



# Economics and Business Quarterly Reviews

---

**Setyowati, N., & Amalina, N. S. S. (2024). Impacts of Inequality and Poverty on COVID-19 in Indonesia. *Economics and Business Quarterly Reviews*, 7(1), 140-151.**

ISSN 2775-9237

DOI: 10.31014/aior.1992.07.01.565

The online version of this article can be found at:  
**<https://www.asianinstituteofresearch.org/>**

---

Published by:  
The Asian Institute of Research

The *Economics and Business Quarterly Reviews* is an Open Access publication. It may be read, copied, and distributed free of charge according to the conditions of the Creative Commons Attribution 4.0 International license.

The Asian Institute of Research *Economics and Business Quarterly Reviews* is a peer-reviewed International Journal. The journal covers scholarly articles in the fields of Economics and Business, which includes, but is not limited to, Business Economics (Micro and Macro), Finance, Management, Marketing, Business Law, Entrepreneurship, Behavioral and Health Economics, Government Taxation and Regulations, Financial Markets, International Economics, Investment, and Economic Development. As the journal is Open Access, it ensures high visibility and the increase of citations for all research articles published. The *Economics and Business Quarterly Reviews* aims to facilitate scholarly work on recent theoretical and practical aspects of Economics and Business.



ASIAN INSTITUTE OF RESEARCH  
Connecting Scholars Worldwide

# Impacts of Inequality and Poverty on COVID-19 in Indonesia

Nur Setyowati<sup>1</sup>, Nur Sabila Soraya Amalina<sup>2</sup>

<sup>1</sup> International Business Department, National Kaohsiung University of Science and Technology, Kaohsiung, Taiwan

<sup>2</sup> College of Business, Southern Taiwan University of Science and Technology, Tainan, Taiwan

## Abstract

**Purpose:** The purpose of this study was to investigate how inequality and poverty contributed to COVID-19 cases and mortality using panel regression. **Design/methodology/approach:** The data cover semiannual observations during the COVID-19 period spanning from 2019 to 2022 in 34 provinces in Indonesia. This study split samples into high- and low-inequality provinces and apply the fixed effect panel regression on COVID-19 cases and mortality. **Findings:** The results suggest that the effect of inequality on the spread of COVID-19 was greater in low-inequality provinces. Whereas poverty and unemployment positively influenced the total cases in high-inequality provinces. The variable of unmet health facility had a negative impact on COVID-19 cases, but education positively influenced COVID-19 cases. There were identical results for all the variables when looking at COVID-19 mortality, except for unemployment. Unemployment showed a positively significant influence on COVID-19 mortalities in all samples, whereas it only influenced COVID-19 cases in high-inequality provinces. **Originality/value:** the most crucial outcome of this study concerns the distinctive implications for different types of inequality and their impact on COVID-19.

**Keywords:** COVID-19, Inequality, Poverty

## 1. Introduction

The COVID-19 pandemic, first identified in Wuhan, China, in December 2019, has threatened major economic interests and businesses, as well as human life. The worldwide economic fallout from the COVID-19 pandemic included a drop in GDP, a slowdown in the business sector, and an increasing unemployment rate. Countless people lost their livelihoods and had to change their work and social interactions due to COVID-19. The severe impact of the pandemic is shown in the increasing number of people experiencing income inequality and living in poverty. Vulnerable groups such as women, those with little education, and informally employed people in urban areas were the most affected. Many women dropped out of the labor force to supervise children during online learning and to take care of older relatives. In urban areas, social distancing and self-isolation requirements pushed workers to work remotely, leaving informal employees and those with low education levels at a disadvantage.

The effect of COVID-19 has been an extreme increase in global poverty. As the result of the pandemic, about 97 million people are living on less than \$1.90 a day, increasing the global poverty rate from 7.8 to 9.1%. Inequality has also worsened due to poorer households having lost income and employment opportunities at a higher rate

than richer households (Sánchez-Páramo et al. 2021). Hence, while large numbers of people have been pushed into poverty, some have become wealthier. Ferreira (2021) suggested that the pandemic worsened inequality and widened the income gap within countries. There is evidence that people entering work during a recession earn less compared to fellow workers beginning just before or after a recession. By causing a global recession, COVID-19 created new inequality among young people who entered the labor force during the pandemic. Similarly, Stancheva (2022) found that vulnerable groups such as low-income workers were affected severely by the COVID-19 pandemic, and their recovery has been slower than other groups.

In Indonesia, a study conducted by Suryahadi et al. (2020) examined the impact of COVID-19 on poverty levels. Assuming an economic growth rate of 1%, the poverty rate will surge from 9.2% to 12.4%, resulting in an additional 8.5 million people falling into poverty. Indonesia has seen a significant impact from the SARS-CoV-2 infection. Lindsey and Mann (2020) mention that the Indonesian government has faced criticism, both domestically and internationally, for its perceived delay in responding to the onset of the epidemic. In February, when Singapore and Malaysia experienced a significant increase in the transmission of the virus, Indonesia said that it had no reported instances of COVID-19. At that time, neighboring countries of Indonesia were implementing widespread testing and imposing limitations on movement in order to control the spread of the virus inside their communities (McCurry et al. 2020). Nevertheless, Indonesia begrudgingly permitted partial school closures and advocated for remote employment. Without stringent containment measures, the number of COVID-19 fatalities in Indonesia escalated to surpass all other countries in Southeast Asia (CNN, 2021).

Studying the impacts of COVID-19 in Indonesia is crucial due to the country's vast territory and uneven population distribution between rural and urban areas. Structural disparities such as those related to socioeconomic status and ethnic background are also large in Indonesia, and these pose challenges in distinguishing between prosperous and disadvantaged areas and their response during a pandemic. Hence, the objective of this study is to examine the influence of poverty and inequality on the incidence and mortality rates of the virus, with a specific focus on the cities with low and high inequality.

This research examines the progression of disparities in Indonesia in multiple areas of society, encompassing poverty, inequality, income levels, unemployment, health facilities, and education. This paper contributes to the existing research on COVID-19 by tackling the enduring disparities that existed before the COVID-19 pandemic and looking at how those impacted the course of the pandemic. Our research differs from the previous work, as we provide a framework to help conceptualize the different potential COVID-19 interventions among people experiencing different levels of inequality.

The subsequent analysis examines the progression of the pandemic in Indonesia, elucidates the estimated linear model, incorporates socioeconomic factors, deliberates on the findings, and ultimately finishes with comprehensive conclusions. Furthermore, the article presents an examination of the progression of COVID-19 in Indonesia.

## **2. Conceptual Framework**

### *2.1 COVID-19 and Inequality*

The COVID-19 pandemic has significantly impacted economic disparity, making it difficult to evaluate its effects. Aspachs et al. (2022) stated that without government intervention, inequality would have surged due to job losses and wage reductions for low-income individuals. However, this increase has been mostly offset by public payments and unemployment insurance systems. Aspachs et al. (2022) used extensive and reliable microdata from previous records to monitor the impact of economic disparity on various demographic segments in the aftermath of the COVID-19 pandemic. The researchers used data sourced from Caixa Bank, the second largest financial institution in Spain, to conduct an analysis of payroll and benefits for a workforce of over three million individuals. Monthly GINI indices were computed to assess the effectiveness of public benefits in mitigating inequality. Findings indicate that the absence of public benefit programs would have led to a significant rise in inequality, mostly impacting individuals with low wages. The activation of public benefits following the pandemic has helped

to alleviate the impact of the crisis on inequality. Martinez-Bravo and Sanz (2021) conducted a study on the impact of the COVID-19 pandemic on Spanish households using two online surveys. The study involved 2,678 individuals, aged 18 and above, who provided information on income, occupation, and well-being. The results showed that the poorest households experienced larger shocks than the richer ones. The study computed the GINI coefficient at three different points in time: 2019, May 2020, and November 2020, resulting in estimates of 0.36, 0.39, and 0.38, respectively. Amate-Fortes and Guarnido-Rueda (2023) found a significant link between inequality and COVID-19 fatality rates in Spain. This result agreed with the study by Chakrabarty et al. (2023), which found higher inequality accelerated the spread of COVID-19.

## *2.2 COVID-19 and Income*

O'Donoghue et al. (2020) used the European Union Survey on Income and Living Conditions to analyze the impact of the pandemic on Ireland's income distribution, finding a 20.64% increase in market income and a 6.62% decline in disposable income. Zhang et al. (2022) mentioned that the COVID-19 epidemic is believed to have exacerbated economic inequality in China by impacting the per capita income of various families. On one hand, Wang et al. (2021) found that rural inhabitants may have experienced more significant declines in income compared to urban residents due to the fact that rural workers have less stable employment arrangements, with migratory workers from rural regions restricted to their villages and unable to resume work in cities. Conversely, Almeida et al. (2021) found that the epidemic disproportionately affected low-income households compared to their more privileged counterparts, thereby worsening economic inequality. Luo et al. (2020) performed a survey that revealed that 7.1% of rural families in China are at risk of experiencing poverty as a result of the pandemic. Additionally, 23% of those who had previously emerged from poverty have been likely to regress back into it.

## *2.3 COVID-19 and Unemployment*

Unemployment rates are positively correlated with COVID-19, even when using viral incidence rates as the dependent variable. Amate-Fortes and Guarnido-Rueda (2023) stated that high unemployment levels in municipalities increased employment instability and teleworking challenges, increasing vulnerability to contagion. Factors like stress and social alienation also contributed to unemployment. Mirahmadizadeh et al. (2022) point out similar findings, stating that unemployment is potentially a measurement factor of low socioeconomic status, malnutrition, and low social support, all factors that affect COVID-19-associated outcomes. According to Samarah, W.A (2021), the Palestinian economy had adverse effects as a result of the COVID-19 pandemic during the period of quarantine, resulting in a rise in unemployment rates. Nevertheless, following the epidemic, the rate of unemployment decreased, and the economy returned to its usual state. The level of competitiveness remained stable due to the ample availability of labor and human resources.

## *2.4 COVID-19 and Poverty*

McKibbin and Fernando (2021) found that the COVID-19 pandemic and its associated measures led to a significant economic decline, with negative GDP growth observed in numerous nations; moreover, the study by Bonaccorsi et al. (2020) suggests that this could potentially impact poverty and income inequality levels. Bukari et al. (2022) revealed a direct correlation between COVID-19 and poverty and food insecurity, with households with COVID-19-infected individuals experiencing a significant increase in poverty levels and food insecurity levels compared to non-COVID-19-affected households, indicating that COVID-19 worsened these issues. The global nature of the COVID-19 pandemic and its restrictive social measures necessitate prompt understanding of its impact on inequality and poverty to develop effective policy responses.

## *2.5 COVID-19 and Healthcare*

Abedi et al. (2020) argues that the virus had a substantial influence on the population in terms of racial, economic, and health disparities, leading to increased vulnerability and mortality rates. The aforementioned arguments have been employed by Patel et al. (2020) to elucidate the reasons behind the heightened susceptibility of those experiencing economic deprivation to the COVID-19 pandemic. Several reasons contribute to the issue at hand,

namely stress, comorbidities linked to poverty, and limited healthcare accessibility. Mahendradhata et al. (2021) mentioned that the COVID-19 pandemic severely impacted a healthcare system that was already weak, particularly in terms of its general capacity and fairness in distributing resources across different regions. There are substantial disparities in the availability and standard of healthcare services across different regions, which provided further challenges in managing the spread of COVID-19 when cases became widespread in both urban and rural areas. Suparmi et al. (2018) demonstrated significant disparities in public health development among provinces using a composite index of 30 variables. The index scores ranged from 44 in Papua (representing the lowest level) to 65 in Bali (representing the highest level).

### 2.6 COVID-19 and Education

Lee and Son (2018) suggest that the link between education and health literacy is influenced by social factors, with lower education levels linked to lower socioeconomic status, increasing cognitive impairment due to inadequate nutrition, reduced healthcare access, and social isolation. According to Joana et al. (2021), persons who are male, older, have more education, and belong to the risk factor group are more likely to have a higher IHK-COV19 globally. They also reveal that education levels are a strong predictor of health outcomes. Increased degrees of higher education are associated with enhanced health knowledge. This finding suggests that those with lower levels of education may require more significant enhancements in their health literacy.

According to Andrew et al. (2020), children's learning experiences during COVID-19 lockdown varied significantly depending on family wealth. Not only did children from higher-income households spend different amounts of time studying, they also had different access to resources at home and in schools. Bacher-Hicks et al. (2021) investigated in real time, using high-frequency internet search data, how U.S. families looked for online learning materials when schools closed. Searches for online learning materials increased significantly more in urban areas with better internet connection and higher incomes. Jaeger and Blaabæk's (2020) research in Denmark likewise implied that during the epidemic, learning opportunities for higher income groups were likely more abundant.

## 3. Data and Methods

The data were mainly derived from the Statistic Indonesia database (BPS), with the exception of the COVID-19 cases and mortality, which were taken from corona case update Andrafarm.com. We covered semiannual observations during the COVID-19 period spanning from 2019 to 2022 in 34 provinces in Indonesia. We then divided the samples into high- and low-inequality groups. We assumed that when the GINI coefficient was larger than 0.39 the sample could be regarded as a high-inequality province, and where the value was lower than 0.39, it could be considered a low-inequality province (Appendix A.1). Table 1 and Table 2 represent the data definitions and sources, together with the analytical statistics for all the variables used in our analysis and the correlation between each variable. The highest standard deviation reported in Table 1 was 11.33 in education, followed by unmet health facilities and unemployment (1.84 and 1.77, respectively). Meanwhile, the lowest standard deviation was within 0.04 for the GINI index. Table 2 shows that the highest correlation between the independent variables was found with unmet health facility and income (-0.60).

Table 1: Variable Definitions and Summary Statistics.

Variable	Definition	Std.			
		Mean	Dev	Min	Max
Cases	Log of the number of confirmed COVID-19 cases within the region. Sources: Corona Case Update AndraFarm.com. <a href="https://m.andrafarm.com/_andra.php?_i=daftar-co19-kota-sumber#sumber1">https://m.andrafarm.com/_andra.php?_i=daftar-co19-kota-sumber#sumber1</a> . Access Time: August 3, 2023	3.55	1.69	0	6.10
Mortality	Log of the number of death cases as a result of COVID-19, Sources: Corona Case Update AndraFarm.com. <a href="https://m.andrafarm.com/_andra.php?_i=daftar-co19-kota-sumber#sumber1">https://m.andrafarm.com/_andra.php?_i=daftar-co19-kota-sumber#sumber1</a> . Access Time: August 3, 2023	2.20	1.29	0	4.50

GINI	The distribution of income across population. Sources: BPS - Statistics Indonesia. Source Url: <a href="https://www.bps.go.id/indicator/23/98/2/gini-ratio-menurut-provinsi-dan-daerah.html">https://www.bps.go.id/indicator/23/98/2/gini-ratio-menurut-provinsi-dan-daerah.html</a> . Access Time: April 11, 2022	0.35	0.04	0.24	0.441
Poverty	Log of the estimated minimum expenditure to fulfil the basic needs of life in a month (IRD/month). Sources: BPS - Statistics Indonesia. <a href="https://www.bps.go.id/indicator/23/195/1/garis-kemiskinan-rupiah-kapita-bulan-menurut-provinsi-dan-daerah.html">https://www.bps.go.id/indicator/23/195/1/garis-kemiskinan-rupiah-kapita-bulan-menurut-provinsi-dan-daerah.html</a> . Access Time: April 18, 2022	5.57	0.11	5.41	6.72
Unemployment	The percentage of unemployed people. Sources: BPS - Statistics Indonesia. Source Url: <a href="https://www.bps.go.id/indicator/6/543/1/unemployment-rate-by-province.html">https://www.bps.go.id/indicator/6/543/1/unemployment-rate-by-province.html</a> . Access Time: April 18, 2022	5.22	1.77	1.25	10.95
Unmet Health Facilities (UHF)	The percentage of people with health problems and the health services actually received (%). Sources: BPS - Statistics Indonesia. <a href="https://www.bps.go.id/indicator/30/1402/1/unmet-need-pelayanan-kesehatan-menurut-provinsi.html">https://www.bps.go.id/indicator/30/1402/1/unmet-need-pelayanan-kesehatan-menurut-provinsi.html</a> . Access Time: August 3, 2022	4.75	1.84	1.28	10.73
Income	Log of average of net income per month of casual worker by province and main industry (IRD thousand). Sources: BPS - Statistics Indonesia. <a href="https://www.bps.go.id/statictable/2022/06/29/2198/rata-rata-pendapatan-bersih-pekerja-bebas-menurut-provinsi-dan-kelompok-umur-2022-2023.html">https://www.bps.go.id/statictable/2022/06/29/2198/rata-rata-pendapatan-bersih-pekerja-bebas-menurut-provinsi-dan-kelompok-umur-2022-2023.html</a> . Access Time: August 3, 2022	3.17	0.09	2.86	3.44
Number of Poor People (NPP)	Log of the number of people living below poverty line (thousands). Sources: BPS - Statistics Indonesia. Source Url: <a href="https://www.bps.go.id/indicator/23/185/1/jumlah-penduduk-miskin-ribu-jiwa-menurut-provinsi-dan-daerah.html">https://www.bps.go.id/indicator/23/185/1/jumlah-penduduk-miskin-ribu-jiwa-menurut-provinsi-dan-daerah.html</a> . Access Time: August 3, 2022	2.62	0.47	1.69	3.66
Education	The percentage of people graduated from high school (%). Sources: BPS - Statistics Indonesia. Source Url: <a href="https://www.bps.go.id/indicator/28/1980/1/tingkat-penyelesaian-pendidikan-menurut-jenjang-pendidikan-dan-provinsi.html">https://www.bps.go.id/indicator/28/1980/1/tingkat-penyelesaian-pendidikan-menurut-jenjang-pendidikan-dan-provinsi.html</a> . Access Time: April 18, 2022	63.88	11.33	5.82	90.12

Table 2: Correlation Results

	Cases	Mortality	GINI	Poverty	Unemployment	UHF	Income	NPP	Education
Cases	1.00								
Mortality	0.96*	1.00							
GINI	0.07	0.09	1.00						
Poverty	0.06	0.04	-0.45*	1.00					
Unemployment	0.29*	0.31*	0.05	0.14	1.00				
UHF	-0.22*	-0.20*	0.13	-0.41	-0.35*	1.00			
Income	-0.06	-0.07	-0.05	0.40*	0.38	-0.60*	1.00		
NPP	0.17*	0.25*	0.40*	-0.35*	0.17	0.21	-0.31*	1.00	
Education	0.26*	0.29	0.07	0.06	0.40*	-0.31	0.14	-0.15	1.00

We estimated panel regression in order to explain COVID-19 cases and mortality as functions of income inequality and poverty, and a number of control variables, including unemployment, unmet health facilities, income, number of poor people, and education. Along with the full set of samples, we divided the samples into high- and low-

inequality categories according to their GINI coefficients. We first applied the Hausman test to determine whether fixed effect or random effect was a better fit to the data. The Hausman's test result showed that fixed effect was consistent throughout the data. Hence, we continued to perform panel fixed-effect regression for the total cases and mortality of COVID-19.

The following model was used:

$$COVID19_{it} = \alpha + \beta_1 GINI + \beta_2 Income + \beta_3 Unemployment + \beta_4 PL + \beta_5 NPP + \beta_6 UHF + \beta_7 Education + \varepsilon_{it}$$

where COVID-19 is the dependent variable, which consists of two variables: COVID-19 cases and mortality rate. The objective was to first analyze how the independent variable affected the total number of cases of COVID-19 virus infection, and finally check how the independent variable effected the COVID-19 mortality rate.

GINI is the explanatory variable, which we used to measure inequality. The GINI index extends the income distribution across the population and measures the deviation from a perfectly equal distribution. A GINI index of 0 illustrates perfect equality, while an index of 1 shows perfect inequality.

Income refers to an individual's monthly average net income. Income, similar to the GINI index, is also a variable to measure inequality. Income data from casual workers, who are employed people who have a temporary employment contract or who work when needed, are included in the data. Compared to permanent or regular employment, this type of casual work has limited benefits and job security. The employees do not have active relationships with their employers and cannot file complaints. Hence, temporary workers exhibit more income inequality compared to full-time employees.

Unemployment is a situation in which a person does not have a job. The unemployment level is one of the measures of a healthy economy. In this study, unemployment was represented by the percentage of unemployed people in each province.

Poverty is defined as a lack of financial resources to meet essential needs. We used the poverty line (PL) as the measurement of the poverty level within a region. In this sense, we calculated the monthly estimated minimum expenditure to fulfill the basic needs of life in each region (IDR/Month).

NPP represents the number of poor people living below the poverty line. This variable was the proxy variable used to examine how poverty affected both COVID-19 cases and mortality.

UHF's are the unmet health facilities. Unmet health facilities represent the percentage of people with health problems compared to the health services actually received. This variable was used to measure how the health facilities influenced the cases and mortality caused by the COVID-19 virus.

Education refers to the percentage of people who graduated from high school. We assumed that regions with higher education levels had fewer COVID-19 effects, as people were more aware of their health and environment.

#### 4. Results and Discussion

Table 3 presents the results of panel regression of the model for COVID-19 cases. The GINI results exhibited significantly negative coefficients in the nation overall and in provinces with low inequality but were insignificant in high-inequality provinces. The GINI coefficient was larger in low-inequality provinces compared to the nation. Similar to the GINI results, the inequality measurement of income was also significantly negatively correlated with COVID-19 cases in all the samples. Both inequality variables, GINI and income, demonstrate how the increase in wage inequality during the pandemic was associated with a reduction in COVID-19 cases. This result is due to the loss of jobs and the increase in remote work caused by the pandemic. Even though the spread of COVID-19 decreased as more people worked at home, these unequal jobs created higher inequality in the society. Bick et al. (2023), Irlacher and Koch (2021), and Bonacini et al. (2021) confirm that high-income workers were more able to work from home and earn a premium wage compared to low-income workers. They also found that

workers who were able to work remotely earned more, deepening the inequality between the workers who could work from home and those who could not.

Table 3: Estimation Results (Cases)

	Nation	Low	High
GINI	-52.05*** (-4.24)	-69.94*** (-4.93)	19.82 (1.19)
Income	-11.16*** (-4.40)	-11.15*** (-3.85)	-4.87* (-1.88)
Poverty	2.02* (1.68)	1.28 (1.04)	25.93*** (4.47)
NPP	24.19*** (4.80)	23.40*** (3.74)	7.74* (1.70)
Unemployment	0.16 (1.23)	0.20 (1.21)	0.24** (2.21)
UHF	-0.48*** (-5.30)	-0.39*** (-3.64)	-0.05 (-0.55)
Education	0.15*** (7.88)	0.13*** (6.54)	0.36*** (7.10)
R2	0.62	0.62	0.61

Notes: The t-test is reported in parentheses, \*\*\*, \*\*, and \* indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Our results also suggest that the effect of inequality on the spread of COVID-19 was greater in low-inequality provinces. As stated by Stancheva (2022), remote work may drive regional inequality, as working from home is not feasible for everyone. Remote jobs were less feasible in low-income-disparity regions, as most of these regions are industrial or rely on tourism, and these were the sectors most affected by COVID-19 because of travel restrictions. Hence, COVID-19 cases decreased due to travel restrictions; however, many workers lost their jobs and needed to find new employment to earn an income, resulting in higher income inequality in these regions. Moreover, the spread of COVID-19 escalated in low-inequality provinces as these are usually poor regions with limited access to health care and less access to government health warnings.

In the nation and in high-inequality provinces, the coefficient of poverty was significantly positive despite being insignificant in low-inequality provinces. Therefore, the number of poor people, which is another measurement of poverty, had a positive influence on the COVID-19 cases in all samples. People living in poverty had a higher risk of COVID-19 transmission, as they tend to live in overcrowded accommodations, do not have access to remote work options, have unstable work and income, and have less access to health care (Patel et al., 2020). Hence, an increase in poverty will increase the number of COVID-19 cases.

Comparing the size of the coefficient in each sample, the results show that poverty highly influenced the total cases in high-inequality provinces (10 times the coefficient in the nation). These results point out the substantial link between inequality and poverty. Inequality worsens economic conditions and creates instability through mechanisms in which the rich spend less of their income compared to people with lower incomes, and the poor borrow money to fulfill their basic needs, leading to the default of consumer loans. Kumhof and Ranciere (2010) reported that as the rich save money, while the poor must spend money, there will be aggregate demand reduction, which results in unemployment. In return, governments decrease interest rates in response to the decrease in demand, resulting in asset bubbles such as rising housing prices. Inequality growth could lead to catastrophic consequences, especially for people living under the poverty line, as small increases in unemployment and interest rates lower the ability of poor people to settle their consumer and mortgage loans, triggering financing default. In addition, poor people living in cities with massive inequality are at high risk of contracting COVID-19 as they do not have enough privilege to access health care and often live in high-density communities.

Unemployment was found to be positively correlated with COVID-19 cases in high-inequality provinces, where it did not have any influence in the nation and in low-inequality provinces. This is perhaps due to high-inequality



provinces having more unemployment compared to low-inequality regions. People without work cannot afford good health care services, yet live in crowded neighborhoods, making them the most vulnerable to COVID-19 infection. Mirahmadizadeh et al. (2022) also point out similar findings, stating that unemployment is potentially a measurement factor of low socioeconomic status, malnutrition, and low social support, all factors that affect COVID-19-associated outcomes.

The variable of unmet health facility was found to have a negative impact on the COVID-19 cases in the nation and in low-inequality provinces but no impact in provinces with high inequality. At the time, the government announced physical distancing and stay-at-home measures. During the COVID-19 pandemic, people gradually reduced their need to go to hospitals or medical facilities. People with mild symptoms recovered at home and did not need go to hospital. This practice helped reduce the spread of COVID-19, and potentially reduced the hazards faced by older and more vulnerable patients. That is to say, increases in unmet health facilities reduced COVID-19 cases due to people being isolated at home.

Education positively influenced COVID-19 cases in all samples. Compared to other variables, the impact of education was relatively small in the nation and in low-inequality regions, potentially due to the government regulations, including wearing masks, hand washing, maintaining distance, and home isolation, that applied to all society and were not limited by education. This guidance needed to be followed by all people, and there was a punishment for breaking these rules. Hence, there was a low influence of education during COVID-19. This result is similar to that found by Rattay et al. (2021) who discovered that the differences in behavior between people with different education levels were relatively small during the pandemic.

After looking at the total number of cases of COVID-19, we analyzed the mortality caused by COVID-19 and how it was related to changes in income inequality and poverty, along with a number of control variables. The results of the fixed-effect panel regression are presented in Table 4. Each variable in Table 4 exhibits similar results to those shown in Table 3, except for unemployment. This result shows that unemployment had a positively significant influence on COVID-19 mortalities in all samples, whereas it had a positive influence on the total COVID-19 cases only in high-inequality provinces.

Table 4: Estimation Results (Mortality)

	Nation	Low	High
GINI	-34.63*** (-3.69)	-48.63*** (-4.48)	19.08 (1.55)
Income	-7.01*** (-3.65)	-7.03*** (-3.17)	-2.60 (-1.36)
Poverty	2.06** (2.24)	1.50 (1.59)	24.13*** (5.62)
NPP	15.82*** (4.11)	14.32*** (2.99)	5.78* (1.72)
Unemployment	0.21** (2.10)	0.28** (2.23)	0.18** (2.30)
UHF	-0.36*** (-5.19)	-0.30*** (-3.55)	-0.03 (-0.44)
Education	0.10* (1.82)	0.09*** (5.61)	0.21*** (5.60)
R2	0.59	0.59	0.81

Notes: The same as Table 3.

The link between unemployment and COVID-19 mortality was also found by Von Watcher (2020) and Bianchi et al (2023). Both studies conclude that the long-term effect of unemployment during COVID-19 increased the economic distress and took a toll on human beings. The link between unemployment and mortality during COVID-19 might be due to indirect causes such as decreases in income which forced people to live in high-density communities, lessened their ability to access good health care, and prolonged stress that caused mental and physical health problems.

In order to check the robustness of the results we excluded the lowest and highest values, or the 5% and 95% rate, for the dependent variables, cases and mortality, as well as for the GINI index, as an independent variable. The results of this check for robustness are shown in Table 5. They show similar findings to the results for the full sample shown in Tables 3 and 4. Hence, we conclude our results are robust within all samples.

Table 5: Robustness Test Results

	Cases	Mortality
GINI	-54.75*** (-4.44)	-36.80*** (-3.90)
Income	-10.77*** (-4.22)	-6.74*** (-3.45)
Poverty	1.93* (1.62)	2.00** (2.18)
NPP	25.43*** (5.02)	16.73*** (4.32)
Unemployment	0.16 (1.19)	0.21** (2.07)
UHF	-0.45*** (-4.99)	-0.34*** (-4.87)
Education	0.15*** (7.82)	0.10*** (6.82)
R2	0.62	0.58

Notes: The same as Table 3.

## 5. Conclusions

This study investigated the relationships between inequality, poverty, unemployment, unmet health facilities, and education on COVID-19 cases and mortality in 34 Indonesia provinces. The study contributes to the socioeconomic knowledge of COVID-19 and the effects of the different levels of inequality in various regions during the COVID-19 pandemic.

The findings from the study suggest that the effect of inequality on COVID-19 spread was greater in low-inequality provinces. Whereas poverty and unemployment positively influenced the total cases in high-inequality provinces. The variable of unmet health facility had a negative impact on COVID-19 cases, but education positively influenced COVID-19 cases. There were identical results for all the variables from the investigation of COVID-19 mortality, except for unemployment. Unemployment showed a positively significant influence on COVID-19 mortalities in all samples, whereas it only influenced COVID-19 cases in high-inequality provinces.

Perhaps the most crucial outcome of this study concerns the distinctive implications for different types of inequality. In provinces with high income inequality, the government should focus on poverty and unemployment to address COVID-19 spread and mortality. Government policies to reduce unemployment and maintain the availability of new jobs are necessary in the high-inequality regions. Unemployment is often caused by poverty, especially in urban environments with poor living communities. Both demand- and supply-side policies are necessary to successfully reduce unemployment. On the demand side, the government could directly employ more people in the public sector and stimulate demand of products that could lead firms to employ more people. On the supply side, increasing employment skills through training and hiring support information is needed. The government could act as an agent to match workers to available jobs, reducing market failure or misinformation.

Therefore, provinces with low income inequality should maintain their inequality level to avoid severe outcomes from future pandemics. Multiple studies have suggested that income inequality is related to people's happiness; therefore, steady low inequality relieved people from uncertain conditions during COVID-19. The government could reduce income inequality through increased tax payments for high-income earners, tax relief for low-income earners, providing welfare services for poor people, and maintaining the availability of health services, schools, and affordable housing to increase living conditions and reduce inequality in the society.

**Author Contributions:** All authors contributed to this research.

**Funding:** Not applicable.

**Conflict of Interest:** The authors declare no conflict of interest.

**Informed Consent Statement/Ethics Approval:** Not applicable.

## References

- Abedi V, Olulana O, Avula V, Chaudhary D, Khan A, Shahjouei S, Li J, Zand R. (2021). Racial, Economic, and Health Inequality and COVID-19 Infection in the United States. *J Racial Ethn Health Disparities*, 8(3):732-742. doi: 10.1007/s40615-020-00833-4.
- Ahmed, T., Rahman, A.E., Amole, T.G. *et al.* (2021). The effect of COVID-19 on maternal newborn and child health (MNCH) services in Bangladesh, Nigeria and South Africa: call for a contextualised pandemic response in LMICs. *Int J Equity Health*, 20(77). <https://doi.org/10.1186/s12939-021-01414-5>
- Almeida, V., Barrios, S., Christl, M. De Poli, S., Tumino, A., and Wielen, W.V.D., (2021). The impact of COVID-19 on households' income in the EU. *J Econ Inequal*, 19, 413–431. <https://doi.org/10.1007/s10888-021-09485-8>
- Amate-Fortes, Ignacio, and Almudena Guarnido-Rueda. (2023). Inequality, public health, and COVID-19: an analysis of the Spanish case by municipalities. *Eur J Health Econ*, 24, 99–110. <https://doi.org/10.1007/s10198-022-01455-9>
- Aspachs, Oriol, Ruben Durante, Alberto Graziano, Josep Mestres, Jose G Montalvo, and Marta Reynal-Querol. (2022). Real-time inequality and the welfare state in motion: evidence from COVID-19 in Spain. *Economic Policy*, 37(109), 165-199. <https://doi.org/10.1093/epolic/eiac008>
- Bacher-Hicks, A., Goodman, J., & Mulhern, C. (2021). Inequality in household adaptation to schooling shocks: Covid-induced online learning engagement in real time. *Journal of Public Economics*, 193, 104345. doi:10.1016/j.jpubeco.2020.104345
- Bick, Alexander, Adam Blandin, and Karel Mertens. (2023). "Work from Home before and after the COVID-19 Outbreak." *American Economic Journal: Macroeconomics*, 15(4): 1-39. DOI: 10.1257/mac.20210061
- Bonaccorsi, G., Pierri, F., Cinelli, M., Flori, A., Galeazzi, A., Porcelli, F., Schmidt, A. L., Valensise, C. M., Scala, A., Quattrociochi, W., & Pammolli, F. (2020). Economic and social consequences of human mobility restrictions under COVID-19. *Proceedings of the National Academy of Sciences of the United States of America*, 117(27), 15530–15535. <https://doi.org/10.1073/pnas.2007658117>
- Bonacini, L., Gallo, G & Scicchitano, S. (2021). Working from home and income inequality: riks of a 'new normal' with COVID-19. *J Popul Econ*, 34, 303-360. <https://doi.org/10.1007/S00148-020-00800-7>
- Bukari, C., Aning-Agyei, M.A., Kyeremeh, C. *et al.* (2022). Effect of COVID-19 on Household Food Insecurity and Poverty: Evidence from Ghana. *Soc Indic Res*, 159, 991–1015. <https://doi.org/10.1007/s11205-021-02766-9>
- Chakrabarty, Ebajyoti, Bhanu Bhatia, Maneka Jayasinghe, and David Low. (2023). Relative deprivation, inequality and the Covid-19 pandemic. *Social Science & Medicine*, 324, <https://doi.org/10.1016/j.socscimed.2023.115858>.
- Ferreirea, F.H.G. (2021). INEQUALITY IN THE TIME OF COVID-19. *International Monetary Fund. FINANCE & DEVELOPMENT*, 20-23.
- Gomes da Silva J, Silva CS, Alexandre B and Morgado P (2021) Education as a Predictor Factor for Knowledge of COVID-19 in Portugal. *Front. Public Health*. 9 (680726). doi: 10.3389/fpubh.2021.680726
- Irlacher, Michael and Koch, Michael. (2021). "Working from Home, Wages, and Regional Inequality in the Light of COVID-19" *Jahrbücher für Nationalökonomie und Statistik*, 241(3), 373-404. <https://doi.org/10.1515/jbnst-2020-0030>
- Jæger, M. M., & Blaabæk, E. H. (2020). Inequality in Learning Opportunities during Covid-19: Evidence from Library Takeout. *Research in Social Stratification and Mobility*, 100524. doi:10.1016/j.rssm.2020.100524
- Kumhof, M., Rancièrè, R. (2010). Inequality, Leverage and Crises. IMF Working Paper. WP/10/268. Available online at <https://www.imf.org/external/pubs/ft/wp/2010/wp10268.pdf>
- Lindsey, T., & Mann, T. (2020, April 9). Indonesia was in denial over coronavirus: now it may be facing a looming disaster. The Jakarta Post. <https://doi.org/10.1017/CBO9781107415324.004>
- Lee JK, Son YJ. (2018). Gender Differences in the Impact of Cognitive Function on Health Literacy among Older Adults with Heart Failure. *Int J Environ Res Public Health*, 15(12), 2711. doi: 10.3390/ijerph15122711.

- Luo, R., Liu, C., Gao, J., Wang, T., Zhi, H., Shi, P., & Huang, J. (2020). Impacts of the COVID-19 pandemic on rural poverty and policy responses in China. *Journal of Integrative Agriculture*, 19(12), 2946–2964. [https://doi.org/10.1016/S2095-3119\(20\)63426-8](https://doi.org/10.1016/S2095-3119(20)63426-8)
- Mahendradhata Y, Andayani NLPE, Hasri ET, Arifi MD, Siahaan RGM, Solikha DA and Ali PB. (2021). The Capacity of the Indonesian Healthcare System to Respond to COVID-19. *Public Health*, 9:649819.
- Martinez-Bravo, M., Sanz, C. (2021). Inequality and psychological well-being in times of COVID-19: evidence from Spain. *Series* 12, 489–548. <https://doi.org/10.1007/s13209-021-00255-3>
- McCurry, J., Ratcliffe, R., Davidson, H. (2020). Mass testing, alerts and big fines: the strategies used in Asia to slow coronavirus. <https://www.theguardian.com/world/2020/mar/11/mass-testing-alerts-and-big-fines-the-strategies-used-in-asia-to-slow-coronavirus>.
- McKibbin, W., & Fernando, R. (2020). The Global Macroeconomic Impacts of COVID-19: Seven Scenarios. *Asian Economic Papers*, 1–55. doi:10.1162/asep\_a\_00796
- Mirahmadizadeh, A., Shamooshaki, M. T. B., Dadvar, A., Moradian, M. J., & Aryaie, M. (2022). Unemployment and COVID-19-related mortality: a historical cohort study of 50,000 COVID-19 patients in Fars, Iran. *Epidemiology and health*, 44, e2022032. <https://doi.org/10.4178/epih.e2022032>
- O'Donoghue, Cathal, Sologon, Denisa M. Sologon, Iryna Kyzyma, and John McHale. (2020). Modelling the Distributional Impact of the COVID-19 Crisis. *Fiscal Studies*, 41, 321-336. <https://doi.org/10.1111/1475-5890.12231>
- Patel, J. A., Nielsen, F. B. H., Badiani, A. A., Assi, S., Unadkat, V. A., Patel, B., Ravindrane, R., & Wardle, H. (2020). Poverty, inequality and COVID-19: the forgotten vulnerable. *Public health*, 183, 110–111. <https://doi.org/10.1016/j.puhe.2020.05.006>
- Rattay, P., Michalski, N., Domanska, O. M., Kaltwasser, A., De Bock, F., Wieler, L. H., & Jordan, S. (2021). Differences in risk perception, knowledge and protective behaviour regarding COVID-19 by education level among women and men in Germany. Results from the COVID-19 Snapshot Monitoring (COSMO) study. *PloS one*, 16(5), e0251694. <https://doi.org/10.1371/journal.pone.0251694>
- Regan Helen. (2021). Delta Variant is Ravaging the World but It's Pushing Southeast Asia to Breaking Point. Hongkong CNN. <https://edition.cnn.com/2021/08/04/asia/southeast-asia-delta-covid-explainer-intl-hnk/index.html>
- Samarah, W.A (2021). 'Evaluating the Effect of COVID-19 on the Palestinian Economy by Estimating the Relationship Between Economic Growth and Unemployment in Palestine. *Studies in Business and Economic*, 16, 206-217. <https://doi.org/10.2478/sbe-2021-0034>
- Carolina Sanchez-Paramo, C., Hill, R., Mahler, D.G., Yonzan, A.N. (2021). COVID-19 leaves a legacy of rising poverty and widening inequality. World Bank Blogs. <https://blogs.worldbank.org/developmenttalk/covid-19-leaves-legacy-rising-poverty-and-widening-inequality>
- Stantcheva, Stefanie. (2022). Inequalities in the Times of a Pandemic . NBER Working Paper No. w29657, SSRN: <https://ssrn.com/abstract=4010506>
- Suryahadi, Asep, Ridho Al Izzati and Daniel Suryadarma. (2020). 'The Impact of Covid-19 Outbreak on Poverty: An Estimation for Indonesia'. *SMERU Working Paper*, SMERU Research Institute.
- Zhang, Qi, Xinxin Zhang, Qi Cui, Weining Cao, Ling He, Yexin Zhou, Xiaofan Li, and Yunpeng Fan. (2022). "The Unequal Effect of the COVID-19 Pandemic on the Labour Market and Income Inequality in China: A Multisectoral CGE Model Analysis Coupled with a Micro-Simulation Approach" *International Journal of Environmental Research and Public Health* 19, 3, 1320. <https://doi.org/10.3390/ijerph19031320>

**Appendix A.**

Table A.1: High- and Low-Inequality Provinces in Indonesia

High	Low	
1. DIY	1. Aceh	14. Kep. Riau
2. DKI Jakarta	2. Bali	15. Lampung
3. Gorontalo	3. Banten	16. Maluku
4. Jawa Barat	4. Bengkulu	17. Maluku Utara
5. Papua	5. Jambi	18. NTT
6. Sulawesi Selatan	6. Jawa Tengah	19. Papua Barat
7. Sulawesi Tenggara	7. Jawa Timur	20. Riau
8. NTB	8. Kalimantan Barat	21. Sulawesi Barat
	9. Kalimantan Selatan	22. Sulawesi Tengah
	10. Kalimantan Tengah	23. Sulawesi Utara
	11. Kalimantan Timur	24. Sumatera Barat
	12. Kalimantan Utara	25. Sumatera Selatan
	13. Kep. Bangka Belitung	26. Sumatera Utara