# Factors influencing children's dietary variety in Eastern Indonesia: A comprehensive national analysis

**Yoyok Bekti Prasetyo[1]*, Sri Sunaringsih Ika Wardojo[2], Agung Dwi Laksono[3]**

[1] Community Nursing Departement-Faculty of Health Sciences- University Muhammadiyah of Malang, East Java, Indonesia
2 Public Health Departement, Faculty of Health Sciences- University Muhammadiyah of Malang, East Java, Indonesia
3 Research, and Development Center for Humanities and Health Management, Ministry of Health Republic of Indonesia., Indonesia

## Abstract

**Background:** Limited dietary diversity among children is a critical public health concern across Indonesia, with Eastern Indonesia facing the most severe nutritional challenges among children.
**Purpose:** This study aims to identify factors influencing children's dietary diversity in Eastern Indonesia.
**Methods:** A cross-sectional study design was employed, utilizing data from the 2017 Indonesia Demographic and Health Survey (n = 1,476). Dietary diversity was assessed using the dietary diversity score (DDS), categorized into adequate and inadequate levels.
**Results:** Key sociodemographic factors associated with DDS included the number of children in the household, place of residence, economic status, breastfeeding practices, and vitamin A supplementation, with p-values of 0.007, <0.001, 0.001, <0.001, and <0.001, respectively. Children who were not breastfed were 0.5 times more likely to have inadequate DDS compared to those who were breastfed (95% CI: 0.36–0.67). Urban-dwelling families had a 0.7 times lower risk of inadequate DDS than rural counterparts (p = 0.026; 95% CI: 0.47–0.95). Additionally, children from low-income families were twice as likely to experience inadequate DDS compared to those from higher-income families (p = 0.012; 95% CI: 1.14–2.99).
**Conclusion:** Rural residency, low income, lack of breastfeeding, and inadequate vitamin A supplementation significantly contribute to poor dietary diversity among children in Eastern Indonesia. These findings highlight the need for targeted government interventions to bridge gaps in maternal education, enhance healthcare access, and improve families' socioeconomic conditions, ultimately advancing child nutrition and health in the region.

**Keywords:** breastfeeding, dietary diversity score, east indonesia, food diversity

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**Corresponding author**

**Yoyok Bekti Prasetyo***
Community Nursing Departement-Faculty of Health Sciences- University Muhammadiyah of Malang, East Java, Indonesia; Address: Kampus II Universitas Muhammadiyah Malang, Jalan Bendungan Sutami No.188A Malang, Jawa Timur, Indonesia; Phone: +6281 252 08825; E-mail: yoyok@umm.ac.id

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## Introduction

Dietary diversity (DD) represents the variety of foods or food groups consumed within a given timeframe, often evaluated over 24 hours (Gonete et al., 2020; Pourebrahim et al., 2024). Conceptually, DD is considered a dependable measure of diet quality and nutritional sufficiency. A diverse diet typically provides a broader range of essential nutrients, which can help prevent nutritional deficiencies and promote overall health (Islam et al., 2023). Higher dietary diversity has been linked to better health outcomes, including enhanced nutritional status, more substantial immune function, and reduced risk of chronic diseases (Grant et al., 2024; Kiuchi et al., 2024). Measuring dietary diversity in settings with limited resources can help identify vulnerable groups, reveal nutritional gaps, and inform targeted policies to improve food security and public health, especially among children and pregnant women (Batame, 2024; Dzudzor et al., 2024).

While both nutritional problems and dietary diversity are critical in public health, they are distinct concepts. Nutritional problems encompass health conditions arising from inadequate or imbalanced nutrition, such as stunting, underweight, obesity, and micronutrient deficiencies, often driven by factors like food insecurity, poverty, limited healthcare, and lack of nutrition education. On the other hand, dietary diversity assesses the variety of food groups consumed and is a marker of dietary quality. A diverse diet can help prevent nutrient deficiencies and improve overall well-being (Deshpande et al., 2024; Kolliesuah et al., 2023). Identifying factors that predict dietary diversity, such as socioeconomic status, education, location, cultural practices, and food accessibility, enables health professionals and policymakers to design strategies that enhance diet quality and diversity, which is crucial in reducing malnutrition and diet-related diseases (Aboagye et al., 2024; Mao et al., 2024; Sato et al., 2024).

Despite the completion of the Millennium Development Goals (MDGs), many health issues, especially nutritional challenges, persist (Balaj et al., 2021; Mohammadi et al., 2020). Children from the lowest 20% income households, particularly in developing countries like Indonesia, remain at high risk of stunted growth (Lönnroth & Raviglione, 2016). The Sustainable Development Goals (SDGs) emphasize improving nutrition, aiming to decrease stunting, wasting, and child mortality caused by nutritional issues (de Onis & Branca, 2016; Haddad et al., 2015). In Indonesia, the National Movement for the Acceleration of Nutrition Improvement (Gerakan Nasional Percepatan Perbaikan Gizi or GNPPG), established under Presidential Regulation No. 42 of 2013, focuses on raising public awareness and encouraging community involvement to address nutritional challenges. Key GNPPG strategies include integrating nutrition improvements into human resource development and increasing the effectiveness of nutrition-based interventions (Prasetyo et al., 2019).

Eastern Indonesia experiences the highest prevalence of childhood malnutrition, with the 2023 Indonesian Health Survey reporting a stunting prevalence of 21.5% and a wasting prevalence of 8.5%. The survey also highlighted that East Nusa Tenggara has the highest rates of underweight children under two (18.8%) and that stunting and wasting rates are alarmingly high in South Papua (11.9%) and West Sulawesi (26.5%) (Seviana et al.,2024). A lack of dietary diversity remains a significant issue, with children consuming predominantly carbohydrate-based diets, often lacking sufficient protein, fruits, and vegetables (Jabri et al., 2020; Khan et al., 2020). Additionally, malnutrition in early childhood is exacerbated by inadequate breastfeeding and complementary feeding practices (Das et al., 2020; Stiller et al., 2020).

Previous research in Indonesia has focused mainly on maternal knowledge of complementary feeding and general child-feeding practices, especially in rural areas. These studies often examine mothers' awareness and understanding of proper feeding practices, identifying significant gaps contributing to childhood malnutrition, including stunting and wasting. For example, research conducted in West Java revealed that numerous mothers lacked awareness about the significance of incorporating a variety of food groups into their children's diets. As a result, children's diets were heavily based on rice and other carbohydrates, with limited protein intake, fruits, or vegetables, leading to nutrient deficiencies (Mauludyani & Khomsan, 2022).

This current study addresses a critical gap by focusing on dietary diversity and its predictors, specifically among children in Eastern Indonesia, an area facing significant nutritional challenges. Unlike previous studies, this research aims to uncover disparities in food diversity and explore factors influencing child nutrition in this under-researched region. The findings intend to identify actionable predictors to help guide effective nutritional interventions and policies tailored to support child health in Eastern Indonesia.

## Materials and Methods

### Study Setting, Design, and Participants

This research employed a cross-sectional study design, utilizing the 2017 Indonesia Demographic and Health Survey (IDHS) data. Secondary analyses were performed on this dataset, collected through a nationwide survey conducted by the Ministry of Health of the Republic of Indonesia in partnership with the National Population and Family Planning Board and the Central Statistics Agency. The study included all women aged 15 to 49 residing in Eastern Indonesia (East Nusa Tenggara, Maluku, North Maluku, Papua, and West Papua) with children under five. Sampling was done using stratification techniques and multistage randomization, resulting in a total sample size of 1,476 participants.

Ethics of Human Subject Participation: Ethical approval for this study was granted by the Indonesia Health Research Council and the Human Research Ethics Committee at ICF Macro International, which oversaw the IDHS. The study received authorization from the Independent Review Boards of New Era and ICF Macro International for all data collection instruments and procedures (Approval Number: Authletter_142047). Access to the dataset was obtained through the DHS program website. Informed written consent was secured from participants before interviews, with mothers or caregivers providing consent on behalf of their children.

### Variable

#### Independent variable

The surveys conducted in this study focused on

dietary diversity, incorporating data on child-related and demographic factors. Child-related factors included age, breastfeeding status, sex, vitamin A supplementation, and a history of illnesses. Children's ages were grouped into three categories: infants (0-12 months), toddlers (13-36 months), and preschoolers (37-60 months). Mothers were asked whether their children were breastfed at the time of the survey. Respondents were asked whether the child had experienced diarrhea within the past 24 hours or two weeks before the interview to assess morbidity. Demographic factors encompassed maternal age (15-19, 20-34, and 35-49), place of residence (urban or rural), educational attainment (no education, primary, secondary, or higher), and wealth index (poor, middle, or rich).

**Dependent variable**

Minimum dietary diversity serves as an indicator of whether a child's diet meets adequate micronutrient requirements. Achieving minimum dietary diversity involves consuming foods from at least four distinct food groups. These include grains, roots, tubers, legumes, nuts, flesh foods (such as meat, poultry, fish, or organ meat), and vitamin A-rich fruits and vegetables (UNICEF &WHO, 2021). The required four food groups are selected from seven broader categories: grains, roots, and tubers (GRT); legumes and nuts; dairy products (milk, yogurt, cheese); flesh foods (meat, poultry, fish, or organ meat); eggs; vitamin A-rich fruits and vegetables (VAFV); and other fruits and vegetables (OFV). The dietary diversity score (DDS) evaluates dietary diversity and categorizes it as good or poor. A DDS is considered good when a child consumes foods from 4-7 groups and poor when they consume foods from only 1-3 groups (DDS 3 = poor; DDS 4 = good).

### Statistical Analysis

The data for this study were analyzed using Statistical Package for THE Social Sciences (SPSS) version 21 (IBM, USA). To describe the sample characteristics, we used frequency distributions and percentages. At the same time, the chi-square test was employed to examine differences in characteristics such as maternal age, place of residence, education, wealth index, breastfeeding, vitamin A supplementation, and history of diarrhea. A collinearity test was also conducted to verify that the independent variables in the final regression model were not strongly correlated. The impact of various factors on the DDS was assessed using multinomial logistic regression, and the odds ratios with 95% confidence intervals (CI) were calculated. A significant effect between DDS and independent variables was considered when the P-value was less than 0.05.

## Results

### Characteristics of Respondents

Table 1 shows that sociodemographic factors significantly associated with the DDS include the number of children, place of residence, economic status, breastfeeding, and vitamin A intake, with p-values of 0.007, <0.001, 0.001, <0.001, and <0.001, respectively. In contrast, maternal age, education level, and diarrhea in children were not significantly related to DDS. In Eastern Indonesia, families typically have 3-5 children, accounting for 88.3%, and most live in rural areas, with 96.9% of the population residing there. Additionally, 86.3% of families in this region experience poverty. This situation is further compounded by the fact that 74% of children do not receive breastfeeding, and 91.4% do not receive vitamin A supplementation. The DDS is categorized as adequate for 15.1% of the population and inadequate for 84.9%.

Table 2 shows the results of the collinearity test of predictor factors, including the number of children, place of residence, economic status, breastfeeding, and vitamin A on DDS in children in Eastern Indonesia. This study shows that there is no strong relationship between the independent variables. Table 2 shows that the tolerance value for all variables is more significant than 0.10, and the variance inflation factor (VIF) value for all factors is less than 10.00. This study found no multicollinearity in the regression model, which indicates the basis for test decision-making.

### Prediction of Food Diversity

Table 3 outlines the predictors of adequate DDS among children in Eastern Indonesia, highlighting key sociodemographic and nutritional factors. Families with 3-5 children have a somewhat higher likelihood of achieving adequate DDS compared to those with 6-12 children, although this association is not statistically significant (p=0.076). Families with 0-2 children showed no significant relationship with DDS adequacy (p=0.695).

Table 3 shows that sociodemographic factors that predict inadequate DDS are place of residence and economic status. Families living in urban areas have a 0.7 times risk of inadequate DDS compared to rural areas (p=0.026; 95% CI 0.47 – 0.95). Low-income families are twice as likely to have children with inadequate DDS as compared to wealthier families (p=0.012; 95%CI 1.14–2.99).

Breastfeeding status is a strong predictor; children who are not breastfed are significantly less likely to achieve adequate DDS than those who are breastfed (OR=0.489, 95% CI: 0.357–0.669, p<0.001). Additionally, children who do not receive vitamin A supplementation are more likely to have an adequate DDS than those who receive it (OR=1.865, 95% CI: 1.294–2.687, p=0.001).

## Discussion

The relationship between family size and dietary diversity is influenced by several factors, which may help explain why families with 3-5 children show a trend toward achieving adequate dietary diversity score (DDS) compared to those with larger families,

**Table 1. Sociodemographic characteristics and their relationship to Dietary Diversity Score (DDS)**

| Characteristics | DDS | | |
|---|---|---|---|
| | Adequate | inadequate | p-value |
| Mother's age (n=1476) | | | |
| 15 – 19 | 15/19% | 64/81% | 0.532 |
| 20 – 34 | 156/14.6% | 912/85.4% | |
| 35 – 49 | 52/15.8% | 277/84.4% | |
| Number of children in the family (n=1476) | | | |
| 0 – 2 | 130/17.7% | 603/82.3% | 0.007 |
| 3 – 5 | 72/11.7% | 546/88.3% | |
| 6 - 12 | 21/16.8% | 104/83.2% | |
| Residence (n=1476) | | | |
| urban | 80/20.7% | 307/79.3% | <0.001 |
| Rural | 143/13.1% | 946/96.9% | |
| Educational (n=1476) | | | |
| No education | 7/12.1% | 51/87.9% | 0.070 |
| Primary | 45/12.2% | 323/87.8% | |
| Secondary | 121/15.2% | 676/84.8% | |
| higher | 50/19.8% | 203/80.2% | |
| Wealth index (n=1476) | | | |
| poor | 167/13.7% | 1051/86.3% | 0.001 |
| Middle | 19/17.4% | 91/82.6% | |
| Rich | 37/24.8% | 112/75.2% | |
| Breastfeeding (n=1476) | | | |
| No | 103/26% | 293/74% | <0.001 |
| Yes | 120/11.1% | 960/88.9% | |
| Vitamin A (n=1448) | | | |
| No | 46/8.6% | 487/91.4% | <0.001 |
| Yes | 175/19.1% | 740/80.9% | |
| Had diarrhea (n=1444) | | | |
| No | 187/14.8% | 1076/85.2% | 0.164 |
| Yes | 34/18.8% | 147/81.2% | |

Note: DSS adequate (15.1%), inadequate (84,9%)

**Table 2. Results of predictor collinearity test that affects DDS**

| predictor | Collinearity statistics | |
|---|---|---|
| | Tolerance | VIF |
| Number of children | 0.992 | 1.008 |
| Resident | 0.826 | 1.211 |
| Wealth index | 0.826 | 1.210 |
| Breastfeeding | 0.981 | 1.020 |
| Vitamin A | 0.993 | 1.007 |

DDS dependent variable; tolerance > 0.10 or VIF < 10.00

**Table 3. Predictors of adequate diet diversity score (DDS) among children in Eastern Indonesia**

| Predictors | p-value | OR | 95%CI | |
|---|---|---|---|---|
| | | | Lower bound | Upper bound |
| Number of children in the family | | | | |
| 0 – 2 | 0.695 | 0.896 | 0.518 | 1.150 |
| 3 – 5 | 0.076 | 1.672 | 0.948 | 2.950 |
| 6 – 12 | Ref. | Ref. | Ref. | Ref. |
| Residence (n=1476) | | | | |
| urban | 0.026 | 0.670 | 0.471 | 0.954 |
| Rural | Ref. | Ref. | Ref. | Ref. |
| Wealth index | | | | |
| poor | 0.012 | 1.851 | 1.144 | 2.993 |
| Middle | 0.225 | 1.510 | 0.777 | 2.935 |
| Rich | Ref. | Ref. | Ref. | Ref. |
| Breastfeeding | | | | |
| No | <0.001 | 0.489 | 0.357 | 0.669 |
| Yes | Ref. | Ref. | Ref. | Ref. |
| Vitamin A | | | | |
| No | 0.001 | 1.865 | 1.294 | 2.687 |
| Yes | Ref. | Ref. | Ref. | Ref. |

Abrevation: OR = odd ratio

despite this study's finding not being statistically significant. Research suggests that, as family size increases, particularly in households with six or more children, financial and caregiving resources are often stretched, impacting the variety and quality of available foods. For example, Issahaku et al. (2023) and Ilori et al. (2024) found that, in low-resource settings, larger family sizes can lead to reduced food expenditure per person, making it more challenging to maintain a varied diet.

Conversely, families with fewer children, such as those with 3-5, may have a more balanced allocation of resources, potentially allowing for improved access to diverse foods (Batame, 2024; Cruz-Sánchez et al., 2024). This aligns with findings that dietary diversity often improves when household resources are sufficient relative to the number of dependents (Kolliesuah et al., 2023). Interestingly, the study found no significant association between DDS adequacy and families with only 0-2 children, which may reflect complex socioeconomic or cultural factors. In some cases, small family size correlates with limited resources, as smaller families may result from economic constraints, limiting dietary diversity (Casado et al., 2024).

This analysis underscores that while family size does play a role in dietary diversity, other factors—such as income, parental education, and community support systems—are critical mediators. Future research across diverse socioeconomic contexts could clarify these patterns and help design targeted interventions to enhance dietary diversity, especially for larger families in economically disadvantaged regions.

The findings in Table 3 highlight a strong link between sociodemographic factors—precisely residence and economic status—and inadequate DDS among children in Eastern Indonesia. Children in urban settings were found to have a 0.7 times lower likelihood of adequate DDS compared to those in rural areas. This trend reflects findings in other research, suggesting that despite better infrastructure in urban areas, urban families may face inconsistent access to affordable, diverse foods. Contributing factors include economic disparities, food deserts, and increased reliance on processed foods with lower nutritional value (Deng & Vicerra, 2024; Kolliesuah et al., 2023). By contrast, rural households often have closer access to home-grown or locally sourced foods, supporting a more varied diet (Mucioki et al., 2024).

Economic status also plays a significant role in dietary diversity. Low-income families were twice as likely to experience inadequate DDS as wealthier families. This association highlights the barriers to food diversity in low-income households, which are more vulnerable to food insecurity and less able to afford various nutrient-rich foods (Pradeilles et al., 2024). Economic constraints limit both the quantity and quality of food available, with children in these households particularly affected by dietary deficiencies, which can lead to malnutrition and stunting (Gutiérrez & Bartelt, 2024). In urban low-income settings, these issues are compounded by limited access to fresh produce, higher food prices, and a reliance on inexpensive, calorie-dense foods

with low nutritional value (Summerhayes et al., 2024). Understanding these factors underscores the importance of policies to improve food accessibility, affordability, and nutrition education for low-income urban and rural populations.

Breastfeeding status is a significant predictor of adequate DDS in children, with non-breastfed children being considerably less likely to achieve an adequate DDS than breastfed children. This finding aligns with existing research showing that breastfeeding supplies essential nutrients and influences long-term dietary habits and food preferences (Cheney et al., 2019). Breast milk provides a uniquely balanced nutrient profile that meets infants' developmental and immune needs, reducing the risk of malnutrition, particularly in low-resource settings (Corley, 2021). The link between breastfeeding and DDS highlights how breastfeeding can mitigate nutritional vulnerabilities by consistently consuming high-quality nutrients during critical early life stages (Carretero-Krug et al., 2024).

Interestingly, children who do not receive vitamin A supplementation are more likely to achieve adequate DDS than those who do. While this may seem counterintuitive, it may reflect that vitamin A supplementation programs are often targeted at children already at risk of or experiencing malnutrition. These children frequently come from households with lower overall dietary diversity, necessitating supplementation to address dietary vitamin A shortfalls (Chanie et al., 2021). This finding underscores the importance of integrating vitamin A programs with broader strategies to improve household food security and dietary diversity. By promoting breastfeeding and access to a varied, nutrient-dense diet, public health efforts can better address malnutrition and stunting in vulnerable populations across Indonesia and similar settings.

### Strengths and Limitations

This research has several strengths. Big data support this research, so the findings of this study can describe food diversity in children in Eastern Indonesia. Another strength is the focus of research on food diversity, which is the main problem related to child nutrition in Indonesia; therefore, the findings of this study can be used as a basis for creating further policies to improve nutrition in children in Indonesia. The weakness of this study is that, given the data collected using a cross-sectional design, the possibility of causal inferences is limited, mainly due to the snapshot nature of the design. The data used in this study are retrospective self-reporting data.

## Conclusion

This study reveals that sociodemographic factors—such as place of residence, economic status, breastfeeding status, and vitamin A supplementation—significantly impact dietary diversity among children in Eastern Indonesia. Children from urban, low-income families and those not breastfed are likelier to have inadequate dietary diversity scores, indicating that environmental and economic barriers are critical in accessing balanced nutrition. These findings emphasize the need for targeted nutrition programs that promote breastfeeding, enhance food security, and ensure better access to nutrient-dense foods.

For nursing services, these insights suggest a strong need for community health nurses to focus on nutrition education, particularly the benefits of breastfeeding and balanced diets for young children. Nurses can advocate for policies that improve food accessibility and nutrition support for at-risk families, especially those in low-income urban areas. In education, incorporating these findings into nursing curricula can equip future nurses with the skills to address nutritional needs in diverse settings. Further research on the effectiveness of specific interventions in urban and rural populations would provide valuable insights for designing targeted nutrition programs that help bridge gaps in dietary diversity and overall child health outcomes.

### Declaration of interest

The authors declare no conflicts of interest.

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### Data availability

The datasets generated during and analyzed during the current study are available from the corresponding author upon reasonable request.

### Authorship

YBP designed the study, performed the statistical analysis, interpreted the findings, discussed them, and wrote a preliminary manuscript draft. SSW, ADL contributed to statistical analysis, interpretation of findings, and manuscript writing.

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