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Analysis Of Determinants Of Regional Food Insecurity In Central Sulawesi Province, Indonesia

Armin Muis[*1], Nurnaningsih[2], Ika Rafika[3], Rita Suirlan[4], Winansibutet[5]

Abstract

This research aims to analyze the determinants of food insecurity in Central Sulawesi Province, Indonesia. The data used is secondary data in the form of data relating to research variables accessed from the Central Statistics Agency and the Food Security Agency of Central Sulawesi. The analytical method used is panel data regression an[1]alysis and cross section of the 2017-2021 time series with the Common Effect Model, Fixed Effect Model and Random Effect Model approaches. Based on testing the best model specifications, the Fixed Effect Model is used. Research findings show that the normative per capita consumption variable is the net availability of food products (X_1), population living below the poverty line (X_2), households without access to electricity (X_3), life expectancy at birth (X_4), stunting (X_5), women aged 15 years and over who are literate (X_6), households without access to clean water (X_7) together have a significant effect on the food insecurity variable (Y). Partial analysis found that the normative per capita consumption variable for net availability of food products (X_1), life expectancy at birth (X_4), and stunting (X_5) had a significant effect on food insecurity. Meanwhile, residents living below the poverty line (X_2), households without access to electricity (X_3), women aged 15 years and over who are illiterate (X_6), and households without access to clean water (X_7) the effect is not significant on food insecurity.

Keywords: *Food Insecurity; Food Products; Household; Regional.*

INTRODUCTION

Food is a Necessity Fundamental Humans who cannot be delayed in their fulfillment. Food is an important factor for ensure human survival. Law No.18 of 2012 explains that "the State is obliged realize availability, affordability, and fulfillment consume sufficient, safe, high-quality and nutritious food balanced, good on level national nor area until individual in a way evenly distributed throughout the territory of the Unitary State Republic of Indonesia at all times by utilizing resources, institutions and culture local". However, food shortages are a crucial problem for developing countries, including Indonesia. According to Rachmaningsih, Triana; Priyarsono (2012) that food shortages can cause economic impact and threaten social security is even left behind development on one potential areas/territories become trigger injustice that can be threat disintegration nation

Food (Food & Agriculture, 2013) Security Agency define that food insecurity is a condition experienced food insufficiency area, community or household, at a certain time for fulfil standard need physiology for growth and health society. It's close relationship with poverty, where poverty according to Purwantini (2016) interpreted as a condition society is unable to fulfill it need basic minimum both food and non-food Because obtain low income thus causing low food consumption and nutrition in a way sustainable. Swastika (2011) in Purwantini (2016) put forward that Chronic food insecurity can result

[12345]Tadulako University

*Corresponding Author: Armin Muis

hunger which is a condition public an area consumes 60 percent less energy from energy needs.

Central Sulawesi Province is a region in the Kawasan Timur Indonesia (KTI) that has abundant natural resources (agricultural land, flora and fauna, and waters). However, it doesn't mean that resilience the food guaranteed. Research result Carrolina (2020) show that the Food Insecurity Rate (ARP) for Central Sulawesi Province in 2018 was 10.44 percent higher than the Indonesian ARP which was at 8.23 percent. Prevalence the population with moderate and severe food insecurity in Central Sulawesi Province in 2021, is still at 7.73 in the top 8 position from 34 provinces. This reflects that food insecurity in Central Sulawesi is still high (BPS Indonesia, 2022).

Ahmed et al., (2021) measured the variables of income loss due to lockdown, type of agricultural work and daily labor, microcredit programs had a positive effect on food insecurity during COVID-19 in rural Bangladesh. Rashid Gill & Khan, (2012) found out that household size, household area square footage, household income, number of rooms in a way significant influence on food insecurity in Pakistan. However, the variable of women aged 15 years and over who are illiterate has no significant effect. Anand et al., (2019) test dimensions socioeconomic (level education and type of wages head of household), and dimensions infrastructure (typology housing, and water connections) are closely related to food security. Measurement (2016) indicated that poverty correlated positively. However, education, animal husbandry, foreign remittances and heads family Woman correlated negative impact on food insecurity. Cheema& Abbas (2016) shows a negative relationship with education, livestock, foreign remittances and female-headed households, while a positive relationship with poverty on food insecurity in Pakistan. The research results of Asghar & Ahmad (2013) show that household size, education of the head of the household, annual income and agricultural income are important determinants of household food insecurity status. stated that food insecurity among small farmers is correlated with socio demographic factors (age, education, migration) and asset ownership in Central America. Mota et al., (2019) stated that household size, lack of livestock, age of the head of the household, land area, borrowing money from moneylenders have a positive effect while education has a negative effect on food insecurity in rural households in Damot, Ethiopia. Findings Uyeh Drammeh (2019) states that the gender of the head of the household, age, educational status, household size, income, poverty and food prices influence household food security status and cause child malnutrition in Sub-Saharan Africa. Bulawayo et al., (2019) using household daily meal frequency as an indicator of food insecurity and household income, education level, family size, gender, age of household head and working household head as determining factors in Zambia. Amaza et al., (2008) examined the determinants of food insecurity of rural households by revealing that household size, gender, education level, farm size, and type of household agricultural enterprise as the main determinants In Nigeria.

Rachmaningsih, Triana; Priyarsono, (2012) analyze determinants of urban and rural food insecurity in Indonesia, findings state that type of material fuel used for cooking, extensive floor of house (m^2) and type of walls of residence, proper sanitation, source of drinking water, location, education head of household, type of floor, and ownership land as a determinant of food insecurity. Mulyasari, (2016) research reason vulnerability to food insecurity using an approach Food Security and Vulnerability Atlas (FSVA). based on approach the grouping indicators into 3 dimensions, namely (i) food availability, (ii) access to food and eyes livelihoods (food and livelihoods access), and (iii) temporary food insecurity (transient food insecurity). Hapsari & Rudiarto (2017) research determinants of food insecurity in the District Rembang, the results state that the factors that influence food insecurity are formed into five groups from socio-economic factors (number of households without access electricity, number of poor households, and puso area), climate factors (number of incidents natural disasters, irregularities bulk rain, and speed growth population), and infrastructure factors (type of road main village, number of households with a distance of > 5 km from facility health, and number of households without access to

clean water), environmental factors (village height and area deforestation and degradation forest), and productivity factors (soil type and ratio normative consumption).

Based on description above, this research aims analyze indicator 1) food availability is grouped into variables consumption normative per capita on availability clean food products, 2) food access grouped into variables The population lives below the poverty line, households without access electricity, and 3) food utilization grouped into variables number life expectancy at the moment birth, toddler tall less (stunting), female blind letters, household without access to clean water as a determinant of food insecurity.

MATERIAL AND METHOD

Scope

This is an empirical study concerning about determinants of food insecurity in a regional context by considering research (Mulyasari, 2016) as a reference main. The difference between this research and Mulyasari (2016) is the method analysis used. This research will use analysis Panel and Cross Section data regression, meanwhile (Mulyasari, 2016) using the Food Security and Vulnerability Atlas (FSVA) approach

Analysis Method

Based on the research objectives, namely analyze determinants of food insecurity in Central Sulawesi Province, the type of research is quantitative, namely research to test theories certain way research connection between variable. These variables are measured so that the data is composed from the numbers can be analyzed based on statistical procedures (Creswell, 2015). This research is expected to provide relative direction appropriate in solving research problems so that the objectives and usefulness of research can be achieved.

The research locations include 12 districts and 1 city. This research data amounted to 65 observations in a way The whole is secondary data obtained from the Central Sulawesi Province Central Statistics Agency (BPS), Central Sulawesi Province Food Security Service and Central Sulawesi Province Food Crops and Horticulture Service through technique documentation.

Analysis using Panel Data Regression (panel pooled data) is a combination of time series data for 5 years from 2017-2021, while cross section data for 12 districts and 1 city in Central Sulawesi Province. There are differences in unit and magnitude variable in equality cause equality regression must made with model natural, semi log or double log, then Eq Panel data regression in this research is:

$$\mathbf{lnY = \beta_0 + \beta_1 lnX_{1it} + \beta_2 lnX_{2it} + \beta_3 lnX_{3it} + \beta_4 lnX_{4it} + \beta_5 lnX_{5it} + \beta_6 lnX_{6it} + \beta_7 lnX_{7it} + \varepsilon_i}$$

Description:

Y	= Food insecurity rate
X_1	= Consumption normative per capita on availability clean food products
X_2	= Population lives below the poverty line
X_3	= Household without access electricity
X_4	= Life expectancy at the time born
X_5	= High toddler lacking (stunting)
X_6	= Women 15 years and over who are blind letter
X_7	= Household without access to clean water
β_0	= Constant
β_1-β_9	= Coefficient regression
ε_{it}	= Component error at the ith observation unit and time t

Determination the most appropriate technique for estimate panel data regression, namely, first test statistics F used for choose between model OLS without variable dummy or Fixed Effect. Second test Langrange Multipliers (LM) used for choose

between OLS without variable dummy or Random Effects. Third, choose between model Fixed Effect or Random Effect used test Hausman. Furthermore, testing through detection deviation assumption classic, that is free multicollinearity, heteroscedasticity, autocorrelation, as well as disturbance error term normally distributed (Widarjono, 2017).

Testing For analyze influence variable Y against variable X, then testing is carried out hypothesis, namely 1) F-statistical test with testing criteria If prob value. F count < 0.05 then H_0 rejected, that is in a way together there influence variable independent of the variable dependent. On the other hand, if prob value. F count > 0.05 then H_0 is not rejected, meaning the data is not sufficient to prove it that variable independent influence on variables dependent. 2) Statistical t-test with the testing criteria used that is If calculated t value <0.05, then H_0 rejected, it can be concluded that variable free influential significant to the variable bound. On the other hand, if calculated t value > 0.05, then H0 $_{is}$ not rejected, variable free has no effect significant to the variable bound.

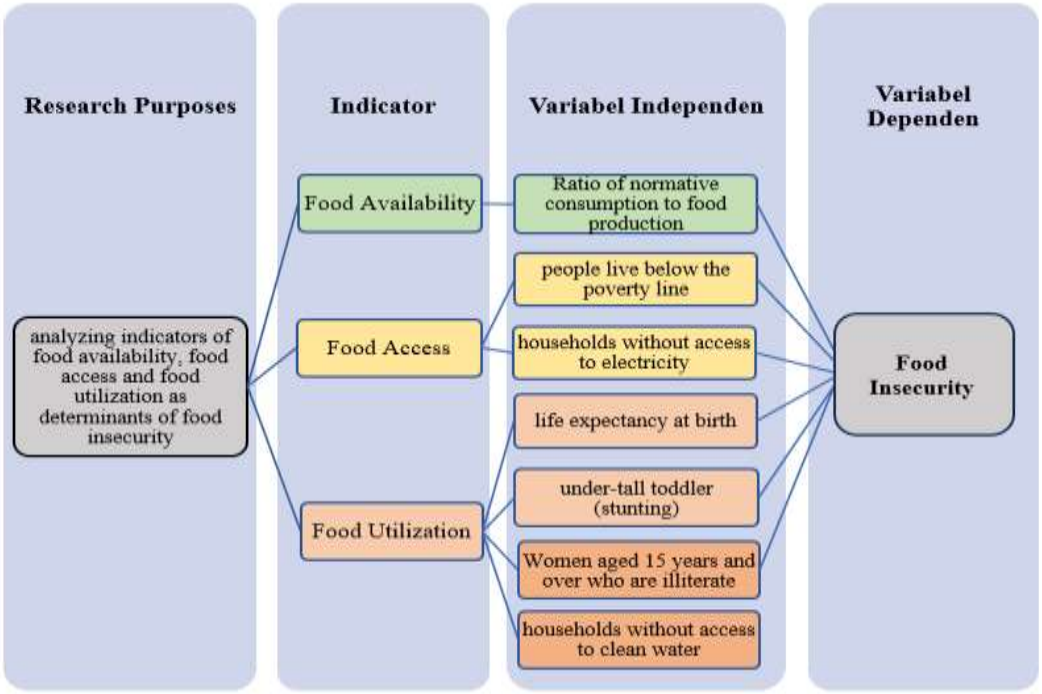


Figure 1. Analysis of the Determinant Model of Food Insecurity in Central Sulawesi Province

RESULTS AND DISCUSSION

General Description of the Research Area

Central Sulawesi Province is located in the central part of Sulawesi Island. The area of Central Sulawesi Province is 61,841.29 km² and the population in 2021 were 3,021,879 people. The Era of Reformation has brought major changes to regional expansion, so that this province has 12 districts and 1 city. A general description of the region can be seen in table 1.

Table 1 Population According to Regency /City of Central Sulawesi Province in 2021

No	Regency /City	Area (km ^{2})	Number of Population (People)	Percentage	
				Rea	Population
1	Banggai Kepulauan	2488.79	121,684	4.02	4.03
2	Banggai	9672.7	366.224	15.64	12.12
3	Morowali	3037.04	167.91	4.91	5.56

4	Poso	7112.25	248,345	11.5	8.22
5	Donggala	4275.08	302,965	6.91	10.03
6	Tolitoli	4079.77	226,796	6.6	7.51
7	Buol	4043.57	146,628	6.54	4.85
8	Parigi Moutong	5089.91	443.17	8.23	14.67
9	Tojo Una-una	5721.15	166,339	9.25	5.5
10	Sigi	5196.02	261,676	8.4	8.66
11	Banggai Laut	725.67	70,872	1.17	2.35
12	North Morowali	10004.28	122.24	16.18	4.05
13	Palu City	395.06	377.03	0.64	12.48
	Central Sulawesi	**61841.29**	**3,021,879**	**100**	**100**

Source:(BPS, 2022)

North Morowali Regency has the highest percentage of area (16.18 percent) of the 13 regions in Central Sulawesi. Followed by the Regency area Banggai has an area of 15.64 percent of the total provincial area, and the Poso Regency area with an area of 11.5 percent of the total provincial area. Meanwhile, Palu City has the lowest area, namely amounting to 0.64 percent of the total area of Central Sulawesi Province

Aspect population give description that percentage resident highest of the total population province is Parigi Moutong Regency (14.67 percent), position percentage resident highest next is Palu City (12.48 percent) and in order third is the Regency Banggai (12.12 percent), meanwhile, the district has the percentage resident The smallest of the total population of Central Sulawesi Province is the Regency Banggai Laut, that is by 2.35 percent thany Regency Banggai Island by 4.03 percent and Regency North Morowali at 4.05 percent.

Estimated Results Panel Data Regression

Estimation results panel data regression using eviews 10 based Common Effect, Fixed Effect, and Random Effect model approaches, namely as follows:

1. Common Effect Model

Table 2. Estimation Results Common Effects Model

Variables	Coefficient	Std. Error	t-Statistics	Prob.
C	10.72249	3.543644	3.025838	0.0037
X1	0.004042	0.046356	0.087199	0.9308
X2	-0.186595	0.249094	-0.749092	0.4569
X3	0.029421	0.045347	0.648788	0.5191
X4	-5.202670	1.868727	-2.784071	0.0073
X5	-0.055182	0.104737	-0.526865	0.6003
X6	0.114476	0.063791	1.794548	0.0780
X7	-0.012053	0.099892	-0.120661	0.9044

R-squared	0.346793	Mean dependent var	0.951491
Adjusted R-squared	0.266574	SD dependent var	0.188896
SE of regression	0.161771	Akaike info criterion	-0.690455
Sum squared resid	1.491678	Schwarz criterion	-0.422838
Log likelihood	30.43978	Hannan-Quinn criter .	-0.584863
F-statistic	4.323104	Durbin-Watson stat	1.603173
Prob(F-statistic)	0.000675		

Source: Data Processing Results with Eviews Version 10 2023

Common Effect model estimation results show that mark R-squared equal to 0.346793, meaning variable Consumption normative per capita on availability clean food products (X_1), Population living below the poverty line (X_2), Household without access electricity (X_3), Life expectancy at the time birth (X_4), Stunting (X_5), Women aged 15 years and over who are blind letter (X_6), Household without access to clean water (X_7) is able to explain amounting to 34.68 percent of the food insecurity variable (Y).

2. Fixed Effect Model

Table 3. Estimation Results Fixed Effect Model

Variables	Coefficient	Std. Error	t-Statistics	Prob.
C	56.17025	18.50895	3.034761	0.0040
X1	0.358356	0.172980	2.071666	0.0441
X2	-1.436096	1.211222	-1.185659	0.2420
X3	0.012248	0.056872	0.215360	0.8305
X4	-29.06593	9.641062	-3.014806	0.0042
X5	-0.386108	0.165067	-2.339104	0.0238
X6	0.059825	0.070423	0.849506	0.4001
X7	0.001872	0.124048	0.015089	0.9880
	Effects Specification			
Cross-section fixed (dummy variables)				
R-squared	0.626160	Mean dependent var		0.951491
Adjusted R-squared	0.468317	SD dependent var		0.188896
SE of regression	0.137736	Akaike info criterion		-0.879292
Sum squared resid	0.853708	Schwarz criterion		-0.210250
Log likelihood	48.57698	Hannan-Quinn criter .		-0.615312
F-statistic	3.966973	Durbin-Watson stat		2.309981
Prob(F-statistic)	0.000074			

Source: Data Processing Results with Eviews Version 10 2023

Fixed Effect model estimation results show that mark R-squared equal to 0.626160, meaning variable Consumption normative per capita on availability clean food products (X_1), Population living below the poverty line (X_2), Household without access electricity (X_3), Life expectancy at the time birth (X_4), Stunting (X_5), Women aged 15 years and over who are blind letter (X_6), Household without access to clean water (X_7) is able to explain amounting to 62.62 percent of the food insecurity variable (Y). These results showing exists influence variable from cross section data (district/city) on research model constants.

3. Random Effect Model

Table 4. Estimated Results Random Effect Model

Variables	Coefficient	Std. Error	t-Statistics	Prob.
C	11.25544	3.910674	2.878132	0.0056
X1	0.010800	0.049248	0.219297	0.8272

X2	-0.164980	0.272064	-0.606401	0.5467
X3	0.023421	0.042833	0.546803	0.5866
X4	-5.470573	2.053055	-2.664601	0.0100
X5	-0.111703	0.094242	-1.185282	0.2408
X6	0.115695	0.057839	2.000303	0.0502
X7	-0.004284	0.095082	-0.045058	0.9642

	Effects Specification	elementary school	Rho
Random cross-section		0.054007	0.1333
Idiosyncratic random		0.137736	0.8667

	Weighted Statistics		
R-squared	0.270302	Mean dependent var	0.715440
Adjusted R-squared	0.180690	SD dependent var	0.166844
SE of regression	0.151020	Sum squared resid	1.300008
F-statistic	3.016361	Durbin-Watson stat	1.801096
Prob(F-statistic)	0.009114		

	Unweighted Statistics		
R-squared	0.342053	Mean dependent var	0.951491
Sum squared resid	1.502502	Durbin-Watson stat	1.558360

Source: Data Processing Results with Eviews Version 10 2023

Random Effect model estimation results show that mark R-squared as big as 0.270302, that is variable Consumption normative per capita on availability clean food products (X_1), Population living below the poverty line (X_2), Household without access electricity (X_3), Life expectancy at the time birth (X_4), Stunting (X_5), Women aged 15 years and over who are literate letter (X_6), Household without access to clean water (X_7) is able to explain amounting to 27.03 percent of the food insecurity variable (Y).

Analysis Selection of the Best Model

The selection of the panel data regression model is carried out by testing suitability of the model for determine the best model among three method estimates (CEM, FEM, and REM). The model specification was carried out using two tests, namely the Chow test and the Hausman test. Below are the test results model specifications for panel data regression models:

1. Test Significance Fixed Effect or Common Effect (Chow Test)

Chow test was used to find out a better model What approach is used? Pooled Least Square (Common Effect) or Fixed Effect Model. Testing was carried out with a test level of 5% ($\alpha = 0.05$). The Chow test is carried out with the following hypothesis:

H_0 = Common Effect is better rather than the Fixed Effect Model

H_1 = Fixed Effect Model is better rather than the Common Effect.

Table 1Chow Test Results

Effects Test	Statistics	df	Prob.

Cross-section F	2.802350	(12.45)	0.0061
Chi-square cross-section	36.274413	12	0.0003

Source: Data Processing Results with Eviews Version 10 2023

Chow test results were obtained mark probability Cross-section F of 0.0061 which means that mark p-value is smaller of α=5% (0.05), so that the conclusion from the Chow Test is to reject H0 so that it approaches Fixed Effect Model is better compared to Common Effects Model.

2. Test Significance Fixed Effect or Random Effect (Hausman Test)

Hausman test was used for choose the best model between Fixed Effect Model with Random Effect Model. Testing was carried out using the Hausman test which uses the H test statistic. Testing was carried out at a test level of 5% (α = 0.05). The hypothesis is as follows:

H_0 = Random Effect Model is better from Fixed Effect Model

H_1 = Fixed Effect Model is better from Random Effect Model

Table 6 Hausman Test Results

Test Summary	Chi-Sq. Statistics	Chi-Sq. df	Prob.
Random cross-section	18.525037	7	0.0098

Source: Data Processing Results with Eviews Version 10 2023

Test results Hausman Test obtained mark Prob. Random Cross Section of 0.0098 smaller of α=5% (0.05) thus rejecting H_0. Fixed Effect Model is better from Random Effect Model. Based on test results intermediate model specifications Common Effect Model and Fixed Effect Model, namely rejects H_0, so the conclusion Fixed Effect Model is appropriate. Test results intermediate model specifications Random Effect Model and Fixed Effect Model, namely rejects H_0, so the conclusion Fixed Effect Model remains appropriate. Thus, the best model in the panel data regression model is Fixed Effect Model For estimates the regional vulnerability of Central Sulawesi Province as described in the following table.

Table 7. Modeling Results Panel Data Regression with Fixed Effect Model

Variables	Coefficient	Std. Error	t-Statistics	Prob.
C	56.17025	18.50895	3.034761	0.0040
X1	0.358356	0.172980	2.071666	0.0441
X2	-1.436096	1.211222	-1.185659	0.2420
X3	0.012248	0.056872	0.215360	0.8305
X4	-29.06593	9.641062	-3.014806	0.0042
X5	-0.386108	0.165067	-2.339104	0.0238
X6	0.059825	0.070423	0.849506	0.4001
X7	0.001872	0.124048	0.015089	0.9880
	Effects Specification			
Cross-section fixed (dummy variables)				
R-squared	0.626160	Mean dependent var		0.951491
Adjusted R-squared	0.468317	SD dependent var		0.188896
SE of regression	0.137736	Akaike info criterion		-0.879292
Sum squared resid	0.853708	Schwarz criterion		-0.210250
Log likelihood	48.57698	Hannan-Quinn criter .		-0.615312

F-statistic	3.966973	Durbin-Watson stat	2.309981
Prob(F-statistic)	0.000074		

Source: Data Processing Results with Eviews Version 10 2023

Equality regression based on the estimation model The Fixed Effect Model in this research is:

$$\mathbf{Log(Yit) = 56.17025 + 0.358356LogX_{1it} - 1.436096LogX_{2it} + 0.012248LogX_{3it} - 29.06593LogX_{4it} - 0.386108LogX_{5it} + 0.059825LogX_{6it} + 0.001872LogX_{6it}}$$

Assumption Test Analysis Results Classic

1. Multicollinearity Test Results

Coefficient value correlation between variable independence is below 0.85, thus the data in this study does not have multicollinearity problems. The model used is the Fixed Effect Model (method Generalized Least Squares), so there is no need to carry out heteroscedasticity tests and autocorrelation tests, because violation assumption This is anticipated in the GLS method (Widarjono, 2015).

Table 8 Multicollinearity Test Results

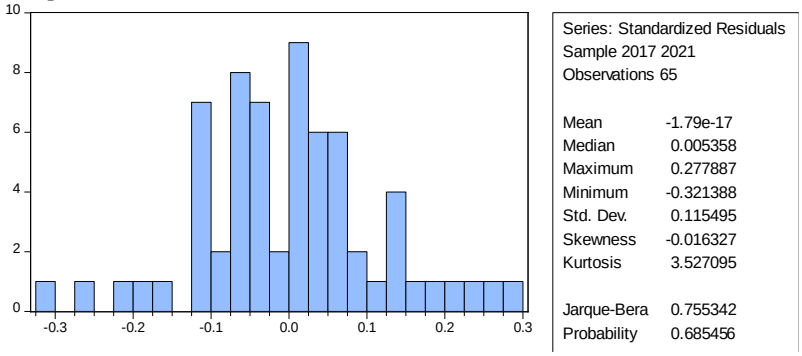
Correlation

	X1	X2	X3	X4	X5	X6	X7
X1	1,000000	-0.266434	-0.236773	-0.117680	-0.058741	-0.484572	-0.627687
X2	-0.266434	1,000000	0.682550	-0.580959	0.246190	0.454840	0.516026
X3	-0.236773	0.682550	1,000000	-0.630372	0.339420	0.617399	0.550927
X4	-0.117680	-0.580959	-0.630372	1,000000	-0.270476	-0.331472	-0.233793
X5	-0.058741	0.246190	0.339420	-0.270476	1,000000	0.385230	0.153550
X6	-0.484572	0.454840	0.617399	-0.331472	0.385230	1,000000	0.551948
X7	-0.627687	0.516026	0.550927	-0.233793	0.153550	0.551948	1,000000

Source: Data Processing Results with Eviews Version 10 2023

2. Normality Test Results

Normality test used to test whether the data is normally distributed or not, the number of observations (n = 65 and k = 7), was obtained degree of freedom (df) = 85, and using α = 5% is obtained $\chi 2$ value table amounting to 79.08. Jarque Bera Value amounting to 0.755342, can be withdrawn conclusion that probability disturbance V_i regression the distributed normally because Jarque Bera's value is smaller compared $\chi 2$ value table. The Jarque-Bera test is carried out as shown below:



Source: Data Processing Results with Eviews Version 10 2023

Figure 2 Normality Test Results

F Statistical Test Results

Test results of the selected model that is Fixed Effect Model shows F-value statistics amounting to 3.966973 and value probability (F-statistic) is 0.000074. By comparing mark

probability F-statistic with a value of α = 5%, then the value probability F-statistics equal to 0.000074 < α 5% value of 0.05 so it is variable Consumption normative per capita on availability clean food products (X_1), Population living below the poverty line (X_2), Household without access electricity (X_3), Life expectancy at the time birth (X_4), Stunting (X_5), Women aged 15 years and over who are literate letter (X_6), Household without access to clean water (X_7) directly together influential significant to the food insecurity variable (Y).

Statistical Test Results t

t statistical test was carried out for influence variable independent of the variable dependent which is carried out by testing significance probability (t-statistic) with a value of α=5% (0.05). If the t- statistical probability < α 0.05, then H_0 rejected, that is variable l independent influence variable l dependent in a way significant. On the other hand, if t-calculated probability > α 0.05, then H_0 accepted, that is variable independent influence variable l dependent insignificantly.

Table 9. Statistical Test Results t

Variables	t-Statistics	Prob.	Significance
X1	2.071666	0.0441	Significant
X2	-1.185659	0.2420	Not Significant
X3	0.215360	0.8305	Not Significant
X4	-3.014806	0.0042	Significant
X5	-2.339104	0.0238	Significant
X6	0.849506	0.4001	Not Significant
X7	0.015089	0.9880	Not Significant

Source: Data Processing Results with Eviews Version 10 2023 (α=5%)

The conclusion is that at the 95% level, variable Consumption normative per capita on availability clean food products (X_1), Life expectancy at the time birth (X_4), stunting (X_5), influence significant to food insecurity (Y), while the variable The population lives below the poverty line (X_2), Household without access electricity (X_3), Women aged 15 years and over who are literate letter (X_6), Household without access to clean water (X_7) has no significant effect on food insecurity (Y).

Model Suitability Test Results

Test results Fixed Effect Model obtained mark R-squared equal to 0.626160 which means variable Consumption normative per capita on availability clean food products (X_1), Population living below the poverty line (X_2), Household without access electricity (X_3), Life expectancy at the time birth (X_4), Stunting (X_5), Women aged 15 years and over who are literate letter (X_6), Household without access to clean water (X_7) is able to explain change Food insecurity was 62.62 percent, while the remainder (37.38 percent) was explained by other variables outside the model used in this research.

The equation resulting from panel regression using the Fixed Effect Model is obtained mark coefficient regression for every the variables in the research are interpreted as follows.

1) Influence Variable Consumption Normative Per Capita on Availability Clean Food Products Against Food Insecurity

Coefficient regression Consumption normative per capita on availability clean food products as big as 0.358356 shows that on condition ceteris paribus, if Consumption normative per capita on availability clean food products increase by 1 percent, then on average food insecurity will increase increase by 0.3 percent. The results of this research are in accordance with research. Hapsari & Rudiarto, (2017) that normative consumption variables on the availability of food production have a significant and positive effect on

food insecurity. This is also in line with the concept put forward by Food Security Agency &; Ministry of Food, (2020) that the aspect of food availability is represented by indicators of the ratio of normative consumption of carbohydrates to food availability which is approached from the production aspect. Thus that food availability can be met from domestic production and national food reserves or imports if both main sources it cannot be fulfilled need.

2) Influence Variable Population Living Below the Poverty Line Against Food Insecurity

Coefficient regression people live below the poverty line as big as -1.436096 shows that on condition ceteris paribus, if population lives below the poverty line increase by 1 percent, then on average food insecurity will increase decrease by 1.4 percent. Variable The population lives below the poverty line show sign negative and has no significant effect on food insecurity.

Percentage The population living below the poverty line in this study is the ratio of the number of poor people to the total population of 13 districts cities in Central Sulawesi Province, meaning that the lower the value percentage means the number of poor people in an area decreases. This research is different from several previous studies that tested relationships poverty to food insecurity. Research Cheema & Abbas, (2016) using data on poor households using logistic regression stated that poverty is positively and significantly related to food insecurity. This research is precisely found that result variable people live below the poverty line show connection negative and has no significant effect on food insecurity. Referring to the data used in this research where number poverty show trend decreased, but not in the same direction as the prevalence data Proxied Food Insufficiency (PoU). be a variable indicating food insecurity trend enhancement from 2017 to 2021. Thus, that number poverty in 13 districts / cities in Central Sulawesi Province experienced decreased but food insecurity experienced increase.

3) Influence Variable Household No Access to Electricity Against Food Insecurity

Coefficient regression Household without access electricity as big as 0.012248 shows that on condition ceteris paribus, if Household without access electricity increase by 1 percent, then on average food insecurity will increase by 0.01 percent. Variable Household without access electricity show sign positive and has no significant effect on food insecurity. The results of this study are in accordance with research Asghar & Ahmad, (2013) where it was found that households that have an electricity connection are 6% (for general households) and 14% (for farming households) less likely to experience food insecurity than households that do not have an electricity connection.

4) Influence Variable Life Expectancy at Birth on Food Insecurity

Coefficient regression Life expectancy at the time born as big as -29.06593 show that on condition ceteris paribus, if Life expectancy at the time born increase by 1 percent, then on average food insecurity will increase decrease by -29.0 percent. Life expectancy at the time born show sign negative and influential significant impact on food insecurity. The results of this study are in accordance with researchHapsari & Rudiarto, (2017), which states that Life Expectancy at birth is positive and significant for food security. According to Food Security Agency &; Ministry of Food (2020) Life expectancy is one of the impacts of the health status of a region. The increase in life expectancy indicates an improvement in the quality of consumption and health of pregnant women, the physical and psychological health status of society in general, including increased access and quality of health services. Life expectancy at birth is defined as an estimate of the average length of life of newborn babies assuming there is no change in mortality patterns throughout their lives

5) Influence Variable Stunting Against Food Insecurity

Coefficient regression Stunting as big as -0.386108 shows that on condition ceteris paribus, if Stunting increase by 1 percent, then on average food insecurity will increase decrease by -0.3 percent. Stunting show sign negative and influential significant impact on food insecurity. The results of this research are in accordance with the concept put forward by the Indonesian Food Security Agency (BKP) that nutritional status is the result of interaction between the food consumed, the metabolism of food nutrients by the body and the human environment. Nutritional status toddler measured using 3 indicators, namely prevalence of stunting (height according to age), underweight (weight according to age) and wasting (weight according to height). Shortness or stunting is a ratio according to height age -TB/U- below -2 standard deviation from the reference mean WHO population 2005, which illustrates not enough nutrition that occurs continuously, over a period of time long and chronic (Badan Ketahanan Pangan & Kementerian Pangan, 2020). WHO classifies stunting in the population an area should be below 20 percent. The fact found in Central Sulawesi is that Stunting cases are still classified as above 20 percent, which means that Stunting cases in Central Sulawesi Province are not good. Lack nutrition tightly relationship with poverty, less availability food, the bad sanitation, error pattern foster care, to put it mildly understanding of a balanced and balanced menu limited facility infrastructure (Food Security Agency & Ministry of Food, 2020). However, nutritional problems are also faced by the community class intermediate until height that is not experienced constraint economic access, technology, information and distance can influence the level of food insecurity in a region.

6) Influence Variable Women aged 15 years and over who are literate against food insecurity

Coefficient regression Women aged 15 years and over who are literate letter as big as 0.059825 shows that on condition ceteris paribus, if Women aged 15 years and over who are literate letter increase by 1 percent, then on average food insecurity will increase increase of 0.05 percent. Women aged 15 years and over who are blind letter show sign positive and has no significant effect on food insecurity. The results of this study are in accordance Asghar & Ahmad (2013)with research findings The research uses a Regression Model Binary Logistics States that education Woman insignificant effect on general household food insecurity. Further Asghar & Ahmad (2013) Women's education level is important in the level of food security of a household because purchasing, preparing and serving food, etc., is largely a woman's business". Study Asghar & Ahmad (2013) find that educated women have relationships opposite direction with food insecurity, different from this study in that Woman blind letters (no education) have a relationship in one direction. Difference the caused different data sorting in principle that condition the state that women with educated status negative effect on food insecurity, or women blind letter influential positive for food insecurity. The results of this study are also in line with Cheema & Abbas, (2016) research findings state that households whose head of household has a relatively better education have a greater chance of experiencing food security than households whose head of household has never attended school or has low education. Thus, the results of this research are in accordance with the framework theory that states that expansion education will reduce the problem of food insecurity.

7) Influence Variable Household Without Access to Clean Water Against Food Insecurity

Coefficient regression Household without access to clean water as big as 0.001872 shows that on condition ceteris paribus, if Household without access to clean water increase by 1 percent, then on average food insecurity will increase increase by 0.001 percent of households without access to clean water show sign positive and has no significant effect on food insecurity. The results of this research are in accordance with the concept put forward byFood Security Agency & Ministry of Food (2020), increasing access to

sanitation facilities and potable water is very important to reduce health problems, so that it can improve nutritional status through increasing the absorption of nutrients by the body.

CONCLUSION

The results of the analysis show that the normative per capita consumption variable on the net availability of food products, population living below the poverty line, households without access to electricity, life expectancy at birth, stunting, women aged 15 years and over who are illiterate, households without access to clean water together has a significant effect on the food insecurity variable. Partial analysis shows that the variables normative consumption per capita on the net availability of food products, life expectancy at birth, and stunting have a significant effect on food insecurity. Meanwhile, residents living below the poverty line, households without access to electricity, women aged 15 years and over who are illiterate, households without access to clean water have no significant effect.

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