
The Impact of COVID-19 Pandemic on Poverty Levels in Central Java: A Comparative Analysis

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Nawalin Nazah^{1*)}; Dwi Winarni² ; Rhis Ogie Dewandaru³

Abstract

This study investigates how poverty levels in Central Java, Indonesia, were affected before, during, and after the COVID-19 pandemic. Initially, there was a gradual decline in poverty rates due to economic growth and poverty alleviation programs. However, the pandemic brought unprecedented challenges, leading to economic disruptions, job losses, and increased vulnerability. Using data from 2017 to 2023 across 29 regencies and 6 cities in Central Java, the research assesses the pandemic's impact on poverty. Factors such as unemployment, education, and minimum wage are examined, with COVID-19 represented by dummy variables. The findings reveal a rise in poverty during and after the pandemic, despite efforts to alleviate it. Education and minimum wage play significant roles in poverty reduction, while unemployment's impact is less clear. The study utilizes statistical models to analyze the data, identifying a random effect model as the most suitable. Heteroscedasticity is addressed using FGLS models, reaffirming the significant impact of variables on poverty. Additionally, the study evaluates Central Java's post-pandemic recovery efforts, providing insights for future policymaking to build resilient and inclusive societies in the face of similar crises.

Keywords: Poverty, COVID-19 Pandemic, Unemployment, Education, Regional Minimum Wage

Code JEL:

1. Introduction

The emergence of the COVID-19 pandemic has spread across the globe, reshaping economies, societies, and livelihoods in its wake. Within the heart of Indonesia, Central Java stands as no exception to the far-reaching impacts of this unprecedented crisis. The presence of the virus gives some implications such as lockdown measures, travel restrictions, the closure of markets, restaurants, and small enterprises, worsened socio-

¹ “Universitas Muhammadiyah Purwokerto”; nawalin_nazah@ump.ac.id

² “Universitas Muhammadiyah Purwokerto”; dwiwinarni@ump.ac.id

³ “Universitas Muhammadiyah Purwokerto”; rhisoghiedewandaru@ump.ac.id

*) Correspondence

economic disparities, and widening inequality as a result leading to the depths of poverty.

The issue of poverty always becomes an interesting point to consider because it can distract economic stability if the government fails to address it with proper policies. Studying the impact of COVID-19 on poverty is crucial for understanding the pandemic's socio-economic consequences. Before the pandemic, there was a gradual decline in poverty in Central Java, however, the number turned to increased once the pandemic outbreak as reported by the Central Bureau of Statistics, during 2018-2023, the poverty levels in Central Java were 11.32%, 10.8%, 11.41%, 11.79%, 10.93 %, and 10.77%. Through a comparative method, this study provides a comprehensive picture of the poverty evolution in Central Java. In addition, the poverty dynamic also able to be seen for each regency, therefore this study can be used as a reference to identify which regency is the most affected or knowing the regency that becomes a concern. This is the thing that differentiates from the previous research. This knowledge not only benefits Central Java but also adds valuable insights to global discussions on pandemic recovery and poverty alleviation.

In a study by Suryahadi et. al, (2020) it is reported that in the case of Indonesia, the pandemic has pushed 1.3 million more people into poverty increasing from 9.2% to 9.7% at the end of 2020, and continued to increase and predicted up to 16.6 % reversing Indonesia's progress in reducing poverty. Moreover, (Romdiati & Kusumaningrum, 2021) documented that regencies in Java and Bali were impacted by the pandemic with the highest increase in poverty in small islands and coastal areas. Meanwhile quarantine mechanism during COVID also generated some massive impacts such as unemployment and, a reduction of the purchasing power parity, as a result, expanded poverty from a multidimensional perspective (Estrada, 2021).

In addition, the Pandemic has a significant effect on economic growth and poverty alleviation shown by a reduction in the Human Development Index by 0.124 which means a reduction in the poverty alleviation efforts for every one percentage point increase in the COVID-19 (Sackey & Barfi, 2021). In the US, the Government helps to slow down the increase in poverty by giving financial assistance and expanding employment insurance, however many of the benefits are temporary, so future estimates of income will depend on how the availability of these benefits changes going forward (Han et al., 2020).

Other factors that contribute to poverty is unemployment. According to the Centre Statistic Agency (BPS) in August 2021 unemployment in Central Java accounted for 5.95 percent and reduced to 5.57 percent in August 2022 and 5.13 percent in August 2023. The economic shocks have a further impact on the decline in income for some people, some even have no income at all because of business shutdowns or the loss of their jobs. Higher unemployment leads to a decrease in the prosperity of society due to lower income, and as a consequence unable to meet and satisfy all their needs properly, as an alternative they have to reduce their expenses. This will increase the number of people living below the poverty line (Anggraini et al., 2023). In the case of Central Java, it is reported that from 2004 to 2009 unemployment was significantly positive on poverty

(Permana & Arianti, 2012). For agricultural areas such as Jambi, Indonesia, unemployment depends on the agricultural season, for example, In the dry season, many farmers do not work, causing an increase in poverty (Sari & Falianto, 2020)

Moreover, education also plays a crucial role in influencing poverty. Education equips individuals with the knowledge and skills necessary to secure better-paying jobs. Higher education is often associated with higher income which can help individuals and families escape from poverty. Education also opens a wider range of job opportunities. Those with higher education are more likely to have access to jobs that offer better wages, benefits, and job security thus reducing the likelihood of poverty (Mihai, et.al. 2015). Moreover, education provides individuals with the knowledge and skills to manage their finances effectively which are essential for escaping poverty. Educated people also have preferences to choose a healthier lifestyle and thus have more productivity at work (Mihai, et.al. 2015). Meanwhile, Hofmarcher (2021) reported in The Europe 2020 strategy, it is noted that *“better educational levels help employability, and progress in increasing the employment rate helps to reduce poverty”*. Education is acknowledged as a fundamental tool to prevent and lift people out of poverty. Therefore, education is not only a tool for personal development but also a powerful weapon against poverty (Susanto & Pangesti, 2019).

Poverty is also affected by the amount of minimum wage which is expected to increase the purchasing power of those with low income thus increasing the consumption of goods and services to meet their needs. Higher minimum wage gives the motivation to upgrade the productivity of workers, they tend to work harder or improve their skills to meet the required standard of work. A rise in minimum wage increases income so they can have a better quality of life and welfare (Pamungkas & Suman, 2017). A Study from an Islamic Perspective (Syarif & Wibowo, 2017) in the case of Indonesia, found that an increase in minimum wage was significant on poverty alleviation and this effect has more impact if the worker is the householder.

On the contrary, a high minimum wage burdens the company as they have to pay a high cost of production thus more likely to able to reduce the interest in investment and economic growth which in turn worsens poverty. the company may respond by reducing the number of workers or preventing new recruitments and this can lead to an increase in unemployment, consequently, it is necessary to balance between worker protection and sustainable economic development to reduce poverty effectively (Ramirez, 2015). Meanwhile, in some developing countries the effect of an increase in minimum wage varies among income earners, for low-income earners, an increase in minimum wage lowers the number of poverties, however, if it occurs among high-income earners, the effect does not significantly reduce poverty (Gindling, 2018).

Even though there are some previous studies discussed about poverty in Indonesia during pandemic COVID (Romdiati & Kusumaningrum, 2021; Masruroh et al., 2021; Sitepu, 2022), they used a descriptive approach and did not specifically explain the relationship between pandemic COVID and poverty in numbers. Instead, this study uses panel data analysis to describe the relationship between the pandemic and poverty using dummy variables to give a clear picture of the differences in poverty before,

during, and after COVID-19, therefore it can be seen how much the impact of the COVID on poverty especially in Central Java that has not been discussed in previous research. This study also provides information on whether the effects are similar in all regions in Central Java and also able to identify which region is the most affected by COVID. Accordingly, it is expected to concentrate the alleviation program on the respective region. This study aims to give a comprehensive description of the dynamic of poverty before, during, and after the pandemic. This analysis provides a deep insight into how pandemics influence poverty levels and identifies factors that worsen or alleviate poverty.

2. Methods

The method that will be used in this research is panel data analysis. This approach can address the combination between cross-section entities of all the regencies in Central Java as well as time series units from 2017 before the pandemic, until 2023 after the pandemic. Besides, the dynamic of each regency also can be seen in addition to the overall measure of Central Java.

2.1. Data

This research employs secondary data retrieved from the Central Statistics Agency (BPS) of Central Java. It consists of 29 regencies and 6 cities in Central Java from 2017-2023 thus there are 245 observations. The data covers the period before, during, and after Covid. The differentiated factor employs two dummy variables to quantify the category of the pandemic period where the benchmark category is the period before Covid and will be coded by 0 in both dummies. The dependent variable is poverty level while the independent variables are Covid, unemployment, education, and regional minimum wage. The research employs panel analysis (Gujarati & Porter, 2009) using STATA which provides three models namely the common effect, fixed effect, and random effect. The model selection will use the Hausman test. Table 1 will summarize the definition of the variables.

Table 1. Variable Description

No	Variable	Explanation
1	Poverty	The percentage of people who live under the poverty line
2	COVID 19	To represent COVID-19 this study employs two dummy variables namely D1 and D2. The period before COVID is the benchmark category, it has a value of 0 in both dummies.
3	Education	The number of years spent at school
4	Unemployment	The percentage of un-employ citizen
5	Minimum wage	The minimum salary earns every month

2.2. Model Specifications

The selection of the variables refers to some previous studies. Some variables that determine poverty are Covid-19 as supported by Suryahadi et. al, (2020), Romdiati & Kusumaningrum (2021), Estrada (2021), Sackey & Barfi (2021), (Han et al. (2020), Masrurroh et al. (2021) and Sitepu (2022), unemployment which is also obvious in contributing to the poverty levels as found in some studies (Anggraini et al., 2023; Permana & Arianti, 2012; Sari & Falianto, 2020). Meanwhile education also strongly suggested reducing poverty as documented (Mihai, et.al. 2015; Hofmarcher, 2021; Susanto & Pangesti, 2019) and lastly is the minimum wage (Pamungkas & Suman, 2017; Syarif & Wibowo, 2017).

Therefore, the model specification utilized in this study is as follows:

$$Poverty_{it} = \beta_0 + \beta_1 D_{1it} + \beta_2 D_{2it} + \beta_3 Une_{it} + \beta_4 Edu_{it} + \beta_5 Min_Wage_{it} + v_{it}, \quad (1)$$

$i=1, \dots, N, t=1, \dots, T.$

where,

i is the unit of observation

t is the unit of time

β_0 is the intercept

β_k is the coefficient of each explanatory variable

v_{it} is the error term*

3. Results

3.1. Regression of Panel Data

Some models in panel data analysis, such as CEM or Pooled OLS, Fixed Effect, Random Effect, and FGLS are reported in Table 2.

Table 2. The Output of Panel Analysis

Poverty	Common Effect	Fixed Effect	Random Effect	FGLS
Covid 1	2.00***	1.87***	1.99***	1.57***
Covid 2	2.93***	2.28***	2.48***	2.54***
Unemployment	0.11	-0.04	-0.05	0.23***
Education	-1.54***	-0.07**	-0.69***	-1.36***
Minimum Wage	-5.75***	-6.05***	-5.72***	-4.66***
Constant	32.32***	22.26***	26.50***	27.59***

*** indicated that the results are significant at 1% level. ** indicated significant at 5% level. The number in the table are the regression coefficient for each variable for all models.

Table 3. Model Selection

Model Selection	F	Chi2	P-value	Selected Model
Chow Test (CEM Vs FE)	120.38	-	0.000	FE
Hausman Test (FE vs RE)	-	7.05	0.217	RE
Breusch Pagan (CEM vs RE)		640.86	0.000	RE

If heteroscedasticity is disregarded, referring to Table 3, the findings are consistent in all three models. The emergence of COVID-19 significantly contributes to escalating poverty levels, the effect continues even more, even though COVID has ended. Meanwhile, unemployment was not significant in all three models. Moreover, education and minimum wage negatively influence poverty, meaning that higher education and higher minimum wage can reduce poverty levels. The interpretation however will refer to Random Effect as the preferred model based on model selection presented in Table 3.

The regression equation is:

$$\text{Poverty} = 26.50 + 1.99 D_1 + 2.48 D_2 - 0.05 \text{Une} - 0.69 \text{Edu} - 5.72 \text{Min_Wage} \quad (2)$$

Variable D_1 indicated 1 for 2020-2022 when the COVID outbreak and 0 for otherwise. While D_2 equals 1 for the year 2023 (post- Covid), and 0 for otherwise. Therefore, the regression equation for the period before Covid is when the coefficients D_1 and D_2 are equal to zero. In this case the period before Covid act as a Benchmark Category.

$$D_1 = \begin{cases} 1, & \text{for 2020 – 2022} \\ 0, & \text{otherwise} \end{cases} \quad \text{and} \quad D_2 = \begin{cases} 1, & \text{for 2023} \\ 0, & \text{otherwise} \end{cases}$$

During the COVID outbreak, the poverty level increased by 2 %, and a year after the pandemic ended, the poverty increased by 2.48% with the assumption other variables remain constant. This effect is higher even though the pandemic has ended, this is because it needs quiet time to recover. Meanwhile, if a citizen spends one year longer in school, it can lead to a decrease in poverty by 0.7% and if someone earns IDR 1 million higher, it can cause poverty to decrease up to 5.72%.

However, since heteroscedasticity is detected, the study also employs FGLS regression. The proposed feasible GLS estimator is more efficient than the ordinary least squares (OLS) in the presence of heteroskedasticity, and cross-sectional correlations.

The regression equation of FGLS is as follows:

$$\text{Poverty} = 27.59 + 1.57 D_1 + 2.54 D_2 + 0.23 \text{Une} - 1.36 \text{Edu} - 4.66 \text{Min_Wage} \quad (3)$$

4. Discussion

4.1. Covid

The interpretations of each variable by referring to equation (6) are as follows:

The regression equation before Covid ($D_1=0$ and $D_2=0$) is:

$$\text{Poverty} = 27.59 + 0.23 \text{ Une} - 1.36 \text{ Edu} - 4.66 \text{ Min_Wage} \quad (4)$$

The regression equation during Covid ($D_1=1$ and $D_2 = 0$) is:

$$\text{Poverty} = 29.16 + 0.23 \text{ Une} - 1.36 \text{ Edu} - 4.66 \text{ Min_Wage} \quad (5)$$

The regression equation after Covid ($D_1=0$ and $D_2 = 1$) is:

$$\text{Poverty} = 30.13 + 0.23 \text{ Une} - 1.36 \text{ Edu} - 4.66 \text{ Min_Wage} \quad (6)$$

It can be seen that by assuming other variables remain constant, the pandemic success contributed to the poverty in Central Java, and this effect was even higher after the pandemic ended. The emergence of COVID-19 increased the poverty level by 1.57 %, and then one percent higher after the pandemic lifted. This may happen due to the multiplier effect of the pandemic that required recovery time, which is not instant and takes longer to return to normal conditions.

Furthermore, by referring to the finding in Table A2 in the appendix, the region differences responding to poverty dynamic easily can be seen. For instance, the regions that are least affected by COVID-19 are Kota Salatiga, Kota Magelang, Kota Pekalongan, and Kota Tegal shown by a negative sign in the coefficient, that means for the respective regions, the constant will be reduced by the coefficient of the region so the value of constant will be less. In contrast, the regions most affected by COVID-19 are indicated by the positive sign in each region's coefficient, which will increase the constant's value. These regencies are Kebumen, Wonosobo, Brebes, Purbalingga, Pemalang, and Demak.

Even though the significant effect of COVID-19 on poverty in the case of Central Java was also found in Wuranti (2022) for the year 2020 using cross-section analysis, however, the coefficient was very small which is 0.002, in other words, the pandemic almost does not affect the number of poor people. Furthermore, by using the spatial approach and Moran's index, (Amin et al., 2023) support the finding that the number of confirmed cases of COVID-19 in the observation districts in Central Java does not have a similar value to poverty. Having this fact, the government should prevent the potential upcoming pandemic by providing a good healthcare system.

4.2. Unemployment

Even though unemployment was not significant in the three former models, using FGLS estimation however shows a contradicting result. The positive sign represents that unemployment contributes to the increase in poverty. For one percent increase in unemployment, will cause the poverty level to increase by 0.23 percent. An increase in unemployment indicates many individuals do not have enough or have no income to fulfill their needs due to being jobless. The condition is even worse as an effect of the pandemic outbreak. As a consequence, they have to cut off some of their expenses. This

situation in turn adds to the number of poor people. This study confirms the findings by Permana & Arianti (2012) for the same case of Central Java. Meanwhile, the effect was slightly different for agricultural areas such as Jambi, Indonesia (Sari & Falianto, 2020). The changes in unemployment depend on the agricultural season, for example, In the dry season, many farmers do not work, causing an increase in poverty. Therefore, if the government is concerned about poverty alleviation programs, providing labor-incentive jobs should become a serious consideration.

4.3. Education

Education was found negatively significant on poverty. The higher education the lower the poverty level. According to equation (6), adding one year spent on school effectively reduces poverty by 1.36 percent. This finding is very important and can be used as a tool for poverty reduction. Education opens to a wider probability of new jobs. Education prepares individuals with the knowledge and skills that enable them to earn higher salaries. As stated by Mihai, et.al. (2015), a high salary raises purchasing power, improving the family's financial welfare and lowering the chance of poverty. Better communication skills gained from higher education made it possible to launch a new firm or enter the workforce. Consequently, education is a potent instrument for battling poverty as well as a tool for personal growth (Susanto & Pangesti, 2019).

4.4. Minimum Wage

The regional minimum wage is used as an indicator of income. The findings show a negative significant impact on poverty. Referring to equation (6), a rise in the minimum wage by IDR one million, is expected to contribute to poverty reduction by 4.66 percent. As compared with all involved variables, the minimum wage has the greatest impact on poverty reduction. This is because an increase in minimum wage upturns the income and purchasing power of lower income earner leading to increased consumption of goods and services, therefore improving the quality of their economic life. An increase in minimum wage motivates the productivity of the workers. The workers become more diligent and triggered to upgrade their skills to improve their working performance.

This finding supports Pamungkas & Suman (2017) and Syarif & Wibowo (2017). In contrast, A high minimum wage burdens businesses since it increases their cost of production. As a result, they may have lower interest in investment and economic growth, which exacerbates poverty. To effectively eliminate poverty, it is vital to strike a balance between worker protection and sustainable economic development. The company may respond by reducing the number of workers or preventing new recruitment, which could increase unemployment (Ramirez, 2015). In certain developing nations, however, the impact of raising the minimum wage varies depending on the income level of the earner. While an increase in the minimum wage reduces the number of people living in poverty for those with low incomes, it has little effect on those with high incomes (Gindling, 2018). Therefore, the government needs to evaluate minimum wage policies to balance the benefits between workers and industries.

5. Conclusion

According to the results above, poverty is greatly impacted by the pandemic of COVID-19. Dummy variable analysis was employed to demonstrate this by distinguishing between the pre-, during-, and post-COVID-19 periods. For Central Java, the pandemic resulted in a 2% (Random Effect model) or 1.57% (FGLS) increase in the poverty rate. Because of the pandemic's widespread effects and the fact that many businesses went bankrupt and had to start over from scratch, poverty did not instantly return to pre-COVID-19 levels. Many people are still having difficulty finding new employment or launching new firms after losing their jobs. The government is supposed to be able to support society, particularly those who are bankrupt, by providing financial support and skill development. Meanwhile, education and the regional minimum wage are among the elements reducing poverty. Time spent in school serves as an indicator of education, which in this case lowers the amount of poverty. Gaining a higher education increases one's chances of receiving information, raising the likelihood of landing a higher-paying job, improving communication skills, and using technology to increase the quality, effectiveness, and productivity of one's output. The minimum wage is another factor that helps to reduce poverty. Raising the minimum wage increases income, particularly for those with lower incomes. Furthermore, poverty is made worse by unemployment because unemployed people cannot afford to meet their necessities.

In summary, the Central Java regional government should expand access to education, create more job possibilities, and make business capital available to the underprivileged to launch their ventures to combat poverty. The government must formulate a minimum wage that has been shown to improve societal welfare. A recommendation for further research may develop a study of poverty in other provinces in Indonesia by involving more factors.

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APPENDIX. Output Per Region

poverty	Coefficient	Std. err.	t	P> t	[95% conf. interval]	
covid1	1.877841	.2074019	9.05	0.000	1.468927	2.286755
covid2	2.286763	.2769603	8.26	0.000	1.740707	2.832818
unemploy	-.045121	.0529629	-0.85	0.395	-.1495429	.0593009
edu	-.0758462	.3066557	-0.25	0.805	-.6804497	.5287572
umr3	-6.052282	.5091171	-11.89	0.000	-7.056059	-5.048505
code						
2	.4354061	.413644	1.05	0.294	-.3801358	1.250948
3	2.996774	.3601987	8.32	0.000	2.286605	3.706943
4	1.524324	.4041447	3.77	0.000	.7275107	2.321137
5	3.895941	.4232613	9.20	0.000	3.061438	4.730445
6	-1.525629	.5338065	-2.86	0.005	-2.578084	-.4731745
7	3.846198	.3968579	9.69	0.000	3.063752	4.628645
8	-1.1435	.4400928	-2.60	0.010	-2.011189	-.2758118
9	-2.693028	.4570484	-5.89	0.000	-3.594146	-1.79191
10	.0611211	.6291734	0.10	0.923	-1.179359	1.301602
11	-5.141865	.7922122	-6.49	0.000	-6.703793	-3.579936
12	-2.793847	.4620116	-6.05	0.000	-3.704751	-1.882943
13	-2.255693	.6187183	-3.65	0.000	-3.47556	-1.035826
14	-.5410118	.4462908	-1.21	0.227	-1.42092	.3388967
15	-1.398677	.4213192	-3.32	0.001	-2.229352	-.5680026
16	-1.724347	.4227268	-4.08	0.000	-2.557796	-.8908969
17	1.738349	.4369233	3.98	0.000	.8769091	2.599788
18	-3.388866	.4219173	-8.03	0.000	-4.22072	-2.557013
19	-4.036825	.6163021	-6.55	0.000	-5.251928	-2.821722
20	-5.241083	.4191042	-12.51	0.000	-6.067391	-4.414776
21	2.426965	.3837307	6.32	0.000	1.670401	3.18353
22	-3.878966	.4627488	-8.38	0.000	-4.791323	-2.966609
23	-3.80469	.4468063	-8.52	0.000	-4.685615	-2.923765
24	-1.100941	.3334066	-3.30	0.001	-1.758287	-.4435958
25	-3.063436	.3505098	-8.74	0.000	-3.754502	-2.37237
26	-2.167827	.3637402	-5.96	0.000	-2.884978	-1.450675
27	2.545377	.3797728	6.70	0.000	1.796616	3.294138
28	-4.867028	.3351597	-14.52	0.000	-5.52783	-4.206226
29	3.34709	.3902314	8.58	0.000	2.577709	4.116472
30	-5.608235	1.182209	-4.74	0.000	-7.939081	-3.277388
31	-3.404823	1.192734	-2.85	0.005	-5.756421	-1.053225
32	-7.217803	1.143252	-6.31	0.000	-9.471843	-4.963764
33	-3.739181	1.057735	-3.54	0.001	-5.824615	-1.653746
34	-4.959426	.6626978	-7.48	0.000	-6.266003	-3.652849
35	-4.996125	.6200607	-8.06	0.000	-6.218639	-3.773611
_cons	23.91558	2.026212	11.80	0.000	19.92069	27.91047