sustainability

MDPI

Article

Government Effectiveness and the COVID-19 Pandemic

Carolyn Chisadza *,† , Matthew Clance † and Rangan Gupta †

Department of Economics, Hatfield Campus, University of Pretoria, Lynnwood Road, Pretoria 0002, South Africa; matthew.clance@up.ac.za (M.C.); rangan.gupta@up.ac.za (R.G.)
* Correspondence: carolyn.chisadza@up.ac.za
† These authors contributed equally to this work.

Abstract: The COVID-19 pandemic threatens to derail progress achieved in sustainable development. This study investigates the effectiveness of government policy responses to the COVID-19 pandemic, namely the number of deaths. Using the Oxford COVID-19 Government Response Tracker (OxCGRT) dataset for a global sample of countries between March and September 2020, we find a non-linear association between government response indices and the number of deaths. Less stringent interventions increase the number of deaths, whereas more severe responses to the pandemic can lower fatalities. The outcomes are similar for a sample of countries disaggregated by regions. These findings can be informative for policymakers in their efforts to mitigate the spread of the virus and save lives.

Keywords: COVID-19 pandemic; OxCGRT; policies

check for updates

Citation: Chisadza, C.; Clance, M.; Gupta, R. Government Effectiveness and the COVID-19 Pandemic. *Sustainability* **2021**, *13*, 3042. https://doi.org/10.3390/su13063042

Academic Editor: Mbodja Mougoué

Received: 13 February 2021
Accepted: 7 March 2021
Published: 10 March 2021

1. Introduction

The risks to sustainable development progress are significantly increased during health pandemics. Such crises make the development, implementation, and effectiveness of national intervention policies critical for alleviating the adverse effects on society. The COVID-19 pandemic has already resulted in widespread economic and social implications across the world, with close to 83 million cases recorded and just under 2 million deaths reported as of (https://www.worldometers.info/coronavirus/, accessed on 29 December 2020).

For many governments in the world, the primary mandate became the preservation of lives, which entailed introducing several interventions to bring down the COVID-19-related infections and deaths. Such interventions, among others, included national lockdowns, travel restrictions, quarantine and isolation for the infected, social distancing, and wearing of personal protective equipment (PPE), such as face masks. Given the various interventions that have been implemented, it is important to provide initial evaluations of the current policy responses that are in place to determine their efficacy in reducing the loss of lives and mitigating the pandemic.

The purpose of this study is twofold. First, we investigate the effects of the combined government policy responses to the pandemic to determine if the policies were effective in reducing the number of deaths. Second, we disaggregate the government responses to determine which of the policies were most effective. Using the Oxford COVID-19 Government Response Tracker (OxCGRT) dataset [1] for a global sample of countries between the March and September 2020, we observe a non-linear effect of government responses on the number of deaths. The findings suggest that the number of deaths increases when the implementation of policies is less strict. However, as the policies become stricter, the number of deaths start to decline. The disaggregation of the government policy responses reveals that these results are largely driven by policies on containment and health.

As we conduct this study, several countries in the world are entering second waves of the pandemic. Even more disconcerting is that pandemics, such as that of COVID-19, can pose serious threats in undoing progress achieved towards sustainable development in many countries, especially in developing ones, which often struggle with capacity and capabilities to respond effectively. According to the Global Economic Prospects report, the economic damage from the COVID-19 pandemic represents the largest economic shock that the world has experienced in decades [2]. In addition, the COVID-19 shock has exacerbated the growth and development challenges that many developing countries were already facing prior to the crisis [2]. This highlights the necessity for policy responses that will reduce the adverse consequences and prevent further delay in progress towards sustainable development. It is therefore imperative to understand the mechanisms that can slow down the spread of the virus in order to alleviate the pressure on health systems and government resources, as well as to maintain the delicate balance between saving lives and protecting livelihoods.

Related Literature

Although the COVID-19 pandemic is a new virus with limited evidence in the literature, we can draw some insights from previous global pandemics that have occurred. From as early as the Black Death in the fourteenth century, which almost halved the European labor force, pandemics in general imply a huge cost in terms of economic activity. For example, the authors of [3] found that pandemics dating back to the fourteenth century negatively affected the real interest rates for years after the pandemics ended. The Spanish flu of 1918–1920 reduced real per capita Gross Domestic Product (GDP) by 6% for affected countries [4]. According to [5], the Severe Acute Respiratory Syndrome (SARS) in 2003 caused significant economic costs associated with excessive preventative interventions by some governments in the affected countries, despite the small death toll. Moreover, the authors of [6] showed that the Ebola virus decreased the competitiveness of Africa, particularly in the West region, as a tourist destination during its peak period. Findings from [7] showed that the HIV/AIDS pandemic impacted labor supply through increased mortality and morbidity, as well as reducing labor productivity, more so in Africa. Currently, the World Economic Outlook Update on the impact of COVID-19 reports that the 2021 global growth is projected at 5.4%, about 6.5 percentage points lower than in the pre-COVID-19 projections of January 2020 [8].

While the pandemics may be different in nature and severity, the objective of saving lives remains the same. As such, the role of the state becomes pivotal in periods of health-related disasters. In the wake of the SARS pandemic, a report by [9] highlighted the importance of the state remaining transparent given that the market structures were unsupportive and inefficient in dealing with SARS at the time of the outbreak. They maintained that managing uncertainty can ease some of the disruptions to the economic activity. Similarly, the authors of [10] found that higher levels of knowledge about the SARS disease indicated higher levels of public trust in Singapore. Such lessons learned from previous pandemics can be valuable today in government responses to the COVID-19 outbreak. Most governments have implemented mixed approaches that combine, among others, awareness campaigns in media, health notices in all shops, welfare programs for the poor, income support for households incurring lost salaries, testing and contact tracing, closure or reduced capacity of public areas that involve crowds (e.g., parks, nightclubs, restaurants), and support for frontline health workers (i.e., provision of PPE, ventilators, and field hospitals to accommodate COVID-19 patients). However, not only is it necessary for governments to remain transparent in the implementation of these interventions, but there also needs to be a collective response from the community at large to these interventions if we hope to flatten the COVID-19 curve for the number of recorded deaths, as seen in Figure 1.

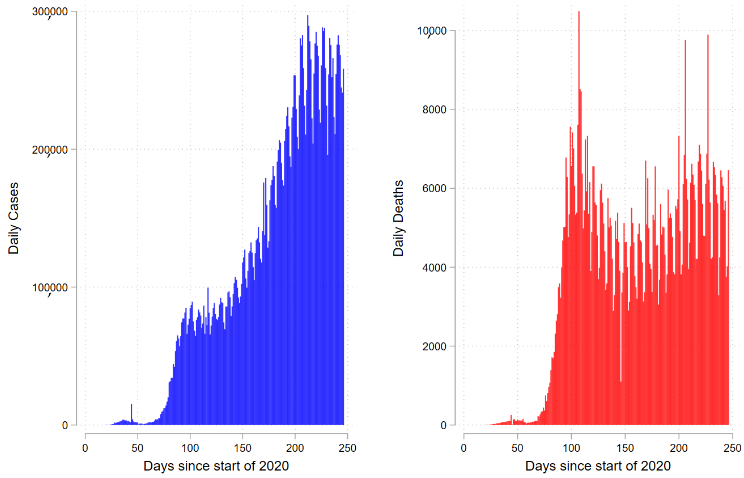

Figure 1. Figure 1 shows the daily count of cases and deaths recorded across the world. Source: Oxford COVID-19 Government Response Tracker (OxCGRT) dataset.

2. Materials and Methods

To test the impact of government policy responses on the number of COVID-19-related deaths, we estimate the following Poisson model:

$$E[V_{it}|x_{it}, \phi_i, \epsilon_{it}] = exp(\gamma + \alpha z_{it} + \beta x_{it} + \epsilon_{it}), \quad (1)$$

where V_{it} is the number of deaths per million in country i, z_{it} is a vector of the main explanatory variables, x_{it} is a vector of control variables, and ϵ_{it} is unobserved regional heterogeneity. We also estimate dynamic regressions using $V_{i,t-1}$ to account for the persistence of deaths. We use the Poisson model because the dependent variable, the number of deaths, is a non-negative count variable.

The dependent variable is the daily count of total deaths attributed to COVID-19 per million people. The data were obtained from the COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University (JHU CSSE COVID-19 Data) [11]. We used data recorded from March to September 2020 for a global sample of 144 countries. During this period, the COVID-19 pandemic affected most countries around the world, requiring governments to implement various levels of interventions to slow down the rate of infection.

The main explanatory variables are collected by the OxCGRT [1]. The data track governments' policies and interventions across a standardized series of indicators and creates composite indices to measure the extent of these responses. For the purpose of this study, we use the government response index, as well as the sub-indices that make up the composite government response index, namely the economic support index, containment and health index, and the stringency index. The economic support index shows how much economic support has been made available to households (such as income support to people who lost their jobs or cannot work and debt relief, e.g., freezing loan repayments). The containment and health index indicates how many and how strict the measures for containing the virus and protecting citizens' health are. These measures combine lockdown restrictions and closures (schools, workplace, public gatherings, public transport, and local and international travel) with health measures (testing policy, contact tracing, public information campaigns, and investments in vaccines and healthcare). The stringency index records the strictness of "lockdown style" for closure and containment policies that primarily restrict people's behavior. The overall government response index records how the responses of countries have varied over all indicators, therefore capturing the full range of government responses. All of these indicators measure policies on an ordinal scale of severity, with 0 being the least severe and a higher number being the most severe.

The control variables measure other social and economic factors that can affect the number of deaths during the pandemic. The number of hospital beds per thousand people was logged and obtained from the World Bank and national governments' statistics. The healthcare systems come under strain during pandemics, especially the capacity at hospitals [12]. According to [13], existing health inequalities in countries due to insufficient health capacity can affect the vulnerable people. We therefore expect the increased availability of hospital beds to be negatively correlated with the number of deaths.

The Gross Domestic Product (GDP) at purchasing power parity (constant 2011 international dollars) was taken from the World Development Indicators (WDIs) and logged. The authors of [14] found that the poverty rate is positively associated with a higher probability of fatality. We expect wealthier countries to have the resources to provide early preventative measures to reduce the number of deaths.

The median age of the population was obtained from the United Nations Population Division. People above the age of 65 years are more susceptible to the COVID-19 virus than the younger population [14,15], although unhealthy behavior, such as obesity and smoking, can make the younger population equally vulnerable to the virus. We also control for underlying health conditions by including the percentage of the population aged 20 to 79 with diabetes prevalence from the WDIs. Findings from [16,17] show that people with pre-existing health conditions and non-communicable diseases (NCDs) are associated with increased incidence of virus and mortality rate.

3. Results and Discussion

The initial results in Table 1 show positive associations for the overall government response index and its sub-indices with the number of deaths.

Table 1. Government effectiveness.

	(1) Total Deaths per million	(2) Total Deaths per million	(3) Total Deaths per million	(4) Total Deaths per million
Govt Response	0.0221 ***			
	(0.0019)			
Economic Support		0.0249 ***		
		(0.0032)		
Containment Health			0.0178 ***	
			(0.0017)	
Stringency				0.0130 ***
				(0.0016)
ln(GDPpc)	0.2500 **	0.2058 *	0.2956 ***	0.3266 ***
	(0.1072)	(0.1246)	(0.1056)	(0.1050)
ln(Hospital Beds per 1000)	0.0445	0.0838	0.0265	0.0444
	(0.1548)	(0.1668)	(0.1560)	(0.1463)
Diabetes prevalence	0.0124	0.0260	0.0063	0.0040
	(0.0210)	(0.0242)	(0.0209)	(0.0202)
Median Age	0.0376 **	0.0279	0.0393 **	0.0400 **
	(0.0174)	(0.0179)	(0.0176)	(0.0172)
Total Deaths per million$_{t-1}$	0.0057 ***	0.0050 ***	0.0059 ***	0.0061 ***
	(0.0007)	(0.0006)	(0.0007)	(0.0007)
Chamberlain	Yes	Yes	Yes	Yes
LogLik	−243,301.674	−220,033.856	−254,352.726	−263,453.359
Obs	27,796	27,804	27,796	27,809

Coefficients reported. Robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

However, we observe statistically significant non-linear associations with the number of deaths when we include the squared terms in Table 2. The findings suggest that the implementation of less strict intervention measures is not effective in reducing the number of deaths, whereas interventions at higher levels of severity reduce deaths. In addition, the authors of [18] found that the greater the strength of government interventions is at an early stage, the more effective the interventions are in decreasing or reversing the mortality rate. Findings from [19] also suggest that higher government stringency is a key predictor for the cumulative number of cases. Therefore, quick and early action by the government in imposing strict measures is important in slowing down the spread of the virus.

Table 2. Government effectiveness—non-linear results.

	(1) Total Deaths per million	**(2) Total Deaths per million**	**(3) Total Deaths per million**	**(4) Total Deaths per million**
Govt Response	0.1258 ***			
	(0.0139)			
Govt Response Sq.	−0.0009 ***			
	(0.0001)			
Economic Support		0.0662 ***		
		(0.0118)		
Economic Support Sq.		−0.0004 ***		
		(0.0001)		
Containment Health			0.1205 ***	
			(0.0172)	
Containment Health Sq.			−0.0009 ***	
			(0.0002)	
Stringency				0.0874 ***
				(0.0111)
Stringency Sq.				−0.0007 ***
				(0.0001)
ln(GDPpc)	−0.0354	0.1693	0.0682	0.1732
	(0.1188)	(0.1303)	(0.1180)	(0.1085)
ln(Hospital Beds per 1000)	0.0927	0.0582	0.0509	0.0965
	(0.1393)	(0.1672)	(0.1407)	(0.1331)
Diabetes prevalence	0.0177	0.0231	0.0040	−0.0024
	(0.0189)	(0.0279)	(0.0187)	(0.0182)
Median Age	0.0572 ***	0.0313 *	0.0601 ***	0.0525 ***
	(0.0174)	(0.0175)	(0.0174)	(0.0160)
Total Deaths per million$_{t-1}$	0.0051 ***	0.0049 ***	0.0050 ***	0.0050 ***
	(0.0006)	(0.0006)	(0.0005)	(0.0006)
Chamberlain	Yes	Yes	Yes	Yes
LogLik	−210,701.111	−201,951.388	−215,056.338	−226,469.993
Obs	27,796	27,804	27,796	27,809

Coefficients reported. Robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

In terms of the sub-indices, we observe that the containment and health index has a relatively larger coefficient compared to the economic support and stringency indices. This finding implies that a combination of interventions related to a strict lockdown environment and public awareness (such as closures of schools and workplaces, cancellations of public events, travel restrictions, keeping the public informed, testing and contact tracing) was most likely a more effective measure of slowing down the spread of the virus and the related number of deaths. We observe similar non-linear results for the total number of COVID-19-related cases. These results are reported in Appendix A under Table A3. The control variables are mostly statistically insignificant, apart from the age of the population, which is in line with [14], who found that older people are at a high risk of COVID-19-related deaths. The lagged dependent variable is positive and significant, indicating the persistence of fatalities. We also estimate Equation (1) with a two-step generalised method of moments GMM for Poisson models. The effects are similar to those of the base Poisson model and the conclusions in the paper remain unchanged. The results are available upon request.

3.1. Additional Analysis

As an additional analysis, we split the sample of countries by regions as classified by "Our World in Data" geographical locations. We combined North and South America together, as well as Asia and Oceania. In Table 3, we observe non-linear results that are similar to our main findings for the overall government response index across the different global regions.

Table 3. Regional effects—Overall government response index.

	(1) Africa	(2) Asia	(3) Europe	(4) Americas
Total Deaths per million				
Govt Response	0.1434 ***	0.1303 ***	0.1208 ***	0.1986 ***
	(0.0353)	(0.0229)	(0.0148)	(0.0655)
Govt Response Sq.	−0.0013 ***	−0.0010 ***	−0.0009 ***	−0.0014 ***
	(0.0003)	(0.0002)	(0.0001)	(0.0005)
ln(GDPpc)	−0.0003	0.3606	−0.0908	−0.0429
	(0.2908)	(0.2430)	(0.2191)	(0.4063)
ln(Hospital Beds per 1000)	0.2113	0.1549	−0.2944	0.2144
	(0.1817)	(0.3220)	(0.2105)	(0.3721)
Diabetes prevalence	0.0264	0.0535	0.0383	0.0004
	(0.0280)	(0.0651)	(0.0519)	(0.0590)
Median age	0.0061	−0.0748 *	0.0155	−0.0207
	(0.0419)	(0.0423)	(0.0430)	(0.0487)
Total Deaths per million$_{t-1}$	0.0204 ***	0.0170 ***	0.0042 ***	0.0051 ***
	(0.0048)	(0.0039)	(0.0005)	(0.0008)
Chamberlain	Yes	Yes	Yes	Yes
LogLik	−17,505.631	−31,313.826	−77,022.193	−59,259.656
Obs	5940	9068	7911	4877

Coefficients reported. Robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

While the sub-indices also show similar non-linear associations with the number of deaths, we notice that the containment and health index in Table 4 is again relatively larger in coefficient size in relation to the other sub-indices across the regions (see Tables 5 and 6).

Table 4. Regional effects—containment index.

	(1) Africa	(2) Asia	(3) Europe	(4) Americas
Total Deaths per million				
Containment Health	0.1554 ***	0.1162 ***	0.1065 ***	0.2119 **
	(0.0351)	(0.0192)	(0.0189)	(0.0842)
Containment Health Sq.	−0.0013 ***	−0.0009 ***	−0.0008 ***	−0.0015 **
	(0.0003)	(0.0002)	(0.0002)	(0.0006)
ln(GDPpc)	0.0992	0.4108 *	0.0568	−0.0857
	(0.2503)	(0.2310)	(0.2020)	(0.4367)
ln(Hospital Beds per 1000)	0.1979	0.1211	−0.2535	0.0980
	(0.1852)	(0.3172)	(0.2207)	(0.3502)
Diabetes prevalence	0.0217	0.0452	0.0327	−0.0059
	(0.0267)	(0.0646)	(0.0506)	(0.0511)
Median age	0.0062	−0.0746 *	0.0137	0.0116
	(0.0385)	(0.0445)	(0.0422)	(0.0502)
Total Deaths per million$_{t-1}$	0.0188 ***	0.0169 ***	0.0043 ***	0.0051 ***
	(0.0043)	(0.0039)	(0.0005)	(0.0007)
Chamberlain	Yes	Yes	Yes	Yes
LogLik	−16,756.492	−32,168.453	−82,180.944	−59,089.920
Obs	5940	9068	7911	4877

Coefficients reported. Robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 5. Regional effects—economic index.

	(1) Africa	(2) Asia	(3) Europe	(4) Americas
Total Deaths per million				
Economic Support	0.0311 **	0.0758 ***	0.0605 ***	0.0705 ***
	(0.0148)	(0.0187)	(0.0184)	(0.0171)
Economic Support Sq.	−0.0000	−0.0004 ***	−0.0004 **	−0.0005 ***
	(0.0002)	(0.0001)	(0.0001)	(0.0001)
ln(GDPpc)	0.0249	0.2816	0.1185	0.1717
	(0.2319)	(0.2427)	(0.2200)	(0.4066)
ln(Hospital Beds per 1000)	0.3672 **	0.2462	−0.3895 *	0.2154
	(0.1758)	(0.2980)	(0.2219)	(0.4065)
Diabetes prevalence	0.0002	0.0773	0.0677	−0.1004 **
	(0.0296)	(0.0651)	(0.0525)	(0.0490)
Median age	0.0169	−0.0896 **	−0.0107	−0.0318
	(0.0491)	(0.0430)	(0.0444)	(0.0474)
Total Deaths per million$_{t-1}$	0.0175 ***	0.0153 ***	0.0043 ***	0.0051 ***
	(0.0067)	(0.0033)	(0.0006)	(0.0010)
Chamberlain	Yes	Yes	Yes	Yes
LogLik	−16,801.643	−27,031.301	−77,990.057	−61,516.709
Obs	5948	9067	7911	4878

Coefficients reported. Robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 6. Regional effects—stringency index.

	(1) Africa	(2) Asia	(3) Europe	(4) Americas
Total Deaths per million				
Stringency	0.1246 ***	0.1090 ***	0.0726 ***	0.1727 ***
	(0.0256)	(0.0184)	(0.0116)	(0.0587)
Stringency Sq.	−0.0012 ***	−0.0009 ***	−0.0006 ***	−0.0012 ***
	(0.0002)	(0.0002)	(0.0001)	(0.0004)
ln(GDPpc)	0.1645	0.4787 **	0.1722	−0.0436
	(0.2404)	(0.2157)	(0.1950)	(0.3371)
ln(Hospital Beds per 1000)	0.2283	−0.0155	−0.1337	0.2010
	(0.1746)	(0.3372)	(0.2141)	(0.3632)
Diabetes prevalence	0.0178	0.0240	0.0297	0.0408
	(0.0242)	(0.0605)	(0.0494)	(0.0379)
Median age	0.0284	-0.0620	0.0130	0.0625
	(0.0505)	(0.0506)	(0.0402)	(0.0499)
Total Deaths per million$_{t-1}$	0.0178 ***	0.0168 ***	0.0045 ***	0.0049 ***
	(0.0038)	(0.0038)	(0.0006)	(0.0008)
Chamberlain	Yes	Yes	Yes	Yes
LogLik	−16,061.114	−31,846.813	−91,586.176	−58,733.588
Obs	5940	9079	7911	4879

Coefficients reported. Robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

The results by regions are somewhat unexpected. First, we expected some regional variations in the government effectiveness in responding to the pandemic, especially between poor regions, such as Africa, and wealthier regions, such as Europe. Second, given that the virus was first detected in Asia, we also expected the results to only show significant effects for those regions that were first affected by the pandemic, as their policies should be progressively stringent in relation to those regions that were affected later. However, it appears that the overall conclusion drawn from these findings is that it comes down more to the severity of the intervention measures implemented, particularly the closure and public awareness policies, which are key in slowing down the spread of the virus and related deaths.

We also specify the sample of countries by economic classifications in Table 7: advanced (developed), emerging and least-developed countries. We used the United Nations classification for the advanced and the least-developed countries [20]. We used the Morgan Stanley Capital International (MSCI) Emerging Markets Index to classify the emerging countries [21].

Table 7. Economic Classification—List of Countries.

Advanced	Emerging	LDC
Australia	Argentina	Afghanistan
Austria	Brazil	Angola
Belgium	Chile	Bangladesh
Bulgaria	China	Benin
Canada	Colombia	Bhutan
Croatia	Egypt	Burkina Faso
Cyprus	Hong Kong	Burundi
Czech Republic	India	Cambodia
Denmark	Indonesia	Central African Republic
Estonia	Jordan	Chad, Comoros
Finland	Korea	DR of the Congo
France	Kuwait	Djibouti
Germany	Malaysia	Eritrea
Greece	Mexico	Ethiopia
Hungary	Pakistan	Gambia
Iceland	Peru	Guinea
Ireland	Philippines	Guinea-Bissau
Italy	Qatar	Haiti
Japan	Russia	Kiribati
Latvia	Saudi Arabia	Lao PDR
Lithuania	Singapore	Lesotho
Luxembourg	South Africa	Liberia
Malta	Taiwan	Madagascar
Netherlands	Thailand	Malawi
Norway	Turkey	Mali
New Zealand	United Arab Emirates	Mauritania
Poland	Vietnam	Mozambique
Portugal		Myanmar
Slovakia		Nepal
Slovenia		Niger
Spain		Rwanda
Sweden		Sao Tome and Principe
Switzerland		Senegal
United Kingdom		Sierra Leone
United States		Solomon Islands
		Somalia
		South Sudan
		Sudan
		Timor-Leste
		Togo
		Tuvalu
		Uganda
		Tanzania
		Vanuatu
		Yemen
		Zambia

Developed countries are usually characterized by more advanced economies with developed infrastructure, developed capital markets, and higher standards of living. Emerging countries are those in the process of rapid growth and development, but they still have lower incomes per capita and less-developed infrastructure, and are prone to high market volatility in currency, commodity prices, and domestic policies. Notably, emerging countries are moving away from their reliance on agriculture and the export of raw materials towards industrialization. The least-developed countries, on the other hand, are characterized by poor economic growth, rudimentary infrastructure, underdeveloped capital markets, and low standards of living. Several countries in the emerging economies have characteristics that could place them in more than one category; however, for the purpose of this analysis, the groupings have been made mutually exclusive.

The results for the overall government response index in Table 8 still show a nonlinear association between government effectiveness and the number of deaths across the different economic classifications of countries. However, we observe that the effectiveness of government responses is not as significant in reducing the number of deaths in the least-developed countries compared to the advanced and emerging groups of countries. These findings reveal that the least-developed countries may be struggling to respond aggressively to the pandemic as compared to the richer countries. This may be due to their weak economic capabilities. Least-developed countries, which are mostly situated in Africa and East Asia, tend to rely heavily on bilateral and multilateral institutions to boost their already limited domestic resources. The lockdowns and closures of borders will have hampered economic activity that would have contributed to people's livelihoods. For example, trade restrictions and supply chain disruptions may exacerbate food security, inequality, and poverty issues in the least-developed countries [2]. Such increased risks to the economies can only serve to worsen economic growth and delay sustainable development for vulnerable countries.

Table 8. Economic classification—overall government response index.

	(1) Advanced	**(2) Emerging**	**(3) LDC**
Total Deaths per million			
Govt Response	0.1222 ***	0.2730 ***	0.0381
	(0.0150)	(0.0810)	(0.0303)
Govt Response Sq.	−0.0009 ***	−0.0020 ***	−0.0003
	(0.0001)	(0.0006)	(0.0003)
ln(GDPpc)	1.0610 ***	0.9588	−1.0584
	(0.3408)	(0.6387)	(0.7484)
ln(Hospital Beds per 1000)	−0.5320 *	0.3131	−0.4070
	(0.2861)	(0.3739)	(0.3207)
Diabetes prevalence	−0.0055	−0.0770	0.2122 **
	(0.0558)	(0.0627)	(0.0981)
Median age	0.1254 **	−0.1380	0.0680
	(0.0500)	(0.1037)	(0.1063)
Total Deaths per million$_{t-1}$	0.0042 ***	0.0051 ***	0.0841 ***
	(0.0004)	(0.0011)	(0.0280)
Chamberlain	Yes	Yes	Yes
LogLik	−64,247.637	−47,840.717	−7769.830
Obs	7561	5345	4969

Coefficients reported. Robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

From the sub-indices, we observe that the effectiveness of economic policies and health and containment policies is not significant in the least-developed countries (see Tables 9 and 10), but what is driving the overall government response is the stringency sub-index in Table 11. The stringency sub-index records the strictest measures of the containment and closure restrictions for schools, workplaces, public gatherings, public transport, intercity, interregional, and international travel, and staying at home. The findings suggest that this type of policy response may be most effective in stemming the number of deaths in the least-developed countries. However, governments would have to factor in the loss to livelihoods in implementing such severe closures.

As robustness checks, we used 7- and 14-day moving averages, as well as the Ordinary Least Squares (OLS) estimator. The overall conclusions of our findings remain consistent. The results are available in Appendix A in Tables A4–A6.

Table 9. Economic classification—containment index.

	(1) Advanced	(2) Emerging	(3) LDC
Total Deaths per million			
Containment Health	0.1001 ***	0.3239 ***	0.0306
	(0.0178)	(0.0860)	(0.0225)
Containment Health Sq.	−0.0007 ***	−0.0024 ***	−0.0003
	(0.0002)	(0.0006)	(0.0002)
ln(GDPpc)	1.0972 ***	0.9287	−1.1951
	(0.3328)	(0.5924)	(0.9703)
ln(Hospital Beds per 1000)	−0.5033 *	0.2324	−0.3695
	(0.2845)	(0.3180)	(0.3816)
Diabetes prevalence	−0.0104	−0.0878	0.2147
	(0.0596)	(0.0633)	(0.1422)
Median age	0.1203 **	−0.1291	0.0239
	(0.0493)	(0.1003)	(0.0854)
Total Deaths per million$_{t-1}$	0.0044 ***	0.0050 ***	0.0831 ***
	(0.0005)	(0.0009)	(0.0278)
Chamberlain	Yes	Yes	Yes
LogLik	−72,145.225	−45,344.604	−7789.105
Obs	7561	5345	4969

Coefficients reported. Robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 10. Economic classification—economic index.

	(1) Advanced	(2) Emerging	(3) LDC
Total Deaths per million			
Economic Support	0.0846 ***	0.1064 ***	0.0151
	(0.0092)	(0.0230)	(0.0172)
Economic Support Sq.	−0.0005 ***	−0.0007 ***	−0.0001
	(0.0001)	(0.0002)	(0.0002)
ln(GDPpc)	1.1074 ***	1.0170	−1.1742
	(0.3450)	(0.7477)	(1.1239)
ln(Hospital Beds per 1000)	−0.4767	0.2079	−0.1275
	(0.3123)	(0.6626)	(0.2679)
Diabetes prevalence	0.0211	−0.0894	0.1178 *
	(0.0452)	(0.1051)	(0.0703)
Median age	0.0982	−0.1579	−0.0472
	(0.0651)	(0.1906)	(0.0704)
Total Deaths per million$_{t-1}$	0.0039 ***	0.0045 ***	0.0838 ***
	(0.0004)	(0.0009)	(0.0253)
Chamberlain	Yes	Yes	Yes
LogLik	−59,564.850	−43,714.656	−7741.987
Obs	7561	5345	4977

Coefficients reported. Robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 11. Economic classification—stringency index.

	(1) Advanced	(2) Emerging	(3) LDC
Total Deaths per million			
Stringency	0.0667 ***	0.1734 ***	0.0508 **
	(0.0108)	(0.0352)	(0.0246)
Stringency Sq.	−0.0005 ***	−0.0013 ***	−0.0005 **
	(0.0001)	(0.0003)	(0.0002)
ln(GDPpc)	1.1694 ***	0.8301	−1.2336
	(0.3320)	(0.6075)	(1.1679)
ln(Hospital Beds per 1000)	−0.3679	0.3416	−0.4268
	(0.2838)	(0.3340)	(0.5771)
Diabetes prevalence	−0.0129	−0.0481	0.2119
	(0.0556)	(0.0645)	(0.1783)
Median age	0.1151 **	−0.1079	0.0431
	(0.0500)	(0.0994)	(0.1095)
Total Deaths per million$_{t-1}$	0.0046 ***	0.0047 ***	0.0781 ***
	(0.0005)	(0.0009)	(0.0285)
Chamberlain	Yes	Yes	Yes
LogLik	−81,171.943	−48,069.052	−7737.934
Obs	7561	5347	4979

Coefficients reported. Robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

4. Conclusions

The COVID-19 pandemic has necessitated quick action from policymakers across the world to save lives. This study investigates the effectiveness of current government policy responses to COVID-19-related deaths. We find that the overall government response index has a non-linear association with the number of deaths—driven by the containment and health interventions—for the aggregated sample of countries. The number of deaths increases with partially relaxed lockdown restrictions, but decreases with severe restrictions. We observe similar non-linear outcomes when we disaggregate the sample by global regions. We also find support for strict government lockdown policies in controlling the number of cases related to COVID-19. However, when we split the sample of countries by economic classifications, we find that effectiveness of the current government responses in place is not significantly associated with reducing the number of deaths in least-developed countries compared to developed and emerging countries. Only for the most severe restrictions do we observe the number of deaths declining in least-developed countries.

As several countries enter the second wave of the pandemic, the valuable insights drawn from this study and other related studies should not be taken lightly. The implications of these findings emphasize the importance of maintaining strict containment measures to slow the spread of the virus. However, the trade-off is that should the pandemic persist for a longer period, these prolonged restrictions will continue to disrupt economic activities, reversing years of progress toward sustainable development goals.

Secondly, the weak economic growth of the developed countries due to the pandemic is bound to have negative spillovers into the least-developed countries, who depend on foreign financing and trade for exporting commodities. Pandemics tend to exacerbate already existing health inequalities in society, and COVID-19 is no different. While the primary goal for policymakers in the short term is to slow down the spread of the virus and simultaneously mitigate the harm to the economy, in the long term, some thorough policy reforms need to be implemented to avoid further economic disparities among the population and delays in economic development. Therefore, it is also vital for policy reforms to be targeted for the impoverished population to facilitate better self-care. These reforms can include increasing programs for early detection and contact tracing, increasing testing centers and public awareness, and investing in health services and equipment, such as more beds, ventilators, and PPE. These reforms are key in the least-developed countries that are struggling with resources, and should be structured so as to provide affordable health service delivery. Consequently, global coordination of measures that are necessary for attenuating the spread of the pandemic, such as strengthening health services and supporting households and firms with stimulus packages, may provide us with the upper hand in the battle over the COVID-19 crisis.

Author Contributions: C.C., M.C., and R.G. contributed to the conceptualization, data analysis, and design of the research. M.C. collated the data and prepared the tables and figures. C.C. drafted the manuscript. All authors contributed to the revision of the manuscript. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: COVID-19 data were obtained from https://github.com/CSSEGISandData/COVID-19, accessed on 2 September 2020.

Acknowledgments: We acknowledge the assistance from our research assistant Anneri Oosthuizen in the data analysis and obtaining relevant literature related to the study.

Conflicts of Interest: The authors declare no conflict of interest.

Appendix A

Appendix A.1

In Tables A1 and A2, we report the variable definitions and statistics. Table A3 reports findings for total cases attributed to COVID-19 per million people, while Tables A4 and A5 report results for the seven-day and 14-day moving averages. Table A6 shows the OLS estimator results. Our findings remain consistent with the main results reported in the paper. Global region effects by total cases and seven- and 14-day moving averages, as well as those using the OLS estimator, also remain robust. The results are available upon request from the authors.

Table A1. List of variables and definitions.

Variable	Description	Source
Total deaths per million	Total deaths attributed to COVID-19 per 1,000,000 people	COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University
Govt Response	Overall Government Response Index	Oxford COVID-19 Government Response Tracker, Blavatnik School of Government
Economic Support	Economic Support Index	Oxford COVID-19 Government Response Tracker, Blavatnik School of Government
Containment Health	Containment and Health Index	Oxford COVID-19 Government Response Tracker, Blavatnik School of Government
Stringency	Stringency Index	Oxford COVID-19 Government Response Tracker, Blavatnik School of Government
GDPpc	Gross domestic product at purchasing power parity (constant 2011 international dollars), most recent year available	World Bank World Development Indicators, source from World Bank, International Comparison Program database
Hospital Beds per 1000	Hospital beds per 1000 people, most recent year available since 2010	OECD, Eurostat, World Bank, national government records and other sources
Diabetes prevalence	Diabetes prevalence (% of population aged 20 to 79) in 2017	World Bank World Development Indicators, sourced from International Diabetes Federation, Diabetes Atlas
Median age	Median age of the population, UN projection for 2020	UN Population Division, World Population Prospects, 2017 Revision

Table A2. Descriptive statistics.

	Obs	Mean	Std.Dev.	Min.	Max.
Total Deaths per million	34,740	50.69	140.60	0.00	1237.55
Govt Response	33,966	55.32	24.02	0.00	96.15
Economic Support	33,458	40.41	32.61	0.00	100.00
Containment Health	34,091	58.06	25.41	0.00	100.00
Stringency	34,105	57.84	28.16	0.00	100.00
GDPpc	32,987	21,561.03	21,235.55	661.24	116,935.60
Hospital Beds per 1000	30,254	3.03	2.46	0.10	13.05
Diabetes prevalence	34,003	7.77	3.96	0.99	22.02
Median age	33,163	31.30	9.21	15.10	48.20

Sources: JHU CSSE COVID-19 Data, OxCGRT, World Bank, United Nations.

Table A3. Total cases per million—government effectiveness.

	(1) Total Cases per million	(2) Total Cases per million	(3) Total Cases per million	(4) Total Cases per million
Govt Response	0.1540 ***			
	(0.0139)			
Govt Response Sq.	−0.0012 ***			
	(0.0001)			
Economic Support		0.0599 ***		
		(0.0095)		
Economic Support Sq.		−0.0004 ***		
		(0.0001)		
Containment Health			0.1323 ***	
			(0.0117)	
Containment Health Sq.			−0.0010 ***	
			(0.0001)	
Stringency				0.1046 ***
				(0.0102)
Stringency Sq.				−0.0009***
				(0.0001)
ln(GDPpc)	0.0899	0.3071 **	0.2341 **	0.3188 ***
	(0.1153)	(0.1344)	(0.1139)	(0.1179)
ln(Hospital Beds per 1000)	0.2305 *	0.1948	0.1949 *	0.2625 **
	(0.1179)	(0.1355)	(0.1136)	(0.1104)
Diabetes prevalence	−0.0002	−0.0082	−0.0158	−0.0218
	(0.0199)	(0.0248)	(0.0193)	(0.0189)
Median age	0.0317 **	0.0043	0.0311 **	0.0203
	(0.0145)	(0.0154)	(0.0148)	(0.0141)
Total Cases per million$_{t-1}$	0.0001 ***	0.0001 ***	0.0001 ***	0.0001 ***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Chamberlain	Yes	Yes	Yes	Yes
LogLik	−6,849,649.631	−7,234,408.436	−7,149,392.860	−7,371,750.750
Obs	27,796	27,804	27,796	27,809

Coefficients reported. Robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A4. Total deaths per million (seven-day moving average (MA)).

	(1) Total Deaths (7-day MA)	(2) Total Deaths (7-day MA)	(3) Total Deaths (7-day MA)	(4) Total Deaths (7-day MA)
Total Deaths (1 Week MA)				
Govt Response	0.1212 *** (0.0136)			
Govt Response Sq.	−0.0009 *** (0.0001)			
Economic Support		0.0638 *** (0.0117)		
Economic Support Sq.		−0.0004 *** (0.0001)		
Containment Health			0.1180 *** (0.0171)	
Containment Health Sq.			−0.0009 *** (0.0002)	
Stringency				0.0863 *** (0.0112)
Stringency Sq.				−0.0007 *** (0.0001)
ln(GDPpc)	−0.0270 (0.1186)	0.1757 (0.1303)	0.0748 (0.1177)	0.1785* (0.1082)
ln(Hospital Beds per 1000)	0.0866 (0.1395)	0.0546 (0.1673)	0.0459 (0.1411)	0.0920 (0.1332)
Diabetes prevalence	0.0165 (0.0189)	0.0223 (0.0278)	0.0030 (0.0187)	−0.0035 (0.0181)
Median age	0.0573 *** (0.0174)	0.0316 * (0.0175)	0.0601 *** (0.0174)	0.0526 *** (0.0160)
Total Deaths$_{t-1}$ (1 Week MA)	0.0050 *** (0.0006)	0.0048 *** (0.0006)	0.0050 *** (0.0005)	0.0049 *** (0.0006)
Chamberlain	Yes	Yes	Yes	Yes
LogLik	−205,123.251	−197,363.853	−207,796.534	−218,102.169
Obs	27,008	27,016	27,008	27,021

Coefficients reported. Robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A5. Total deaths per million (14-day moving average).

	(1) Total Deaths (14-day MA)	(2) Total Deaths (14-day MA)	(3) Total Deaths (14-day MA)	(4) Total Deaths (14-day MA)
Govt Response	0.1195 *** (0.0134)			
Govt Response Sq.	−0.0009 *** (0.0001)			
Economic Support		0.0624 *** (0.0112)		
Economic Support Sq.		−0.0004 *** (0.0001)		
Containment Health			0.1178 *** (0.0175)	
Containment Health Sq.			−0.0009 *** (0.0002)	
Stringency				0.0858 *** (0.0113)
Stringency Sq.				−0.0007 *** (0.0001)
ln(GDPpc)	−0.0221 (0.1188)	0.1845 (0.1313)	0.0788 (0.1178)	0.1822 * (0.1085)
ln(Hospital Beds per 1000)	0.0761 (0.1409)	0.0437 (0.1687)	0.0364 (0.1426)	0.0838 (0.1344)
Diabetes prevalence	0.0149 (0.0188)	0.0211 (0.0280)	0.0017 (0.0186)	−0.0048 (0.0181)
Median age	0.0584 *** (0.0174)	0.0326 * (0.0176)	0.0612 *** (0.0174)	0.0536 *** (0.0160)
Total Deaths$_{t-1}$ (2 Week MA)	0.0049 *** (0.0005)	0.0048 *** (0.0005)	0.0048 *** (0.0005)	0.0048 *** (0.0005)
Chamberlain	Yes	Yes	Yes	Yes
LogLik	−194,709.841	−188,724.385	−196,368.352	−206,054.168
Obs	26,058	26,063	26,058	26,067

Coefficients reported. Robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A6. Ordinary Least Squares (OLS) results—government effectiveness.

	(1) Total Deaths per million	(2) Total Deaths per million	(3) Total Deaths per million	(4) Total Deaths per million
Govt Response	−0.00359			
	(0.00687)			
Govt Response Sq.	0.00022 **			
	(0.00009)			
Economic Support		0.00846		
		(0.00651)		
Economic Support Sq.		0.00003		
		(0.00010)		
Containment Health			0.00617	
			(0.00714)	
Containment Health Sq.			0.00009	
			(0.00008)	
Stringency				0.00618
				(0.00630)
Stringency Sq.				0.00009
				(0.00007)
ln(GDPpc)	0.11763 *	0.20647 ***	0.15461 **	0.17885 ***
	(0.07044)	(0.07298)	(0.06972)	(0.06676)
ln(Hospital Beds per 1000)	−0.10087	−0.13248 *	−0.11027	−0.08741
	(0.07253)	(0.07584)	(0.07083)	(0.06838)
Diabetes prevalence	−0.03441 **	−0.02933*	−0.03756 **	−0.03636 **
	(0.01527)	(0.01554)	(0.01511)	(0.01444)
Median age	0.01309	0.00403	0.01404	0.01222
	(0.01088)	(0.01198)	(0.01033)	(0.00997)
Total Deaths per million$_{t-1}$	1.00222 ***	1.00193 ***	1.00233 ***	1.00248 ***
	(0.00140)	(0.00151)	(0.00140)	(0.00137)
Chamberlain	Yes	Yes	Yes	Yes
Overall R2	0.9997	0.9997	0.9997	0.9997
Obs	27,796	27,804	27,796	27,809

Coefficients reported. Robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

References

1. Hale, T.; Webster, S.; Petherick, A.; Phillips, T.; Kira, B. *Oxford COVID-19 Government Response Tracker*; Blavatnik School of Government Working Paper Series; Blavatnik School of Government: Oxford, UK, 2020.
2. World Bank. *Global Economic Prospects*; Technical Report; The World Bank: Washington, DC, USA, 2020.
3. Jorda, O.; Singh, S.; Taylor, A. Longer-Run Economic Consequences of Pandemics. *Covid Econ.* **2020**, *1*, 1–15. [CrossRef]
4. Barro, R.J.; Ursua, J.F.; Weng, J. *The Coronavirus and the Great Influenza Epidemic—Lessons from the "Spanish Flu" for the Coronavirus's Potential Effects on Mortality and Economic Activity*; CESifo Working Paper Series 8166; CESifo: Munich, Germany, 2020.
5. Brahmbhatt, M.; Dutta, A. *On SARS type economic effects during infectious disease outbreaks*; The World Bank: Washington, DC, USA, 2008.
6. Maphanga, P.; Henama, U. The Tourism Impact of Ebola in Africa: Lessons on Crisis Management. *Afr. J. Hosp. Tour. Leis.* **2019**, *8*, 1–13.
7. Dixon, S.; McDonald, S.; Roberts, J. The impact of HIV and AIDS on Africa's economic development. *BMJ* **2002**, *324*, 232–234. [CrossRef] [PubMed]
8. IMF. *A Crisis Like No Other, An Uncertain Recovery*; World Economic Outlook: Washington, DC, USA, 2020.
9. Tan, W.J.; Enderwick, P. Managing threats in the global era: The impact and response to SARS. *Thunderbird Int. Bus. Rev.* **2006**, *48*, 515–536. [CrossRef]
10. Deurenberg-Yap, M.; Foo, L.; Low, Y.; Chan, S.; Vijaya, K.; Lee, M. The Singaporean response to the SARS outbreak: Knowledge sufficiency versus public trust. *Health Promot. Int.* **2005**, *20*, 320–326. [CrossRef] [PubMed]
11. Dong, E.; Du, H.; Gardner, L. An interactive web-based dashboard to track COVID-19 in real time. *Lancet Inf. Dis.* **2020**, *20*, 533–534. [CrossRef]
12. Khan, J.R.; Awan, N.; Islam, M.M.; Muurlink, O. Healthcare Capacity, Health Expenditure, and Civil Society as Predictors of COVID-19 Case Fatalities: A Global Analysis. *Front. Public Health* **2020**, *8*, 1–10. [CrossRef] [PubMed]
13. Bambra, C.; Riordan, R.; Ford, J.; Matthews, F. The COVID-19 pandemic and health inequalities. *J. Epidemiol. Community Health* **2020**, *74*, 964–968. [CrossRef] [PubMed]
14. Banik, A.; Nag, T.; Chowdhury, S.R.; Chatterjee, R. Why Do COVID-19 Fatality Rates Differ Across Countries? An Explorative Cross-country Study Based on Select Indicators. *Glob. Bus. Rev.* **2020**, *21*, 607–625. [CrossRef]
15. Haldar, A.; Sethi, N. The Effect of Country-level Factors and Government Intervention on the Incidence of COVID-19. *Asian Econ. Lett.* **2020**, *1*. [CrossRef]

16. Mathur, P.; Rangamani, S. COVID-19 and noncommunicable diseases: Identifying research priorities to strengthen public health response. *Int. J. Noncommunicable Dis.* **2020**, *5*, 76. [CrossRef]
17. Singh, A.K.; Misra, A. Impact of COVID-19 and comorbidities on health and economics: Focus on developing countries and India. *Diabetes Metab. Syndr.* **2020**, *14*, 1625–1630. [CrossRef] [PubMed]
18. Dergiades, T.; Milas, C.; Mossialos, E.; Panagiotidis, T. Effectiveness of Government Policies in Response to the COVID-19 Outbreak. *Ssrn Electron. J.* **2020**. [CrossRef]
19. Allel, K.; Tapia-Muñoz, T.; Morris, W. Country-level factors associated with the early spread of COVID-19 cases at 5, 10 and 15 days since the onset. *Glob. Public Health* **2020**, *15*, 1589–1602. [CrossRef] [PubMed]
20. United Nations. *World Economic Situation and Prospects*; Technical Report; United Nations: New York, NY, USA, 2020.
21. Amadeo, K. *Emerging Market Countries and Their Five Defining Characteristics*; The Balance; U.S. & World Economies: New York, NY, USA, 2020.