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8957
2021

March 2021

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CESifo

Impressum:

CESifo Working Papers
ISSN 2364-1428 (electronic version)
Publisher and distributor: Munich Society for the Promotion of Economic Research - CESifo GmbH
The international platform of Ludwigs-Maximilians University's Center for Economic Studies and the ifo Institute
Poschingerstr. 5, 81679 Munich, Germany
Telephone +49 (0)89 2180-2740, Telefax +49 (0)89 2180-17845, email office@cesifo.de
Editor: Clemens Fuest
https://www.cesifo.org/en/wp
An electronic version of the paper may be downloaded
· from the SSRN website: www.SSRN.com
· from the RePEc website: www.RePEc.org
· from the CESifo website: https://www.cesifo.org/en/wp

CESifo *Working Paper No. 8957*

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Abstract

The cross-country relationship between Covid-19 crude mortality rates and previously measured income inequality and poverty in the pandemic's first wave is studied, controlling for other underlying factors, in a sample of 141 countries. An older population, fewer hospital beds, lack of universal BCG (tuberculosis) vaccination, and greater urbanization are associated with higher mortality. The death rate has a consistent strong positive relationship with the Gini coefficient for income. Poverty as measured by the $1.90 per day standard has a small negative association with death rates. The elasticity of Covid-19 deaths with respect to the Gini coefficient, evaluated at sample means, is 0.9. Assuming the observed empirical relationships unchanged, if the Gini coefficient in all countries where it is above the OECD median was instead at that median, 67,900 fewer deaths would have been expected after 150 days of the pandemic - - a reduction of 11%. Shrinking higher Gini's down to the G7 median reduces predicted deaths by 89,900, or 14%.

JEL-Codes: I140, I390.

Keywords: Covid-19 pandemic inequality poverty mortality.

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April 2021
Helpful comments or assistance were provided by Charles Beach, Jessica Davies, Herbert Emery, Samantha Goertz, Michael Hoy, Dean Jolliffe, Rodrigo Lluberas, Anthony Shorrocks and Wayne Simpson. Responsibility for any errors or omissions is my own.

I. Introduction

Disadvantaged minorities and some low-income groups have been hit hard by Covid-19 infection and deaths, suggesting that its severity within countries may have been affected by their degree of economic inequality. Such an impact would be in line with the considerable body of evidence on the impact of inequality on health. This paper asks to what extent differences across countries in Covid-19 crude mortality rates were related to their pre-existing differences in income inequality and poverty in the first global wave of the pandemic, which ended in August 2020. This is done controlling for other important underlying factors.

While international data are available on cases as well as deaths, the focus is on the latter here because they are likely more accurate. The variable studied is the crude mortality rate, that is the cumulative total of officially reported Covid-19 deaths divided by population as of a particular date. This rate will be referred to simply as the *death rate* or the *mortality rate.* In order to control for the length of time the pandemic had been present, the death rates used are those observed 150 days after total confirmed cases in a country had reached 10.

The empirical work reported here controls for pre-existing factors other than income inequality and poverty that are expected to be associated with Covid-19 death rates: the elderly and urban fractions of the population, BCG (tuberculosis) vaccination, level of democracy, GDP per capita (in PPP terms), and the number of hospital beds per thousand. Covid-19 severity in the first wave was of course also likely affected by a host of proximate factors, including testing, contact tracing, lockdowns, mask wearing, social distancing, and travel. While it would be interesting to study their impact, and others have done so, that is not the purpose of this paper. The goal here is to look at the pre-existing underlying factors that may have worked through those proximate causes.

This paper confines attention to the first global wave of Covid-19 for a couple of reasons. One is that by the second wave, which began in September 2020, differences in inequality and poverty across countries had had time to change from their pre-existing patterns, for example because relief payments and other measures countered distributional impacts significantly in most rich countries but less so elsewhere. Another reason is that, at the time that this research was conducted, the second wave was still in progress, and had become more complex than the first wave in key ways, for example with the rise of new variants of the virus and the onset of vaccination programs in many countries at different times and different rates.

While this study finds significant relationships between Covid-19 death rates and income and poverty, it does not establish causation. The results should be taken only as describing the empirical relationship between these variables. Nevertheless, one can explore how death rates would have been altered if one or more of the underlying factors had been different but the empirical relationships between the observed variables remained the same. That is done here in a counterfactual exercise wherein countries with income Gini coefficients above a certain threshold have their Gini's reduced towards it. The results indicate, for example, that if the Gini coefficients of all countries were capped at the OECD median, 67,900 fewer deaths would have been predicted after 150 days of the pandemic, while capping country Gini coefficients at the G7 median reduces expected deaths by 89,900. These numbers are 11% and 14% of actual deaths respectively.

As pointed out in the literature review below, some economists have questioned the apparent relationship between income inequality and health outcomes, arguing that it is mostly due to the effects of poverty. Here it is found that income inequality and poverty have distinct relationships with the Covid-19 death rate in cross-country analysis. Moreover, the effects are not in the same direction: income inequality is associated with a higher death rate while poverty is associated with a lower rate.

There has been some previous investigation of the cross-country relationships between poverty and Covid-19 mortality, and also the effect of mean income and other underlying factors, as set out in the next section. However, only one of these studies (International Monetary Fund, 2020) was global in scope and it did not look at the impact of poverty. Also, these studies produced conflicting results on the impact of poverty and did not looked at the effect of income inequality. This paper breaks new ground with an examination of the effects of both poverty and income inequality on Covid-19 mortality on a consistent basis using a global sample of countries. Such a study is urgent not only in light of the seriousness of the Covid-19 pandemic and the possibility of future similar pandemics occurring, but also in view of the strong upward trend in income inequality within many countries around the world that has been seen in recent decades (Davies and Shorrocks, 2021).

The paper proceeds as follows. The next section provides a brief and selective review of relevant literature. Section III then discusses modeling. Section IV describes the data. Regression results and a counterfactual exercise are provided in section V. Section VI concludes.

II. Literature

This brief overview of some of the most relevant literature begins by looking at studies on the effect of economic inequality, including poverty, on pandemics and on health in general. Then existing evidence concerning the relationship between Covid-19 severity and inequality is examined.

There has long been interest in the relationship between inequality and pandemics (Slack, 1985; Campbell, 2016; Scheidel, 2017; Snowden, 2019). That interest has tended to focus on the effect of a pandemic on inequality, which remains true today (Furceri et al., 2020; Alfani, forthcoming). However, the impact of inequality *on pandemics* has also had some study. In a sociological analysis, Farmer (1996, 2001) argued that social inequalities played a key role in fostering modern epidemics of Ebola, TB and HIV. Anbarci et al. (2012) studied cholera outbreaks in 55 poor countries over 1980-2002, finding that both cases and deaths were negatively related to the availability of clean water, which in turn was reduced by inequality. And Cummins et al. (2016) found that in many outbreaks of plague in London over the period 1560 – 1665, elevated mortality began in poor suburbs rather than in the docks as previously thought, implying an important impact of poverty.

There is a well-developed literature on the impact of inequality on health more generally. The Whitehall studies in the United Kingdom that began in 1967 found that civil servants of higher rank had less heart disease and other chronic conditions, controlling for smoking, physical activity, obesity and other risk factors, despite their similarity of working conditions (Pickett and Wilkinson, 2009, 2015). Status in itself appeared to have a positive impact on health, in part because the low-status individuals were subject to more job stress. These observations contributed to interest in the relative income hypothesis, which posits that health depends on income relative to others in society in addition to or possibly rather than on absolute income. A string of public health studies confirmed the relative income hypothesis. Results were reviewed and summarized in Wagstaff and van Doorslaer (2000), Karlsson et al. (2010) and Pickett and Wilkinson (2015).

Some economists have concluded that there is not yet convincing evidence that income inequality *per se* generally has a negative effect on health although poverty and other factors that are correlated with income inequality, such as unequal healthcare and government services and racial injustice, do harm health (Deaton, 2003, 2013; Case and Deaton, 2017). These conclusions do not, of course, imply that one should not investigate the relationship between income inequality and Covid-19 severity. It could be that in this case there is an impact distinguishable from that of poverty. And since we know that income inequality is correlated with a range of inequities that have been proven to be related to health, it can at the least serve as a useful proxy for data on those inequities, which are not as readily available.

Covid-19 health impacts among disadvantaged minority groups have received attention in several countries. In the United States black, Hispanic and indigenous people have suffered more than whites (APM Research Lab, 2020; Stafford, Hoyer and Morrison, 2020; Foundation for AIDS Research, 2020). Gross et al. (2020) examined the health-related data for 28 states that reported race and ethnicity-stratified Covid-19 mortality. Controlling for differences in age structure, they found that the risk of death for blacks was 3.6 times that of whites, while the corresponding ratio for Hispanics was 1.9. Similar death rate differentials have been found in the UK among black, Asian, and Middle Eastern, or BAME, groups (Office for National Statistics, 2020; Pubic Health England, 2020), and have been noted widely for minority groups in other countries, including indigenous people in the Americas and Australia (APM Research Lab, 2020; Engels, 2020; Yashadhana et al., 2020).

The incidence of Covid-19 cases and deaths is higher in U.S. counties with relatively more non-whites, but there is a more complex pattern for poverty. Samrachana et al. (2020) find that both cases and deaths are higher in substantially non-white counties that have greater poverty, but that the opposite is true for substantially white counties. Jung, Manley and Shrestha (2020) find a U-shaped pattern of cases and deaths according to poverty rates in counties with high population density, but a unidirectional positive impact of poverty on cases and deaths in low density counties.

Banik et al. (2020) examined the impact of poverty and other underlying factors on Covid-19 outcomes across countries. They studied 29 countries selected as representative of developed and developing countries, finding that the absolute poverty rate has an insignificant negative effect on the Covid-19 case fatality rate except when an interaction with the BCG tuberculosis vaccination rate is introduced. In the latter case, poverty has a significant positive effect except in countries with a relatively high BCG vaccination rate, where the relationship is negative. They find that such factors as the public health system and population structure are "powerful contributory factors in determining fatality rates". They also note that "…poor citizens' access to the public healthcare system is worse in many countries irrespective of whether they are developed or developing countries."

International Monetary Fund (2020) asserts that poverty has worsened Covid-19 impacts, looking across countries, but does not provide evidence to substantiate that. The study does show that death rates are negatively related to the use of the BCG vaccine in a country and to the number of hospital beds per capita. Interestingly, it omitted GDP per capita from its death rate regressions because it had "the wrong sign", that is a positive effect. Miller et al. (2020) also find that BCG vaccination has had a negative impact on Covid-19 deaths in middle-high and high-income countries (as classified by the World Bank) and that the difference in mortality between countries with and without universal BCG vaccination could not be accounted for by differences in mean income.

The mixed evidence on the impact of poverty on Covid-19 severity in the U.S. and internationally, including indications of a negative effect in some cases, is notable. The present study also finds a negative effect. The reasons for this effect are not clear. It is to be hoped that they will become the subject of careful investigation in future research. A conjecture is that many of the poor may be relatively isolated socially due to lack of employment or the means to engage in much market activity. This would militate against infection in the case of an airborne disease like Covid-19. In cross-country comparisons it may also be that countries with more poor people tend to be less integrated into networks of global commerce and travel, again reducing the spread of the disease.

Although they did not look at the impact of inequality or poverty, Sorci, Faivre and Morand (2020) studied the impact of other underlying demographic, economic and political factors on case fatality rates across 143 countries.[1] They found that the case fatality rate was positively related to the percent of population aged 70+, GDP per capita, and a democracy index, while it was negatively related to hospital beds per capita. These are aspects that are kept in mind in the empirical work reported below.

III. Modeling

In order to die from Covid-19 one must first be infected. The crude mortality rate for any population group in a country is the product of its infection rate and its case fatality rate. These two aspects may be affected in different ways by different factors, which is reflected in the following discussion.

Why would one expect the Covid-19 death rate to depend on the level of income inequality? The effects can be either direct or indirect. An indirect effect could arise if, for example, governments were more sensitive to the wishes of people with high incomes. There are more high-income people in more unequal countries, and they would tend to have more influence on policy, at least in democracies. If support for public health programs, and healthcare generally, falls with income, greater inequality could therefore lead to less expenditure on such programs. Or it could be that public education is underfunded and therefore of lower quality in countries with higher inequality, leading to poor public understanding of science-based recommendations for measures to combat infection - - masking and the like. While such effects may be at work, modeling and measuring them is challenging and beyond the scope of this paper.

A positive direct effect of income inequality on the overall death rate is obtained via Jensen's inequality if the mortality probability is a convex function of income. Consider two people who have the same income and the same mortality probability. Take income from one and give it to the other. Income inequality rises and if the crude chance of dying from Covid-19 is a strictly convex function of income, the average probability of dying for these two individuals goes up. This is true whether the mortality probability is rising or falling with income.

Income inequality could potentially be measured with any one of several standard measures of inequality (Sen, 1997; Cowell 2011). The most popular measure by far is the Gini coefficient. This measure has a well-known intuitive relationship with the Lorenz curve, a fundamental tool in inequality measurement. Estimates of the Gini for a large number of countries are included in the World Development Indicators published annually by the World Bank. Those are the estimates used in this paper.

Conceptually, the comparison of two countries' income distributions and mortality situations can be broken into two components: differences in mean income and in inequality. Whether a

[1] The case fatality rate is the official numbers of Covid-19 deaths divided by the number of confirmed cases.

higher mean leads to a lower crude death rate depends simply on whether the death rate for individuals is falling or rising with income. That is not the case on the inequality side. As mentioned above, whether higher inequality reduces or increases the overall death rate from Covid-19 depends on whether the probability of being infected and dying from the disease is concave or convex in income. Thus, it is not necessary for the death rate to fall with income in order for higher inequality to cause a higher death rate. This means that the way inequality affects the death rate is fundamentally different from how it is affected by poverty. Higher poverty will only raise the overall death rate if the probability of catching and dying from the disease declines with income; concavity or convexity is not the issue.

Some major factors that are relevant to Covid-19 death rates are demographic. Among those, the fraction of the elderly in a population should be important since the case fatality rate goes up strongly at advanced ages. This paper finds that there is also an effect from the rate of urbanization, perhaps due to the greater congestion in urban areas raising infections as well as air pollution.[2] So individual mortality chances depend not just on income, but on age and rural/urban location at the least. Hence population composition according to these factors should affect the overall death rate for a country.

Age income can each be lumped into two categories, creating binary variables to go along with the urban/rural split. Old vs. young, low vs. higher income and urban vs. rural location divide a population into six groups, ranging from the rural /young/non-poor to the urban/old/poor. Total Covid-19 deaths, D, in a country over a given period of the pandemic can be related to the crude death rates m_{ijk} , and population numbers, N_{ijk} for these six groups by:

(1) $D = \sum_{i=1}^{2} \sum_{j=1}^{2} \sum_{k=1}^{2} m_{ijk} N_{ijk}$, $\quad i, j, k = 1{,}2$

where $i = 1$ stands for rural, $i = 2$ for urban, $j = 1$ for young and $j = 2$ for old, and $k = 1$ for non-poor and $k = 2$ for poor. We may let

(2) $m_{ijk} = m_{111} + p_{ijk}$, $\quad m_{111} \geq 0,\ p_{111} = 0,\ -m_{111} \leq\ p_{ijk} \leq 1 - m_{111}$

where p_{ijk} is a "premium" on the mortality rate for the urban, old or poor. Note that p_{ijk} could be negative.

A Simple Model

A simple model is obtained if we assume that the death rate premia for being urban, old or in poverty are additive. Letting the additive components be $\pi_u, \pi_o, and\ \pi_v$ respectively, in that case we have:

(3) $m_{ijk} = m_{111} + p_{ijk} = m_{111} + (i-1)\pi_u + (j-1)\pi_o + (k-1)\pi_v$, $i, j, k = 1{,}2$

[2] Using global data Pozzer et al. (2020) find that air pollution makes a significant contribution to Covid-19 mortality.

and (1) becomes:

(1’) $D = m_{111}N + \pi_u N_u + \pi_o N_o + \pi_v N_v$

where N is the size of the total population, and $N_u, N_o,$ and N_v are the number of urban, old and poor people, respectively. Dividing by N we have the death rate equation:

(4) $d = \frac{D}{N} = m_{111} + \pi_u n_u + \pi_o n_o + \pi_v n_v$

where n_u, n_o and n_v are the fractions of the population that are urban, old or poor.

An advantage of this formulation for applied work is that data on d, n_u, n_o and n_v are readily available. Nevertheless, the assumption that the mortality premia for being urban, old or poor are additive may not be correct, so that one should check for interactions between these variables in empirical work.

How do mean income, income inequality and other underlying factors work into the analysis? If such factors only shift the base mortality rate, m_{111} , up or down, they can be accommodated by simply adding other variables to (4) in an estimating equation. These additional variables could be in polynomial form if there are non-linear effects. It is possible that the additional factors could affect the m_{ijk}s non-uniformly, creating interactions between them and n_u, n_o or n_v.

Some potentially important underlying factors are not readily observed or easily compared across a large group of countries. Such factors may include customs and attitudes, political aspects not picked up, say, in a democracy index, climate/weather, travel patterns, and even the incidence of protective genes. While it may not be easy to quantify these aspects adequately, it may be possible to take them into account to an extent implicitly if there is sufficient similarity in these respects within world regions on these counts, motivating the use of regional dummies as in the empirical work reported in this study.

This discussion points to the use of the following estimating equation:

(5) $d = a_o + a_1 Gini + a_2 Pov + a_3 Age + a_4 Urban + a_5 X + \varepsilon$

where $Gini$ and Pov are of course the Gini coefficient and a poverty index, while Age and $Urban$ are respectively the number of elderly and urban residents as a percent of population. *X* is a vector of other underlying factors, which in this study will include healthcare variables, mean income as captured by GDP per capita, a democracy index and regional dummies. Non-linear and interaction terms can also be introduced, and are investigated in the empirical exercise of section V. No strong assumption is made on the distribution of ε other than it has mean zero and finite variance, and is not necessarily homoscedastic.

IV. Data

Table 1 lists the variables used in the regressions reported in the next section, along with their descriptive statistics. The data are for the most recent available year prior to 2020, as indicated in the Description column.[3]

The variable Deaths is the cumulative total of deaths per million population in the first 150 days of the pandemic in a country, counting from the date by which at least 10 confirmed cases had been recorded.[4] The Deaths observation date for 93 countries is in August, the last month of the first Covid-19 wave.[5] Another 29 countries' death totals were observed in July, and all but three of the remaining countries' deaths were observed in late June or in September.

There is high variation in Deaths across countries. Eight countries, including for example Tanzania, Thailand and Sri Lanka, had fewer than one death per million, while at the other extreme, Belgium, Spain and Peru had more than 600 deaths per million. Although at the extremes for the world as a whole these countries were not such outliers in their own regions or among their peers. Five out of the ten countries with the fewest deaths per million were in Sub-Saharan Africa while six European countries were in the top ten. No OECD countries were in the bottom 20, while eight were in the top ten.[6]

The Gini coefficient has an unweighted mean of 38.5 and a median of 36.7. It varies quite widely, from 24.2 in Slovenia to 63.0 in South Africa. Among the G7 countries, the lowest Gini coefficients are seen in France (31.6) and Germany (31.9), while the highest are found in Italy (35.9) and the U.S. (41.4). Among large emerging market countries, Russia (37.5) and India (37.8) are at the low end while Brazil (53.9) and South Africa (63.0) are at the high end. Many countries in Africa and Latin America have quite high-income inequality; the median Gini coefficient in Sub-Saharan Africa is 44.5 and that in Latin America & the Caribbean is 46.1. High income countries in Northern Europe and the Asia-Pacific region, on the other hand, tend to be at the opposite extreme.

Pov1.9, Pov3.2 and Pov5.5 are the absolute poverty headcount ratios published by the World Bank, calculated using poverty lines of $1.90, $3.20 or $5.50 (USD; 2011 PPP), respectively.

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[3] For some countries a variable was not available for the indicated year. In those cases the most recent available year was used.

[4] The date of the first confirmed case is not a reliable indicator of when the pandemic began in a country. There are several countries which reported a single case for many days before numbers began to increase, which may indicate that the initial case was contained and spread of the virus had not begun.

[5] Globally, new Covid-19 cases reached their trough in the third week of August, when the daily average number of new cases was 257,396. After that, numbers began to slowly increase week by week. Deaths reached their trough in the second week of September, with an average of 5,066 deaths per day. See European Centre for Disease Prevention and Control (2021).

[6] The five Sub-Saharan countries in the bottom ten were Botswana, Mozambique, Rwanda, Tanzania and Uganda. The six European countries in the top ten were Belgium, France, Italy, Spain, Sweden and the UK. Together with Chile and the US they make up the eight OECD countries in the top ten.

Table 1: Data Characteristics

Variable Names	Description	Source	Mean	Median	Standard Deviation	Minimum	Maximum
Deaths	Cumulated Covid-19 deaths per million persons, 150 days after 10th confirmed case	OWID	96.8	27.4	155.7	0.1	848.7
Gini	Gini Coefficient, 2018	WDI	38.5	36.7	8.2	24.2	63.0
Pov1.9, Pov3.2, Pov5.5	Poverty headcount ratio (% of population); with \$1.90, \$3.20 and \$5.50 per day poverty lines (USD, 2011 PPP), 2018.	WDI	13.6 25.1 39.1	2.1 9.7 27.8	20.1 29.3 35.5	0.0 0.0 0.0	77.6 91.0 97.7
SocPov	"Societal poverty" headcount ratio (% of population); poverty line = 50% of median income or consumption with \$1.90 PPP per day lower bound, 2018.	WB	27.3	24.0	15.3	3.0	75.8
Age	% of population aged 65 or over, 2019	WDI	9.5	7.0	6.7	1.2	28.0
Urban	Urban population as % of total population 2019	WDI	60.3	61.9	21.1	13.3	98.0
BCG	Dummy: country has a current universal BCG vaccination policy	BCGWA	0.820	1	0.384	0	1
Beds	Hospital beds per 1,000 people, 2015.	WDI	2.8	2.1	2.4	0.1	13.4
GDPpc	GDP Per Capita (USD PPP) 2019	WDI	20,521	13,574	20,717	984	121,293
Democracy	2020 Democracy Index	EIU	5.6	5.9	2.1	1.1	9.8

Notes: 1) BCGWA = BCG World Atlas (2021); EIU = Economist Intelligence Unit (2021); OWID = Our World in Data (2021); WDI = World Bank's World Development Indicators 2020: WB = communication with members of the Development Data Group at the World Bank, as reported in Section IV of the paper.
2) Data are unweighted.

Researchers in the Development Data Group at the World Bank have recently developed a "societal poverty" measure, referred to here as SocPov (Schoch, Jolliffe and Lakner, 2020;

Jolliffe and Prydz, forthcoming). It uses a poverty line equal to 50% of country median income or consumption, but with a lower bound of $1.90 (2011 PPP). While it is a hybrid between relative and absolute poverty measures, since the lower bound is binding for only seven of the countries considered here, for present purposes it is close to a relative poverty measure. Among the poverty measures, Pov1.9 performs best in the regressions reported in the next section.

Per cent of the population aged 65 or more (the variable Age) has a mean of 9.5% and ranges widely, from 1.2% (United Arab Emirates) to 28.0% (Japan). As seen in the next section, this variable is quite strongly related to Covid-19 mortality. Regionally, it is lowest in Sub-Saharan Africa, where its median is just 3.3%, and highest in Europe, where the median is 18.6%.

As found in studies mentioned in section II, BCG tuberculosis vaccination has a negative effect on Covid-19 severity. BCG here is a dummy variable indicating that a country has a current policy of universal BCG vaccination. As indicated by the mean, 82% of countries in the sample have such a policy. The ones that don't are mostly in the rich world, where tuberculosis is no longer a widespread threat. A few countries - - Cyprus, Italy, the Netherlands and the US - - are reported as never having had a universal BCG vaccination policy although they do have vaccination of special groups.

Beds is the number of hospital beds per 1,000 people. As found in the previous studies mentioned in section II, this variable has a negative effect on Covid-19 deaths. It may reflect partly the quality of a country's healthcare system and partly its capacity to handle a surge of patients during an epidemic. The number of hospital beds varies considerably both within and across regions, even when mean income is similar. For example, it is 2.8 per 1,000 in the U.K. but 8.3 in Germany. The range across regions is from a median of 1.0 in Sub-Saharan Africa to 4.8 in Europe.

Alternative indexes are available for the level of democracy by country. Here the index published annually by the Economist Intelligence Unit (associated with *The Economist* magazine) is used. This index is based on assessments of the quality of the electoral process, the degree of pluralism, how well government functions, political participation and culture, and civil liberties. Unlike some alternative indexes, such as Polity IV used by Banik et al., it recognizes differences in the quality of democracy among some rich countries that qualify as democracies but cannot reasonably be regarded as equally democratic.[7]

GDPpc is GDP per capita in USD and 2011 PPP terms. It ranges from $984 in the Central African Republic to $121,293 in Luxembourg. The country mean is $4,037 in Sub-Saharan Africa;

[7] For example, the Polity IV democracy index rates both Norway and the US at 10 on a 10-point scale. In contrast, the EIU index places Norway at 9.81, the highest score awarded, and the US at 7.92, which appears more appropriate given the differences in these countries' electoral practices and systems.

$6,610 in South Asia, $49,629 in Europe & North America, and between $15,300 and $18,400 in the other world regions.

The final variable is Urban, the fraction of the population living in urban areas. This has a mean of 60.3% and varies widely - - from 13.3 % in Papua New Guinea to 98.0% in Belgium. Other countries with very low urbanization include many in Africa (e.g. Niger, Malawi and Rwanda) and a few in Asia-Pacific (Nepal and Sri Lanka). Countries that are almost as highly urbanized as Belgium include Argentina, Israel and Uruguay.

Table 2 provides information on the regions identified. The regional breakdown is conventional for Latin America & the Caribbean (LAC) , Sub-Saharan Africa (Sub-Sah) , South Asia, and East Asia & Pacific (EAP). MENACA adds Central Asia to the Middle East & North Africa, on the grounds of cultural and socio-economic similarity as well as broadly similar Covid-19 experience. For similar reasons, Europe and North America (including only Canada and the US) are put together in EurNA.

Table 2: Characteristics of Regions

Region	Geographic Description	Number of Countries	Share of Population (%)	Share of Total Deaths (%)	Mean Gini Coeff.	Mean Pov1.90 Headcount Ratio (%)
EAP	East Asia & Pacific	10	29.8	2.1	38.1	1.5
EurNA	Europe & North America	39	14.6	51.3	35.9	0.7
LAC	Latin America & Caribbean	23	8.7	31.5	48.2	4.1
MENACA	Middle East, North Africa & Central Asia	23	7.7	5.8	35.1	5.8
SAsia	South Asia	6	24.7	6.9	36.7	18.2
SubSah	Sub-Saharan Africa	40	14.6	2.4	41.4	45.6
ALL	All regions	141	100.0	100.0	38.6	12.5

Notes: 1) For definitions and sources see Table 1.
2) Means for the Gini Coefficient and Pov1.90 Headcount Ratio are weighted using country population.

One sees wide differences in Covid-19 deaths across regions in Table 2. EurNA and LAC have shares of Covid-19 deaths that are more than three times their share of global population. At the other extreme, SA has a death share equal to about a quarter of its population share, while both EAP and Sub-Sah have death share less than one sixth of their population share. Gini and Pov1.90 also vary widely across the regions, in line with the earlier discussion.

V. Results

Table 3 shows the main regression results. The dependent variable is Deaths, that is Covid-19 deaths per million after 150 days of the pandemic at the country level. The regressions use OLS, weighted by country population. All runs use both the Gin coefficient and the World Bank's absolute measure Pov1.9, based on a living standard of $1.90 (2011 PPP) per day. The regressions can be run instead using $3.20 and $5.50 poverty lines, as well as the societal poverty measure SocPov, which is close to being a relative poverty index, as mentioned in the previous section. Regressions with these alternative poverty measures and the full set of independent variables are reported in Appendix Table A1. Using the alternative measures provides insignificant and slightly less precise estimates of the coefficient on poverty, all of which are negative except for SocPov, which has a positive coefficient. If the Gini coefficient is omitted, the coefficient on poverty is negative and insignificant, whatever poverty measure is used when there is a full set of regressors (Appendix Table A2).

In column 1 of Table 3 a regression of Deaths on Gini and Pov1.9 alone is reported for reference. The variable Gini has a significant positive effect and Pov1.9 a significant negative effect, features that continue through the four following regressions, which introduce regional dummies and then demographic, healthcare, and other variables. [8] The negative association of poverty with Covid-19 deaths across countries may come as a surprise, given it is well established that poverty generally harms health. However, this finding is not inconsistent with findings from the few previous studies that have looked at the effect of poverty on Covid-19 cases and deaths, discussed in Section II. A negative effect of poverty can be reconciled with a positive effect of the Gini, mathematically, if Covid-19 deaths are an *increasing* convex function of income.[9]

The regional dummies have high explanatory power, raising R^2 from 0.164 in the first column to 0.668 in the second, and remaining highly significant when other variables are added. East Asia and the Pacific (EAP) is the omitted category. The largest effects are for Europe & North America (EurNA) and Latin American & the Caribbean (LAC), associated with 134 and 202 additional deaths per million, respectively, in the final regression compared with EAP. Next comes the Middle East, North Africa & Central Asia (MENACA) with 59 extra deaths per million,

[8] As a check on these results the regressions were run using the WIID estimates of the Gini coefficient, as used in Davies and Shorrocks (2021). Results were similar, although the coefficients on Gini and Pov1.9 were somewhat lower. For example, those coefficients were 2.944 and -0.881 in regression 5, compared with 3.566 and -0.781 in Table 3. Also, the p-values were higher for Gini and a little lower for Pov1.9 than seen here.

[9] As pointed out in Section III, inequality will increase average morbidity and mortality, in general, if the latter are convex functions of income, in view of Jensen's inequality. This result does not depend on the sign of the relationship.

Table 3: Regression Results for First-Wave Covid-19 Deaths per Million

Variables:	(1)	(2)	(3)	(4)	(5)	(6)
Gini	8.091**	4.847***	4.242**	3.482**	3.566**	-9.962**
	(3.786)	(1.698)	(1.702)	(1.574)	(1.529)	(4.384)
Pov1.9	-2.790**	-0.915***	-0.642**	-0.689**	-0.781**	-0.106
	(1.167)	(0.295)	(0.289)	(0.318)	(0.346)	(0.395)
Age			0.265	9.235*	8.901 †	11.190*
			(3.583)	(5.310)	(5.438)	(5.774)
Urban			1.582*	1.275*	1.568**	1.866**
			(0.852)	(0.742)	(0.788)	(0.769)
BCG				-136.008**	-164.817*	-185.660**
				(65.176)	(88.342)	(82.565)
Beds				-20.787*	-18.754*	-18.710*
				(10.557)	(10.846)	(10.662)
GDPpc					-1.410	-1.775
					(1.707)	(1.759)
Democracy					3.266	-87.437***
					(3.910)	(32.581)
Gini x Dem.						2.341***
						(0.844)
EurNA		312.362***	282.584***	138.750***	145.951***	133.899***
		(49.834)	(52.125)	(28.523)	(30.580)	(30.478)
LAC		264.642***	238.889***	233.681***	219.943***	202.273***
		(46.514)	(49.009)	(47.701)	(46.634)	(45.407)
MENACA		77.644***	72.490***	74.496***	73.220***	58.849**
		(16.870)	(27.431)	(24.795)	(24.505)	(25.100)
SAsia		40.277***	77.582***	46.733***	36.950**	41.194**
		(7.665)	(16.044)	(14.860)	(17.372)	(16.004)
SubSah		32.763***	55.650**	61.191***	54.119***	45.104**
		(13.413)	(25.336)	(21.682)	(20.707)	(18.530)
Constant	-190.175	177.198***	253.595***	-86.636	-70.160	435.926***
	(137.876)	(64.930)	(68.191)	(113.458)	(120.566)	(167.639)
N	141	141	141	139	135	135
R Squared	0.164	0.668	0.679	0.762	0.765	0.781

Notes: † $p < 0.15$, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$; robust standard errors in brackets; see Table 1 for variable definitions.

and then Sub-Saharan Africa (SubSah) and South Asia (SAsia) at 45 and 41. Given mean deaths per country of 97 unweighted and 87 weighted, these are large effects indeed.

One question that could be asked is whether the regional dummies rob poverty of a positive effect. Table A3 in the Appendix runs the same regressions as shown in Table 3, but without the regional dummies. The coefficient of Pov1.9 is insignificant in all the regressions that include variables beyond the Gini and Pov1.9. Briefly positive, when the demographic variables Age and Urban are first added, it becomes negative as soon as the healthcare variables BCG and Beds are included. These results suggest that using the regional dummies in the main regression results does not obscure a true positive effect of Pov1.9.

The coefficients on both Gini and Pov1.9 fall, in absolute value, when the region dummies are introduced, and then decline a little further in the next four columns, where additional variables are added. The possibility that Gini, Pov1.9 and the other continuous variables had non-linear effects was checked by introducing squared terms, but none proved significant even at the 10% level. A search for interaction effects between Gini and Pov1.9 with all the other variables generated one significant result: a positive interaction between the Gini and the Democracy index that is significant at the 1% level according to a partial F test. This is shown in the final column of Table 3, where one sees that introducing this interaction results in the Democracy level itself becoming significant at the 1% level and also in increased significance for Age and BCG.

At the means, the elasticity of Deaths with respect to Democracy is 0.17 while the elasticity with respect to the Gini is 0.91. The marginal effect of Democracy on Deaths is positive when the Gini is above 37.36, which holds for 68 countries that together have 70.0% of the global population. The marginal effect of the Gini on Deaths is positive when Democracy is above 4.26, which is true for 97 countries that together have 61.7% of global population.

The demographic variables Age (% of population aged 65+) and Urban (% of population living in urban areas) are basic components of the estimating equation (5) derived in Section III. They are each expected to have a positive effect on Deaths. When introduced in the third regression shown in Table 3 they have the expected positive coefficients, but only Urban is significant - - at the 10% level. However, Age becomes significant, also at the 10% level, when the healthcare variables - - the dummy for a universal BCG tuberculosis vaccination policy (BCG) and the number of hospital beds per 1,000 people (Beds) - - are introduced. The latter two variables have relatively large effects. One extra hospital bed per thousand, which would represent an average rise in Beds by about one third across countries, would reduce predicted deaths per million by 19 according to the final regression. Having universal BCG vaccination is associated with a reduction in expected deaths by fully 186 per million.

The last two variables introduced are GDP per capita in 2011 PPP terms (GDPpc) and a democracy index. Neither has a significant effect. In the case of GDPpc this may be surprising, although International Monetary Fund (2020) and Miller et al. (2020) found a similar result, as mentioned in section II. The crude correlation of GDPpc and Deaths is positive: the correlation coefficient is 0.414. The inclusion of variables like Age and Urban, which are correlated with GDPpc and have a positive effect on Deaths, appears to reveal that GDPpc does not have a positive direct impact on Deaths. The coefficient on GDPpc is in fact negative, although insignificant.

Counterfactuals

Table 4 reports a counterfactual exercise for the world, regions, and selected countries with large populations in each region. The purpose is to see how much first-wave Covid-19 death rates might have been reduced if countries with above-average Gini coefficients had had less inequality. It is assumed that the empirical relationship between the Gini coefficient and death rates in the data considered here remains unchanged. For this purpose, a regression excluding poverty and the interaction between Gini and Democracy was used (Appendix Table A4). Holding poverty constant while reducing inequality would not have been in the spirit of the exercise. Including the Gini – Democracy interaction leads to implausibly large effects on Deaths of reducing the Gini for countries with either very high or very low values of Democracy. [10]

One approach in this exercise would be to reduce all countries' Gini coefficients by the same amount. However, it is not clear that that is the most relevant exercise. Some countries already have low Gini coefficients. For example, Japan, France and Germany each have a Gini in the range 31.6 to 32.9. At the other extreme we have Brazil, South Africa and 13 smaller countries that all have a Gini above 50. Instead of reducing all Gini coefficients, the Table 4 experiments therefore only reduce them for countries with Gini coefficients above a reasonable threshold. Two alternative benchmarks are used.

The thresholds used in Table 4 are the median Gini coefficient in the OECD (35.6) and that in the G7 (33.8).[11] The table shows the results of shrinking the Gini coefficients of those countries with "excess" inequality relative to the chosen benchmarks, by reducing their Gini alternatively by 50% of the excess and then by 100%. The results are shown in the last four columns of the table.

The counterfactual changes are of course greatest in the "100% shrinkage" case. Total deaths globally would have been smaller by 67,900 using the OECD median Gini target and 89,900 with

[10] For reference, Table A5 in the Appendix reports the counterfactual results using the final regression equation in Table 3, which includes Pov1.9 and the Gini x Democracy interaction. With this alternative procedure the globa reduction in deaths resulting from a reduction in inequality is somewhat smaller.

[11] These medians are weighted by country population. That is, half the OECD or G7 population is in countries that have Gini coefficients below the respective median.

Table 4: Counterfactual Effects of Changes in Gini Coefficient on First-Wave Covid-19 Deaths

Region/Country	Gini[1]	Deaths per million	Total Deaths	Fall in Total Deaths when "excess" Gini reduced toward median Gini for..			
				OECD by 50%	OECD by 100%	G7 by 50%	G7 by 100%
East Asia & Pacific							
China	38.5	3.2	4,638	4,638	4,638	4,638	4,638
Indonesia	39.0	19.7	5,388	1,610	3,219	2,484	4,967
Japan	32.9	7.7	971	0	0	0	0
Region:	**38.1**	**6.2**	**13,631**	**8,109**	**10,100**	**9,360**	**11,901**
Europe & North America							
United States	41.4	375.0	124,142	3,335	6,670	4,393	8,785
Russia	37.5	96.6	14,104	477	953	943	1,886
United Kingdom	34.8	597.7	40,576	0	0	119	237
Region:	**35.9**	**306.9**	**318,474**	**3,929**	**7,857**	**5,974**	**11,947**
Latin America & Caribbean							
Brazil	53.9	442.7	94,104	6,781	13,562	7,460	14,921
Mexico	45.4	348.1	44,876	2,200	4,399	2,612	5,223
Colombia	50.4	240.7	12,250	1,312	2,625	1,475	2,950
Region:	**48.2**	**317.0**	**201,828**	**13,601**	**26,677**	**15,501**	**30,314**
Middle East, North Africa and Central Asia							
Turkey	41.9	69.3	5,844	923	1,847	1,193	2,380
Iran	40.8	166.4	13,979	758	1,517	1,027	2,053
Egypt	31.5	47.5	4,865	0	0	0	0
Region:	**35.1**	**65.2**	**36,881**	**2,053**	**4,069**	**2,941**	**5,591**
South Asia							
India	37.8	25.3	34,956	5,229	10,458	9,639	19,278
Pakistan	33.5	26.7	5,892	0	0	0	0
Bangladesh	32.4	21.1	3,471	0	0	0	0
Region:	**36.7**	**24.5**	**44,506**	**5,240**	**10,469**	**9,650**	**19,289**
Sub-Saharan Africa							
South Africa	63	161.9	9,604	2,834	5,669	3,024	6,048
Kenya	40.8	8.8	472	472	472	472	472
Nigeria	35.1	4.7	973	0	0	468	936
Region:	**41.4**	**14.5**	**15,557**	**5,745**	**8,750**	**6,873**	**10,807**
World	**38.6**	**87.2**	**640,877**	**38,677**	**67,922**	**50,298**	**89,949**

1.Region and World Gini coefficients are country population weighted means.

the G7 target, rounding off to the nearest 100. These reductions are 11% and 14%, respectively, of the actual total deaths of 640,877.[12]

The counterfactual reductions in total deaths vary considerably by region. The absolute reductions differ depending not only on the size of the average "Gini excess" in a region but also on its population. Further, the simulated reductions are not allowed to exceed the actual number of Covid-19 deaths in a country, which is a binding constraint in some of the runs for China and Kenya.

A smaller population and low excess inequality lead to the small counterfactual death reductions in the Middle East, North Africa and Central Asia (5,504 at the most), while Latin America and the Caribbean, with similar population but much higher inequality has a much larger reduction (29,813 in the most extreme case). South Asia and East Asia & the Pacific have fairly large reductions (18,960 and 11,816 at the most), not because of high inequality but due to large population.

Country level results are striking. Six of the 18 countries highlighted in the table have a zero reduction in deaths in the OECD target case, because their actual Gini is less than the OECD median. Four - - Bangladesh, Egypt, Japan and Pakistan - - continue to have no reduction in the G7 target case. At the other end, another four countries- - Brazil, India, South Africa and the United States account for 53% of the total reduction of deaths in the "full shrinkage" OECD target case and 54% in the corresponding G7 case.

The United States had the largest number of deaths, accounting for 19% of recorded global Covid-19 deaths here, despite being one of the richest and most advanced countries. Its case is therefore of particular interest. Canada is a natural comparator for the US and, conveniently, has the G7 median Gini of 33.8. The G7 case in Table 4 therefore indicates the result of shrinking a country's Gini down toward Canada's level, if its Gini is above that. If done fully, the counterfactual calculation suggests, that shrinkage would have resulted in 8,636 fewer deaths in the US, a drop equal to 7.0 % of actual deaths. Reducing US deaths per million to the Canadian level would be a 37.7% drop. Hence, according to this calculation, the higher Gini coefficient in the US accounts for 19% of the gap between its deaths per million and those of Canada.

VI. Conclusion

It has been found that first-wave Covid-19 crude death rates by country were consistently and positively related to the Gini coefficient for income. Absolute poverty was found to have a significant negative effect in this setting. At the margin a one percentage point increase in a

[12] The reduction in deaths is not directly proportional to the % Gini shrinkage because in some cases the calculation would lower a country's Covid-19 deaths below zero, if not corrected. A zero lower bound on these deaths is applied, and binds more often under 100% shrinkage.

country's Gini coefficient yielded 2.0 additional deaths per million people. The elasticity of deaths with respect to the Gini, evaluated at the means was 0.9.

The regressions indicate that two underlying factors that might be expected to reduce Covid-19 deaths had no significant effect: GDP per capita and democracy. The impact of other underlying factors is more as expected. The percent of elderly in the population, and the % living in urban areas, both have a positive impact while the number of hospital beds per thousand has the opposite effect. Having universal BCG vaccination reduces deaths substantially.

Differences in Covid-19 death rates across countries and regions are striking. Deaths in Latin America and the Caribbean, and in Europe and North America, were over 300 per million, while at the opposite extreme, in East Asia and the Pacific, they were only six per million. These regional differences are partly related to the variables included in the regressions, but the size of the coefficients on regional dummies indicates that the differences are also due to unobserved factors. The latter may include socio-economic differences, culture, climate, completeness of recorded deaths, travel patterns and various other factors. But these differences are not related to the duration of the pandemic, as deaths are observed 150 days after the onset the pandemic in each country.

The paper ended with counterfactual calculations that assume the empirical pattern shown in the regressions would be unchanged. On this basis, there would have been an appreciable reduction in Covid-19 deaths in the first wave if countries that have high income inequality had had Gini coefficients at, or closer to, the median Gini's for the OECD or G7, which are moderate. If the Gini coefficient in all countries where it is above the OECD median of 35.6 was instead at that median, 67,900 fewer deaths would have been expected after 150 days of the pandemic. That is a reduction of 11% in total deaths. Shrinking "excess Ginis" to the G7 median of 33.8 would have reduced deaths by 89,900, or 14% of actual deaths, according to these calculations.

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Appendix

Table A1: Regressions for First-Wave Covid-19 Deaths per m., Alternative Poverty Measures

Variables:	Pov1.9	Pov3.3	Pov5.5	SocPov
Gini	-9.962**	-10.068**	-10.117**	-7.980**
	(4.384)	(4.217)	(4.008)	(3.992)
Poverty	-0.106	-0.052	-0.131	0.187
	(0.395)	(0.400)	(0.536)	(0.776)
Age	11.190*	11.185*	10.996*	11.444*
	(5.774)	(5.846)	(5.932)	(5.821)
Urban	1.866**	1.857**	1.814**	2.055***
	(0.769)	(0.785)	(0.771)	(0.771)
BCG	-185.660**	-185.550**	-186.841**	-169.075**
	(82.565)	(82.845)	(84.238)	(78.998)
Beds	-18.710*	-18.729*	-18.697*	-20.739**
	(10.662)	(10.685)	(10.638)	(10.464)
GDPpc	-1.775	-1.776	-1.835	-1.434
	(1.759)	(1.777)	(1.847)	(1.691)
Democracy	-87.437***	-88.005***	-87.955***	-74.285**
	(32.581)	(32.060)	(30.379)	(28.721)
Gini x Dem.	2.341***	2.357***	2.361***	1.947***
	(0.844)	(0.819)	(0.783)	(0.721)
EurNA	133.899***	133.659***	132.936***	138.261***
	(30.478)	(30.344)	(31.115)	(30.370)
LAC	202.273***	201.922***	201.452***	216.846***
	(45.407)	(45.160)	(45.297)	(41.836)
MENACA	58.849**	58.568**	58.478**	58.447**
	(25.100)	(25.214)	(24.689)	(24.142)
SAsia	41.194**	41.351***	43.203**	45.887***
	(16.004)	(15.847)	(17.323)	(14.810)
SubSah	45.104**	43.335**	44.831**	40.734**
	(18.530)	19.439)(	(20.013)	(19.036)
Constant	435.926***	440.585***	452.002***	334.010**
	(167.639)	(162.024)	(171.430)	(133.593)
N	135	135	135	136
R Squared	0.781	0.781	0.781	0.791

Notes: † $p < 0.15$, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$; robust standard errors in brackets; see Table 1 for variable definitions.

Table A2: Regression Results for First-Wave Covid-19 Deaths per million. without Gini, Alternative Poverty Measures

Variables:	Pov1.9	Pov3.3	Pov5.5	SocPov
Poverty	-0.707	-0.564	-0.462	0.126
	(0.445)	(0.486)	(0.606)	(0.726)
Age	8.326	7.992	7.720	9.203*
	(8.326)	(5.336)	(5.430)	(5.348)
Urban	2.041**	1.892**	1.856**	2.337***
	(0.811)	(0.834)	(0.862)	(0.812)
BCG	-144.974	-145.361	-146.879	-133.093
	(89.751)	(90.408)	(91.525)	(84.774)
Beds	-21.459**	-21.394*	-21.493**	-23.786**
	(10.826)	(10.839)	(10.778)	(10.558)
GDPpc	-1.189	-1.251	-1.333	-0.848
	(1.704)	(1.731)	(1.810)	(1.623)
Democracy	4.047	4.949	4.770	1.020
	(4.118)	(4.674)	(4.919)	(3.152)
EurNA	140.960***	140.137***	137.476***	141.465***
	(30.876)	(31.119)	(32.057)	(30.217)
LAC	236.737***	234.999***	232.591***	249.195***
	(49.541)	(49.575)	(50.356)	(45.325)
MENACA	53.893**	53.774**	52.622**	50.243**
	(21.404)	(21.864)	(21.903)	(20.935)
SAsia	31.149*	37.318**	33.962*	34.006**
	(18.069)	(17.605)	(17.742)	(14.998)
SubSah	60.468**	56.848**	45.502*	36.915
	(26.438)	(27.256)	(23.054)	(24.098)
Constant	28.175	42.925	60.019	-0.498
	(105.038)	(108.556)	(121.837)	(105.593)
N	135	135	135	136
R Squared	0.756	0.756	0.755	0.772

Notes: † $p < 0.15$, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$; robust standard errors in brackets; see Table 1 for variable definitions.

Table A3: Regression Results for First-Wave Covid-19 Deaths per Million, without Regional Dummies

Variables:	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
Gini	8.091**	5.566*	5.354**	4.817**	-14.174***
	(3.786)	(2.906	(2.313)	(2.047)	(4.974)
Pov1.9	-2.790**	0.348	-0.122	-0.436	0.365
	(1.167)	(1.184)	(0.559)	(0.486)	(0.626)
Age		5.302	10.514**	7.747 †	12.029**
		(5.813)	(4.851)	(5.482)	(5.643)
Urban		3.461***	3.408***	3.926***	3.848***
		(1.055)	(0.875)	(0.997)	(0.959)
BCG			-167.624***	-217.008**	-232.914***
			(57.520)	(87.949)	(87.296)
Beds			-31.970***	-23.677**	-24.106**
			(9.873)	(9.843)	(10.020)
GDPpc				-2.213	-2.668
				(1.933)	(1.941)
Democracy				12.169*	-114.361***
				(6.371)	(38.961)
Gini x Democ.					3.274***
					(1.005)
Constant	-190.175	-373.559***	-173.348***	-153.708	556.595***
	(137.876)	(120.748)	(147.481)	(138.519)	(203.550)
N	141	141	139	135	135
R Squared	0.164	0.375	0.649	0.670	0.704

Notes: † $p < 0.15$, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$; robust standard errors in brackets; see Table 1 for variable definitions.

Table A4: First-Wave Covid-19 Deaths per Million Regression without Poverty variable or Gini-Democracy Interaction

Variables:	Coefficients		Variables (continued):	Coefficients
Gini	3.492**		**EurNA**	145.508***
	(1.590)			(29.872)
Age	9.216*		**LAC**	215.381***
	(5.397)			(46.937)
Urban	1.682**		**MENACA**	69.921***
	(0.791)			(24.358)
BCG	-155.547*		**SAsia**	27.881
	(84.351)			(18.820)
Beds	-19.564*		**SubSah**	24.161
	(10.601)			(16.845)
GDPpc	-1.256		**Constant**	-86.743
	(1.664)			(118.717)
Democracy	3.045		**N**	137
	(3.940)		**R Squared**	0.762

Notes: * p < 0.1, ** p < 0.05, *** p < 0.01; robust standard errors in brackets; see Table 1 for variable definitions.

Table A5: Counterfactual Effects of Changes in Gini Coefficient on First-Wave Covid-19 Deaths, based on regression including Pov1.9 and Gini-Democracy interaction

Region/Country	Gini[1]	Deaths per million	Total Deaths	Fall in Total Deaths when ”excess” Gini reduced toward median Gini for..			
				OECD by 50%	OECD by 100%	G7 by 50%	G7 by 100%
East Asia & Pacific							
China	38.5	3.2	4,638	-9,601	-19,203	-15,724	-31,417
Indonesia	39.0	19.7	5,388	2,205	4,411	3,403	5,388
Japan	32.9	7.7	971	0	0	0	0
Region:	**38.1**	**6.2**	**13,631**	**-5,153**	**-12,549**	**-9,993**	**-23,712**
Europe & North America							
United States	41.4	375.0	124,142	8,191	16,381	10,788	21,577
Russia	37.5	96.6	14,104	-302	-604	-598	-1,196
United Kingdom	34.8	597.7	40,576	0	0	340	681
Region:	**35.9**	**306.9**	**318,474**	**8,096**	**16,192**	**11,529**	**23,185**
Latin America & Caribbean							
Brazil	53.9	442.7	94,104	12,109	24,218	13,322	26,644
Colombia	50.4	240.7	12,250	2,449	4,898	2,752	5,505
Mexico	45.4	348.1	44,876	2,675	5,349	3,176	6,351
Region:	**48.2**	**317.0**	**201,828**	**20,533**	**40,714**	**23,282**	**46,198**
Middle East, North Africa and Central Asia							
Turkey	41.9	69.3	5,844	139	277	179	358
Iran	40.8	166.4	13,979	-1,045	-2,090	-1,415	-2,829
Egypt	31.5	47.5	4,865	0	0	0	0
Region:	**35.1**	**65.2**	**36,881**	**-746**	**-1,492**	**-1,217**	**-2,442**
South Asia							
India	37.8	25.3	34,956	8,251	16,502	15,209	30,419
Pakistan	33.5	26.7	5,892	0	0	0	0
Bangladesh	32.4	21.1	3,471	0	0	0	0
Region:	**36.7**	**24.5**	**44,506**	**8,262**	**16,513**	**15,220**	**30,430**
Sub-Saharan Africa							
South Africa	63	161.9	9,604	5,309	9,604	5,664	9,604
Kenya	40.8	8.8	472	258	472	350	472
Nigeria	35.1	4.7	973	0	0	49	98
Region:	**41.4**	**14.5**	**15,557**	**2,255**	**2,420**	**1,586**	**80**
World	**38.6**	**87.2**	**640,877**	**33,247**	**61,798**	**40,470**	**73,738**

1.Region and World Gini coefficients are country population weighted means.