

Early childhood patterns of wasting and stunting in the Philippines: Evidence from the 2018-2019 Expanded National Nutrition Survey (ENNS)

Eva A Goyena*, Ma. Lynell V Maniego & Romalyn L Tordecilla

Department of Science and Technology, Food and Nutrition Research Institute, Taguig City, Philippines

ABSTRACT

Introduction: The prevalence of wasting in the Philippines has not significantly declined in recent years, from 5.7% in 2018-2019 to 5.5% in 2021. This study examined age-related patterns of wasting and stunting across socio-demographic groups and identified socioeconomic and demographic factors associated with wasting among Filipino children under five years. **Methods:** The study utilised cross-sectional population-based surveys conducted in 2018 and 2019. Descriptive statistics and multiple logistic regression analysis were used to analyse data from 26,416 under-five children. **Results:** Wasting was highest at birth (8.2%) and peaked at 12-17 months (8.4%) before declining to 5.1% by age two. In contrast, stunting was lower at birth (10.2%), increasing sharply to 29.4% at 12-17 months and 38.3% at 18-23 months before slightly decreasing to 32.4% at two years old. Boys, children in rural areas, and those from poor households were more affected by wasting and stunting. Multivariate analysis showed increased odds of wasting in children whose mothers were thin (BMI <18.5 kg/m²) (AOR=1.4, *p*=0.013), short (<150 cm) (AOR=1.3, *p*=0.013), and less educated (AOR=1.5, *p*<0.001); for children over two, only mothers who were thin (AOR=1.6, *p*=0.006). Rural-urban differences were observed, with maternal and child factors strongly associated with wasting in rural areas, and maternal and household factors in urban areas. **Conclusion:** The findings underscore importance of strengthening interventions during the first 1,000 days of life. Context-specific strategies addressing maternal nutrition, education, and household conditions, while accounting for rural-urban disparities, are essential to prevent wasting and stunting among Filipino children.

Keywords: children under five, infant, Philippines, stunting, wasting

*Corresponding author:

Eva A. Goyena

Department of Science and Technology

Food and Nutrition Research Institute

Taguig City, Philippines

Tel. No.: (02) 8839-1843 and (02) 8837-8113 local 325; E-mail: eva2@fnnri.com

doi: <https://doi.org/10.31246/mjn-2025-0027>

INTRODUCTION

The global nutrition targets for 2025 calls for all countries to reduce and maintain child wasting to below 5% (WHO, 2014), aligning with the Sustainable Development Goals. Child wasting is referred to as acute malnutrition because of its sensitivity to short-term shocks, such as a decline in diet quality or quantity, poor feeding and caring practices, and the presence of illnesses or infections (Harding *et al.*, 2018; Headey & Ruel, 2022). Wasted children have weakened immune systems, predisposing them to severe infections as a consequence of immunodeficiencies (Chang *et al.*, 2013; Ijaiya *et al.*, 2024), and a higher risk of death, particularly when wasting is severe, known as severe acute malnutrition (SAM). Re-occurrence of wasting among children may contribute to stunting and long-term harm (Mertens *et al.*, 2023).

Wasting is measured using weight-for-length z-scores (WLZ), defined as less than -2 standard deviations (SD) from the median of the World Health Organization (WHO) Child Growth Standards, and less than -3 SD for severe acute malnutrition (SAM) (WHO, n.d.). Wasting affected 45 million (6.8%) under-five children in 2022, with 13.6 million (2.1%) suffering from severe wasting (UNICEF/WHO/World Bank Group, 2023). Based on the recent Joint Malnutrition Estimates (JME) report in 2023, there is unsatisfactory progress in reaching the wasting reduction targets in the 2030 SDG 2 targets and the 2025 World Health Assembly (WHA) nutrition targets.

In the Philippines, wasting was 5.7% in 2018 and 2019, declining only slightly to 5.5% in 2021, a level comparable to estimates reported two decades earlier (DOST-FNRI, 2022). The Philippines ranks 8th among the 84 countries with the highest number of children under 5 affected by SAM, as reported in the JME 2023. National estimates are generated through the National Nutrition Survey (NNS), an official statistical activity designated by the government under Executive Order No. 352 (1996) and conducted by the Department of Science and Technology – Food and Nutrition Research Institute (DOST-FNRI). Conducted every five years since 1978, the survey provides comprehensive information on the nutrition and health status of Filipinos. In 2018, the survey was redesigned as the Expanded NNS (ENNS), a three-year rolling survey (2018-2021) that generates provincial and highly urbanised city estimates to support more targeted, evidence-based interventions by local government units.

In the country, the risk of wasting increases during environmental shocks such as typhoons, floods, landslides, and armed conflict (Garg *et al.*, 2016). Although treatment approaches have shifted from hospital-based malnutrition wards to community-based management of acute malnutrition (CMAM), access to essential nutrition services remains limited among poor and marginalised populations due to resource constraints and weak service delivery systems (Garg *et al.*, 2016). Rural-urban disparities and wealth inequalities further shape the distribution of undernutrition, with higher prevalence observed among children from low-income households and urban poor communities (Singh *et al.*, 2020; Toma *et al.*, 2023).

Previous research has primarily focused on age patterns of stunting, although evidence suggests that wasting is more common among children under two years of age (Martorell & Young, 2012; Karlsson *et al.*, 2022). While stunting reflects chronic exposure to nutritional deprivation, wasting is more sensitive to acute nutritional deficits. Examining patterns of wasting can therefore provide insights

into periods of heightened vulnerability to undernutrition and its potential consequences. Although several studies have examined the drivers of stunting in the Philippines (Ulep *et al.*, 2022), evidence on the determinants of wasting remains limited.

This study aimed to examine patterns of wasting and stunting among children under five years of age in the Philippines. Specifically, it aimed to 1) assess wasting and stunting patterns by child's age, sex, place of residence, and wealth status, and 2) identify socioeconomic and demographic predictors of wasting during the first two and over two years of life in rural and urban Philippines.

METHODOLOGY

The study examined data on children aged 0-59 months from the 2018-2019 ENNS, a nationally representative cross-sectional survey conducted by the DOST-FNRI. The ENNS employed a two-stage cluster sampling design based on the 2013 Master Sample Frame (MSF) of the Philippine Statistics Authority (PSA) (DOST-FNRI, 2022).

In the first stage, primary sampling units (PSUs), each approximately 100–400 households (HHs), were selected. PSUs correspond to a *barangay*, a group of small *barangays*, or an enumeration area (EA). In the second stage, an average of 12 sample housing units in highly urbanised cities (HUCs) or 16 sample housing units in provinces were selected from each PSU using systematic random sampling with proportionate allocation. Of the 39,334 under-five children in the dataset, 26,416 under-five children (10,006 infants aged 0-23 months and 16,410 children aged 24-59 months) with complete data on anthropometric, maternal, household, and child characteristics were included in the study. Nutritional status (NS) of children was assessed using the WHO Child Growth Standards (CGS) (WHO, n.d.). Wasting was identified as weight-for-height z -score $< -2SD$, while stunting was identified as height-for-age z -score $< -2SD$.

Independent variables included child's age and sex, maternal age, maternal NS and educational attainment, household wealth status, and place of residence. Wealth quintile was used as a proxy indicator of household socioeconomic status, dividing the population into equal quintiles (poorest, poor, middle, rich, and richest) as a simple way of looking at relative poverty. It was computed using principal component analysis (PCA) based on household asset ownership and housing-related characteristics (dwelling type, tenure, construction materials, number of bedrooms, cooking fuel, transport assets, electricity access, and ownership of household appliances) (DOST-FNRI, 2022). All variables were coded as binary or categorical indicators, while wealth scores were ranked and categorised into quintiles, from poorest to richest households.

Statistical analysis

Means and percentages were utilised to characterise the children sampled in the study. Multivariable logistic regression analysis was performed to identify factors independently associated with wasting. Variables were selected for inclusion in the multivariable models based on a combination of statistical significance in bivariate analyses ($p < 0.20$). Key covariates known to be associated with child undernutrition (child's age and sex, maternal education, and household wealth status) were retained in the final model to minimise residual confounding. Model building

followed a hierarchical approach, whereby child-level variables were entered first, followed by maternal- and household-level variables. Multicollinearity among independent variables was assessed using variance inflation factors (VIF), with <10 considered acceptable. Model fit was evaluated using the Hosmer–Lemeshow goodness-of-fit test. Robust standard errors were applied to account for potential heteroskedasticity and the complex survey design. Adjusted odds ratios (AORs) with 95% confidence intervals (CI) were reported. Sampling weights and post-stratification adjustments were applied to ensure national representativeness by age and sex. All analyses were performed using Stata 15 (Stata Corporation, Texas, USA, 2017). Statistical significance was set at $p < 0.05$.

Ethical considerations

The 2018–2019 ENNS was approved by the DOST-FNRI Institutional Ethics Review Committee with protocol code FIERC-2017-017. Informed consent during primary data collection was obtained through the parent or guardian of children less than 7 years old, orally and in writing through informed consent forms to affirm voluntary participation.

RESULTS

General characteristics

Weighted frequencies and means for selected household, maternal and child characteristics are shown in Table 1. More than half (51.1%) of the children under five years belonged to the poorest (28.4%) and poor (22.7%) households. Mean age of the mothers was 31 ± 0.08 years, with similar ages among rural and urban mothers. More overweight mothers were present in urban (38.1%) than in rural (29.8%) areas. Educational attainment was higher among urban mothers (68.4%). Approximately 5% of the children were wasted, higher in rural children, while 1% were severely wasted and did not differ between rural and urban children. Stunting was more common, with 21.6% of the children stunted and 8.2% severely stunted. Rural children exhibited a higher proportion of stunting (23.5% vs. 19.5%) and wasting (5.5% vs. 4.3%).

Patterns of wasting

Figure 1 shows the overall wasting prevalence among children under five years of age. By age (A), wasting was highest between birth (8.2%) and 12–17 months of age (8.4%); it then declined sharply around 18–23 months (5.5%) and gradually decreased until it reached 36–47 months (4.6%), implying a declining pattern of wasting as the child grows older. By sex (B), wasting was more prevalent among boys than girls, except during 12–17 months and 48–59 months. By place of residence (C), wasting was higher among rural children, with differences ranging from 0.5 to 2.6, except for children 18–23 months of age, where wasting was higher in urban than in rural areas. Significant differences ($p < 0.05$) were only found at 12–17 and 48–59 months. By wealth status (D), wasting was significantly higher among children from poor households, and this pattern was consistent from six months all the way to age five years old.

Patterns of stunting

Stunting showed an opposite pattern to wasting, as shown in Figure 2. Among the

Table 1. Descriptive statistics of study participants (0-59 months old) by selected household, maternal and child characteristics, Philippines: 2018-2019 (n=26,416)

Variables	All		Rural Areas		Urban Areas	
	n (Prop/Mean)	SE	n (Prop/Mean)	SE	n (Prop/Mean)	SE
All	26,416 (100.0%)	-	16,631 (53.1%)	4.2	9,785 (46.9%)	4.2
Wealth status						
Poorest	9,023 (28.4%)	2.1	7,060 (39.2%)	2.9	1,963 (16.1%)	2.1
Poor	6,352 (22.7%)	1.0	4,247 (25.1%)	1.1	2,105 (20.0%)	1.3
Middle	4,781 (20.1%)	0.9	2,602 (16.4%)	1.0	2,179 (24.3%)	1.3
Rich	3,643 (16.8%)	1.2	1,690 (12.0%)	1.3	1,953 (22.4%)	1.4
Richest	2,617 (12.0%)	1.0	1,032 (7.3%)	1.1	1,585 (17.3%)	1.2
Maternal characteristics						
Age						
All (Mean age in years)	26,416 (31)	0.08	16,631 (31)	0.11	9,785 (31)	0.11
<20 years old	587 (2.2%)	0.1	360 (2.1%)	0.2	227 (2.3%)	0.2
≥20 years old	25,829 (97.8%)	0.1	16,271 (97.9%)	0.2	9,558 (97.7%)	0.2
BMI						
All (Mean BMI in kg/m ²)	26,416 (23.6)	0.07	16,631 (23.2)	0.08	9,785 (24.1)	0.05
Thin (<18.5kg/m ²)	2,407 (9.7%)	0.4	1,574 (10.7%)	0.5	833 (8.6%)	0.5
Normal	15,242 (56.7%)	0.5	9,957 (59.6%)	0.6	5,285 (53.4%)	0.7
OW (≥25kg/m ²)	8,767 (33.7%)	0.7	5,100 (29.8%)	0.8	3,667 (38.1%)	0.6
Height (Mean height in cm)						
All	26,416 (151.8)	0.14	16,631(151.5)	0.16	9,785 (152.1)	0.18
<150 cm	10,223 (37.1%)	0.9	6,786 (39.2%)	1.2	3,437 (34.7%)	1.1
≥150 cm	16,193 (62.9%)	0.9	9,845 (60.8%)	1.2	6,348 (65.3%)	1.1
Education						
High school undergraduate	10,737 (38.9%)	1.9	7,630 (45.4%)	2.5	3,107 (31.6%)	1.8
Above high school	15,679 (61.1%)	1.9	9,001 (54.6%)	2.5	6,678 (68.4%)	1.8
Child characteristics						
Age (months)						
All (mean age in months)	26,416 (31)	0.16	16,631 (31)	0.18	9,785 (31)	0.23
0-5	2,529 (9.5%)	0.2	1,610 (9.4%)	0.3	919 (9.5%)	0.3
6-11	2,615 (9.7%)	0.3	1,649 (9.9%)	0.4	966 (9.5%)	0.3
12-17	2,385 (9.2%)	0.3	1,501 (9.1%)	0.3	884 (9.2%)	0.4
18-23	2,477 (9.3%)	0.3	1,534 (9.3%)	0.4	943 (9.2%)	0.4
24-35	4,744 (18.0%)	0.4	2,976 (17.6%)	0.4	1,768 (18.4%)	0.6
36-47	5,693 (21.7%)	0.4	3,583 (21.4%)	0.5	2,110 (21.9%)	0.5
48-59	5,973 (22.7%)	0.4	3,778 (23.2%)	0.4	2,195 (22.2%)	0.7
Sex						
Boys	13,643 (51.5%)	0.2	8,575 (51.2%)	0.3	5,068 (51.9%)	0.5
Girls	12,773 (48.5%)	0.2	8,056 (48.8%)	0.3	4,717 (48.1%)	0.5
Height-for-age z-score, HAZ						
All (mean HAZ)	26,416 (-1.35)	0.03	16,631 (-1.46)	0.04	9,785 (-1.23)	0.03
<-3 SD (Severely stunted)	2,195 (8.2%)	0.4	1,486 (9.2%)	0.6	709 (7.0%)	0.6
<-2 SD (Stunted)	5,872 (21.6%)	0.7	3,927 (23.5%)	0.8	1,945 (19.5%)	0.8
≥-2 SD (Normal)	18,349 (70.2%)	0.9	11,218 (67.3%)	1.3	7,131 (73.4%)	1.1
Weight-for-height z-score, W						
All (Mean WHZ)	26,416 (-0.39)	0.02	16,631 (-0.47)	0.02	9,785 (-0.29)	0.02
<-3 SD (Severely wasted)	321 (1.0%)	0.1	205 (1.0%)	0.1	116 (1.0%)	0.1
<-2 SD (Wasted)	1,328 (4.9%)	0.2	893 (5.5%)	0.3	435 (4.3%)	0.4
≥-2 SD (Normal)	24,767 (94.1%)	0.2	15,533 (93.5%)	0.3	9,234 (94.7%)	0.4

Prop: Proportion; BMI: Body Mass Index; OW: Overweight

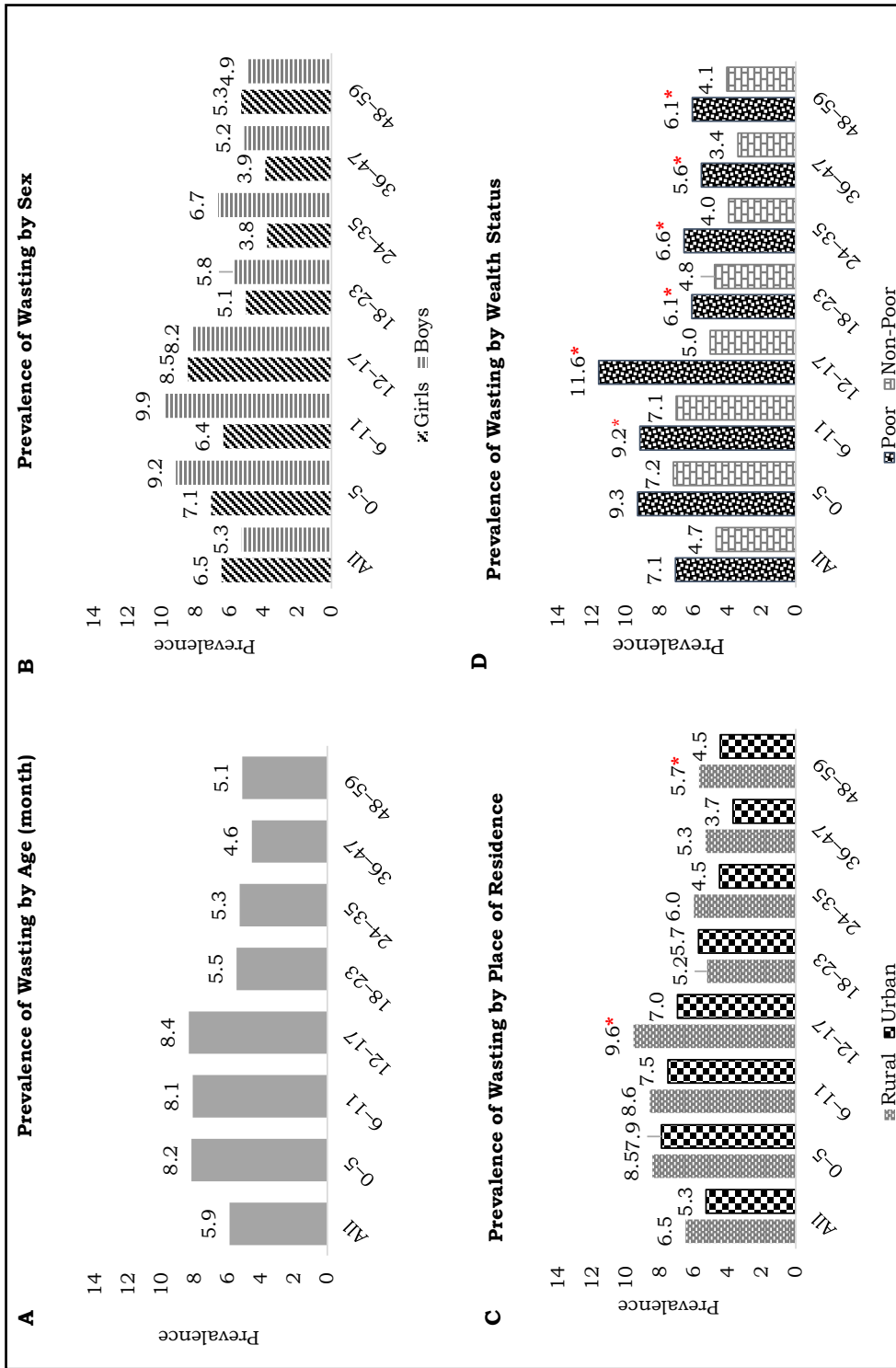


Figure 1. Patterns of wasting prevalence among children under five (0-59 months) by (A) age in months, (B) sex, (C) place of residence, and (D) wealth status in the Philippines: 2018-2019 (n=26,416); *significant at p<0.05.

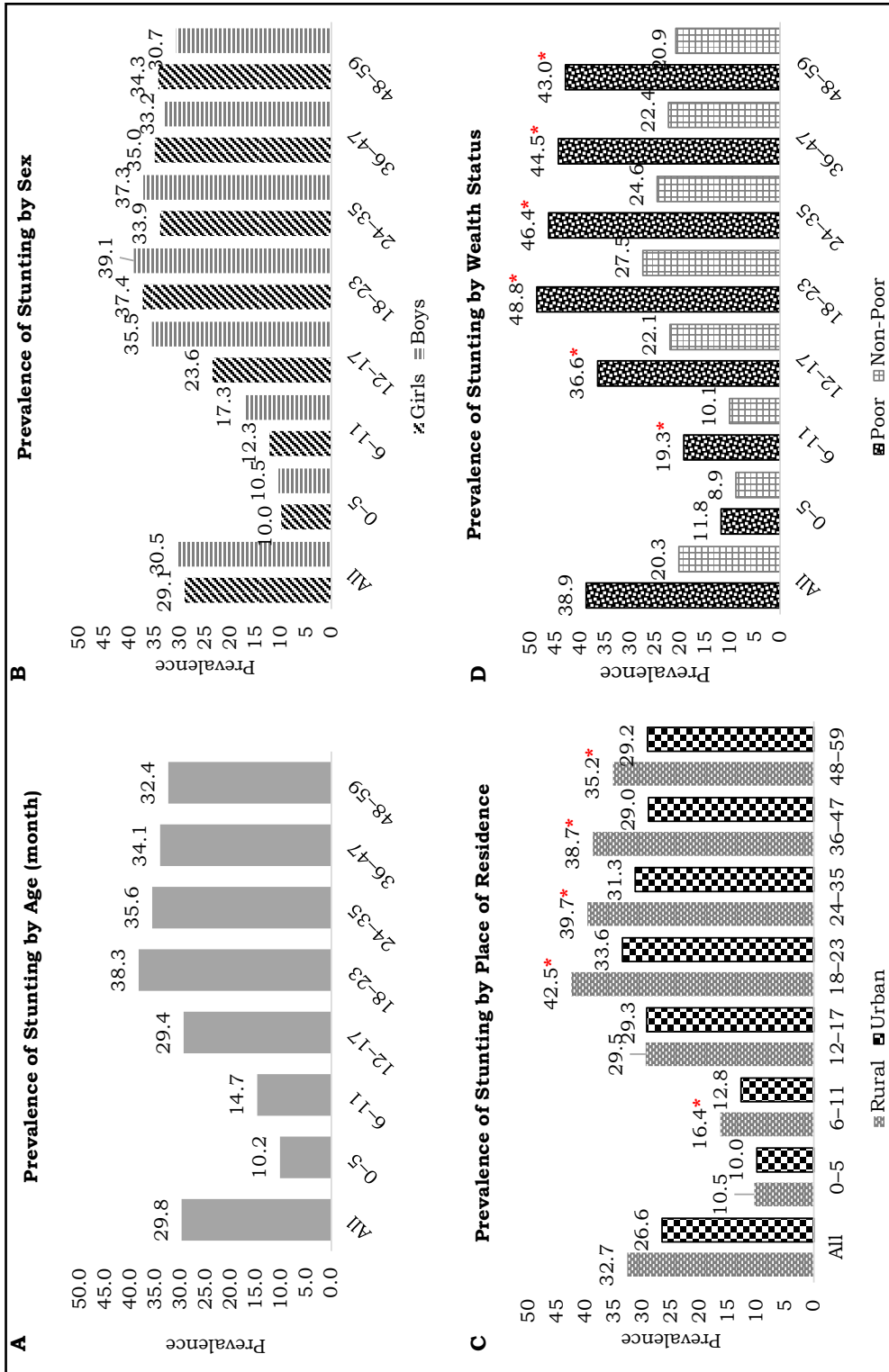


Figure 2. Patterns of stunting prevalence among children under five (0-59 months) by (A) age in months, (B) sex, (C) place of residence, and (D) wealth status in the Philippines: 2018-2019 ($n=26,416$)wealth status in the Philippines: 2018-2019 ($n=26,416$); *significant at $p<0.05$.

sampled children, stunting rapidly increased during the second year of life, from 14.7% at 6-11 months to 29.4% at 12-17 months, reaching 38.3% at 18-23 months, and then decreasing gradually over time until five years old (32.4%). By sex (B), stunting prevalence was higher among boys than girls between 0-5 months up to 24-35 months old. By residence (C), stunting was significantly higher among rural than urban children at 6-11 months (16.4% vs. 12.8%, respectively) and 18-23 months (42.5% vs. 33.6%, respectively) until 48-59 months (35.2% vs. 29.2%, respectively). The variation of stunting prevalence throughout the first five years was explicitly highlighted when disaggregated by wealth status (D), indicating that children from poor households have a significantly higher prevalence of stunting.

Factors associated with child wasting in rural and urban areas

Regression analysis revealed that factors associated with wasting among all children aged 0-23 months old, regardless of place of residence, were maternal characteristics of BMI, height, and education, as well as child's age, as shown in Table 2. By maternal characteristics, children were 1.4 ($p=0.013$), 1.3 ($p=0.013$), and 1.5 ($p<0.001$) times more likely to be wasted if their mothers were thin (BMI<18.5 kg/m²), have short height (<150 cm), and only finished high school or below, respectively, than their counterparts. By child characteristics, younger children aged 0-5 months, 6-11 months, and 12-17 months were 1.6 ($p=0.003$), 1.5 ($p=0.019$), and 1.6 ($p=0.006$) times more likely to be wasted, respectively, than those older children aged 18-23 months.

In rural areas, maternal thinness and low maternal education were associated with higher odds of wasting by 1.8 ($p=0.002$) and 1.4 ($p=0.032$), respectively. In urban areas, children with mothers of short stature and low education had higher odds of wasting by 1.4 ($p=0.006$) and 1.5 ($p=0.015$), respectively. Younger age (0-17 months vs. 18-23 months, $p<0.05$) was also associated with wasting in rural areas but not within urban areas. Girls had significantly lower odds of being wasted only in rural areas (AOR=0.8, $p=0.032$). There was a 40% lower chance of being wasted when the mother was overweight in urban areas (AOR=0.6, $p=0.007$).

Among older children aged 24-59 months, regardless of residence, the factors significantly associated with wasting were maternal BMI and child's sex. Children were 1.6 times ($p=0.006$) more likely to experience wasting with thin mothers while 0.6 times less likely with overweight mothers compared to children with mothers of normal BMI. Sex was the only child characteristic that appeared significantly associated with wasting among all children aged 24-59 months, with girls less likely to be wasted (AOR=0.8, $p=0.046$).

In rural areas, maternal BMI was the only factor associated with wasting among older children. Similar to the overall trend, mothers who were thin had higher odds of having wasted children, while mothers who were overweight had lower odds. In urban areas, household wealth status, toilet facility, and maternal overweight were associated with wasting. Children belonging to the poorest and poor households were 2.4 ($p=0.022$) and 3.2 times ($p=0.002$) more likely to be wasted than those from the richest households, respectively. Wealth was found to be associated with only wasting in urban areas, indicating the burden of undernutrition among urban poor children beyond two years. Further, unsealed toilets and the absence of toilet facilities increased the odds of wasting by 2.4 ($p=0.031$) and 2.0 ($p=0.016$), respectively.

Table 2. Multiple logistic regression analysis on wasting in children 0-59 months with selected socio-demographic factors in the Philippines: 2018-2019 (*n*=26,416)

Variables	All			Rural			Urban		
	AOR [†]	(95% CI)	<i>p</i> -value	AOR [†]	(95% CI)	<i>p</i> -value	AOR [†]	(95% CI)	<i>p</i> -value
Children aged 0-23 months									
Maternal characteristics									
BMI (kg/m ²)									
Thin (<18.5)	1.4*	(1.1-1.9)	0.013	1.8*	(1.3-2.5)	0.002	1.1	(0.8-1.5)	0.703
Normal	<i>ref</i>			<i>ref</i>			<i>ref</i>		
OW (≥25)	0.7*	(0.5-1.0)	0.023	0.9	(0.6-1.2)	0.351	0.6*	(0.4-0.8)	0.007
Height									
<150 cm	1.3*	(1.1-1.7)	0.013	1.3	(0.9-1.7)	0.107	1.4*	(1.1-1.8)	0.006
≥150 cm	<i>ref</i>			<i>ref</i>			<i>ref</i>		
Education									
High school undergraduate and below	1.5*	(1.2-1.8)	<0.001	1.4*	(1.0-2.0)	0.032	1.5*	(1.1-2.1)	0.015
Above high school	<i>ref</i>			<i>ref</i>			<i>ref</i>		
Child characteristics									
Age (months)									
0-5	1.6*	(1.2-2.1)	0.003	1.7*	(1.2-2.4)	0.003	1.4	(0.9-2.1)	0.085
6-11	1.5*	(1.1-2.2)	0.019	1.7*	(1.1-2.6)	0.013	1.3	(0.7-2.5)	0.344
12-17	1.6*	(1.2-2.1)	0.006	1.9*	(1.3-2.9)	0.004	1.2	(0.8-1.9)	0.362
18-23	<i>ref</i>			<i>ref</i>			<i>ref</i>		
Sex									
Boys	<i>ref</i>			<i>ref</i>			<i>ref</i>		
Girls	0.8	(0.6-1.0)	0.096	0.8*	(0.6-1.0)	0.032	0.8	(0.5-1.4)	0.417
Children aged 24-59 months									
Household characteristics									
Wealth status									
Poorest	1.6	(0.8-3.1)	0.167	0.8	(0.4-1.9)	0.665	2.4*	(1.2-4.9)	0.022
Poor	1.5	(0.8-2.8)	0.169	0.6	(0.3-1.3)	0.190	3.2*	(1.6-6.4)	0.002
Middle	1.1	(0.6-2.1)	0.649	0.7	(0.3-1.5)	0.330	1.7	(0.9-3.3)	0.095
Rich	1.1	(0.6-2.2)	0.694	0.6	(0.3-1.3)	0.181	1.9	(0.8-4.5)	0.114

To be continued...

Table 2. Multiple logistic regression analysis on wasting in children 0-59 months with selected socio-demographic factors in the Philippines: 2018-2019 (n=26,416) (Continued)

Variables	All			Rural			Urban		
	AOR [†]	(95% CI)	p-value	AOR [†]	(95% CI)	p-value	AOR [†]	(95% CI)	p-value
Richest	ref			ref			ref		
Water used for drinking									
Improved source	ref			ref			ref		
Non-improved source	1.2	(0.8-1.8)	0.260	1.4	(0.9-2.2)	0.128	0.6	(0.2-1.7)	0.310
Toilet facility									
Water-sealed	ref			ref			ref		
Not water-sealed	1.2	(0.8-1.9)	0.369	1.0	(0.6-1.5)	0.978	2.4*	(1.1-5.4)	0.031
No toilet	1.2	(0.9-1.7)	0.249	1.0	(0.7-1.4)	0.960	2.0*	(1.2-3.5)	0.016
Maternal characteristics									
BMI (kg/m ²)									
Thin (<18.5)	1.6*	(1.2-2.2)	0.006	1.9*	(1.3-2.8)	0.004	1.2	(0.8-2.0)	0.389
Normal	ref			ref			ref		
OW (≥25)	0.6*	(0.5-0.8)	0.005	0.6*	(0.5-0.9)	0.007	0.6*	(0.4-1.0)	0.033
Height									
<150 cm	1.2	(0.9-1.5)	0.182	1.2	(0.9-1.5)	0.198	1.2	(0.8-1.8)	0.324
≥150 cm	ref			ref			ref		
Child Characteristics									
Sex									
Boys	ref			ref			ref		
Girls	0.8*	(0.6-1.0)	0.046	0.8	(0.6-1.1)	0.164	0.7	(0.5-1.0)	0.068

BMI: Body Mass Index; OW: Overweight

Using multivariate logistic regression analysis

[†]Adjusted Odds Ratio

*significant at p<0.05

DISCUSSION

Patterns of wasting and stunting

The overall prevalence of wasting (5.9%) in Figure 1 was slightly above the WHA target of <5% by 2025 (WHO, 2014). A notable finding of this study was the contrasting age-related patterns between stunting and wasting. Wasting prevalence was highest in early life, with a high prevalence rate of 8.2% at birth to five months, peaking at 8.4% at 12-17 months, and then declining to 5.1% at four to five years old. Similar patterns have been observed in the Philippines through its national nutrition surveys, wherein wasting is high in the first two years and then declines thereafter. Growing literature implies that wasting occurs early in the life stage, particularly among children under two years old (Saaka & Gaala, 2016). This period represents a critical stage of vulnerability due to rapid growth, major feeding transitions from exclusive breastfeeding to complementary feeding, and increased exposure to infections. At this stage, children are highly dependent on caregivers for adequate feeding and care, and any gaps in these provisions can quickly lead to acute weight loss and wasting (Karlsson *et al.*, 2022).

In contrast, stunting follows an opposing trajectory, increasing with age. Stunting (21.6%) in this sample remained high, although lower than the estimated national prevalence of 30.3% in 2018 (DOST-FNRI, 2020). Of particular concern was the sharp increase in stunting beginning at around 12 months of age, reaching over 40% among older children. This pattern is consistent with the study by Capanzana *et al.* (2020), which showed that stunting in the Philippines rises rapidly between 6 and 18 months and is influenced by household income. However, the study also suggested that increased income alone may not fully reverse growth deficits during this period but may only slow the decline in linear growth. This highlights the cumulative nature of linear growth faltering, reflecting prolonged exposure to inadequate dietary intake and recurrent infections (Karlsson *et al.*, 2022).

Patterns of wasting and stunting were consistent in most age groups, with higher prevalence among boys, rural children, and those from poor households. Evidence in South and Southeast Asian countries (Harding *et al.*, 2018; Rahut *et al.*, 2024) showed similar patterns. Since wasting and stunting are affected by both diet and care (UNICEF, 2021), the finding that wasting is higher during the first six months of life and that stunting occurs particularly during 12 to 23 months (at 29.3% to 38.3%, respectively) underscores the importance of strengthening nutrition interventions across early childhood. These findings highlight the need to prioritise interventions before and after age two – protecting infants from early wasting and sustaining adequate nutrition, health, and caregiving beyond infancy. Such efforts are vital to prevent stunting during the first 1,000 days of life, when growth and development are most vulnerable to nutritional and environmental factors.

Factors associated with child wasting

This study is the first in the Philippines to examine wasting and its associated factors in two distinct age groups: 0-23 months and 24-59 months. Significant factors associated with wasting differed by age and residence. Among children under two years, maternal and child factors were most influential; for older children, household characteristics, maternal factors, and child's sex were more

prominent. Maternal BMI and child's sex emerged as consistent factors associated with wasting across both age groups. Child's age was significantly associated with wasting, consistent with previous studies (Boah *et al.*, 2019; Schoenbuchner *et al.*, 2019). However, age was not associated with wasting for children aged 24–59 months, likely reflecting the pattern observed in this study where wasting declined after 12–17 months and stabilised thereafter, consistent with global evidence (Thurstans *et al.*, 2022). These findings highlight the increased vulnerability of infants to nutritional deficiencies and infections, reinforcing the need to strengthen interventions during the first 1,000 days of life (Nyarko *et al.*, 2024). Preventing early wasting is crucial as it reduces the risk of recurrent episodes that increase the likelihood of child mortality and stunting (Mertens *et al.*, 2023; Schoenbuchner *et al.*, 2019).

Girls had lower odds of wasting compared with boys, although this association was observed only in rural areas. Similar patterns have been reported in previous studies (Harding *et al.*, 2018; Schoenbuchner *et al.*, 2019), although the mechanisms remain unclear. Possible explanations include higher nutrient requirements among boys and greater exposure to infections due to increased outdoor activity.

Maternal NS, reflected by BMI and height, was a significant predictor of child wasting, with notable urban–rural variation. Thin mothers had higher odds of having wasted children in rural areas, whereas overweight mothers had lower odds in urban areas. This pattern may reflect differences in socioeconomic conditions and food access. Rural mothers often experience higher levels of poverty and food insecurity, limiting their access to nutritious foods and health services during pregnancy, thus affecting foetal growth (Suansing, 2017; Sahiledengle *et al.*, 2023). Inadequate nutrition increases the risk of poor birth outcomes and early-life wasting. Addressing maternal undernutrition is therefore critical to breaking the cycle of intergenerational malnutrition. On the other hand, the protective association of maternal overweight should be interpreted cautiously, as maternal overnutrition is also linked to adverse pregnancy outcomes and increased risk of child overweight and metabolic conditions (Kim & Ayabe, 2023). Promoting healthy maternal weight before and during pregnancy remains essential for both maternal and child health.

Low maternal education (high school level or below) was associated with increased odds of wasting regardless of residence. Studies have shown that educated mothers are more likely to have a greater awareness of prenatal nutrition and adopt appropriate childcare practices, including age-appropriate feeding and health-seeking behaviours (Harding *et al.*, 2018; Toma *et al.*, 2023; Afrah *et al.*, 2024). Therefore, strengthening maternal education and nutrition literacy is important for improving child growth outcomes (Goyena & Valdeabella-Maniego, 2022).

Household wealth and sanitation facilities were associated with wasting among older children, particularly in urban areas. Children from the poorest and poor households had 2.4 times and 3.2 times higher odds of wasting, respectively, compared to those from wealthier households, consistent with previous study (Bustos *et al.*, 2025). However, this association was only significant in urban areas. Despite greater food availability in urban areas, poor households may still struggle to afford nutritious foods, highlighting the need to strengthen the targeting of vulnerable urban populations.

Poor water, sanitation, and hygiene (WASH) conditions were also associated with increased odds of wasting (Paltán-Hernandez *et al.*, 2021). Children living in households with unsealed toilets and no toilets had significantly higher odds of wasting by 2.4 times and 2.0 times, respectively, likely due to increased exposure to pathogens that contribute to diarrhoeal diseases and infection-related undernutrition. These risks are particularly pronounced in densely populated urban slums, emphasising the importance of improving sanitation infrastructure to protect child nutrition and growth.

While the higher odds of wasting among children from poor households than among those from the poorest households may appear counterintuitive, the substantially higher prevalence of stunting among children from the poorest households (DOST-FNRI, 2022) suggests a greater burden of stunting, a chronic undernutrition, in this group. In contrast, wasting reflects acute undernutrition and may be more sensitive to short-term shocks and immediate environmental conditions. Similarly, although households with non-water-sealed toilets exhibited higher odds of wasting than households with no toilet facilities, the overall association between inadequate sanitation and child undernutrition underscores the importance of sanitary living conditions for optimal child growth and nutrition.

Policy implications

The findings highlight the need to strengthen early life nutrition interventions during the first 1,000 days, consistent with the First 1000 Days Law (Republic Act 11148). Given the strong association between maternal NS, maternal education, and child wasting, programmes should prioritise improving maternal nutrition before and during pregnancy and strengthening nutrition education for mothers. Addressing socioeconomic disparities through nutrition-sensitive social protection programmes such as the *Pantawid Pamilyang Pilipino* Program (4Ps) is also critical to support vulnerable households. In addition, strengthening water, sanitation, and hygiene infrastructure, particularly in informal urban settlements, can help reduce infection-related undernutrition. These actions require coordinated, multi-sectoral efforts to break the cycle of child undernutrition in the Philippines.

Limitations of the study

As with any research, this study has several limitations. Firstly, cross-sectional data may not allow identification of the exact age at which wasting began; cases in older children may have occurred earlier and continued after two years. Secondly, the design limits interpretation to associations rather than causations. Thirdly, multivariate analysis was constrained by available survey variables, excluding key child and maternal factors such as prenatal care, feeding practices, and employment status. Future research should include these in the analyses to increase explanatory power and guide targeted policies. Longitudinal studies incorporating maternal and child data may better clarify these relationships.

CONCLUSION

Wasting was highest from birth to 12-17 months, while stunting increased rapidly during the second year of life, indicating the critical importance of the first 1000 days of life. Boys, children in rural areas, and those from poor households were more affected by both wasting and stunting. Maternal factors, particularly low

BMI (<18.5 kg/m²), short stature (<150 cm), and low educational attainment, significantly increased the odds of wasting among children under two years of age. These findings emphasise the need to strengthen early detection and targeted nutrition interventions for children under two, alongside programmes that improve maternal nutrition and education to prevent early growth faltering.

Acknowledgement

The authors would like to thank the households for their participation in the survey, as well as all local researchers and technical and non-technical staff who were involved in the 2018 and 2019 ENNS.

Authors' contributions

Goyena EA, principal investigator, conceptualised, designed, drafted, and approved the final manuscript; Maniego MLV, assisted in drafting the manuscript, conducted data analysis, and reviewed the final manuscript; Tordecilla RL, contributed technical assistance in drafting the initial manuscript, data interpretation, reviewed the final manuscript.

Conflict of interest

The authors declared no potential conflicts of interest concerning the study, authorship, and/or publication of this article.

References

- Afrah R, Desmawati D & Sriyanti R (2024). Tackling toddler malnutrition: Exploring maternal influences on wasting. *IJRR* 11(1):31-40. doi:10.52403/ijrr.20240105
- Boah M, Azupogo F, Amporfro DA & Abada LA (2019). The epidemiology of undernutrition and its determinants in children under five years in Ghana. *PLoS ONE* 14(7):e0219665.
- Bustos M, Lau L, Manguerra H & Dodd W (2025). Sociodemographic factors associated with concurrent stunting and wasting among children experiencing extreme poverty in the Philippines: A cross-sectional study. *Nutr Health* 31(2):585-596.
- Capanzana M, Demombynes G & Gubbin P (2020). Why are so many children stunted in the Philippines? In: *Policy Research Working Paper 9294*. World Bank Group. From <https://thedocs.worldbank.org/en/doc/823021598886801368-0090022020/original/TF0A8125WhyAreSoManyChildrenStuntedinthePhilippines.pdf> [Retrieved October 12 2023].
- Chang CY, Trehan I, Wang RJ, Thakwalakwa C, Maleta K, Deitchler M & Manary MJ (2013). Children successfully treated for moderate acute malnutrition remain at risk for malnutrition and death in the subsequent year after recovery. *J Nutr* 143(2):215-220.
- DOST-FNRI (2022). *Philippine Nutrition Facts and Figures: 2018-2019 Expanded National Nutrition Survey (ENNS)*. FNRI Bldg., DOST Compound, Gen. Santos Avenue, Bicutan, Taguig City, Metro Manila, Philippines.
- Garg A, Calibo A, Galera R, Bucu A, Paje R & Zeck W (2016). Management of SAM in the Philippines: from emergency-focused modelling to national policy and government scale-up | Scaling Up Nutrition. From <https://www.unicef.org/philippines/media/441/file/Management%20of%20Severe%20Acute%20Malnutrition%20in%20the%20Philippines.pdf> [Retrieved October 12 2023].
- Goyena E & Valdeabella-Maniego ML (2022). Adherence to age-appropriate feeding practices among Filipino Children. *Mal J Nutr* 28(3):423-439.
- Harding KL, Aguayo VM & Webb P (2018). Factors associated with wasting among children under five years old in South Asia: Implications for action. *PLoS ONE* 13(7):e0198749.
- Headley DD & Ruel MT (2022). Economic shocks predict increases in child wasting prevalence. *Nat Commun* 13:2157. doi.org:10.1038/s41467-022-29755-x

- Jjaiya MA, Anjorin S & Uthman OA (2024). Quantifying the increased risk of illness in malnourished children: a global meta-analysis and propensity score matching approach. *Glob Health Res Pol* 9:29. doi:10.1186/s41256-024-00371-0
- Karlsson O, Kim R, Guerrero S, Hasman A & Subramanian SY (2022). Child wasting before and after age two years: A cross-sectional study of 94 countries. *The Lancet* 46. doi.org/10.1016/j.eclinm.2022.101353
- Kim J & Ayabe A (2023). Obesity in Pregnancy. In: *StatPearls [Internet]*. StatPearls Publishing, Treasure Island. From <https://www.ncbi.nlm.nih.gov/books/NBK572113> [Retrieved 15 February 2024].
- Martorell R & Young MF (2012). Patterns of stunting and wasting: potential explanatory factors. *Adv Nutr* 3(2):227-233.
- Mertens A, Benjamin-Chung J, Colford JM, Hubbard AE, Van Der Laan M, Coyle J, Sofrygin O, Cai W, Jilek W, Rosete S, Nguyen A, Pokpongkiat NN, Djajadi S, Seth A, Jung E, Chung EO, Malenica I, Hejazi N, Li H, Hafen R, Subramoney V, Häggström J, Normal T, Christian P, Brown KH, Arnold BF & Ki Child Growth Consortium (2023). Child wasting and concurrent stunting in low- and middle-income countries. *Nature* 621:558-567.
- Nyarko MJ, Van Rooyen DR & Ten Ham-Baloyi W (2024). Preventing malnutrition within the first 1000 days of life in under-resourced communities: An integrative literature review. *J Child Health Care* 28(4):898-913.
- Paltán-Hernández AR, Stobaugh HC, Cumming O, Angioletti A, Pantchova D, Lapègue J, Stern S & N'diaye DS (2021). Water, sanitation and hygiene interventions and the prevention and treatment of childhood acute malnutrition: A systematic review. *Matern Child Nutrition* 18(1):e13257.
- Rahut DB, Mishra R & Bera S (2023). Geospatial and environmental determinants of stunting, wasting, and underweight: Empirical evidence from rural South and Southeast Asia. *Nutrition* 120(2024). doi:10.1016/j.nut.2023.112346
- Saaka M & Gaala SZ (2016). Relationships between Wasting and Stunting and Their concurrent occurrence in Ghanaian Preschool Children. *J Nutr Metab*. doi:10.1155/2016/4654920
- Sahiledengle B, Agho KE, Petrucka P, Kumie A, Beressa G, Atlaw D, Tekalegn Y, Zenbaba D, Desta F & Mwanri L (2023). Concurrent wasting and stunting among under-five children in the context of Ethiopia: a generalised mixed effect modelling. *Matern Child Nutr* (19)2:e13483.
- Schoenbuchner SM, Dolan C, Mwangome M, Hall A, Richard SA, Wells Jc, Khara T, Sonko B, Prentice AM & Moore SE (2019). Relationship between wasting and stunting: a retrospective cohort analysis of longitudinal data in Gambian children from 1976 to 2016. *Am J Clin Nutr* 109:1-10.
- Singh SK, Srivastava S & Chauhan S (2020). Inequality in child undernutrition among urban population in India: a decomposition analysis. *BMC Public Health* 20:1852. doi:10.1186/s12889-020-09864-2
- Suansing B (2017). Philippines' Poverty Rate: Rural Communities Still Left Behind. *Borgen Project*. From <https://borgenproject.org/philippines-poverty-rate/> [Retrieved 14 February 2024].
- Thurstans, S, Sessions N, Dolan C, Sadler K, Cichon B, Isanaka S, Roberfroid D, Stobaugh H, Webb P & Khara T (2022). The relationship between wasting and stunting in young children: A systematic review. *Matern Child Nutr* 18(1):e13246.
- Toma TM, Andargie KT, Alula BA, Kebede BM & Gujo MM (2023). Factors associated with wasting and stunting among children aged 06-59 months in South Ari District, Southern Ethiopia: a community-based cross-sectional study. *BMC Nutr* 9:34
- Ulep VGT, Uy J & Casas LD (2022). What explains the large disparity in child stunting in the Philippines? A decomposition analysis. *Public Health Nutrition* 25(11):2995-3007. <https://doi.org/10.1017/S136898002100416X>
- UNICEF (2021). UNICEF Conceptual Framework. From <https://www.unicef.org/documents/conceptual-framework-nutrition> on [Retrieved October 17 2024].
- UNICEF/WHO/World Bank Group (2023). Joint Child Malnutrition Estimates 2023 edition. From <https://www.who.int/publications/i/item/9789240073791> [Retrieved October 11 2023].

WHO (2014). Global Nutrition Targets 2025: Policy Brief Series (WHO/NMH/NHD/14.2). World Health Organization, Geneva.

WHO (n.d.). Who Child Growth Standards: Length/Height-for-age, Weight-for-age, Weight-for-length, Weight-for-height and Body Mass Index-for age. From <https://www.who.int/tools/child-growth-standards/standards> [Retrieved September 15 2023].