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How social indicators and healthcare systems shape pandemic outcomes: Lessons from COVID-19

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Abstract

Introduction: The COVID-19 pandemic exposed structural weaknesses in healthcare and socioeconomic systems worldwide. This study examines how perceived corruption, health literacy, and communication with healthcare workers influenced COVID-19 cases and deaths across 79 countries. While earlier research considered various determinants, these socio-institutional factors remain underexplored in cross-country analyses. By integrating them into a single empirical framework, this study offers new insights into how trust and public awareness affect pandemic outcomes.

Methods: Using cross-sectional data from 79 countries, we employed Ordinary Least Squares (OLS) regression to analyze two outcomes: reported COVID-19 cases and deaths. Key independent variables include perceived corruption, a composite health literacy index, and citizens' ability to communicate with healthcare workers.

Results: Perceived corruption is negatively associated with both cases and deaths, significant at the 1% level—a one-unit rise predicts a 76% drop in cases and 2.77-fold reduction in deaths. Perceived criminality increases death rates by 148% (5% significance). Health literacy shows a positive association with reported cases (2.28-fold increase, 5% significance), likely reflecting greater testing and awareness. Its relationship with deaths is positive but not statistically significant. Communication with healthcare workers is linked to a 119% increase in deaths (10% significance), possibly indicating late engagement with medical services.

Discussion: The results highlight how institutional trust, public awareness, and healthcare access shape pandemic responses. Corruption may undermine public compliance, while health literacy enhances early detection. Increased mortality associated with delayed communication suggests gaps in timely care access.

Take-home message: Strengthening health literacy and institutional integrity is essential for managing future health crises. These factors significantly influence pandemic outcomes and should be prioritized in global health policy.

Keywords: COVID-19, healthcare systems, socio-economic indicators, public trust, health literacy, pandemic response.

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INTRODUCTION

The World Health Organization first became aware of an onset of 'pneumonia of unknown cause' in Wuhan in December 2019 [1]. That was the beginning of the domino effect that has gripped the whole world in its chain of events. Regardless of the country's economic and social standings around the world, the pandemic spread in multiple waves at an unprecedented level [2], highlighting the grim state of the healthcare sectors rife with inequality [3], underfunding, and resource scarcity relative to demand [4], people's distrust of government institutions [5] as well as towards each other when it comes to important health information [6], and people's reluctance to accept scientific knowledge surrounding the disease [7]. As of June 1, 2025, the global number of confirmed COVID-19 cases stands at 778,050,175, with 7,096,935 confirmed deaths, reflecting the enduring impact of the pandemic over the past five years. [8].

Cacciapaglia, Cot, and Sannino [2] argue that the proliferation of pandemics in waves can be mitigated by taking the right measures when the spread of the virus is still linear. In other words, adequate policy measures and their implementation are of crucial importance during the initial stage of a pandemic. Proper implementation of public policy goes hand in hand with public compliance. Therefore, to understand the whys of this unprecedented spread of COVID-19, certain socio-economic indicators pertaining to public trust, dissemination of information, public awareness, and the state of the healthcare sector in countries are explored in this paper.

With a cross-section dataset of 79 countries, this paper empirically tests whether some important indicators, namely corruption, political rights, perceived criminality, access to online governance, Health Literacy Index, Gini coefficient, and state of the healthcare sector indicators, namely out of pocket health expenditure as percentage of current health expenditure, access to quality health, emergency preparedness and response planning, laboratory systems, and communication with healthcare workers, had any impact on the spread of Covid-19, measured by reported cases and deaths as of 31st December 2020.

One important indicator considered in this paper is the Health Literacy Index, which is calculated using the Social Progress Index database to capture the extent to which people can understand and utilize health information. The socio-economic component of the model comprises six indicators, whereas the state of the healthcare sector component comprises five. A detailed explanation of the construction and explanation of the indicators are presented in the Methodology section of the paper. In order to obtain unbiased and robust estimated impacts of the variables, the effects of other important factors have been controlled.

The primary objective of this study is to analyze the impact of socio-economic indicators and healthcare system characteristics on the outcomes of the COVID-19 pandemic across different countries. Specifically, the study examines how factors such as public trust, political rights, health literacy, income inequality, and healthcare accessibility influenced the rates of transmission and mortality associated with COVID-19. By investigating these relationships, the study aims to identify key socio-economic and healthcare determinants that shaped the varied pandemic responses and outcomes observed globally. This objective emphasizes the importance of understanding how societal factors and healthcare infrastructure interact during a health crisis, providing empirical insights that can inform policy recommendations for enhancing public health systems and

preparedness for future pandemics. Against this backdrop, our paper seeks to test the following two hypotheses.

Hypothesis 1

Higher levels of public trust and health literacy are associated with lower COVID-19 transmission rates and mortality, as these factors enhance compliance with health guidelines and preventive measures.

According to Van de Walle and Migchelbrink [15], public trust, particularly in institutions free from corruption, positively affects law compliance and public cooperation with health guidelines during crises like pandemics. This suggests that higher public trust can lead to better adherence to preventive measures, reducing transmission rates. Another study by Blair, Morse, and Tsai [11] found that higher public trust during the Ebola outbreak in Liberia resulted in greater compliance with government health policies, supporting the idea that trust can influence behavior during health crises. In another study, Miller [21] argued that health literacy improves adherence to medical guidelines and preventive care, indicating that individuals with higher health literacy are more likely to adopt health-protective actions during pandemics.

Hypothesis 2

Countries with stronger healthcare infrastructure, characterized by greater accessibility and quality of healthcare services, experience lower COVID-19 mortality rates, irrespective of the socio-economic disparities.

According to Sanyaolu et al. [22], populations with better access to healthcare facilities and healthcare workers generally have lower mortality rates, as timely intervention helps manage severe cases. Another study conducted by Abbey et al. [39] analyzed OECD countries and found that the Global Health Security Index (which includes healthcare infrastructure quality) significantly impacts pandemic preparedness, suggesting that countries with robust healthcare infrastructure handle crises more effectively. Moreover, Litewka and Heitman [4] discussed how resource-rich healthcare systems in Latin American countries were better positioned to respond to the pandemic, reducing mortality rates through more accessible quality care.

Following the introduction, the Methods section outlines the data sources, construction of variables, and the econometric models used to assess the impact of socio-economic indicators and healthcare system characteristics on COVID-19 outcomes. This is followed by the Results section, which presents the key findings from two OLS regression models, examining reported COVID-19 cases and deaths across 79 countries. The Discussion section then interprets these findings in the context of existing literature, highlighting underlying mechanisms, policy implications, and study limitations. Finally, the Conclusion section summarizes the main insights and offers recommendations to improve institutional trust, strengthen health literacy, and enhance future pandemic preparedness.

The level of public trust is of paramount importance when it comes to the effectiveness of government policies. Low public trust acts as a hindrance in the implementation of public policies [9]. Moreover, Marien and Hooghe [10] showed that public trust and people's tendency to comply with the law are positively correlated. Specifically relating to a healthcare crisis, it has been shown from survey data that the more public trust there was, the greater the chances were for citizens to comply with healthcare policies imposed by the government during the Ebola outbreak [11]. The same conclusion was reached about COVID-19 with existing data [12] and the recent outbreak of Ebola in the Democratic Republic of Congo [13]. Another interesting finding is that law compliance is not only influenced by whether one trusts the law-giving institution but also by the attitudes of other people around that individual [14].

Van de Walle and Migchelbrink [15], with a sample size of 173 countries, empirically showed that among the three determinants of public trust (institutional quality, impartiality, and absence of corruption), institutional quality and absence of corruption were positively correlated with public trust, with the effect of the absence of corruption being the strongest. This finding is in line with

multiple previous studies that concluded corruption deteriorates public trust [16–18] and consequently undermines the effectiveness of government policies in a time of crisis.

Devine et al. [19] highlighted that perceived corruption erodes public trust, which in turn diminishes compliance with public health measures. Their analysis found that transparent governance positively correlates with adherence rates, emphasizing the need for integrity in public health communication and policy implementation. This finding aligns with Van de Walle and Migchelbrink's [15] work, which showed that corruption undermines public trust, subsequently weakening collective compliance during crises [19].

Recent studies have emphasized the importance of health literacy in shaping public response to health guidelines. A study by [20] demonstrated that higher health literacy among populations promotes proactive health behaviors, including adherence to preventive measures and vaccination uptake. This builds on Miller's [21] findings, showing that the integration of digital literacy with conventional health education significantly enhances public engagement with health advisories [20].

The role of healthcare infrastructure in managing pandemic mortality has been further analyzed in recent literature. Antioch, K. M. (2024) examined responses across several countries and concluded that robust healthcare systems, characterized by advanced emergency preparedness, are linked to lower mortality rates. These findings reinforce Sanyaolu et al.'s [22] conclusions, emphasizing the importance of sustained healthcare investment to improve pandemic resilience (Antioch, K. M., 2024)

When it comes to inequality and public trust, a number of empirical studies showed that income inequality and the extent to which people trust each other are negatively correlated [23–25]. Gustavsson and Jordahl [26] specifically showed that disparities in disposable income in the bottom half of the income distribution are associated with lower levels of trust. Although there isn't much literature available on the relationship between health inequality and the proliferation of pandemics or any healthcare crisis, Quinn and Kumar [27] discussed that income and social inequalities do aid in spreading contagious diseases. Ahmed et al. [28] wrote that poorer people with lower access to healthcare and communication channels are the most vulnerable since they are very likely to be unaware of many risk factors.

Multiple authors have identified the internet as an effective tool for spreading health-related information [29–31]. Therefore, it can be assumed that the extent of e-governance and the public's accessibility to it are important factors in the government's dissemination of important health information during pandemics. However, Filia et al. [32] showed a different side of the internet where social media have largely propagated the anti-vaccination movement, and as a result, the incidences of measles have increased in some countries. The quick spread of misinformation may undermine public trust and reduce the level of law compliance when it comes to government policies to combat a healthcare crisis.

Health literacy is defined as 'the degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions' [33]. Education is a key dimension of health literacy [34] since higher education is likely to increase rational behavior by developing thinking skills, accumulation of knowledge, and so forth [35]. This goes in line with the finding that health literacy leads to more compliance with medicative and preventive care [21], and lower healthcare literacy leads to choices that are not pro-health [36]. Moreover, it was found that people with health literacy are more likely to use the Internet to look for health information and make informed healthcare choices [37].

The quality of healthcare services reveals stark contrasts between developed and developing countries, reflecting systemic disparities exacerbated by various socioeconomic factors. Both the World Health Organization (WHO) and the World Bank (WB) have underscored these challenges in their analyses of global health systems. The literature emphasizes that inadequacies in healthcare infrastructure and human resources significantly impact healthcare quality, particularly in developing countries [38-40]. The state of the healthcare sector should reflect quality, accessibility, and affordability. The Global Health Security (GHS) Index released its first report on the preparedness of countries to tackle healthcare crises, shedding light on the poor state of the healthcare

sector in many countries. Although an analysis of OECD countries found no significant relation between COVID-19 cases and the GHS Index [41], three relevant variables were chosen from this index for this paper to represent the state of the healthcare sector, specifically when it comes to preparedness in dealing with crises. Three specific variables were chosen from within the Index, and not more, to avoid multicollinearity.

Recent literature has also provided important insights into the various impacts of the COVID-19 pandemic, particularly in terms of mental health, belief systems, and burnout across professional and volunteer populations. A persistent deterioration in student mental health, emphasizing prolonged effects such as anxiety, depression, and diminished academic motivation following the peak pandemic years, was observed [42]. Another author explored the psychological function of conspiracy theories, arguing that such beliefs may serve as cognitive coping mechanisms in contexts of uncertainty and distrust [43]. In a related study, a group of researchers found that childhood trauma and insecure attachment styles significantly moderated mental health trajectories during the prolonged pandemic, particularly among women, indicating long-term psychological vulnerability. Occupational burnout has emerged as a widespread consequence, especially among health professionals and volunteers [44]. Another group identified high burnout prevalence among Italian psychologists after the first wave, with workload and emotional exhaustion as dominant predictors [45].

Similarly, some researchers found that volunteer psychologists experienced elevated burnout levels during crisis response, influenced by overcommitment and lack of institutional support [45-46]. Broader systemic impacts were also documented, which quantified the financial burden of multiple COVID-19 waves in Israel, emphasizing the importance of preparedness and governance in mitigating long-term public health costs. Finally, a group employed time-series analysis to demonstrate both short- and long-term dynamics in hospitalization risk, reinforcing the need for responsive and adaptive healthcare infrastructure [47-49].

METHODS

Our empirical model aims to capture the impact of selected social indicators and the state of the healthcare sector on Covid-19 induced reported cases and deaths. Social indicators include corruption (Measures the perceived corruption in the public sector by citizens and ranges from 0 (very corrupt) to 100 (very clean)), political rights (PolRights), perceived criminality (PerCriminality), access to online governance (AccOnlineGov), Health Literacy Index (HealthIndex), and Gini coefficient. The state of the healthcare sector is represented by out-of-pocket health expenditure as a percentage of current health expenditure (OutofPocHCE), access to quality health (AccQualHealth), emergency preparedness and response planning (EpRp), laboratory systems (LabSys) and communication with healthcare workers (CommHCW). Control variables, namely Human Development Index (HDI), percentage of the population over the age of 65 years (Pop65), log of population (logPop) and GDP/Capita (logGDP/Capita), and a dummy variable to control for heterogeneity among countries.

Data is collected from a number of sources. The reported number of COVID-19 cases and deaths are collected from the Covid-19 database of the World Health Organization. The social indicators are collected from the Social Progress Index database (Corruption, Political Rights, Perceived Criminality, Access to Online Governance, and Health Index) and the World Bank data warehouse (GINI coefficient). Variables representing the state of the healthcare sector are collected from the World Bank data warehouse (Out-of-Pocket Healthcare Expenditure), the Social Progress Index database (Access to Quality Healthcare), and the Global Health Security Index (Emergency Preparedness and Response Planning, Laboratory Systems, and Communication with Healthcare Workers). Control variables are collected from the World Bank data warehouse (HDI, Percentage of Population over 65, Population, and GDP/Capita) and United Nations (Dummy).

E-participation tools on national government portals, ranging from 0 (low) to 1 (high), reflect the availability of information, e-consultation, and e-decision-making services. The variable 'access to essential services' from the Social Progress Index was initially included as a social indicator but

dropped due to a correlation above 0.9 with log GDP per capita, ensuring better econometric results. Access to quality healthcare is measured on a scale from 0 (poor quality for ⩾75% of citizens) to 4 (poor quality for <5%). The indicators EpRp, LabSys, and CommHCW are scored from 0 (poor) to 100 (perfect). The dummy variable distinguishes developed nations (coded '1', 31 countries) from developing nations (coded '2', 48 countries), with the latter category including both developing economies and economies in transition, as per the World Economic Situation and Prospects (2019). Due to limited data, Gini coefficients from 2016–2018 (latest available for each country) were used under the assumption that income inequality remains relatively stable over 1–3 years. Mortality rates are observed to be higher among individuals aged over 65 years. [50-51]

The dependent variables—cumulative reported COVID-19 cases and deaths—are measured as of December 31, 2020. This time point was purposefully selected as it reflects the global peak of the pandemic, prior to the widespread implementation of large-scale interventions such as mass vaccination and adaptive containment strategies by most countries. Utilizing data from this early phase allows the analysis to examine the fundamental relationships between socio-economic and institutional factors and pandemic outcomes without the confounding effects of later policy measures and varying national responses that emerged in subsequent years. Independent variables from the Social Progress Index, Global Health Security Index, and World Bank data warehouse correspond to 2019 values except for the Gini coefficient and out-of-pocket health expenditure.

Two cross-section ordinary least squares regressions are run with the same independent variables and the number of reported COVID-19 cases (Model 1) and number of reported COVID-19 deaths (Model 2) as the dependent variable.

The models are given by:

Model 1:

$$LogCases = \beta_0 + \beta_1 Corruption + \beta_2 PolRights + \beta_3 PerCriminality + \beta_4 AccOnlineGov + \beta_5 HealthIndex + \beta_6 Gini + \beta_7 OutofPocHCE + \beta_8 AccQualHealth + \beta_9 EpRp + \beta_{10} LabSys + \beta_{12} CommHCW + \beta_{13} Dummy + \beta_{14} HDI + \beta_{15} Pop65 + \beta_{16} logPop + \beta_{17} logGDP/Capita + \varepsilon$$

Model 2:

$$LogDeaths = \beta_0 + \beta_1 Corruption + \beta_2 PolRights + \beta_3 PerCriminality + \beta_4 AccOnlineGov + \beta_5 HealthIndex + \beta_6 Gini + \beta_7 OutofPocHCE + \beta_8 AccQualHealth + \beta_9 EpRp + \beta_{10} LabSys + \beta_{12} CommHCW + \beta_{13} Dummy + \beta_{14} HDI + \beta_{15} Pop65 + \beta_{16} logPop + \beta_{17} logGDP/Capita + \varepsilon$$

Due to the different ranges of variables in the dataset, the independent variables, namely Corruption, PolRights, PerCriminality, OutofPocHC, AccQualHealth, EpRp, LabSys, and CommHCW, have been normalized to a range of 0 to 1 with the formula:

$$Normalized\ Variable_i = (Actual\ variable_i - minimum\ (x)) / (Maximum\ (x) - minimum\ value\ (x))$$

For the calculation of the Health Literacy Index, four variables (primary school enrollment, secondary school attainment, years of tertiary schooling, and mobile subscription per 100 people), were used in equal weightage (0.25) and added together, where the maximum value is 1, representing perfect health literacy, and the minimum is 0, representing no health literacy. For some countries, mobile subscription per 100 people were more than 100. Any value above 100 has been set to 100.

The HDI calculation method was used where the values of the variables were first normalized to a range of 0 to 1 and then multiplied by 0.25. The equation used for normalizing was:

$$Variable_i = (actual\ value_i - minimum\ value_i) / (maximum\ value_i - minimum\ value_i)$$

According to UNDP [52], the minimum value represents 'natural zeroes', and the maximum value represents 'aspirational targets. For minimum values, it states, 'societies can subsist without formal education, justifying the education minimum of 0 years. Similarly, societies can subsist without any mobile subscription. Hence, for all four variables in the index, the minimum value was set to 0.

For maximum values, primary school enrollment and secondary school attainment were given as percentages of population. The maximum value was taken to be 100 % since Goal 4 (Target 4.1) of the Sustainable Development Goals aspires to ensure 'all girls and boys complete free, equitable and quality primary and secondary education…by 2030'. UNDP [52] states, "The maximum for expected

years of schooling, 18, is equivalent to achieving a master's degree in most countries". 12 years of primary and secondary education was deducted from the maximum of 18 years, and the maximum years of tertiary schooling was set to 6 years. For mobile subscriptions per 100 people, the maximum was set to 100. Only Greece had a value of 6.183 years. It was set at 6 years.

RESULTS

The regression results presented in Table 1 show that for both Model 1 and Model 2, corruption is significant at the 1% level. As the corruption score rises by one unit, i.e., the country becomes more 'clean', the number of reported COVID-19 cases and deaths are predicted to fall drastically by 76% and 277%, (The dependent variables are log transformed and the independent variable is normalized between 0 and 1). Percentage change calculation was done by (ecoefficent – 1) * 100 * 0.1.

Table 1. Regression Results of Model 1 and Model 2.

Independent variables	**(1)** **Model 1**	**(2)** **Model 2**
Corruption	-2.158*** (0.727)	-3.360*** (0.971)
Political Rights	0.702 (0.523)	1.074 (0.700)
Perceived Criminality	0.655 (0.536)	1.485** (0.716)
Access to Online Governance	-0.605 (0.848)	-1.628 (1.133)
Health Literacy Index	3.285** (1.620)	1.195 (2.259)
Gini	2.553 (1.795)	2.382 (2.427)
Out-of-Pocket Health Expenditure	-0.294 (0.574)	-0.648 (0.775)
Access to Quality Health	-0.371 (0.628)	-0.975 (0.856)

Emergency Preparedness & Response Planning	0.611 (0.707)	0.195 (0.947)
Laboratory Systems	-0.584 (0.551)	-0.208 (0.737)
Communication with Healthcare Workers	1.147 (0.821)	2.193* (1.097)
Country Group Dummy (=1 if Developed)	-0.153 (0.419)	0.145 (0.570)
HDI	0.662 (1.120)	2.575* (1.497)
Percentage of Population > 65 Years	4.621 (3.604)	7.320 (4.829)
Log of Population	0.813*** (0.0782)	0.862*** (0.105)
Log of GDP/Capita	0.846*** (0.251)	0.832** (0.336)
Constant	-13.62*** (2.132)	-18.00*** (2.867)
Observations	79	78
R-squared	0.880	0.829

Note: Model 1 (y = LogCases) & Model 2(y = LogDeaths). Standard errors are given in parentheses.
* significant at 10%; ** significant at 5%; *** significant at 1%.

Under the assumption that public trust played an important role in the proliferation of the pandemic, the result confirms Van de Walle and Migchelbrink's [15] finding that perceived corruption is indeed one of the most important factors in determining the extent of trust citizens have on public institutions which consequently dictates the degree of compliance with government regulations during a crisis.

Perceived criminality, measuring the extent to which citizens trust each other, is significant at the 5% level for Model 2, suggesting that the more distrust there is among citizens, the more the rate of deaths is likely to be. There have been a multitude of studies that have demonstrated the negative relationship between public trust and law compliance, but little research has been done on trust between citizens. Survey analysis in Spain reveals that people who directly suffered the impact of COVID-19e., either themselves or a close relative or friend, tended to have lower trust levels than people who did not suffer directly [53]. This is in line with the findings in this paper since people who died from the disease suffered directly from COVID-19. This may have undermined public trust in the whole family, potentially leading to more cases and deaths due to not following government healthcare guidelines.

The Health Literacy Index is significant for Model 1 at the 5% significance level. The more health-literate a person is, the more he/she would want to get tested at the onset of symptoms, which would lead to a higher rate of reported cases among health-literate citizens. It is not significant for Model 2, suggesting that health-literate people tend to get tested early and take the necessary steps and precautions that aid in their recovery, echoing Miller's [21] and MacLeod's [36] findings.

Communication with healthcare workers in a crisis is significant at the 10% level for Model 2, suggesting a positive correlation with rates of COVID-19 deaths. One possible explanation is that the more severe the symptoms among patients, the more likely there is to be communication with healthcare workers. People with any medical pre-condition have more communication with healthcare workers, and they are one of the most vulnerable groups with severe symptoms and high death rates [22].

For Model 1, percentage changes in population and GDP/Capita significantly affecting percentage changes in reported Covid-19 cases are straightforward. The more people there are, the more cases there will be, and the more developed a country is, in terms of GDP/Capita, the more testing is likely to be available. Similarly for Model 2, the impact of percentage change in population on the rate of reported deaths is straightforward. However, a positive correlation of percentage changes in GDP/Capita and HDI with rates of reported deaths is rather jarring, but this pattern is confirmed by Schellekens and Sourrouille [54]. They have argued that this could be due to poor data quality in developing countries. Given that developing countries have more older people in absolute terms and the prevalence of comorbidities is higher than developed nations, it makes little sense that the distribution of reported cases and deaths is skewed towards developed nations to that extent.

In both the models, the positive coefficient of political rights, comprising of the electoral process, political pluralism, and proper functioning of government, is consistent with recent empirical studies showing that the more democratic countries incurred a greater COVID-19 death toll than less democratic countries, at least in the initial stage of the pandemic [55, 56]. Moreover, a high degree of political pluralism may mean difficulty in reaching a consensus by the government when making policies such as the compulsory wearing of masks and social distancing, which is reflected in anti-mask-wearing sentiments and protests in countries such as the United States and Canada [57].

Theoretically, the proper functioning of the government, which is a proxy for government effectiveness, should have a negative coefficient in both models, and that was, indeed, the case when political rights were dropped from the two regression equations and replaced with the variable 'government effectiveness' from the Worldwide Governance Indicators dataset. Therefore, the positive coefficient of political rights is very likely to come from the impact of political regimes and political pluralism. The individual effects of electoral process and political pluralism on the independent variables could not be explored because the ratio of the composite index was not defined in the Social Progress Index dataset and no suitable proxy was found for these two components.

DISCUSSION

The regression findings suggest complex interrelationships between socio-institutional variables and COVID-19 outcomes, pointing to both direct effects and potential mediating and moderating dynamics. Corruption demonstrates a significant negative association with reported cases and deaths, which may indicate institutional failure in both pandemic response and data transparency.

This relationship could be mediated by weak governance capacity, where corruption reduces the effectiveness of public health infrastructure, testing, and reporting mechanisms. Conversely, perceived criminality shows a positive relationship with mortality, potentially moderating the impact of governance failures by exacerbating social vulnerability and weakening public compliance with health directives. Health literacy appears to play a mediating role in the relationship between institutional quality and COVID-19 outcomes; in more literate societies, higher case detection may reflect stronger awareness and testing uptake. However, its diminished effect on mortality suggests that information access alone is insufficient without corresponding service delivery.

Access to quality health systems and preparedness indicators showed limited direct effects, which may be moderated by structural inequalities or logistical bottlenecks that reduce the functional impact of formal capacities during crises. Meanwhile, communication with healthcare workers shows a positive link with reduced mortality, likely acting as a mediator that translates public health messaging into behavioral compliance and early treatment-seeking. Human development indicators and demographic variables also influence outcomes; for instance, HDI and population size correlate positively with case and death counts, potentially moderated by higher urbanization and more advanced surveillance systems. These patterns underscore the possibility that pandemic impacts are not merely the result of single determinants but reflect the interplay of mediating pathways (e.g., health literacy, institutional trust) and moderating factors (e.g., inequality, criminality, governance quality) that either amplify or dampen health system effectiveness across countries.

The findings of this study can offer valuable insights for policymakers, especially in developing and transitional economies where weak institutions often coexist with limited healthcare capacity. By examining the initial wave of the COVID-19 pandemic—before large-scale interventions were widely adopted—this research highlights the critical role of health system preparedness, public awareness, and resilience in explaining why some groups of countries managed the pandemic more effectively than others.

Study limitations

Data unavailability is the primary limitation of the paper. Unavailability of the Gini coefficient and out-of-pocket expenditure as a percentage of current health expenditure for 2019 led to the latest available data to be taken, ranging from 2016-2018, under the assumption that these variables are not likely to change drastically within a span of 3 years. Up-to-date data may reveal a clearer picture.

A panel dataset could produce more efficient estimates than cross-sectional data via more degrees of freedom and more sample variability, control the effect of omitted variables, and shed light on the dynamic relationships between variables [58]. Panel data regression could not be performed since figures for the dependent variables and all independent variables for 2021 and 2020, respectively are not available yet.

Moreover, some relevant factors, such as the implications of Covid-19 tests in terms of frequency, availability and ease of access by the public, the phenomenon of 'infodemic' [59] and the role of public reluctance towards vaccines [60] could not be explored and included in the regressions.

CONCLUSIONS

The results of the regression analyses show that for a large-scale exogenous shock like COVID-19to spread throughout the world the way it did, there had to be a close interplay of social, economic, and personal factors. Perceived corruption is found to be a significant variable in the proliferation of and deaths due to COVID-19, confirming the findings of previous pandemic literature. Trust is of crucial importance since the success of containment measures will largely depend on public compliance. The dynamic of trust in the personal and public sphere in shaping perceptions and decisions, especially in the context of a healthcare crisis, warrants more research because it will undoubtedly have policy implications for governments to be prepared for the next pandemic.

Health literacy may potentially be a powerful preventive tool when it comes to spreading disease. Like earlier studies, it has been confirmed in this paper that health-literate people make more pro-health choices, for instance, in this case, by getting tests done early and taking appropriate actions for recovery. The avenue of public awareness pertaining to health literacy and its potential for

favorable public health outcomes warrants more research. The impact of political regimes and political pluralism is rather undermined in this paper due to the presence of a composite index. Decomposed research assessing the individual effects of these two variables on the proliferation of disease during a pandemic may produce significant results.

From the policy recommendation angle, governments should strive to strengthen public trust. This can be done through policies aimed at curbing corruption and increasing transparency and accountability, leading to increased law compliance among citizens associated with following government directives. Moreover, governments should aim to make health literacy a priority in their public health policies so that citizens are better equipped to make pro-health choices on their own and sift out the right health information from the media and online platforms. For instance, the concept of health literacy could be taught in schools as part of the school curriculum, and public awareness campaigns may be undertaken to educate people about disease prevention and care.

Governments should also facilitate easier communication with healthcare workers so that it can be used as a preventive tool when it comes to public health issues as opposed to people primarily getting into contact with them only in the case of severe symptoms.

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