DETERMINANT OF THE PREVALENCE OF UNDERNOURISHMENT (POU) IN DISTRICTS/CITIES OF PAPUA PROVINCE FROM 2021 - 2024

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Abstract

The study aims to analyze factors related Prevalence of Undernourishment (PoU) in 29 districts and city of Papua Province from year 2021-2024. The proportion of the population that does not consume enough energy is PoU. Panel data regression model using the Fixed Effect Model (FEM) was employed in the analysis. Variables such as economic growth, poverty, population density, average length of schooling and life expectancy have been considered. The estimation results show that the PoU is negatively and significantly influenced by economic growth, while number of poor people and life expectancy have a positive and significant influence. These findings confirm that increasing economic growth and reducing poverty are important strategies for reducing food insecurity in Papua. Thus, the implementation of policies focused on inclusive economic growth and poverty alleviation is expected to support the achievement of Sustainable Development Goal (SDG) 2, "Zero Hunger," while improving the welfare of the community.

Keywords: Prevalence of Undernourishment (PoU); Economic Growth; Poverty; Life Expectancy

INTRODUCTION

The Prevalence of *Undernourishment* (PoU) is a key indicator for assessing food consumption adequacy in a region, defined as the proportion of the population with energy intake below the Minimum Dietary Energy Requirement (MDER) or 2,100 kcal/day (Food Security Agency, 2022). Adequate food consumption is an important element that must be fulfilled by every resident. Law of the Republic of Indonesia No. 18 of 2012 regulates the role and obligations of the government in ensuring adequate and affordable food consumption that is sufficient and safe at both the regional and national levels. This provision is in line with Constitution of the state of the Republic of Indonesia of the year of 1945, which makes food security the foundation for developing quality human resources for inclusive and equitable growth across all regions (Susanti and Irfan, 2024). The Sustainable Development Goals (SDGs) emphasize sustainability, progress, and economic, social, and environmental well-being (Putri et al., 2023). One of them is Target Zero Hunger, which aims to eliminate hunger and malnutrition and ensure access to nutritious food for all levels of society (Yahya et al., 2023).

After the COVID-19 pandemic, the challenge of food security has become even more complex. According to the FAO and UNICEF in Nisa and Triani (2024), More than half of the cases of food insecurity in the world occur in Asia, affecting around 418 million people. This situation shows that food insecurity remains a serious problem at the global level, particularly in Asia, and is relevant to developing countries, including Indonesia. This term represents that food insecurity still becomes the most serious problem world widely, including in Asia as one of the regions with worst condition and is a very important issue for developing countries like Indonesia. To know how this global problem applies at the national level, an assessment of Indonesia's PoU trend from 2021 to 2024 is conducted.

Table 1. National PoU in Indonesia for 2021-2024

Country	PoU			
	2021	2022	2023	2024
Indonesia	8.49	10.21	8.53	8.27

Source: (Statistics Indonesia (BPS), 2025)

As shown in Table 1, the level of *undernourishment* in Indonesia varied widely from 2021 through 2024. The percentage of the population that was *undernourishment* (PoU) was 8.49 percent in 2021, then increased quite suddenly to 10.21 percent in 2022. The major factors leading to this rise in *undernourishment* were post-Covid 19 conditions particularly, reduced purchasing power and disruptions to food distribution methods. However, subsequent to the peak in PoU in 2022, the followings years indicated a downward trend with figures of 8.53 percent for 2023 and then 8.27 percent for 2024 appearing to be more positive. Although this positive trend indicates some level of reduced *undernourishment*, the actual figure remains within the moderate category and therefore indicates that *undernourishment* continues to persist and be an ongoing concern within Indonesia. According to Yahya et al. (2023), *undernourishment* continues to remain a significant contributory element to the stunting, wasting, and low weight-for-age of children, therefore these factors will be barriers to overall growth and development of future generations. Additionally, Susanti and Irfan (2024), state that low amounts of nutritional value provided by food will reduce all individual age group's ability to respond appropriately to emergencies (system) through their immune systems inability to fight infections as well as through a diminished capacity for cognitive

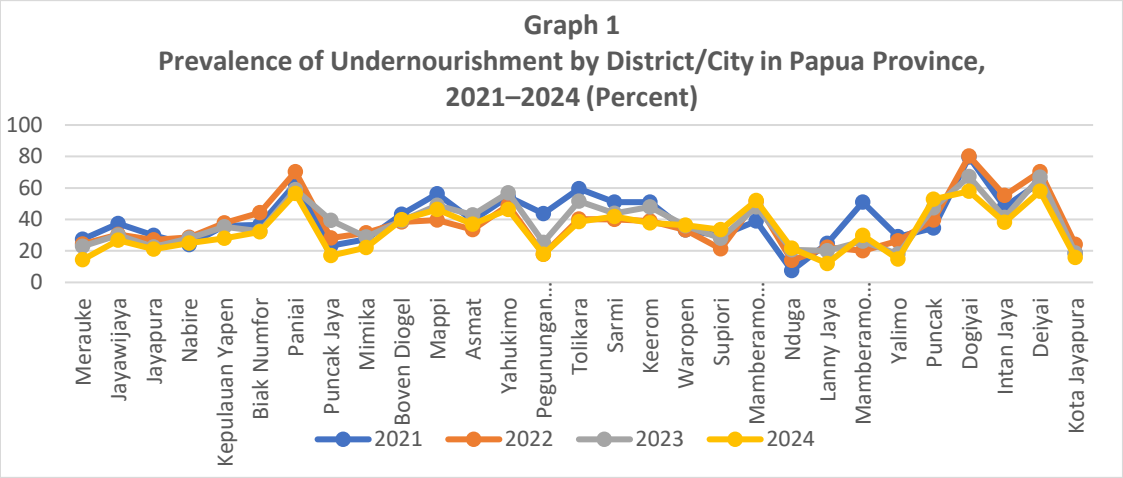
function and normal physical growth, because they are unable to grow normally. Finally, according to Sehusman et al. (2023), the PoU is categorized into five classifications: very low (below 2.5 percent), low (2.5-4 percent), moderate (5-19 percent), high (20-34 percent), and very high (above 35 percent). The provinces with the highest PoU scores should be used to highlight regional differences in access to food and food security.

Table 2. Top 5 Provinces in Indonesia in Terms of PoU for 2021-2024

Province	**PoU**			
	2021	**2022**	**2023**	**2024**
Papua	37.37	36.18	35.63	26.03
Maluku	29.62	31.68	30.27	31.66
North Maluku	28.86	30.71	29.56	28.44
West Papua	24.59	29.38	24.00	21.91
North Kalimantan	12.75	23.01	15.92	14.61

Source: (Statistics Indonesia (BPS), 2025)

This is in line with what the table shows whereby Papua Province always stays as the province that has the highest prevalence of *undernourishment* during 2021-2024. In 2021, the PoU in Papua was estimated at 37.37 percent and although it declined substantially to 26.03 percent by 2024, this table is still well above the national average of 8.27 percent. Position of the prevalence of *undernourishment* other provinces with a relatively high PoU are Maluku, North Maluku, West Papua and North Kalimantan. These results show that food security continues to be particularly problematic in the east of Indonesia especially in Papua and Maluku. The disparity between Papua's PoU and the national average is significant and persistent. Papua has shown a large decrease in *undernourishment* from 2021-2024, but the gap with the national level is still significant. This scenario indicates that interventions to decrease food insecurity in Papua should not be based on general national policies, as specific and context-based strategies are needed. These considerations must account for the region's unique geography scarce infrastructure and limitations in food distribution and logistics. To better emphasize the internal variance in food consumption inadequacy among Papua, graph 1 also presents a map showing district and municipality distribution of prevalence of *undernourishment* for period 2021-2024.



Source: (Statistics Indonesia (BPS), 2025)

The graph demonstrates large variations in the levels of *undernourishment* among districts and cities in Papua. Central highlands regions such as Puncak, Yahukimo, Dogiyai and Pegunungan Bintang always have PoU higher than 30 percent which are mainly a result of deficiencies in infrastructure, access to transportation and weak local economies. On the other land, Jayapura City presents much less PoU a reflecting better infrastructure, hence perennial existence. This difference confirms that food insecurity in Papua is not only determined by aggregate food availability, but also by spatial and socio-economic factors, thus requiring different place-based food policies for urban and remote mountainous areas. Districts in the Papua region are located in flatlands and remote mountainous areas. A total of 4,114 villages, or around 79.68% of the 5,163 identified villages, are located in mountainous areas that are difficult to access, resulting in transportation constraints. In addition, geographical disparities, both in terms of area and location of districts/cities, are one of the obstacles to the government's ability to provide optimal public services to all villages (Papua Provincial Development Planning Agency, 2022).

Based on previous research, there are a number of social, economic, and demographic factors that influence the Prevalence of *Undernourishment* (PoU). Putri et al. (2023), explain that PoU is influenced by the COVID-19 pandemic, rice production, the percentage of poor people, the alertness index, per capita income, and average length of schooling. In line with this, Nisa and Triani (2024), highlight per capita expenditure on food, the number of poor people, and rice production as determining factors of PoU. Mardison (2020) found that poverty and economic growth are highly determining variables, while Susanti and Irfan (2024), added the role of rice production, rainfall, temperature, poverty, and economic growth. Yahya et al. (2023), the rate of *Undernourishment is influenced by social and environmental factors such as the percentage of individuals living in poverty, life expectancy, economic growth, population density, rice production and access to clean drinking water. These results indicate that PoU is a multidimensional phenomenon resulting from the interplay of several structural and contextual determinants.*

Within these factors, poverty stands out as the single most consistent predictor explaining variance in PoU. Study by Putri et al. (2023), Nisa and Triani (2024), Mardison (2020), and Yahya et al. (2023), who find across countries at a point in time that larger numbers of poor people are associated with higher *Undernourishment. Low purchasing*

power is a constraint for low-income households to meet their daily energy needs and access good quality food. This situation was exacerbated by limited access to health services and low levels of nutritional knowledge, which placed the poor families at greatest risk of inadequate food consumption. Thus, poverty can be considered as a primary cause that directly affects household food security.

Education is also crucial beyond poverty in determining PoU. Putri et al. (2023), emphasize that average length of schooling has positive effects on food adequacy mainly because education represents the capacity of individuals to grasp and use nutritional knowledge. Individuals with lower levels of education are usually less knowledgeable about balanced and healthy eating habits, which may lead to being at higher risk for ingesting food that does not meet the dietary energy standard. Maybe it is not the variable of all professionals in a statistically significant way, but education still represents an important aspect on consumption attitudes, food preferences and especially how easy or hard is for household to have access to healthier food choices.

Economics determinants, in particular economic growth, also show differentiated dynamics when related to the Prevalence of *Undernourishment. Rice production, climatic conditions including precipitation and temperature, poverty and economic advancement all have an impact on PoU, according to* (Susanti and Irfan, 2024). Likewise, Mardison (2020) asserts that poverty and economic growth are related key variables affecting PoU outcome. Economic advancement is further substantiated as a factor that affects variations in *Undernourishment by* Yahya et al. (2023), in relation to demographic characteristics, agriculture, economic advancement is an essential factor for PoU, but its degree and direction to a region a dependent upon the socio-economic and geographic circumstances of the region.

According to the study conducted by Susanti and Irfan (2024), regional economic growth has no statistically significant impact on *Undernourishment rates and therefore it does not automatically lead to less food insecurity for people living in a area.* Therefore, in some cases, regional economic growth will not affect food security unless food is distributed equally among all people. In addition, if the distribution of income is not equal, that will further limit people's ability to meet their basic needs. The strength of this relationship varies by geographic location due to the structural characteristic specific to each geographical area (Susanti and Irfan, 2024). Mardison (2020), supports this finding. He found a significant negative correlation between economic growth and the number of food insecure individuals in his study. The increase in production capacity and higher efficiencies of the food supply chain, economic growth allows consumers to have affordable access to enough food. Yahya et al. (2023), report a positive relationship suggesting that economic growth may increase food demand without a proportional rise in food supply.

Factors beyond the economic environment influence the incidence of persistent or extreme poverty. *Undernourishment decreases in relation to an increase in population density.* Yahya et al. (2023), concluded that the availability of greater number of food access points for a larger number of individuals will directly impact the overall health status of a population. For example, the availability of a greater number of ways to access food for the same number of individuals assists in making it possible for individuals to achieve food affordability, thus lowering the rate of *Undernourishment. However, in times of food cannot meet population growth, there are increased pressures upon land and food resources. Thus,*

the measure of population density is a good indicator pf a region's ability to effectively provide food for the individuals who live within its boundaries.

In addition to population density, demographic characteristics also impact the incidence of persistent or extreme poverty. Yahya et al. (2023), found that individuals who have a longer life expectancy also have a greater proportion of their population that are considered non-productive. As this demographic structure leads to an increase in dependence upon productive- age individuals to fulfill the overall food needs to their families, it can also create or contribute to an increase in the level of stress upon household and regional food security. If household economic capacity is unable to offset this consumption burden, the risk of food insecurity will increase. While life expectancy reflects the level of regional welfare, an unbalanced demographic structure can put additional pressure on food security, thereby affecting the level of PoU. Overall, previous research findings confirm that PoU is influenced by a combination of factors, including poverty, education, economic growth, population density, and life expectancy. These determinants are grounded in strong empirical evidence and collectively account for regional variation in insufficient food intake *within* Indonesia.

The Prevalence of *Undernourishment is the most direct SDGs indicator related to SDGs 2 on hunger and access to food. The majority of existing studies have been focused on national level analysis and up to 2022 only, thus providing a distorted view of post Covid 19 situations, especially at the local level. This deficiency highlights an obvious research gap as there are still barely any empirical studies with attention to the pos pandemic situation, especially in Papua's Province which had the highest PoU. Also, previous research indicates that average* length of schooling are not significantly correlates with PoU at the national level. The result builds an interesting question on whether it also happens in Papua with the differences of social, culture and geographical condition. Furthermore, the great regional contrast is characteristic of Papua where there are differences between mountain regions and city center areas, thus suggesting that a more context-specific approach to analysis of socio-economic factors for PoU should also be taken into account. The objective of this study is therefore to investigate the economic growth, poverty, population density, average length of schooling and life expectancy on PoU over 29 districts and cities in Papua Province for the period 2021-2024.

Based on a theoretical framework, this research expands upon existing material related to factors that affect poor food consumption in impoverished areas, specifically within specific socio-economic and geographical settings such as Papua. Empirically, the result also broaden debate on theories of economic growth and poverty regional food security. From a policy perspective, the findings of this study can be used as an input for policy recommendations at regional and other relevant institutions in designing more effective strategies to reduce poverty and address food insecurity at regional level. In addition, these findings are expected to serve as a basis for the formulation of a more targeted food system development, particularly in mountainous areas and areas with limited access in Papua Province.

The novelty of this study lies in the use of data from the 2021–2024 post-pandemic period, focusing on 29 districts/cities in Papua, as well as retesting the previously insignificant effect of average length of schooling at the national level. In addition, this study also considers factors such as economic growth, the number of poor people, population density, and life expectancy. Through this study, a more comprehensive understanding of the

influence of various factors is expected to be obtained, resulting in appropriate and effective policy recommendations to reduce the prevalence of of *undernourishment* in Papua Province. Therefore, this issue was then made the focus of a study entitled: "Determinant of the Prevalence of *Undernourishment* (PoU) in Districts /Cities in Papua Province from 2021-2024."

REVIEW OF LITERATURE

Prevalence of Undernourishment

The Prevalence of Undernourishment (PoU) indicator is used as a measure of achievement of the second pillar of the Sustainable Development Goals (SDGs) (Iwang et al., 2024). Poor access to food hinders healthy living and individual productivity (Ismail et al., 2023). According to Aulia et al. (2024), people in good health contribute significantly to sustainable planning, faster economic progress, and a comprehensive reduction in disability in a region. National resilience makes PoU a unifying tool for communities to improve their quality of life in the future (Irhamsyah, 2019). According to the FAO, food security is achieved when every individual has physical, social, and economic access to safe, nutritious, and adequate food to support a healthy and productive life. Food security has four main dimensions, namely availability, accessibility, nutritional utilization, and supply stability. The inability to meet minimum energy requirements is reflected in the Prevalence of Undernourishment (PoU) indicator. In line with this, Keynes argued that household consumption behavior is influenced by disposable income, and continues even when income is low, but increases in consumption are usually smaller than increases in income, so that limited purchasing power has the potential to limit the fulfillment of food needs (Nisa and Triani, 2024).

Economic Growth

Economic growth shows an increase in a country's GDP/GRDP and production capacity, which is measured annually (Gwijangge et al., 2018). This is an indicator of development that increases national income and community welfare and drives economic progress (Trisnawati et al., 2023). According to Lamanele et al. (2024), economic growth is influenced by a combination of high productivity and a large population. When the population is too large, per capita productivity can decline, which ultimately has a negative impact on economic activity. As a result, social welfare declines, and the economy is at a very low level of prosperity (Weya et al., 2015). The productive contribution of the population to the economic growth process is influenced by demographic structure and composition, not just by population size alone (Andriyani and Wibowo, 2019). A country's long-term capacity to produce goods and services for its population is reflected macroeconomically through economic growth supported by technological and institutional adjustments (Farah and Sugiyanto, 2024). Neo-Classical Theory emphasizes that technological progress and an increase in the skills of the population are the main concepts in driving economic improvement (Soleh, 2015).

Poverty

Poverty describes a situation in which a person does not have sufficient capacity to meet their basic needs, such as food, health, shelter, and political participation (Nabila et al., 2023). Soleh (2015) defines poverty using a basic needs approach. Poverty is defined as a person's inability to meet their basic needs, which include food (equivalent to 2100 kcal per

capita per day) or other non-food needs. The poor are defined by the Central Statistics Agency (BPS) as individuals whose average per capita monthly expenditure is below the poverty line (Dipayani and Hidayah, 2023) . The causes of poverty can be explained through the concept of the Vicious Circle of Poverty. Underdeveloped market conditions, economic system failures, and capital constraints lead to decreased productivity, resulting in low income, which in turn limits the ability to save and invest. The lack of investment then exacerbates underdevelopment, causing the cycle to repeat itself (Hardinandar, 2019).

Population Density

According to Thomas Robert Malthus / the Malthusian school of thought in, Sabiq (2021) Food is a basic necessity for sustaining life, but human desire for food is difficult to control, while population growth increases much faster than food production. In addition, it is argued that humans need food to survive, but the rate of food production growth is not balanced with population growth. Population density can affect the level of community welfare. In areas with increasing population density, efforts to improve the level of community welfare become more difficult than in areas with low population density (Silvia and Ikhsan, 2021).

Average Length of Schooling

Education is seen as an instrument for human capital development that reflects the quality of human resources (Mandey et al., 2023). According to Mankiw in Mustakim et al. (2022), education acts as an investment in human capital, which enables greater improvement in the quality of life of individuals as their level of education increases. These enchancements are crucial to maximize the aggregate economic well-being of a nation. Wilantari (2021) states through the Human Capital Investment Theory, human capital investment had a positive effect by increasing individual performance and consequently creatinghigher productivity and income. Higher income provides the means to satisfy consumption needs and to save and commit resources to investments, which ultimately supports long-term welfare (Wilantari, 2021).

It is also with the education that encourage building a stronger economic competitiveness by establishing a more qualified and efficient human resources (Fathoni et al., 2025). Average Length of Schooling is commonly used as a major index to access the education achievement and human resources development in regional economy (Valiant Kevin et al., 2022). In line with these, Haq and Yuliadi (2018), reflecting on Todaro's model argue that education is an important investment in human resource quality. Improving the quality of education which drives the skills base in work force and meore effective utilization of resources which support regional sustainable economic development.

Life Expectancy

According to Human Capital Theory by Utari Swastika and Arifin (2023), the increase of HDI in regional and national levels can contribute to an optimal level of growth economically. This happens as improvements in human resources especially health result in multiplier effects that promote a broader economic development (Utari Swastika and Arifin, 2023). The increase in life expectancy indicates better nutritional status and greater public attentionto health and environmental problems, leading to further increase in labor productivity (Rasnino et al., 2022). Following in the same line, Amartya Sen's as quoted in Kristin and Sulia (2018), assertion that development cannot be judged just on the basis of income alone but on humans quality of life which is well accounted for by HDI. Thus gain

in health and education services stimulate growth through inreasing the level of community income (Kristin and Sulia, 2018). This view is similar to the HDI model that measures health based n a long-lived and healthy life where life expectancy rates occupy an important place in describing the state of health of a population (Asmara et al., 2024).

Empirical literature also shows that the effects of seeral variables on the PoU vary substantially across countries. These disparities become especially apparent in the average length of schooling, which was found to be non-significant across multiple studies at cognitive level. More broadly, previous studies have analysed the influence of a range of variables including economic growth, number of poor people, population density, average length of schooling, and life expectancy yet their direction and magnitude vary across contexts. This variety of result indicates a high degree of regional idiosyncrasy in the links between these variable. Against this backdrop, the current research focuses on these determinants in the context of Papua Province for the period 2021-2024. Papua is chosen as it is province with high PoU in Indonesia and own specific socioeconomic compared to other regions. More specifically by concentrating on Papua, this paper seeks to offer of the factors associated with undernutrition in in locations with particularly high levels of inequality in development. Based on the theoretical development and empirical evidence reviewed, the following hypothesis is proposed:

H1: PoU is negatively and significantly influenced by economic growth, population density, and average length of schooling, while it is positively and significantly influenced by the number of poor people and life expectancy.

RESEARCH METHOD

This study uses a quantitative method, namely panel data regression, which combines both cross-sectional and time series dimensions. The sample includes 29 districts and cities in Papua Province from 2021 to 2024, totalling 116 observations. The study used secondary data which were derived from published documents of Statistics Indonesia (BPS).

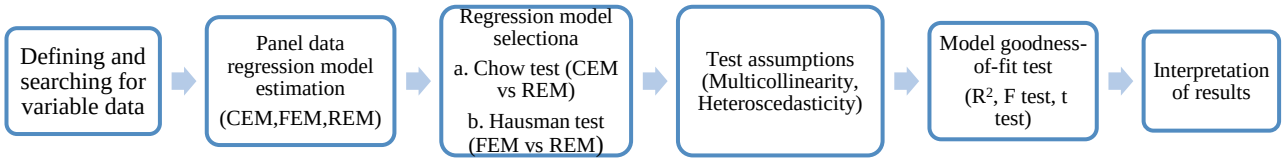
No	Variable	Data	Symbol	Unit	Source
1	Prevalence of *Undernourishment*	The ratio between the population and food consumption is insufficient, while the total population per district/city in Papua Province in 2021-2024	PoU	Percent	(Statistics Indonesia (BPS), 2025)
2	Economic growth	The value of GRDP at constant 2010 prices, eliminating the effect of price changes in each district/city in Papua Province in 2021-2024	PDRB	Billion rupiah	(Statistics Indonesia (BPS), 2025)
3	Poverty	The number of residents with per capita monthly expenditure below the poverty line in each district/city in Papua Province in 2021-2024	JPM	Thousands of people	(Statistics Indonesia (BPS), 2024)

4	Population density	The ratio between the total population and the area of each district/city in Papua Province in 2021-2024	KP	People /Km^2	(Statistics (BPS) of Papua Province)
5	Average length of schooling	The education level of the population aged 25 years and above, measured by the total years of formal education completed in each district/city in Papua Province in 2021-2024	RLS	Years	(Statistics Indonesia (BPS), 2024)
6	Life expectancy	The estimated average life expectancy of individuals from birth is formulated using mortality indicators in each district/city in Papua Province in 2021-2024	UHH	Years	(Statistics Indonesia (BPS), 2024)

EViews is the principal software for analysis in this work. As noted by Madany et al. (2022), a panel data regression can be fit by the three below methods:

1. Common Effect Model (CEM)
2. Fixed Effect Model (FEM)
3. Random Effect Model (REM)

The advantages of the panel data regression approach, according to Fairuz (2017) lies in the large number of observations, which makes the panel data more informative and varied, reduces the problem of collinearity between data, and increases the degree of freedom (df) of the variables, thereby providing more accurate estimates. The steps in data analysis include (Fairuz, 2017):



Research Model

$$PoU_{it} = \beta_0 + \beta_1 PDRB_{it} + \beta_2 JPM_{it} + \beta_3 KP_{it} + \beta_4 RLS_{it} + \beta_5 UHH_{it} + \varepsilon_{it}$$

Description:

PoU	: Prevalence of *Undernourishment* (Percent)
PDRB	: Economic growth (Billions of rupiah)
JPM	: Number of poor people (Thousands of people)
KP	: Population density (People/Km2)
RLS	: Average length of schooling (Years)
UHH	: Life expectancy (Years)
β_0	: Constant
$\beta_1,\beta_2,\beta_3\beta_4,\beta_5$	: Coefficients
ε	: Eror term
it	: Observation unit I and time t

RESULTS AND DISCUSSION

This study focuses on measuring the direction and intensity of the influence of economic growth, the number of poor people, population density, average schooling, and life expectancy on the Prevalence of *Undernourishment* (PoU) in 29 districts/cities in Papua Province from 2021 to 2024. The analysis process was carried out by applying panel data regression, and parameter estimates were obtained through the Common Effect Model (CEM), Fixed Effect Model (FEM), and Random Effect Model (REM) approaches, as presented in Table 1 below:

Table 1. Panel Data Regression Results

Variable	Regression Coefficients					
	CEM	**Prob.**	**FEM**	**Prob.**	**REM**	**Prob.**
C	64.27089	0.0434	421.7510	0.0200	68.22819	0.0068
LOG (PDRB)	-6.969791	0.0008	-81.38827	0.0009	-7.873452	0.0335
LOG(JPM)	4.743284	0.0748	50.29479	0.0778	4.849590	0.3147
KP	-0.027348	0.1369	-0.009073	0.7815	-0.017025	0.4788
LOG(RLS)	9.579416	0.0381	30.64184	0.2416	7.837661	0.3290
LOG(UHH)	-0.989558	0.8820	6.831752	0.0686	0.272544	0.9300
R^2	0.148058		0.880256		0.054196	
Adjusted. R^2	0.109334		0.832066		0.011205	
F Statistics	3.823361		18.26649		1.260637	
Prob. F Statistics	0.003124		0.000000		0.286137	
Model Selection Test (1) Chow Cross-Section F (28,82) = 17.907315; Prob. F (28,82) = 0.0000 Hausman Cross-Section random χ^2 (5) = 18.631507; Prob. χ^2 = 0.0023						

Source: EViews 12 Data Processing Results

Based on the table above, the probability of Cross-Section F is recorded at 0.0000, which is smaller than the value of $\alpha = 0.05$, so the Chow Test results indicate that the appropriate model is Fixed Effect. Furthermore, the probability in the Hausman Test is

0.0023, which is also below α = 0.05, so the Fixed Effect model is again declared as the more appropriate model.

Table 2. Heteroscedasticity Test

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	18.76470	16.15996	1.161185	0.2489
PDRB	0.000283	0.000417	0.677303	0.5001
JPM	0.086517	0.295014	0.293265	0.7701
KP	0.004016	0.016074	0.249856	0.8033
RLS	-2.791878	1.768351	-1.578803	0.1182
UHH	-0.021875	0.115459	-0.189464	0.8502

Source: EViews 12 Data Processing Results

Note:*Significant at α = 0.01;**Significant at α = 0.05;***Significant at α = 0.1

From Table 2, we can see that the probability values for the Economic Growth variable are 0.5001, the Poor Population variable are 0.7701, the Population Density variable are 0.8033, the Average Length of Schooling variable are 0.1182, and the Life Expectancy variable are 0.8502. Since all independent variables have probability values exceeding α = 0.05, the model does not show signs of heteroscedasticity.

Table 3. Multicollinearity Test

	POU	LOG(PDRB)	LOG(JPM)	KP	LOG(RLS)	LOG(UHH)
POU	1.000000	-0.311532	-0.012943	-0.200905	-0.117028	0.058389
LOG(PDRB)	-0.311532	1.000000	0.100009	0.286871	0.671634	-0.156091
LOG(JPM)	-0.012943	0.100009	1.000000	0.268023	-0.411628	-0.013444
KP	-0.200905	0.286871	0.268023	1.000000	0.106611	0.103589
LOG(RLS)	-0.117028	0.671634	-0.411628	0.106611	1.000000	0.025959
LOG(UHH)	0.058389	-0.156091	-0.013444	0.103589	0.025959	1.000000

Source: EViews 12 Data Processing Results

To test for multicollinearity, the correlation coefficients between variables can be examined. Correlation values exceeding 0.85 indicate multicollinearity (Hidayah, 2023). From the table, the correlation coefficients between variables are identified as being below 0.85, so the data in this study do not cause multicollinearity issues. Data in econometric analysis can be in various scales, namely nominal, ordinal, interval, and ratio (Nizar and Arif, 2023). The model estimation summary table presents a summary of these four scales, as shown in Table 4.

Table 4. Econometric Model Estimation Results

$$PoU_{it} = \underset{}{421.7510} - \underset{(0.0009)^{*}}{81.38827 logPDRB_{it}} + \underset{(0.0778)^{***}}{50.29479 logJPM_{it}} - \underset{(0.7815)}{0.009073 KP_{it}} + \underset{(0.2416)}{30.64184 logRLS_{it}} + \underset{(0.0686)^{***}}{6.831752 logUHH_{it}} + \varepsilon_{it}$$

R^2 = 0.8802 ; DW = 2.449636 ; F statistic = 18.26649 ; Prob. F = 0.000000

Source: EViews 12 Data Processing Results

Note:*Significant at α = 0.01;**Significant at α = 0.05;***Significant at α = 0.10. The values listed in parentheses indicate the probability of the t-statistic.

The table of econometric model estimation results above presents a summary of the regression, including the coefficient values, probability, R-square, Durbin-Watson, F-statistic, and prob-F of the selected model, namely Fixed Effect.

The F-test produced an F-statistic probability of 0.000000, which is less than α 0.05. Thus, simultaneously, the variables of economic growth, number of poor people, population density, average length of schooling, and life expectancy are declared to have an effect on the prevalence of undernourishment. Then, the coefficient of determination (R2) value is 0.8802, indicating that 88.02% of the variation in the the prevalence of undernourishment variable can be explained by the variables of economic growth, number of poor people, population density, average length of schooling, and life expectancy. Meanwhile, the remaining 11.98% is influenced by independent variables outside the model. As shown in Table 4, the coefficients that proved to be significant are β1 , β2 , and β5, so that the independent variables that have a significant effect on the prevalence of undernourishment are economic growth, the number of poor people, and life expectancy, while population density and average length of schooling have no effect.

Table 4 shows that the coefficient for the economic growth variable is -81.38827, with a t-statistic probability of 0.0009. This indicates that the prevalence of *undernourishment* is negatively and significantly influenced by economic growth. The relationship between the two variables follows a linear-logarithmic pattern. Thus, every 1% increase in economic growth is estimated to reduce the prevalence of *undernourishment* by 0.8138827 units, while a 1% decrease in economic growth will increase the prevalence of *undernourishment* inadequacy by 0.8138827 units. Thus, higher economic growth has the potential to reduce the level of food consumption inadequacy in districts/cities in Papua Province. Economically, increased growth drives an increase in GRDP and community income, thereby increasing food purchasing power. This result is consistent with the principles of Neo-Classical Theory, which emphasizes that technological advances and labor skills increase productivity and economic output (Soleh, 2015). Better economic growth leads to more equitable food distribution and greater community access to minimum energy consumption, thereby reducing the PoU rate. The results of this study are also consistent with Mardison (2020), which show that economic growth has a negative and significant effect on the prevalence of undernourishment. This is further reinforced by Susanti and Irfan (2024), who proved that economic growth can boost food production and availability within a region. The implications of these findings indicate the need for a strategic direction for economic growth in Papua Province towards sectors that promote income equality and food affordability. Inclusive economic growth will improve household access to nutritious food, so that local governments need to prioritize strengthening food distribution infrastructure, market access, and the creation of productive jobs to reduce the prevalence of *undernourishment.*

Based on the estimation results, the prevalence of *undernourishment* is positively and significantly influenced by the variable of the number of poor people, with a coefficient of 50.29479 and a t-statistic probability of 0.0778. The relationship between the two variables follows a linear-logarithmic pattern. Therefore, if the number of poor people increases by 1%, the prevalence of *undernourishment* will increase by 0.5029479 units, and conversely, if the number of poor people decreases by 1%, the prevalence of *undernourishment* will decrease by 0.5029479 units. Thus, an increase in the number of

poor people will worsen food consumption inadequacy at the district/city level in Papua Province. From an economic perspective, poverty reduces people's purchasing power and limits their access to adequate and nutritious food. This is consistent with the Vicious Circle of Poverty theory, which states that low income leads to limited purchasing power for food, thereby exacerbating poverty and increasing food insecurity Soleh, (2015). The findings of Putri et al. (2023), confirm that poverty affects residents ability's to meet their food and health needs. People living below the poverty line generally cannot meet their energy needs through their daily food intake. In addition, their limited access and purchasing power for food means that their food consumption is inadequate. The findings of this study support Nisa and Triani (2024), who found that the greater the number of people living in poverty, the higher the prevalence of *undernourishment* in a region. These findings indicate that programs to mitigate food insecurity in Papua need to target poverty reduction more intensively. Local governments are urged to prioritize programs oriented to community-based economic empowerment, capacitybuilding of smallscale emterprises and increased access to productive employment, especially for rural people. In addition, the need to futher enhance food affordability by improving distribution systems and decreasing transportation cocts is a priority as low-income household are among those most affected by changes in food prices. This therefore calls for an approach that is more socially and economically inclusive to ensure poor households have sustainable exits from food insecurity.

The life expectancy variable has a coefficient of 6.831752 with a t-statistic probability value of 0.0686, which means that life expectancy is indicated to have a positive and significant effect on the prevalence of *undernourishment*. The relationship between the two variables follows a linear-logarithmic pattern. Therefore, if life expectancy increases by 1%, the prevalence *undernourishment* will increase by 0.06831752 units, and conversely, if life expectancy decreases by 1%, the prevalence of *undernourishment* will decrease by 0.06831752 units. Thus, an increase in life expectancy has the potential to increase the prevalence of *undernourishment* at the district/city level in Papua Province. Theoretically, these findings are consistent with the Human Capital Theory that health is an important asset in development (Utari Swastika and Arifin, 2023). However, if increased life expectancy is not accompanied by increased productivity or an adequate food system, the consumption needs of non-productive groups, such as the elderly and children, could rise beyond what the economy can support. The results of this study are consistent with the findings of Yahya et al. (2023), who indicate that an increase in life expectancy is positively correlated with a high prevalence of inadequacy food consumption due to an increased household burden and greater food needs. This is because the higher the life expectancy, the greater the possibility of an increase in the prevalence of *undernourishment*, as the economic burden increases. The implications of these findings indicate that an increase in life expectancy needs to be accompanied by the strengthening of health services and nutritional interventions at all stages of life, especially for non-productive groups Local governments need to encourage household food self-sufficiency through family food garden programs, local food diversification, and expanded access to preventive health services. These efforts are important so that increased life expectancy does not lead to greater consumption pressure and worsen food insecurity, especially in remote areas of Papua.

The probability value of the t-statistic for the population density and average length

of schooling variables is greater than $\alpha = 0.1$. Therefore, these two variables are not considered significant and no further interpretation is necessary.

CONCLUSION

New empirical evidence related to factors affecting the prevalence of undernourishment in Papua Province after the COVID-19 pandemic has been presented by this study. Panel data regression estimation results using the Fixed Effect Model (FEM) show that the Prevalence of Undernourishment (PoU) is negatively and significantly affected by economic growth, while the number of poor people and life expectancy have a positive and significant effect. Meanwhile, population density and average length of education were not found to have a significant effect. These findings confirm that increasing economic growth and reducing poverty are important factors in reducing the prevalence of undernourishment in Papua Province. In this regard, policy attention to the reinforcement of local economic systems more access to education and a better distribution of food among territories is needed. The implications of this study pertain to local governments in particular towards strengthening poverty elimination efforts and also expanding the food logistics infrastructure in rural regions.

And it is imperative for the government to utilize a place-based development approach according to geographical conditions of districts and cities in Papua. Thus, the dual task of increasing economic productivity and empowering low-income communities should be a centerpiece in order to reach sustainable food security. The limitations of this study can be attributed to the fact it is based on macroeconomic secondary data from BPS. They are however unable to account for certain aspects of the myriad causes of undernutrition such as local food accessibility and availability, household consumption behaviour, food distribution chains from market to table and the socio-cultural setting of Papuan society. In addition, the limited time frame of 2021-2024 restricts modeling of long-term food security dynamics in the region. We anticipate that, in the future additional detailed food security indicator information will be incorporated such as food availability, food price inflation and availability to logistics and transport. Another added value would be the use of spatial analysis or dynamic panel model to discover inter-area disparities and relations in Papua, it is expected that these methods will contribute to an improved understanding of the determinants of PoU and for targeting more efficient, localised food security policies.

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