The Effect of Food Ingredients Containing Protein on Stunting Cases in East Java

Indora Yusakobus Komang¹, Khusnul Ashar², Wildan Syafitri³
Economics Department, Faculty of Economics and Business, Universitas Brawijaya, Indonesia¹,²,³
Jl. MT. Haryono No. 165, Malang, 65145, Indonesia
Correspondence Email: indora@student.ub.ac.id
ORCID ID: 0000-0001-7245-3082

ARTICLE INFORMATION

ABSTRACT

Stunting is a condition in which children are experienced growth disturbances and affect them into adulthood (maturity). In the long period, stunting can cause decreasing economic country. East Java is province that supporting the economy of Indonesia, including the producer of foodstuffs that contain protein. Where protein is one of the micronutrients that affects cases of stunting. In fact, there are many cases of stunting in East Java. By using the data from BPS, this study wanted to determine the effect of food ingredients containing protein on stunting cases in East Java. Based on BPS data, there are seven high-protein food ingredients that are most consumed by the people in East Java. However, based on the panel data regression, there is only one food ingredient that has the effect of reducing stunting rates, it was egg consumption. By focusing on it, hopes that the government can control the prices and distribution. Therefore, public can consume it easily and cheaply.

Keywords: Panel data regression, Stunting, Protein consumption, East Java
INTRODUCTION

Stunting is a condition where children experience growth disorders, so that the child’s height does not match with his age, as a result of chronic nutritional problems, namely malnutrition intake for a long time. According to Anton, Bukhari, Baso, and Erika (2022) claimed that stunting in childhood significantly affects future development. Stunting is not only a matter of impaired physical growth, but stunting can also cause children to get sick more easily, malnutrition occurs from infancy in the womb and in the early period of life after birth, but is only apparent after the child is 2 (two) years old (Izwardy, 2019). In addition, due to stunting, there are also disorders in brain development and intelligence until children grow up, so stunting is a major threat to the quality of human resources.

Even in many countries stunting cases are closely related to the low cognitive abilities of children and affect their activities at school. Stunting affects learning ability in school-age children, grades and academic performance in school, working wages as they grow up, the risk of chronic diseases such as diabetes, morbidity and mortality, and even economic productivity (Grantham-mcgregor & Baker-henningham, 2005). In fact, according to a study from the world bank in 2016 said that in the long run stunting can cause economic losses to a country of 2-3% of GDP per year.

In Indonesia, economic losses due to stunting have been conducted in a study where the average economic loss in 32 provinces in Indonesia is around Rp 96 billion-Rp 430 billion (0.15-0.67%) of the average Gross Regional Domestic Product of provinces in Indonesia (Renyoet, Martianto, & Sukandar, 2016).

Meanwhile, according to Sow et al. (2010) the level of daily food consumption affects stunting cases. The study even without paying attention to the diversity and content of the food consumed. Furthermore, there are more specific studies where food diversity and high-protein feeding have a significant relationship with the incidence of stunting in infants and toddlers (Damanik & Wanda, 2019).

Based on economic law, the abundant supply of food sources should make it easier for people to access protein source food. However, this does not appear to be the case in East Java. As one of the major provinces and influential on the Indonesian economy, the prevalence rate of stunting in East Java is still high at 23.5% in 2021. This figure by the World Health Organization (WHO) is still considered high and even said to be chronic because the prevalence of stunting is still more than 20%. This is an irony because East Java is one of the food barns of several foodstuffs that have high protein content such as beef and eggs in Indonesia.

According to the Central Statistics Agency (Badan Pusat Statistik, 2018), there were seven high-protein food commodities that were most consumed by the people of East Java. The seven food commodities include ready-made food and beverages, rice, meat, fish, eggs, milk, and nuts. Even though it is also still according to BPS (Dinas Kominfo Jatim, 2022), recording the total production of East Java beef of 93,303.43 tons is the highest in Indonesia. It far exceeds the total beef production in West Java Province in the second position with 64,425.18 tons per year. Not only beef production, egg production, which is also a food ingredient that contains much protein, in East Java is also the highest compared to egg production in other provinces.

However, the high production of high-protein food does not make the stunting rate in East Java lower than the other regions. The report of the Special Index for Handling Stunting (IKPS) by the Ministry of Health in collaboration with BPS shows that the decline in stunting rates in East Java is no better than other provinces. On the other hand, apart from the high production
and consumption of high-protein foods, inequality is still a development problem in East Java in relation to the equitable distribution of development results between regions (Pratiwi, Santosa, & Ashar, 2018).

This study aims to determine which foods and drinks are high in protein and most consumed by the people in East Java which have an impact on handling cases of stunting prevalence. By knowing what foodstuffs have an impact on stunting rates, it is hoped that the government can control the price and distribution of these foodstuffs so that they are easily and cheaply consumed by the public. The price of foodstuffs needs to be set by the government in an effort to deal with this stunting case, the government is obliged to provide a high price range for this protein. Considering that pricing is also a form of protection to the public by the government in the trade sector that can be applied with the lowest price determination to guarantee producers' income and the highest price setting as a form of consumer or community protection. Where pricing can reduce the negative impact of the trade sector on income equality (Sutiono, et al., 2018)

LITERATURE REVIEW

Several previous studies have shown research results that are related to this study. These studies can be used as a support in obtaining the purpose of this study, namely to determine the effect of food consumption on stunting cases in East Java. Previous studies are also used as a reference in understanding the relationships, influences, and differences between research variables.

The influence between purchasing power or the amount of public consumption has a role in the incidence of stunting cases. Direct factors related to stunting are food intake and health status. Furthermore, this study (Semba & Bloem, 2002) also said that indirect factors related to stunting are parenting patterns, health services, maternal factors, and the household environment. Meanwhile, the root of the problem that causes stunting events is the low family economy. Research from the Data and Information Center of the Ministry of Health of the Republic of Indonesia (2020) also emphasizes the same thing. This research says that the direct cause of stunting is the quantity and variety of food consumed by household members in Indonesia which is not diverse.

More specifically, the intended consumption is mainly consumption of foods that contain high protein such as red meat. The very high stunting rate in toddlers and the effect of lack of meat consumption on stunting underscore the need for interventions to improve complementary feeding practices (Krebs et al., 2011). This is in line with the research of (Krasevec, An, Kumapley, Bégin, & Frongillo, 2017) which revealed that food diversity and food consumption sourced from animals can be associated with stunting, with associations varying according to stratified groups.

Research related to food consumption and the prevalence of stunting both in Indonesia and abroad is quite a lot that discusses the influence of large amounts of food consumption on the incidence of stunting cases in a certain region and period, but both not much has discussed what high-protein food commodities are the most widely produced and consumed in areas with surplus production but high stunting rates such as in East Java.

RESEARCH METHOD

Research methods are steps and procedures that will be carried out in collecting empirical data or information to solve problems and test research hypotheses. In collecting the data needed to compile this study, the authors used the following research methods.
The scope for this study was conducted in East Java Province. East Java Province consists of 38 regencies / cities for the period using data series for the period 2015 - 2021.

The type of data used in this study is secondary data in the form of a quantitative times series. The used source data was obtained from the publication of the East Java Provincial Government Health Office and the Central Statistics Agency (BPS) of East Java Province. Then collected data is transformed in the form of panel data, which is a combination of times series data and cross-section data from 2015 – 2021. The data collection method is secondary data, as the used data in this study, including data on household food expenditure and consumption in East Java as a result of Susenas 2015-2021 (BPS Prov.East Java), Data on the Prevalence of Stunting in Regencies/Cities throughout East Java Province 2015-2021 (Dinkes Prov.Jawa Timur).

The variables used in the model in this study were used to analyze the effect of food commodity consumption on the prevalence rate of stunting in East Java. The variables used include:

**Bound Variables**

The bound variable used in answering the objectives of the model in this study is the stunting prevalence rate in East Java 2015-2021 which is a ratio scale (S).

**Free Variables**

The free variability in the second model uses the most consumed level of consumption of food and beverages with the highest protein content by the people of East Java. There are seven free variables in this study, namely consumption of finished food and beverages (X1), rice consumption (X2), meat consumption (X3), fish consumption (X4), egg consumption (X5), milk consumption (X6), and nut consumption (X7).

The analysis in this study uses descriptive analysis to find out an overview of the research subject based on variable data obtained from certain subject groups and by using panel data regression to find out how much influence some free variables have on non-free variables with data structures in the form of panel data. The panel data regression equation in this study is as follows:

\[ Y = \alpha + \beta_1 \text{ finished food and beverages consumption } + \beta_2 \text{ rice consumption } + \beta_3 \text{ meat consumption } + \beta_4 \text{ fish consumption } + \beta_5 \text{ egg consumption } + \beta_6 \text{ milk consumption } + \beta_7 \text{ peanuts consumption } + \epsilon \]
RESULTS

Descriptive Analysis describes the data and conditions of each variable used in this study. Here's an overview of the data used:

Table 1. Descriptive Statistics (N=342)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Min.</th>
<th>Max.</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stunting</td>
<td>6.9</td>
<td>54.75</td>
<td>26.6968</td>
<td>7.67253</td>
</tr>
<tr>
<td>Finished food and beverages</td>
<td>5.29</td>
<td>21.16</td>
<td>12.1985</td>
<td>3.15996</td>
</tr>
<tr>
<td>Rice Consumption</td>
<td>3.39</td>
<td>8.06</td>
<td>5.1375</td>
<td>0.83876</td>
</tr>
<tr>
<td>Meat Consumption</td>
<td>0.14</td>
<td>0.82</td>
<td>0.4004</td>
<td>0.13608</td>
</tr>
<tr>
<td>Fish Consumption</td>
<td>0.34</td>
<td>2.24</td>
<td>0.8774</td>
<td>0.38694</td>
</tr>
<tr>
<td>Egg Consumption</td>
<td>4.66</td>
<td>11.28</td>
<td>8.0351</td>
<td>1.23385</td>
</tr>
<tr>
<td>Milk Consumption</td>
<td>0.02</td>
<td>0.37</td>
<td>0.1121</td>
<td>0.05787</td>
</tr>
<tr>
<td>Peanut Consumption</td>
<td>0.92</td>
<td>2.97</td>
<td>1.7124</td>
<td>0.39336</td>
</tr>
</tbody>
</table>

Note. M = Mean, SD = Standard Deviation.
Source: Processed by Researchers (2023)

The results of the descriptive analysis above showed the number of studies as many as 342 data from free variables and bound variables in this study from 38 cities / regencies in East Java. The smallest stunting prevalence rate is 6.9% in Mojokerto City in 2021, while the largest stunting prevalence rate is 54.75% in Probolinggo Regency in 2019. Meanwhile, the average stunting prevalence rate in East Java for seven years from 2015-2021 is at 26.6968% with a standard deviation of 7.67253. From the table above, it also appears that there are five consumptions of high-protein food commodities, namely consumption of finished food and beverages, consumption of rice, consumption of fish, consumption of eggs, and consumption of legumes. Meanwhile, meat consumption and milk consumption from 38 regencies/cities in East Java during the period 2015 to 2021 are still low or none of them have consumption levels exceeding 1 kg / capita / year.

Table 2. Regression Results Data Panel

<table>
<thead>
<tr>
<th>Construct</th>
<th>Coef.</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>9.111425</td>
<td>0.0194</td>
</tr>
<tr>
<td>X1</td>
<td>0.948935</td>
<td>0.0001</td>
</tr>
<tr>
<td>X2</td>
<td>3.11***</td>
<td>0.7065</td>
</tr>
<tr>
<td>X3</td>
<td>2.92***</td>
<td>0.1150</td>
</tr>
<tr>
<td>X4</td>
<td>5.72***</td>
<td>0.1247</td>
</tr>
<tr>
<td>X5</td>
<td>-2.47***</td>
<td>0.7364</td>
</tr>
<tr>
<td>X6</td>
<td>23.35002</td>
<td>0.2274</td>
</tr>
<tr>
<td>X7</td>
<td>1.937816</td>
<td>0.2967</td>
</tr>
</tbody>
</table>

Note. $R^2 = 0.524817$ (p < 0.05) ***p < 0.05
Source: Processed by Researchers (2023)

Panel data regression is carried out by conducting the Chow test and Hausmann Test first, it is known that the appropriate model is using the Fixed Effect Model (FEM). FEM results are known to only egg consumption which has a negative correlation with stunting prevalence rates. Meanwhile, 6 (six) out of 7 (seven) consumption of food commodities containing protein,
namely finished food and beverages, rice, meat, fish, milk, and nuts in East Java has a positive correlation with stunting. Even the X1 variable, namely the consumption of finished food and beverages, significantly positively affects stunting. An R-square value of 0.524817 means that the model is able to explain more than 50% of the data.

Meanwhile, for the assumption test used, the normality test shows a probability value of 0.343781 or higher than α which means it is normally distributed. The second test, namely the multicollinearity test, shows that multicollinearity does not occur. The third test, namely the heterochedasticity test, also did not occur. And the fourth test is autocorrelation using the Durbin-Watson test.

**DISCUSSION**

Finished food and beverages are the most consumed commodities by people in East Java. Although it also contributes a lot related to protein consumption, as we know if food and beverage ingredients that are processed inappropriately will damage the protein content contained in the food and beverage ingredients themselves. This is very unfortunate because many food and beverage ingredients that are high in protein content, can be produced in East Java, are widely consumed by the people of East Java, but due to improper processing, they are not significantly able to reduce the prevalence of stunting. This happens because many people's food expenditures in East Java are spent on finished food and beverage commodities which in processing need to be reviewed because it will damage the protein content in them. Fast food that is widely consumed by the public also needs attention, that a lot of protein content is lost when processing even though many ingredients in it contain high protein such as meat, fish, milk, and other high-protein foodstuffs.

Other variables such as the consumption of rice, meat, fish, milk, and legumes were also positively correlated. This is certainly contrary to several previous studies where the consumption of foods that are high in protein will reduce the prevalence rate of stunting. Studies need to be carried out further regarding the diversity of consumption because according to even though they have consumed enough protein, because the diversity of food consumed is still low, it will have a tendency to experience high stunting (Handriyanti & Fitriani, 2021). According Khairani (2020) in the Data and Information Center of the Indonesian Ministry of Health also said that stunting is a multidimensional problem, not just a lack of food. The direct cause that causes stunting is eating that is not diverse.

The variable that has a negative correlation to stunting in East Java is egg consumption. This is in line with research (Prijono, Andarwulan, & Palupi, 2020) which says that toddlers who consume enough eggs are less susceptible to stunting than toddlers who lack egg intake. As is known if eggs are a high-protein food ingredient which besides being easy to get is also an easy food ingredient. According to BPS in 2021, egg production in East Java was 1,674,356.27 tons. This figure far exceeds the second and third egg production figures, namely Central Java Province with 668,670.98 tons and West Java Province with a total production of 573,012 tons. The high production and consumption of eggs by the people of East Java and having a positive impact in reducing stunting rates certainly requires more attention to be optimally increased. Considering that the average egg consumption in East Java is also the second highest after the consumption of finished food and beverages.

**CONCLUSION**

Egg consumption is the only variable that has an impact on reducing stunting rates in East Java. This certainly justifies the picture of East Java as a producer of high-protein foodstuffs with a stunting rate that is not lower than other regions. Considering that in addition to eggs,
the production rate of other high-protein foodstuffs is actually able to be produced by themselves in East Java. Even meat production in East Java is also the highest compared to other regions in Indonesia.

Factors of processing food and beverage ingredients also need to be considered. Based on the results of the study, it is known that the consumption of foods containing high protein is the highest in East Java, namely the consumption of finished food and beverages. This means that household spending on food in East Java is also high for this variable, but in this study, it is known that the consumption of food and beverages has significantly increased the prevalence rate of stunting. Fast food and the wrong processing of food ingredients will damage the protein content needed for the treatment of stunting. As known that the households spending their funds to buy food and drink outside. It means that the household’s protein needs are certainly less optimal.

From this research we can find out that in addition to parents’ education on parenting to children, parents’ education in processing food ingredients is also needed. It is hoped that in addition to being able to buy, parents in this case a mother is also able to process the foodstuffs purchased properly so that the food given to the child does not lose the micronutrients needed in the child's growth and development, in this case protein.

There are 2 (two) things that can be input to the government. First, the government is expected to provide training and counseling to parents regarding high-protein food processing techniques and nutritional awareness for their communities. Second, by knowing what foodstuffs have an impact on stunting rates, it is hoped that the government can control the price and distribution of these foodstuffs so that they are easily and cheaply consumed by the public. Especially in this study, namely eggs consumption which will directly have an impact on handling stunting in East Java.

LIMITATION
This research only focuses on the quantity of food and beverage consumption consumed by people in East Java. However, the existing data is not able to explain the diversity and spread of the level of consumption of these foodstuffs/beverages. Given the area, cultural diversity in East Java and other factors related to stunting, there is more research related to diversity and other variables such as gini ratio and household income level in an effort to reduce stunting rates.

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DECLARATION OF CONFLICTING INTERESTS
In this study the author has no personal or special interest. This research is purely for academic purposes.

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