



Protein Consumption in Communities Affected by Stunting in Daerah Istimewa Yogyakarta, Indonesia

Dwi Aulia Puspitaningrum¹, Khoirul Hikmah², Muhammad Maulana Azimatun Nur³, Aditya Ananta Putra¹, Ravid Ikhsan T.J¹, Mukminan Arief H¹, and Vista Nur Defiana¹

¹Department of Agribusiness Faculty of Agriculture, Universitas Pembangunan Nasional Veteran, Yogyakarta

²Department of Management, Faculty of Economic and Business, Universitas Pembangunan Nasional Veteran, Yogyakarta

³Department of Chemical Engineering, Faculty of Industrial Engineering Universitas Pembangunan Nasional Veteran, Yogyakarta

Jl. SWK 104, Condongcatur, Depok District, Sleman Regency, Yogyakarta, Indonesia
dwi.aulia@upnyk.ac.id

ARTICLE INFO

Article History :

Submitted 30 April 2023

Revised 12 October 2023

Accepted 15 December 2023

Keywords :

consumption

protein

related Factors

stunting

How to cite :

Puspitaningrum.D.A., Hikmah, K., Nur, M.M.A., Putra, A.A., Trijuna, R.I., Hidayadi, M.A., and Defiana, V.N.2023. Protein Consumption in Communities Affected by Stunting in Daerah Istimewa Yogyakarta, Indonesia. *Agro Ekonomi* 34 (2), 148-165

ABSTRACT

Inadequate protein consumption is characterized by a low intake of energy and proteinous foods, leading to stunted growth and negative public health outcomes. Therefore, this study aims to determine the factors influencing consumer behavior in purchasing animal and vegetable proteinous foods in Daerah Istimewa Yogyakarta (DIY), as well as to analyze the relationship between protein consumption and these influential factors. A quantitative design was used along with a survey approach, involving both primary and secondary data. The study participants were selected using a non-probability sampling method. Data were collected through observations, interviews, literature studies, and documentations. Multiple linear regression analysis, including covariate tests, was then used for analysis. The results of the research showed that household income, the income of women, the number of family members, the number of children under the age of five, the age of women, and the distance from the house to the nearest shop/minimarket had a significant impact on protein consumption among households with stunted children in DIY. Furthermore, Gunung Kidul, Kulon Progo, and Sleman districts had protein consumption of <1 million Indonesian Rupiah (IDR), while Bantul Regency and Yogyakarta Municipality were >1 million IDR.

INTRODUCTION

Protein, an essential nutrient, intricately orchestrates numerous vital life processes. Comprising a spectrum of amino acids, some of which are indispensable as they elude endogenous synthesis, its acquisition

via dietary sources is imperative. The corpus of research underscores its pivotal role in cellular proliferation, renovation, and rejuvenation within the human framework (Maulidiana & Sutjiati, 2021). The indispensability of a robust intake manifests in the

optimal panorama of growth and maturation. Moreover, protein underpins the genesis of nascent tissues while also stewarding the perpetuity of extant substrates. Inadequacies herein have been correlated with malnutrition, an affliction that casts a long shadow over human resource viability (Umaroh & Vinantia, 2018). A parallel strand of significance is interwoven with protein's contribution to the architectural scaffold of bones, thereby intimately influencing skeletal advancement. This nutrient further exerts a hand in modulating the exudation and efficacy of the osteotropic hormone IGF-I, thereby imprinting upon the genetic latitude for attaining zenith bone mass (Sari et al., 2016).

In Indonesia, insufficient intake of protein coupled with shifts in dietary patterns has emerged as a prominent catalyst for malnutrition. Despite persistent endeavors spanning the last two decades, a distressing statistic persists: a substantial one-third of children below the age of five continue to grapple with malnourishment, presenting as stunting, wasting, or even exhibiting overweight conditions. Concurrently, the remaining two-thirds teeter on the precipice of malnourishment and veiled undernourishment due to suboptimal dietary consumption. Evidently, a staggering cohort of Indonesian children and adolescents bear the brunt of stunting as a consequence of malnutrition's grip (Suryana & Azis, 2023) Of paramount

concern, the insufficiency of protein uptake during the critical growth phase of toddlers can precipitate developmental lags and the onset of stunting. A cogent antecedent inquiry unveiled a direct correlation between the adequacy of protein provisioning and the incidence of stunted growth (Amalia et al., 2022).

Stunting, a condition colloquially denoted as reduced stature among toddlers, encompasses a state of growth faltering characterized by chronic malnutrition, culminating in an age-incongruent diminution in physical stature. This predicament holds pivotal import, as it intertwines intricately with the human resource quotient. Beyond malnutrition, its etiology extends to encompass recurrent infections within the formative period of initial 1,000 days of existence. The ramifications of stunting are far-reaching, with implications encompassing the constriction of both physical maturation and cognitive advancement, thereby exerting a prospective influence upon intellectual acumen and eventual productivity (Mozin & Husain, 2021) Furthermore, empirical evidence lends credence to the assertion that stunted individuals often endure a 7% decrement in optimal cognitive progression compared to their non-stunted counterparts. This decrement's amplitude is modulated by a confluence of variables including geographic locale, educational stratum, and familial knowledge reservoirs (Ekholuenetale et al., 2020) The trajectory of stunted toddlers is

fraught with elevated susceptibility to mortality, morbidity, alongside suboptimal cognitive and motor unfolding (Vaivada et al., 2020).

Mulyaningsih et al. (2021) underscore that the probability of childhood stunting manifests a complex interplay contingent upon factors spanning the individual child, household dynamics, provincial parameters, and subdistrict delineations. Within the mosaic of child-level covariates encapsulated by the model, dimensions such as dietary patterns, neonatal weight, infection history, and gender emerge as conspicuous risk contributors. Simultaneously, the socioeconomic status of the household and parental educational attainments constitute salient household-level covariates concomitantly fostering heightened susceptibility to this condition. The domicile within communities devoid of access to water, sanitation, and hygiene amplifies the vulnerability to stunting.

The Indonesian Toddler Nutrition Status Survey or Studi Status Gizi Balita di Indonesia (SSGBI) of 2021 espouses the prevalence of stunting at 24.4%, impacting an approximate cohort of 5.33 million children under five. Notably, although a reduction from the 2020 incidence of 26.92% is evident, this status quo remains a grave conundrum meriting redressal in the context of nurturing competitive human resources. Significantly, the prevailing stunting rate in Indonesia transcends the threshold of tolerance delineated by the World Health Organization

(WHO), stipulating a ceiling of 20%. Addressing this predicament resonates as an exigent mandate imperative for human resource optimization. Household consumption behavior, including consumption of protein-rich food sources, is influenced by various factors. These factors include prices, income, and household preferences, which vary based on the area of residence, the education level of the housewife, the number of family members, and cultural habits (Vaivada et al., 2020). Furthermore, consumer behavior is often affected by environmental factors, such as culture, social class, family, and situation, as well as individual differences in motivation, knowledge, attitudes, personality, lifestyle, and demographics (Kodish et al., 2015). Consumption of protein in a household can be influenced by the psychological process of information processing, learning, and attitude, as well as behavior change. Income has also been reported to be a crucial factor in measuring the ability of the household to purchase essential elements related to improving child nutrition (Vaivada et al., 2020). Families with high income are more likely to consume a variety of protein-rich foods (Annisa et al., 2022).

Research on stunting, as examined through the adequacy of both animal and plant protein intake, is not well known so far, particularly when approached through an integrated lens that considers the causal factors and potential solutions to the problem. Previous research has primarily focused on food access and

household food security (Sitompul et al., 2023) food access and its relationship with the development of small businesses , and household protein consumption in rural settings ((Umaroh & Vinantia, 2018) . To the best of our knowledge, no prior studies have investigated households impacted by stunting in Yogyakarta. The novelty of this research is to understand the relationship of the protein access on the stunted children in Daerah Istimewa Yogyakarta (DIY). To achieve balanced nutrition and prevent stunting, it is essential to promote local food production in DIY. Despite the significant effort to reduce the incidence of stunted growth, with the prevalence falling from 21% percent in 2019 to 17.3 percent in 2021, access to adequate nutrition for pregnant women and toddlers, especially those from lower-income households, remains a challenge. Therefore, this study aims to determine the factors influencing consumer behavior in purchasing animal and plant protein foods in DIY, as well as to analyze the relationship between protein consumption and these influential factors. The results are expected to help in providing alternative solutions to reduce the prevalence of stunting in DIY.

METHODS

The study location was determined based on certain considerations in line with the objectives. The aimed of the research to Analyze each district in DIY because we consideration that every location having different in

socio-economic and lifestyle related factors to consume of Protein in Stunted Communities. Furthermore, the procedures were carried out in the Special Province of Yogyakarta (DIY), covering 5 districts/cities: Kabupaten Sleman, Bantul, Gunung kidul, Kulonprogo dan Yogyakarta city. The determination of the sample size in this study was based on previous study (Huriah et al., 2019) . This study employed nine variables, consisting of seven independent variables and two dummy independent variables. Therefore, the minimum required sample size is $9 \times 10 = 90$ respondents. For Multivariate data analysis Include regression analysis, the sample size should be 10 times greater than the number of variables (Roscoe, 1975) . In this research, a sample size of 150 respondents was employed, considering the study's span across five districts and cities. Each district and city contributed 30 respondents, selected through a random sampling method using a simple random sampling technique involving a lottery system by Spiner Api.

Some areas were selected due to their stunting rate exceeding 10%, as reported in the SSGBI, showing the need to provide alternative solutions to reduce the rates. This study employed descriptive quantitative methods, which were in line with concrete, objective, measurable, rational, and systematic scientific principles, using numbers and statistics for analysis. The descriptive method was used to explain, predict, and control a symptom by systematically describing and creating an

accurate picture of the facts, nature, and relationships between the phenomena studied. The procedure carried out included field surveys and data collection via questionnaires. Laboratory tests were carried out for data processing at the Statistics laboratory and Department of Agribusiness, Faculty of Agriculture, UPN Veteran Yogyakarta. The field survey was performed through direct observation of the respondent's condition and all the data obtained were recorded. Data collection was carried out using triangulation techniques, which involved semi-structural interviews with observed respondents, forum group discussions (FGD), direct observation in the field, and statistical laboratory tests.

Multiple Linear Regression

This study was focused on protein consumption among communities and families affected by stunting, rather than their staple food intake. This is due to the consideration that the primary cause of stunting is a deficiency in protein, which serves as a crucial building block for the body. Setyani's research in 2021 found that the lowest protein intake in the stunted group was 68.7%, whereas in the non-stunted group, it was 90.1%. There are three articles utilizing a cross-sectional research design and seven articles using a case-control design, all of which report prevalence rates exceeding 20% (high). Nine articles indicate a significant relationship between protein intake and the occurrence of stunting, with a

minimum protein intake sufficiency level of 90%. Therefore, this research focuses specifically on protein consumption within families affected by stunting and employs a Multiple Linear Regression approach for analysis.

Multiple regression analysis was carried out to analyze the factors influencing consumer behavior in purchasing animal and vegetable protein foods in DIY, as shown below:

$$Y_i = b_0 + b_1 X_1 + b_2 X_2 + b_3 X_3 + b_4 X_4 + b_5 X_5 + b_6 X_6 + b_7 X_7 + b_8 D_1 + b_9 D_2 + \mu$$

Information:

Y_i = Consumption of protein food at the i th household level (Rp/capita/year)

i = 1, 2, ..., n

b_0 = Constant

b_i = The coefficient of the i -th variable

X_1 = Household income (Rp/year)

X_2 = Women's income (Rp/year)

X_3 = Female age (years)

X_4 = Women's education (years)

X_5 = Number of household members (people)

D_1 = Dummy information

$D_1 = 0$, information obtained from print media

$D_1 = 1$, information obtained from electronic media

D_2 = Number of children under five in the family (Dummy)

$D_2 = 0$, No children under five in the family

$D_2 = 1$, Any Children under five in the family

X_6 = Distance from house to the nearest market

X_7 = Distance from house to the

nearest shop/minimarket/store
 μ = Error rate

children under five years old intake these model to approach of the research.

Factor Analysis

The relationship between animal and Plant protein food consumption and stunting conditions in DIY was analyzed using factor analysis, as shown below:

$$F_m = \ell_{m1} X_1 + \ell_{m2} X_2 + \dots + \ell_{mp} X_p$$

Condition, $m \leq p$
 If written in matrix form is:
 $F = \ell X$,

where:

F= Factor principal components (unobservable)

X = Variables studied (observable)

ℓ = Weight of linear combination (loading)

Several factors have been identified as influencing Consume of Protein of communities stunting in DIY, that showed in Factor principal components (F).

Variables studied had observable to analysis of the factor influencing of the principal Component. Other factors include household income, Maternal characteristics, the appropriateness of giving complementary feeding of

RESULT AND DISCUSSION

Protein Consumption in the Special Region of Yogyakarta

The pivotal role of protein consumption in facilitating the construction of new tissue and the preservation of existing tissue within the human body underscores its indispensability. Notably, the quantum required by children is comparatively elevated in relation to that mandated for adults or the elderly demographic stratum. It is axiomatic that human sustenance traverses a multifarious repertoire of dietary constituents to satiate the imperatives of protein provision, encompassing both animal and vegetable sources.

Consumption of Animal Protein

The data presented in Table 1 illustrates that within Sleman Regency, the average respondent exhibited a predilection for fish consumption, while in Gunungkidul Regency, Kulonprogo Regency, and Yogyakarta

Table 1. Animal Protein Consumption Data in Each Regency/City in the Special Region of Yogyakarta (rupiah/month/household)

Animal Protein	Sleman	Gunungkidul	Kulonprogo	Bantul	Yogyakarta
Milk	145,733	125,000	152,933	140,783	142,133
Chicken Meat	142,750	91,233	79,133	220,973	89,867
Beef	25,567	56,467	30,867	131,133	37,000
Fish	147,883	95,933	65,600	109,953	57,633
Egg	54,820	52,050	50,300	28,517	56,240

Source: Primary Data Analysis 2022

Table 2. Plant Protein Consumption Data in Each Regency/City in the Special Region of Yogyakarta (rupiah/month/household)

Vegetable Protein	Sleman	Gunungkidul	Kulonprogo	Bantul	Yogyakarta
Tofu	36,200	36,333	27,640	23,600	33,067
Tempeh	47,667	39,600	42,133	45,933	45,067
Nuts	11,467	8,980	12,227	10,027	2,360
Plant Milk	10,633	21,933	6,067	11,667	30,833

Source: Primary Data Analysis 2022

City, animal milk emerged as a prevalent source of protein. In parallel, within Bantul Regency, the normative protein source embraced by the average respondent was chicken meat.

Consumption of Plant Protein

Based on the data from the five districts in Yogyakarta, tempeh was the most commonly consumed source

of vegetable protein among the respondents due to its availability and easy accessibility, as shown in Table 2. Furthermore, it was relatively cheaper, making it a more affordable option for the majority of people.

Lailiyah et al. (2021) also stated that tempeh was the dominant source and it was consumed daily. Legumes and their processed products were the main contributors

Table 3. Regression Analysis of Protein Consumption in DIY

Model	Nonstandard coefficient B	Sig.t
(Constant)	935,584.478	0.000
X1 (Household Income)	0.047	0.000*
X2 (Women's Income)	0.155	0.000*
X3 (Women's Age)	-5,593.986	0.007*
X4 (Women's Education)	6,456.274	0.314
X5 (Number of Family Members)	83,323.532	0.000*
d1 (Number of Toddlers)	-311,869.012	0.000*
d2 (Information Dummy)	39,172.350	0.378
x6 (Distance from house to the nearest traditional market)	18,506.605	0.148
x7 (Distance from house to the nearest shop/minimarket/store)	-34,359.697	0.001*
Adj R ² = 0.645		
Sig.F = 0.000		

Source: Primary Data Analysis 2022

to vegetable protein intake. Based on the relatively high cost of animals, it was not affordable for some people, leading to a dependence on vegetable protein products (Swarinastiti et al., 2018).

Analysis of Factors Affecting Protein Consumption in Households with DIY Stunting Potential

Table 3 shows the results of the regression analysis of protein consumption in the Special Region of Yogyakarta (DIY). The analysis revealed that several factors significantly influenced protein consumption in the province. These factors include household income (0.000), women's income (0.000), number of family members (0.000), number of children under five (0.000), age of women (0.007), and distance of the house to the nearest shop/minimarket (0.001). The significance of t values for all six variables was less than the alpha level of 0.05, indicating that they had a significant impact. These findings suggested that efforts to increase the intake of this nutrient as well as prevent stunting in the region must consider these significant factors, especially household income and women's income. The regression analysis results showed that the selected variables significantly influenced protein consumption, as indicated by the significance value of the F test, namely $0.000 < \alpha < 0.05$. Furthermore, the nine variables had a 64.5% effect on the intake of this nutrient, which was indicated by the

Adjusted R^2 value of 0.645. The remaining 35.5% was influenced by other factors that were not included in this model.

The results showed household income, women's income, women's age, number of family members, dummy toddlers, and distance from home to the nearest shop/shop/mini market, significantly affected protein consumption in families and homes with stunting potential. Supariasa & Purwaningsih (2019) reported that one of the main factors causing stunting was household income. A low income could affect the ability of the family to purchase food needs. Insufficient consumption of nutrition in toddlers had been shown to be one of the causes of stunted growth. Women's age also had a significant influence on the potential for stunting through protein consumption. (Sani et al., 2020). stated that women played a major role in the occurrence of this condition. Furthermore, the occurrence of pregnancy at an age of <20 years or >35 years posed the risk for complications. These pregnancies could lead to intrauterine growth restriction, premature birth, infant death, and poor child growth. The number of toddlers in a family had also been reported to be a factor affecting protein consumption and potential stunting among children. Families with many children, especially those with less economic conditions, could not provide adequate attention and food to all the toddlers (Siswati et al., 2020).

In households within the Yogyakarta Special Region (DIY) that are susceptible to stunting, there exists

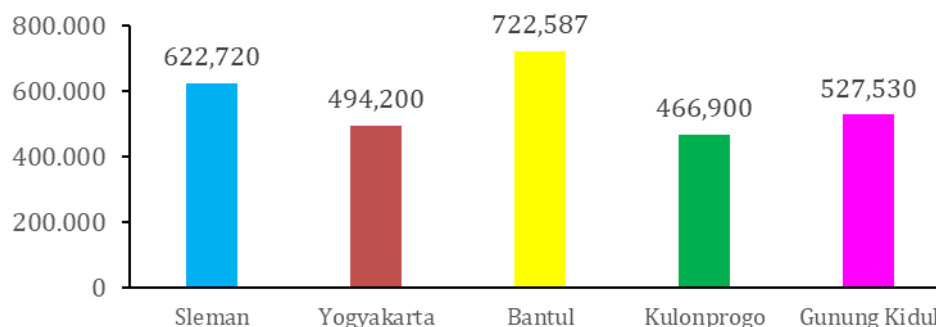


Figure 1. District/City Protein Consumption Diagram in DIY
Source: Primary Data Analysis 2022

a notable divergence in the consumption of animal and vegetable proteins. This disparity is particularly evident across different districts, as illustrated in Figure 1. The data indicates that the highest protein intake occurs in Bantul Regency, succeeded by Sleman, Gunungkidul, Yogyakarta, and Kulonprogo. These variations are attributed to a spectrum of factors within the population, encompassing economic status, environmental influences, and other pertinent variables. The distinct circumstances prevailing in each district contribute to the diversity in protein consumption levels. Consequently, tailored strategies for averting stunting must be devised, accounting for the unique conditions present in every district within DIY.

The five regencies/municipalities in DIY, particularly Kulon Progo, had low protein consumption, which could be attributed to various factors highlighted in Table 3, as well as environmental conditions, topography, and geography. Furthermore, Kulon Progo had a mountainous area and was quite

remote, making it challenging for households to access food. These conditions led to limited food diversity and reliance on carbohydrates in the area. Socio-demographic and economic factors, such as the head of the household, their age and education level, number of household members, area of residence status, and household per capita income, could affect the diversity of household food intake (Dewanti, 2020).

The low protein intake in families with stunting potential also significantly contributed to the presence of stunted growth in DIY (Siringoringo et al., 2020). This study demonstrated that the risk of stunting was 6.495 times higher in toddlers with low consumption, highlighting the importance of increasing protein intake, particularly among vulnerable populations in the region.

Analysis Factors Protein Consumption in Household Analysis of Protein Consumption Factors in households with Potential for Stunting in DIY

The existence of multicollinear-

Table 4. KMO and Bartlett's Test

KMO Measure of Sampling Adequacy.		.518
Bartlett's Test of Sphericity	Approx. Chi-Square	126.433
	Df	21
	Sig.	.000

Source: Primary Data Analysis 2022

ty could be explained using Bartlett's Test of Sphericity, partial correlation, and Kaiser Meyer-Oklin (KMO) Measure of Sampling Adequacy, which were used to evaluate the variables as a whole.

The result from KMO and Bartlett's Test showed a sphericity coefficient of 126.433 with a significance of 0.000. This indicated that the correlation between the variables was significant at the 0.05 level. Furthermore, KMO Measure of Sampling Adequacy test showed a value of 0.518, indicating that the sample adequacy measure was satisfactory, as shown in Table 4.

Diet plays a crucial role in determining the nutritional status of individuals and their families. Factors such as economic status, availability and accessibility of food, cultural beliefs and practices, and knowledge about nutrition all contribute to the dietary choices made by families,

which in turn can impact their nutrition . (Lin et al., 2011) Additionally, the level of protein consumption in a family can also significantly affect their nutrition. Research has shown that protein intake is strongly correlated with family nutrition. Higher protein consumption is associated with improved nutritional status, including better growth and development in children.

Communalities Test

The concept of communality pertains to the extent to which the variance exhibited by a given variable can be elucidated by the latent or underlying factors present within a dataset. This metric is quantified within a range of 0.0 to 1.0, whereby a value of 0.0 signifies an absence of any discernible correlation between the variable in question and the latent factors. Conversely, a communality

Table 5. Communality Test

	Communalities	
	Initial	Extraction
x1	1.000	.551
x2	1.000	.642
x3	1.000	.494
x4	1.000	.733
x5	1.000	.579
x6	1.000	.784
x7	1.000	.765

Extraction Method: Principal Component Analysis.

Source: Primary Data Analysis 2022

value of 1.0 signifies that the entire spectrum of variance displayed by the variables is entirely attributable to a set of shared underlying factors.

In essence, communality serves as a means to gauge the degree of influence that latent factors exert on the variability observed in a specific variable. This measure allows researchers to comprehend the extent to which a variable's behavior can be ascribed to hidden factors, offering insights into the interplay between these latent ascribed to hidden factors, offering insight into the interplay between these latent influences and the observed data patterns. By calculating and interpreting communality values, researchers can gain a deeper understanding of the relationships that contribute to the overall variance exhibited by the variables under investigation. The communality of the study variables ranged from 0.494 to

that the variable could be reduced into several factors, as shown in Table 5.

Principle Component Test

The principal component analysis (PCA) was employed as a technique to condense the original set of 7 study variables into a more concise representation defined by several underlying factors. This dimensionality reduction aimed to capture the essential information within the dataset while minimizing redundancy. The criteria chosen for extracting these factors was the Latent Root Criterion, which involves identifying factors that possess eigenvalues greater than 1, indicative of their significance in explaining the data's variance.

Upon executing the PCA, the outcome was the identification of 3 distinct factors as evident from the results presented in Table 6. These factors collectively accounted

Table 6. Total Variance Analysis

Com- ponen t	Total Variance Explained								
	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Vari- ance	Cumula- tive %	Total	% of Variance	Cumula- tive %	Total	% of Variance	Cumula- tive %
1	1.735	24.792	24.792	1.735	24.792	24.792	1.641	23.448	23.448
2	1.434	20.490	45.281	1.434	20.490	45.281	1.513	21.609	45.057
3	1.377	19.678	64.959	1.377	19.678	64.959	1.393	19.902	64.959
4	.822	11.736	76.696						
5	.679	9.695	86.391						
6	.560	8.004	94.395						
7	.392	5.605	100.000						

Extraction Method: Principal Component Analysis.

Source: Primary Data Analysis 2022

for a substantial portion, specifically 76.96%, of the total variability inherent in the dataset. To provide a more detailed breakdown, the first factor accounted for 24.792% of the variance, the second factor explained 20.490% of the variance, and the third factor contributed to 19.678% of the total variance.

In essence, this PCA-driven reduction analysis effectively summarized the original dataset's complexity into a more interpretable framework defined by a handful of prominent factors. These factors, with their corresponding eigenvalues and variances, encapsulated the major patterns and trends within the initial set of variables, thereby offering a consolidated perspective on the data's underlying structure.

Factor Rotation

Factor rotation was carried out to obtain solutions that were theoretically and practically

meaningful, thereby providing an explicit interpretation of the factors obtained. Furthermore, it could be used to improve interpretation by reducing the dualism in the solutions. This method was carried out using Varimax due to its ability to maximize variance.

Based on Table 7, factor 1 consisted of Distance to the Traditional Market (X6) and Distance to the Store/Minimarket/Warung (X7), which could be referred to as the shopping location factor. Furthermore, factor 2 comprised variables of Household Income (X1), Age of the Woman (X3), and Number of Family Members (X5), and could be referred to as the family needs factor. The results also showed that factor 3 consisted of variables of Women's Income (X2), and Women's Education (X4), and was further considered the Women's factor. The distance from the house to the nearest minimarket or store (X7) shows a significant negative correlation. This phenomenon can be attributed to the

Table 7. Factor Rotation Varimax Method

	Component		
	1	2	3
x1	.104	.672	.297
x2	-.023	.217	.771
x3	-.296	.625	-.127
x4	-.048	-.222	.825
x5	.037	.756	-.079
x6	.884	-.052	.014
x7	.870	-.002	-.086

Extraction Method: Principal Component Analysis.
 Rotation Method: Varimax with Kaiser Normalization.
 a. Rotation converged in 4 iterations.

Source: Primary Data Analysis 2022

fact that, for the community, proximity to the residence influences the ease of food access based on location. However, it exerts a negative influence because even though the distance is not a hindrance, the purchasing power of the family regarding food items, especially protein-rich foods available at that location, is not their preferred choice. Nevertheless, due to the closest available option being the nearest warung, minimarket, or store, they rely on purchasing their goods from these establishments, thus rendering the relationship significant. Previous research reported that the presence of a market did not affect the rise in HAZ (height-for-age Z score) in children (Bakhtsiyarava & Grace, 2021) The absence of a connection between food diversity and proximity to the market could clarify the restricted access to food and suboptimal utilization. Even though animal-derived food resources were accessible at the market, they were not being consumed. Consequently, the distance to the market is not

linked to malnutrition (Adachi & Urabe, 2021)

Table 8 presents a concise overview of the descriptive analysis conducted on the protein consumption variable (Y) within the level II regions situated across five distinct areas within Yogyakarta. The outcomes of this analysis reveal that the mean protein consumption (Y) across these areas is computed at 1,007,433 units. Moreover, a breakdown of the average intake in the regions portrays the following values: Bantul, Gunung Kidul, Kulon Progo, Sleman Regencies, and Yogyakarta Municipality exhibit average intakes of 1,148,216, 953,148, 906,495, 974,875, and 1,054,481 units respectively.

Drawing insights from these findings, it becomes apparent that three regions, specifically Gunung Kidul, Kulon Progo, and Sleman districts, register protein consumption (Y) levels below one million units, while Bantul Regency and Yogyakarta Municipality showcase values surpassing the one million rupiah mark. It is recorded that household

Table 8. Analysis of Covariance Protein Consumption in DIY

Descriptive Statistics			
Dependent Variable: y			
District/City	Mean	Std. Deviation	N
Bantul	1,148,216.6667	297,304.72882	30
Gunung Kidul	953,148.6667	259,272.64519	30
Kulon Progo	906,495.0000	236,345.74263	30
Sleman	974,875.0000	187,306.77320	30
Kota Yogyakarta	1,054,481.1333	183,237.55543	30
Total	1,007,443.2933	248,629.54021	150

Source: Primary Data Analysis 2022

Table 9. Inter-District Covariance Analysis Test Results in DIY

Tests of Between-Subjects Effects						
Dependent Variable: y						
Source	Type III Sum of Squares	df	Mean Square	F	Sig.	
Corrected Model	1086865775218.296 ^a	4	271716443804.574	4.850	.001	
Intercept	152241298392346.900	1	152241298392346.900	2717.318	.000	
K	1086865775218.294	4	271716443804.574	4.850	.001	
Error	8123814816390.800	145	56026309078.557			
Total	161451978983956.000	150				
Corrected Total	9210680591609.096	149				

a. R Squared = .118 (Adjusted R Squared = .094)

Source: Primary Data Analysis 2022

income, women's income, number of family members, number of children under five, age of women, and distance from the house to the nearest shop/minimarket had a significant impact on protein consumption in households with stunting cases.

A comprehensive overview of the ANACOVA test outcomes is encapsulated within Table 9, which furnishes valuable insights into the statistical analysis conducted. Specifically, the F test conducted to evaluate the disparities in protein consumption (Y) across various level II regions yields a computed value of 4.850. Intriguingly, this computed F value is accompanied by a corresponding Sig. (Significance) value of 0.001, which significantly falls below the threshold of α (alpha) set at 0.05. The results of this statistical analysis hold significance. The small significance value of 0.001 (which is

less than 0.05) indicates a clear difference in protein consumption (Y) among the level II regions being studied. In simpler words, the data suggests that the differences in protein consumption across these regions are not random but are due to real disparities between them. This finding highlights the importance of investigating the factors behind these regional variations in protein consumption and emphasizes the need to adopt region-specific strategies when addressing dietary habits and nutrition-related matters. Previous study reported that the factors contributing to stunting prevalence revealed a correlation between the household's economic status and the incidence of stunting. Poor economic conditions impacted purchasing ability, access to nutritious food, and adequate healthcare services. The presence of numerous family members, including children aged 1–3 years, played a significant role in the occurrence of stunting. This is due to the larger family size affecting the availability and accessibility of quality food, resulting in

challenges in attaining sufficient nutrition and good health status (Titaley et al., 2019). Research conducted in Africa has revealed a noteworthy correlation: the simultaneous presence of stunting and wasting in children can lead to a substantial increase in childhood mortality, ranging from 5 to 11 times higher. It's rational to acknowledge that amino acids and protein lack viable substitutes due to their crucial role in the development of immune system proteins, brain function, body growth, and other essential physiological processes (Acevedo et al., 2017; Watts, 2019).

CONCLUSION AND RECOMMENDATION

This study showed that household income, women's income, number of family members, number of children under five, age of women, and distance from the house to the nearest shop/minimarket had a significant impact on protein consumption in households with stunting cases. Furthermore, the result of the research found that the districts of Gunung Kidul, Kulon Progo, and Sleman had protein intakes of <1 million IDR, while values >1 million IDR were obtained in Bantul Regency and Yogyakarta Municipality. Stunting is a prevalent issue in Indonesia, particularly among children under the age of five. Several factors have been identified as influencing family stunting in Indonesia. Household condition especially Maternal characteristics have been found to significantly influence the occurrence of stunting among children under five years old. The findings of this research can

serve as fundamental insights for shaping government operational approaches aimed at mitigating stunting in Yogyakarta. These strategies encompass the development of economical and accessible functional food options as a potential solution to address this problem. A pivotal determinant contributing to stunting is the economic status of households. Enhancing household income and overall welfare can be achieved through community empowerment initiatives targeting families affected by stunting. This holds particular significance, especially in a province led by a Sultan, with the potential to set an example for stunting prevention efforts in Indonesia, ultimately leading to improved living standards and well-being.

REFERENCES

- Acevedo, P., García Esteban, M. T., Lopez-Ejeda, N., Gómez, A., & Marrodán, M. D. (2017). Influence of malnutrition upon all-cause mortality among children in Swaziland. *Endocrinologia, Diabetes y Nutricion*, 64(4). <https://doi.org/10.1016/j.endinu.2017.01.008>
- Adachi, M., & Urabe, D. (2021). Diet diversity was limited in Malawi resulting in stunting despite availability of foods in markets. *Pediatrics International*, 63(3). <https://doi.org/10.1111/ped.14382>
- Amalia, R., Ade Lia Ramadani, & Lailatul Muniroh. (2022). Associations of Complementary Feeding Practice History and Protein Adequacy Level with

- Childhood Stunting in the Working Area of Puskesmas Bantaran in Probolinggo Regency. *Media Gizi Indonesia*, 17(3). <https://doi.org/10.20473/mgi.v17i3.310-319>
- Annisa, A., Saputri, B. G. D., Asmara, R., Fahriyah, F., & Hanani, N. (2022). Analysis of Household Income and Food Security of Watermelon Farmers During The Covid-19 Pandemic in Lamongan Regency. *Agro Ekonomi*, 33(2). <https://doi.org/10.22146/ae.76175>
- Bakhtsiyarava, M., & Grace, K. (2021). Agricultural production diversity and child nutrition in Ethiopia. *Food Security*, 13(0). <https://doi.org/10.1007/s12571-021-01173-9>
- Dewanti, S. (2020). Keragaman Konsumsi Pangan Rumah Tangga di Provinsi Jawa Tengah (Household dietary in Central Java Province). *Jurnal Kawistara*, 10(7). <https://doi.org/10.22146/kawistara.46787>
- Ekholuenetale, M., Barrow, A., Ekholuenetale, C. E., & Tudeme, G. (2020). Impact of stunting on early childhood cognitive development in Benin: evidence from Demographic and Health Survey. *Egyptian Pediatric Association Gazette*, 68(5). <https://doi.org/10.1186/s43054-020-00043-x>
- Huriah, T., Fitriami, E., Erviana, & Rahman, A. (2019). The Prevalence and Associated Factors of Stunting Children in Rural Area, Yogyakarta, Indonesia. *Proceedings of the Third International Conference on Sustainable Innovation 2019 – Health Science and Nursing (IcoSIHSN 2019)*. Atlantis Press. <https://doi.org/10.2991/icosihsn-19.2019.30>
- Kodish, S., Aburto, N., Hambayi, M. N., Kennedy, C., & Gittelsohn, J. (2015). Identifying the sociocultural barriers and facilitating factors to nutrition-related behavior change: Formative research for a stunting prevention program in Ntchisi, Malawi. *Food and Nutrition Bulletin*, 36(6). <https://doi.org/10.1177/0379572115586784>
- Lailiyah, N., Ariestiningih, E. S., & Supriatiningrum, D. N. (2021). Hubungan pengetahuan ibu dan pola pemberian makan dengan kejadian stunting pada balita (2-5 tahun)(Correlation between Mother's Knowledge and Feeding Pattern with stunting in Toddlers aged 2-5. *Ghidza Media Jurnal*, 3(1). <https://doi.org/10.30587/ghidzamediajurnal.v3i1.3086>
- Lin, Y., Bolca, S., Vandevijvere, S., Van Oyen, H., Van Camp, J., De Backer, G., Foo, L. H., De Henauw, S., & Huybrechts, I. (2011). Dietary sources of animal and plant protein intake among Flemish preschool children and the association with socio-economic and lifestyle-related factors. *Nutrition Journal*, 10(5). <https://doi.org/10.1186/1475-2891-10-97>
- Maulidiana, A. R., & Sutjiati, E. (2021). Low intake of essential amino acids and other risk factors of stunting among under-five children in Malang City, East Java, Indonesia *Journal of Public Health Research*, 10(6). <https://doi.org/10.4081/jphr.2021.2161>
- Mozin, S. Y., & Husain, S. P. (2021). Strategi Peningkatan

- Kemampuan Pencegahan Dan Penanganan Stunting Melalui Pengembangan Potensi Desa Di Tengah Pandemi Covid-19 (Capacity Building Strategy in Preventing and Managing Stunting Through Village Potential Development During Covid-19 Pandemic). *Jurnal Sibermas (Sinergi Pemberdayaan Masyarakat)* 9 (3). <https://doi.org/10.37905/sibermas.v9i3.8093>
- Mulyaningsih, T., Mohanty, I., Widyaningsih, V., Gebremedhin, T. A., Miranti, R., & Wiyono, V. H. (2021). Beyond personal factors: Multilevel determinants of childhood stunting in Indonesia. *PLoS ONE*, 16(55 November). <https://doi.org/10.1371/journal.pone.0260265>
- Roscoe, J. T. (1975). Fundamental research statistics for the behavioral sciences. *Holt Rinehart & Winston, New York*.
- Sani, M., Solehati, T., & Hendarwati, S. (2020). Hubungan usia ibu saat hamil dengan stunted pada balita 24-59 bulan (Correlation between the age of mothers and the occurrence of Stunting in Children aged 24-59 Months). *Holistik Jurnal Kesehatan*, 13(8). <https://doi.org/10.33024/hjk.v13i4.2016>
- Sari, E. M., Juffrie, M., Nurani, N., & Sitaresmi, M. N. (2016). Asupan protein, kalsium dan fosfor pada anak stunting dan tidak stunting usia 24-59 bulan (Protein, Calcium, and Phosphorus Consumption in Children aged 24-59 Months with Stunted Growth and Those Without Stunted Growth). *Jurnal Gizi Klinik Indonesia*, 12 (4). <https://doi.org/10.22146/ijcn.23111>
- Siringoringo, E. T., Syauqy, A., Panunggal, B., Purwanti, R., & Widyastuti, N. (2020). Karakteristik keluarga dan tingkat kecukupan asupan zat gizi sebagai faktor risiko kejadian stunting pada baduta. (Family characteristics and the level of nutrition fulfillment as Risk factors for the prevalence of stunting in children under the age of two). *Journal of Nutrition College*, 9 (1). <https://doi.org/10.14710/jnc.v9i1.26693>
- Siswati, T., Hookstra, T., & Kusnanto, H. (2020). Stunting among children Indonesian urban areas: What is the risk factors? *Jurnal Gizi Dan Dietetik Indonesia (Indonesian Journal of Nutrition and Dietetics)*, 8(5). [https://doi.org/10.21927/ijnd.2020.8\(1\).1-8](https://doi.org/10.21927/ijnd.2020.8(1).1-8)
- Sitompul, V. S., Sudaryati, E., & Aritonang, E. Y. (2023). Socio-Demographic Influence And Food Security Against Stunting Events In Medan City. *Journal of Research and Comunity Service*, 4(5).
- Supariasa, I. D. N., & Purwaningsih, H. (2019). Faktor-faktor yang mempengaruhi kejadian stunting pada balita di kabupaten malang (Factors influencing the incidence of stunting in infants in the Malang District). *Karta Rahardja: Jurnal Pembangunan Dan Inovasi*, 1(0).
- Suryana, E. A., & Azis, M. (2023). The potential of economic loss due to stunting in indonesia. *Jurnal Ekonomi Kesehatan Indonesia*, 8 (1). <https://doi.org/10.7454/eki.v8i1.6796>
- Swarinastiti, D., Hardaningsih, G., &

- Pratiwi, R. (2018). Dominasi Asupan Protein Nabati Sebagai Faktor Risiko Stunting Anak Usia 2-4 Tahun (Domination of Plant Protein Intake as a Risk Factor of Stunting in Children aged 2 to 4 years). *Diponegoro Medical Journal (Jurnal Kedokteran Diponegoro)*, 7(6).
- Titaley, C. R., Ariawan, I., Hapsari, D., Muasyaroh, A., & Dibley, M. J. (2019). Determinants of the stunting of children under two years old in Indonesia: A multi level analysis of the 2013 Indonesia basic health survey. *Nutrients*, 11(5). <https://doi.org/10.3390/nu11051106>
- Umaroh, R., & Vinantia, A. (2018). Analisis Konsumsi Protein Hewani pada Rumah Tangga Indonesia (Analysis of Animal Protein Consumption in Indonesian Households). *Jurnal Ekonomi Dan Pembangunan Indonesia*. <https://doi.org/54.21002/jepi.v0i0.869>
- Vaivada, T., Akseer, N., Akseer, S., Somaskandan, A., Stefopoulos, M., & Bhutta, Z. A. (2020). Stunting in Childhood: An Overview of Global Burden, Trends, Determinants, and Drivers of Decline. *American Journal of Clinical Nutrition* (Vol. 112). <https://doi.org/10.1093/ajcn/nqaa159>
- Wahyuni, D., Purnastuti, L., & Mustofa, M. (2016). Analisis elastisitas tiga bahan pangan sumber protein hewani di Indonesia. (Elasticity Analysis of Three Animal Protein Food Materials in Indonesia). *Jurnal Economia*, 12(1). <https://doi.org/10.21831/economia.v12i1.9544>
- Watts, P. D. (2019). Maternal Indigenous and Artisanal Coastal Nutrition, the SDG Imperative: A Suggested Renaissance of Ethics for Research and Tertiary Education in the Anthropocene Era. *International Journal of Nutrition*, 4(3). <https://doi.org/10.14302/issn.2379-7835.ijn-19-2774>