Differences of type of foods consumed by households in urban and rural West Java, Indonesia

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Abstract. Dietary diversity is a critical indicator of food and nutrition security, with a minimum consumption of four food groups shown to lower the risk of malnutrition and related health issues. This study aims to assess household dietary diversity scores and examine differences in food consumption patterns between urban and rural households in West Java. The study involved 300 households in Sukabumi City and Cianjur District in June 2022. While urban households have a higher prevalence of dietary diversity (78%) compared to rural areas (68%), these differences are not statistically significant. Food insecurity and stunting remain high across both settings, with rural households experiencing higher rates of both. The study also notes that while higher dietary diversity includes diverse food groups in both urban and rural areas, disparities in access remain, especially in rural areas where diets are more limited. Households in low and medium dietary diversity only consumed eggs as primary protein sources. Programs promoting diverse protein source consumption could help reduce the incidence of food insecurity and stunting, especially in rural settings.

1 Introduction

Dietary diversity is a key indicator of food and nutrition security, reflecting food accessibility to essential nutritional fulfillment. Consuming at least four food groups was shown to significantly lower the risk of stunting, malnutrition, and related health issues [1,2]. Conversely, a less diverse diet can lead to nutrient deficiency such as anemia, compromised immunity, and cognitive delays. Children and pregnant women are among the most vulnerable to malnutrition caused by a less diverse diet. Although dietary diversity score (DDS) is a useful predictor of malnutrition, it was found to be especially accurate in rural areas, where limited food options can restrict dietary diversity [3].

Among the essential four food groups that must be consumed to reduce the risk of stunting, at least one must be animal-sourced and one from fruits or vegetables. Animal-sourced foods provide essential protein for growth and micronutrients like iron and vitamin

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B12 for blood production [4]. Fruits and vegetables provide vitamins and antioxidants vital for immune function and development [5].

Dietary patterns in lower-income households tend to rely heavily on staple and plant-based foods, which can contribute to nutrient deficiencies [6,7]. This challenge is often caused by socioeconomic factors such as household income, food prices, and access to the food market that may vary between urban and rural settings. Additionally, in rural communities, local agricultural practices may affect the availability and consumption of certain food groups [8]. While several studies have highlighted the role of dietary diversity in addressing malnutrition, there remains a notable gap in understanding the disparities in dietary diversity between urban and rural households, particularly in specific regional contexts. In West Java, Indonesia's most populous province, disparities in dietary diversity between urban and rural households, especially in regions like West Java, is understudied. Despite West Java's agricultural abundance, malnutrition persists, suggesting that food availability alone is insufficient. Investigating these disparities can shed light on local food security challenges and guide effective interventions. This study, therefore, aimed to identify household dietary diversity scores (HDDS) and analyze the differences in food consumption between urban and rural households in West Java based on their HDDS categories.

2 Materials and methods

The study used cross-sectional design. Study areas were chosen based on their status as focus locations for stunting reduction integrated intervention by the government in the previous year. The respondents were 150 mothers from Sukabumi City (urban) and 150 mothers from Cianjur District (rural). Mothers were chosen using clustered sampling according to their respective Integrated Healthcare Centre to ensure data representation.

Data collection took place in June 2022 through interviews using structured questionnaires. The research was approved by the ethical committee of the researchers' institution (registration number 680/IT3.KEPMSM-IPB/SK/2022). Data collected were socioeconomic characteristics, dietary diversity, food security, and nutrition security. Socioeconomic characteristics were evaluated by income per capita per month and food expenditure per capita per month. Dietary diversity was assessed using household dietary diversity score based on the food consumed by all household members, covering 12 food groups including cereals, tubers, vegetables, fruits, eggs, oils and fats, meat, poultry, and offal, fish and seafood, beans, legumes, and nuts, dairy products, sugar and honey, and miscellaneous foods [9]. Food security was evaluated using the Food Insecurity Experience Scale (FIES) for the past month [10], while nutrition security was measured by children's height-for-age Z-score (HAZ) from anthropometric measurements. Chi-square test was performed to analyze the differences between dietary diversity categories and incidence of food insecurity and stunting among urban and rural areas. Independent sample t-test was used to analyze the differences in socioeconomic characteristics between both groups.

3 Results and discussion

The proportion of households with high dietary diversity is higher in urban (78%) than rural (68%) although there are no significant differences observed (χ^2=4.869, p=0.088) (Table 1). The incidence of food insecurity and stunting also remains high in both urban and rural areas with no significant differences. However, rural area with lower dietary diversity trends have higher incidences of food insecurity (70%) and stunting (33.3%) than urban area.

Table 1 indicates significant differences in income (t=2.335, p=0.018) and food expenditure (t=2.145, p=0.033) between urban and rural households, with urban households

having higher average income and food expenditure, showing socioeconomic disparities between urban and rural areas. However, despite these differences, neither income nor expenditure appears to significantly impact food security or stunting outcomes when analyzed by dietary diversity categories as shown on Table 2 and Table 3.

Table 1. Dietary diversity, food security, and stunting in study area

Variables	Urban	Rural	Sig.
Household dietary diversity score, n (%)			
● Low (≤5 food groups)	7 (4.7)	6 (4.0)	χ^2=4.869
● Medium (6-7 food groups)	26 (17.3)	42 (28.0)	p^a=0.088
● High (>7 food groups)	117 (78.0)	102 (68.0)	
Incidence of food insecurity, n (%)	95 (63.3)	105 (70.0)	χ^2=1.500 p^a=0.221
Incidence of stunting, n (%)	46 (30.7)	50 (33.3)	χ^2=0.245 p^a=0.621
Income (IDR), mean±SD	917,699±607,141	763,465±508,840	t=2.385 p^b=0.018*
Food expenditure (IDR), mean±SD	622,265±302,093	550,849±273,928	t=2.145 p^b=0.033*

[a]Chi-square test, [b]Independent sample t-test, *p<0.05

Table 2 provides more detailed information about the incidence of food insecurity within dietary diversity categories. In both urban and rural settings, there is no statistically significant association between household dietary diversity score and food security status (urban: χ^2 = 0.080, p = 0.961; rural: χ^2 = 0.584, p = 0.747), despite higher HDDS being observed in food secure households (68.9% in urban and 76.4% in rural settings). The lack of significance may stem from measurement constraints and the influence of other socioeconomic determinants alongside dietary diversity. Dietary diversity can reflect better food security outcomes, but the relationship is often mediated by other factors specific to each sample frame [11]. Additionally, it is worth considering the possibility of reverse causality, where food security status may influence dietary diversity by enabling access to a greater variety of foods.

Table 2. Dietary diversity and the incidence of food insecurity

Variables	Food secure	Food insecure	Sig.
Urban HDDS, n (%)			
● Low (≤5 food groups)	2 (4.4)	4 (3.8)	χ^2=0.080
● Medium (6-7 food groups)	12 (26.7)	30 (28.6)	p=0.961
● High (>7 food groups)	31 (68.9)	71 (67.7)	
Rural HDDS, n (%)			
● Low (≤5 food groups)	2 (3.6)	5 (4.7)	χ^2=0.584
● Medium (6-7 food groups)	11 (20.0)	15 (15.8)	p=0.747
● High (>7 food groups)	42 (76.4)	75 (78.9)	

Table 3 shows that within both urban and rural settings, there is no significant relationship between dietary diversity categories and stunting (urban: χ^2=2.861, p=0.239; rural: χ^2=0.236, p=0.888). While stunting is somewhat less common in households with higher dietary diversity, the lack of statistical significance implies that dietary diversity alone may not be a strong determinant of stunting in this population. This could happen because of the underlying socioeconomic or environmental factors that affect food access and nutritional quality in both rural and urban contexts. Previous study found that province and sub-district

level characteristics shaping the community's access to water, sanitation, and hygiene adds to the risk of stunting on top of personal characteristics such as dietary habits [11].

Table 3. Dietary diversity and the incidence of stunting

Variables	Normal	Stunted	Sig
Urban HDDS, n (%)			
● Low (≤5 food groups)	5 (5.0)	1 (2.0)	χ^2=2.861
● Medium (6-7 food groups)	24 (24.0)	18 (36.0)	p=0.239
● High (>7 food groups)	71 (71.0)	31 (62.0)	
Rural HDDS, n (%)			
● Low (≤5 food groups)	5 (4.8)	2 (4.4)	χ^2=0.236
● Medium (6-7 food groups)	19 (18.3)	7 (15.2)	p=0.747
● High (>7 food groups)	80 (76.9)	37 (80.4)	

To determine the type of foods consumed in each dietary diversity category, tabulation of food groups consumed by ≥ 50% households in each category was made (Fig. 1). Households with high dietary diversity consumed eleven out of twelve food groups, excluding tubers, showing a significantly more varied diet compared to other categories. Rural and urban diets are notably similar in this category, suggesting that when households have access to more food resources, they are able to incorporate a well-rounded diet regardless of location [11,12]. The inclusion of nutrient-dense food groups such as dairy, meat, pulses, and fish highlights improved dietary quality and suggests these households are likely at lower risk of food insecurity and malnutrition.

Table 4. Food group consumed by ≥ 50% households by dietary diversity in West Java

	Low dietary diversity (≤5 food groups)	Medium dietary diversity (6-7 food groups)	High dietary diversity (>7 food groups)
Rural	Cereals; Eggs; Oils/fats; Vegetables	Cereals; Eggs; Oils/fats; Vegetables; Sugar/honey; Miscellaneous	Cereals; Vegetables; Eggs; Oils/fats; Fruits; Meat, poultry, offal; Fish and seafood; Pulses, legumes, nuts; Milk and milk products; Sugar/honey; Miscellaneous
Urban	Cereals; Eggs; Oils/fats;	Cereals; Eggs; Oils/fats; Fruits; Sugar/honey; Miscellaneous	Cereals; Vegetables; Eggs; Oils/fats; Fruits; Meat, poultry, offal; Fish and seafood; Pulses, legumes, nuts; Milk and milk products; Sugar/honey; Miscellaneous

Households with medium dietary diversity, whether in urban or rural areas, typically consumed six food groups. Five common food groups across both areas were cereals, eggs, oils/fats, sugar/honey, and miscellaneous items. The difference is in the inclusion of vegetables in rural diets and fruits in urban ones. Rural households are located in agricultural communities, providing better access to vegetables, hence the inclusion of vegetables in diet [13]. Urban households' consumption of fruits may be due to better availability to a wider variety of stores offering fruit products in urban area [14]. While these households have a more diverse diet than those in the low diversity category, they still lack key food groups such as dairy, fish, and pulses, which are essential for a balanced diet.

Households with low dietary diversity commonly only included three food groups. In urban area, households with low dietary diversity typically consumed cereals, eggs, and oils/fats. Additionally, low dietary diversity rural households consumed vegetables as a part of their diet. Higher availability of vegetables in rural agriculture may influence this addition [8,13]. The limited variety suggests a constrained diet, focusing on staple foods with little

inclusion of protein-rich or nutrient-dense food groups such as dairy, fruits, or pulses. This limited diversity could contribute to nutrient deficiencies, potentially impacting overall health and increasing the risk of malnutrition [1,7].

Notably, more than 50% of households in low and medium dietary diversity categories only consumed eggs as protein source. Therefore, consumption of diverse plant and animal-based protein rich food groups must be promoted among households in urban and rural areas. Educating households on the importance of dietary diversity, especially in low-diversity groups, could encourage the inclusion of more diverse food items within available means [15]. It is also important to integrate nutrition education with agricultural interventions such as small-scale livestock rearing initiatives to provide the household with sustainable access to animal protein source foods.

The differences in dietary diversity between rural and urban households may reflect disparities in access to various food groups, with urban households generally having more access to a diverse diet. This is particularly evident in the medium dietary diversity category, where urban households consume more fruits, a food group often limited in rural diets due to availability or cost [14]. Programs aimed at supporting low-income households with nutrient-dense foods could also help mitigate health risks associated with low dietary diversity [16].

High dietary diversity in both settings includes a variety of food groups, indicating that households with greater resources or access are able to consume a well-rounded diet, which can contribute to better health outcomes. This supports the importance of increasing access to diverse food groups, especially in rural areas, to improve dietary quality and reduce the risk of food insecurity and stunting. To improve dietary diversity, particularly in rural areas, interventions could focus on enhancing access to a wider variety of food groups through agricultural diversification, subsidies, or support for local markets [17].

The study's limitations include the use of dietary diversity scores rather than specific nutrient intake data, limiting insights into nutritional adequacy, and a cross-sectional design, which restricts causal inferences. Future research could address these gaps by conducting longitudinal studies, incorporating socioeconomic factors, specific dietary quality measures, and using more metrics for food security and malnutrition. Including qualitative research and exploring food environments would further enrich the understanding of dietary diversity's impact as well as regional characteristics on food and nutrition security outcomes in both urban and rural settings.

4 Conclusion

Despite higher dietary diversity trends in urban households, food insecurity and stunting persist across urban and rural populations. This points to underlying socioeconomic and environmental challenges, including disparities in food access and resource availability. Promoting the consumption of diverse protein sources is essential for households categorized in low and medium dietary diversity, especially in rural area where the incidence of food insecurity and stunting is higher. The study underscores the need for policies promoting dietary diversity, particularly in nutrient-dense food groups, to promote food and nutrition security. Further longitudinal research is recommended to explore these associations over time and to investigate specific nutritional impacts within these contexts.

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