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# A multilevel analysis of the double burden of malnutrition among under-five children within the same household in Indonesia

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## Abstract

**Purpose:** Indonesia faces a persistent double burden of malnutrition (DBM), in which undernutrition and overnutrition coexist within populations. Although national stunting rates have declined, other nutritional challenges persist across provinces, with moderate-to-high rates indicating a complex nutritional transition. This study aims to identify individual, household, and contextual factors influencing the DBM among children in the same household and to provide evidence-based recommendations for region-specific, sustainable interventions. **Methods:** Using cross-sectional data from the Indonesian Nutrition Status Survey (SSGI) 2024, we analyzed 0-59-month-old children using multilevel logistic regression. Progressive models examined individual, household, and contextual (district or provincial) determinants of DBM, defined as the coexistence of undernutrition and overnutrition within households. **Results:** The prevalence of household-level DBM was 0.08%. In adjusted models, residing in Java–Bali was associated with significantly lower odds of DBM (OR = 0.39; 95% CI: 0.27–0.57). Children without birth certificates had significantly higher odds of experiencing DBM (OR=1.70; 95% CI: 1.48–1.95). Exclusive breastfeeding was associated with lower odds of DBM (OR = 0.54; 95% CI: 0.48–0.61). Households having more than one child under five showed substantially higher odds of DBM (OR = 3.30; 95% CI: 2.93–3.71), and district-level DBM remained a strong contextual predictor (OR = 2.01; 95% CI: 1.66–2.45). At the contextual level, the district-level DBM index remained strong contextual predictor. **Conclusion:** Household-level DBM among children in Indonesia exists but remains rare, yet it signals emerging intra-household nutritional inequalities and complexity. Key determinants include household structure, exclusive breastfeeding, birth certificate ownership, region disparities, and district-level contextual factors. These findings highlight the need for integrated, multilevel interventions that address both undernutrition and overnutrition, particularly in vulnerable households and underserved areas.

**Keywords:** child; Indonesia; malnutrition; multilevel analysis

## INTRODUCTION

The double burden of malnutrition (DBM) refers to the simultaneous occurrence of undernutrition and overnutrition at the individual, household, or population levels; it is commonly found in developing countries, including Indonesia [1,2]. Recent national data indicate that while stunting prevalence has declined, multiple forms of malnutrition, including wasting, underweight, and overweight, remain prevalent across several regions. For example, Papua Pegunungan Province has a stunting prevalence of 40% (very high), while the overweight prevalence is 10.3% (also high) [3]. These prevalence rates remain above the WHO thresholds for public health concern, which classify stunting at <20% and overweight at <5% as not constituting a public health problem [4]. Such regional disparities highlight the coexistence of multiple nutritional problems and suggest that DBM is shaped by multilevel determinants across geographic contexts [5]. Addressing DBM is a strategic issue directly related to Sustainable Development Goals (SDGs) 2.2 (end all forms of malnutrition), 3.2 (reduce child mortality), and 3.4.1 (reduce non-communicable diseases) by promoting healthy diets [6]. At the national level, reducing DBM is also in line with the 2025–2029 RPJMN, which prioritizes improving community nutrition and preventing chronic diseases [7].

Previous studies show that the incidence of DBM at the household level can be influenced by several factors, including residential factors, the child's gender, birth order, breastfeeding practices, the mother's age, socioeconomic status, and imbalances in food distribution among household members [8,9]. Evidence from low- and middle-income countries also suggests that broader policy and programmatic factors may influence DBM patterns. Programs designed to address undernutrition, such as food-based programs, can inadvertently promote overnutrition when the risk of dual forms of malnutrition is not considered [10]. However, most of these studies focus on single-level determinants and rarely account for the simultaneous interaction among individual, household, and contextual factors.

A recent narrative review on the burden of malnutrition at the individual, household, and community levels, based on 60 articles from around the world, found that the most widely discussed topics were at the household level. Most studies on the DBM at the household level have operationalized the double burden using only mother–child or adult–child pairs to capture intergenerational nutritional transitions [11]. Although informative, this approach may overlook important nutritional inequalities occurring among children within the same household. In households with more than one child under five years of age, children are exposed to broadly similar socioeconomic and environmental conditions. However, caregiving and feeding practices are not always applied uniformly across siblings for various reasons. Such differences in caregiving may result in unequal dietary intake and growth outcomes, leading to one child experiencing undernutrition. At the same time, another becomes overweight, even in households with comparable food availability [12]. These patterns may also be influenced by household-level and community-level factors, including economic constraints, caregiver knowledge, and access to health and nutrition services.

Despite growing attention to DBM, two key gaps remain. First, there is a research gap in capturing intra-household nutritional inequality among children (sibling-level DBM), as most studies rely on mother–child definitions. Second, there is a programmatic gap: existing nutrition interventions are often designed to address undernutrition and overnutrition separately, without fully accounting for their coexistence within the same household and across different contexts. This disconnect may limit the effectiveness of interventions in settings experiencing rapid nutritional transition. Examining DBM through a child–child household lens, therefore, provides a more sensitive indicator of intra-household nutritional inequality and early nutrition transition that mothers may not capture–child definitions alone. This distinction is important because determinants of the double burden may differ across the individual, household, and community levels, necessitating tailored interventions at each level. This study aims to provide policymakers with a comprehensive overview of factors at the household and community levels that affect the double nutritional burden, using a multilevel analysis of SSGI data from 2024. The findings are expected to inform more targeted, context-specific, and integrated nutrition interventions across different administrative levels.

## METHODS

### Study design and setting

The data used in this study comprises secondary cross-sectional data from the Indonesian Nutrition Status Survey (SSGI) 2024 as the primary source, along with supporting data from BPS and the Ministry of Health of the Republic of Indonesia. The SSGI survey was observational, focusing solely on documenting existing conditions. It covered all provinces in Indonesia using nationally representative survey data.

The SSGI population consists of all households with children aged 0-59 across Indonesia, with a sample of 345,000 households in 514 districts/cities, recorded by SSGI in 2024. The sampling method in SSGI used a two-stage multi-stage technique. First, samples were selected using the PPS (Probability Proportional Size) method with replacement. Second, households with children under five years old were systematically selected. Data on the household list were updated using the FASIH (Flexible Authentic Survey Instrument Harmony) application. All children who met the inclusion criteria were interviewed and measured. The inclusion criteria for the survey are that the children under five years old are registered and meet the SSGI criteria. The study excluded children with congenital limb deficiencies or severe congenital anomalies that could affect anthropometric measurements [3].

**Data collection**

We processed a dataset obtained from the Ministry of Health's Health Development Policy Agency (BKPK KEMENKES RI) following the official approval process, which contained data for 300,143 children from 273,959 households. After data merging, the analytical sample included 300,143 children from 273,959 households, which were analyzed using univariate and bivariate methods. For the multilevel analysis, the sample was restricted: observations with missing data in key covariates and clustering variables were excluded, yielding a final complete-case sample of 105,570 children (64.8% (Figure 1).

In this study, the variables included children's demographic characteristics, child characteristics, contextual variables, and dummy variables for nutritional status related to DBM occurrence. The data included height, weight, age in days, and other variables, from which dummy variables for nutritional status were created. The WHO standard is used for the anthropometric indices, in which z-scores <-2 for Height for Age Z-Score (HAZ), Weight for Age Z-Score (WAZ), and Weight for Height Z-Score (WHZ) are categorized as stunting, wasting, and underweight, respectively. Overweight was defined using WHZ > +2 standard deviations, in accordance with WHO standards. Nutritional status analysis in this study was conducted using the WHO Anthro Survey Analyzer website. Household-level DBM was defined as the coexistence of undernutrition and overnutrition among children aged 0–59 months within the same household. Undernutrition was defined as the presence of at least one child with stunting, wasting, or underweight (HAZ, WHZ, WAZ <-2), while overnutrition was defined as the presence of at least one child with overweight (WHZ > +2). The unit of analysis for DBM in this study is the household level, constructed from individual child-level data. In the analysis, we only look for households with more than two children under five: if one or more children are undernourished and one or more are overnourished, they are included as DBM.

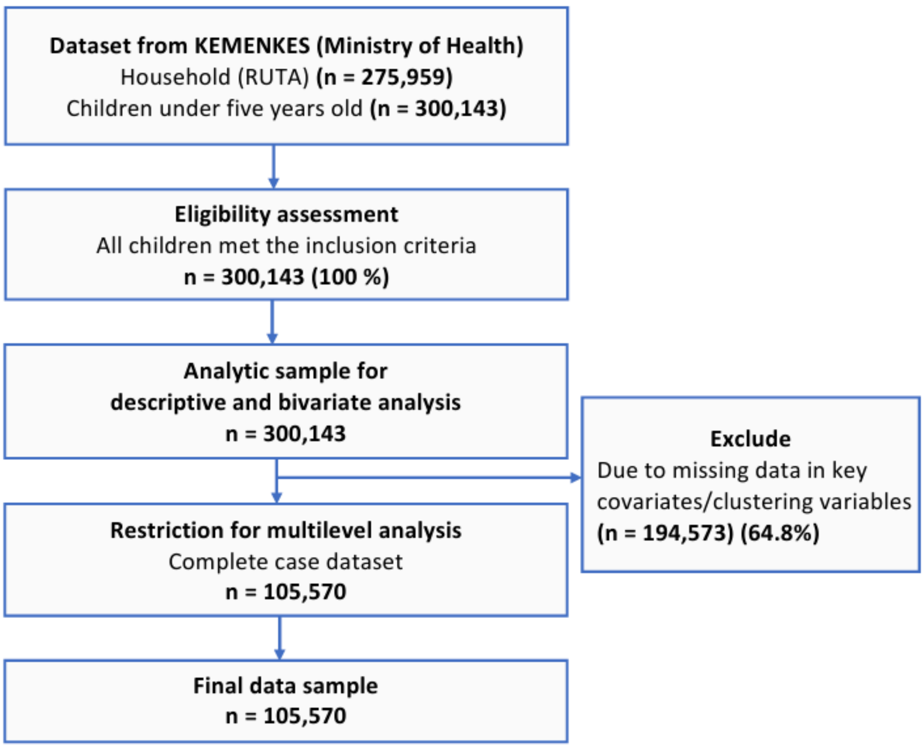


**Figure 1. Data flowchart**

**Data analysis**

Before the analysis, we combined the individual and household datasets, then grouped and reprocessed the data to prepare them for analysis. Missing data were identified, but we did not exclude them. We used all 300,143 toddler data for univariate and bivariate analyses. Missing data are recoded to the corresponding province code with a standardized suffix (999) for observations with missing district codes, ensuring inclusion in multilevel analysis. This research data is weight-adjusted using household-level survey weights (SSGI 2024). Both weighted frequencies (n) and percentages (%) were reported. Descriptive analysis was used to characterize children at the individual, household, and community levels. Bivariate analyses were conducted using the chi-square test to identify factors associated with a double nutritional burden among children in the same household with individual/household and regional factors.

The analysis model uses a multilevel logistic regression approach to account for hierarchical data structures. We designed several increasingly complex models to understand the effects at the individual and regional levels. Model 0 was an empty model that estimated the basic variance. In Model 1, we added predictors at the individual and household levels. In Model 2, we added contextual variables (district). Robustness analyses were conducted using alternative model specifications to assess the stability of results. Assumptions for multilevel logistic regression were assessed, including model convergence and absence of multicollinearity. Normality assumptions were not required for the binary outcome model. All analyses were performed using Stata version 17, with significance set at $p < 0.05$.

## RESULTS

Based on the analysis of SSGI 2024 data shown in Figure 2, which illustrates the distribution of nutritional status among Indonesian children under five years old. This pattern reflects the coexistence of multiple nutritional challenges within this population. Approximately 22.37 % of children were stunted, 18.98% were underweight, and 8.85% were wasted, while 3.60% were overweight. The prevalence of household-level DBM among children under 5 years old in the same household was 0.08%, indicating a very low prevalence in the study population. These prevalence estimates are higher than those reported in the official SSGI 2024 report, which documented stunting, underweight, acute malnutrition (wasting), and overweight at 19.8%, 16.8%, 6.2%, and 3.4%, respectively. In contrast, the national SSGI report included approximately 345,000 households, whereas the present analysis was based on 273,959 households from a given dataset, which may have influenced prevalence estimates.

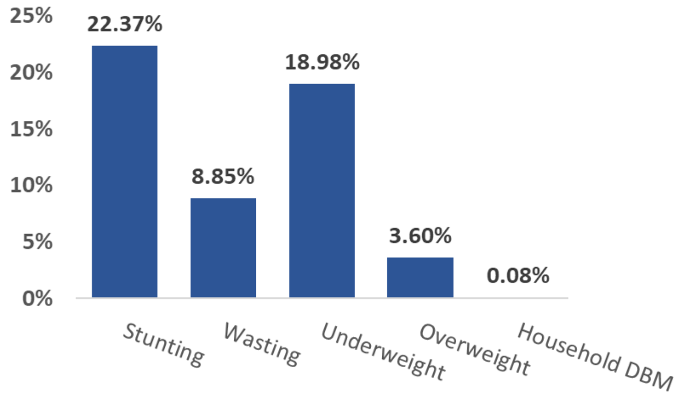


**Figure 2. The distribution of nutritional status among Indonesian children**

Based on the sociodemographic characteristics (Table 1), most of the children were male (51.09%). The majority were aged ≥2 years (64.87%), while only a small proportion had more than one child under five years old (17.41%). In addition, most participants resided in the Java-Bali region (53.1%), did not receive PBI assistance (71.61%), and lived in urban areas (58.8%).

**Table 1. Socio-demographic characteristics of children**

| Variable | n (%) weighted |
|---|---|
| **Child gender** | |
| Male | 10,431,885 (51.09) |
| Female | 9,986,216 (48.91) |
| **Child age group (years)** | |
| < 2 | 7,173,073 (35.13) |
| ≥ 2 | 13,245,027 (64.87) |
| **Number of children (in one household)** | |
| 1 child | 16,861,915 (81.36) |
| > 1 child | 3,556,186 (18.64) |
| **Health-economic status** | |
| PBI / Subsidized (poorer) | 5,797,580 (28.39) |
| Non-PBI / Non-subsidized (wealthier) | 14,620,521 (71.61) |
| **Region** | |
| Java–Bali | 10,841,577 (53.10) |
| Outside Java–Bali | 9,576,523 (46.90) |
| **Type of residence** | |
| Urban | 12,023,014 (58.88) |
| Rural | 8,395,086 (41.12) |

**Note**: *Weighted using household-level survey weights (SSGI 2024); (PBI = subsidized national insurance)

**Table 2. Bivariate associations between socio-demographic, child, maternal characteristics, and household-level double burden of malnutrition**

| Variable | Category | DBM n (%) weighted | Non-DBM n (%) weighted | *p*-value |
|---|---|---|---|---|
| Child gender | Male | 73,704 (0.12) | 1,035,8181 (99.29) | 0.32 |
| | Female | 65,382 (0.65) | 9,920,834 (99.35) | |
| Child age group (years) | < 2 | 67,618 (0.94) | 7,105,455 (99.06) | < 0.001*** |
| | ≥ 2 | 71,468 (0.54) | 13,173,560 (99.46) | |
| Number of children (in one household) | 1 child | 70,058 (0.42) | 16,791,857 (99.58) | < 0.001*** |
| | > 1child | 69,027 (1.94) | 3,487,158 (98.06) | |
| Birth certificate | No | 37,620 (1.54) | 2,404,686 (98.46) | <0.001*** |
| | Yes | 101,465 (0.56) | 17,874,329 (99.44) | |
| Exclusive breastfeeding (ASI) | Appropriate | 21,251 (0.58) | 3,568,187 (99.42) | <0.001*** |
| | Inappropriate | 46,367 (1.33) | 3,443,683 (98.67) | |
| Maternal anemia | Yes | 11,832 (0.45) | 2,588,691 (99.55) | <0.001*** |
| | No | 127,254 (0.71) | 17,690,324 (99.29) | |
| Basic Immunization | No | 56,120 (1.03) | 5,376,648 (98.97) | <0.001*** |
| | Yes | 82,965 (0.55) | 14,902,367 (99.45) | |
| Health-economic status | PBI / Subsidized (poorer) | 38,381 (0.66) | 5,759,199 (99.34) | 0.63 |
| | Non-PBI /Non-subsidized (wealthier) | 105,171(0.69) | 14,519,817 (99.31) | |
| Insurance | Non Insurance | 68,727 (0.72) | 9,492,419 (99.28) | < 0.001*** |
| | Have insurance | 70,359 (0.65) | 10,786,596 (99.35) | |
| Region | Java–Bali | 38,585 (0.36) | 10,802,993 (99.64) | < 0.001*** |
| | Outside Java–Bali | 100,501 (1.05) | 9,476,023 (98.95) | |
| Type of residence | Urban | 75,048 (0.62) | 11,947,967 (99.38) | 0.020* |
| | Rural | 64,038 (0.76) | 8331048 (99.24) | |

**Note:** *Weighted using household-level survey weights (SSGI 2024). (PBI = subsidized national insurance); Significance: *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$

**Table 3. Multilevel analysis results of DBM on individuals, between children in households, districts/cities, and provinces**

| Variable | Model 0 | Model 1 (Household) | Model 2 (District) |
|---|---|---|---|
| **Fixed effects (OR, 95% CI)** | | | |
| **Region** | | | |
| Java Bali | — | 0.37*** [0.24–0.56] | 0.39*** [0.27–0.57] |
| (Ref: Outside Java Bali) | — | — | — |
| **Residence** | | | |
| Rural | — | 0.96 [0.84–1.08] | 0.98 [0.86–1.12] |
| (Ref: Urban) | — | — | — |
| **Birth certificate** | — | | |
| No | | 1.68*** [1.46–1.93] | 1.70*** [1.48–1.95] |
| (Ref: Yes) | — | — | — |
| **Exclusive breastfeeding** | | | |
| Appropriate | — | 0.54*** [0.47–0.61] | 0.54*** [0.48–0.61] |
| (Ref: Inappropriate) | — | — | — |
| **Maternal anemia** | | | |
| Yes | — | 1.09 [0.89–1.34] | 1.10 [0.89–1.35] |
| (Ref: No) | | — | — |
| **Number of under-five children** | | | |
| > 1 child | — | 3.29*** [2.92–3.70] | 3.30*** [2.93–3.71] |
| (Ref: 1 child) | — | — | — |
| **Basic immunization** | | | |
| Incomplete | — | 1.10 [0.98–1.25] | 1.10 [0.98–1.24] |
| (Ref: Complete) | — | — | — |
| **Insurance** | | | |
| Yes | — | 1.02 [0.79–1.17] | 1.01 [0.88–1.15] |
| (Ref: No) | — | — | — |
| **District double burden index** | | | |
| Yes | — | — | 2.01*** [1.66–2.45] |
| (Ref: No) | — | — | — |
| **Random effects (variance components)** | | | |
| Province-level variance | 1.41*** [1.15–1.74] | 1.17* [1.03–1.33] | 1.13* [1.02–1.24] |
| District-level variance (within province) | 1.40*** [1.28–1.53] | 1.38*** [1.23–1.54] | 1.28*** [1.16–1.40] |
| **Model Fit** | | | |
| N | 300,143 | 105,570 | 105,570 |
| Log likelihood | -14022.68 | -6264.01 | -6240.94 |
| AIC | 28051.36 | 12550.02 | 12505.89 |
| BIC | 28083.20 | 12655.25 | 12655.25 |

**Note:** Values are Odds Ratios (OR) with standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.
Model 0: empty model estimating baseline variance; Model 1: adds individual- and household-level predictors;
Model 2: adds contextual (district) variables.

Table 2 shows the distribution of DBM across socio-demographic, child, and maternal factors. Chi-square analysis indicated significant associations between household-level DBM and child age group, number of children in the household, birth certificate, exclusive breastfeeding, maternal anemia, complete basic immunization, insurance, region, and type of residence ($p<0.05$). The subsequent models (Table 3) incorporate both individual and contextual-level variables to identify determinants of DBM across Indonesia's districts and provinces.

In the fixed-effects section of Model 1, which included individual- and household-level variables, several factors were significantly associated with DBM. After incorporating district-level context in Model 2, the magnitude and direction of these associations remained largely unchanged, indicating stability of the estimates. In the final specification, residing in Java–Bali was consistently associated with lower odds of DBM (Model 2: OR = 0.39; 95% CI: 0.27–0.57) than outside Java-Bali. Conversely, children without birth certificates had significantly higher odds of experiencing DBM (OR = 1.70; 95% CI: 1.48–1.95) than children with birth certificates. Exclusive breastfeeding was also significantly associated with appropriate practice, with lower odds (OR = 0.54; 95% CI: 0.48–0.61) than with inappropriate practice. Household structure emerged as one of the strongest predictors, with households with more than one child under five showing substantially higher odds of DBM (OR = 3.30; 95% CI: 2.93–3.71) than households with one child under five. The district-level DBM index was a strong contextual determinant (Model 2: OR = 2.01; 95% CI: 1.66–2.45), and its effect remained consistent in subsequent models. Other variables, including maternal anemia, immunization status, and insurance coverage, were not statistically significant across models.

Variance components from the empty model (Model 0) indicated substantial clustering at both province and district levels. After sequential adjustment of individual, household, and contextual factors, meaningful variation was primarily explained at the district level (Model 2), while variance at the provincial level became negligible. Model fit improved substantially from Model 1 to Model 2, as indicated by lower AIC and BIC values. However, the inclusion of additional provincial-level variables and cross-level interaction terms did not improve model fit or add meaningful explanatory value. In addition, these models did not materially change the magnitude or direction of the estimated coefficients. Therefore, based on considerations of model parsimony, interpretability, and model fit, Model 2 was selected as the final model.

## DISCUSSION

Undernutrition remains one of Indonesia's dominant challenges, while the rising prevalence of overweight signals a nutrition transition within the same population. The coexistence of undernutrition and overnutrition has been widely reported across low- and middle-income countries [13]. Although the proportion of households experiencing both under-nutrition and overnutrition (sibling pairs) in this study is small (0.08%), it remains important from a public health perspective. DBM may represent an early signal of the ongoing nutrition transition; even at low prevalence, it identifies vulnerable subgroups facing contrasting nutritional risks [14]. Most previous studies have focused on DBM in mother–child pairs, while the incidence of DBM among children within a household has not been investigated. This approach is important because it enables the identification of nutritional inequities within households that may not be detected using the mother–child definition. Thus, analysis at the household level provides a perspective more sensitive to the early dynamics of the nutritional transition. In the Indonesian context, where disparities in food access and consumption patterns among household members persist, the prevalence of DBM is likely to increase if not addressed early on [15]. These findings underscore the importance of strengthening integrated nutrition interventions (double-duty actions) that not only focus on the population or regional level but also identify and target more specific interventions for households with various forms of child malnutrition.

The very low prevalence of household-level DBM (0.08%) has important methodological implications. Analyses involving rare outcomes are often subject to limited statistical power, which may reduce the ability to detect significant associations and can lead to unstable regression estimates, including wide confidence intervals [16]. Therefore, after conducting the multilevel logistic regression analysis, robustness checks were conducted to assess the stability of the findings. Alternative model specifications and variable-exclusion analyses were applied, and the results remained consistent, with minimal changes in effect sizes and statistical significance. These findings suggest that, despite the rare outcome, the main pattern observed in this study is relatively robust.

The analysis explores these associations to identify subgroups that may serve as entry points for more targeted dual-nutrition interventions. This study provides evidence that both household-level and contextual factors shape the household DBM in Indonesia, with consistent patterns observed across multiple models. One of the most prominent findings is the strong association between household structure and household-level DBM. Households with more than one child under five exhibited substantially higher odds of DBM (OR 3.30). This finding is consistent with previous research showing that a higher number of children in a household is associated with an increased risk of household-level DBM, likely due to unequal food allocation among family members [15]. Differences in food allocation among siblings may be influenced by birth order and child characteristics; unwanted children receive a less varied diet, while children with faster eating behaviors consume more, thereby increasing the risk of overweight. Consequently, parental feeding practices may be more responsive to children's preferences than to their nutritional needs, and they can vary among siblings within the same household, leading to differences in nutritional status [12,17,18].

Exclusive breastfeeding was consistently associated with a lower likelihood of household-level DBM across all models (final model: OR = 0.54). This association remained stable across household, district, and provincial levels, suggesting a robust relationship between early-life feeding practices and nutritional outcomes. Several studies have shown that children who are not exclusively breastfed are significantly more likely to experience undernutrition [19]. The nutritional and immunological benefits of breast milk may explain this [20]. Additionally, children who are not exclusively breastfed and are fed formula have a higher risk of becoming overweight due to formula's higher energy content and the potential for overfeeding [21].

Children without a birth certificate had significantly higher odds of experiencing DBM (OR = 1.70), highlighting the role of administrative and social inclusion in shaping nutritional outcomes. Research in 31 low- and middle-income countries shows that birth registration is associated with better nutritional outcomes in children. Children without birth certificates tend to have poorer growth indicators, including height-for-age and weight-for-age scores, compared to children with birth certificates [22]. This relationship is often explained by limited access to health and nutrition services, as well as broader socioeconomic disadvantages among unregistered children [23].

The lower likelihood of DBM observed among households residing in Java–Bali (OR = 0.39) may reflect structural advantages, including better access to health services, infrastructure, and socioeconomic opportunities. Evidence from Indonesia shows substantial regional disparities in health service utilization, with populations in more developed regions such as Java–Bali having significantly higher access to and use of health facilities than those in less developed areas [24]. These disparities are reinforced by the unequal distribution of health infrastructure and the workforce, with more advanced services concentrated in western Indonesia. At the same time, outer regions face limited availability and geographic barriers to care [25]. Inadequate access to health and nutrition services can increase the risk of malnutrition [26].

At the contextual level, the district DBM index remained a strong and consistent predictor across models. This finding underscores the importance of local-level factors, such as service delivery capacity, environmental conditions, and community-level socio-economic patterns. The persistence of district-level variance, even after adjustment, suggests that unobserved contextual factors may still influence nutritional outcomes. In contrast, adding province-level variables did not meaningfully improve model fit, and cross-level interactions were not statistically significant. This indicates that higher-level aggregation may not provide additional explanatory power beyond district-level variation, and that the effects of individual- and household-level factors are relatively consistent across contexts. Local systems play a major role in improving health outcomes, including nutrition [27]. Decentralized governance has contributed to inter-district variation in health service delivery and outcomes, with districts with stronger capacity and health governance experiencing faster reductions in malnutrition and improvements in food security [28–30]. Importantly, the robustness analysis demonstrated that the estimated associations remained stable across model specifications. The consistency of effect sizes and statistical significance across Models 1 to 4 strengthens confidence in the validity of the findings and suggests that the results are not sensitive to model assumptions.

From a policy perspective, these findings highlight the need for interventions operating at multiple levels. Programs should prioritize households with multiple young children, where unequal food allocation may occur, and strengthen efforts to promote optimal infant and young child feeding practices, including exclusive breastfeeding. Efforts to improve civil registration coverage, such as birth certificate ownership, may also help enhance access to health and nutrition services. In addition, the strong influence of district-level variation indicates that strengthening local health system capacity, including service delivery and program implementation, is critical. Tailoring interventions to district-specific contexts may be more effective than relying solely on national-level strategies.

There are several limitations in this study. The usage of a cross-sectional design in this study limits the ability to establish causal relationships between individual and contextual factors. Although multilevel modeling accounted for clustering at the district and provincial levels, unmeasured contextual influences, such as dietary patterns, food prices, or cultural practices, may still confound the associations. Reliance on secondary survey data limited the inclusion of certain behavioral and environmental variables relevant to the nutrition transition. A substantial reduction in sample size was observed between the initial dataset and the final analytical sample used in the multilevel models. This was primarily due to the use of a complete-case analysis, which retained only observations with complete data across all variables included in the model. Given the inclusion of multiple variables at the individual, household, and contextual levels, observations with missing values in any of these variables were excluded from the analysis. This may introduce selection bias if the excluded observations differ systematically from the included ones, potentially affecting the sample's representativeness. As a result, the findings may not be fully generalizable to the original population and should be interpreted with caution. Future research should adopt longitudinal and mixed-method approaches to explore causal pathways. Integrating spatial and qualitative analyses could also illuminate how local governance, health system capacity, and community resilience shape the persistence of the double burden across regions.

## CONCLUSION

This study demonstrates that household-level DBM among children in Indonesia exists but remains rare. Despite its low prevalence, the presence of DBM reflects emerging intra-household nutritional inequalities and signals increasing complexity in the country's nutritional landscape. Several key determinants were identified, including household structure, exclusive breastfeeding, birth certificate ownership, and geographic disparities, particularly between Java–Bali and other regions. In addition, district-level contextual factors play a significant role, highlighting the importance of local health system capacity and socioeconomic conditions. These findings underscore the need for integrated, multi-level interventions that address both undernutrition and overnutrition simultaneously, with particular attention to vulnerable households and local health system capacity.

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**Authors' contribution**

A.B.: Conceptor, methodology, data curation, formal analysis, project administration, resources, validation, roles/writing original draft, writing review & editing; F.Y., A.A.S.I.O., M.C.H.Z., N.M.A.: Supervision, validation, writing review & editing; A.B.A**:** Data curation, resources, roles/writing original draft, writing review & editing; A.P.H.: Data curation, resources, roles/writing original draft, writing review & editing; I.A.: Validation, writing review & editing; N.M.: Conceptor, data curation, formal analysis, funding acquisition, investigation, project administration, supervision, validation, visualization, roles/writing original draft, writing review & editing.

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**Data availability**

The data supporting the findings of this study are available from the corresponding author upon reasonable request.

**Ethics statement**

This study has been approved by the Ethical Committee of Medical Research Faculty of Dentistry, University of Jember, with No. 3517/UN25.8/KEPK/DL/2025.

**Ethical consideration**

This study uses secondary data that has been anonymized and is available for research purposes. Therefore, no direct consent from the respondent is required. Nevertheless, the use of data still adheres to research ethics and data-use permits from the provider institutions, and to the principles of confidentiality and the protection of individual identities. This particular research has been approved by the Ethical Committee of Medical Research Faculty of Dentistry, University of Jember, with No. 3517/UN25.8/KEPK/DL/2025.

**Conflicts of interest**

All authors declare no conflict of interest in this article.

**Use of artificial intelligence (AI)**

The authors used Grammarly only to check for grammatical errors and improve clarity. The authors have reviewed all content and are responsible for the originality of this work.

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