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# When Informality Meets Poverty: Vulnerability of Informal Workers in North Sumatra's Rural and Urban Divide

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## Abstract

The province of North Sumatra, with its 33 districts/cities, faces significant challenges in managing the informal sector, where a high proportion of the workforce is employed compared to the formal sector. This study aims to analyze the vulnerability of informal workers to poverty in the region, focusing on demographic characteristics, economic factors, and regional disparities. The research employs ordinal logistic regression analysis to identify key determinants of vulnerability to extreme poverty among informal workers. The results show that informal workers, particularly in rural areas, are more likely to experience poverty, with factors such as low education levels, limited access to financing (especially microcredit), lack of luxury goods, short working hours, and marital status being significant contributors. Workers in urban areas have better access to formal sector jobs and are less vulnerable, while those in rural areas are highly dependent on the informal sector with limited opportunities for economic advancement. The study concludes that improving access to financing, education, and employment opportunities in rural areas can reduce the vulnerability of informal workers to poverty. Additionally, policies supporting the growth of the formal sector in rural areas and enhancing social safety nets are essential for reducing economic disparities.

Keywords: informal workers, poverty vulnerability, microcredit access, regional disparities

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## 1. Introduction

Poverty is a global problem with ongoing structural challenges, including in Indonesia. Despite continued economic growth, millions of Indonesians are still trapped in conditions of deprivation, especially those working in the informal sector. As stated in Rencana Pembangunan Jangka Menengah Nasional (RPJMN) 2025–2029, poverty alleviation is one of the three main priorities. Persistent poverty not only hinders access to education, health, and decent work, but also perpetuates the cycle of vulnerability, especially among informal workers who do not have access to social protection and economic mobility.

The informal sector plays a very important role in the global economy, especially in developing countries like Indonesia. This sector serves as an alternative for people who lose their jobs in the formal sector, especially during a crisis. In the economic crisis of 1997-1998, many large companies went bankrupt and were forced to lay off their employees, resulting in a drastic increase in unemployment. In such conditions, the informal sector serves as a "safety net" that can absorb the affected workforce, thereby contributing to reducing a larger spike in unemployment (Karmini et al., 2022; Tambunan, 2016).

A similar situation occurred during the COVID-19 pandemic, when many formal companies carried out mass layoffs, prompting workers to turn to the informal sector as an alternative source of income (de los Santos & Fynn, 2024). In fact, during the peak of the pandemic in 2020, the percentage of informal workers in Indonesia reached its highest level in the last decade (Natalia & Putranto, 2023). The increasing number of street vendors, home workers, and freelance workers reflects the flexibility of the informal sector in adapting to economic pressures. In other words, the informal sector acts as a "social cushion" that not only absorbs labour from the affected formal sector but also contributes to maintaining people's purchasing power amidst difficult economic conditions (Dellas et al., 2019; Nureev & Akhmadeev, 2021).

In addition to playing a role as an economic supporter during times of crisis, the informal sector also makes a significant contribution to the economy. Data from the Ministry of Cooperatives and Small Medium Enterprises (SMEs) shows that the contribution of Micro Small Medium Enterprises (MSMEs), most of which are in the informal sector, contributes 61.07 percent of the Gross Domestic Product (GDP), making it one of the main pillars of the national economy (Damayanti, 2024). Most workers in the informal sector are active in agriculture, small trade, home industries, and services, all of which make important contributions to maintaining economic stability at the community level. In many regions, the informal sector is even superior to the formal sector in terms of the number of workers absorbed (Y. Liu et al., 2017).

Despite its large contribution, the informal sector still faces various challenges that leave its workers in a vulnerable and unstable position. Workers in the informal sector generally do not have formal employment contracts, do not receive a decent minimum wage, and do not receive social protection (Sugiharti et al., 2022). As a result, they are more susceptible to economic turmoil, such as rising prices of basic necessities or inflation, which can have a direct impact on their ability to meet their living needs.

In Indonesia, around 59.17 percent of the total workforce is in the informal sector, reflecting the importance of this sector in the national employment ecosystem (BPS, 2024). To support and protect informal workers, the government has implemented various policies, such as pre-employment cards, village fund programs, and microcredit, to address the challenges they face. These programs are designed to provide skills training, financial support, and access to capital for informal workers. However, their effectiveness still faces various challenges, such as limitations in reaching workers in remote areas and administrative constraints in registering them into the formal system (Ferdiana et al., 2019; Muara Setyanti, 2020).

One of the regions facing major challenges in the informal sector is the Province of North Sumatra. With a large population and diverse socio-economic backgrounds, this province has a significant level of dependence on the informal sector. Many workers in North Sumatra are engaged in the agricultural, small trade, and home industry sectors, sectors that generally have high levels of economic uncertainty. The agricultural sector is one of the dominant sectors in the informal sector in this province, especially in rural areas. However, they face various problems such as fluctuations in commodity prices, limited access to markets, and low levels of agricultural mechanization, which cause their incomes to be unstable (Lubis et al., 2020). Meanwhile, in urban areas, the small trade and home industry sectors dominate. Street vendors, motorcycle taxi drivers, and home craftsmen operate without clear legal guarantees and often face challenges such as limited access to capital, minimal social protection, and fierce competition with more stable formal businesses (Rachmawati et al., 2023). The dual burden of informality and poverty is particularly pronounced across districts in North Sumatra. As illustrated in Figure 1, many districts with a high proportion of informal sector workers also exhibit elevated poverty rates, reinforcing the premise that informality is closely linked with regional economic vulnerability.

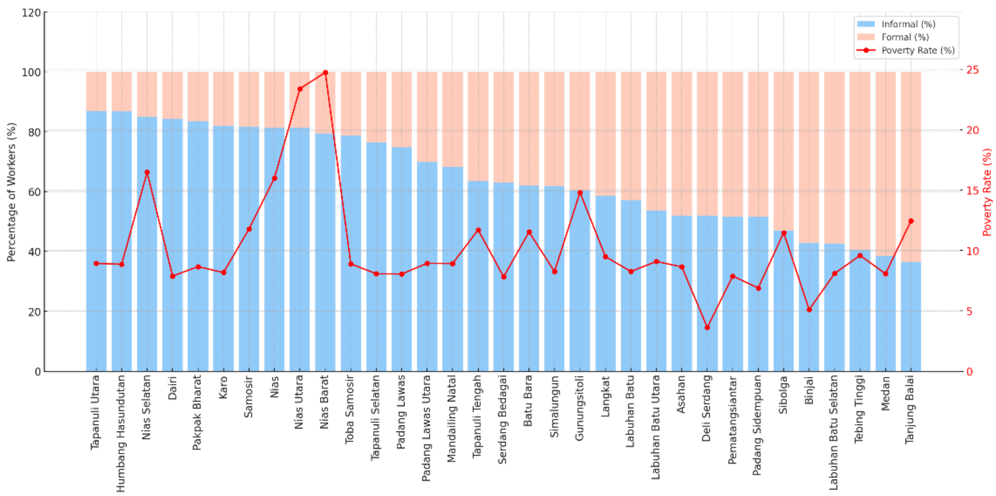


Figure 1. Distribution of Informal and Formal Workers by District/City and Poverty Rate in North Sumatra, 2022

Source: Susenas 2022 (author's compilation)

While this overall trend holds, some deviations are notable indicating that local economic or policy conditions may mediate the impact of informality on poverty. This observed relationship invites a deeper investigation through established theoretical frameworks that explain the structural determinants of poverty. Human capital theory posits that individuals with limited education and skills are more likely to be employed in low-paying, unstable jobs with minimal upward mobility (Becker, 1994). This is especially relevant in the informal sector, where a lack of formal qualifications often restricts access to decent work. Furthermore, social exclusion theory highlights how marginalized groups are systematically denied access to resources such as credit, social protection, and institutional support conditions frequently faced by informal workers, particularly in rural settings (Sen, 2000). Chambers (2014) access to resources framework adds that vulnerability to poverty is amplified when individuals lack control over productive assets, information, and networks essential for economic resilience. Collectively, these theories emphasize that poverty is not only a result of income deficiency but also of structural disadvantages in education, finance, and institutional access factors that are deeply embedded in the everyday realities of Indonesia's informal workforce.

Social and economic factors contribute to the level of vulnerability of informal workers in North Sumatra. Informal workers with low levels of education, especially those who only have primary to junior high school education, face difficulties in accessing business capital and skills training that can increase productivity, resulting in lower income levels and limited access to economic resources (Setyanti, 2020). Similar patterns have been observed in Latin America, where low education and lack of vocational training significantly hinder informal workers from transitioning into more stable employment (de los Santos & Fynn, 2024). In sub-Saharan Africa, informal workers are often excluded from microfinance institutions, further entrenching their poverty (Gemma, 2015). In Vietnam, informal sector workers with lower financial literacy and without access to savings mechanisms are more likely to remain trapped in intergenerational poverty (Thu Diem, 2023). In addition to education and financial access factors, informal workers who have many dependents also tend to be more vulnerable to economic difficulties (Suripto & Wicaksono, 2023). Greater financial pressure makes it difficult for them to save or invest in business development, so they remain in a cycle of poverty without any opportunity to improve their standard of living. On the other hand, informal workers in rural areas face additional challenges in the form of limited access to formal banking and financial services (Eka, 2023). This is due to the low level of financial literacy, resulting in a lack of utilization of financial assistance programs provided by the government or financial institutions.

Although many studies have addressed the economic vulnerability of informal workers, there remains a lack of integrated analysis that simultaneously considers both social and economic determinants of their well-being. This study contributes to the literature by incorporating a broader set of variables, including social factors, such as age, gender, marital status, and educational attainment and economic factors, such as ownership of luxury goods and access to microcredit, which are often understudied in this context. In addition, this study uses a more comprehensive poverty classification (non-poor, poor, and extremely poor), which allows for the identification of factors that differentiate the extreme poor from the ordinary poor. Furthermore, this study also explores the differences between informal workers in urban and rural areas to provide a deeper understanding of how regional characteristics affect levels of economic vulnerability.

Therefore, this study aims to explore the factors that exacerbate the vulnerability of informal workers in North Sumatra and formulate policy recommendations that are expected to be a basis for the government and stakeholders in designing more effective policies that are oriented towards improving the welfare of informal workers.

## 2. Research Method

### 2.1. Research Scope

This study examines the factors that exacerbate the economic vulnerability of informal workers in North Sumatra. This study focuses on informal workers viewed based on employment status, namely self-employed, self-employed assisted by casual workers/unpaid workers, freelance workers, and family/unpaid workers (Sibagariang et al., 2023). The informal sector population covered in this study includes working-age individuals who rely on informal employment as their main source of income.

The variables in this study consist of dependent and independent variables. The dependent variable is economic vulnerability, which is classified into three categories: non-poor, poor, and extremely poor. Meanwhile, the independent variables include social and economic factors that can affect economic vulnerability including age, gender, marital status, education level, place of residence, ownership of luxury goods, access to micro-credit services, and number of working hours. In addition, this study also examines the differences between informal workers in urban and rural areas.

### 2.2. Data

This study uses cross-sectional data from the National Socioeconomic Survey (Susenas) conducted in March 2022. This data covers 24,589 individuals working in the informal sector in North Sumatra Province. The description of the variables can be seen in Table 1 below :

Table 1. Description of Research Variables

| Variables | Naming | Description |
|---|---|---|
| Dependent | | |
| Poverty | poor | 0= not poor; 1=poor; 2=extremely poor |
| Independent | | |
| Gender | gender | 0= female; 1= male |
| Marital Status | status | 0=other; 1=married |
| Age | Age | age at the last birthday |
| Place of Residence | region | 0=rural; 1=urban |
| Education | edu | 0=below high school; 1=high school; 2=University |
| Accessibility of Microcredit | microcredit | 0=not accessing; 1=accessing |

| Variables | Naming | Description |
|---|---|---|
| Ownership of Luxury Goods | luxury_goods | 0=do not have; 1=have |
| Length of Working Hours | working_hours | 0=part time; 1=full time |

Source: BPS (raw data of the 2022 National Socio-Economic Survey), Author's compilation

The dependent variable in this study is the poverty status of informal workers, which is categorized into three levels on an ordinal scale. This classification of poverty status is based on a comparison of workers' monthly expenditure with the poverty line. In this study, the extreme poverty line is determined using an absolute poverty approach to ensure consistency of comparisons between countries and across time (Natalia & Putranto, 2023). The absolute standard used refers to the World Bank definition, namely purchasing power parity (PPP) below USD 1.9 per day. To allow for the calculation of extreme poverty in the current year, the PPP standard of USD 1.9 per day is adjusted to changes in the Consumer Price Index (CPI) in the related year (Adji et al., 2022).

In this study, informal workers are categorized as not poor (Y=0) if their monthly per capita expenditure is above the poverty line of IDR 561,004.00. They are categorized as poor (Y=1) if their expenditure is below the poverty line but above the extreme poverty threshold. Meanwhile, informal workers are classified as extremely poor (Y=2) if their monthly per capita expenditure is lower than the standard of US$1.9 PPP per day, which is equivalent to IDR 394,780.00 per capita per month, based on the calculation of extreme poverty adjusted for changes in the CPI in the current year.

## 2.3. Data Analysis Method

The analysis methods used in this study include descriptive analysis and inferential analysis. A descriptive analysis was conducted to see the general picture of informal workers and patterns and differentials of economic vulnerability of informal workers in North Sumatra Province. Furthermore, inferential analysis was conducted to explore the factors that determine the vulnerability of informal workers in North Sumatra Province using an ordinal logistic regression model. The ordinal logistic regression model with dependent variables that have three categories is as follows (D. Liu & Zhang, 2018):

$$logit[P(Y \leq i|x)] = \beta_{0i} + \beta_1 X_1 + \beta_2 X_2 + \cdots + \beta_p X_p, i = 1,2 \qquad (1)$$

where,

$P(Y \leq i|x)$ : the cumulative probability that variable $Y$ is in category i or lower
$\beta_{0i}$ : *threshold or estimated limit for category i*
$\beta_1, \beta_2, \dots, \beta_p$ : regression coefficient for independent variables $X_1, X_2, \dots, X_p$

The obtained logistic regression analysis is then tested for significance, both overall (simultaneous) and individually (partial). Simultaneous testing is carried out using the Likelihood Ratio Test (LRT) to assess whether the overall model provides significant information, while partial testing uses the Wald test to evaluate the influence of each independent variable in the model (Peng et al., 2002). Since the dependent variable in this study has three ordinal categories (not poor = 0, poor = 1, extremely poor = 2), the ordinal logistic regression estimates the cumulative odds of being at or below a certain level of economic vulnerability. The resulting odds ratios reflect the change in the odds of falling into a higher poverty category (e.g., $Y \geq 1$ or $Y \geq 2$), given a one-unit change in the independent variable, compared to the reference group of independent variable (Hilbe, 2016).

The odds ratio provides insight into how likely a certain factor is to influence the probability of falling into a higher poverty category. In the context of this study, for example, an odds ratio of less than 1 for the education variable (e.g., high school or university level) indicates that workers with higher education are less likely to be categorized as poor or extremely poor compared to those with education below high school. This means the chance of being in a higher poverty category such as extremely poor compared to poor or not poor is lower when the odds ratio is less than one, and higher when the odds ratio is greater than one. Similarly, an odds ratio significantly below 1 for access to microcredit suggests that individuals with access to microfinance services are substantially less likely to experience extreme economic vulnerability than those without such access. Conversely, an odds ratio above 1 for being married indicates that married informal workers are more likely to fall into a higher poverty category, possibly due to the added financial burden of dependents. Thus, the odds ratio in this study allows us to quantify how each social or economic factor contributes to the increased or decreased likelihood of falling into higher levels of poverty among informal workers.

Furthermore, this study also examines differences based on the characteristics of the residential area, namely rural and urban. This analysis aims to understand how differences in regional conditions affect the level of vulnerability of informal sector workers, such as access to economic opportunities, job protection, and income, which can impact job stability and increase the risk of job transition or intention to change jobs (Chen et al., 2004; Fields, 2011).

## 3. Results and Discussion

### 3.1. Overview of Characteristics of Informal Workers

Understanding the demographic and socio-economic profile of informal workers is essential to contextualize their vulnerability to poverty. Based on descriptive statistics from a one-way frequency table (see Table 2), the sample comprises 24,589 informal workers, with 52.88 percent being male and 47.12 percent female. This gender distribution reflects broader national trends in which men are more likely to engage in informal occupations that require physical mobility, such as transportation, agriculture, and construction (ILO, 2018).

Table 2. Distribution of Informal Workers by Socioeconomic and Demographic Characteristics

| Characteristics | Category | Frequency | Percentage |
|---|---|---|---|

| | | | |
|---|---|---|---|
| Poverty Status | Not Poor | 20,976 | 85.31 |
| | Poor | 2,497 | 10.15 |
| | Extremely Poor | 1,116 | 4.54 |
| Gender | Female | 11,586 | 47.12 |
| | Male | 13,003 | 52.88 |
| Marital Status | Others | 7,658 | 31.14 |
| | Married | 16,931 | 68.86 |
| Place of Residence | Rural | 17,249 | 70.15 |
| | Urban | 7,340 | 29.85 |
| Education | below high school | 14,527 | 59.08 |
| | High school | 8,949 | 36.39 |
| | University | 1,113 | 4.53 |
| Accessibility of Microcredit | Not Accessing | 22,605 | 91.93 |
| | Accessing | 1,984 | 8.07 |
| Ownership of Luxury Goods | Do not Have | 19,831 | 80.65 |
| | Have | 4,758 | 19.35 |
| Length of Working Hours | Part Time | 8,702 | 35.39 |
| | Full Time | 15,887 | 64.61 |
| Total | - | 24,589 | 100 |

Source: Susenas 2022 (Author's compilation)

A significant proportion of the sample (68.86 percent) is married, a factor that can influence income security and economic pressure due to larger household responsibilities (Hervías Parejo & Radulović, 2023). Additionally, 70.15 percent of informal workers live in rural areas, reinforcing the well-documented dominance of informal labor markets in non-urban regions where formal job opportunities and institutional support remain limited (World Bank, 2020). Educational attainment among informal workers is notably low. Around 59.08 percent have not completed high school, while only 4.53 percent hold a university degree. This distribution supports previous findings that education strongly correlates with employment formality and income stability (Becker, 1994; Gasparini, 2007). Access to financial services is also constrained, with only 8.07 percent accessing microcredit schemes. Limited financial inclusion significantly hampers informal worker's ability to invest in productive activities, buffer income shocks, or build long term assets (Demirguc-Kunt, 2017). Related to this, 80.65 percent do not own luxury goods, which may serve as proxies for asset accumulation and household wealth. In terms of working time, 64.61 percent are engaged in full time informal work, while 35.39 percent are part time workers, a pattern that may reflect underemployment, unstable demand, or dual roles within households, especially for women (ILO, 2002).

To further understand patterns of vulnerability, Table 3 presents the distribution of informal worker's characteristics across poverty status (Not Poor, Poor, Extremely Poor), using row-standardized percentages. This bivariate analysis highlights how demographic and socio-economic factors differentiate informal workers based on their poverty status. Males appear more represented among the extremely poor, likely due to their concentration in high-risk informal sectors such as agriculture and construction (Cuevas et al., 2009).

In addition, by marital status, most informal workers who are vulnerable to poverty and extreme poverty are married. This shows that workers with family responsibilities are more vulnerable to their vulnerabilities because they have additional economic burdens that are more difficult to overcome if they only rely on unstable informal work.

Table 3. Percentage distribution of poverty status by background characteristics: North Sumatera National Socioeconomic Survey, 2022

| Background Characteristics | Category | | | Total (n) |
|---|---|---|---|---|
| | Not Poor | Poor | Extremely Poor | |
| Gender | | | | |
| Male | 87.76 | 9.95 | 2.28 | 100.0 (13,003) |
| Female | 97.36 | 10.38 | 2.25 | 100.0 (11,586) |
| Marital Status | | | | |
| Married | 87.62 | 10.14 | 2.24 | 100.0 (16,931) |
| Others | 97.48 | 10.19 | 2.34 | 100.0 (7,658) |
| Place of Residence | | | | |
| Urban | 92.28 | 6.63 | 1.09 | 100.0 (7,340) |
| Rural | 85.58 | 11.65 | 2.77 | 100.0 (17,249) |
| Education | | | | |
| below high school | 84.68 | 12.26 | 3.06 | 100.0 (14,527) |
| High school | 91.35 | 7.44 | 1.21 | 100.0 (8,949) |
| University | 94.97 | 4.49 | 0.54 | 100.0 (1,113) |
| Accessibility of Microcredit | | | | |
| Accessing | 96.32 | 3.63 | 0.05 | 100.0 (1,984) |
| Not Accessing | 86.81 | 10.73 | 2.46 | 100.0 (22,605) |
| Ownership of Luxury Goods | | | | |
| Have | 97.37 | 2.33 | 0.29 | 100.0 (4,758) |
| Do not Have | 85.23 | 12.03 | 2.74 | 100.0 (19,831) |
| Length of Working Hours | | | | |
| Full Time | 88.69 | 9.32 | 1.99 | 100.0 (15,887) |
| Part Time | 85.54 | 11.68 | 2.78 | 100.0 (8,702) |
| Total | 85.31 | 10.15 | 4.54 | 100.0 (24,589) |

Source: Susenas 2022 (Author's compilation)

The table also shows that the large number of rural areas in North Sumatra Province is one of the factors that causes informal sector workers to be more vulnerable to falling into the poor and very poor categories compared to urban areas. This shows that limited access to formal employment opportunities in rural areas makes many workers dependent on the informal sector. In terms of education, informal workers who are vulnerable to becoming poor and very poor mostly have low levels of education, namely below high school or equivalent. One variable that has not been widely included in previous studies is accessibility to microcredit. Informal workers in North Sumatra who do not have access to microcredit are more vulnerable to becoming poor and very poor. This limited access to financing hinders their ability to increase their business or open up new opportunities in the formal sector.

In addition, ownership of luxury goods also shows significant differences where informal workers who do not own luxury goods tend to be more vulnerable to falling into the poor category. This reflects the economic gap between workers who have access to wealth or other resources and those who do not. In terms of working hours, informal workers with full time working hours (more than 35 hours a week) are more vulnerable to being poor and very poor compared to part-time workers.

### 3.2. Determinants of Vulnerability of Informal Workers

Table 4 presents the results of the ordinal logistic regression analysis used to identify factors that influence the vulnerability of informal workers to poverty and extreme poverty. Interpretation of the regression results is also carried out using the odds ratio for each variable studied, as listed in Table 4.

Table 4. Ordinal Logistic Regression Results with Odds Ratio

| Variables | Full Model | | Urban Model | | Rural Model | |
|---|---|---|---|---|---|---|
| | Coefficient | Odds Ratio | Coefficient | Odds Ratio | Coefficient | Odds Ratio |
| Gender (Male) | -0.044 | 0.957 | 0.213** | 1.237 | -0.109** | 0.896 |
| Marital Status (Married) | 0.549*** | 1.732 | 0.650*** | 1.915 | 0.532*** | 1.702 |
| Age | -0.035*** | 0.964 | -0.026*** | 0.973 | -0.037*** | 0.963 |
| Place of Residence (urban) | -0.394*** | 0.674 | | | | |
| Education (High School) | -0.631*** | 0.532 | -0.488*** | 0.613 | -0.674*** | 0.509 |
| Education University) | -0.874*** | 0.417 | -1.170*** | 0.310 | -0.756*** | 0.469 |
| Accessibility of Microcredit (accessing) | -1.412*** | 0.243 | -0.611*** | 0.542 | -1.670*** | 0.188 |
| Ownership of Luxury Goods (have) | -1.617*** | 0.198 | -1.328*** | 0.264 | -1.785*** | 0.167 |
| Length of Working Hours (full time) | -0.101** | 0.903 | -0.019 | 0.980 | -0.110** | 0.895 |
| Intercept (0\|1) | 0.2614 | | 1.386 | | 0.123 | |
| Intercept (1\|2) | 2.137 | | 3.446 | | 1.967 | |
| Observation | 24,589 | | 7,340 | | 17,249 | |
| Pseudo $R^2$ | 0.080 | | 0.059 | | 0.076 | |
| LRT | 1708.6*** | | 1260*** | | 266.39*** | |

**sig. 0.1; **sig. 0.05; ***sig. 0.01*

Source: Susenas 2022 (Author's compilation)

Demographic characteristics of informal workers have a significant influence on their vulnerability to poverty or extreme poverty compared to those who are not poor. male informal workers have slightly lower odds (OR = 0.957) of falling into extremely poor compare to poor or not poor category than female workers, although the effect is not statistically significant. Meanwhile, married workers are 1.73 times more likely to be in extremely poor compared to poor or not poor category compared to unmarried workers. Age, as a demographic aspect, also affects the vulnerability of informal workers. The older an informal worker is, the less likely he is to be in extremely poor category than to be in poor and not poor category, although the effect is relatively small. Specifically, the odds ratio of 0.964 indicates that each additional year of age slightly reduces the odds of falling into extremely poor compared to poor or not poor status.

In terms of human capital, workers with lower education, especially those with education below high school, show a low odds ratio, such as in the university education category which has an odds ratio of 0.417. Workers with higher education tend to have a lower chance of falling into the extremely poor compared to poor or not poor.

From an economic perspective, microcredit accessibility also has a significant effect with an odds ratio of 0.243, indicating that informal workers who do not have access to microcredit are more vulnerable to becoming extremely poor than to becoming poor and not poor. Ownership of luxury goods also has a significant effect with an odds ratio of 0.198, indicating that informal workers who do not own luxury goods are more vulnerable to falling into the extremely poor compared to poor or not poor.

When viewed from the length of working hours which shows an odds ratio of 0.903, which means that workers with full time working hours have slightly lower odds of falling into into extremely poor compare to poor or not poor category than workers who work part-time. Meanwhile, if viewed from the place of residence it shows an odds ratio of 0.674, which means that workers in urban areas have a 32.6 percent lower chance of falling into the extremely poor compared to poor or not poor category than workers in rural areas. This shows that workers in rural areas are more vulnerable to poverty.

These findings highlight the multidimensional nature of informal workers' vulnerability to poverty, which is shaped by both social and economic factors. For example, married workers often face greater financial pressure due to family responsibilities, which increases their susceptibility to poverty (Boertien et al., 2018). Education plays a key role in improving social mobility and reducing economic vulnerability, as workers with higher educational attainment are better positioned to access more stable income opportunities (Dartanto et al., 2020). In addition, access to financing mechanisms such as microcredit is crucial for enabling informal workers to improve their economic conditions and transition toward more formal employment (Pratomo & Manning, 2022). Asset ownership also plays a protective role, as workers who lack valuable assets like luxury goods are more exposed to economic shocks and instability, which are more frequent in informal employment (Setyanti, 2020). Interestingly, the relationship between working hours and poverty is not linear; part-time workers tend to be more vulnerable, but full-time informal workers may also struggle to meet their living needs, reflecting the limited income-generating capacity of the informal sector regardless of time invested (Thu Diem, 2023). In connection with these findings, it is essential to further examine regional disparities, as differences in access to education, financial resources, and social services between urban and rural areas contribute significantly to variations in economic vulnerability among informal workers.

### 3.3. Determinants of Vulnerability of Informal Workers Based on Regional Characteristics

Based on a more specific analysis can also be carried out on the types of workers according to place of residence, namely the specifications of urban and rural models. In the urban model, most variables show an increase in the odds ratio compared to the overall model, indicating that these factors have a greater influence on the vulnerability of informal workers in urban areas. For instance, male workers in urban areas have an odds ratio of 1.237, meaning they are 23.7 percent more likely to fall into the extremely poor category compared to the poor or not poor category, relative to female workers. Accessibility to microcredit, for example, shows an odds ratio of 0.542, higher than the overall model which is only 0.243, reflecting that formal financing is more accessible in urban areas than in rural areas so that it can help informal workers avoid poverty (Kumar & Jie, 2023). Meanwhile, education, especially higher education, has a lower odds ratio in urban areas (OR = 0.310), meaning that workers with higher education in urban areas have a greater chance of getting out of the extremely poor category compared to the poor or not poor category.

In the rural model, the change in odds ratio shows a significant decrease for several variables, reflecting the higher vulnerability of informal workers in rural areas compared to urban areas. For example, the odds ratio for male workers is 0.896, indicating slightly lower odds compared to female workers, although not statistically significant. Accessibility to microcredit shows an odds ratio of 0.188, much lower than the overall model of 0.243. This indicates that informal workers in rural areas who do not have access to microcredit have a very high chance of falling into the extremely poor category compared to the poor or not poor category. Limited access to finance in rural areas is a major obstacle for workers to improve or expand their businesses. Ownership of luxury goods also shows an odds ratio of 0.167, lower than the overall model of 0.198, confirming that informal workers in rural areas who do not have assets are more vulnerable to economic instability. Assets such as luxury goods can be an indicator of economic stability, and without access to such assets, workers in rural areas are more vulnerable to being trapped in a cycle of poverty. In addition, workers who work full time in rural areas have slightly lower odds (OR = 0.895) of falling into the extremely poor category compared to the poor or not poor category, indicating that full time work may offer modest protection in rural settings.

Based on the results of ordinal logistic regression presented in Table 4, it can be seen that in all model specifications (overall, urban, and rural models), the direction of the influence of independent variables on the vulnerability of informal workers shows consistency. This indicates robustness in the research model, where the results of the influence of these variables do not change significantly even though they are separated by region. It is important to note that, due to the cumulative nature of ordinal logistic regression, the odds ratios reflect the likelihood of being in a higher poverty category whether poor or extremely poor. In other words, the influence of independent variables on the vulnerability of informal workers remains stable in each model, which adds credibility and reliability to the findings in this study.

## 4. Conclusion and Recommendations

Descriptive and regression analyses indicate that informal workers in North Sumatra Province are highly vulnerable to poverty and extreme poverty, particularly in districts with a high concentration of informal sector employment. As shown in Figure 1, several districts with a greater share of informal workers also exhibit higher poverty rates, supporting this conclusion. Factors contributing to their vulnerability include gender, marital status, age, education, access to financing such as microcredit, ownership of luxury goods, working hours, and place of residence. Male and married workers tend to be more vulnerable to poverty. Lower education, limited access to microcredit, and the inability to access luxury goods also increase their vulnerability to extreme poverty. In addition, although workers with part-time working hours are more likely to fall into the poor category, this is not much different from full time workers. This shows the inequality between working hours and income in the informal sector. These findings also indicate that workers in urban areas have a greater chance of avoiding poverty compared to workers in rural areas, although they also remain vulnerable.

Recommendations that can be taken include expanding access to formal financing such as microcredit, especially in rural areas where financial inclusion is limited. In addition, instead of merely strengthening education which may not be feasible for those who have already dropped out policy efforts should focus on supporting informal workers with low education levels through targeted poverty alleviation programs. These may include vocational training, skills upgrading, functional literacy programs, and financial management education to help them move towards more stable income opportunities. Policies aimed at improving economic security for informal workers, such as cash transfers, social protection schemes, or subsidized entrepreneurship programs, can provide a safety net while enhancing their ability to invest in productive activities. The government should also take proactive steps to encourage the development of the formal sector in district-level economies. For example, incentives such as tax relief for MSMEs that formalize, simplified business registration procedures, or public-private partnerships in labor intensive industries could create more stable and formal job opportunities.

Furthermore, the government should facilitate access to product markets for informal workers—for instance, by purchasing or aggregating their goods through cooperatives, creating guaranteed price schemes, or opening state-backed distribution platforms. This kind of monetization mechanism would ensure that informal workers can generate consistent income and scale their productivity. Addressing exploitative practices such as illegal levies and middleman dominance in informal trade chains is also critical to protect worker income and promote fairness in the market ecosystem.

For future research, it is recommended to explore the role of social capital, institutional support, and local government initiatives in reducing the vulnerability of informal workers. It would also be valuable to analyze how different types of government interventions impact the sustainability and transition pathways of the informal economy.

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