Putin in Russia, delayed their response to the virus for reason of electoral popularity. Indeed, many less democratic regimes have been quite successful at curbing the coronavirus (e.g. China, Sri Lanka, Vietnam) compared with some full democratic regimes (e.g. the United States, United Kingdom, Spain, Italy), while democracies with robust healthcare systems have been able to deal with the virus more effectively (e.g. Germany, Australia, New Zealand).

Similarly, governments that comprehended the magnitude of the pandemic and communicated effectively with their citizens have also been able to contain the virus in a timely manner (e.g. Australia, New Zealand, Portugal, Austria, Greece, Namibia; see Ben-Ami 2020). Thus, the association between healthcare access and death rates have also been influenced by government policies on closure, lockdown, and testing, despite the specific natures of their welfare systems and equity of access to healthcare. When the Chinese government locked down Hubei Province, on 23 January 2020, by halting transportation, restricting internal movement of people (from going to work, school, buy groceries), they managed to reduce the infection rate to zero by 19 March 2020 (Sault 2020). Many other countries, such as Taiwan, Singapore, New Zealand, Namibia, Australia, and Germany, that introduced early lockdown measures have also been successful in flattening the curve, as opposed to countries that delayed lockdown. Similarly, these countries also undertook proper screening and testing measures, thereby managing to contain the virus. Australia has had one of the highest testing rates per capita, while in Taiwan the COVID-19 tests were provided free of charge to the public. South Korea tested millions of people free after the first case was diagnosed in early January 2020. It appears that, among democracies, there is variation in terms of the willingness and capacity of governments to act early and decisively. Thus, after accounting for the capacity of the healthcare system, it is not clear whether there are additional benefits to fighting disease from the broader setting of egalitarian governance. From this discussion, we derive our second hypothesis:

> HYPOTHESIS 2. *Healthcare equity should matter more than broad egalitarian governance for reducing the harm from health pandemics.*

In addition to the above-mentioned hypotheses, we also investigate (i) whether the effects of healthcare access on deaths are conditional upon how stringent government policy responses are on closure and lockdown; (ii) whether the impact of healthcare access on COVID-19 tests is conditional upon government policy of 'universal access' to testing; and (iii) whether democracies with equal access to healthcare for its citizens have been able to deal with the COVID-19 virus more effectively. The rest of this paper is structured as follows. Section 2 describes our data and methodology. Section 3 presents our empirical results and Section 4 concludes.

2 Data and methods

2.1 Model specifications

To examine our hypotheses, we utilize a cross-section of data for 210 countries (see Appendix Table A1 for the list of countries) that faced the COVID-19 pandemic up until 25 May 2020. We estimate:

$$\ln(COVID)_c = \varphi_c + \beta HCE_c + \beta Z_c + \lambda_r + \omega_c \quad (1)$$

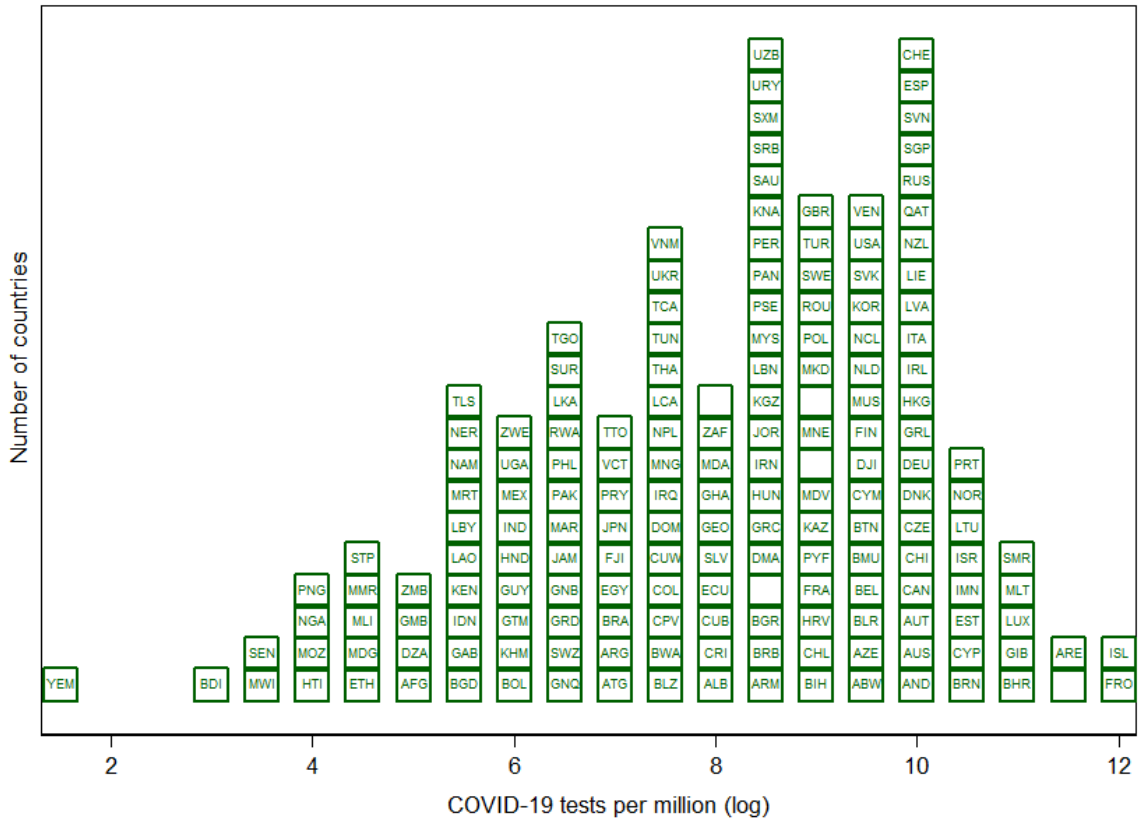
where $\ln(COVID)_c$ captures two measures related to COVID-19, namely, (i) COVID-19 tests per million (log), and (ii) COVID-19 deaths per million (log) in country *c* as of 25 May 2020. The data on these two measures are sourced from the Worldometer COVID-19 dataset (*Worldometers.info* 2020), which is an ongoing data collection project that manually sources real-time information on the COVID-19 pandemic from various countries across the world.[4] A global COVID-19 live statistic is generated by analysing, validating, and aggregating the data collected from various sources.[5] The mean value of COVID-19 tests in our sample is 23,452 per million, while the standard deviation is 35,390 per million. The maximum value of tests is around 1,83,981 per million and the minimum value is 4 per million. The average number of COVID-19 deaths is about 60 per million with a standard deviation of 151 deaths per million. The maximum number of COVID-19 deaths recorded is 1,209 per million. Figure 1 captures COVID-19 tests per million across the world as of 25 May 2020.

The strip plot from Figure 1 suggests a significant variation in the number of COVID-19 tests across countries. This is corroborated by the standard deviation being much higher than the mean, indicating a significant variation in the sample. Appendix Table A2 provides a list of countries with the number of COVID-19 deaths and deaths per million. Once again, a higher standard deviation in deaths per million suggests a considerable variation among countries in fighting this pandemic.

[4] For more information on the methodology adopted in data collection, see *Worldometers.info* (2020).

[5] We use the Worldometer COVID-19 data over other sources, such as the European Centre for Disease Prevention and Control, the Oxford COVID-19 Government Response Tracker, OurWorldInData.org published by Roser et al. (2020), because the coverage and usage are larger. The COVID-19 data collected are available for about 210 countries and the data are used by other governments and prominent news outlets, such as the government of the United Kingdom, BBC, *New York Times*, and *Financial Times*, among others. Nevertheless, our results remain robust to using COVID-19 data from other sources, such as Roser et al. (2020).

Figure 1: COVID-19 tests per million (log) across the world as on 25 May 2020



Notes: all countries have been represented using World Bank country codes. There are no World Bank country codes for the following countries: Anguilla, Caribbean Netherlands, Falkland Islands, French Guiana, Martinique, Mayotte, Montserrat, Réunion, Saint Pierre Miquelon, St. Barth, Taiwan.

Source: authors' compilation based on data described in Section 2.

The hypothesis variable is HCE_c, which measures the extent of equity in healthcare in country c. The Varieties of Democracy (V-Dem) project measures the degree to which any given country at any given point in time provides access to adequate healthcare for the poor that is comparable to the healthcare accessed by the rich. The V-Dem dataset includes several aspects of equity that measure the equality in distribution of political power in any given society in terms of gaining access to government and to resources that empower people politically and enable all people to participate meaningfully (see Coppedge et al. 2020). The V-Dem data on equity are generated by asking several country experts to score countries on the following question, according to the scale in Box 1.

Box 1: Healthcare scoring scale

To what extent is high-quality basic healthcare guaranteed to all, sufficient to enable them to exercise their basic rights as adult citizens? […]

0: Extreme. Provision of high-quality basic healthcare is extremely unequal, and at least 75 per cent of citizens receive such low-quality healthcare that it undermines their ability to exercise their basic rights as adult citizens.

1: Unequal. Provision of high-quality basic healthcare is extremely unequal and at least 25 per cent of citizens receive such low-quality healthcare that it undermines their ability to exercise their basic rights as adult citizens.

2: Somewhat equal. Basic healthcare is relatively equal in quality but 10–25 per cent of citizens receive such low-quality healthcare that it undermines their ability to exercise their basic rights as adult citizens.

3: Relatively equal. Basic healthcare is overall equal in quality but 5–10 per cent of citizens receive such low-quality healthcare that it probably undermines their ability to exercise their basic rights as adult citizens.

4: Equal. Basic healthcare is equal in quality and less than 5 per cent of citizens receive such low-quality healthcare that it probably undermines their ability to exercise their basic rights as adult citizens.

Source: Coppedge et al. (2020: 195).

V-Dem codes healthcare equality by consulting numerous country and regional experts who make subjective judgements about the level of access of the poorest segments of society to healthcare compared with the richest segments. These expert codings are then subject to rigorous scrutiny and testing using an item response theory that reduces uncertainty and assigns a single value to each country for each year (Pemstein et al. 2018). The data are coded as healthcare equality index ranging from −3 to +3, where higher values denote greater equity. We use a five-year average of this index for the years 2014–18. This measure shows a strong correspondence with the World Bank's World Development Indicators (WDIs) data on infant mortality rate (r=−0.75) and a measure of government healthcare expenditure as a share of gross domestic product reported by the WDIs (r=0.69) (World Bank 2019). In other words, the equal access to healthcare index measures actual outcomes in terms of infant mortality and government expenditure on healthcare quite well.

Our second main variable of interest is the V-Dem's measure of the *egalitarian democracy index*. According to V-Dem researchers, an egalitarian democracy builds on the theorized notion that individuals from all social groups ought to be equally capable of exercising their political rights and freedoms, and of influencing political and governing processes. Underlying this broad principle are two main sub-components: equal protection and equal distribution of resources and income protection. Equal protection implies that the state grants and protects rights and freedoms evenly across social groups (Sigman and Lindberg 2019). An egalitarian democracy must also assure equal access to political power for all social groups, so that there is inclusivity in political decision making. Sigman and Lindberg (2019) argue that greater egalitarian processes make democratic polity more effective. Equality among groups would produce lower levels of polarization and greater egalitarian democratic processes would resolve political and policy disputes more effectively than less egalitarian democratic processes (Sigman and Lindberg 2019). Thus, V-Dem's egalitarian democracy measurement includes several indicators capturing equal access to power, political resources, liberties and political inclusion, plus the degree of electoral democracy, or polyarchy, indicated by free and fair elections without coercion or violence in a competitive processes (Coppedge et al. 2020). The index is coded on a 0–1 scale where higher values denote higher egalitarian democratic processes. The equality of access to healthcare is one of the several indicators that make up the egalitarian democracy index. Thus, when we run our models with both in it, we are able to estimate the net effects of both independently of each other and the rest of the controls. The index of egalitarian democracy related only moderately with equitable access to healthcare, where these variables explain roughly 65 per cent of the variance between each other.

The vector of control variables ($\boldsymbol{Z}_{it}$) includes other potential determinants of COVID-19 outcomes, which we obtain from the literature emerging on the subject (Barrios and Hochberg 2020; Cepaluni et al. 2020; Chen and Krieger 2020; Cronert 2020; Bollyky et al. 2019). The list of potential control variables is long, and we are aware of the trap of 'garbage-can models' or 'kitchen-sink models' in which numerous variables are lumped onto the right hand side of the equation, making the interpretation of results difficult (Achen 2005; Schrodt 2014). We adopt the

conservative strategy of accounting only for key factors that affect COVID-19 outcomes, adding several more in the robustness checks. Accordingly, we include the level of development measured as *per capita income* in US dollars 2010 constant prices obtained from the World Bank (2019). The income level has a bearing on COVID-19 tests and deaths via its impact on healthcare equity, as richer countries should have greater demand for social equity. Next, we also include a measure of *urbanization* (percentage share of urban population) as studies show transmission of COVID-19 cases is high in urban centres (Chen and Krieger 2020). It is noteworthy that for control variables we use the last five-year averages (2014–18). The descriptive statistics are provided in Appendix Table A3 and the details on definitions and data sources are provided in Appendix Table A4. We estimate ordinary least square (OLS) specifications that include Huber–White corrected robust standard errors, a method that is robust to heteroskedasticity (Wiggins 1999). We also include geographic regional dummies (λ_r) to account for regional heterogeneity.

2.2 Endogeneity

It is quite plausible that our healthcare equity measure could be affected by endogeneity problems if healthcare equity, for example, is an outcome rather than cause of health pandemics. This issue is not trivial because those who argue that healthcare equity affects how the system responds to health pandemics also make causal claims that healthcare equity is an outcome of health pandemics (Price 2020; Quinn and Kumar 2014; Rosella et al. 2013; Smith et al. 2011). For instance, Levin et al. (2007) argue that pandemics like COVID-19 and influenza have overwhelmed public health and healthcare delivery systems very quickly, thereby exacerbating existing levels of healthcare inequities in society. Furthermore, healthcare inequity could also be caused by other factors, which could then explain COVID-19 outcomes, such as budgetary constraints, state capacity in terms of administrative efficiency, and reach of the healthcare system. Failing to account for endogeneity might yield biased results. To address the problem of endogeneity, we use a two-stage least-squares instrumental variable (2SLS-IV) estimator, including the control variables discussed above along with geographic regional dummies. We use *number of years since independence* of country c as our instrument. The validity of the instrument depends on two conditions. The first is instrument relevance; that is, the selected instrument must be correlated with the explanatory variable in question, otherwise it has no power. Bound et al. (1995) suggest examining the joint F-statistic on the excluded instrument in the first-stage regression. The selected instrument would be relevant when the first-stage regression model's joint F-statistic is greater than 10 (Bound et al. 1995). The second condition is that the selected instrument should not differ systematically with the error term in the second stage of the equation; that is, $[\omega_{it}|IV_{it}]=0$, meaning that the selected instrument should not have any direct effect on the outcome variable of interest—COVID-19 tests and deaths.

We believe our instrument satisfies the exclusion restriction based on the following logic: the longer a country has been independent, the less likely it is to reverse historic inequities inherited at the time of independence. This feeds into the institutional persistence mechanism highlighted by many scholars who suggest that weak institutions, as a result of colonization, that are inherited at the time of independence become irreversible as they tend to persist and endure over time (Nunn and Wantchekon 2011; Banerjee and Iyer 2005; Acemoglu and Johnson 2005; Acemoglu et al. 2001, 2002). The duration of independence, however, should have no systematic bearing on how many COVID-19 tests and deaths a country has incurred. The first-stage regression results are reported in Table 1. We find a negative effect of our selected instrument on healthcare equity index, which is significantly different from zero at the 1 per cent level. Furthermore, the joint F-statistic from the first-stage rejects the null that our selected instrument is not relevant. In fact, we obtained a higher joint F-statistic and a Kleibergen–Paap LM statistic (Kleibergen and Paap 2006)

in both estimation models reported in Table 1, which remains significantly different from zero at the 1 per cent level.

2.3 Interaction effects

Next, we introduce interaction terms to examine (i) whether the effect of healthcare equity on COVID-19 outcomes is conditional upon government responsive policies, and (ii) whether democracies are better when they have better healthcare system access. We therefore introduce:

$$\ln(COVID)_c = \varphi_c + \beta(HCE \times policy)_c + \beta HCE_c + \beta policy_c + \beta Z_c + \lambda_r + \omega_c \quad (2)$$

$$\ln(COVID)_c = \varphi_c + \beta(HCE \times dem)_c + \beta HCE_c + \beta dem_c + \beta Z_c + \lambda_r + \omega_c \quad (3)$$

where $(HCE \times policy)_c$ is the interaction term and $policy_c$ consists of two government policy responses to the COVID-19 pandemic in country c. The first policy response is regarding testing. We introduce a *testing policy index* in country c as of 25 May 2020, developed by Oxford University researchers Hale et al. (2020), which captures those who can get tested in the country. The index is coded on a 0–3 scale where 0 suggests there is no adequate COVID-19 testing policy in place and 3 indicates an open public testing policy in which COVID-19 testing is made available to asymptomatic people (for more details, see Hale et al. 2020). Thus, in the first interaction model, we examine the conditional effects of the testing policy index on COVID-19 tests per million (log).

In the second interaction model, we examine the effect of government lockdown policies to contain the pandemic on COVID-19 deaths per million (log). Accordingly, we use the *stringency index* developed by Hale et al. (2020) that captures variation in containment and closure policies of governments as of 25 May 2020. The index is a composite measure consisting of seven different response indicators: school and workplace closures, cancellation of public events, restrictions on public gathering size, closure of public transport, internal movement restrictions, international travel restrictions, and public information campaigns. The index is an additive score of these seven policy response measures ranging from 0 to 100 (for details, see Petherick et al. 2020). A higher value denotes more stringent policy response on these seven response indicators. Both indices are cross-national measures that allow for a systematic cross-country comparison of government response to COVID-19 on testing and stringency of lockdown policies.

The third interaction (3), $(HCE \times dem)_c$, is the interaction term between healthcare equity and the egalitarian democracy index (described above). We examine whether democracies reduce COVID-19 deaths per million when they have better healthcare system access. Thus, if the conditional effect of democracy has a negative effect on COVID-19 deaths compared with the more targeted government strategies, it would imply that healthcare capacity factors matter for fighting health pandemics and not broad-based egalitarian virtues. As before, we use the OLS estimator with geographic regional fixed effects to estimate Equations (2) and (3) and generate marginal plots to assess the interaction effects.

3 Empirical results

Table 1 reports the impact of equity in healthcare on COVID-19 tests and deaths: Columns 1 and 2 show the results estimated with OLS using basic control variables and controlling for geographic regional dummies; Columns 3 and 4 present findings using the 2SLS-IV estimator to address endogeneity concerns. Table 2 presents the results of the interaction effects.

As seen in Table 1, equity in healthcare access has a positive impact on COVID-19 tests, which is significantly different from zero at the 1 per cent level. Notice that the substantive effects are large. At the mean value of the healthcare equity index (0.50) there is roughly a 0.74 per cent increase in COVID-19 tests per million (log). However, a standard deviation increase above the mean value yields an increase of 1.31 per cent in COVID-19 tests per million (log), which is about two-thirds the standard deviation of our dependent variable. Increasing the healthcare equity index from extremely unequal to the maximum value (i.e. highly equal system) is associated with 4.3 per cent increase in COVID-19 tests per million (log). Furthermore, Column 2 shows that equity in healthcare access has a negative effect on COVID-19 deaths, which is statistically significant at the 5 per cent level. The substantive effects suggest that a standard deviation increase above the mean value of the healthcare equity index is associated with a 0.38 per cent decrease in COVID-19 deaths per million (log), which is roughly 20 per cent of the standard deviation of the dependent variable. These results support our hypothesis that equality in access to healthcare matters because it captures the healthcare system's administrative, medical, infrastructural capacity and reach dynamics, which enables the system to deal with a pandemic.

Table 1: Healthcare equity and COVID-19 tests and deaths per million (log)

	(1) Tests	(2) Deaths	(3) Tests	(4) Deaths
Healthcare equity	0.554***	–0.317**	0.655**	–1.367***
	(0.133)	(0.138)	(0.319)	(0.440)
Egalitarian democracy index	–1.212*	2.289***	–1.457	4.874***
	(0.717)	(0.730)	(0.984)	(1.394)
Per capita GDP (log)	0.462***	0.527***	0.422**	0.953***
	(0.163)	(0.174)	(0.190)	(0.249)
Urban population share	0.0144*	0.00954	0.0136*	0.0146
	(0.00799)	(0.00889)	(0.00796)	(0.0107)
Constant	4.688***	–3.583***	5.080***	–7.607***
	(1.135)	(1.277)	(1.517)	(2.073)
Estimator	OLS	OLS	2SLS-IV	2SLS-IV
Regional fixed effects	Yes	Yes	Yes	Yes
First-stage *F*-statistic			19.11***	23.40***
Cragg–Donald Wald *F*-statistic			15.71***	20.97***
Kleibergen–Paap rk LM statistic			15.05***	18.41***
No. of countries	152	151	152	151
R-squared	0.705	0.624	0.703	0.490
First-stage regressions				
Years since independence			–1.183***	–1.261***
			(0.271)	(0.261)
Control variables			Yes	Yes
Regional fixed effects			Yes	Yes
No. of countries			152	151

Notes: OLS, ordinary least square; 2SLS-IV, two-stage least-squares instrumental variable. Standard errors in parentheses. Statistical significance: ***p<0.01, **p<0.05, *p<0.1.

Source: authors' compilation based on estimation.

With respect to controls, both per capita income and urban population share are found to be positive in explaining COVID-19 tests that are significantly different from zero at the 1 per cent and 5 per cent level, respectively. Interestingly, while the effect of income on COVID-19 deaths is positive, the effect of urbanization remains statistically insignificant. These results are to be expected as high-income countries have witnessed much higher cases and deaths than low-income countries. Furthermore, early research on COVID-19 shows that urban centres are more likely to witness a substantial transmission of cases (Chen and Krieger 2020). Interestingly, our egalitarian democracy measure is negative on tests and positive on deaths at conventional levels of statistical significance. These results are robust across Table 1. Although contrary to conventional wisdom,

these results are corroborated by Cepaluni et al. (2020) who have found that democracies have experienced larger deaths per capita than less democratic countries. They have also found that the policy response to COVID-19 in democracies has been less effective in reducing deaths. In fact, our results suggest that equality in access to healthcare matters more than broad egalitarian governance for reducing the harm from health epidemics because access to healthcare increases the capacity to deal with them.

Columns 3 and 4 contain the results with instrumental variable (IV) estimations of our variable of interest. As discussed, we correct for endogeneity of healthcare equity using an instrumental variable. While Column 3 reports the results of COVID-19 tests, Column 4 captures COVID-19 deaths. There are three observations to be drawn from these results. First, the IV estimation results of healthcare equity on COVID-19 tests per million in Column 3 and deaths per million in Column 4 are similar to those reported in our baseline estimates in Columns 1 and 2. We find a strong positive and statistically significant effect of healthcare equity on COVID-19 tests and negative effect of the same on deaths after controlling for endogeneity concerns.

Second, as seen from Columns 3 and 4, the effect of healthcare equity is not only statistically significant but also large. For instance, holding other controls constant, a standard deviation increase in healthcare equity measure is associated with an increase in COVID-19 tests per million (log) by 1.70 per cent, which is significantly different from zero at the 5 per cent level (see Column 3). The substantive effect in this instance is at least 30 per cent as large as in the corresponding OLS estimations reported in Column 1. Similarly, a standard deviation increase in healthcare equity index is associated with a decline in COVID-19 deaths per million (log) by roughly 0.88 per cent (see Column 4), an effect which is twice as large as the one estimated using OLS in Column 2.

Third, the additional statistics provided in Columns 3 and 4 in Table 1 suggest that the selected instrument is valid. The joint *F*-statistic from the first-stage rejects the null that the instruments selected are not relevant instruments. In fact, we obtained a higher joint *F*-statistic and a Kleibergen–Paap statistic on both estimation models reported in Columns 3 and 4, respectively, which remain significantly different from zero at the 1 per cent level. Taken together, our results on the impact of equity in healthcare access remain robust to alternative estimation techniques and endogeneity concerns. The results of the control variables are roughly the same as reported in Columns 1 and 2.

In Table 2, we introduce the interaction terms between healthcare equity and various other measures capturing specific government actions: Column 1 shows the interaction results of healthcare equity and government testing policy on COVID-19 tests per million; Columns 2 and 3 report the interaction effects for healthcare equity, the stringency index, and the egalitarian democracy index, respectively, on COVID-19 deaths per million. As seen in Column 1, our interaction term is positive but statistically insignificant. Interestingly, the healthcare equity index on its own (i.e. when the testing policy is 0) has a positive significant effect on COVID-19 tests per million. However, it is important to note that the interpretation of the interaction terms even in linear models is not so simple. Consequently, a simple *t*-test on the coefficient of the interaction term is not sufficient to examine whether or not the interaction term is statistically significant (Ai and Norton 2003). We therefore rely on marginal plots. The interactive effect is best assessed with a margins plot that depicts the magnitude of the interaction effect in Figure 2. To calculate the marginal effect of healthcare equity on COVID-19 tests, we take into account both the conditioning variable (*testing policy index*) and the interaction term and display graphically the total marginal effect conditional on the testing policy index coded on a 0–3 scale.

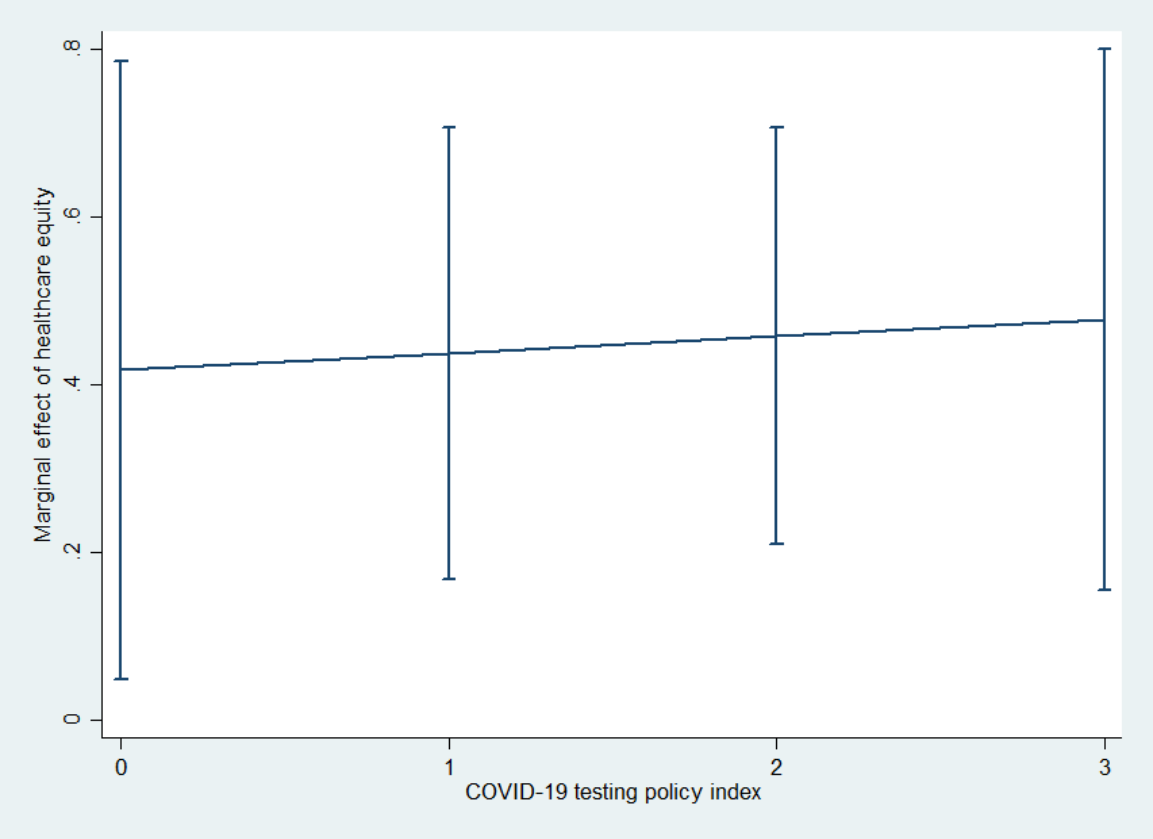
Table 2: Conditional effects on COVID-19 tests and deaths per million

	(1) Tests	(2) Deaths	(3) Deaths
Healthcare equity×COVID-19 testing policy	0.0202		
	(0.0979)		
COVID-19 testing policy	0.215		
	(0.186)		
Healthcare equity×Stringency index		−0.000849	
		(0.00608)	
Stringency index		0.00171	
		(0.00867)	
Healthcare equity× Egalitarian democracy index			−0.621*
			(0.352)
Healthcare equity	0.417*	−0.254	−0.165
	(0.222)	(0.593)	(0.153)
Egalitarian democracy index	−1.293*	2.705***	3.035***
	(0.759)	(0.863)	(0.922)
Per capita GDP (log)	0.575***	0.548***	0.612***
	(0.185)	(0.202)	(0.176)
Urban population share	0.00910	0.00311	0.00715
	(0.00817)	(0.00933)	(0.00915)
Constant	3.912***	−3.735**	−4.335***
	(1.343)	(1.511)	(1.309)
Estimator	OLS	OLS	OLS
Regional fixed effects	Yes	Yes	Yes
No. of countries	124	127	151
R-squared	0.727	0.650	0.630

Notes: standard errors in parentheses. Statistical significance: ***p<0.01, **p<0.05, *p<0.1.

Source: authors' compilation based on estimation.

Figure 2: Healthcare equity, testing policy, and marginal effect on COVID-19 tests per million

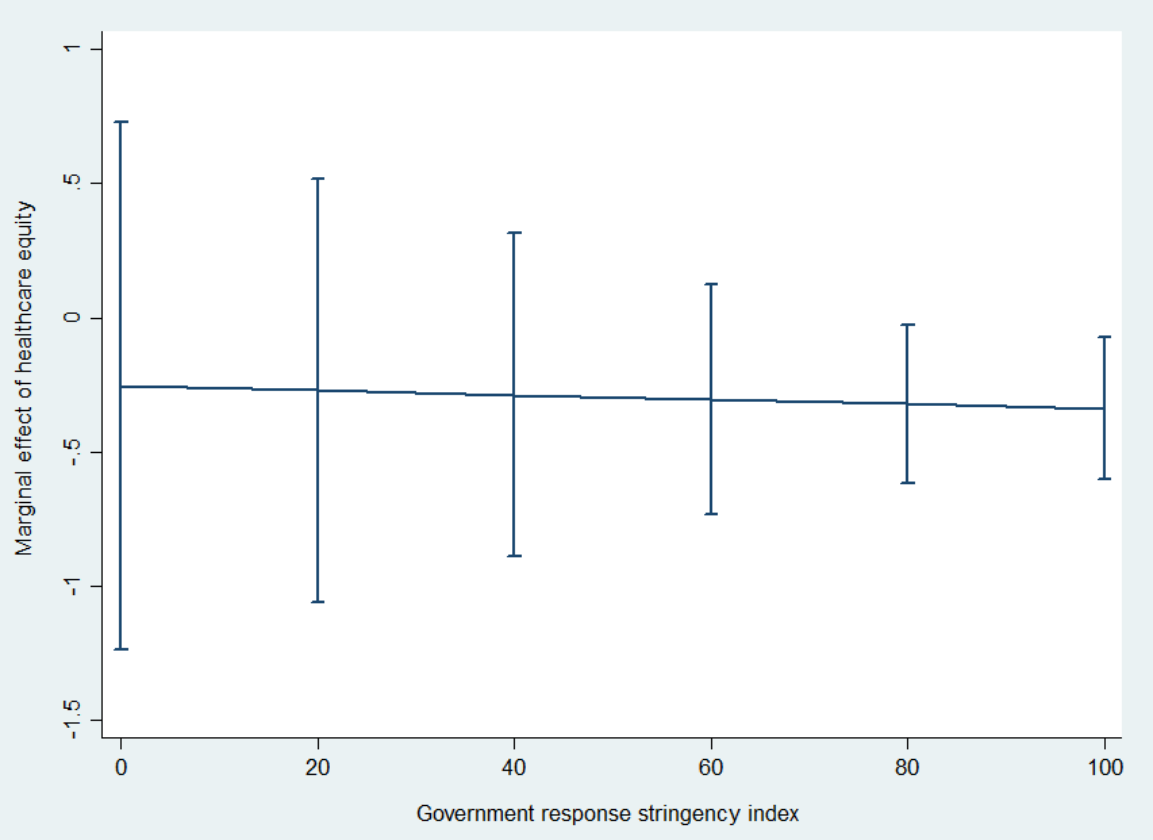


Source: authors' compilation based on estimation.

The *y*-axis of Figure 2 displays the marginal effect of healthcare equity, and the marginal effect is evaluated on the testing policy index on the *x*-axis. Note that we include the 90 per cent confidence interval. As seen in Figure 2, and in line with our theoretical expectations, healthcare equity leads to an increase in COVID-19 tests when the testing policy index is above the score of 0 (on a scale of 0–3). For instance, the marginal effects suggest that healthcare equity increases COVID-19 tests per million (log) by 0.62 per cent when the testing policy index is at a maximum score of 3, that is, when a country has an open public testing system in place. This result is significantly different from zero at the 5 per cent level.

We turn next to the conditional effect of healthcare equity and stringency index presented in Column 2 of Table 2. Once again, we resort to the marginal plot to provide a graphical interpretation of the magnitude of the interaction effect. The *y*-axis of Figure 3 shows the marginal effect of an additional increase in a unit of the healthcare equity index, whereas the *x*-axis shows the government stringency index at which the marginal effect is evaluated. As before, we include the 90 per cent confidence interval in Figure 3.

Figure 3: Healthcare equity, government response stringency, and marginal effect on COVID-19 deaths per million



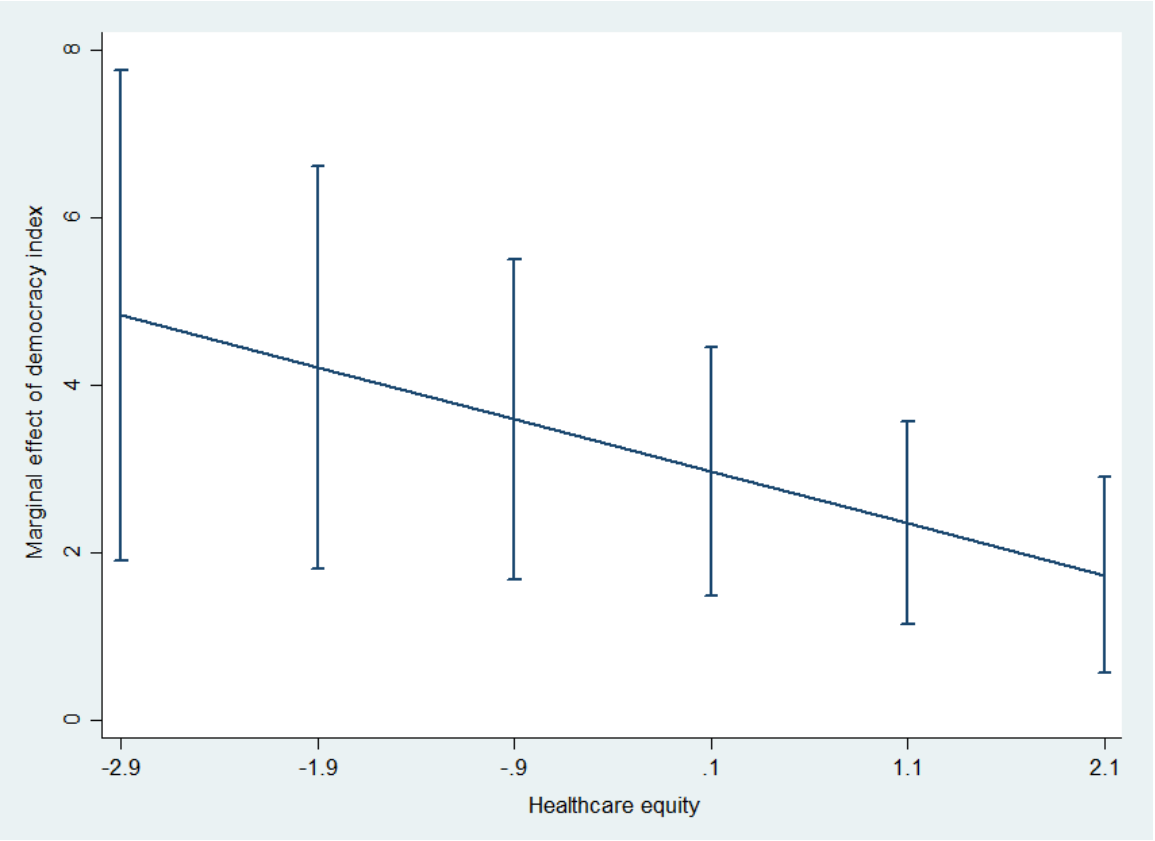
Source: authors' compilation based on estimation.

The conditional plot in Figure 3 reveals that an additional unit of the healthcare equity index decreases COVID-19 deaths per million (log) when the government stringency index is above 60 (on a scale of 0–100). Figure 3 also shows that the marginal effects are statistically insignificant, although negatively when the stringency index is below the score of 60. For instance, healthcare equity reduces COVID-19 deaths per million (log) by 0.30 per cent when the government responses to COVID-19 is very strict (i.e. stringency index of 100), which is statistically significant at the 5 per cent level. Once again, the gains realized in the fight against COVID-19, as shown in Figures 2 and 3, occur at the higher end of a robust healthcare system. These results suggest that

countries with a robust healthcare system are able to provide their citizens equal access to healthcare, increasing their capacity to deal with a pandemic. General levels of equity in terms of broad and inclusive governance continue to have the opposite effect.

Finally, in Column 3 of Table 2 we show the interaction between healthcare equity and egalitarian democracy. The interaction effect is negative and significantly different from zero at the 10 per cent level. We show the marginal effect of an additional increase in a unit of the egalitarian democracy index on the *y*-axis of Figure 4, whereas the healthcare equity index marginal effect is evaluated on the *x*-axis. As seen from Figure 4, an egalitarian democracy reduces COVID-19 deaths as healthcare equity increases, but the effects are weaker. For instance, at the maximum score of the healthcare equity index, an egalitarian democracy reduces COVID-19 deaths per million (log) by 4.6 per cent, which is significantly different from zero at the 5 per cent level. This is an interesting result because seen in previous models in Tables 1 and 2, the egalitarian democracy index is associated with an increase in COVID-19 deaths. However, once it is accompanied by a robust healthcare system its effect on COVID-19 deaths subside. This lends support to our hypothesis that access to healthcare matters more than broad egalitarian governance for reducing the harm from health pandemics. In other words, the negative effect on COVID-19 deaths is largely accruing from the 'structural effect' of having a robust healthcare system; that is, the question of capacity rather than the encompassing 'societal environment' within which pandemics are fought. Our results are in line with those who argue that the unequal burden of the COVID-19 pandemic within democratic countries can be traced to inadequate public health infrastructure (Chen and Krieger 2020; van Dorn et al. 2020; Risnick et al. 2020; Quinn and Kumar 2014).

Figure 4: Egalitarian democracy, healthcare equity, and marginal effect on COVID-19 deaths per million



Source: authors' compilation based on estimation.

4 Conclusion

There seems to be a large body of literature in public health blaming neoliberal epidemics for damaging health outcomes, particularly of the poor. The spread of disease and epidemics are blamed on inequitable governance, where inequities hinder societal cooperation required for achieving collective goods. While equity and welfare are goods in their own right, have such egalitarian systems of inclusivity and equity been more successful against the COVID-19 pandemic? We find, like many others, that greater equity in terms of access to healthcare has mattered for reducing the societal impact of COVID-19, but the mechanism is most likely based on factors associated with healthcare system capacity rather than the broad societal impact of egalitarian governance. Moreover, we observe that increased access to healthcare leads to an increase in COVID-19 tests when accompanied with universal testing policy and fall in COVID-19 deaths when complemented with stringent lockdown measures. Furthermore, we find that the number of COVID-19 deaths fall in an egalitarian democracy as healthcare equity increases. This holds important policy implications for several countries, such as the United States, United Kingdom, and the Republic of Ireland, among others, as they grapple with questions of the type of healthcare system and capacity they would like to develop in the post-pandemic period. Fighting deadly diseases that require extraordinary measures entail more than just societal resources, namely, a clear and targeted physical infrastructure geared for dealing with disease. Giving access to egalitarian societal processes outside the healthcare sector is a good in its own right, but relying too heavily on them for cauterizing the spread of a deadly virus might be a mistake. Governments might do well to pay more attention to the specifics of fighting the spread of disease by increasing the capacities of healthcare systems. Broad egalitarian values and processes up to now have not seemed to have had any cauterizing effect on death rates from COVID-19. Future studies might examine how exactly this occurs.

References

Acemoglu, D., and S. Johnson (2005). 'Unbundling Institutions'. *Journal of Political Economy*, 113(5): 949–95. https://doi.org/10.1086/432166

Acemoglu, D., S. Johnson, and J.A. Robinson (2001). 'The Colonial Origins of Comparative Development: An Empirical Investigation'. *American Economic Review*, 91(5): 1369–401. https://doi.org/10.1257/aer.91.5.1369

Acemoglu, D., S. Johnson, and J.A. Robinson (2002). 'Reversal of Fortune: Geography and Institutions in the Making of the Modern World Income Distribution'. *Quarterly Journal of Economics*, 117(4): 1231–94. https://doi.org/10.1162/003355302320935025

Achen, C.H. (2005). 'Let's Put the Garbage-Can Regressions and Garbage-Can Probits Where They Belong'. *Conflict Management and Peace Science*, 22: 327–39. https://doi.org/10.1080%2F07388940500339167

Ai, C., and E. Norton (2003). 'Interaction Terms in Logit and Probit Models'. *Economics Letters*, 80(1): 123–29. https://doi.org/10.1016/S0165-1765(03)00032-6

Alesina, A., E. Glaeser, and B. Sacerdote (2001). 'Why Doesn't the US Have a European-Style Welfare State?'. HIER Working Paper 1933. Cambridge, MA: Harvard University.

Bambra, C., R. Riordan, J. Ford, and F. Matthews (2020). 'The COVID-19 Pandemic and Health Inequalities'. *Journal of Epidemiology and Community Health*, 0: 1–5. https://doi.org/10.1136/jech-2020-214401

Banerjee, A., and L. Iyer (2005). 'History, Institutions, and Economic Performance: The Legacy of Colonial Land Tenure Systems in India'. *American Economic Review*, 95(4): 1190–213. https://doi.org/10.1257/0002828054825574

Barrios, J.M., and Y.V. Hochberg (2020). 'Risk Perception Through the Lens of Politics in the Time of the COVID-19 Pandemic'. Becker Friedman Institute for Economics Working Paper 2020-32. Chicago, IL: University of Chicago. https://doi.org/10.2139/ssrn.3568766

Ben-Ami, S. (2020). 'Democracies Are Better at Managing Crises'. *Project Syndicate*, 19 May. Available at: https://www.project-syndicate.org/commentary/democracy-or-autocracy-better-during-crisis-by-shlomo-ben-ami-2020-05?barrier=accesspaylog (accessed June 2020).

Bollyky, T.J., T. Templin, M. Cohen, D. Schoder, J.L. Dieleman, and S. Wigley (2019). 'The Relationships between Democratic Experience, Adult Health, and Cause-Specific Mortality in 170 Countries between 1980 and 2016: An Observational Analysis'. *Lancet*, 393(10181): 1628–40. https://doi.org/10.1016/S0140-6736(19)30235-1

Booth, R. (2020). 'BAME Groups Hit Harder by Covid-19 Than White People, UK Study Suggests'. *The Guardian*, 7 April. Available at: https://www.theguardian.com/world/2020/apr/07/bame-groups-hit-harder-covid-19-than-white-people-uk (accessed June 2020).

Bound, J., D. Jaeger, and R. Baker (1995). 'Problems with Instrumental Variables Estimation when the Correlation between the Instruments and the Endogenous Explanatory Variable Is Weak'. *Journal of American Statistical Association*, 90(430): 443–50. https://doi.org/10.1080/01621459.1995.10476536

Cepaluni, G., M. Dorsch, and R. Branyiczki (2020). 'Political Regimes and Deaths in the Early Stages of the COVID-19 Pandemic'. Working Paper. *ASPA Preprints*. https://doi.org/10.33774/apsa-2020-5lhhc

Chen, J.T., and N. Krieger (2020). 'Revealing the Unequal Burden of COVID-19 by Income, Race/Ethnicity, and Household Crowding: US County vs ZIP Code Analyses'. HCPDS Working Paper Series, Volume 19, Number 1. Boston, MA: Harvard Center for Population and Development Studies.

Coppedge, M., J. Gerring, S.I. Lindberg, S.-E. Skaaning, J. Teorell, D. Altman, F. Andersson, M. Bernhard, S.M. Fish, A. Glynn, A. Hicken, K.H. Knutsen, K. Marquandt, K. McMann, V. Mechkova, P. Paxton, D. Pemstein, L. Saxer, B. Seim, R. Sigman, J. Staton et al. (2020a). 'V-Dem codebook v10'. Varieties of Democracy (V-Dem) Project. Gothenburg: University of Gothenburg. Available at: https://www.v-dem.net/en/data/data-version-10 (accessed June 2020).

Cronert, A. (2020) 'Democracy, State Capacity, and COVID-19 Related School Closures'. Working Paper. *ASPA Preprints*. https://doi.org/10.33774/apsa-2020-jf671-v4

Eichengreen, B. (2020). 'Rage Against the Pandemic'. *Project Syndicate*, 8 June 2020. Available at: https://www.project-syndicate.org/commentary/covid19-racial-disparities-fuel-usa-protests-by-barry-eichengreen-2020-06 (accessed June 2020).

Ellyatt, H. (2020). 'Sweden's Chief Scientist Admits Lessons Have Been Learned Over No-Lockdown Policy'. *CNBC: Health and Science*, 7 May. Available at: https://www.cnbc.com/2020/05/07/sweden-coronavirus-chief-scientist-admits-lessons-have-been-learned.html (accessed June 2020).

Farmer, P. (1996). 'Social Inequalities and Emerging Infectious Diseases'. *Emerging Infectious Diseases*, October–December, 2: 259–69.

Garoon, J.P., and P.S. Duggan (2008). 'Discourses of Disease, Discourses of Disadvantage: A Critical Analysis of National Pandemic Influenza Preparedness Plans'. *Social Science and Medicine*, 67(7): 1133–42. https://doi.org/10.1016/j.socscimed.2008.06.020

Hale, T., S. Webster, A. Petherick, T. Phillips, and B. Kira (2020). Oxford COVID-19 Government Response Tracker. Oxford: Blavatnik School of Government, Oxford University. Available at: https://www.bsg.ox.ac.uk/research/research-projects/coronavirus-government-response-tracker (accessed June 2020).

Ji, Y., Z. Ma, M. Peppelenbosch, and Q. Pan (2020). 'Potential Association between COVID-19 Mortality and Healthcare Resource Availability'. *Lancet*, 8(April): e480. https://doi.org/10.1016/S2214-109X(20)30068-1

Kawachi, I., and B. Kennedy (2002). *The Health of Nations: Why Inequality is Harmful to Your Health*. New York: The New Press.

Kleibergen, F., and K. Paap (2006). 'Generalized Reduced Rank Tests Using the Singular Value Decomposition'. *Journal of Econometrics*, 133(1): 97–126. https://doi.org/10.1016/j.jeconom.2005.02.011

Levin, P.J., E.N. Gebbie, and K. Qureshi (2007). 'Can the Health-Care System Meet the Challenge of Pandemic Flu? Planning, Ethical, and Workforce Considerations'. *Public Health Reports*, 122(5): 573–78. https://doi.org/10.1177%2F003335490712200503

Maizland, L., and C. Felter (2020). 'Comparing Six Health-Care Systems in a Pandemic'. *Council on Foreign Relations*, April 15, 2020. Available at: https://www.cfr.org/backgrounder/comparing-six-health-care-systems-pandemic (accessed June 2020).

Mamelund, S., C. Shelley-Egan, and O. Rogeberg (2019). 'The Association between Socioeconomic Status and Pandemic Influenza: Protocol for a Systematic Review and Meta-Analysis'. *Systematic Reviews*, 8(5): 1–6. https://doi.org/10.1186/s13643-018-0931-2

Marmot, M. (2005). *The Status Syndrome: How Social Standing Affects our Health and Longevity*. New York: Henry Holt & Company.

Mazzucato, M., and G. Quaggiotto (2020). 'The Big Failure of Small Government'. *Project Syndicate*, 19 May. Available at: https://www.project-syndicate.org/commentary/small-governments-big-failure-covid19-by-mariana-mazzucato-and-giulio-quaggiotto-2020-05?barrier=accesspaylog (accessed June 2020).

Nunn, N., and L. Wantchekon (2011). 'The Slave Trade and the Origins of Mistrust in Africa'. *The American Economic Review*, 101(7): 3221–52. https://doi.org/10.1257/aer.101.7.3221

Pemstein, D., K.L. Marquardt, E. Tzelgov, Y.-t. Wang, J. Krusell, and F. Miri (2018). 'The V-Dem Measurement Model: Latent Variable Analysis for Cross-National and Cross-Temporal Expert-Coded Data'. V-Dem Working Paper 213. Gothenburg: University of Gothenburg, Varieties of Democracy Institute. https://doi.org/10.2139/ssrn.3167764

Petherick, A., B. Kira, N. Angrist, T. Hale, and T. Phillips (2020). 'Variation in Government Responses to COVID-19'. Blavatnik School Working Paper. Oxford: Oxford University. Available at: https://www.bsg.ox.ac.uk/research/publications/variation-government-responses-covid-19 (accessed June 2020).

Price, A. (2020). 'The Lasting Impact of the COVID-19 Pandemic on Our Healthcare Delivery System'. *Berkeley News*. Available at: https://news.berkeley.edu/2020/05/04/the-lasting-impart-of-the-covid-19-pandemic-on-our-healthcare-delivery-system (accessed June 2020).

Quinn, S.C., and S. Kumar (2014). 'Health Inequalities and Infectious Disease Epidemics: A Challenge for Global Health Security'. *Biosecurity and Bioterrorism: Biodefense Strategy, Practice, and Science*, 12(5): 263–73. https://doi.org/10.1089/bsp.2014.0032

Resnick, A., S. Galea, and K. Sivashanker (2020). 'Covid-19: The Painful Price of Ignoring Health Inequities'. *The BMJ Opinion*. Available at: https://blogs.bmj.com/bmj/2020/03/18/covid-19-the-painful-price-of-ignoring-health-inequities/ (accessed June 2020).

Rosella, L.C., K. Wilson, N.S. Crowcroft, A. Chu, R. Upshur, D. Willison, S.L. Deeks, B. Schwartz, J. Tustin, D. Sider, and V. Goel (2013). 'Pandemic H1N1 in Canada and the Use of Evidence in Developing Public Health Policies—A Policy Analysis'. *Social Science & Medicine*, 83: 1–9. https://doi.org/10.1016/j.socscimed.2013.02.009

Roser, M., H. Ritchie, E. Ortiz-Ospina, and J. Hasell (2020). Coronavirus Pandemic (COVID-19). Available at: https://ourworldindata.org/coronavirus (accessed June 2020).

Rothstein, B. (2001). 'Social Capital in a Social Democratic Welfare State'. *Politics and Society*, 29(2): 207–41. https://doi.org/10.1177%2F0032329201029002003

Sault, S. (2020). 'Why Lockdowns Can Halt the Spread of COVID-19'. *World Economic Forum*, 21 March. Available at: https://www.weforum.org/agenda/2020/03/why-lockdowns-work-epidemics-coronavirus-covid19/ (accessed June 2020).

Schrecker, T., and C. Bambra (2015). *How Politics Makes Us Sick: Neoliberal Epidemics*. London: Palgrave Macmillan. https://doi.org/10.1057/9781137463074

Schrodt, P.A. (2014). 'Seven Deadly Sins of Contemporary Quantitative Political Analysis'. *Journal of Peace Research*, 51(2): 287–300. https://doi.org/10.1177%2F0022343313499597

Sigman, R., and S. Lindberg (2019). 'Democracy for All: Conceptualizing and Measuring Egalitarian Democracy'. *Political Science Research and Methods*, 7(3): 595–612. https://doi.org/10.1017/psrm.2018.6

Smith, R.D., M.R. Keogh-Brown, and T. Barnett (2011). 'Estimating the Economic Impact of Pandemic Influenza: An Application of the Computable General Equilibrium Model to the UK'. *Social Science & Medicine*, 73(2): 235–44. https://doi.org/10.1016/j.socscimed.2011.05.025

Tricco, A., E. Lillie, C. Soobiah, L. Perrier, and S. Straus (2012). 'Impact of H1N1 on Socially Disadvantaged Populations: Systematic Review'. *PLoS One*, 7: 1–17. https://doi.org/10.1371/journal.pone.0039437

van Dorn, A., R.E. Cooney, and M.L. Sabin (2020). 'COVID-19 Exacerbating Inequalities in the US'. *Lancet*, 395(10232): 1243–44. https://doi.org/10.1016/S0140-6736(20)30893-X

Wiggins, V. (1999). Comparing XTGLS with Regress Cluster'. Stata Corporation. Available at: www.stata.com/support/faqs/stat/xtgls_rob.html (accessed June 2020).

Wilkinson, R., and K. Pickett (2009). *The Spirit Level: Why More Equal Societies Almost Always Do Better*. London: Allen Lane.

WHO (2020). WHO Timeline—COVID-19. Geneva: World Health Organization. Available at: https://www.who.int/news-room/detail/27-04-2020-who-timeline---covid-19 (accessed June 2020).

World Bank (2019). The World Development Indicators: Online Database. Available at: http://data.worldbank.org/data-catalog/world-development-indicators (accessed June 2020).

Worldometers.info (2020). Worldometer COVID-19 Data. Available at: https://www.worldometers.info/coronavirus/about (accessed June 2020).

Appendix A

Table A1: List of countries

Afghanistan	China	Guinea-Bissau	Mayotte	Saudi Arabia
Albania	Colombia	Guyana	Mexico	Senegal
Algeria	Comoros	Haiti	Moldova	Serbia
Andorra	Congo, Rep.	Honduras	Monaco	Seychelles
Angola	Costa Rica	Hong Kong	Mongolia	Sierra Leone
Anguilla	Croatia	Hungary	Montenegro	Singapore
Antigua and Barbuda	Cuba	Iceland	Montserrat	Sint Maarten
Argentina	Curaçao	India	Morocco	Slovakia
Armenia	Cyprus	Indonesia	Mozambique	Slovenia
Aruba	Czechia	Iran	Myanmar	Somalia
Australia	Denmark	Iraq	Namibia	South Africa
Austria	Djibouti	Ireland	Nepal	South Sudan
Azerbaijan	Dominica	Isle of Man	Netherlands	Spain
Bahamas	Dominican Republic	Israel	New Caledonia	Sri Lanka
Bahrain	Congo, Dem. Rep.	Italy	New Zealand	St. Barth
Bangladesh	Ecuador	Ivory Coast	Nicaragua	St. Vincent Grenadines
Barbados	Egypt	Jamaica	Niger	Sudan
Belarus	El Salvador	Japan	Nigeria	Suriname
Belgium	Equatorial Guinea	Jordan	North Macedonia	Sweden
Belize	Eritrea	Kazakhstan	Norway	Switzerland
Benin	Estonia	Kenya	Oman	Syria
Bermuda	Eswatini	Kuwait	Pakistan	Taiwan
Bhutan	Ethiopia	Kyrgyzstan	Palestine	Tanzania
Bolivia	Faeroe Islands	Laos	Panama	Thailand
Bosnia and Herzegovina	Falkland Islands	Latvia	Papua New Guinea	Timor-Leste
Botswana	Fiji	Lebanon	Paraguay	Togo
Brazil	Finland	Lesotho	Peru	Trinidad and Tobago
British Virgin Islands	France	Liberia	Philippines	Tunisia
Brunei	French Guiana	Libya	Poland	Turkey
Bulgaria	French Polynesia	Liechtenstein	Portugal	Turks and Caicos
Burkina Faso	Gabon	Lithuania	Qatar	United Arab Emirates
Burundi	Gambia	Luxembourg	Réunion	Uganda
Cabo Verde	Georgia	Macao	Romania	United Kingdom
Cambodia	Germany	Madagascar	Russia	Ukraine
Cameroon	Ghana	Malawi	Rwanda	Uruguay
Canada	Gibraltar	Malaysia	South Korea	United States of America

Central African Republic	Greece	Maldives	Saint Kitts and Nevis	Uzbekistan
Caribbean Netherlands	Greenland	Mali	Saint Lucia	Venezuela
Cayman Islands	Grenada	Malta	Saint Martin	Vietnam
Chad	Guadeloupe	Martinique	Saint Pierre Miquelon	Yemen
Channel Islands	Guatemala	Mauritania	San Marino	Zambia
Chile	Guinea	Mauritius	Sao Tome and Principe	Zimbabwe

Source: authors' compilation based on Coppedge et al. (2020).

Table A2: COVID-19 deaths by countries as on 25 May 2020

Countries	Deaths	Deaths per million	Countries	Deaths	Deaths per million	Countries	Deaths	Deaths per million
Afghanistan	193	5	French Guiana	1	3	New Zealand	21	4
Albania	31	11	French Polynesia			Nicaragua	17	3
Algeria	568	13	Gabon	12	5	Niger	58	2
Andorra	51	660	Gambia	1	0.4	Nigeria	200	1
Angola	3	0.09	Georgia	12	3	North Macedonia	111	53
Anguilla			Germany	8,271	99	Norway	234	43
Antigua and Barbuda	3	31	Ghana	31	1	Oman	30	6
Argentina	403	9	Gibraltar			Pakistan	1,017	5
Armenia	70	24	Greece	166	16	Palestine	2	0.4
Aruba	3	28	Greenland			Panama	287	67
Australia	100	4	Grenada			Papua New Guinea		
Austria	633	70	Guadeloupe	13	32	Paraguay	11	2
Azerbaijan	44	4	Guatemala	45	3	Peru	3,024	92
Bahamas	11	28	Guinea	18	1	Philippines	846	8
Bahrain	12	7	Guinea-Bissau	6	3	Poland	965	25
Bangladesh	408	2	Guyana	10	13	Portugal	1,277	125
Barbados	7	24	Haiti	22	2	Qatar	17	6
Belarus	185	20	Honduras	151	15	Réunion	1	1
Belgium	9,186	793	Hong Kong	4	0.5	Romania	1,151	60
Belize	2	5	Hungary	473	49	Russia	3,099	21
Benin	2	0.2	Iceland	10	29	Rwanda		
Bermuda	9	144	India	3,457	3	South Korea	264	5
Bhutan			Indonesia	1,278	5	Saint Kitts and Nevis		
Bolivia	199	17	Iran	7,249	86	Saint Lucia		
Bosnia and Herzegovina	140	43	Iraq	134	3	Saint Martin	3	78
Botswana	1	0.4	Ireland	1,571	319	Saint Pierre Miquelon		
Brazil	19,038	90	Isle of Man	24	282	San Marino	41	1,209
British Virgin Islands	1	33	Israel	279	32	Sao Tome and Principe	8	37
Brunei	1	2	Italy	32,330	535	Saudi Arabia	351	10
Bulgaria	120	17	Ivory Coast	29	1	Senegal	30	2
Burkina Faso	52	2	Jamaica	9	3	Serbia	237	27
Burundi	1	0.08	Japan	771	6	Seychelles		

Cabo Verde	3	5	Jordan	9	0.9	Sierra Leone	34	4
Cambodia			Kazakhstan	35	2	Singapore	22	4
Cameroon	146	6	Kenya	50	0.9	Sint Maarten	15	350
Canada	6,031	160	Kuwait	129	30	Slovakia	28	5
Central African Republic			Kyrgyzstan	14	2	Slovenia	106	51
Caribbean Netherlands			Laos			Somalia	61	4
Cayman Islands	1	15	Latvia	22	12	South Africa	339	6
Chad	57	3	Lebanon	26	4	South Sudan	4	0.4
Channel Islands	45	259	Lesotho			Spain	27,888	596
Chile	544	28	Liberia	23	5	Sri Lanka	9	0.4
China	4,634	3	Libya	3	0.4	St. Barth		
Colombia	630	12	Liechtenstein	1	26	St. Vincent Grenadines		
Comoros	1	1	Lithuania	61	22	Sudan	121	3
Congo, Rep.	15	3	Luxembourg	109	174	Suriname	1	2
Costa Rica	10	2	Macao			Sweden	3,871	384
Croatia	97	24	Madagascar	2	0.07	Switzerland	1,893	219
Cuba	79	7	Malawi	3	0.2	Syria	3	0.2
Curaçao	1	6	Malaysia	114	4	Taiwan	7	0.3
Cyprus	17	14	Maldives	4	7	Tanzania	21	0.4
Czechia	304	28	Mali	55	3	Thailand	56	0.8
Denmark	561	97	Malta	6	14	Timor-Leste		
Djibouti	9	9	Martinique	14	37	Togo	12	1
Dominica			Mauritania	4	0.9	Trinidad and Tobago	8	6
Dominican Republic	446	41	Mauritius	10	8	Tunisia	47	4
Congo, Dem. Rep.	61	0.7	Mayotte	19	70	Turkey	4,222	50
Ecuador	2,888	164	Mexico	6,090	47	Turks and Caicos	1	26
Egypt	680	7	Moldova	228	57	United Arab Emirates	233	24
El Salvador	32	5	Monaco	4	102	Uganda		
Equatorial Guinea	7	5	Mongolia			United Kingdom	36,042	531
Eritrea			Montenegro	9	14	Ukraine	579	13
Estonia	64	48	Montserrat	1	200	Uruguay	20	6
Eswatini	2	2	Morocco	196	5	United States of America	95,016	287
Ethiopia	5	0.04	Mozambique			Uzbekistan	13	0.4
Faeroe Islands			Myanmar	6	0.1	Venezuela	10	0.4
Falkland Islands			Namibia			Vietnam		
Fiji			Nepal	3	0.1	Yemen	30	1
Finland	306	55	Netherlands	5,775	337	Zambia	7	0.4
France	28,132	431	New Caledonia			Zimbabwe	4	0.3

Source: authors' compilation based on *Worldometers.info* (2020).

Table A3: Descriptive statistics

Variables	Mean	Standard Deviation	Minimum	Maximum	Observations
COVID-19 tests per million	23,452.77	35,390.63	4	183,981	185
COVID-19 tests per million (log)	8.81	1.95	1.39	12.12	185
COVID-19 deaths per million	60.32	150.99	0.04	1,209	178
COVID-19 deaths per million (log)	2.13	2.16	–3.22	7.10	178
Per capita GDP (log)	8.75	1.53	5.44	12.08	189
Urban population share	59.81	23.63	11.80	100.00	198
Egalitarian democracy index	0.41	0.24	0.04	0.86	169
Healthcare equity	0.50	1.50	–3.17	3.00	169
COVID-19 testing policy	1.41	0.75	0.00	3.00	146
Stringency index	81.64	14.73	20.00	97.00	148

Source: authors' compilation based on estimation.

Table A4: Data sources and definitions

Variables	Data definition and sources
COVID-19 tests and deaths per million (log)	Number of COVID-19 tests and deaths per million (log) recorded for country *c* as on 25 May 2020, sourced from *Worldometer.info* (2020).
Healthcare equity index	V-Dem healthcare equity index, sourced from Coppedge et al. (2020), measures high-quality basic healthcare guaranteed to all, sufficient to enable them to exercise their basic rights as adult citizens. The index ranges from –3 to +3, where a higher value indicates basic healthcare is equal in quality and less than 5 per cent of citizens receive low-quality healthcare, which probably undermines their ability to exercise their basic rights as adult citizens. We use five-year average of this index for 2014–18.
Per capita GDP (log)	Five-year average of GDP per capita (log) for 2014–18 measured in US dollars 2010 constant prices, sourced from World Bank (2019).
Urbanization	Five-year average of percentage share of urban population for 2014–18, sourced from World Bank (2019).
Egalitarian democracy index	V-Dem's egalitarian democracy index, sourced from Coppedge et al. (2020), includes several indicators capturing equal access to power, political resources, liberties, and political inclusion, plus the degree of electoral democracy, or polyarchy, indicated by free and fair elections without coercion or violence in a competitive processes. The index is coded on a 0–1 scale where a higher value denotes higher egalitarian democratic processes. We use five-year average of this index for 2014–18 years.
COVID-19 testing policy index	Testing policy index is coded on a scale of 0–3, where 0 suggests there is no adequate COVID-19 testing policy in place, while 3 indicates an open public testing policy in which COVID-19 testing is made available to asymptomatic people by government. The index is developed by Hale et al. (2020).
Stringency index	Stringency index is coded on a scale of 0–100, where a higher score indicates more stringent government responses to COVID-19. The index is created by Hale et al. (2020) based on the ordinal values of government policy response on seven variables: restrictions of mass gathering, workplace closures, cancellation of public events, public information campaigns, school closures, internal moment restrictions, and international travel controls. The index is the average of these seven scores.

Source: authors' compilation based on study data.