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Factors and comparative analysis of COVID-19's impact on household food security in rural and urban regions

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ABSTRACT

Introduction: The COVID-19 pandemic has significantly affected household food security in Indonesia, particularly in both rural and urban areas. This study compares food security between rural and urban households during the pandemic. This study aims to compare food security between rural (Paser Regency) and urban (Balikpapan City) households during the pandemic.

Methods: Using a cross-sectional design, 300 households were sampled (150 each from Balikpapan and Paser), with data collected through interviews and questionnaires. Household income, food, and non-food expenditure were analyzed using Pearson correlation with IBM SPSS Statistics 24.

Result: The results of the correlation test showed that the increase in spending on food consumption during the COVID-19 pandemic had a significant positive correlation with food security in rural areas and moderate overall. Spending on non-food items had a small positive correlation in rural and urban. Post-COVID-19 income positively correlated in rural areas but weaker in urban areas. Social assistance receipts are negatively associated with food security in rural areas and urban areas. Maternal concerns about home food provision significantly negatively correlated with rural and overall.

Conclusion: The COVID-19 pandemic has significantly impacted household spending on food consumption, both in urban and rural areas. A positive correlation exists between increased food expenditure and food security in rural areas, but social assistance recipients tend to have lower food security. The government needs to strengthen food assistance programs and diversify sources of income in rural areas through job training and small business support.

KEYWORDS

Basic needs, food vulnerability, inequality, socioeconomic impact, subsistence.

INTRODUCTION

The COVID-19 pandemic that has spread since early 2020 has changed various aspects of human life throughout the worldwide. The COVID-19 pandemic has significantly impacted Indonesia, with the first confirmed case reported on March 2, 2020. As of June 3, 2020, there have been 28,233 confirmed cases of COVID-19 in the country, resulting in a current incidence rate of 0.11‰. Unfortunately, the senior population has been hit the hardest, with a death rate of 17.68%. Among COVID-19 patients, the most common symptoms reported were fever in the past (50.4%), fever at present (47.1%), and cough (76.2%)[1]. Research by Bautista Jacobo et al. 2023 regarding eating disorders, it was found that one in five University in North-Western Mexico students surveyed were at risk of developing an eating disorder. The dominant level of anxiety in respondents during the pandemic ranged from moderate to severe. The most common symptoms experienced by students are nervousness, lack of relaxation, and fear that something bad will happen. This suggests that the effects of COVID-19 can attack psychology.

One of the significant impacts of this pandemic is related to household food security, especially in rural and urban areas. Food security is the ability of a household or community to meet staple food needs such as food, and access to sufficient, safe, balanced, and nutritious food. The COVID-19 pandemic has triggered several factors that can influence

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household food security, including limitations on the acquisition of farm inputs, movement restrictions, and job loss or reduced income[3,4].

Indonesia's economy has been significantly impacted by COVID-19, which has caused economic decline in several sectors. The industries most impacted were the household sector, trade, tourism, transportation, and health[5]. The impact of the pandemic on economic activity and food supply networks has raised serious concerns about the relationship between COVID-19 and food security in Indonesia. Research has indicated that food insecurity has increased because of the epidemic, especially for vulnerable groups like young children[6].

During the COVID-19 pandemic, food security in Indonesia is a complicated problem that differs depending on the area and people. A study carried out in Indonesia revealed that 42% of the nation still experiences low food security, with areas like DKI Jakarta, West Java, Banten, Bali, Central Kalimantan, East Kalimantan, South Kalimantan, North Sulawesi, West Papua, and Papua being particularly affected[7]. The impact of the COVID-19 outbreak in Indonesia has been different in urban and rural areas, affecting various aspects of life. Furthermore, a cross-sectional study conducted in Indonesia suggested that the limitations placed on community activities during the pandemic hurt the mental well-being of residents living in both urban and rural areas[8]. In another research during the COVID-19 pandemic, 20.2% of individuals in a study on pregnant women in Semarang, Indonesia, reported having mild to moderate to severe anxiety. Low COVID-19 knowledge and gravida for the first or > fourth time were factors linked to anxiety levels[9].

The following are the primary causes of food insecurity in Indonesia during the COVID-19 pandemic: 1. Economic downturn: people who are unemployed or losing their income have seen a decrease in purchasing power due to the epidemic, primarily affected the middle and lower classes[10], 2. Cost increases for staple foods: as a result of the epidemic, staple food costs have gone up, making it more difficult for households to afford a balanced diet[10], 3. Food supply chain disruption: as a result of the pandemic's disruption of food supply systems, there is a shortage of food in some places[7], 4. Legal and economic policies: food insecurity and inequality in Indonesia have been made worse by ingrained elements connected to the country's legal and economic systems[10], and 5. Lack of access to assistance: due to a lack of legal identity, impoverished women, especially those who have recently divorced, may encounter difficulties getting support from programs aimed at reducing poverty[11]. In summary, the relationship between COVID-19 and food security in Indonesia is a complicated one that calls for constant observation and action to lessen its detrimental effects on people who are already at risk. This study aims to compare food security in rural and urban households during the COVID-19 pandemic with 16 independent variables that have been selected.

METHODS

Study Design

The methodology for this study involved a clustered sampling approach, in which each location was carefully chosen based on its frequency in the area[12]. The study honed in on households within each subdistrict and utilized the clusters of each integrated healthcare center as a basis. The total number of samples used was n = 300 with the division of n = 150 Balikpapan City and n = 150 Paser Regency. This study is a cross-sectional investigation aimed at documenting the state of household food security in East Kalimantan, Indonesia, amidst the COVID-19 pandemic. This research encompasses both urban (Balikpapan City) and rural (Paser Regency) areas, guided by the Decree of the Minister of National Development Planning of the Republic of Indonesia Number 42/M.PPN/HK/04/2020[13]. This investigation take place between May and September 2022 and received ethical approval from the Ethics Committee for Research Involving Human Subjects at the Bogor Agricultural Institute (reference number 680/IT3.KEPMSM-IPB/SK/2022).

Data Collection

This study collected primary data obtained from interview using questionnaire and in-depth interview about COVID-19 impact at household level. Household income and expenditure are assessed using instruments adapted from the 2020 National Social Economic Survey[14] about household food expenditure, consumption, income, and revenue. Expenditure covers expenses on food (staple food, vegetables, and raw protein, prepared food, and beverages) and non-food (medicine, vitamins, sanitation, cellular credit/data pacakge). The structure of the selected survey questions is presented in table 1.

Statistical Analysis

The data obtained was processed using Ms. Office Excel 2019 related to the 16 variables selected. Pearson's correlation descriptive statistics were used to analyze 16 variables selected with food security through the Food Insecurity Experience Scale (FIES) using software IBM SPSS Statistic 24.

RESULTS

Based on the data in table 2, several significant findings are related to changes in maternal expenditure and conditions in urban and rural areas during the COVID-19 pandemic. First, changes in household spending on food consumption have mainly remained stable in both regions, with 58% of households in urban areas and 65% in rural areas unchanged. However, there is almost the same percentage between the increase in food expenditure in urban (24%) and rural (25%).

Second, spending on non-food items was essentially unchanged in both regions, although there was a slight difference, with more households in rural areas (58.7%) reporting

Table 1. List of survey questions

No	Questions	Category
1	Compared to the time since the COVID-19 outbreak occurred, how has the expenditure on food/food ingredients consumed/ eaten/ drunk/ cooked/ used/ consumed by your household today?	1. Increase 2. No Change 3. Increase
2	Compared to the time since the COVID-19 outbreak occurred, how has your current expenditure on non-household food items changed?	1. Increase 2. No Change 3. Increase
3	When compared to since the COVID-19 outbreak occurred, what is the total of all your household expenses today?	1. Increase 2. No Change 3. Increase
4	Which production change is the most dominant? Food ingredients (staple food, vegetables, and raw protein sources)?	1. Yes 2. No
5	Which production change is the most dominant? Prepared food and beverages?	1. Yes 2. No
6	Which production change is the most dominant? Health (medicine, vitamins, and sanitation)?	1. Yes 2. No
7	Which production change is the most dominant? Cellular credit/data package?	1. Yes 2. No
8	What has been the impact on your income since the Covid-19 outbreak occurred?	1. Increase 2. No Change 3. Increase
9	During the pandemic, did you ever receive social assistance from the government? (cash or staple food)	1. Yes 2. No
10	The current condition and various news reports about Covid-19, have made me feel (Mother):	1. Not affected 2. Worried
11	After COVID-19, Mother's perception of maternal health	1. Not affected 2. Worried
12	After COVID-19, Mother's perception of the health of family members	1. Not affected 2. Worried
13	After COVID-19, Mother's perception when going outside the house	1. Not affected 2. Worried
14	During COVID-19, did you experience unwanted weight loss?	1. Yes 2. No
15	During COVID-19, did your child experience unwanted weight loss?	1. Yes 2. No
16	During COVID-19, are you worried about food availability at home?	1. Yes 2. No

no change than in urban (48.7%). The same is true for changes in total household spending, with most households in rural (56%) and urban (45.3%) reporting no change. Expenditure on staple foods showed a dominance of increase in both regions, although slightly higher in urban areas (78.7%) than in rural areas (74%). As for ready-to-eat food and beverages, more households in rural areas (54.7%) reported changes compared to urban (50%).

Regarding health, most households in both regions experienced increased spending on medicines and sanitation, with the percentage almost the same between urban (75.3%) and rural

Table 2. Results of percentage data processing of each variable in urban and rural

Variabel	Category	Urban, n (%)	Rural, n (%)
Change in food consumption expenditure during COVID-19	1. Increase	36 (24)	37 (25)
	2. No Change	87 (58)	97 (65)
	3. Increase	27 (18)	16 (11)
Change in spending on non-food items by current households during COVID-19	1. Increase	62 (41.3)	54 (36)
	2. No Change	73 (48.7)	88 (58.7)
	3. Increase	15 (10)	8 (5.3)
The total change in all household expenditure now compared since the COVID-19 outbreak occurred	1. Increase	56 (37.3)	53 (35.3)
	2. No Change	68 (45.3)	84 (56)
	3. Increase	26 (17.3)	13 (8.7)
The most dominant change in total expenditure for food ingredients (staple food, vegetables, and raw protein sources)	1. Yes	118 (78.7)	111 (74)
	2. No	32 (21.3)	39 (26)
The most dominant change in total expenditure for prepared food and beverages	1. Yes	75 (50)	82 (54.7)
	2. No	75 (50)	68 (45.3)
The most dominant change in total expenditure for health (medicine, vitamins, and sanitation)	1. Yes	113 (75.3)	108 (72)
	2. No	37 (24.7)	42 (28)
The most dominant change in total expenditure for cellular credit/data package	1. Yes	40 (26.7)	36 (24)
	2. No	110 (73.3)	114 (76)
Revenue since the COVID-19 outbreak	1. Increase	10 (6.7)	5 (3.3)
	2. No Change	59 (39.3)	87 (58)
	3. Increase	81 (54)	58 (38.7)
Received social assistance from the government during the COVID-19 pandemic (cash or stapel food)	1. Yes	77 (51.3)	92 (61.3)
	2. No	73 (48.7)	58 (38.7)
Mother's worry about conditions during the pandemic due to various report about COVID-19	1. Not affected	16 (10.7)	24 (16)
	2. Worried	134 (89.3)	126 (84)
Mother's worry about own health during COVID-19	1. Not affected	16 (10.7)	24 (16)
	2. Worried	134 (89.3)	126 (84)
Mother's worry about the health of family members during COVID-19	1. Not affected	16 (10.7)	25 (16.7)
	2. Worried	134 (89.3)	125 (83.3)
Afraid to go outside during COVID-19	1. Not affected	15 (10)	27 (18)
	2. Worried	135 (90)	123 (82)
Mother's experience unintended wight loss during COVID-19	1. Yes	27 (18)	27 (18)
	2. No	123 (82)	123 (82)
Mother's experience unintended child's weight loss during COVID-19	1. Yes	5 (3.3)	15 (10)
	2. No	145 (96.7)	135 (90)
Mother's worry about food availability at home	1. Yes	43 (28.7)	46 (30.7)
	2. No	107 (71.3)	104 (69.3)

(72%). However, in terms of spending on mobile data packages, most households have not changed, both in urban (73.3%) and rural (76%). Household income experienced a significant decline in both regions, with 54% of urban households and 38.7% of rural households reporting a decrease in income. In addition, more households in rural areas (61.3%) received social assistance from the government than in urban areas (51.3%).

Maternal concerns related to the pandemic, personal health, and family members are particularly high in both regions, with more than 80% of urban and rural mothers reporting such concerns. In addition, fear of leaving the house is more reported in urban areas (90%) than in rural areas (82%). Regarding weight change, 18% of mothers in both regions reported unintentional weight loss, but child weight loss was more common in rural areas (10%) than in urban areas (3.3%).

Overall, these data show that despite some differences, households in urban and rural areas experienced similar impacts in various aspects during the COVID-19 pandemic, with households in rural areas more vulnerable to declining incomes and more dependent on social assistance.

The results of the correlation test between the selected independent variable and the dependent variable (Food Security) in rural, urban, and overall areas (table 3), reveal several important findings related to changes in expenditure and concerns during the COVID-19 pandemic.

Changes in expenditure on food consumption have a significant positive correlation with food security in rural areas ($r = 0.414$), which shows that the increase in spending on food during the pandemic is closely related to better food security conditions in rural areas. In urban areas, the correlation was lower ($r = 0.077$), and overall, a correlation value of $r = 0.230$ showed that a moderate increase in food expenditure was related to food security.

Changes in expenditure on non-food goods showed a slight positive correlation in rural ($r = 0.144$) and urban ($r = 0.086$)

Table 3. Correlation between 16 variables and dependent variables (food security)

No	Variable	Rural (r value)	Urban (r value)	Overall (r value)
1	Change in food consumption expenditure during COVID-19	0.414**	0.077	0.230**
2	Change in spending on non-food items by current households during COVID-19	0.144	0.086	0.113*
3	The total change in all household expenditure now compared since the COVID-19 outbreak occurred	0.190*	-0.013	0.076
4	The most dominant change in total expenditure for food ingredients (staple food, vegetables, and raw protein sources)	0.089	0.155	0.126*
5	The most dominant change in total expenditure for prepared food and beverages	0.160	0.046	0.097
6	The most dominant change in total expenditure for health (medicine, vitamins, and sanitation)	0.080	0.067	0.079
7	The most dominant change in total expenditure for cellular credit/data package	0.060	-0,005	0.034
8	Revenue since the COVID-19 outbreak	0.177*	0.037	0.086
9	Received social assistance from the government during the COVID-19 pandemic (cash or stapel food)	-0.100	-0.141	-0.149**
10	Mother's worry about conditions during the pandemic due to various report about COVID-19	0.071	0.047	0.046
11	Mother's worry about own health during COVID-19	0.071	0.047	0.046
12	Mother's worry about the health of family members during COVID-19	0.085	0.047	0.052
13	Afraid to go outside during COVID-19	0.076	0.036	0.038
14	Mother's experience unintended wight loss during COVID-19	-0.100	-0.175*	-0.132*
15	Mother's experience unintended child weight loss during COVID-19	-0.126	-0.066	-0.125**
16	Mother's worry about food availability at home	-0.293**	-0.082	-0.196**

(**) Correlation is significant at 0.01 level (2-tailed), (*) Correlation is significant at the 0.05 level (2-tailed), and the sign on the correlation coefficient (positive or negative) indicates the direction of the relationship. If it is positive, it shows that the higher the independent variable, the higher the dependent variable. Meanwhile, if it is negative, the higher the independent variable, the lower the dependent variable.

areas, as well as overall (r = 0.113). This indicates that changes in spending on non-food items are related to food security, although not as strongly as spending on food. The total household expenditure change had a minimal correlation (r = 0.076). In rural areas, there was a slight positive correlation (r = 0.190), while in urban areas, the correlation was negative and insignificant (r = -0.013). This shows that the total change in household expenditure does not significantly influence food security.

Expenditure on staple foods was positively correlated with food security in both regions, with higher values in urban (r = 0.155) than rural (r = 0.089), and overall r = 0.126. This shows that spending on staple foods (such as basic foodstuffs, vegetables, and protein) is critical to food security, especially in urban areas.

Since COVID-19, income has shown a positive correlation with food security in rural areas (r = 0.177), but only a minimal correlation in urban areas (r = 0.037). The correlation of income with food security is r = 0.086, indicating that although some households in rural areas have experienced increased revenue, the effect on food security is relatively small.

Social assistance receipts negatively correlated in rural (r = -0.100) and urban (r = -0.141) areas. An overall correlation of r = -0.149 indicates that households receiving social assistance tend to have lower food security, which may be related to more vulnerable economic conditions.

Maternal concerns related to home food provision have a significant negative correlation in rural areas (r = -0.293) and overall (r = -0.196). This suggests that the increasing concern of mothers is linked to a decrease in household food security, particularly in rural areas. Accidental weight loss in urban areas has a significant negative correlation with food security (r = -0.175), indicating that mothers who experience weight loss tend to be in households with lower food security. Similarly, as concerns about food availability at home rise, households' food cesurity is lower.

DISCUSSION

Changes in expenditure on food have not changed significantly in either region. This indicates that changes in food consumption levels tend to be stable. Although the condition in Paser Regency is more stable, it is 10% adrift compared to Balikpapan City. Meanwhile, the increase experienced by respondents in Paser Regency was 35.3%, and Balikpapan City was 37.3%. Based on of the correlation test results, expenditure on food consumption in rural areas is significant (r value = 0.414) compared to urban areas. In general, expenditure on food consumption is positively correlated (r value = 0.230). This condition can occur due to limited mobility and increasing health problems, necessitating increased spending on food and health supplies to ensure safety and health[15,16].

The economic uncertainty during the pandemic also led to a shift in consumption patterns, with a greater emphasis on home-cooked meals than prepared foods[17]. According to Saragih & Saragih (2020) research shows several factors are interrelated. For instance, changes in eating habits correlate with age, food diversity correlates with the type of work, breakfast habits correlate with the type of work, and consumption diversity correlates with changes in eating habits. Conversely, there are no correlations between consumption diversity and concerns about food shortages, breakfast habits and concerns about food shortages, herbal drink habits and meal frequency, and types of herbs and weight gain. The results of another study by Bautista et al. (2024), the consumption of dietary supplements during the COVID-19 pandemic in Mexico shows that more than half of consumers receive recommendations from health experts. Most of respondents considered that dietary supplements contributed to the prevention of COVID-19.

Income during the COVID-19 pandemic was relatively stable in Paser Regency, which experienced a decrease of 38.7% compared to 54% in Balikpapan City. This is in line with the results of the study Varma et al. (2023), which stated that informal workers, who constitute 81% of urban labor in places like India, faced job losses and food access issues during lockdowns.

Urban areas are more affected by several the business sector conditions in urban areas, including tourism, hospitality, and transportation, which are directly affected by the COVID-19 pandemic[21,22], restrictions on mobility and community activities that reduce economic activities in urban areas[23,24], and higher unemployment and layoffs in urban areas[24]. Based on the results of research conducted by Carrillo-Álvarez et al. (2024) The city of Catalonia, Spain, stated that urban areas experienced a 52.1% prevalence of severe food insecurity among food aid recipients, exacerbated by the pandemic. Based on the results of the study by Ajibade et al. (2024), key factors influencing food spending included household income, size, and the age of the household head, with income being the most significant determinant.

However, receiving assistance from the government is an interesting concern based on the findings of this study. Receiving aid from the government in cash or staple food in rural areas reached 61.3% compared to urban areas at 51.3%. This shows that rural areas are more vulnerable to food than urban areas, with the variable of receiving social assistance from the government. At the same time, the overall correlation results show that this variable is negatively correlated significantly (r-value = -0.149). This can be interpreted that the more social assistance obtained, the more food insecurity can suddenly occur. The link between income levels in a region and the prevalence of COVID-19 is stronger in rural areas, indicating a greater need for assistance[27].

The variable of maternal weight loss experience during the COVID-19 pandemic in urban areas was negatively correlated

(r-value = -0.175). This can happen to households in urban areas that experience food insecurity. Overall, this variable also provides a negative correlation to household food security in rural and urban areas (r-value = -0.132). Following the results of research conducted by Vicheet et al. (2024), food security is not significantly correlated with changes in the weight of working women in Malaysia in the 18 – 49 age range.

Of the respondents, 69.3% of mothers in Paser Regency and 71.3% in Balikpapan City stated they were not worried about food availability at home. The results of the correlation analysis related to this independent variable with food security show that concerns about food availability in rural areas are more significant for food availability at home compared to urban areas. However, overall maternal concerns about food availability are significant (r-value = -0.196), although both are negatively correlated. This means that this concern only occurs in households experiencing food insecurity. These variables reflect the heightened economic uncertainty and shifts in consumer behavior during the pandemic, as evidenced by increased expenditure on home-cooked meals and reduced spending on prepared foods in Indonesia[17].

The results showed that the most influential variable on household food security in rural areas was the change in food consumption and income distribution during the COVID-19 pandemic. Meanwhile, there is no positive correlation between independent variables and household food security in urban areas. This suggests a broader impact on household financial decisions and food choices[29,30]. These findings underscore the complex interplay between economic factors and food consumption behaviors during the pandemic, highlighting the need for targeted government interventions to support vulnerable populations[17,31].

STUDY LIMITATIONS

The study involved 300 households from diverse rural and urban settings, utilizing extensive questionnaires and in-depth interviews to gather a comprehensive dataset. Meticulous processing and validation were required to ensure the reliability of findings, particularly when addressing the socioeconomic factors affected by the COVID-19 pandemic. The research included 16 independent variables related to household food security, demanding complex statistical analyses to identify significant patterns. The time-consuming nature of these analyses and the need to cross-validate findings against existing literature extended the research timeline. The evolving socioeconomic impacts of COVID-19 necessitated consideration of longitudinal effects, including the sustained influence of government assistance and shifts in household expenditure patterns, requiring careful contextual interpretation.

CONCLUSION

The conclusion of this study shows that the COVID-19 pandemic significantly impacts household spending, especially on food consumption, in urban and rural areas. Rural households are more vulnerable to declining incomes and are more dependent on social assistance than urban households. There was a significant positive correlation between increased spending on food and food security in rural areas. Still, social assistance showed a negative correlation, indicating that households receiving assistance tended to have lower food security.

The results of this study suggest the importance of more targeted government intervention to support vulnerable households, especially in rural areas that are more dependent on social assistance. The government needs to strengthen food assistance programs by improving sustainable food access. In addition, diversifying sources of income in rural areas through job training programs or support for small businesses can help improve food security. Nutrition and household financial management education can also help people adapt to economic changes during a crisis.

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