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Food Consumption Patterns and Welfare in South Kalimantan Before and During the Covid-19 Pandemic: LA/AIDS Application in Susenas Data March 2019 and March 2021

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Abstract: *Covid-19 pandemic affects the socio-economic conditions of the people. BPS-Statistics Indonesia recorded an increase in Indonesia's poverty rate from 9.41 percent in March 2019 to 10.14 percent in March 2021. South Kalimantan Province also experienced a similar problem. During this period, the province's poverty increased to 4.83 in 2021 percent from 4.55 percent in 2019. It happened due to changes in population consumption patterns and tends to reduce the value of consumption per capita. Consequently, they are trapped in the poverty line. The elasticity and pattern of budget share of a commodity compared to other commodities represent consumption patterns. This research focuses on food consumption since it is the major contributor in measuring the poverty line. Hence, it is important to see how food consumption patterns are related to the decline of welfare level in South Kalimantan. This study aims to analyze the food consumption patterns of the people of South Kalimantan during the Covid-19 pandemic compared to before the pandemic as well as analyzing its impact on the welfare in South Kalimantan. The analytical method used is modeling with the Linear Approximation of Almost Ideal Demand System (LA/AIDS). This model produces a Compensating Variation (CV) which is used as a proxy measure of well-being. The data used are the National Socio-Economic Household Survey (Susenas) Consumption Module of South Kalimantan period March 2019 and March 2021. The results reveal that the largest budget share decline is in the prepared food and beverage group in March 2021 compared to March 2019. The result also shows a welfare loss of around IDR 214,842 per capita per month. This means that there is a decrease in the level of people's welfare in March 2021 compared to March 2019. Therefore, this research strengthens the hypothesis that the Covid-19 pandemic has lowered the level of people's welfare in South Kalimantan.*

Keywords: *food, elasticity, Covid-19, LA/AIDS, Compensating Variation*

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I. Introduction

Coronavirus Disease or Covid-19 has spread since the beginning of 2020 all over the world and in March 2020 in South Kalimantan. As the number of Covid-19 cases increases, several public policies were implemented to reduce the risk of a wider spread, such as community restrictions (PPKM Level 4,3,2,1) and work/school from home methods. Physical distancing policies delayed and even cancelled the activities involving crowds. It requires people to stay at home, therefore activities, both large and small scale, must be limited or even stopped.

Covid-19 is not only related to public health, but also has an impact on the socio-economic conditions of the community. The wheel of life is no longer running as it should. The impacts of Covid-19 in Indonesia include layoffs, a decline in exports/imports, inflation, and the loss of the transportation and tourism sectors (Yamali & Putri, 2020). In addition, there was an increase in Indonesia's poverty level from 9.41 percent in March 2019 to 10.14 percent in March 2021 (BPS, 2021d). The same thing happened in South Kalimantan where poverty increased to 4.83 in 2021 percent from 4.55 percent in 2019 (BPS, 2021b). The pandemic also had an impact on the decline in South Kalimantan's economic performance, which contracted to -1.81 percent in 2020 (BPS, 2021c).

Development inevitably is one thing that has to continue as long as human life. The state is obliged to carry out the mandate of development to provide welfare and benefits to its people. Concerning the fulfillment of food needs as mandated in Constitution Law Number 18 of 2012 concerning Food, the state is obligated to ensure the availability, affordability, and fulfillment of food consumption that is sufficient, safe, quality, and nutritionally balanced.

Essentially, food is a basic need that must always be available in households. Food is also an important part of household budget considerations before other expenses such as clothing and housing. Fulfilling food needs is also related to efforts to improve the quality of public health, so that later the country will obtain healthy, potent, and competitive human resources.

Along with the increase in population, the need for food also continues to rise. According to the 2020 Population Census' results, the population of South Kalimantan in 2020 reached 4.07 million inhabitants or grew 1.13 percent per year in the last decade (BPS, 2021a). The government must answer the challenge of this demographic portrait to ensure food availability for the population. The commitment to meet the population's food needs has even become one of the goals in the Sustainable Development Goals (SDGs), Zero Hunger, which implies that all countries must protect their citizens from hunger.

Until now, food security is still the main focus of policy-makers around the world, especially during the global Covid-19 pandemic. Food security has four main dimensions: physical availability of food, economic and physical access to food, food utilization, and stability of the other three dimensions over time (Food and Agriculture Organization, 2008). In the access dimension, food security is influenced by the affordability of food prices. In addition to naturally following the market mechanism, changes in prices and income can be intervened through government policies. The effectiveness of achieving policy goals depends on many aspects, including understanding the behavior of people's food demand and consumption patterns for commodities which are represented through elasticity and the pattern of budget share of a commodity compared to other commodities.

The government need to observe the effect of changes in food prices and income on the quantity and quality of people's food consumption, especially during the Covid-19 outbreak since these important information will help the government to craft better policies to improve people's food consumption.

Based on the description presented above, it can be said that the Covid-19 outbreak has been interfering all aspects of life and affected people's welfare. In economics, one of the methods used to measure changes in the level of welfare is Compensating Variation (CV). CV is the amount of money needed to compensate consumers at their initial level of satisfaction (before the Covid-19 outbreak). From the CV value, it can be seen whether there is a better off or worse off in social welfare (Deaton & Muellbauer, 1980 and Just et al., 2004).

Thus, the problems in this study include:

1. How is the household food consumption pattern in South Kalimantan during the Covid-19 pandemic compared to conditions before the pandemic?
2. Has Covid-19 caused welfare loss for the people of South Kalimantan?

This study aims to analyze: (1) the food consumption patterns of the people of South Kalimantan during the Covid-19 pandemic compared to before the pandemic; (2) the impact of the Covid-19 pandemic on the welfare of the people of South Kalimantan by observing the magnitude and direction of CV.

The results of this study can be used by the government in analyzing the welfare level of the people of South Kalimantan in monetary terms so that it can be used to make appropriate policies to minimize the impact of the Covid-19 outbreak on the people of South Kalimantan. This research also provides additional information related to elasticity that is useful for anyone engaged in the economy.

II. Research Methods

Place and Time of Research

The research was carried out in South Kalimantan Province, starting from proposal making in January 2021 and continuing with data processing until the completion of the research report in November 2021.

Data Types and Sources

This study uses secondary data, National Socio-Economic Household Survey (Survei Sosial Ekonomi Nasional—SUSENAS) Consumption Module data for March 2019 and March 2021 for South Kalimantan Province which were collected by Statistics of Kalimantan Selatan Province. Susenas data is cross-section data with household unit sampling. The number of samples was 7,670 households in 2019 and 8,300 households in 2021 which were obtained from 767 Census Blocks (CBs) in 2019 and 830 CBs in 2021 spread across all regencies/cities in South Kalimantan according to regional status (urban and rural). In each CB, 10 households were taken by systematic sampling with implicit stratification based on the education level of the head of the household.

Almost Ideal Demand System (AIDS)

Almost Ideal Demand System (AIDS) is a model derived from the "Price independent generalized logarithmic" (PIGLOG) class which is represented by the cost or income function which defines the minimum expenditure necessary to attain a specific utility level at given prices. The AIDS cost function in the form of a budget share formulated as follows:

$$w_i = \alpha_i + \sum_j \gamma_{ij} \log p_j + \beta_i log \frac{y}{P} + u_i \quad \ldots. (1)$$

where w_i is expenditure proportion (budget share) of ith group commodity, p_j is the price of the jth commodity, y is the total expenditure, and P is the Stone's price index.

Measurement of Welfare Level Changes

Changes in commodity prices and incomes can cause the level of community welfare in the area to be better-off or worse-off. The measure commonly used to express welfare is utility. Graphically, utility is expressed in terms of an indifference curve. The further the indifference curves from the origin, the consumer's preference for commodity bundles expressed by the higher curve is better than the preference for other commodity bundles with a lower indifference curve. In welfare analysis, changes in welfare for the better-off are indicated by a shifting of the indifference curve to a higher position. Hicks (1943) proposed a monetary measure to represent changes in welfare using a willingness to pay (WTP) approach, including compensating variation (CV) and Equivalent Variation (EV) (Just et al, 2004).

CV is the amount of income that must be taken away from (or possibly otherwise paid to) the consumers due to price and/or income changes to restore their initial welfare level. Meanwhile, EV is the amount of income that must be given to (or possibly vice versa, the amount of income paid by) consumers as a substitute due to price and/or income changes to bring consumers to a position of welfare level that is in line with these changes.

Figure 1 shows an illustration of CV and EV for a condition when there is a decline in commodity prices. Consumer preferences are faced with commodity bundles consisting of q and y with prices p and 1, and income m. In the initial position with the budget constraint $p_oq_o + y = m_o$, the consumer's optimum consumption is at point a $(=q_o,y_o)$ with the welfare level as shown by the indifference curve I_o. The policy of reducing the price from p_o to p_1 which is injected causes relative income to increase so that consumers are able to consume more commodity q to q_1 and reduce commodity y to y_1 at point b $(=q_1,y_1)$ with a better welfare level as shown by the indifference curve I_1 , $I_1 > I_0$.

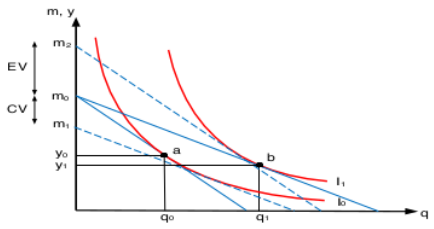

Figure 1. CV and EV in the case of the p price reduction policy for commodity q (Just et al., 2004)

CV in this p price reduction condition is $m_1–m_0<0$, which is the maximum amount of money that must be taken away from consumers who benefit from the implementation of the policy so that their welfare level returns to its original position (I_0). Meanwhile, EV is the minimum amount of money that must be given, which is $m_2–m_0>0$ as compensation for not implementing the policy, while the consumer welfare level is already in a position if the policy is implemented (I_1).

In this research, the grouping of food commodities is based on the Classification of Individual Consumption According to Purpose (COICOP) code, a standard classification of household consumption. The source of the COICOP code is the 2003 Standard Classification of Indonesian Household Expenditure/ Consumption (BPS, 2019).

The Linear Approximation of Almost Ideal Demand System (LA/AIDS) model is a semilog so that the households that can be analyzed are those that consume the type of food being analyzed or there is no zero value in each of the food groups analyzed. Therefore, food commodities are aggregated into larger groups so that more data is eligible for analysis. In detail, food groupings include:

1. cereals and tubers;
2. dairy product;
3. vegetables, legumes, fruits, spices, fats and oils;
4. fish and meat;
5. prepared food and beverage;
6. other food.

This research uses the LA/AIDS model with the following formula:

$$w_i = \alpha_1 + \sum_{j=1}^{6} \gamma_{1j} \ln P_j + \beta_1 ln\frac{y}{p} + u_1 \quad \text{.....(2)}$$

where:

i,j : 1,2,3,4,5,6 (commodity group)
w_i : food budget share of six group commodities
lnPj : natural logarithm (ln) of the j group estimated price
ln(y/P) : ln total household food consumption expenditure deflated by the Stone's price index
P : Stone's price index, where $\ln P = \Sigma w_i \ln p_i$

CV Measurement from AIDS Model

Based on the parameters generated by the AIDS model, own-price elasticity, cross-price elasticity, and income elasticity can be calculated. The formulas for income/expenditure elasticity (e_i), own-price elasticity (ε_{ii}), Marshallian (uncompensated) cross-price (ε_{ij}) and Hicksian compensated cross-price elasticity (ε^*_{ij}):

$$\varepsilon_{ii} = -(1 + \beta_i) + \gamma_{ij}/w_i \quad \text{.....(3)}$$

$$\varepsilon_{ij} = \gamma_{ij}/w_i - \beta_i(\frac{w_j}{w_i}) \quad \text{.....(4)}$$

$$\varepsilon^*_{ij} = \varepsilon_{ij}\, w_j e_i \quad \text{.....(5)}$$

where e_i is defined as:

$$e_i = 1 + {}^{\beta_i}/_{w_i} \quad \text{.....(6)}$$

The food groups demand elasticity to total food expenditure obtained from the LA/AIDS model is the demand elasticity for each food group to total food expenditure, not to total household expenditure. To obtain the demand elasticity for each food group to total household expenditure (as a proxy for household income), the elasticity of total food expenditure from the calculation using the LA/AIDS model is multiplied by the elasticity value of total food expenditure to total household expenditure. This total elasticity is required for CV measurement.

The total food expenditure elasticity to total household expenditure (household income) is estimated by a linear logarithm model as follows:

$$\ln y_{food} = a + b \ln y_{total} + u_i \quad \text{.....(7)}$$

$$e_p = (dln\, y_{food})/(dln y_{total}) = b \quad \text{.....(8)}$$ with:

y_{food} : total of monthly household expenditure for food
y_{total} : total of monthly household expenditure

Furthermore, the demand elasticity for certain food groups to the total household expenditure or income elasticity is calculated based on the following formula:

$$e_{il} = e_i \text{ x } e_p \quad \text{..... (9)}$$

with:

e_{il} : demand elasticity for food group i to household income/expenditure.
e_i : elasticity of demand for food group i to total food expenditure (results of LA/AIDS model analysis).
e_p : elasticity of total food expenditure to total household expenditure

The elasticity function in equation (9) is needed for measuring CV. Regarding CV, the coefficient can be positive or negative. Huffman et al (2000) in Rosy et al (2108) states that a positive CV means that there is a worse-off in the welfare level and vice versa if it is negative it means that there is a better-off in the welfare level (welfare gain).

In the LA/AIDS model, CV can be estimated using a second-order Taylor expansion of the expenditure function as follows:

$$\Delta \ln e \approx \sum_i w_i\, \Delta ln P_i + \frac{1}{2}\sum\sum_j w_i\, \varepsilon^*_{ij} \Delta \ln P_i\, \Delta \ln P_j \quad \text{....(10)}$$

with:

w_i : the average proportion of expenditures for commodity group i in the initial period or before the Covid-19 pandemic (March 2019)
$\Delta \ln P_i$: proportional change in the average price of commodity group i
$\Delta \ln P_j$: proportional change in the average price of a commodity group j
ε^*_{ij} : compensated price elasticity of commodity group i due to prices changes of commodity group j for the initial period (March 2019).

The calculation using the formula above will produce the CV as a proportion or percentage of the total initial expenditure, in this case the total expenditure before the Covid-19 pandemic, namely 2019. To get the money value of the CV, this proportion is multiplied by the average value of the total household expenditure in 2019.

III. Results

Budget Share

To answer the first question of this research, it is necessary to describe the budget share before and during the Covid-19 pandemic. The dependent variable used in the research using the LA/AIDS model is budget share according to food commodity groups. Table 1 shows the budget share for each food commodity group in both urban and rural areas based on the results of the 2019 and 2021 Susenas data processing.

In 2019, the largest proportion of expenditure on food commodities for the people of South Kalimantan in general, was in the prepared food and beverage group (w_5) and the smallest proportion is in the dairy product group (w_2).

Food consumption in 2021 still has the same pattern as in 2019. An interesting pattern to observe is the increase in the budget share in almost all food commodity groups in the pandemic year, except for the vegetables, legumes, fruits, spices, fats and oils group (w_3) and prepared food and beverage group (w_5).

In urban areas, the increase in budget share occurred in almost all food commodities except for group 5 (processed food and beverages). In 2019 the proportion of expenditure on food and beverages reached 40 percent, then this proportion decreased by 3.23 percent to 36.76 percent in 2021. This condition is the impact of the government's policy for people to stay at home, so that people reduce consumption of ready-made food/beverages outside the home and replace it with cooking at home. The same thing happened in rural areas, the largest decline in consumption occurred in group 5, from 32.22 percent in 2019 to 30.79 percent in 2021. In addition, the decline also occurred in group 2 (dairy product) and group 3 (vegetables, legumes, fruits, spices, fats and oils). This indicates that the Covid-19 outbreak has resulted in a decline in people's purchasing power, so they have to reduce their consumption of dairy products (w_2) as well as groups of vegetables, legumes, fruits, spices, fats and oils (w_3).

Table 1. Average budget share for food commodity groups in 2019 and 2021 (percent)

Budget Share	Urban			Rural			Urban + Rural		
	2019	2021	Changes	2019	2021	Changes	2019	2021	Changes
w_1	9,62	10,80	1,18	13,30	14,37	1,08	11,87	12,94	1,07
w_2	6,21	6,42	0,21	5,32	5,25	-0,07	5,67	5,73	0,06
w_3	15,87	16,15	0,28	17,80	17,22	-0,58	17,05	16,79	-0,26
w_4	14,56	15,72	1,16	14,69	15,48	0,79	14,64	15,57	0,93
w_5	39,99	36,76	-3,23	32,22	30,79	-1,43	35,23	33,19	-2,04
w_6	13,75	14,15	0,40	16,67	16,88	0,22	15,54	15,78	0,25

Source: National Sosioeconomic Survey—Susenas March 2019 and March 2021 (data processed)

Note:
w_1 : Cereals and tubers group budget share
w_2 : Dairy product group budget share
w_3 : Vegetables, legumes, fruits, spices, fats and oils group budget share
w_4 : fish and meat group budget share
w_5 : prepared food and beverage group budget share
w_6 : other food group budget share

Along with the decrease of the budget share for some of these food groups, there was an increase in budget share for some other food groups. The grains and tubers (group 1) is the commodity group that increases the most, both in urban/rural areas and in total.

Estimation of Demand System

The estimation of the demand system in this research uses the Seemingly Unrelated Regression (SUR) model. The SUR model facilitated by Stata satisfies the restrictions required by the LA/AIDS demand system: adding up, homogeneity, and symmetry. The model is formed for 2019 and 2021, respectively. These models will derive elasticity—both price elasticity and income elasticity. The directions and magnitudes of elasticities will complete the analysis of the food consumption patterns of the people in South Kalimantan and also answer the first question of this research.

The demand equation models for 2019 in urban areas are as follows:

$w_1 = 0{,}2632 + 0{,}0614\ \ln P_1 - 0{,}0102\ \ln P_2 + 0{,}0018\ \ln P_3 - 0{,}0129\ \ln P_4 - 0{,}0399 \ln P_5 - 0{,}0001\ \ln P_6 - 0{,}0395\ \ln YperP$

$w_2 = 0{,}2046 - 0{,}0102\ \ln P_1 + 0{,}0256\ \ln P_2 - 0{,}0082 \ln P_3 - 0{,}0094 \ln P_4 - 0{,}0029\ \ln P_5 + 0{,}0051\ \ln P_6 - 0{,}0238\ \ln YperP$

$w_3 = 0{,}3828 + 0{,}0018\ \ln P_1 - 0{,}0082 \ln P_2 + 0{,}0401 \ln P_3 - 0{,}0127 \ln P_4 - 0{,}0388 \ln P_5 + 0{,}0179\ \ln P_6 - 0{,}0455\ \ln YperP$

$w_4 = 0{,}3224 - 0{,}0129\ \ln P_1 - 0{,}0094\ \ln P_2 - 0{,}0127\ \ln P_3 + 0{,}0609\ \ln P_4 - 0{,}0239 \ln P_5 - 0{,}0020\ \ln P_6 - 0{,}0589\ \ln YperP$

$w_5 = 0{,}4022 - 0{,}0399 \ln P_1 - 0{,}0029 \ln P_2 - 0{,}0388 \ln P_3 - 0{,}0239\ \ln P_4 + 0{,}1070 \ln P_5 - 0{,}0016 \ln P_6 + 0{,}0150\ \ln YperP$

$w_6 = -0{,}5751 - 0{,}0001\ \ln P_1 + 0{,}0051\ \ln P_2 + 0{,}0179 \ln P_3 - 0{,}0020 \ln P_4 - 0{,}0016 \ln P_5 - 0{,}0192\ \ln P_6 + 0{,}1527\ \ln YperP$

The demand models for urban areas in 2021:

$w_1 = 0{,}3097 + 0{,}0729\ \ln P_1 - 0{,}0107\ \ln P_2 - 0{,}0035\ \ln P_3 - 0{,}0162\ \ln P_4 - 0{,}0424\ \ln P_5 - 0{,}0001\ \ln P_6 - 0{,}0473\ \ln YperP$

$w_2 = 0{,}2037 - 0{,}0107\ \ln P_1 + 0{,}0256\ \ln P_2 - 0{,}0081\ \ln P_3 - 0{,}0089\ \ln P_4 + -0{,}0053\ \ln P_5 + 0{,}0075\ \ln P_6 - 0{,}0225\ \ln YperP$

$w_3 = 0{,}3776 - 0{,}0035\ \ln P_1 - 0{,}0081\ \ln P_2 + 0{,}0294\ \ln P_3 - 0{,}0102\ \ln P_4 - 0{,}0241\ \ln P_5 + 0{,}0165\ \ln P_6 - 0{,}0444\ \ln YperP$

$w_4 = 0{,}3008 - 0{,}0162\ \ln P_1 - 0{,}0089\ \ln P_2 - 0{,}0102\ \ln P_3 + 0{,}0602\ \ln P_4 - 0{,}0282\ \ln P_5 + 0{,}0033\ \ln P_6 - 0{,}0496\ \ln YperP$

$w_5 = 0{,}3524 - 0{,}0424\ \ln P_1 - 0{,}0053\ \ln P_2 - 0{,}0241\ \ln P_3 - 0{,}0282\ \ln P_4 + 0{,}1077\ \ln P_5 - 0{,}0076\ \ln P_6 + 0{,}0177\ \ln YperP$

$w_6 = -0{,}5442 - 0{,}0001\ \ln P_1 + 0{,}0075\ \ln P_2 + 0{,}0165\ \ln P_3 + 0{,}0033\ \ln P_4 - 0{,}0076\ \ln P_5$

-0,0197 $\ln P_6$ + 0,1460 lnYperP

The demand models for rural areas in 2019:

w_1 = 0,3756 + 0,0867 $\ln P_1$ -0,0135 $\ln P_2$ -0,0062 $\ln P_3$ -0,0254 $\ln P_4$ -0,0408 $\ln P_5$ -0,0009 $\ln P_6$ -0,0573 lnYperP

w_2 = 0,1731 -0,0135 $\ln P_1$ + 0,0267 $\ln P_2$ -0,0103 $\ln P_3$ -0,0071 $\ln P_4$ -0,0041 $\ln P_5$ + 0,0083 $\ln P_6$ -0,0169 lnYperP

w_3 = 0,3888 -0,0062 $\ln P_1$ -0,0103 $\ln P_2$ + 0,0204 $\ln P_3$ -0,0085 $\ln P_4$ -0,0155 $\ln P_5$ + 0,0201 $\ln P_6$ -0,0411 lnYperP

w_4 = 0,2929 -0,0254 $\ln P_1$ -0,0071 $\ln P_2$ -0,0085 $\ln P_3$ + 0,0551 $\ln P_4$ -0,0099 $\ln P_5$ -0,0043 $\ln P_6$ -0,0491 lnYperP

w_5 = 0,3523 -0,0408 $\ln P_1$ -0,0041 $\ln P_2$ -0,0155 $\ln P_3$ -0,0099 $\ln P_4$ + 0,0778 $\ln P_5$ -0,0076 $\ln P_6$ + 0,0041 lnYperP

w_6 = -0,5827 -0,0009 $\ln P_1$ + 0,0083 $\ln P_2$ + 0,0201 $\ln P_3$ -0,0043 $\ln P_4$ -0,0076 $\ln P_5$ -0,0157 $\ln P_6$ + 0,1603 lnYperP

The mathematical equations of the demand model for rural areas in 2021:

w_1 = 0,4066 + 0,0912 $\ln P_1$ -0,0131 $\ln P_2$ -0,0099 $\ln P_3$ -0,0292 $\ln P_4$ -0,0342 $\ln P_5$ -0,0048 $\ln P_6$ -0,0622 lnYperP

w_2 = 0,1577 -0,0131 $\ln P_1$ + 0,0247 $\ln P_2$ -0,0075 $\ln P_3$ -0,0076 $\ln P_4$ -0,0041 $\ln P_5$ + 0,0076 $\ln P_6$ -0,0139 lnYperP

w_3 = 0,3897 -0,0099 $\ln P_1$ -0,0075 $\ln P_2$ + 0,0286 $\ln P_3$ -0,0171 $\ln P_4$ -0,0153 $\ln P_5$ + 0,0210 $\ln P_6$ -0,0419 lnYperP

w_4 = 0,2837 -0,0292 $\ln P_1$ -0,0076 $\ln P_2$ -0,0171 $\ln P_3$ + 0,0631 $\ln P_4$ -0,0091 $\ln P_5$ -0,0001$\ln P_6$ -0,0448 lnYperP

w_5 = 0,3030 -0,0342 $\ln P_1$ -0,0041 $\ln P_2$ -0,0153 $\ln P_3$ -0,0091 $\ln P_4$ + 0,0611 $\ln P_5$ + 0,0015 $\ln P_6$ + 0,0134 lnYperP

w_6 = -0,5406 -0,0048 $\ln P_1$ + 0,0076 $\ln P_2$ + 0,0210 $\ln P_3$ -0,0001 $\ln P_4$ + 0,0015 $\ln P_5$ -0,0252 $\ln P_6$ + 0,1494 lnYperP

Overall, in urban and rural areas, the demand models for 2019 are:

w_1 = 0,3317+ 0,0850 $\ln P_1$ -0,0125$\ln P_2$ -0,0048 $\ln P_3$ -0,0225 $\ln P_4$ -0,0470 $\ln P_5$ + 0,0018 $\ln P_6$ -0,0497 lnYperP

w_2 = 0,1864 -0,0125 $\ln P_1$ + 0,0263$\ln P_2$ -0,0094 $\ln P_3$ -0,0081 $\ln P_4$ -0,0027 $\ln P_5$ + 0,0065 $\ln P_6$ -0,0199 lnYperP

w_3 = 0,3835 -0,0048 $\ln P_1$ -0,0094 $\ln P_2$ + 0,0287 $\ln P_3$ -0,0098 $\ln P_4$ -0,0249 $\ln P_5$+ 0,0201 $\ln P_6$ -0,0421 lnYperP

w_4 = 0,3018 -0,0225 $\ln P_1$ -0,0081 $\ln P_2$ -0,0098 $\ln P_3$ + 0,0579 $\ln P_4$ -0,0142 $\ln P_5$ -0,0034 $\ln P_6$ -0,0525 lnYperP

w_5 = 0,3822 -0,0470 $\ln P_1$ -0,0027 $\ln P_2$ -0,0249 $\ln P_3$ -0,0142 $\ln P_4$ + 0,0985 $\ln P_5$ -0,0097 $\ln P_6$ + 0,0055 lnYperP

w_6 = -0,5857 + 0,0018 $\ln P_1$ + 0,0065 $\ln P_2$ + 0,0201 $\ln P_3$ - 0,0034 $\ln P_4$ -0,0097 $\ln P_5$-0,0153 $\ln P_6$ + 0,1587 lnYperP

Meanwhile, the total demand models for 2021:

w_1 = 0,3662 + 0,0902 $\ln P_1$ -0,0127 $\ln P_2$ -0,0074 $\ln P_3$ -0,0263 $\ln P_4$ -0,0425 $\ln P_5$ -0,0013 $\ln P_6$ -0,0554 lnYperP

w_2 = 0,1777 -0,0127 $\ln P_1$ + 0,0254 $\ln P_2$ -0,0080 -0,0082 $\ln P_4$ -0,0035 $\ln P_5$ + 0,0070 $\ln P_6$ -0,0177 lnYperP

w_3 = 0,3856 -0,0074 $\ln P_1$ -0,0080 $\ln P_2$ + 0,0289 $\ln P_3$ -0,0186 $\ln P_4$ -0,0241 $\ln P_5$+ 0,0196 $\ln P_6$ -0,0429 lnYperP

w_4 = 0,2900 -0,0263 $\ln P_1$ -0,0082 $\ln P_2$ -0,0145 $\ln P_3$ + 0,0626 $\ln P_4$ -0,0144 $\ln P_5$ + 0,0008 $\ln P_6$ -0,0468 lnYperP

w_5 = 0,3269 -0,0425 $\ln P_1$ -0,0035 $\ln P_2$ -0,0186 $\ln P_3$ -0,0144 $\ln P_4$ + 0,0837 $\ln P_5$ -0,0046 $\ln P_6$ + 0,0136 lnYperP

w_6 = -0,5464 -0,0013 $\ln P_1$ + 0,0070 $\ln P_2$ + 0,0196 $\ln P_3$ + 0,0008 $\ln P_4$ -0,0046 $\ln P_5$-0,0214 $\ln P_6$ + 0,1492 lnYperP

In general, the price and income variables have a significant influence in determining the proportion of food group expenditures. To determine the effect of price and income on demand, it can be seen from the demand elasticity.

Demand Elasticity

The demand elasticity, both price elasticity, and income elasticity, can be derived from the coefficients in the demand equation system using formulas (3) to (6). Uncompensated price elasticity (Marshallian) and compensated price elasticity (Hicksian) derived from the equations system are attached in Appendix 1 to 6.

The Own-Price Elasticity

The own-price elasticity can be seen on the main diagonal. Appendix 1–6 show that the own-price elasticity has negative signs. This is in accordance with the law of demand: "A decrease in the own price of a normal good will cause quantity demanded to increase" (Jehle, 2011). The absolute value of elasticity that is more than one indicates that the commodity is price elastic. If the price increases by 1%, the demand for the commodity will decrease by more than 1. This condition occurs in commodities in group 6, other food. Meanwhile for groups 1 to 5, both in rural and urban areas, and in total, the absolute value of elasticity is less than one. This indicates that for both rural and urban households in South Kalimantan, these groups are inelastic, i.e. a good whose proportion of change in the quantity demanded of a good is less than the proportion of change in its price. This means that if the price increases by 1%, the demand for the five commodity groups will decrease by less than 1%. This illustrates that groups 1 to 5 are basic needs for households in South Kalimantan so that price changes do not much change the amount of demand.

Based on the absolute value of elasticity according to the characteristics of the region, the absolute value of the own-price elasticity in urban areas for groups 1, 2, and 6 is greater than the absolute value in rural areas. It implies that households in urban areas respond more strongly to price changes in these three groups. On the other hand, for groups 3, 4, and 5, although the elasticities for urban and rural areas are not much different, the absolute value of own-price elasticity in rural areas is greater than the absolute value of own-price elasticity in urban areas. This means that households in rural areas are more sensitive to changes in commodity prices in groups 3, 4, and 5.

The Cross-Price Elasticity

In appendices 1 to 6, numbers other than the main diagonal indicate the cross-price elasticity. The relationship between food groups, whether they are substitutes or complementary goods, can be seen from the sign of elasticity (read by column). They have a substitution relationship if the elasticity value is> 0, and are complementary if the elasticity value is < 0 (Widarjono, 2016).

In rural areas, both in 2019 and 2021, all commodity groups from group 2 to group 6 are complementary goods for the cereals and tubers group. In other words, in rural areas, the cereals and tubers group (group 1) does not have substitute goods. Meanwhile, in urban areas, group 3 (vegetables, legumes, fruits, spices, fats and oils) is a substitute for the cereals and tubers group. It seems that urban communities are starting to reduce their consumption of carbohydrates and substitute them with high-nutrient foods as an effort to avoid the bad effects of excessive carbohydrate consumption.

The dairy product group (group 2) in 2019 did not have substitute goods in both rural and urban areas. Other commodities in the group other than dairy products are complementary to this commodity group. The same pattern occurs in 2021, there are no substitutes for dairy products in both rural and urban areas.

In rural areas in 2019, the cereals and tubers group (group 1) and the fish and meat group (group 4) were substituted for the fruit, vegetable, legumes, fat and oil commodity group (group 3). It is strongly expected that fish and meat commodities replaced commodities in group 3: tofu/tempe/other legumes. Meanwhile, in urban areas, group 3 only has substitute goods from group 1. This is presumably because there are commodities in the tuber group that are considered "vegetables" by the people of South Kalimantan.

The fish and meat commodity group (group 4) in 2019 did not have substitute goods in either rural or urban areas. The same pattern occurs in 2021.

The dairy products group and the fish and meat group are substitutes for the prepared food and beverage group (group 5) in 2019 and 2021 in rural areas. While in urban areas in 2019 and 2021, group 5 has a substitution relationship with dairy product groups.

Group 6 (other food groups) in 2019 and 2021 both in rural and urban areas are substituted with group 1, group 2, group 3, and group 4. Apart from that, they are complementary goods. Similarly, in 2021, the substitute goods are group 1, group 3, group 4.

Income Elasticity

Income elasticity is the proportion of changes in demand for a commodity due to changes in income. The income elasticity referred to in this discussion is the income elasticity that is approximated by expenditure—in this case the total expenditure of all consumption commodities that is food and non-food commodities. The assumption is that all income earned by a household will be spent on consumption. The total

income elasticity is obtained from equation (9). Table 2 shows the results of calculating income elasticity using equation (9).

Nicholson (1995) explains the economic theory of income elasticity stating that if an item has an income elasticity of less than one, then the item is a necessity item. Conversely, if the elasticity value is more than one, then this commodity is considered a luxury good.

The signs of elasticity as listed in Table 2 all show positive values, both in rural and urban areas, which means that an increase in income earned by a household will increase the consumption of these commodities or are classified as normal goods. Then, if you look at the magnitudes, in 2019 and 2021, both in urban and rural areas all groups of commodities are necessities except for commodity group 6 (other food).

Table 2. Income elasticity in 2019 and 2021

Group	2019		2021	
	Urban	Rural	Urban	Rural
1	0.4325	0.4827	0.4436	0.5013
2	0.4520	0.5785	0.5131	0.6497
3	0.5229	0.6525	0.5722	0.6685
4	0.4367	0.5652	0.5404	0.6276
5	0.7607	0.8592	0.8272	0.9218
6	1.5472	1.6647	1.6036	1.6650

Source: Result of processed data (2019 and 2021)

Compensating Variation (CV)

Based on the AIDS model obtained and the elasticity derived from the model, it can be further derived the measurement of Compensating Variation (CV) which can be considered as the representation of welfare. The value of CV obtained from the formula in equation (10) by applying it to the Susenas data of March 2019 and March 2021 in South Kalimantan gives a result of 17.18 percent or equals to IDR 214,842 per capita/month. A positive sign of CV indicates a welfare loss as a result of the Covid-19 outbreak. Therefore, a compensation of IDR 214,842 is needed to bring consumers back to their original utility or satisfaction in 2021.

In further analysis according to the regional classification, CV in urban and rural areas is 19.83 percent and 15.09 percent, respectively, or equivalent to IDR 247.916 in urban areas and IDR 188.734 in rural areas. Higher CV values in urban areas indicate that urban communities experience a worse decline in welfare than people in rural areas. This phenomenon further strengthens the notion that the Covid-19 outbreak gave a worse effect on the urban communities. The population number and density, and the mobilization of urban residents which are higher than in rural areas are strongly suspected as the causes of the high spread of Covid-19 in urban areas. Another reason is that in urban areas, more locations that allow people to gather in large numbers, such as shopping centers and entertainment venues.

Table 3. The open unemployment rate of South Kalimantan by regional status, 2019-2021

Unemployment Rate	2019	2020	2021
Urban + Rural	4.31	4.74	4.95
Urban	5.84	6.45	6.66
Rural	2.79	3.34	3.53

Source: Sakernas 2019-2021, processed

The high spread of Covid-19 in urban areas has an impact on the raising of the unemployment rate in urban areas as shown in Table 3. This is also in line with the results of the National Labor Force Survey (Sakernas) which includes indicators of the impact of Covid-19 on employment. The pandemic triggers an increase in unemployment in urban areas, which is much higher than in rural areas; almost doubled. Likewise, residents who are temporarily out of work and who have had to experience reduced working hours due to the Covid-19 pandemic in urban areas have doubled in numbers of the rural areas' as shown in Table 4.

Table 4. The impact of Covid-19 on the working-age population by regional residence in 2021

Components of the impact of the pandemic on Working-age population	Urban (person)	Rural (person)	Total (person)
Unemployment due to Covid-19	16.552	8.303	24.855
Temporary layoff due to Covid-19	14.403	7.460	21.863
Reduced working hours due to Covid-19	162.401	82.216	244.617

Source: Sakernas 2021, processed

With the reduction or limitation of working hours, it is certainly detrimental to workers who do not have a fixed monthly wage/salary. Moreover, those who have temporary layoffs due to Covid-19, will receive a lower income than usual.

IV. Conclusions

Based on the results of the analysis and discussion described previously, this research concludes the following:

1. There was a change in the food consumption pattern of the people of South Kalimantan before and during the Covid-19 outbreak.

a. The largest portion of food expenditure for the people of South Kalimantan before the pandemic was in the prepared food and beverages group. The same pattern still occurs during the pandemic, but the proportion has decreased. It is strongly assumed that the community responds to the government's policy to reduce mobility and stay at home.

b. The Covid-19 pandemic has been diminishing people's purchasing power so they have to reduce the consumption of some high-quality commodities and substitute them for low-quality food.

c. Based on the size of the income elasticity, all food commodity groups in South Kalimantan except for commodity group 6 (other food) are necessity goods both in the period before and during the Covid-19 pandemic, which means that changes in prices for groups 1 to 5 did not change the amount of demand. Meanwhile, other food commodities (group 6) are sensitive to changes in prices and consumer income.

2. Welfare loss occurs in 2021 as a result of the impact of the Covid-19 outbreak.

a. The amount of money that needs to be compensated to consumers to achieve the level of satisfaction as before the pandemic is IDR 214,842.

b. Urban communities experience a worse decline in welfare than people in rural areas.

V. Suggestions

The findings of this study suggest the following:

1. Amid of the Covid-19 outbreak that weakened the purchasing power, we need to apply several adjustments to survive. With various modifications to business processes in the new normal, people are expected to be able to adapt to these changes. Various adaptation of new habits can be done by changing lifestyles, ways of interaction, education system, or work methods. Innovation and creativity at work are some of the important points, for example, the online trading. If one has to experience payroll deductions or even lose the job due to Covid-19, it is advisable to look for a new job/alternative job while still prioritizing health protocols.

Self-protection against the pandemic must be a part of community adaptation initiatives. The government must continue to protect the public by increasing vaccination rates. Eventhough the government have stated firmly that they provide free vaccines to the public, however, there are still some obstacles and challenges, from vaccine hoaxes, refusal to vaccinate to the problem of the limited supply of vaccine raw materials. It is necessary to design strategies to accelerate the fulfillment of the population's vaccination rate target.

2. To maintain the stability of food security, the government have to regularly observe food prices through inflation control policies. The government must manage food distribution so that no food shortage shall trigger price increases. These policies can maintain people's purchasing power.

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Appendix 1. Uncompensated (Marshallian) price elasticity in urban and rural areas, 2019 and 2021

Food Group	On Price					
	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6
Year 2019						
Group 1	**-0,2344**	-0,0819	0,0313	-0,1282	-0,2482	0,0800
Group 2	-0,1794	**-0,5163**	-0,1066	-0,0912	0,0755	0,1693
Group 3	0,0014	-0,0414	**-0,7894**	-0,0213	-0,0591	0,1565
Group 4	-0,1111	-0,0349	-0,0057	**-0,5518**	0,0293	0,0326
Group 5	-0,1352	-0,0086	-0,0733	-0,0426	**-0,7258**	-0,0300
Group 6	-0,1098	-0,0161	-0,0445	-0,1713	-0,4224	**-1,2573**
Year 2021						
Group 1	**-0,2474**	-0,0736	0,0147	-0,1365	-0,1864	0,0576
Group 2	-0,1819	**-0,5396**	-0,0877	-0,0949	0,0419	0,1708
Group 3	-0,0110	-0,0329	**-0,7849**	-0,0464	-0,0262	0,1572
Group 4	-0,1300	-0,0354	-0,0425	**-0,5515**	0,0074	0,0525
Group 5	-0,1334	-0,0128	-0,0631	-0,0497	**-0,7616**	-0,0205
Group 6	-0,1306	-0,0099	-0,0345	-0,1422	-0,3432	**-1,2850**

Appendix 2. Compensated (Hicksian) price elasticity in urban and rural areas, 2019 and 2021

Group Makanan	On Price					
	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6
Year 2019						
Group 1	**-0,0125**	-0,0021	0,0024	-0,0084	-0,0392	0,0056
Group 2	-0,0106	**-0,0146**	-0,0091	-0,0067	0,0133	0,0131
Group 3	0,0001	-0,0014	**-0,0781**	-0,0018	-0,0121	0,0141
Group 4	-0,0065	-0,0010	-0,0005	**-0,0399**	0,0051	0,0025
Group 5	-0,0125	-0,0004	-0,0098	-0,0049	**-0,2000**	-0,0036
Group 6	-0,0203	-0,0014	-0,0118	-0,0390	-0,2317	**-0,3042**
Year 2021						
Group 1	**-0,0160**	-0,0023	0,0009	-0,0105	-0,0291	0,0045
Group 2	-0,0142	**-0,0202**	-0,0062	-0,0088	0,0079	0,0160
Group 3	-0,0009	-0,0013	**-0,0597**	-0,0046	-0,0053	0,0159
Group 4	-0,0103	-0,0013	-0,0030	**-0,0518**	0,0014	0,0050
Group 5	-0,0157	-0,0007	-0,0067	-0,0069	**-0,2168**	-0,0029
Group 6	-0,0287	-0,0010	-0,0069	-0,0371	-0,1826	**-0,3391**

Appendix 3. Uncompensated (Marshallian) price elasticity in urban area, 2019 and 2021

Food Group	On Price					
	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6
Year 2019						
Group 1	**-0,3225**	-0,0808	0,0834	-0,0741	-0,2506	0,0549
Group 2	-0,1278	**-0,5633**	-0,0716	-0,0955	0,1072	0,1345
Group 3	0,0387	-0,0340	**-0,7018**	-0,0384	-0,1297	0,1521
Group 4	-0,0495	-0,0394	-0,0232	**-0,5232**	-0,0024	0,0421
Group 5	-0,1033	-0,0095	-0,1030	-0,0652	**-0,7473**	-0,0092
Group 6	-0,1078	-0,0320	-0,0462	-0,1760	-0,4556	**-1,2924**
Year 2021						
Group 1	**-0,2773**	-0,0714	0,0386	-0,0813	-0,2321	0,0615
Group 2	-0,1294	**-0,5793**	-0,0703	-0,0830	0,0455	0,1665
Group 3	0,0082	-0,0328	**-0,7733**	-0,0199	-0,0482	0,1409
Group 4	-0,0691	-0,0362	-0,0139	**-0,5675**	-0,0637	0,0657
Group 5	-0,1206	-0,0176	-0,0734	-0,0844	**-0,7248**	-0,0274
Group 6	-0,1118	-0,0132	-0,0503	-0,1388	-0,4327	**-1,2851**

Appendix 4. Compensated (Hicksian) price elasticity in urban area, 2019 dan 2021

Group Makanan	On Price					
	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6
2019						
Group 1	**-0,0134**	-0,0022	0,0057	-0,0047	-0,0433	0,0033
Group 2	-0,0056	**-0,0158**	-0,0051	-0,0063	0,0194	0,0084
Group 3	0,0019	-0,0011	**-0,0582**	-0,0029	-0,0271	0,0109
Group 4	-0,0021	-0,0011	-0,0016	**-0,0333**	-0,0004	0,0025
Group 5	-0,0076	-0,0004	-0,0124	-0,0072	**-0,2273**	-0,0010
Group 6	-0,0160	-0,0031	-0,0113	-0,0397	-0,2819	**-0,2750**
2021						
Group 1	**-0,0148**	-0,0018	0,0030	-0,0052	-0,0361	0,0043
Group 2	-0,0080	**-0,0169**	-0,0062	-0,0061	0,0082	0,0133
Group 3	0,0006	-0,0011	**-0,0766**	-0,0016	-0,0097	0,0126
Group 4	-0,0045	-0,0011	-0,0013	**-0,0438**	-0,0121	0,0055
Group 5	-0,0120	-0,0008	-0,0105	-0,0100	**-0,2100**	-0,0035
Group 6	-0,0216	-0,0012	-0,0139	-0,0318	-0,2431	**-0,3219**

Appendix 5. Uncompensated (Marshallian) price elasticity in rural areas, 2019 dan 2021

Food Group	On Price					
	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6
2019						
Group 1	**-0,2904**	-0,0785	0,0300	-0,1274	-0,1678	0,0652
Group 2	-0,2110	**-0,4816**	-0,1377	-0,0867	0,0263	0,2089
Group 3	-0,0042	-0,0458	**-0,8442**	-0,0136	-0,0125	0,1514
Group 4	-0,1282	-0,0306	0,0018	**-0,5760**	0,0404	0,0265

Group 5	-0,1283	-0,0133	-0,0503	-0,0325	**-0,7627**	-0,0257
Group 6	-0,1332	-0,0014	-0,0506	-0,1670	-0,3555	**-1,2542**
2021						
Group 1	**-0,3034**	-0,0687	0,0059	-0,1364	-0,1047	0,0399
Group 2	-0,2121	**-0,5165**	-0,0963	-0,1039	0,0038	0,1896
Group 3	-0,0223	-0,0305	**-0,7918**	-0,0614	-0,0137	0,1630
Group 4	-0,1471	-0,0340	-0,0603	**-0,5473**	0,0303	0,0480
Group 5	-0,1173	-0,0155	-0,0570	-0,0363	**-0,8148**	-0,0025
Group 6	-0,1554	-0,0014	-0,0280	-0,1378	-0,2636	**-1,2987**

Appendix 6. Compensated (Hicksian) price elasticity in rural area, 2019 dan 2021

Food Group	On Price					
	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6
2019						
Group 1	**-0,0186**	-0,0020	0,0026	-0,0090	-0,0261	0,0052
Group 2	-0,0162	**-0,0148**	-0,0142	-0,0074	0,0049	0,0201
Group 3	-0,0004	-0,0016	**-0,0981**	-0,0013	-0,0026	0,0165
Group 4	-0,0096	-0,0009	0,0002	**-0,0478**	0,0074	0,0025
Group 5	-0,0147	-0,0006	-0,0077	-0,0041	**-0,2112**	-0,0037
Group 6	-0,0295	-0,0001	-0,0150	-0,0408	-0,1907	**-0,3480**
2021						
Group 1	**-0,0193**	-0,0017	0,0005	-0,0092	-0,0158	0,0031
Group 2	-0,0175	**-0,0170**	-0,0106	-0,0091	0,0007	0,0194
Group 3	-0,0019	-0,0010	**-0,0894**	-0,0055	-0,0028	0,0171
Group 4	-0,0117	-0,0011	-0,0064	**-0,0464**	0,0057	0,0047
Group 5	-0,0137	-0,0007	-0,0089	-0,0045	**-0,2268**	-0,0004
Group 6	-0,0328	-0,0001	-0,0079	-0,0310	-0,1325	**-0,3400**

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