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Food accessibility and its influencing factors during the the early social restriction period of the COVID-19 pandemic in Indonesia

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Abstract

Purpose: This study aims to assess food accessibility and its influencing factors among adults in Indonesia during the early COVID-19 pandemic. **Methods:** The research was cross-sectional and conducted using an online questionnaire that assessed sociodemographic characteristics, food access, physical access (enabling factors for individuals to reach food physically), financial access, social support, and coping strategies of the respondents. We included 439 adults, 358 females and 81 males, aged 20-62 years. **Results:** This research found that physical access difficulties (aOR=3.945; CI:1.652-9.421; p=0.002), unemployment status (aOR=3.104; CI:1.436-6.712; p=0.004), and lower education level (aOR=2.819; CI:1.036-7.672; p=0.042) were associated with increased inability to access food. Meanwhile, coping strategies for food insecurity conditions (aOR=0.634; CI:0.536-0.750; p<0.001) were protective of the inability to access food (R^2=0.298). **Conclusion:** People with a high risk of unemployment and low education who will have difficulty accessing food in times of social restrictions should be protected.

Keywords: adults; COVID-19; food accessibility

INTRODUCTION

The outbreak of novel coronavirus disease (COVID-19) that emerged in China at the end of December 2019 is becoming a global pandemic affecting 2.8 million people and causing nearly two hundred thousand deaths in 210 countries worldwide, including Indonesia [1]. WHO Indonesia reported that COVID-19 has already spread through local transmission and infected 9.096 people in 34 Indonesian provinces with 765 deaths, making it positioned as the country with the highest mortality rate in Asia [2]. The Indonesian Government has implemented national quarantine, starting in March 2020, and large-scale social restrictions (PSBB; Pembatasan Sosial Berskala Besar) in some of the most affected big cities to slow the spread of the infection [3].

COVID-19 and the quarantine measures have impacted many aspects of life. One of the aspects affected by the pandemic is the food and agricultural sector. Shortages of food production and processing labor, energy, transportation, food loss, and waste are among several factors causing limited food availability from the supply side. On the demand side, panic purchases of food driven by the fear of food supply shortage can result in price crises. The loss of purchasing power can worsen the situation, which affects food access. Food is one of the necessities of human life [4]. When the food is not enough, accompanied by unstable income, people are less able to cope with other conditions such as hospital stays or the death of family members, increasing the risk of their vulnerability to the infection of COVID-19 [5].

Changes in individual movement and physical access to food due to large-scale social restrictions also change people's dietary intake patterns from nutrient-rich food, usually to unhealthy food options, which give rise to adverse health outcomes and significant public health crises [6]. A study has shown that online food delivery has increased by 9% during the restriction period, and the food types that were mainly bought during the restriction period were energy-dense and ultra-processed foods [7]. This situation worsens undernutrition and obesity due to increased disruptions in the local and global food systems [8]. Large-scale social restrictions also have adverse socioeconomic impacts, including reduced workforce, job losses, mental health impacts, and sedentary behaviors [9]. A previous study showed that 54% of households spread over Indonesia stopped working because of business closures due to COVID-19 legal restrictions. Furthermore, the highest incidences of food insecurity are among the poorest, who experienced a food shortage and ate less [10]. This condition is more likely to happen when social support is absent, such as food aid, and the household implements no coping strategy to ensure food adequacy in responding to crisis moments [11].

Easy access to healthy food is essential to improve immunity. This is proven by a study among samples of adult patients at US urban hospitals, which concludes that food insecurity, including limited access to food, can worsen one’s health condition through the role of dietary intake [12]. A previous study in Tehran also showed that social support and food-based intervention programs are needed to improve the population's nutritional needs [13]. Assessing the COVID-19 impact on food accessibility and its influencing factors through the severity levels is important. Thus, in this study, we aimed to explore Indonesia's food accessibility situation and its influencing factors. The study result may be beneficial in providing information to improve food access during the pandemic.

METHODS

This cross-sectional study used an online-based questionnaire disseminated in the third to fourth week of May 2020. Respondents aged 20 years and above, living in Indonesia for at least the last 6 months, can access online questionnaires, are willing to fill out the informed consent form, and do not follow a diet, which was included in the study. The sample size for the survey was calculated based on the previous research, which estimated 0.4 as the proportion of the population with limited food access measured by food insecurity [14]. Based on the earlier study's findings, the minimum total sample size estimated for this study was 381. An additional 10% of the total sample was added to cover for incomplete data. The questionnaire was developed based on a literature review and consultation with food economics and epidemiology experts. The reliability testing resulted in Cronbach's Alpha coefficient of 0.816, which showed that the instrument had high reliability.

The questionnaire consisted of two parts. The first part covered demographic information by the first part asking about the personal respondents' information, physical access, financial access, social support, and coping strategy of the re-access explained as enabling factors for individuals to reach food physically, including frequency of food shopping, primary food providers used (the place to buy/produce leading food by the respondent which consists of food, food products, or beverages such as traditional store, supermarket, minimarket, grocery store, mobile vegetable store, online, restaurants or food store's delivery services and garden), and food store accessibility, as well as respondents' perception on the difficulties to get food (difficult or not difficult) [15].

Financial access assesses economic resources that influence access to food, including changes in food expenditure and income (decrease, no change, and increase). Social supports identified any governance or community support that enables individuals to access or get food, including social safety net and community food sharing. The last component was a coping strategy to respond to conditions under which the respondents do not have enough money or other resources to eat, presented in the number of coping strategies adapted from none to eight [16]. The questions on personal information were asked for two different time frames: before (in February 2020) and during large-scale social restriction (since March 2020).

The second part covered food access experiences using a validated FIES (Food Insecurity Experience Scale) questionnaire for individuals. We adapted the questionnaire from The National Socioeconomic Survey (SUSENAS) 2017 (BPS, 2018). For FIES, respondents were given eight questions covering their experience on the ability to access and consume healthy and adequate food related to financial or other resource limitations with the choice to answer "yes" if affirmative or "no" if not affirmative. Questions with an affirmative answer were given one score, while questions with a not affirmative answer were given a null score. The score was then summed up and categorized into able (score ≤4) and less able (score 5-8) to access food [8]. The FIES questionnaire was asked for conditions in 30 days during the large-scale social restriction (since March 2020).

LimeSurvey was used as an online baseline to gather all the data needed for a restricted situation. Ethical committee of the Faculty of Medicine, Universitas Indonesia-Cipto Mangunkusumo Hospital with the registered number KET.517/UN2.F1/ETIK/PPM.00.02/2020.

The chi-square test determined and approved this research association between the distribution of sociodemographic characteristics, physical access, financial access, social support, and coping strategy based on food access categories. Logistic regression analysis using the enter method was performed to understand the factors influencing food access. We included all the variables that fulfilled the pre-requirements of p-value <0.2 and or factors that might contribute to food accessibility based on literature review as the predictor at first. We iteratively removed the least helpful predictor with a non-significant p-value, one at a time, to avoid losing essential variables.

The variables being tested in the regression analysis were sociodemographic characteristics (e.g., gender, education level, employment status, monthly income, change in food expenditure, implementation of large-scale social restriction, number of dependent people, and place of residency), physical access difficulties, change in financial access (income and food expenditure), social support receiving status, and number of adopted coping strategy. The test results showed as significant if p <0.05. To obtain the contribution of the model to food accessibility, the R^2 value was determined. The analyses were performed using SPSS statistical software version 20 (SPSS Inc., an IBM Company, Chicago, IL, USA).

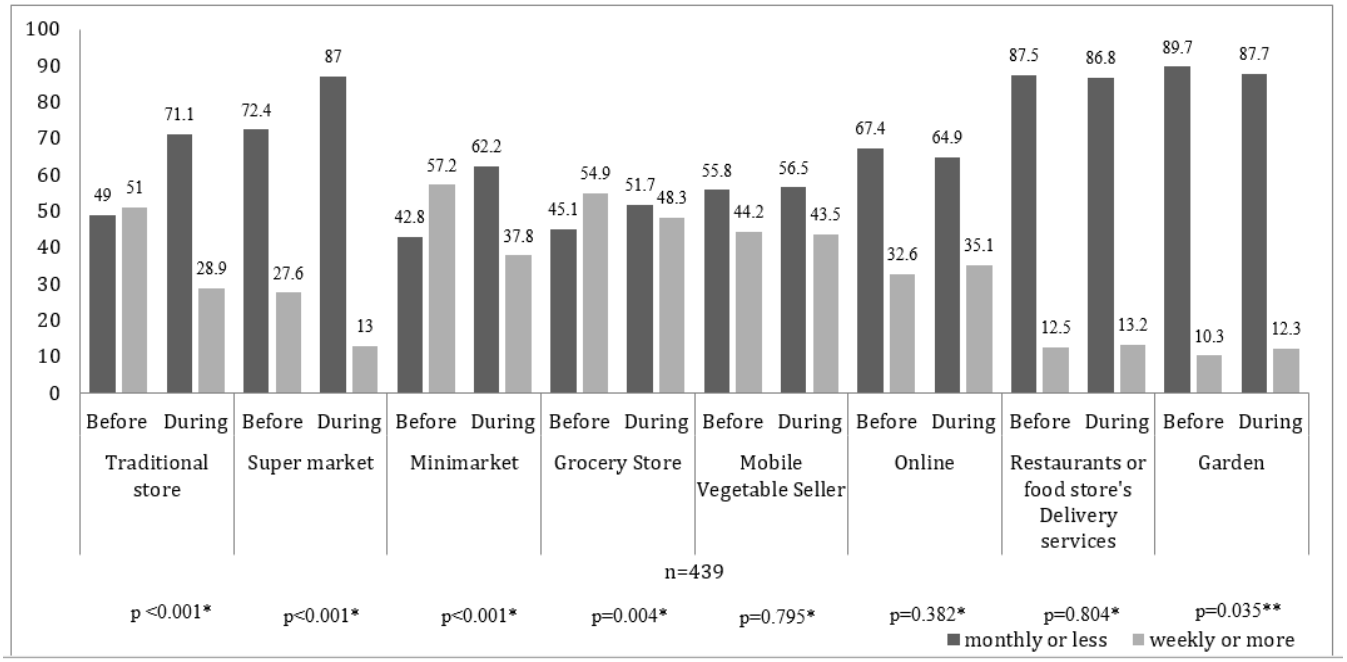
RESULTS

Table 1. Characteristic of respondents (N=439)

Variable	%
Age (median, min-max)	26 (20-62)
Gender	
Female	81.5
Education	
Senior highschool	8
College graduate	92
Occupation	
Private employees	35.1
Government employees	21
Student	16.2
Professional	7.5
Entrepreneur	6.6
Housewife	4.6
Unemployed	7.1
Income	
<Rp 1.800.000	27.3
Rp 1.800.000 - Rp 2.999.999	17.1
Rp 3.000.000 - Rp 4.799.999	21.6
Rp 4.800.000 - Rp 7.199.999	21.2
≥Rp 7.200.000	12.8
Large-scale social restriction status	
Yes	69.7
No	30.3
Place of residency	
Java	74.9
Sumatera	10.7
Bali-Nusa Tenggara	6.2
Sulawesi	4.8
Kalimantan	2.3
Maluku-Papua	0.9
Number of people being supported financially for food by the respondent	
≤4	85.4
>4	14.6
With whom respondents live	
With nuclear family	65.8
Alone	15.3
With nuclear and/or extended family	18.9
Financial access	
Change in income	
No change	49.2
Increased	3.4
Decreased	47.4
Change in food expenditure	
No change	31.2
Increased	49.4
Decreased	19.4
Physical access	
Access difficulties during COVID-19 pandemic	
Yes	11.2
No	88.8
Shopping habits during COVID-19 pandemic	
No change, always more often buy food in non-online channel	58.8
No change, always more often buy food through online service	3.2
Change, more often buy food in non-online channel	13.4
Change, more often buy food through online service	24.6
Shopping habits during COVID-19 pandemic	
Difficult	11.2
Not difficult	88.8
Food accessibility (FIES)	
Able to access food	90.1
Unable to access food	9.9

Table 1 shows the distribution of respondents' ages. The median age was. Most respondents were female (358 female, 81.5%), had a high education (404 respondents, 92%), and had food security (395 respondents, 90.1%).

Figure 1 shows that there is a significant difference between the frequency of shopping in traditional markets (p<0.001), supermarkets (p<0.001), minimarket (p<0.001), grocery stores (p<0.004), own field (p<0.035) before and during the pandemic. During the pandemic, people access food more often through online shopping, delivery service, and their garden.



Note: Vertical Axis represents percentages. black bar = Monthly or less/ frequency between never until 1-3x/month, grey bar= Weekly or more/frequency between 1-3x/weeks, 4-6x/weeks and everyday

*McNemar Test

**Binomial distribution

Figure 1. Food shopping frequency on each food provider before and during COVID-19 pandemic

In Figure 2, we show reasons for choosing primary food providers (Fig. 2a) and distance from the most frequently used food providers (Fig. 2b) before and during the COVID-19 pandemic. There was a shift in the reasons for choosing primary food providers before and during the pandemic in that the respondents avoided going outside during the pandemic. There was also a shift in the choice of distance before and during the pandemic when the respondents chose providers closer to them.

Figure 3 shows the mode of transport to access the shops before and during the pandemic. The mode of transport was slightly shifted from public transportation (1.6%) to delivery services (10%). Among the respondents, 28.2% (n=124) received social support, while 71.8% received none. Most social support was from their neighbors and/or family members living in the same house. The number of coping strategies adopted by the respondent's area shown in Figure 4.a. As many as 59.7% (n=262) adopted coping strategies, while 40.3% (n=177) did not have any coping strategy. Figure 4b. explains that among those with coping strategies, the top coping strategy was consuming less preferred/less expensive food (40.1%, n=106).

Table 2 shows significant associations between food accessibility, as the dependent variable, education level, employment status, monthly income level, physical access, social support status, and coping strategies. Respondents with difficulties accessing food did not get social support, did not adopt any coping strategy, and were less able to access food. However, there is no significant relationship between financial access, such as a change in income and food expenditure, and food accessibility. More than 80% of the respondents can access food (FIES score ≤4) despite the experience of income change, whether it is decreased, increased, or does not change during the COVID-19 pandemic.

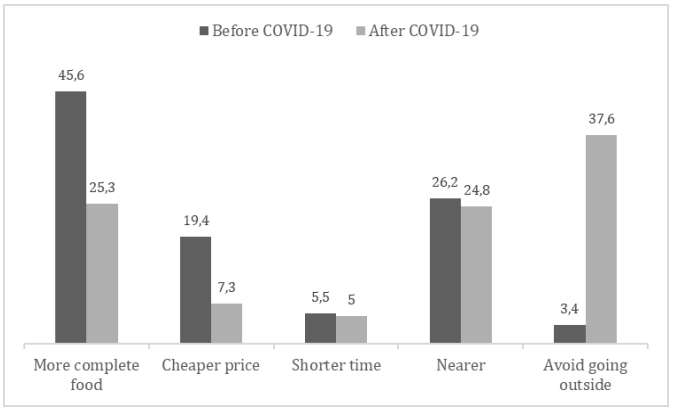
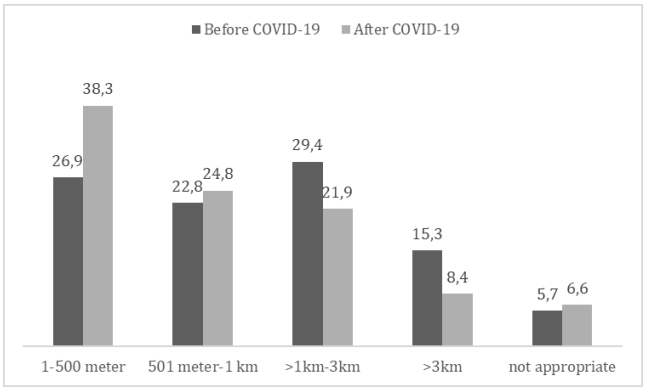
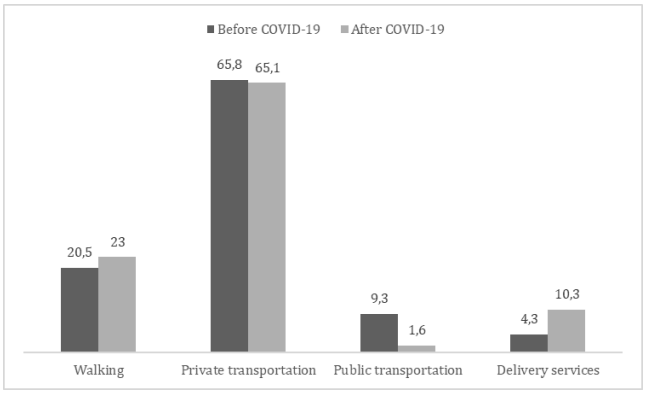


Figure 2a. Reasons for choosing primary food providers



*Note: Vertical Axis represents percentages. *Food provider defined as (the place to buy/produce leading food by the respondents, which consists of products or beverages).*

Figure 2b. Distance from most frequent food providers*used



Note: Vertical Axis represents percentages

Figure 3. Mode of transport to access the most frequent food provider before and during the COVID-19 pandemic

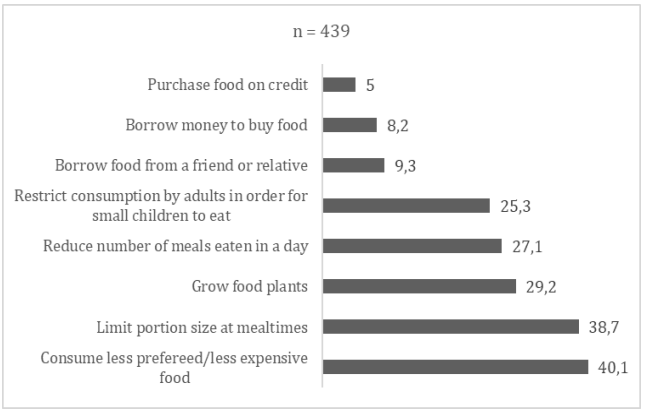


Figure 4a. Types of coping strategies adopted by the respondents

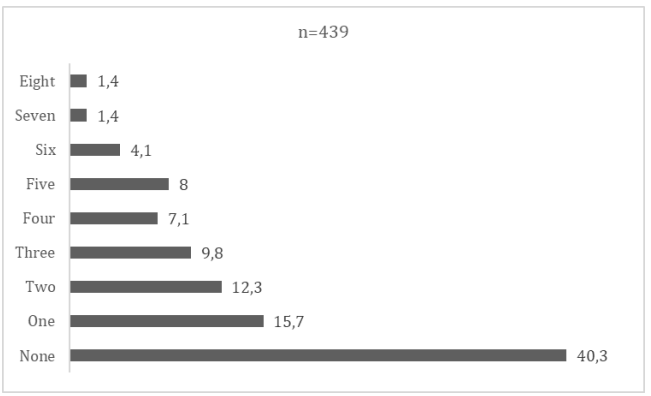


Figure 4b. Number of coping strategies adopted by the respondents (multiple responses)

After applying logistic regression multivariate analysis with the enter method, the result shows that physical access difficulties, the number of adopted coping strategies, education, and employment status contributed to food accessibility. The level R square = 0.298 indicates that 29.8% of the variations in food accessibility can be explained or are due to these factors. Respondents with access difficulties, middle education, and unemployment status about 4 times, 3 times, and 3 times, respectively, were less likely to be able to access food compared to thanks. This found a significant relationship between LSRR and physical access difficulties, change in revenue, and social support received.

Table 2. Relationship between food accessibility, sociodemographic, financial access, physical access, social support, and coping strategy

Variable	OR (CI 95%)	p-value	aOR (CI 95%)	p-value
Middle education level (vs higher education)	3.4(1.44-8.20)	0.009[a]	2.819 (1.036-7.672)	0.042[c]
Unemployment status (vs employment status)	4.10(2.10-7.98)	<0.001[a]	3.014(1.436-6.712)	0.004[c]
Monthly income level		0.003[a]		
Physical access difficulties (vs not difficult)	4.85(2.305-10.227)	<0.001[a]	3.945(1.652-9.423)	0.002[c]
Change in income		0.088[a]		
Change in food expenditure		0.456[a]		
No receiving social support status (vs receiving social support)	2.53(1.310-4.898)	0.008[a]		
Number of adopted coping strategies		<0.001[b]	0.634(0.536-0.750)	<0.001[c]

[a]Chi-Square test
[b]Mann-Whitney test
[c]Logistic regression multivariate, R Nagelkerke 0.298

DISCUSSION

In the present study, we found that factors contributing independently to food accessibility (FIES) were physical access difficulties, employment status, number of adopted coping strategies, and education level of the respondents. Physical access to food shops impacts how people procure their food. Our multivariate analysis showed that people with physical difficulties were more prone to be less able to access food than people with no physical access difficulties. Likewise, the problem of accessing food increases the cost of food shopping, requiring money and time for transportation, thereby increasing the risk of food security, which is impacted by financial constraints at the family or individual level [17]. Studies showed that individuals with better access in terms of distance from the store and vehicle ownership had higher consumption of fruits and vegetables and better diet quality than those who lived further away from the store [18]. Another study showed that some people also restrict themself from going further for shopping and prefer choosing a market nearby to avoid potential disease transmission [19].

Our multivariate analysis also showed that those with unemployment status were more likely to have difficulty accessing food. Employees laid off will have their family purchasing power and economic access to food affected. To cope with such a situation, households already vulnerable before the COVID-19 outbreak will compromise their quantity and quality of food [20]. Studies showed that households with some unemployed members were more susceptible to some degree of food insecurity. Food insecurity was seen in more than two-thirds of households where one of their members had lost a job during the pandemic [21]. Food prices also increase when the Government regulates the closure of restaurants and markets. During the crisis, households with limited economic access preferred staple foods that were more filling yet low in nutritional value, as food prices were conversely linked with nutrition value [22].

Education level is one of the factors that can contribute to food access. Moreover, education is associated with better job opportunities. It provides households with the knowledge of how to meet the health of their families' nutritional needs of their free education and a more stable economic situation during the crisis. In contrast, those with low and medium education were more vulnerable to suspension of labor, being less adaptable to remote working [24]. It showed that poor households spend more than 50 % of their income on food and are more vulnerable to food price increases and housing. Higher levels are more likely to be food secure because of increased purchasing power [25]. This is similar to a study in which a significant relationship was reported between the educational level of female-headed households and months of adequate food provisioning. It showed that the more educated the female household head, the more likely it will be able to ensure access to sufficient food compared with less educated female household heads [26].

Changes in income and food expenditures may contribute to food accessibility and food security state. However, we did not find any relationships between financial access and food access indicators, revealing that household income during the pandemic has become a determinant of household food security. Households with low income were three times more likely to experience food insecurity than households with higher income [27]. The financial access indicators, including income and expenditure changes, correlated with food accessibility as defined based on the FIES score category. This may be attributed to most of our respondents being categorized as able to access food (90.1%) and having an income above the regional minimum wage (72.7%). This implies that necessities can be obtained securely even though several

respondents experienced a change in income. Another study also found similar findings, which concluded that changes in income and full-time employment were not associated with a change in the severity of food insecurity. People facing income shocks respond to food access and insecurity based on the resources that can protect themselves from feeling the impact of this change, such as assets and access to credit, as a coping strategy[28]. In a crisis, including the COVID-19 pandemic, individuals would be more strategic about spending their money so income change does not influence food security in their household [29].

A coping strategy is any response to conditions under which the respondents do not have enough resources to eat. Generally, households adopt coping strategies in the early stages of food insecurity [30]. Most households have faced food insecurity because of lower income during the pandemic, have low dietary diversity, and tend to use coping strategies to survive [16]. Studies showed that 65,5% of the households did a two-food coping strategy, and 14,9% even had to do the most extreme during COVID-19. Most households use food coping strategies by changing their food habits [31]. Another study showed that COVID-19 measures led households to adopt several coping strategies to resist, adapt, and cope with the disruptions in their livelihood activities. Their household security is maintained or worsened depending on their different strategies and ability to respond to the implications of the containment measures on their socioeconomic and livelihood activities [32].

Our study may have limitations with generalizability, as our respondents may not describe the Indonesian population as a whole since we use online surveys that may only be accessed by those who live in areas with sufficient internet access. Also, most of our respondents were categorized as able to access food. However, given that social restrictions are generally practiced on the island of Java, which has good internet access, our research provides a good description of the impact of social restrictions on food access in Java. The results of this study provide helpful information for exploring some of the immediate implications of the COVID-19 crisis and help governments design and implement tailored policies to address food access during COVID-19.

CONCLUSION

Physical access difficulties, unemployment status, and lower education levels are related to the inability to access food. Meanwhile, coping strategies are protective of the inability to access food. The government should ensure food supply stability by supporting farmers in increasing agricultural productivity, conducting logistics distribution and marketing of nutritious food, and ensuring the need for a healthy food supply chain to minimize food scarcity and food price eases and help household food access. The Government needs to ensure that people with a high risk of unemployment and low education, who will have difficulty accessing food, are protected in times of social restrictions.

The government should set more robust supply chain regulations for producers, distributors, and sellers. Technology, such as the food marketplace, could benefit bothr and buyer during the pandemic. Further, a qualitative study is recommended for further research to capture the results in depth. This study can also be developed by examining food access before and after COVID-19 to see if there are differences before and after social restrictions are not applied to food access in Indonesia.

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