What Remains After a Quarter Century of Progress? Independent Correlates of Childhood Stunting, Wasting, and Underweight in Ethiopia Using the 2024–25 Demographic and Health Survey

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Abstract

Background

Ethiopia has experienced substantial social, health, and nutritional change since the first Ethiopia Demographic and Health Survey (EDHS) in 2000, yet childhood undernutrition remains an important public health challenge. National trends show marked long-term reductions in stunting, wasting, and underweight, but progress has been uneven across nutritional outcomes, population groups, and geographic areas. Understanding the characteristics independently associated with the residual burden is important for moving from broad national nutrition strategies toward more differentiated interventions. This study examined the independent correlates of stunting, wasting, and underweight among children aged 0–59 months using the nationally representative 2024–25 EDHS.

Methods

We conducted a cross-sectional secondary analysis of the 2024–25 EDHS. Anthropometric outcomes were defined according to World Health Organization Child Growth Standards: stunting as height-for-age z score (HAZ) <-2 standard deviations (SD), wasting as weight-for-height z score (WHZ) <-2 SD, and underweight as weight-for-age z score (WAZ) <-2 SD. We used a UNICEF- and WHO-informed conceptual framework and directed acyclic graph to prespecify a common adjustment set. Survey-weighted logistic regression models incorporated the complex sampling design and retained region in every model. Outcome-specific multivariable samples were 5,714 children for stunting, 5,754 for wasting, and 5,823 for underweight.

Results

National prevalence in 2024–25 was 39.9% (95% CI 37.6–42.3) for stunting, 4.7% (3.8–5.6) for wasting, and 18.3% (16.3–20.3) for underweight. Since 2000, these represented declines of 17.8, 7.5, and 22.9 percentage points, respectively; however, stunting showed little further progress after 2016 (38.4% in 2016 versus 39.9% in 2024–25). Stunting increased sharply with age, reaching 52.1% at 24–35 months; relative to 0–2 months, the adjusted odds were 12.73 times higher at 24–35 months (95% CI 6.50–24.92). Birth order 6+ (AOR 1.87, 95% CI 1.17–2.98) and a preceding birth interval <24 months (AOR 2.03, 1.48–2.79) were associated with higher odds of stunting. Higher household wealth was associated with lower odds of stunting and underweight, while any maternal education was associated with lower odds of wasting (AOR

0.52, 0.31–0.86). Regional prevalence and adjusted regional associations varied substantially and differently across the three outcomes.

Conclusions

Ethiopia has achieved major long-term reductions in childhood undernutrition, but the remaining burden is increasingly differentiated by nutritional outcome, age, socioeconomic position, reproductive history, and geography. The apparent post-2016 stunting plateau warrants renewed attention to prevention from pregnancy through the first two years of life, alongside equity-focused and geographically responsive programming. Because the EDHS is cross-sectional, the adjusted associations should not be interpreted as causal effects.

Keywords: Ethiopia; child malnutrition; stunting; wasting; underweight; Demographic and Health Survey; socioeconomic inequality; regional disparities; child growth; multivariable analysis

1. Introduction

Childhood malnutrition remains among the most consequential threats to child survival, growth, development, and human capital in low- and middle-income countries. Malnutrition encompasses both deficiencies and excesses in nutrient intake and utilization, but undernutrition among young children is conventionally characterized by three related anthropometric outcomes: stunting, wasting, and underweight. Stunting, defined as low height-for-age, reflects accumulated constraints on linear growth; wasting, defined as low weight-for-height, generally reflects more acute or recent nutritional deficits; and underweight, defined as low weight-for-age, may reflect stunting, wasting, or their coexistence. These distinctions are not merely classificatory. They imply different temporal processes, potentially different determinants, and different prevention and treatment requirements.

The consequences extend well beyond anthropometric status itself. Undernutrition increases children's vulnerability to illness and mortality, while impaired growth during early childhood is associated with consequences for cognitive development, schooling, adult economic productivity, and subsequent health. The global literature has therefore positioned adequate nutrition during pregnancy and the first years of life as central to child survival and long-term human development (Black et al., 2013; Victora et al., 2008). WHO similarly emphasizes that chronic growth restriction can prevent children from reaching their physical and cognitive potential and that wasting substantially increases vulnerability to severe illness and death.

The determinants of childhood nutritional status operate at multiple and interconnected levels. The UNICEF conceptual framework distinguishes immediate, underlying, and enabling determinants of maternal and child nutrition, emphasizing the roles of diets and care as well as food, practices, services, resources, and broader social and economic conditions (United Nations

Children's Fund, 2020a, 2020b). WHO's conceptualization of childhood stunting similarly places proximal nutritional and infectious processes within wider household, health-system, educational, sociocultural, agricultural, and environmental contexts. These frameworks caution against interpreting child nutrition as the product of a single exposure and instead point toward a hierarchical system in which distal socioeconomic and contextual conditions can influence more proximal maternal, household, environmental, and child-level processes.

Ethiopia provides a particularly important setting for examining these relationships. The country has undergone major demographic, socioeconomic, health-service, infrastructural, and political changes since the first EDHS was conducted in 2000. Over the same period, childhood nutritional status has improved substantially. Our reconstruction of the five comparable national EDHS rounds shows that stunting declined from 57.7% in 2000 to 39.9% in 2024–25, while underweight fell from 41.2% to 18.3% and wasting from 12.2% to 4.7%. These changes represent major population-health gains. Yet they also reveal an important asymmetry: improvement in acute and weight-related deficits has been considerably greater than the reduction in linear growth failure, leaving approximately four in ten Ethiopian children under five stunted in 2024–25.

The persistence of this burden despite substantial long-term improvement raises a different question from that posed at the beginning of the DHS era. The relevant policy question is no longer simply whether childhood malnutrition has declined. It is increasingly who remains affected, where the remaining burden is concentrated, and whether the factors independently associated with stunting are the same as those associated with wasting and underweight.

Previous Ethiopian studies have identified associations between childhood nutritional outcomes and child age and sex, maternal characteristics, household socioeconomic position, morbidity, sanitation, residence, and geographic context (Haile et al., 2016; Gebremeskel et al., 2022; Kuse & Debeko, 2023; Tamir et al., 2022). Analyses of earlier EDHS rounds have also demonstrated substantial spatial heterogeneity and clustering of childhood undernutrition. More recent analyses of the 2016 and 2019 surveys continue to find associations spanning individual, household, and community domains. A 2000–2019 geospatial and decomposition analysis likewise documented persistent geographic variation in the combined burden of wasting and stunting.

Much of this literature, however, relies on earlier survey rounds. Consequently, the independent correlates identified in those analyses describe Ethiopia before the most recent period of demographic, socioeconomic, administrative, and nutritional change. In addition, many determinant studies focus on a single nutritional outcome, a restricted age group, selected subpopulations, or model specifications developed separately for each outcome. This makes it difficult to determine whether apparent differences between stunting, wasting, and underweight reflect genuinely different epidemiologic profiles or differences in analytical specification. Recent Ethiopian research continues to demonstrate the complexity of the relationship between childhood malnutrition, morbidity, household characteristics, and broader contextual factors, reinforcing the need for analyses that recognize multiple pathways rather than treating malnutrition as a homogeneous endpoint.

A second methodological concern is the common practice of selecting candidate covariates according to bivariable p-values and retaining only statistically significant variables in final multivariable models. Such procedures can make models highly sample-dependent and can exclude conceptually important confounders merely because their individual coefficients fail an arbitrary significance threshold. Contemporary epidemiologic reasoning instead favors prespecification of adjustment variables using substantive knowledge and explicit causal or hierarchical frameworks (Greenland et al., 1999; Hernán & Robins, 2020). For childhood nutrition, this approach is especially pertinent because socioeconomic position, maternal characteristics, reproductive history, household environment, geographic context, and child characteristics are interconnected rather than mutually isolated exposures.

The availability of the 2024–25 EDHS creates an opportunity to reassess childhood undernutrition after approximately a quarter century of nationally comparable DHS observation. Rather than searching independently for statistically significant predictors of each outcome, we applied a common, conceptually prespecified adjustment framework to stunting, wasting, and underweight. This permits direct comparison of the multivariable profiles of three major anthropometric manifestations of undernutrition while preserving region as an important contextual dimension.

The objectives of this study were therefore to **(1)** identify the child, maternal, reproductive-history, socioeconomic, environmental, and geographic characteristics independently associated with stunting, wasting, and underweight among Ethiopian children aged 0–59 months in 2024–25; **(2)** determine the extent to which these adjusted associations are shared across, or specific to, the three nutritional outcomes; and **(3)** examine whether regional differences persist after adjustment for measured individual- and household-level characteristics. By situating these contemporary associations within Ethiopia's quarter-century nutritional transition, the study seeks to inform the next generation of nutrition policy: not simply how to continue reducing national prevalence, but how to address the increasingly differentiated residual burden.

2. Methods

2.1 Study design and data source

This study used data from the 2024–25 Ethiopia Demographic and Health Survey (EDHS), a nationally representative cross-sectional household survey implemented as part of the international Demographic and Health Surveys Program. The EDHS employs a stratified, multistage cluster sampling design designed to generate population-representative estimates at national and major subnational levels. (Ethiopian Statistical Service & ICF, 2026).

The analysis used the child-level anthropometric and household information in the EDHS household/person recode structure (Figure 1). Sampling weights, primary sampling units, and survey strata supplied with the survey were retained throughout the analysis so that point estimates and statistical inference reflected the complex survey design rather than treating observations as a simple random sample.

The 2024–25 survey constituted the primary analytic dataset. Earlier EDHS rounds—2000, 2005, 2011, and 2016—were used to establish the quarter-century epidemiologic context presented in the Introduction and descriptive trend analyses, but the multivariable models reported in this study were estimated from the 2024–25 survey (Central Statistical Authority [Ethiopia] & ORC Macro, 2001; Central Statistical Agency [Ethiopia] & ORC Macro, 2006; Central Statistical Agency [Ethiopia] & ICF International, 2012; Central Statistical Agency [Ethiopia] & ICF, 2017).

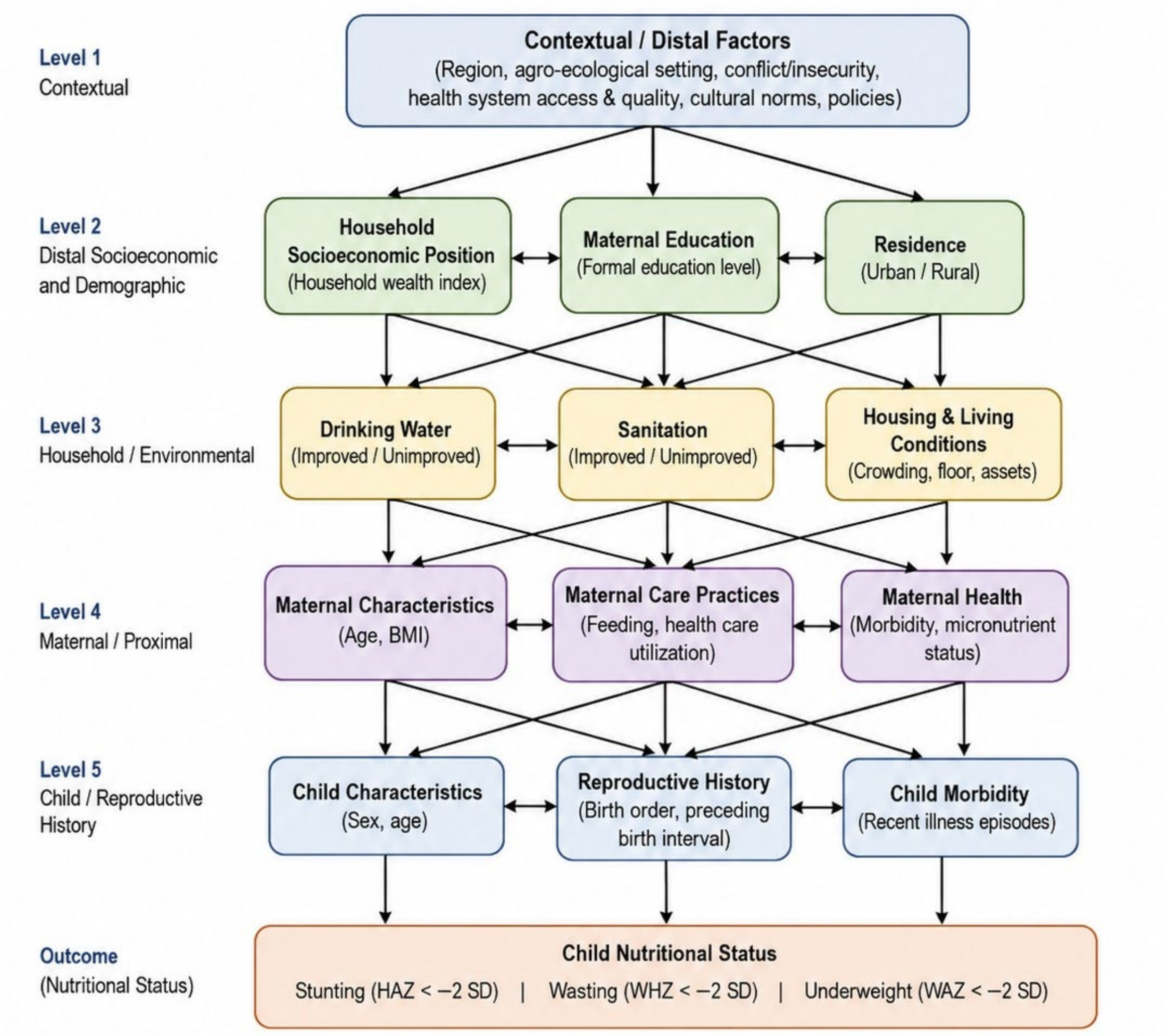
2.2 Study population

The target population was de facto children aged 0–59 completed months who slept in the sampled household the night before the survey (hv103 = 1) and were eligible for anthropometric assessment.

For each nutritional outcome, children were required to have a valid age and the corresponding biologically plausible anthropometric z score. Because height, weight, and derived anthropometric indices are not available or valid for every eligible child, outcome-specific denominators differed slightly in the descriptive analyses.

For the primary multivariable analysis, we also required complete information for the variables included in the prespecified adjustment set. Because valid anthropometric and covariate information differed slightly by outcome, the final unweighted analytic samples were outcome-specific: 5,714 children for stunting, 5,754 for wasting, and 5,823 for underweight.

Figure 1. Simplified Directed Acyclic Graph (DAG) for the multivariate analysis of childhood stunting, wasting, and underweight in Ethiopia, EDHS 2024-25



The DAG reflects assumptions informed by UNICEF and WHO conceptual frameworks for childhood malnutrition. It is not an empirical model and does not establish causality. →Arrows show the hypothesized direction of influence; ↔ two-way arrows indicate bidirectional or correlated relationships; Adjustment set in the primary model (common to all three outcomes): Child age, Child sex, Birth order, Preceding birth interval, maternal age, Maternal education, Region, Residence, Household wealth index, drinking water, Sanitation. Variables not in the primary adjustment set: Maternal BMI, recent child morbidity, and maternal morbidity (e.g., anemia), because temporal ordering or potential mediator status was ambiguous.

2.3 Nutritional outcomes

We examined three binary nutritional outcomes: stunting, wasting, and underweight. Classification followed WHO Child Growth Standards and standard DHS conventions. WHO defines these anthropometric indicators relative to the WHO Child Growth Standards median.

Stunting was defined as a height-for-age z score (HAZ) below −2 standard deviations from the WHO reference median. Stunting represents impaired linear growth and is generally interpreted as an indicator of cumulative or chronic nutritional and health constraints.

Wasting was defined as a weight-for-height z score (WHZ) below −2 standard deviations. Wasting represents low body mass relative to height and is more closely associated with acute or recent nutritional deficit, illness, or both, although episodes may persist or recur.

Underweight was defined as a weight-for-age z score (WAZ) below −2 standard deviations. Because weight-for-age incorporates elements of both attained height and body mass, underweight can occur among children who are stunted, wasted, or both.

We modeled the three outcomes separately rather than combining them into a composite malnutrition indicator. This decision was made a priori because the measures represent different dimensions and temporal expressions of childhood nutritional status.

2.4 Conceptual framework and covariate selection

Selection and organization of explanatory variables were guided by a prespecified conceptual framework developed from the UNICEF conceptual framework on maternal and child nutrition, the WHO framework on childhood stunting, and hierarchical epidemiologic approaches to childhood nutritional determinants (Victora et al., 1997; United Nations Children's Fund, 2020b; World Health Organization, 2016). UNICEF's contemporary framework explicitly distinguishes enabling, underlying, and immediate determinants, while WHO emphasizes that child growth reflects interactions between proximal nutritional and infectious processes and broader socioeconomic, health-system, cultural, agricultural, and environmental conditions.

We represented these relationships in a directed acyclic graph (DAG) before interpreting the multivariable results. We grouped covariates conceptually into contextual, distal socioeconomic, household/environmental, maternal/proximal, and child/reproductive-history domains.

The primary adjustment set included child age, child sex, birth order, preceding birth interval, maternal age, maternal education, region, urban/rural residence, household wealth, drinking-water classification, and sanitation classification. Region was retained in every primary model as a contextual adjustment variable.

Importantly, covariates were **not selected according to bivariable statistical significance**, and variables were not removed from the final models simply because their adjusted p-values exceeded 0.05. The same conceptual adjustment set was applied to all three outcomes. This strategy was intended to reduce outcome-specific data-driven model selection and permit more meaningful comparison of adjusted association patterns across stunting, wasting, and underweight.

Maternal body mass index and recent maternal or child morbidity variables were not included in the primary adjustment set where temporal ordering or potential mediator status was ambiguous. Excluding these variables avoided automatically conditioning the primary models on factors that could lie along pathways between upstream determinants and child nutritional status.

2.5 Child and reproductive-history characteristics

Child age was categorized into completed-month groups: 0–2, 3–5, 6–11, 12–17, 18–23, 24–35, 36–47, and 48–59 months, with 0–2 months serving as the reference category in the multivariable models. This specification was designed to capture the pronounced nonlinear evolution of nutritional status across infancy and early childhood rather than impose a single linear age effect.

Child sex was modeled as a binary categorical variable, with male children serving as the reference group.

Birth order was categorized to distinguish first births from successively higher-order births. Preceding birth interval was included to represent reproductive spacing; the longest interval category/first-birth classification served as the model reference as applicable.

These variables were treated as child or reproductive-history characteristics within the conceptual hierarchy rather than interpreted as isolated causal exposures.

2.6 Maternal characteristics

Maternal age was included categorically, with women aged **25–29 years** serving as the reference category.

Maternal education was classified by formal educational attainment, with no formal education as the reference category. Education was conceptualized as a distal-to-intermediate determinant that may operate through knowledge, autonomy, economic opportunity, care practices, use of health services, and household resources. Consequently, adjusted education coefficients were interpreted as residual associations after accounting for other measured model characteristics rather than as causal effects of schooling.

2.7 Household socioeconomic and environmental characteristics

Household socioeconomic position was represented using the DHS household wealth index. For the primary regression models, wealth was entered using the survey's ordered wealth categories, with the poorest quintile serving as the reference category.

Residence was classified as urban or rural, with urban residence as the reference.

Household drinking water and sanitation were classified according to the analytic categories developed for Chapter 6, with unimproved drinking water and unimproved sanitation, respectively, serving as reference categories.

These variables represented different components of the household socioeconomic and physical environment. They were retained simultaneously because wealth, residence, water, and sanitation are related but measure different dimensions of material or environmental disadvantage.

2.8 Geographic context

The 2024–25 analysis used Ethiopia's contemporary 14-region geography: Tigray, Afar, Amhara, Oromia, Somali, Benishangul-Gumuz, Central Ethiopia, Sidama, South West Ethiopia, South Ethiopia, Gambella, Harari, Addis Ababa, and Dire Dawa.

Oromia served as the regional reference category in the primary multivariable models.

Region was conceptualized as a contextual marker rather than an individual-level exposure. Regional coefficients therefore represent residual geographic associations after adjustment for the measured child, maternal, reproductive, socioeconomic, residence, water, and sanitation characteristics included in the model. They may incorporate differences in food systems, ecology, livelihood, health-service environments, culture, conflict exposure, infrastructure, disease environments, and other measured or unmeasured contextual characteristics.

Accordingly, regional adjusted odds ratios were not interpreted as causal effects of residence in a particular region.

For historical descriptive comparisons involving earlier EDHS rounds, the former Southern Nations, Nationalities, and Peoples' Region (SNNPR) was retained as the historically comparable geographic domain. The four contemporary successor regions—Central Ethiopia, Sidama, South Ethiopia, and South West Ethiopia—were not projected backward into earlier surveys. Where a 2024–25 historical SNNPR comparator was required, the four successor regions were reconstructed at the microdata level using the original DHS weights and survey-design variables rather than by averaging their regional prevalence estimates.

2.9 Statistical analysis

All analyses incorporated the EDHS sampling weights, primary sampling units, and stratification variables using survey-design-based estimation procedures.

The analysis proceeded in two stages. First, weighted descriptive prevalence estimates and 95% confidence intervals were calculated for stunting, wasting, and underweight nationally and across relevant population characteristics. These descriptive analyses established the contemporary burden and informed interpretation of the multivariable findings.

Second, three separate **survey-weighted multivariable logistic regression models** were fitted, with stunting, wasting, and underweight as binary dependent variables. Each model contained the same prespecified primary adjustment set.

Exponentiated regression coefficients are reported as adjusted odds ratios (AORs) with design-based 95% confidence intervals and corresponding p-values.

An AOR greater than 1 indicates higher adjusted odds of the outcome relative to the designated reference category, whereas an AOR below 1 indicates lower adjusted odds. Because stunting and underweight are relatively common outcomes, odds ratios were interpreted specifically as ratios of odds and were not described as equivalent relative risks or percentage changes in probability.

Statistical significance was evaluated conventionally at a two-sided $p<0.05$, but interpretation did not rely on statistical significance alone. Effect magnitude, confidence-interval width, consistency across nutritional outcomes, conceptual plausibility, and public-health relevance were considered jointly.

2.10 Comparison across nutritional outcomes

A central feature of the analysis was directly comparing adjusted association profiles across stunting, wasting, and underweight.

Rather than assuming that the three indicators represented interchangeable measures of a single latent condition, we examined whether individual covariates showed concordant, outcome-specific, or divergent adjusted associations. Particular attention was given to child age, socioeconomic position, maternal education, environmental characteristics, and residual regional variation.

This comparative interpretation was prespecified because chronic linear growth failure, acute weight deficit, and low weight-for-age represent overlapping but epidemiologically distinct manifestations of childhood undernutrition.

2.11 Validation and reproducibility

The analysis followed a replicate-first, extend-second strategy. Before conducting novel descriptive or multivariable analyses, national anthropometric indicators reconstructed from the DHS microdata were compared with the corresponding published EDHS estimates.

Across the five national survey rounds used for the quarter-century trend—2000, 2005, 2011, 2016, and 2024–25—the reconstructed values for stunting, severe stunting, underweight, wasting, and overweight reproduced all 25 published national estimates at the reported integer precision. The 2024–25 regional stunting estimates likewise reproduced the published regional values at the reported precision.

These replication exercises were treated as analytical quality-control procedures confirming the implementation of the relevant survey universe, anthropometric definitions, weights, and survey design before extending the analysis beyond the published tables. Successful replication was not regarded as proof that every subsequent model specification was correct.

2.12 Interpretation of causality

The EDHS is cross-sectional. Consequently, the multivariable models estimate adjusted **associations**, not causal effects.

The conceptual framework and DAG guided covariate selection and interpretation, but they do not transform a cross-sectional observational analysis into a causal design. Residual confounding, measurement error, unmeasured contextual factors, and uncertain temporal ordering remain possible.

Throughout the study, terms such as "independently associated with," "higher adjusted odds," "lower adjusted odds," and "residual regional association" are therefore preferred. Terms implying demonstrated causality—such as *caused*, *protected against*, *effect of region*, or *led to*—are avoided.

2.14 Ethical considerations

The study used de-identified secondary data collected through the Demographic and Health Surveys Program. The original survey obtained the required national ethical approvals and informed consent from participants. The study obtained access to the de-identified EDHS datasets under applicable DHS data-use procedures. The study made no attempt to identify individual respondents or households.

3. Results

3.1 Analytic sample and contemporary burden

The 2024–25 Ethiopia Demographic and Health Survey documented a substantial continuing burden of childhood malnutrition, although its magnitude differed markedly across anthropometric outcomes. Among children aged 0–59 months with valid anthropometric measurements, the national prevalence of **stunting was 39.9% (95% CI 37.6–42.3)**, compared with **18.3% (95% CI 16.3–20.3) for underweight** and **4.7% (95% CI 3.8–5.6) for wasting**. Thus, approximately two in five Ethiopian children were stunted, nearly one in five were underweight, and approximately one in twenty were wasted in 2024–25. The corresponding unweighted anthropometric samples were **6,333 children for stunting, 6,451 for underweight, and 6,376 for wasting**. Differences in sample size across outcomes reflect availability of valid height-for-age, weight-for-age, and weight-for-height measurements, respectively.

The multivariable analytic samples were somewhat smaller because the adjusted models required complete information on the outcome and the full pre-specified covariate set. The final survey-weighted logistic regression models included **5,714 children for stunting, 5,754 for wasting, and 5,823 for underweight**. These outcome-specific denominators were retained rather than imposing a single common complete-case sample across all three outcomes, thereby maximizing the available information for each anthropometric endpoint while maintaining the same conceptually pre-specified adjustment set.

The contemporary national estimates also demonstrate that the residual burden in Ethiopia is dominated by **chronic rather than acute anthropometric deficit**. Stunting prevalence was more than twice the prevalence of underweight and more than eight times that of wasting. At the same time, the three indicators should not be interpreted as mutually exclusive categories: an individual child may satisfy the anthropometric definition of more than one form of malnutrition. The substantially different national prevalences therefore describe overlapping but epidemiologically distinct dimensions of child nutritional status rather than components of a single distribution summing to 100%.

These 2024–25 estimates provide the contemporary reference point for the analyses that follow. The next section places the current burden within the longer trajectory of nutritional change since 2000, before examining how the three outcomes vary by child age and whether their adjusted correlates share a common pattern or differ across anthropometric outcomes.

Table 1. Characteristics of the study population and prevalence of childhood stunting, wasting, and underweight, Ethiopia, 2024–25

Characteristic	Category	Unweighted n	Weighted %	Stunting % (95% CI)	Wasting % (95% CI)	Underweight % (95% CI)
National anthropometric prevalence	**All children with valid outcome measurement**		—	**39.9 (37.6–42.3)**	**4.7 (3.8–5.6)**	**18.3 (16.3–20.3)**
Child age (months)	0–2	340	4.6	9.7 (3.8–15.6)	5.9 (1.5–10.3)	9.8 (3.4–16.2)
Child age (months)	3–5	362	5.5	13.6 (6.4–20.9)	8.8 (3.6–14.0)	10.9 (3.6–18.2)
Child age (months)	6–11	658	9.4	20.1 (15.4–24.9)	6.0 (3.4–8.6)	17.4 (12.3–22.4)
Child age (months)	12–17	668	9.3	30.0 (25.0–35.0)	7.8 (4.0–11.5)	16.8 (11.9–21.7)
Child age (months)	18–23	551	9.1	43.9 (37.2–50.7)	5.1 (2.4–7.8)	20.3 (15.0–25.7)
Child age (months)	24–35	1357	18.7	52.1 (46.7–57.5)	4.8 (2.3–7.2)	21.9 (17.7–26.2)
Child age (months)	36–47	1533	22.9	49.8 (45.3–54.4)	3.2 (1.8–4.7)	18.1 (14.9–21.2)
Child age (months)	48–59	1403	20.6	43.4 (39.0–47.9)	2.8 (1.7–3.9)	19.3 (15.5–23.1)
Child sex	Male	3552	51.9	40.7 (37.6–43.9)	5.5 (4.1–7.0)	19.0 (16.4–21.5)
Child sex	Female	3320	48.1	39.1 (36.0–42.1)	3.8 (2.8–4.8)	17.6 (15.3–19.9)
Birth order	1	1292	19.4	32.4 (28.2–36.5)	3.6 (1.9–5.4)	14.2 (11.0–17.4)
Birth order	2–3	2241	33.5	38.4 (35.0–41.7)	5.3 (3.5–7.1)	17.8 (14.7–20.8)
Birth order	4–5	1379	19.7	43.5 (39.0–47.9)	5.3 (3.5–7.1)	21.9 (17.6–26.2)
Birth order	6+	1329	18.3	47.3 (42.1–52.5)	5.0 (3.2–6.8)	19.8 (15.8–23.8)
Preceding birth interval	First birth	1292	19.4	32.4 (28.2–36.5)	3.6 (1.9–5.4)	14.2 (11.0–17.4)
Preceding birth interval	<24 months	1083	13.0	56.3 (50.7–61.8)	5.9 (3.6–8.2)	26.9 (21.1–32.7)

Characteristic	Category	Unweighted n	Weighted %	Stunting % (95% CI)	Wasting % (95% CI)	Underweight % (95% CI)
Preceding birth interval	24–35 months	1458	20.3	45.6 (40.5–50.6)	4.2 (2.7–5.8)	20.8 (17.0–24.6)
Preceding birth interval	36+ months	2398	38.0	35.1 (32.1–38.2)	5.6 (3.8–7.3)	16.1 (13.6–18.7)
Maternal age (years)	15–19	200	2.9	35.5 (22.8–48.2)	9.7 (2.2–17.1)	19.6 (6.8–32.4)
Maternal age (years)	20–24	1111	16.2	40.8 (35.5–46.1)	6.0 (3.2–8.8)	18.1 (13.8–22.4)
Maternal age (years)	25–29	1936	28.8	38.2 (34.5–41.8)	4.7 (3.2–6.1)	18.4 (15.4–21.5)
Maternal age (years)	30–34	1366	18.1	38.2 (33.5–42.9)	4.4 (2.1–6.6)	18.3 (14.5–22.1)
Maternal age (years)	35–39	1081	17.5	42.7 (37.6–47.8)	4.1 (2.1–6.1)	17.2 (13.2–21.1)
Maternal age (years)	40–49	547	7.4	45.3 (38.4–52.2)	4.9 (2.4–7.4)	20.5 (15.3–25.7)
Maternal education	No education	2835	38.7	46.5 (43.2–49.8)	6.7 (5.0–8.4)	23.0 (19.9–26.1)
Maternal education	Any education	3406	52.2	35.1 (32.4–37.9)	3.6 (2.4–4.7)	14.8 (12.4–17.2)
Household wealth quintile	Poorest	2524	24.6	48.3 (43.3–53.3)	7.7 (5.6–9.9)	26.4 (21.1–31.6)
Household wealth quintile	Poorer	1261	18.6	44.0 (39.3–48.6)	4.4 (2.5–6.4)	19.0 (15.0–23.1)
Household wealth quintile	Middle	991	18.4	43.6 (37.9–49.4)	3.1 (1.2–4.9)	16.6 (13.4–19.8)
Household wealth quintile	Richer	880	19.1	35.6 (30.8–40.4)	3.1 (1.6–4.6)	14.4 (11.1–17.6)
Household wealth quintile	Richest	1216	19.3	25.8 (21.1–30.4)	4.4 (2.2–6.6)	12.8 (8.6–16.9)
Residence	Urban	1924	28.0	31.0 (27.1–35.0)	5.0 (3.3–6.7)	15.5 (12.0–19.0)
Residence	Rural	4948	72.0	43.2 (40.4–46.1)	4.6 (3.6–5.6)	19.4 (16.9–21.8)

Notes. The certified descriptive universe is de facto children aged 0-59 months who slept in the sampled household the night before the survey (hv103 = 1), with positive DHS weight and valid survey-design information. National anthropometric denominators are outcome-specific because valid measurements differ: stunting n=6,333; wasting n=6,376; underweight n=6,451. We obtained maternal and reproductive-history characteristics through deterministic PR-KR linkage using cluster, household, and child household-line identifiers. Estimates incorporate DHS sampling weights, primary sampling units, and stratification. Stunting = HAZ < -2 SD; wasting = WHZ < -2 SD; underweight = WAZ < -2 SD. We suppress category-specific outcome estimates when fewer than 25 unweighted children are available. Table 4 presents regions separately.

3.2 A quarter century of change in childhood malnutrition

Ethiopia experienced substantial reductions in childhood malnutrition over the quarter century from 2000 to 2024–25, although the magnitude and temporal pattern of improvement differed across anthropometric outcomes. Stunting declined from 57.7% in 2000 to 50.8% in 2005, 44.4% in 2011, and 38.4% in 2016, then rose to 39.9% in 2024–25. Thus, although the most recent estimate is slightly higher than in 2016, stunting prevalence was 17.8 percentage points lower in 2024–25 than in 2000, a relative reduction of about 31% over the full period. The trajectory therefore documents major long-term progress in reducing chronic undernutrition but also suggests that the sustained decline evident between 2000 and 2016 has stalled in the most recent survey interval.

Table 2. National prevalence of childhood stunting, wasting, and underweight, Ethiopia, 2000–2024–25

Survey	Stunting (%)	Wasting (%)	Underweight (%)
2000	57.7	12.2	41.2
2005	50.8	12.2	32.9
2011	44.4	9.7	28.7
2016	38.4	9.9	23.6
2024–25	39.9	4.7	18.3

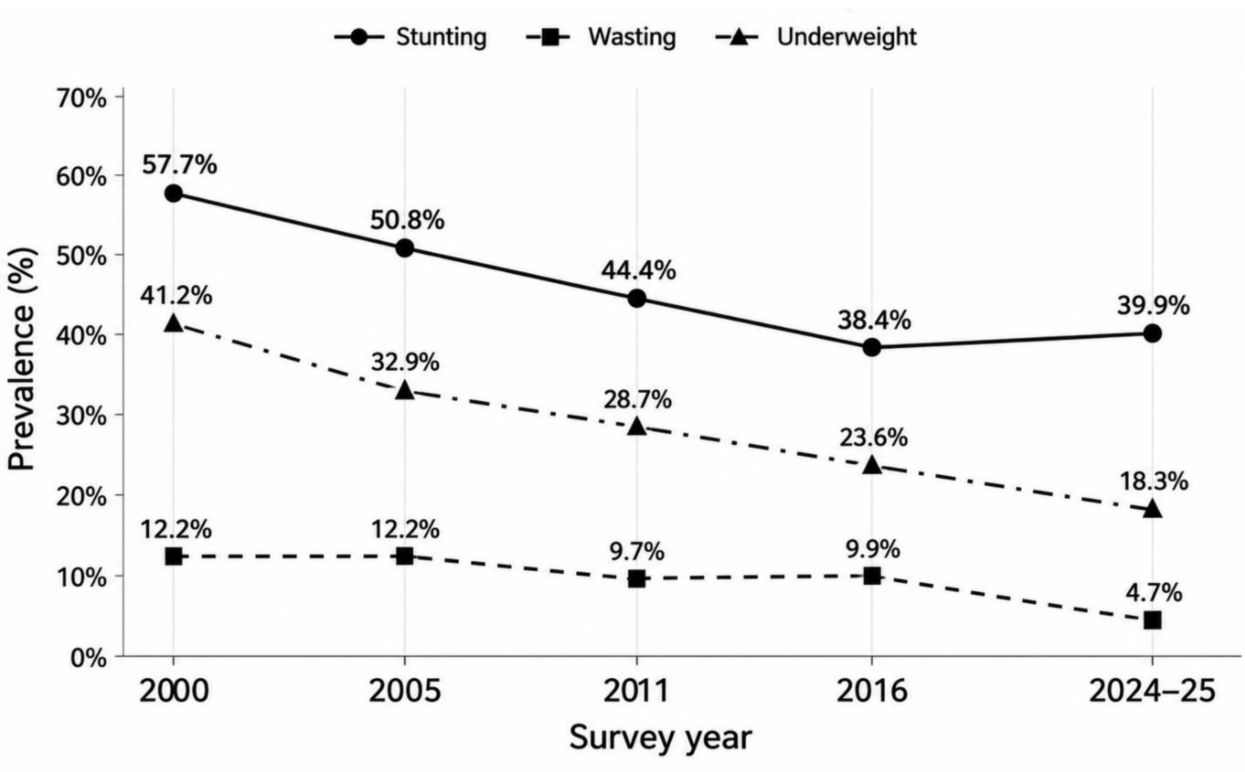
Note. Values are survey-weighted national prevalence estimates among children aged 0–59 months with valid anthropometric measurements. Stunting is defined as height-for-age z score (HAZ) < −2 SD, wasting as weight-for-height z score (WHZ) < −2 SD, and underweight as weight-for-age z score (WAZ) < −2 SD. The 2024–25 estimate of stunting (39.9%) is slightly above the 2016 estimate (38.4%); this descriptive difference should not be interpreted as a statistically significant increase without a formal between-survey test.

Source. Ethiopia Demographic and Health Surveys, 2000, 2005, 2011, 2016, and 2024–25; authors' analysis.

The long-term decline in underweight was even larger. National prevalence fell from 41.2% in 2000 to 32.9% in 2005, 28.7% in 2011, 23.6% in 2016, and 18.3% in 2024–25. This represents an absolute reduction of 22.9 percentage points and a relative reduction of approximately 56% between 2000 and 2024–25. Unlike stunting, underweight continued to decline after 2016, falling by a further 5.3 percentage points between 2016 and 2024–25. The underweight trajectory therefore shows both substantial cumulative improvement and continued progress during the most recent survey interval.

Wasting followed a different temporal pattern. Its prevalence was essentially unchanged between 2000 (12.2%) and 2005 (12.2%), then declined to 9.7% in 2011 and remained similar at 9.9% in 2016. By 2024–25, however, wasting had fallen to 4.7%, representing a reduction of 7.5 percentage points from 2000 and approximately 61% in relative terms. Notably, more than two-thirds of the absolute reduction in wasting over the entire 25-year period occurred after 2016, when prevalence declined by 5.2 percentage points, from 9.9% to 4.7%.

Figure 2. National trends in childhood stunting, wasting, and underweight in Ethiopia, 2000–2024–25

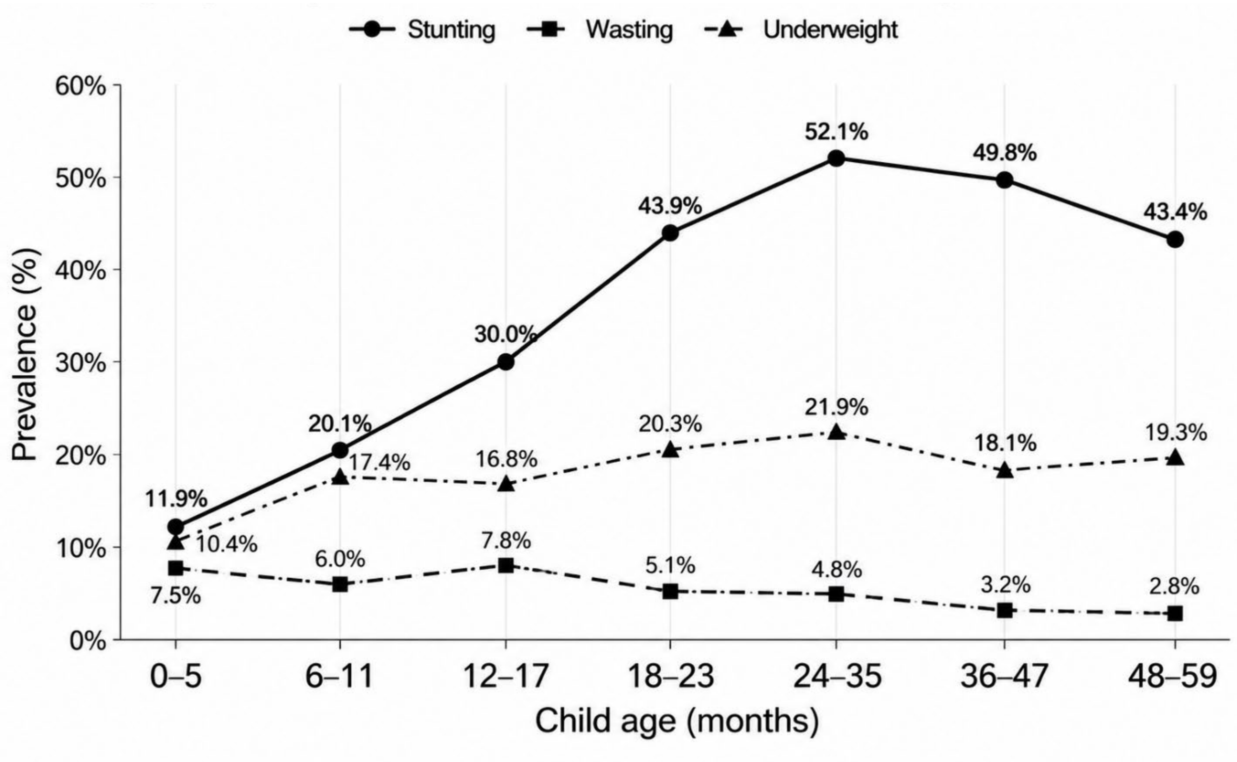


Taken together, the three trajectories demonstrate considerable improvement in childhood nutritional status since 2000, but they also reveal increasing divergence in recent trends. Underweight continued its long-term decline, and wasting showed its largest improvement during the most recent interval, whereas stunting showed little further progress after 2016. The change from 38.4% in 2016 to 39.9% in 2024–25 is only 1.5 percentage points and should not, without a formal statistical test of the difference between surveys, be interpreted as evidence of a significant increase in stunting. Rather, the most defensible interpretation is an apparent post-2016 plateau or stalling of progress in stunting reduction, leaving approximately two in five Ethiopian children affected by chronic linear-growth impairment in 2024–25. This divergence provides important context for the subsequent analyses of age-specific patterns and the independent correlates of contemporary childhood malnutrition.

3.3 Age-specific pattern of the remaining burden

The contemporary burden of childhood malnutrition varied markedly by child age, with particularly pronounced age gradients in stunting. Stunting prevalence was relatively low among infants aged **0–5** months (11.9%), but increased progressively to 20.1% at 6–11 months, 30.0% at 12–17 months, and 43.9% at 18–23 months. Prevalence reached its highest level at 24–35 months, when 52.1% of children were stunted. Thereafter, stunting declined moderately but remained very high, affecting 49.8% of children aged 36–47 months and 43.4% of those aged 48–59 months. Thus, the prevalence at 24–35 months was more than four times that observed during the first six months of life.

Figure 3. Age-specific prevalence of childhood stunting, wasting, and underweight, Ethiopia, 2024–25



Underweight exhibited a less pronounced age gradient. Prevalence increased from 10.4% among children aged 0–5 months to 17.4% at 6–11 months, remained similar at 16.8% at 12–17 months, and rose to 20.3% at 18–23 months. Like stunting, underweight reached its highest observed prevalence at 24–35 months (21.9%), although the increase was substantially smaller. Prevalence then declined to 18.1% at 36–47 months and rose to 19.3% at 48–59 months.

Wasting showed a contrasting age profile. It was already present among the youngest infants, with a prevalence of 7.5% at 0–5 months, compared with 6.0% at 6–11 months. The highest observed prevalence occurred at 12–17 months (7.8%), after which wasting declined progressively to 5.1% at 18–23 months, 4.8% at 24–35 months, 3.2% at 36–47 months, and 2.8% at 48–59 months. Unlike stunting, therefore, wasting did not accumulate progressively across the first two to three years of life; its burden was concentrated more heavily in infancy and the second year of life.

Taken together, these age profiles reveal substantial heterogeneity in when the three anthropometric deficits are most evident. The most striking pattern was the progressive emergence of stunting after early infancy, culminating in a prevalence exceeding 50% at 24–35 months and remaining above 40% through 48–59 months. Underweight increased more moderately with age, whereas wasting was more prominent at younger ages and declined thereafter. These descriptive patterns establish child age as an important dimension of the remaining nutritional burden and provide the empirical context for the multivariable analyses that follow. Because the data are cross-sectional, the age pattern should therefore be interpreted as differences in prevalence across age groups rather than as direct evidence that individual children become stunted as they age.

3.4 Independent correlates of stunting, wasting, and underweight

The adjusted analyses revealed substantially different association profiles across the three anthropometric outcomes. Child age was the dominant correlate of stunting, whereas the age pattern was considerably weaker for underweight and largely absent for wasting. Relative to children aged 0–2 months, the adjusted odds of stunting were already higher at 6–11 months (AOR 2.45, 95% CI 1.20–4.97; $p=0.014$) and increased sharply thereafter. The contrast was greatest at 24–35 months (AOR 12.73, 95% CI 6.50–24.92; $p<0.001$), while children aged 48–59 months continued to have markedly higher odds of stunting (AOR 8.24, 95% CI 4.33–15.67; $p<0.001$). Underweight showed a more moderate age gradient: at 24–35 months, for example, the adjusted odds were approximately three times those among children aged 0–2 months (AOR 3.10, 95% CI 1.31–7.34; $p=0.010$). In contrast, corresponding age associations with wasting were not statistically significant, including at 24–35 months (AOR 0.76, 95% CI 0.26–2.25; $p=0.624$) and 48–59 months (AOR 0.52, 95% CI 0.17–1.57; $p=0.245$). This divergence was consistent with the markedly different descriptive age profiles shown in Figure 3.

Reproductive-history characteristics were also more strongly associated with stunting than with the other outcomes. Children of birth order six or higher had greater adjusted odds of stunting than first-born children (AOR 1.87, 95% CI 1.17–2.98; $p=0.009$), whereas the corresponding associations were not statistically significant for underweight (AOR 1.33, 95% CI 0.65–2.72; $p=0.428$) or wasting (AOR 1.98, 95% CI 0.49–8.00; $p=0.335$). Short preceding birth intervals showed a similar outcome-specific pattern. Compared with first births or children following an interval of at least 36 months, a preceding interval of <24 months was associated with approximately twice the adjusted odds of stunting (AOR 2.03, 95% CI 1.48–2.79; $p<0.001$) and higher odds of underweight (AOR 1.66, 95% CI 1.13–2.45; $p=0.010$), but not wasting (AOR 0.75, 95% CI 0.42–1.36; $p=0.345$).

Maternal characteristics showed a less consistent pattern after adjusting for the other pre-specified covariates. Maternal education was not independently associated with stunting after adjustment (any education versus no education: AOR 0.87, 95% CI 0.71–1.07; $p=0.197$), despite the substantial unadjusted difference in stunting prevalence by maternal education reported in Table 1. The association with underweight was stronger but remained just outside the conventional 0.05 threshold (AOR 0.74, 95% CI 0.55–1.01; $p=0.054$). In contrast, children whose mothers had any formal education had substantially lower adjusted odds of wasting (AOR 0.52, 95% CI 0.31–0.86; $p=0.011$). Child sex was not independently associated with stunting or underweight; for female versus male children, the AORs were 0.91 (95% CI 0.75–1.10; $p=0.332$) and 0.87 (95% CI 0.71–1.06; $p=0.164$), respectively. The estimate for wasting was also below one but did not meet the conventional threshold for statistical significance (AOR 0.69, 95% CI 0.46–1.03; $p=0.072$).

Table 3. Adjusted associations of child, maternal, socioeconomic, household, and regional characteristics with childhood stunting, wasting, and underweight, Ethiopia, 2024–25

Characteristic / contrast	Stunting AOR (95% CI); p	Wasting AOR (95% CI); p	Underweight AOR (95% CI); p
Child characteristics			
Child age: 3–5	1.43 (0.56–3.70); 0.46	1.30 (0.41–4.14); 0.65	1.43 (0.50–4.12); 0.50
Child age: 6–11	2.45 (1.20–4.97); 0.01	0.88 (0.32–2.40); 0.81	2.20 (0.93–5.18); 0.07
Child age: 12–17	4.14 (2.11–8.10); <0.001	1.30 (0.44–3.81); 0.63	2.16 (0.95–4.87); 0.06
Child age: 18–23	8.28 (4.05–16.89); <0.001	0.85 (0.29–2.50); 0.77	2.80 (1.16–6.79); 0.02
Child age: 24–35	12.73 (6.50–24.92); <0.001	0.76 (0.26–2.25); 0.62	3.10 (1.31–7.34); 0.01
Child age: 36–47	11.04 (5.76–21.17); <0.001	0.51 (0.18–1.42); 0.19	2.31 (1.02–5.25); 0.05
Child age: 48–59	8.24 (4.33–15.67); <0.001	0.52 (0.17–1.57); 0.24	2.50 (1.07–5.81); 0.03
Child sex: Female	0.91 (0.75–1.10); 0.33	0.69 (0.46–1.03); 0.07	0.87 (0.71–1.06); 0.16
Reproductive history			
Birth order: 2–3	1.31 (0.95–1.79); 0.10	2.12 (0.82–5.47); 0.12	1.22 (0.77–1.93); 0.41
Birth order: 4–5	1.62 (1.07–2.46); 0.02	2.40 (0.75–7.65); 0.14	1.52 (0.82–2.79); 0.18
Birth order: 6+	1.87 (1.17–2.98); 0.009	1.98 (0.49–8.00); 0.33	1.33 (0.65–2.72); 0.43
Preceding birth interval: <24 months	2.03 (1.48–2.79); <0.001	0.75 (0.42–1.36); 0.35	1.66 (1.13–2.45); 0.01
Preceding birth interval: 24–35 months	1.36 (1.06–1.74); 0.02	0.63 (0.36–1.13); 0.12	1.25 (0.94–1.66); 0.12
Maternal characteristics			
Maternal age: 15–19	1.64 (0.85–3.19); 0.14	2.45 (0.86–6.97); 0.09	1.36 (0.59–3.11); 0.47
Maternal age: 20–24	1.52 (1.12–2.07); 0.008	1.59 (0.76–3.34); 0.22	1.19 (0.79–1.80); 0.40
Maternal age: 30–34	0.85 (0.65–1.10); 0.22	0.82 (0.38–1.75); 0.60	0.88 (0.63–1.22); 0.44
Maternal age: 35–39	0.85 (0.60–1.20); 0.35	0.72 (0.30–1.70); 0.45	0.75 (0.48–1.17); 0.20
Maternal age: 40–49	0.78 (0.52–1.17); 0.23	1.04 (0.43–2.52); 0.93	0.85 (0.50–1.44); 0.54
Maternal education: Any education	0.87 (0.71–1.07); 0.20	0.52 (0.31–0.86); 0.01	0.74 (0.55–1.01); 0.05
Socioeconomic / residence			
Wealth: Poorer	0.78 (0.57–1.06); 0.11	0.69 (0.36–1.35); 0.28	0.66 (0.44–0.98); 0.04
Wealth: Middle	0.89 (0.61–1.29); 0.53	0.57 (0.25–1.33); 0.19	0.65 (0.43–1.00); 0.05
Wealth: Richer	0.58 (0.40–0.86); 0.006	0.57 (0.26–1.25); 0.16	0.52 (0.33–0.81); 0.004
Wealth: Richest	0.40 (0.22–0.71); 0.002	1.04 (0.35–3.12); 0.94	0.52 (0.27–0.99); 0.05
Residence: Rural	0.79 (0.59–1.05); 0.10	0.79 (0.38–1.64); 0.53	0.76 (0.52–1.10); 0.14
Region			
Region: Tigray	1.25 (0.92–1.68); 0.15	1.45 (0.73–2.88); 0.29	1.50 (0.97–2.30); 0.07
Region: Afar	0.81 (0.56–1.18); 0.28	2.06 (1.15–3.67); 0.01	2.20 (1.42–3.42); <0.001
Region: Amhara	1.28 (0.97–1.69); 0.09	1.63 (0.86–3.09); 0.14	1.99 (1.31–3.03); 0.001
Region: Oromia	**1.00 (Reference)**	**1.00 (Reference)**	**1.00 (Reference)**
Region: Somali	0.40 (0.25–0.64); <0.001	2.70 (1.52–4.81); <0.001	1.13 (0.71–1.80); 0.61
Region: Benishangul-Gumuz	1.62 (1.09–2.40); 0.02	1.05 (0.53–2.09); 0.88	2.36 (1.46–3.80); <0.001
Region: Central Ethiopia	0.84 (0.60–1.18); 0.31	1.39 (0.65–2.98); 0.40	0.96 (0.57–1.61); 0.86
Region: Sidama	0.78 (0.57–1.07); 0.12	1.26 (0.56–2.81); 0.58	1.28 (0.84–1.96); 0.25
Region: South West Ethiopia	1.04 (0.73–1.48); 0.82	0.76 (0.33–1.78); 0.53	1.36 (0.86–2.15); 0.19
Region: South Ethiopia	1.01 (0.71–1.44); 0.96	1.41 (0.70–2.87); 0.34	1.29 (0.85–1.98); 0.23
Region: Gambella	0.27 (0.17–0.43); <0.001	3.49 (1.80–6.73); <0.001	0.79 (0.47–1.31); 0.35
Region: Harari	0.90 (0.58–1.39); 0.62	0.80 (0.28–2.34); 0.69	1.15 (0.69–1.92); 0.60

Characteristic / contrast	Stunting AOR (95% CI); p	Wasting AOR (95% CI); p	Underweight AOR (95% CI); p
Region: Addis Ababa	0.52 (0.32–0.83); 0.007	0.69 (0.20–2.35); 0.55	0.64 (0.27–1.54); 0.32
Region: Dire Dawa	0.79 (0.51–1.21); 0.27	1.72 (0.78–3.80); 0.18	1.49 (0.90–2.47); 0.12
Household/environment			
Drinking water: Improved	1.12 (0.86–1.45); 0.41	0.75 (0.47–1.21); 0.24	1.03 (0.76–1.39); 0.85
Sanitation: Improved	0.87 (0.66–1.15); 0.33	0.96 (0.58–1.57); 0.87	0.82 (0.60–1.13); 0.22

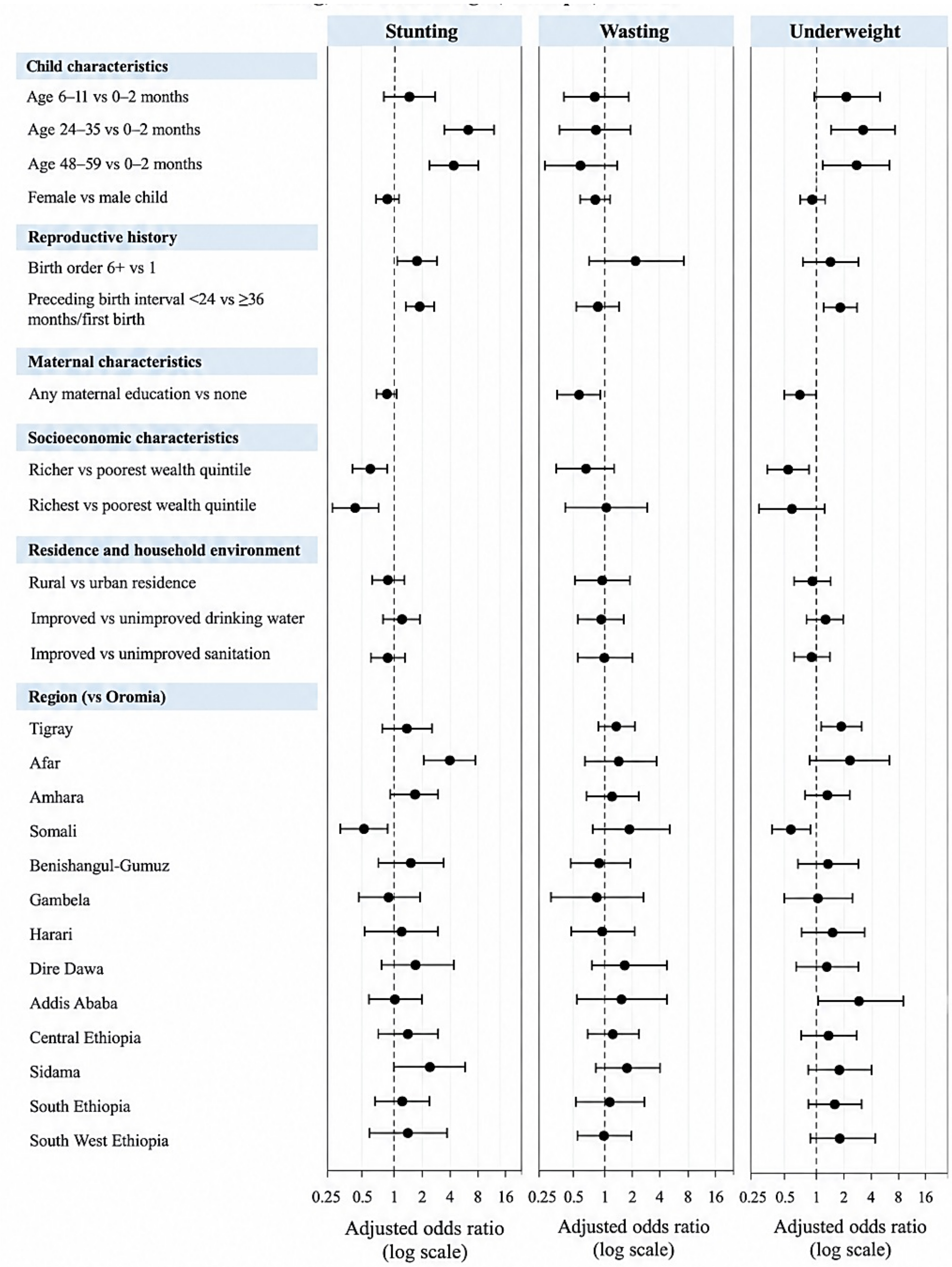
Notes. Adjusted odds ratios (AORs) are from separate survey-weighted logistic regression models for stunting, wasting, and underweight. All models include the same prespecified adjustment set. Reference categories are: child age 0–2 months; male sex; birth order 1; first birth or preceding interval ≥36 months; maternal age 25–29 years; no maternal education; poorest wealth quintile; urban residence; Oromia; unimproved drinking water; and unimproved sanitation. Regional AORs are therefore all expressed relative to Oromia. Model Ns: stunting n=5,714; wasting n=5,754; underweight n=5,823. AORs describe adjusted associations and should not be interpreted as causal effects.

Socioeconomic position remained independently associated with chronic and composite anthropometric deficits, particularly at higher household wealth levels. Compared with children in the poorest wealth quintile, those in the richer quintile had lower adjusted odds of both stunting (AOR 0.58, 95% CI 0.40–0.86; p=0.006) and underweight (AOR 0.52, 95% CI 0.33–0.81; p=0.004). Among children in the richest quintile, the adjusted odds of stunting were 60% lower than among those in the poorest quintile (AOR 0.40, 95% CI 0.22–0.71; p=0.002), while the adjusted odds of underweight were approximately 48% lower (AOR 0.52, 95% CI 0.27–0.99; p=0.048). By contrast, household wealth showed no comparable association with wasting in these contrasts; for the richest versus poorest quintile, the estimate was essentially null (AOR 1.04, 95% CI 0.35–3.12; p=0.940).

Residence and household WASH characteristics showed no strong independent associations after adjustment for the broader covariate set. Rural residence was not significantly associated with stunting (AOR 0.79, 95% CI 0.59–1.05; p=0.104), underweight (AOR 0.76, 95% CI 0.52–1.10; p=0.145), or wasting (AOR 0.79, 95% CI 0.38–1.64; p=0.527). Similarly, improved drinking water was not independently associated with stunting (AOR 1.12, 95% CI 0.86–1.45; p=0.408), underweight (AOR 1.03, 95% CI 0.76–1.39; p=0.849), or wasting (AOR 0.75, 95% CI 0.47–1.21; p=0.238). The corresponding estimates for improved sanitation were likewise not statistically significant: AOR 0.87 (95% CI 0.66–1.15; p=0.328) for stunting, 0.82 (95% CI 0.60–1.13; p=0.224) for underweight, and 0.96 (95% CI 0.58–1.57; p=0.867) for wasting. These adjusted estimates should not be interpreted as evidence that residence, water, or sanitation are unimportant for child nutrition; rather, they indicate that these broad measures did not retain statistically detectable independent associations within the fully adjusted models.

Overall, the multivariable results demonstrate that the three anthropometric outcomes did not share a single correlate profile. Stunting was distinguished by an exceptionally strong age gradient, associations with high birth order and short preceding birth intervals, and a pronounced household wealth gradient. Underweight shared some of these features—particularly associations with age, short birth intervals, and wealth—but generally with smaller effect estimates. Wasting differed: the age, reproductive-history, and wealth contrasts prominent for stunting were not independently associated with wasting, while maternal education emerged as a significant correlate of lower wasting odds. Figure 4 summarizes these contrasts on a common adjusted-odds-ratio scale. The outcome-specific analytic samples were 5,714 children for stunting, 5,754 for wasting, and 5,823 for underweight. All estimates are survey-weighted, adjusted associations from cross-sectional data and therefore should not be interpreted as causal effects.

Figure 4. Contrasting adjusted association profiles for childhood stunting, wasting, and underweight, Ethiopia, 2024–25



Note: points show adjusted odds ratios (circles) and 95% confidence intervals (horizontal lines) from multivariable logistic regression models. Reference categories are 0-2 months (age), male child, birth order 1, preceding birth interval; ≥36 months, first birth, no maternal education, poorest wealth quintile, urban residence, unimproved drinking water, and unimproved sanitation, and Oromia for region.

3.5 Regional burden and residual geographic heterogeneity

Substantial geographic heterogeneity remained in childhood malnutrition in 2024–25, but the regional pattern differed considerably across anthropometric outcomes. For stunting, observed prevalence ranged from 14.7% in Addis Ababa to 51.6% in Benishangul-Gumuz, a difference of nearly 37 percentage points. Prevalence was also high in Afar (46.0%), Amhara (43.1%), South West Ethiopia (41.8%), Tigray (41.6%), South Ethiopia (41.6%), and Oromia (41.3%). At the other end of the distribution, Gambella (16.5%) and Sidama (30.8%), along with Addis Ababa, had substantially lower observed stunting prevalence than the national estimate of 39.9%. These descriptive estimates show the magnitude of contemporary geographic inequality in chronic undernutrition but do not account for differences in regional population composition.

Regional variation in wasting followed a markedly different pattern. The highest observed prevalence occurred in Somali (13.7%) and Gambella (12.9%), followed by Afar (10.5%), compared with a national prevalence of 4.7%. By contrast, wasting prevalence was 2.4% in Addis Ababa, 2.6% in Harari, 3.2% in South West Ethiopia, and 3.3% in Central Ethiopia. The geographic distribution of underweight again differed. Afar had the highest observed underweight prevalence at 38.9%, followed by Benishangul-Gumuz (29.9%), Somali (25.6%), Amhara (21.5%), South West Ethiopia (20.4%), and Tigray (20.0%). Addis Ababa had the lowest observed prevalence (6.8%), compared with the national estimate of 18.3%.

Thus, the regions with the greatest burden did not match across stunting, wasting, and underweight. The adjusted regional coefficients provide a different perspective from these observed prevalences. In the multivariable models, regional AORs represent residual adjusted associations after accounting for the pre-specified child, reproductive-history, maternal, socioeconomic, residence, and household WASH characteristics included in the models. Consequently, they should not be interpreted as regional effects or as estimates of the causal influence of residence in a particular region. Importantly, a region's position in the crude prevalence distribution need not correspond to its adjusted regional association: adjustment changes the comparison from the total observed burden in a region to the residual difference between otherwise statistically adjusted populations.

This distinction is evident in several regional patterns. A region may show high observed prevalence partly because its population is distributed differently across child age, reproductive, maternal, socioeconomic, or household characteristics that are themselves associated with malnutrition. Adjustment can therefore attenuate its regional coefficient. Conversely, a region with a comparatively moderate observed prevalence may retain a relatively elevated adjusted AOR if its observed burden is lower than would otherwise be anticipated from its covariate distribution. Consequently, interpret the adjusted regional coefficients alongside—not as replacements for—the observed prevalence estimates.

Table 4. Regional prevalence and adjusted regional associations for childhood stunting, wasting, and underweight, Ethiopia, 2024–25

Region	Stunting % (95% CI)	Stunting AOR (95% CI); p	Wasting % (95% CI)
Tigray	41.6 (37.1–46.1)	1.25 (0.92–1.68); p=0.149	5.2 (2.9–7.5)
Afar	46.0 (40.4–51.5)	0.81 (0.56–1.18); p=0.275	10.5 (7.8–13.2)
Amhara	43.1 (38.7–47.6)	1.28 (0.97–1.69); p=0.085	4.5 (2.7–6.3)
Oromia	**41.3 (36.5–46.0)**	**1.00 (reference)**	**3.9 (2.1–5.7)**
Somali	34.6 (28.6–40.5)	0.40 (0.25–0.64); p=<0.001	13.7 (10.9–16.5)
Benishangul-Gumuz	51.6 (43.4–59.9)	1.62 (1.09–2.40); p=0.017	4.2 (2.3–6.0)
Central Ethiopia	35.0 (29.6–40.5)	0.84 (0.60–1.18); p=0.314	3.3 (1.4–5.3)
Sidama	30.8 (25.9–35.7)	0.78 (0.57–1.07); p=0.122	4.3 (2.1–6.5)
South West Ethiopia	41.8 (35.5–48.2)	1.04 (0.73–1.48); p=0.824	3.2 (1.0–5.4)
South Ethiopia	41.6 (35.9–47.3)	1.01 (0.71–1.44); p=0.964	4.9 (2.3–7.5)
Gambella	16.5 (11.5–21.6)	0.27 (0.17–0.43); p=<0.001	12.9 (9.0–16.9)
Harari	34.8 (27.2–42.5)	0.90 (0.58–1.39); p=0.622	2.6 (0.4–4.9)
Addis Ababa	14.7 (10.6–18.8)	0.52 (0.32–0.83); p=0.007	2.4 (0.0–4.7)
Dire Dawa	33.3 (26.5–40.0)	0.79 (0.51–1.21); p=0.274	6.8 (3.3–10.4)

Table 4 continued

Region	Wasting AOR (95% CI); p	Underweight % (95% CI)	Underweight AOR (95% CI); p
Tigray	1.45 (0.73–2.88); p=0.290	20.0 (15.9–24.2)	1.50 (0.97–2.30); p=0.067
Afar	2.06 (1.15–3.67); p=0.014	38.9 (33.8–44.1)	2.20 (1.42–3.42); p=<0.001
Amhara	1.63 (0.86–3.09); p=0.138	21.5 (17.1–25.9)	1.99 (1.31–3.03); p=0.001
Oromia	**1.00 (reference)**	**15.6 (11.8–19.5)**	**1.00 (reference)**
Somali	2.70 (1.52–4.81); p=<0.001	25.6 (21.4–29.9)	1.13 (0.71–1.80); p=0.608
Benishangul-Gumuz	1.05 (0.53–2.09); p=0.883	29.9 (22.3–37.4)	2.36 (1.46–3.80); p=<0.001
Central Ethiopia	1.39 (0.65–2.98); p=0.399	13.6 (9.1–18.2)	0.96 (0.57–1.61); p=0.865
Sidama	1.26 (0.56–2.81); p=0.576	15.4 (12.3–18.5)	1.28 (0.84–1.96); p=0.246
South West Ethiopia	0.76 (0.33–1.78); p=0.528	20.4 (15.3–25.6)	1.36 (0.86–2.15); p=0.188
South Ethiopia	1.41 (0.70–2.87); p=0.339	18.9 (14.3–23.4)	1.29 (0.85–1.98); p=0.234
Gambella	3.49 (1.80–6.73); p=<0.001	14.6 (9.0–20.3)	0.79 (0.47–1.31); p=0.354
Harari	0.80 (0.28–2.34); p=0.689	15.0 (9.8–20.3)	1.15 (0.69–1.92); p=0.603
Addis Ababa	0.69 (0.20–2.35); p=0.553	6.8 (2.8–10.8)	0.64 (0.27–1.54); p=0.322
Dire Dawa	1.72 (0.78–3.80); p=0.182	19.5 (14.0–25.1)	1.49 (0.90–2.47); p=0.120

Notes. Prevalence estimates are survey-weighted regional percentages with 95% confidence intervals. AOR = adjusted odds ratio; CI = confidence interval. Oromia is the reference category for all adjusted regional associations (AOR = 1.00). Regional AORs are residual adjusted associations after simultaneous adjustment for the pre-specified child, reproductive history, maternal, socioeconomic, residence, and WASH covariates and should not be interpreted as causal regional effects. Observed prevalence and adjusted AORs answer different questions and need not rank regions similarly.

Source. Authors' analysis of the 2024–25 Ethiopia Demographic and Health Survey.

Across the three outcomes, the persistence of regional differences after multivariable adjustment indicates that the measured individual- and household-level covariates did not fully account for Ethiopia's geographic heterogeneity in childhood malnutrition. Moreover, the configuration of these residual associations differed between stunting, wasting, and underweight, reinforcing the broader finding that the three anthropometric outcomes have distinct epidemiologic profiles. Such remaining regional variation may encompass differences in measured and unmeasured contextual conditions, but the present cross-sectional models cannot identify which contextual mechanisms account for those residual associations.

Taken together, the descriptive and adjusted results answer two related but fundamentally different questions. Regional prevalence identifies where the burden is currently concentrated and is therefore directly relevant to geographic targeting and resource allocation. Adjusted regional AORs indicate whether differences between regions remain after accounting for the measured covariate composition of their populations. Maintaining this distinction is essential: the former describes population burden, whereas the latter describes residual statistical association conditional on the model specification. Neither the magnitude nor statistical significance of a regional AOR should, by itself, be interpreted as evidence of a causal regional effect.

4. Discussion

4.1 Principal findings

This study documents both the magnitude of Ethiopia's long-term progress in child nutrition and the unfinished nature of that progress. Across a quarter century of nationally representative surveys, stunting declined from 57.7% in 2000 to 39.9% in 2024–25, underweight from 41.2% to 18.3%, and wasting from 12.2% to 4.7%. However, the trajectories were not parallel. Underweight declined steadily, wasting improved substantially between 2016 and 2024–25, and the long decline in stunting appears to have stalled: prevalence was 38.4% in 2016 and 39.9% in 2024–25. The 1.5-percentage-point difference should not be interpreted as evidence of a statistically significant increase in the absence of a formal between-survey test. More consequentially, the data provide little evidence of further national progress in reducing stunting since 2016.

The contemporary analyses further show that the residual burden cannot be characterized adequately by a single concept of "child malnutrition." Stunting exhibited an exceptionally strong age gradient, reaching 52.1% at 24–35 months; short preceding birth intervals, high birth order, and household wealth remained independently associated with stunting. Underweight shared some of these associations but generally with smaller magnitudes. Wasting, in contrast, had a different age profile and a substantially different adjusted correlate structure. Finally, large regional differences were evident in observed prevalence, and geographic heterogeneity remained after adjustment for measured child, reproductive, maternal, socioeconomic, residence, and household environmental characteristics. Together, these findings suggest that Ethiopia has moved from an era in which multiple anthropometric deficits were extremely widespread toward a more differentiated epidemiologic situation in which chronic growth restriction, acute nutritional deficit, socioeconomic inequality, and geographic heterogeneity increasingly require distinct analytical and programmatic responses.

This distinction is consistent with the contemporary global understanding of child undernutrition. Stunting reflects cumulative linear-growth restriction, whereas wasting captures a more acute deficit in weight relative to height; underweight, based on weight for age, can reflect elements of both processes. Consequently, the three indicators overlap at the individual level but are not interchangeable epidemiologic outcomes (Black et al., 2013; Victora et al., 2021).

4.2 Major progress, but an apparent stunting plateau

Ethiopia's long-term improvement should not be understated. A reduction in stunting from 57.7% to 39.9% represents a 17.8 percentage-point decline over 25 years, while underweight declined by 22.9 percentage points and wasting by 7.5 percentage points. Earlier analyses of Ethiopian DHS data similarly documented substantial reductions in linear-growth failure and identified improvements in maternal nutrition, maternal education, child health, environmental hygiene, and related conditions as plausible contributors to earlier progress (Headey et al., 2017). That work also emphasized that the factors associated with improvements differed by child age and livelihood context, cautioning against attributing national change to a single intervention or determinant.

The post-2016 pattern nevertheless raises an important concern. Between 2000 and 2016, stunting declined by 19.3 percentage points, from 57.7% to 38.4%. In 2024–25 it was 39.9%. In contrast, underweight continued to fall from 23.6% in 2016 to 18.3% in 2024–25, and wasting fell from 9.9% to 4.7%. The appropriate characterization is therefore not a generalized deterioration in child nutrition, but an apparent stalling of progress specifically in chronic linear-growth restriction.

That distinction matters programmatically. Stunting is the cumulative manifestation of nutritional and health insults occurring across fetal life and early childhood rather than a contemporaneous measure of food intake alone. Its determinants extend across maternal nutrition, fetal growth, infant feeding, dietary adequacy, infection, sanitation, socioeconomic conditions, and the broader environment in which children grow (Black et al., 2013; Victora et al., 2021). Consequently, continued improvement in some proximal indicators or in acute malnutrition does not necessarily produce a comparable decline in stunting.
The plateau also deserves attention because the residual burden is very large. A national prevalence near 40% means that chronic growth restriction remains common even after a quarter century of improvement. The implication is not that previous strategies failed—historical reductions show otherwise—but that the combination of interventions and broader socioeconomic changes that produced earlier gains may not be enough to drive the next phase of decline. Ethiopia's National Food and Nutrition Strategy appropriately conceptualizes nutrition as a multisectoral issue rather than solely a health-sector responsibility (Federal Democratic Republic of Ethiopia, 2021). The present findings reinforce the importance of that framing.

At the same time, interpret the apparent plateau conservatively. The present analysis compares repeated cross-sectional surveys; it does not decompose the 2016–2024–25 change into causal contributions, nor did we formally test whether the 1.5-percentage-point difference in national stunting prevalence is statistically distinguishable from zero. Changes in population composition, shocks, food security, health-service access, conflict, displacement, climatic conditions, and other contextual circumstances could all potentially influence national trends. Determining why progress slowed therefore requires analyses specifically designed to explain change over time. Our results establish the empirical phenomenon that needs explanation; they do not establish its cause.

4.3 The age pattern identifies a critical period for prevention

Perhaps the most striking contemporary finding was the age profile of stunting. Only 11.9% of children aged 0–5 months were stunted, compared with 20.1% at 6–11 months, 30.0% at 12–17 months, 43.9% at 18–23 months, and 52.1% at 24–35 months. Although prevalence subsequently declined, it remained 49.8% at 36–47 months and 43.4% at 48–59 months. The adjusted models strengthened this observation: relative to children aged 0–2 months, the adjusted odds of stunting were 2.45 times higher at 6–11 months and 12.73 times higher at 24–35 months.

This pattern is highly consistent with the biological and programmatic importance assigned to the period spanning pregnancy through the first two years of life. WHO identifies complementary feeding from 6 to 23 months as a period of particularly high risk for growth faltering and nutrient deficiencies. At approximately six months, breast milk alone no longer meets all energy and nutrient requirements, and nutritionally adequate, diverse, safe complementary foods must be introduced while breastfeeding continues (World Health Organization, 2023).

The correspondence between this vulnerable developmental period and the Ethiopian age curve is notable. Stunting rises sharply after six months, accelerates through the second year, and reaches its highest observed prevalence at 24–35 months. Previous Ethiopian DHS analyses have likewise identified child age as an important correlate of undernutrition, including in analyses of the 2016 and 2019 surveys (Kassie & Workie, 2020; Tamir et al., 2022).

These results should not, however, be interpreted as demonstrating that complementary feeding inadequacy caused the observed age gradient. The current study did not follow individual children longitudinally, nor does the cross-sectional comparison demonstrate that the same children transitioned from normal linear growth to stunting between successive age categories. Moreover, growth faltering after six months can reflect multiple interacting exposures: insufficient dietary quantity or quality, micronutrient inadequacy, recurrent infection, unsafe food and water, poor sanitation, and antecedent maternal and fetal nutritional disadvantage. WHO similarly emphasizes that complementary feeding involves not merely the timing of food introduction but nutritional adequacy, dietary diversity, food safety, appropriate frequency and responsive feeding (World Health Organization, 2023).

Nevertheless, the findings have a clear prevention implication. Interventions cannot begin when stunting is first recognized at two or three years of age. By then, much of the population-level divergence in linear growth has already emerged. Prevention must begin during pregnancy and continue without interruption through breastfeeding and the complementary-feeding transition, with particularly intensive attention to children between 6 and 23 months. This is consistent with the broader literature identifying pregnancy and the first two years as a central window for interventions addressing maternal and child undernutrition (Black et al., 2013; Victora et al., 2021).

4.4 Reproductive history links child nutrition to maternal and family health

The association between reproductive history and stunting adds another important dimension to the findings. Children of birth order six or higher had 87% higher adjusted odds of stunting than first-born children, while a preceding birth interval shorter than 24 months was associated with approximately twice the adjusted odds of stunting and 66% higher odds of underweight than first births or intervals of at least 36 months. Neither contrast showed a statistically significant association with wasting.

Previous Ethiopian studies have also identified preceding birth interval as a correlate of childhood stunting. Analyses of Ethiopian DHS data have reported associations involving reproductive history, maternal characteristics, and household socioeconomic circumstances (Kassie & Workie, 2020; Mohammed et al., 2019). Short birth intervals themselves are socially patterned in Ethiopia and have been associated with maternal, household, contraceptive, educational, and contextual characteristics.

Several pathways could plausibly underlie the association, including maternal nutritional depletion, competition for caregiving time and household resources, shortened breastfeeding duration, and clustering of socioeconomic disadvantage. These mechanisms cannot be distinguished with the present cross-sectional models and should therefore be regarded as hypotheses rather than explanations established by our data. Nonetheless, the persistence of the birth-interval association after adjustment suggests that reproductive health and child nutrition should not be treated as independent programmatic domains.

This has practical relevance for integrated maternal and child health services. Family-planning access, postpartum contraceptive counseling, maternal nutrition, breastfeeding support, and child nutrition interventions can operate along the same reproductive continuum. The association observed here does not establish that increasing birth intervals would by itself prevent stunting, but it strengthens the rationale for integrating nutrition objectives into reproductive, maternal, newborn, and child health programming rather than organizing them as isolated vertical activities.

4.5 Socioeconomic position remains important after adjustment

Household wealth remained independently associated with stunting and underweight even after adjustment for the other measured characteristics. Compared with children in the poorest quintile, children in the richer quintile had 42% lower adjusted odds of stunting and 48% lower odds of underweight. Among those in the richest quintile, the adjusted odds of stunting were 60% lower and the odds of underweight 48% lower. This persistent gradient is consistent with previous Ethiopian evidence showing socioeconomic inequalities in child growth failure and identifying household wealth as an important contributor to inequality in anthropometric outcomes (Bekele et al., 2021).

Wealth is unlikely to represent a single biological pathway. Rather, the DHS wealth index captures broad differences in household material circumstances that can influence food quantity and diversity, housing, hygiene, transportation, access to services, ability to absorb economic shocks, maternal workload, and numerous other conditions. Its association after adjustment for education, residence, water, sanitation, and other measured covariates therefore suggests that the socioeconomic gradient is not reducible to any one of these variables.

Maternal education showed a more nuanced pattern. Descriptively, children of mothers with no formal education had substantially higher stunting prevalence than those whose mothers had any education. Yet maternal education was not independently associated with stunting after full adjustment (AOR 0.87, 95% CI 0.71–1.07), and its association with underweight narrowly missed the conventional statistical threshold (AOR 0.74, 95% CI 0.55–1.01). In contrast, any maternal education was associated with substantially lower adjusted odds of wasting (AOR 0.52, 95% CI 0.31–0.86).

Earlier Ethiopian studies have frequently reported maternal education as a correlate of stunting (Mohammed et al., 2019; Tamir et al., 2022), although findings vary with model specification, categorization, analytic population, and included covariates. Our findings should not be interpreted to mean that maternal education is unimportant. Education is upstream of multiple pathways represented elsewhere in the model—including wealth, reproductive behavior, health knowledge, service use, and household living conditions. Adjusting simultaneously for variables along or correlated with those pathways can substantially attenuate the education coefficient. The adjusted AOR therefore answers the narrower question of whether education remains associated with the outcome conditional on the other covariates in the model; it does not estimate the total social contribution of maternal education.

4.6 WASH and residence: absence of an independent coefficient is not absence of relevance

Neither rural residence nor the broad binary measures of improved drinking water and improved sanitation were independently associated with any of the three anthropometric outcomes in the fully adjusted models. This finding requires particularly careful interpretation. It would be incorrect to conclude that water, sanitation, hygiene, or rural living conditions are irrelevant to childhood nutrition.

First, “improved” water and sanitation classifications are relatively coarse proxies. They do not directly measure microbial contamination, continuity or quantity of water supply, actual household hygiene behavior, child feces disposal, food hygiene, or community-level environmental exposure. Second, residence and WASH conditions are socially patterned and correlated with wealth, education, region, and other characteristics included simultaneously in the models. Their adjusted coefficients therefore represent associations conditional on those correlated variables rather than total relationships with child nutritional status.

Previous Ethiopian studies have reported associations between sanitation, drinking-water characteristics and stunting under different model specifications, while others have found weaker or non-significant associations for particular WASH measures. This variation reinforces the importance of distinguishing between the conceptual importance of environmental health and what a particular DHS variable can identify statistically.

Accordingly, the present null adjusted associations should be described as absence of statistically detectable independent associations for these broad measures in these models, not evidence against WASH interventions. Safe preparation and handling of complementary foods remain central to WHO infant and young-child feeding recommendations precisely because the complementary-feeding period introduces new routes of pathogen exposure (World Health Organization, 2023).

4.7 Stunting, wasting, and underweight have different epidemiologic profiles

One of the clearest findings of this study is that the three conventional anthropometric indicators should not be treated as interchangeable manifestations of a single underlying condition. Their prevalence trajectories, age distributions, and adjusted correlates differed substantially.

Stunting showed the strongest age dependence and the clearest associations with reproductive history and household wealth. Underweight partly resembled stunting but generally displayed smaller adjusted age associations. Wasting differed most sharply: its prevalence did not rise progressively through early childhood, the selected age contrasts were not statistically significant after adjustment, short birth interval and high birth order were not significant, and the wealth contrasts prominent for stunting were not reproduced. Maternal education, however, was associated with substantially lower adjusted odds of wasting.

These differences are biologically plausible because the indicators capture different dimensions of anthropometric failure. Linear growth restriction develops through accumulated processes over time, whereas wasting can arise and resolve more rapidly in response to inadequate intake, infection, or other acute insults. Underweight occupies an intermediate position because low weight for age can reflect short stature, low weight relative to height, or both (Black et al., 2013; Victora et al., 2021). Ethiopian spatial research likewise demonstrates that stunting, wasting, and underweight do not necessarily share identical geographic distributions or determinants.

The policy implication is important. A program judged successful because wasting has declined cannot be assumed to have achieved equivalent progress against stunting. Ethiopia's recent experience illustrates this directly: wasting declined markedly between 2016 and 2024–25 while stunting showed little further improvement. Similarly, interventions directed at acute food insecurity and treatment of wasting remain essential but cannot substitute for sustained prevention of chronic growth faltering beginning before birth and continuing through the first two years of life.

4.8 Geography remains important—but prevalence and adjusted regional association answer different questions

The regional analysis revealed striking geographic heterogeneity. Stunting ranged from 14.7% in Addis Ababa to 51.6% in Benishangul-Gumuz; wasting from 2.4% in Addis Ababa to 13.7% in Somali; and underweight from 6.8% in Addis Ababa to 38.9% in Afar. Importantly, the regions with the highest prevalence differed by outcome. Geography therefore does not simply divide Ethiopia into uniformly high- and low-malnutrition regions.

Previous spatial analyses have repeatedly demonstrated non-random geographic variation in childhood malnutrition in Ethiopia. Analyses of the 2011, 2016, and 2019 surveys identified substantial spatial clustering and regional heterogeneity in stunting, with patterns varying over time and across outcomes (Haile et al., 2016; Tamir et al., 2022). Spatiotemporal analyses have likewise documented persistent regional inequalities despite national progress.

Our analysis adds an important distinction between observed regional burden and residual adjusted regional association. Prevalence describes the proportion of children currently affected in each region and therefore has direct relevance for burden assessment and allocation of services. Regional AORs, by contrast, compare regions after statistical adjustment for measured differences in child, reproductive, maternal, socioeconomic, residence, and WASH characteristics. A region can consequently have high prevalence but a comparatively modest adjusted AOR if part of its observed burden is associated with an adverse distribution of measured covariates. Conversely, a region with moderate crude prevalence can retain an elevated adjusted association conditional on its covariate profile.

For this reason, the adjusted regional coefficients should not be called regional effects. They are residual conditional associations relative to the reference region. They may capture measured and unmeasured contextual differences—including food systems, ecology, livelihoods, service access, disease environments, infrastructure, cultural feeding practices, shocks, and other conditions—but the coefficient itself cannot identify which of these mechanisms is responsible. Nor does statistical adjustment transform region into a causal exposure.

This distinction also has practical implications. Prevalence should primarily guide where the burden is greatest; adjusted analyses can help identify where compositional differences fail to explain that burden. Regions that remain unusual after adjustment may warrant deeper contextual investigation, but the next analytical step should be to identify mechanisms rather than treating geographic location itself as the mechanism. The persistence of geographic heterogeneity after adjustment supports geographically differentiated nutrition strategies, an approach consistent with previous Ethiopian spatial evidence calling for interventions responsive to local patterns rather than uniform national assumptions.

4.9 Implications for policy and programming

These findings carry several programmatic implications. First, restarting the decline in stunting should be a central priority. Ethiopia has demonstrated that rapid nutritional improvement is possible, but the post-2016 pattern suggests that continued reliance on the same intensity or configuration of interventions may not be sufficient. The National Food and Nutrition Strategy provides an appropriate multisectoral framework; implementation should increasingly be judged not only by national coverage indicators but by whether chronic growth faltering resumes its decline across regions and socioeconomic groups (Federal Democratic Republic of Ethiopia, 2021).

Second, the age profile argues for an especially strong operational focus on the transition from exclusive breastfeeding to complementary feeding. The sharp rise in stunting after six months should not be interpreted as evidence against breastfeeding; rather, it underscores the vulnerability of the period when nutrient requirements increase and children become increasingly dependent on complementary foods while continuing to breastfeed. WHO recommends introducing complementary foods at six months, continuing breastfeeding, maintaining age-appropriate meal frequency, promoting dietary diversity, providing nutrient-dense foods, ensuring safe preparation, and supporting responsive feeding (World Health Organization, 2023). In food-insecure settings where available foods cannot meet nutrient requirements, WHO also recognizes context-specific roles for fortified foods or nutrient supplements, including small-quantity lipid-based nutrient supplements.

Third, nutrition programming should connect more explicitly with reproductive health and birth spacing. The associations of short preceding intervals and high birth order with stunting suggest that the nutritional circumstances of a child begin before the child’s own feeding practices are considered. Maternal nutrition, family planning, postpartum services, breastfeeding support, and infant nutrition constitute a continuum rather than independent interventions.

Fourth, the persistent wealth gradient argues for maintaining an explicit equity lens. Universal nutrition programs may improve national averages while leaving children in materially disadvantaged households behind. Nutrition-sensitive social protection, food security, women’s economic opportunities, health-service accessibility, and measures that reduce the cost of nutritionally adequate diets may therefore complement nutrition-specific interventions. The historical Ethiopian evidence that socioeconomic inequality contributes materially to inequalities in child growth reinforces this concern.

Finally, the regional findings argue against a uniform implementation model. The highest-burden region depends on the outcome considered, and adjusted geographic heterogeneity persists after accounting for measured household characteristics. National standards and financing can coexist with regionally differentiated implementation, informed by local dietary systems, livelihoods, food security, disease patterns, service access, and the particular anthropometric problem most prominent in each setting.

4.10 Strengths and limitations

This study has several strengths. It uses nationally representative DHS data and a quarter-century perspective spanning five surveys, permitting the contemporary 2024–25 burden to be interpreted against long-term national change rather than as an isolated cross-section. The primary analyses incorporated the DHS sampling weights, clustering, and stratification. We independently reconstructed the 2024–25 national anthropometric estimates and validated them against the published survey estimates before undertaking the analytical extensions. We specified multivariable covariates conceptually rather than selecting them through automated stepwise procedures or bivariate significance screening, and we retained region in the primary models. Finally, modeling stunting, wasting, and underweight separately allowed differences among anthropometric outcomes to emerge rather than assuming a common determinant structure.

Several limitations are equally important. First, the 2024–25 analysis is **cross-sectional**. Temporal ordering cannot be established for many covariates, and adjusted associations should not be interpreted causally. The strong association between age and stunting, for example, describes differences among children observed at different ages; it does not constitute a longitudinal growth trajectory for individual children.

Second, residual confounding is unavoidable. DHS surveys contain extensive information but cannot measure every relevant determinant of child growth. Dietary quality and quantity, food insecurity, infection burden, maternal nutritional history, maternal stature, fetal growth, environmental contamination, caregiving practices, health-service quality, conflict exposure, displacement, climatic shocks, and local food systems may be incompletely measured or absent from the primary models. Maternal BMI and recent morbidity were deliberately excluded from the primary adjustment set because of concerns about temporal interpretation and potential mediation; this improves conceptual clarity but means the primary coefficients are not adjusted for these factors.

Third, several exposures are necessarily broad. Binary classifications of improved water and sanitation, for example, do not capture actual water quality, reliability, household storage, hygiene behavior, food contamination, or community sanitation. Null adjusted coefficients for these variables therefore cannot be generalized to the broader WASH environment.

Fourth, anthropometric indicators are subject to measurement error. Although DHS applies standardized measurement protocols and implausible anthropometric values are excluded according to established procedures, height and weight measurement error can still affect classification, particularly around z-score thresholds.

Fifth, the outcome-specific regression samples differed because valid anthropometric and covariate information was not identical for every child. The final models included 5,714 children for stunting, 5,754 for wasting, and 5,823 for underweight. This maximized available information for each outcome but means that small differences between models could partly reflect differences in analytic samples.
Sixth, regional estimates—particularly for less populous regions—can have substantial sampling uncertainty. Rankings based solely on point estimates should therefore be interpreted cautiously. Likewise, adjusted regional AORs are conditional statistical comparisons and should not be interpreted as direct measures of contextual causal effects.

Finally, the apparent post-2016 stunting plateau is a descriptive finding. Although the difference between the 2016 and 2024–25 point estimates is epidemiologically important because it indicates an absence of continued obvious decline, formal inference regarding change would require a survey-to-survey comparison explicitly incorporating uncertainty in both estimates. The present study therefore describes stalling or an apparent plateau, not a statistically demonstrated increase.

4.11 Conclusion

Ethiopia's experience over the past quarter century is simultaneously a story of substantial achievement and persistent nutritional vulnerability. Stunting, wasting, and underweight all declined markedly from their levels in 2000, demonstrating that large-scale improvement in child nutrition is possible. Yet the 2024–25 results show that progress has become uneven. Underweight continued to decline and wasting fell substantially, while stunting remained close to 40% and showed little improvement beyond its 2016 level.

The contemporary pattern further indicates where the unfinished agenda is concentrated. Stunting rises sharply after early infancy and peaks at 24–35 months; short preceding birth intervals and high birth order remain associated with chronic growth restriction; household wealth continues to differentiate nutritional outcomes; and substantial geographic heterogeneity persists even after adjustment for measured individual and household characteristics. Wasting, meanwhile, exhibits a different age and correlate profile, underscoring that Ethiopia's remaining anthropometric deficits should not be approached as a single homogeneous problem.

The next phase of nutritional progress will therefore require more than preserving earlier gains. It will require renewed prevention of growth faltering from pregnancy through the first two years of life, stronger integration of nutrition with reproductive and maternal health, sustained attention to socioeconomic inequality, and geographically differentiated implementation responsive to local burdens and contexts. The central challenge is no longer simply whether Ethiopia can reduce childhood malnutrition—the historical record shows that it can—but how to restart progress against chronic linear-growth restriction while consolidating the substantial gains already achieved against wasting and underweight.

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