

# Food consumption pattern Far Away From Home as a source of household food protein in Indonesia

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economy's low level contributes to their lack of access to high-quality protein. Because high-quality animal protein sources are more expensive than veggie protein sources [9,10].

Household consumption behavior, including food sources of animal protein, is influenced by a variety of factors, including the cost of commodities, household income, and household preferences for consumed [11]. Variances in preferences amongst households are a result of differences in parameters such as regional location, family member education level, household size, habits, and culture, to name a few. Thus, variations in food prices, particularly those of animal protein sources, and variances in household income will be interpreted differently by households depending on their characteristics.

Food far away from home is defined as food that is not prepared at home [12–14]. All meals are offered in public restaurants, fast food outlets, cafeterias, and small vendors or kiosks where the consumer or those who host the food must pay for, order, prepare, and serve the food, as well as any expenditures associated with providing a space to dine. This definition excludes all prepared foods and foods purchased in grocery stores, such as supermarkets, convenience stores, and some specialized food stores. Rather than that, these items are classified as fully processed foods consumed at home, despite the fact that they are not cooked at home.

Consumption of animal food away from home by households is increasing year after year [15,16]. Socioeconomic and demographic factors influence animal food consumption trends away from home [14,17]. The importance of animal food necessitates continual research on animal food consumption patterns as a source of household protein, including in Indonesia. As a developing country, domestic consumption of animal food is insufficient. Research on food consumption patterns in Indonesia, particularly animal food as a source of protein, has never taken into account consumption of animal food outside from home.

Food research in Indonesia, particularly animal food research, has historically been focused on pure commodities such as beef, poultry, fish, milk, or eggs, but study on processed or prepared animal food is still uncommon. be a dish that may be consumed alongside or in addition to rice [18–20]. This study is fundamentally different in the following ways: (1) All food consumed away from home with the ingredients beef, chicken, fish, eggs, and milk is analyzed; (2) the analysis is conducted for all Indonesian households in aggregate, urban households, rural households, poor households, and non-poor households; and (3) the elasticity number is obtained from the LA-AIDS demand model with SUR analysis in order to calculate EV and CV as welfare indicators..

The study's findings can be utilized as a guide for policymakers seeking to enhance animal welfare by examining animal food consumption patterns away from home. The availability of empirical data on demand for animal food away from home and the impact of changes in animal food costs away from home on welfare in Indonesia can be utilized to further research and to inform strategies for achieving food sufficiency and increasing household welfare in the country.

While food consumption away from home is increasing year after year, little study has been conducted on this subject, particularly research that includes households throughout Indonesia. Additionally, this research is novel in that it examines households divided into aggregate Indonesian household groups, urban household groups, rural household groups, poor household groups, and non-poor household groups; (2) the Tobit model is used to model household consumption patterns; and (3) the LA/AIDS model is used to model animal food consumption away from home. (4) the notion of Equivalent Variation (EV) and Compensating Variation (CV) is used to calculate the impact of rising animal food prices on households is minimal.

Recent changes in the socio-demographic and economic structure of Indonesian homes have resulted in a shift in the pattern of household consumption changes di beberapa negara di dunia [21–25], both in terms of composition and packaging, including food using animal protein sources. Indonesian households' sociodemographic and economic structures have changed, resulting in an increase in their use of processed foods derived from animal protein. This state of affairs is mostly the result of an increase in household income [18]. This event underscores the critical nature of doing studies on food consumption outside the home involving animal protein sources [26–31] research on animal food intake that excludes food consumed away from home produces skewed estimates. In

2020, utilizing Susenas data, we will analyze family consumption preferences for animal food consumed away from home. Analyze the elements that affect the assessment of animal food consumption when it occurs away from home.

## 2. Methods: model specification of probit model

This study employs quantitative analysis, namely the Probit regression model methodology. According to Xin et al (2020), when the dependent variable (Y) is dichotomous or binary and is assumed to have a binomial distribution, probit or logit is utilized [32]. One advantage of utilizing probit regression is that direct fitting values can be transformed to probabilities using values from the standard normal table. The probability value linked with the model's z-score is desired in this scenario. The objective is to forecast the probability of an event occurring or not occurring based on the existing predictor values. The event is the status of the response variable that is being examined, and the subsequent objective is to classify research subjects using a probability threshold. The equation for linear regression with a single predictor (X) is defined as:  $Y = \beta_0 + \beta_1 X$ , where 0 denotes the intercept and 1 denotes the slope. The meaning of slope is that it indicates the extent to which the predictor (X) contributes to the explanation of the output variable (Y). By converting the linear regression equation to a probability (P) when  $P = 1$ , we obtain logistic regression (probability to get a score of 1) [32-34]. The model is transformed into:

$$P = \frac{\exp(\beta_0 + \beta_1 X)}{1 + \exp(\beta_0 + \beta_1 X)} \text{ or } \text{Ln} \left[ \frac{P}{1-P} \right] = \beta_0 + \beta_1 X \quad (1)$$

While probit regression is a variant of logistic regression in which the logit equation is normalized [33]. By employing probability unit regression (Probit), we may view  $\beta_0 + \beta_1 X$  as a standard Z score that fits the distribution:

$$P = \frac{\exp(Z)}{1 + \exp(Z)} \text{ or } \text{Ln} \left[ \frac{P}{1-P} \right] = Z \quad (2)$$

This equation is based on the normal distribution ( $\Phi$ ) described below, so that the probit regression is denoted by  $\Phi(Z)$ . The symbol  $\Phi$  shows the inverse standard normal distribution function's validity.

$$P(Y = 1) = \int_{-\infty}^t \frac{1}{\sqrt{2\pi}} e^{-\frac{t^2}{2}} dt = \Phi(Z) \quad (3)$$

Z is a continuous variable that is hidden (latent) since it indicates an event's "propensity" to occur. The relationship between the Tobit regression results and the normal curve is expressed using continuous probability. When the Tobit regression equation returns zero, the resulting probability value is 50%. The essential form of the probability unit (Probit) model employed in this work is as follows:

$$Y = \ln \frac{P_i}{1-P_i} = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 \quad (4)$$

Note:

- Y = the value of household decisions in consuming protein foods far away from home
- X1 = soup
- X2 = sate, tongseng
- X3 = noodles with meatballs, boiling noodles, and fried noodles
- X4 = cooked fish
- X5 = poultry/cooked meat
- X6 = meat that has been processed
- X7 = porridge made with chicken
- X8 = siomay, batagor
- X9 = household size (HHsize)

The goal of the first year of research is to **31**over whether or not the nine characteristics associated with food consumption away from home **have an effect on the dependent variable** of intake. The Tobit Model is believed to be the most suited since the dependent variable consumption or not consumption is a qualitative variable with only two values (dichotomous values), namely 0 and 1, given that  $y = 1$  represents a household that consumes FAFH less **10**an or equal to two FAFHs. Meanwhile,  $y=1$  if the FAFH content of animal food is more than 2. **To determine the magnitude of the effect of the inde 33**dent variable (x) on the dependent variable (Y), the model is **simultaneously** assessed for fit using **the goodness of fit test** based on **the likelihood ratio test** as follows:

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1. The Chi-Square test is used to determine the significance of an **independent variable** in predicting the dependent variable in a model [33,35]. The following hypothesis is proposed:

$$H_0 : \beta_1 = \beta_2 = \dots, \beta_9 = 0$$

$H_1$  : at least one of the values of  $i$  is not zero.

The choice criteria are as follows:

- If  $\chi^2_{\text{test}} \leq \chi^2_{\text{table (0.01;8)}} \rightarrow H_0$  is allowed, it implies that all FAFH foods are unable to account for the decision to ingest FAFH simultaneously.

- If  $\chi^2_{\text{test}} > \chi^2_{\text{table (0.01;8)}} \rightarrow H_1$  is allowed, this indicates that all FAFH foods may simultaneously explain the decision to consume FAFH, or that the tobit model for FAFH consumption is fit.

2. The goodness of fit test, which compares the goodness of fit values for two tables [33,36].

The following hypothesis is advanced:

$H_0$ : there is no discrepancy between observed and anticipated data.

$H_1$ : There is a discrepancy between observed and projected data

The following **3** criteria are used to make the decision:

- If the **goodness of fit**  $\leq \chi^2_{\text{table (0.01;9)}}$   $\rightarrow H_0$  is allowed, it implies that all FAFH foods are unable to **3** account for the decision to ingest FAFH simultaneously.

- If the **goodness of fit**  $> \chi^2_{\text{table (0.01;9)}}$   $\rightarrow H_1$  is allowed, there is a discrepancy between the observed and predicted values. As a result, the derived parameters cannot be utilized to quantify the effect of consumption factor factors on protein FAFH decision-making.

3. Correspondence between likelihood **observed** ( $-2 \log \text{likelihood } d_1$ ) with  $\chi^2_{\text{table (0.01;31)}}$ .

The following **3** criteria are used to make the decision as follows:

- If  $-2 \log \text{likelihood } d_1 \leq \chi^2_{\text{table (0.05;334,127)}}$   $\rightarrow H_0$  is accepted, the observed likelihood is equal to 1, implying that the FAFH consumption model is fit

- If  $-2 \log \text{likelihood } d_1 > \chi^2_{\text{table(0.05;334,127)}}$   $\rightarrow H_1$  is accepted, the observed likelihood value is more than one, indicating that the FAFH consumption model does not fit.

To determine the extent to which each FAFH food can explain the chance of consuming FAFH, the following formula **19** utilized [34]:

$$R^2_{L} = \frac{-2 \log L_1 - (-2 \log L_0)}{-2 \log L_0} \quad (5)$$

Additionally, to ascertain the influence of each FAFH food on the chance of consuming FAFH (Y), a partial test (t test) was conducted as follows.:

$$t_{\text{hitung}} = \frac{\beta_i}{se(\beta_i)} t_{\text{tabel}(\alpha/2)(n-k)} \quad (6)$$

$\beta_i$  = the i-th variable's tobit regression coefficient, and  
 $\beta_i$  = the i-th variable's standard error coefficient of tobit regression  
 = varians  $\beta_i$

The proposed hypothesis is as follows:

$$H_0 : \beta_i = 0$$

$$H_1 : \beta_i \neq 0$$

The following criteria are used to make the decision as follows:

- If  $t_{test} \leq t_{table} (\alpha/2; n-k) \rightarrow H_0$  is accepted, this indicates that the first food has an effect on the likelihood of consuming FAFH, and

- If  $t_{test} > t_{table} (\alpha/2; n-k) \rightarrow H_1$  is approved, this indicates that the first food has an effect on the likelihood of consuming.

### 6.1. Data and data source

The data utilized in this study are secondary data from the Central Bureau of Statistics household surveys, dubbed Susenas (National Socioeconomic Survey), conducted in March 2020. The data used in this study are cross sectional data derived from the Central Bureau of Statistics's microdata (BPS). The data used to analyze food away from home demand are derived from SUSENAS data on food expenditure and consumption by households. SUSENAS is a BPS national survey activity that aims to collect complete socioeconomic demographic data. The data for this study were extracted from BPS's SUSENAS database. Income, household size, expenditure, and intake of animal food outside from home are all data extracted from SUSENAS. The commodities investigated in this study are food commodities consumed away from home as a source of protein, specifically processed beef, chicken, fish, eggs, and milk. Due to the absence of data on the actual price paid by households in SUSENAS, the unit price is determined by dividing spending by quantity. Table 1 shows food data away from home as a source of household protein based on Susenas data in 2020.

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**Table 1.** List of food far away from home sources of household protein.

| Code | Food groups  |
|------|--|
| 163  | Soup (included <i>Soto, gule, sop, rawon, cincang</i> )  |
| 165  | Satay, <i>tongseng</i>   |
| 166  | Noodles with meatballs, boiling noodles, and fried noodles ( <i>Mie bakso, mie rebus, mie goreng</i> )               |
| 169  | Cooked fish ( <i>Ikan matang</i> )   |
| 170  | Poultry/cooked meat (fried chicken, <i>rendang</i> , etc.) ( <i>Ayam/daging matang (ayam goreng, rendang, dsb)</i> ) |
| 171  | Meat that has been processed (sausage, nuggets, etc.)  |
| 172  | Porridge made with chicken (local term: <i>Bubur ayam</i> )  |
| 173  | <i>Siomay, batagor</i>   |

Source: Susenas, 2020 (Number of categorize in accordance with the questionnaire).

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## 3. Results and discussion

### 3.1. Food consumption patterns in Indonesian households

In Indonesia, households consume a variety of foods, including staples, supplemental foods, fruit, vegetables, and milk. This is as stated in the four healthy five perfect national nutrition food program. Rice serves as a carbohydrate supply, additional food serves as a protein source, fruits and vegetables serve as a source of minerals and other nutrients, and milk serves as a protein source. In Indonesia, additional food is frequently referred to as side dishes (a local term). Vegetables, various fried foods such as tofu, tempeh, chicken meat and preparations, beef meat and preparations, shrimp, eggs, sea fish, and land fish are included as side dishes. FAFH meals, such as those used in this study, frequently serve as supplemental food. The supplementary meal referred to include rice complements,

such as soto, sugar, soup, and rawon, as well as the second FAFH group, which includes satay and tongseng. When rice is consumed, the cooked fish group, the chicken/processed meat group, and the processed meat group consisting of nuggets, sausages, and so on all become complementary foods. Rice is a staple item in practically all Indonesian families. Almost all households in Indonesia, regardless of poverty level or income quintile, have consumed rice as a carbohydrate food source, in accordance with the 2100 kcal/capita/day calorie adequacy rate. Grain expenditure accounts for the highest share of household expenditure in Indonesia, accounting for 20% of total household expenditure. Food and beverages account for the second biggest share of household expenditure. FAFH protein foods are classified as prepared foods and beverages. However, only non-poor households consume enough protein to meet the national protein adequacy rate of 57 grams/capita/day in protein diet. Protein foods account for the third largest share of household expenditure, after cereals and ready-to-drink foods. Protein spending as a percentage of total expenditure grows as households become less impoverished. Alternatively, if we examine the share of expenditure at the five income quintile levels, we see that households increase protein expenditure in lockstep with household income growth.

### 3.2. Animal food Far Away Home consumption patterns in Indonesian

Food away from home, alternatively referred to as Food Far Away From Home (FAFH), is a source of food for some households in Indonesia. Additionally, FAFH adds to household food security. FAFH not only contributes to carbohydrate and fat diet adequacy, but also to protein adequacy in particular. FAFH has various advantages as a source of protein food for households, including its accessibility and affordability for households in the first, second, and third income quintiles. Table 2 shows the average monthly expenditure per capita in Indonesia over the last five years on processed food and beverage items (FAFH).

**Table 2.** Prepared food and beverages expenditure for households in Indonesia.

| Year | Prepared food and beverages expenditures<br>(IDR/capita/day) |         |                            |
|------|--|---------|----------------------------|
|      | Urban  | Rural   | Indonesia<br>(Urban+Rural) |
| 2015 | 145,416  | 73,905  | 109,968                    |
| 2016 | 177,775  | 87,296  | 133,834                    |
| 2017 | 236,425  | 13,165  | 187,899                    |
| 2018 | 237,325  | 131,149 | 189,223                    |
| 2019 | 264,362  | 147,710 | 212,933                    |
| 2020 | 257,945  | 141,710 | 206,736                    |

Source: Susenas data, BPS.

As illustrated in Table 2, the proportion of Indonesian household expenditure on prepared food and beverages is decreasing, both in rural and urban areas. The greatest decline occurred in urban regions, where it decreased from IDR 264,362 to IDR 257,945. This can be explained by the fact that 2020 is the year and the Covid 19 pandemic period runs from March to December 2020. In that year, a large-scale social restriction known as PSBB was implemented. PSBB was a government regulation on a local, regional, and national level that prohibited people from leaving their homes. PSBB is applied not once, but numerous times, depending on the scenario and circumstances of covid 19. Field findings indicate that PSBB actually increases online transactions, including prepared food and beverages, whereas BPS research indicates that food and beverage spending is declining. Online purchases are made by households with a high level of technology literacy and a middle to upper income, while FAFH's animal foods are primarily comprised of foods that are rarely traded online. As a result, the share of FAFH animal feeding expenses decreased throughout the covid 19 pandemic.





The following details the influence of each animal food consumed Far Away From Home (FAFH) on raising or lowering FAFH consumption in Indonesia:

1. Soup (included soto, gule, sop, rawon, cincang)

Soto, gule, soup, and rawon are all frequently enjoyed as a side dish to breakfast, lunch, or dinner. This dish is extremely popular, particularly in Javanese society, and is typically served as a side dish with white rice. Soto is a dish with gravy, which may or may not contain coconut milk. In general, Soto is classified as either Soto Ayam or Soto Beef. Additionally, soto ayam is classified into two types: kampung soto ayam and chicken soup lehom. Gule is a goat flesh vegetable. Soup is a vegetable that contains a range of vegetables such as carrots, potatoes, cabbage, and beans, but also contains sliced beef or chicken. While rawon is a meal that is primarily composed of beef. The data analysis revealed that increasing the prices of soto, gule, soup, and rawon increased the possibility to consume FAFH animal food. Alternatively, an increase in the price of soto, gule, soup, and rawon stimulates consumption. This contradicts the demand hypothesis, which states that a rise in price reduces consumption. While the Probit regression coefficient is positive, it is quite modest.

2. Satay, tongseng

Satay is a Indonesian dish that is typically cooked with chicken or beef. If made using chicken meat, it is referred to as chicken satay; if made with goat meat, it is referred to as goat satay. Apart from chicken and goat satay, there is also beef satay, which is frequently referred to as satay komoh (a local term). Komoh satay is frequently more expensive than chicken or goat satay. Meanwhile, tongseng is a dietary supplement. Satay and tongseng enhanced the likelihood of drinking FAFH, according to data analysis. Sate and tongseng are high in animal protein because they are not treated with flour and are derived directly from beef or mutton. This cuisine is extremely delectable for lovers of goat foods. Because it feels so one-of-a-kind. The increase in the price of satay and tongseng expands the market for FAFH animal feed.

3. Noodles with meatballs, boiling noodles, and fried noodles (Mie bakso, mie rebus, mie goreng)

Mie bakso is a noodle and meatball dish. Meatballs are a circular meal cooked with a variety of flours, spices, and beef. While meatball noodle is a dish made with noodles and minced chicken. Meatball noodles and chicken noodles are frequently consumed as snacks or as an accompaniment to other foods. This meatball noodle dish is made with beef and chicken noodles, as well as aged chicken. Thus, these meatball and chicken noodles provide as a source of protein for Indonesian homes. These two dishes both feature beef but are rarely served with rice. These two forms of food are universally adored. The increase in the price of meatball and chicken noodles has resulted in an increase in household consumption of FAFH in Indonesia. A significance of less than 0.01 and a positive Tobit regression coefficient imply this. The coefficient of tobit regression is really modest. It is possible to deduce that the increase in the price of meatball and chicken noodles has a minimal effect on household consumption of meatball and chicken noodles. In other words, despite rising prices for meatball and chicken noodles, households continue to consume these two types of meals.

4. Cooked fish (local term: ikan matang)

Cooked fish is a type of meal produced from fish that has been cooked with specific spices. Generally, cooked fish is taken as a side dish to rice. If rice is a carbohydrate source, cooked fish is a protein source. The combination of these two types of food is also a popular breakfast, lunch, and dinner option in Indonesian households. Cooked fish is an animal protein rich side dish. The increase in the price of fried fish expands the market for animal food consumed away from home. The data analysis results reveal that the importance of grilled fish is less than 0.01. The Tobit coefficient of regression is really modest. Although it is a minor component, this product also adds to Indonesian households' protein consumption sufficiency.

#### 5. Poultry/cooked meat (fried chicken, rendang, etc.). (local term: ayam goreng, rendang, ect.)

Chicken or cooked meat is a dish made using chicken, beef, or mutton that has been marinated in a variety of spices. Generally, chicken or cooked meat is consumed alongside staple foods such as rice, corn rice, ampok rice, or tiwul rice. In Indonesia, the primary food is carbohydrate-rich meals. Nasi is a type of white rice that has been cooked. Nasi ampok is corn rice with smaller grains than regular corn rice grains. Maize rice is a mixture of white rice and little grains of corn. Nasi tiwul is made using white rice and tiwul. All of this rice is consumed as a staple diet along with cooked fish, poultry, or beef. In comparison to other continents, European countries consume carbs through bread, wheat, and other grains rather than rice. Chicken or cooked meat is also critical for increasing animal food consumption away from home. Additionally, this product serves as a source of animal protein for Indonesian households. The increase in commodity prices had a negligible effect on the consumption of animal food FAFH.

#### 6. Meat that has been processed (sausage, nuggets, etc.)

Processed meat is a widely popular food item among children, adolescents, and adults in Indonesia. This cuisine is extremely simple to prepare, inexpensive, and can be enjoyed straight as a supplement to rice or as a snack or snack. This dish is created with flour and beef or chicken. If the nuggets are premium, the beef or chicken is 100% authentic. However, if the quality is moderate, the beef or chicken is frequently insignificant or even contains beef or chicken extract. Because it comprises beef or chicken, processed meat in the shape of nuggets or sausages is also a source of protein for homes in Indonesia. Nuggets or sausages also dramatically enhanced the likelihood of ingesting animal products away from home, according to data analysis. Despite increased costs, Indonesian households continue to consume processed meat.

#### 7. Porridge made with chicken (local term: Bubur ayam)

Chicken porridge is a rice-based dish that is cooked in extra water to make it thinner, more delicate, and more flavorful than white rice. Porridge is frequently served with chicken mince. This chicken porridge is also a source of animal protein due to the chicken flesh. In Indonesia, households frequently have this chicken porridge for breakfast. Chicken porridge is sold in both little stalls along the side of the road and huge restaurants, as this dish is enjoyed by all ages, including infants, children, and adults. Indeed, when people are ill or have stomach problems, this chicken porridge is frequently substituted for white rice as a main diet. Chicken porridge is also a major factor in raising animal food consumption away from home, despite the fact that Tobit's regression coefficient is tiny. The increase in the price of chicken porridge can be viewed as an increase in the likelihood of consuming this FAFH animal food.

#### 8. Batagor, siomay

Siomay and batagor are traditional cuisines from West Java. Siomay is a dish composed of a variety of ingredients, including potatoes, cabbage, bitter melon, tofu, eggs, and the dumplings themselves, which are made of wheat and mackerel. Siomay is boiled, but batagor is fried. Batagor is a fried delicacy made from wheat flour and different spices. Consumption of dumplings and batagor, coated with peanut sauce and a variety of specific dumpling and batagor spices. These two commodities contain mackerel or eggs and hence provide a source of animal protein for Indonesian households. This cuisine is also highly popular among young people as snacks or as an accompaniment to other foods, such as breakfast, lunch, or dinner. Dumplings and batagor also played a substantial role in raising animal protein consumption away from home, according to data analysis.

#### 9. Household size (the number of household members)

The model developed in this study also incorporates socioeconomic characteristics pertaining to households, specifically the number of family members and household income. When the household income variable is entered, it is determined that it is not significant and is therefore omitted from the

model. After repeating the data analysis, a significantly improved model was obtained, as evidenced by a greater coefficient of determination. The more household members there are, the more the household need. If a household purchases food, however, a higher income is necessary, such that the number of household members is inversely related to the chance of making a food purchase decision. This is consistent with data analysis findings indicating the number of household members has a substantial impact on the decision to consume FAFH animal products. The increase in household members results in a decrease in the consumption of FAFH animal food. It is possible to explain that increasing the number of household members increases the amount of animal food consumed, but if this increase is not accompanied by an increase in household income, the household's purchasing power decreases, reducing the household's ability to consume FAFH animal food.

#### 4. Conclusion

The findings indicated that all of FAFH's animal foods had a significant impact on the consumption patterns of other FAFH animal foods. The variable household size exhibits a negative connection. This suggests that as the number of household members increases, the likelihood of consuming FAFH animal food decreases. The findings of this study demonstrate that FAFH animal food adds to the protein sufficiency of Indonesian households. This finding confirms that all food away from home contains animal protein as a source of protein for households in Indonesia.

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