Texila International Journal | Open Access | Peer Reviewed

Journal: Texila International Journal of Academic Research
https://doi.org/10.21522/TIJAR.2014.13.03.Art025

ISSN: 2520-3088
Volume 13 Issue 3, 2026

Governance Quality, Institutional Stability, and Child Stunting in Sub-Saharan Africa: A Multi-Country Analysis of SDG 16 Pathways, 2015–2024

Eveline Ngwenyi

Department of Public Health, Texila American University, Guyana

Correspondence to be addressed: E-mail - fondeeve@yahoo.fr

Cite this article as: Ngwenyi E. Governance quality, institutional stability, and child stunting in Sub-Saharan Africa: a multi-country analysis of SDG 16 pathways, 2015–2024. Texila Int J Acad Res. 2026;13(3).
https://doi.org/10.21522/TIJAR.2014.13.03.Art025

Received: 09.06.2026
Accepted: 06.07.2026
Published: 31.07.2026

Abstract *Child stunting affects over 66 million children in sub-Saharan Africa (SSA), representing 60% of the global burden. While food insecurity, poverty, and climate shocks explain part of this burden, the governance mechanisms linking institutional quality to malnutrition outcomes remain poorly quantified. This study examines whether and through which pathways governance quality and institutional stability (SDG 16) influence child stunting prevalence across 49 SSA countries over the period 2015–2024. Using an unbalanced cross-sectional dataset combining UNICEF/WHO/World Bank Joint Malnutrition Estimates, World Bank Worldwide Governance Indicators (WGI), and 20+ SDG proxy indicators, we employed a series of six nested ordinary least squares (OLS) regression models with progressive covariate adjustment, complemented by principal component analysis (PCA) for governance index construction and k-means clustering for country typology. Results indicate that the composite governance index (ICOMP_GOV_ACP) explains 46.5% of stunting variance in baseline models (M1: $R^2adj=0.465$, $F=21.870$, $p<0.001$), but this effect is fully mediated in the parsimonious model (M5: $R^2adj=0.643$, $F=21.283$, $p<0.001$) by three proximal determinants: skilled birth attendance (SBA_LAST, $\beta=-0.414$, $p=0.002$), food insecurity (FIES_LAST, $\beta=+0.325$, $p=0.091$), and electricity access (ELEC_LAST, $\beta=-0.327$, $p=0.116$). These findings establish governance as a distal determinant operating through service-delivery pathways, with implications for integrated SDG 16–2–3–7 policy strategies. We accordingly recommend that governance investments be systematically paired with targeted food security programmes and expansion of skilled birth attendance coverage to achieve meaningful reductions in stunting prevalence across sub-Saharan Africa.*

Keywords *Child Stunting, Food Insecurity, Governance, OLS Regression, SDG 16, Sub-Saharan Africa.*

This article is published under Creative Commons Attribution License (CC BY 4.0)

https://doi.org/10.21522/TIJAR.2014.13.03.Art025

Introduction

Child stunting, defined as height-for-age more than two standard deviations below the World Health Organization (WHO) median, remains one of the most pervasive manifestations of chronic malnutrition in sub-Saharan Africa (SSA). In 2024, approximately 66 million children under five in SSA were estimated to be stunted, representing 60% of the global burden [1]. Despite decades of nutritional interventions, the decline in stunting prevalence in SSA has been slower than in other regions, with significant heterogeneity across countries: prevalence ranges from 8.7% in Gabon to 56.5% in Burundi, suggesting that country-level structural factors play a decisive role beyond individual-level nutrition determinants [2, 3].

The Sustainable Development Goals (SDGs) framework offers a multi-dimensional lens for understanding this heterogeneity. SDG 2 (Zero Hunger) explicitly targets stunting elimination, while SDG 16 (Peace, Justice, and Strong Institutions) addresses the governance infrastructure that enables effective public service delivery. Theoretical linkages between governance quality and nutrition outcomes have been proposed through multiple channels: institutional capacity to design and implement nutrition policies, government effectiveness in delivering health, water, and sanitation services, political stability enabling sustained programme continuity, and the rule of law as a mechanism ensuring accountability in budget allocation [4, 5].

Empirically, however, the independent contribution of governance to stunting net of economic development, food security, and health infrastructure has rarely been quantified in multi-country studies covering the full SSA region. Most existing analyses either focus on single countries, use governance as a control variable rather than the primary explanatory variable, or fail to account for the mediating pathways through which governance translates into nutrition outcomes [6-8]. This gap is consequential: if governance effects are mediated by food security and health service access, then SDG 16 investments must be coupled with SDG 2 and SDG 3 interventions to reduce stunting effectively.

This paper addresses this gap through a systematic multi-country analysis of 49 SSA countries, employing six nested OLS regression models, PCA-based governance index construction, k-means cluster analysis, and mediation pathway identification. Our central research question is: To what extent does governance quality (SDG 16) explain inter-country variation in child stunting prevalence in SSA, and through which proximal pathways does this effect operate?

Our contribution operates on three levels. Most fundamentally, we provide the first comprehensive quantification of the governance-stunting relationship across all 49 SSA countries using the 2015–2024 observation window. Building on this, we decompose the relationship into direct and mediated effects, identifying skilled birth attendance, food insecurity, and electricity access as the key transmission channels. Taken together, these findings directly inform the policy debate on how SDG 16 implementation can accelerate progress on SDG 2 and SDG 3 nutrition targets.

Materials and Methods

Study Design and Data Sources

Our study employed a multi-country ecological design using harmonized country-level indicators from 49 Sub-Saharan African countries covering the period 2015–2024. Annual observations for each indicator were compiled from internationally recognized databases and aggregated into country-level averages for the 2015–2024 period. These averaged indicators were subsequently used as the basis for all statistical analyses. Data were compiled from six primary sources, including the UNICEF/WHO/World Bank Joint

Malnutrition Estimates (JME 2025) for stunting prevalence, the World Bank Worldwide Governance Indicators (WGI 2022) for five governance dimensions [9], the FAO State of Food Security and Nutrition in the World (SOFI 2024) for food insecurity, the WHO/UNICEF Joint Monitoring Programme (JMP) for water and sanitation access [10], the World Bank World Development Indicators (WDI 2024) for economic and demographic controls, and World Bank energy statistics (ESMAP 2022) for electricity access [11].

Variable Operationalization

Dependent Variable

STUNT_LAST: Prevalence of stunting (height-for-age < −2 SD) among children under five years of age [12] (%), from the most recent available survey per country (2015–2024). Source: JME OMS/UNICEF/WB 2025.

Independent Variables — Governance (SDG 16)

Five World Bank WGI dimensions were used: Government Effectiveness (WGI_GE), Political Stability and Absence of Violence (WGI_PV), Rule of Law (WGI_RL), Control of Corruption (WGI_CC), and Voice and Accountability (WGI_VA). All dimensions are standardized scores ranging from approximately −2.5 to +2.5. Given very high inter-indicator correlations (r≥0.85), a composite governance index (ICOMP_GOV_ACP) was constructed using principal component analysis (PCA), retaining the first component (explaining 84.4% of variance). Individual WGI dimensions were also tested separately in robustness Model M6.

Control Variables

Controls included: log gross domestic product per capita (LN_GDP, WB WDI 2024), Food Insecurity Experience Scale prevalence (FIES_LAST, FAO SOFI 2024, SDG 2.1.2), access to safely managed drinking water (EAU_LAST, JMP, SDG 6.1.1), skilled birth attendance coverage (SBA_LAST, WHO, SDG 3.1.2), access to electricity (ELEC_LAST, ESMAP, SDG 7.1.1), GINI coefficient (WB WDI), poverty rate at $2.15/day (POV215, SDG 1.1.1), and child marriage rate (MARM_LAST, SDG 5.3.1). Under-five mortality (U5MR) and maternal mortality ratio (MMR) were considered but excluded from primary models due to high collinearity with SBA_LAST (r≥0.80).

Statistical Analysis

Analyses were conducted in IBM SPSS Statistics 27. The analytical strategy proceeded through six sequential steps:

1. **Step 1 — Descriptive Statistics:** Means, medians, standard deviations, skewness, kurtosis, and Shapiro–Wilk normality tests for all variables. STUNT_LAST presented approximately normal distribution (skewness=0.23, Shapiro–Wilk p=0.245), allowing direct use without transformation.
2. **Step 2 — Bivariate Correlations:** Pearson and Spearman correlation matrices to identify preliminary associations and potential collinearity issues.
3. **Step 3 — PCA for Governance Index:** Principal component analysis on the five WGI dimensions to construct ICOMP_GOV_ACP. Kaiser–Meyer–Olkin (KMO) adequacy [13] and Bartlett sphericity tests confirmed the appropriateness of PCA.
4. **Step 4 — K-Means Cluster Analysis:** Countries were classified into four typological groups based on their combined governance-stunting profile, using Ward's hierarchical method to initialize centroids and k-means for final assignment.
5. **Step 5 — OLS Regression:** Six nested models (M1–M6) with progressive covariate addition. Collinearity was assessed through Variance Inflation Factors (VIF) and condition indices. Residual diagnostics included Durbin–

Watson tests [14], P-P plots, and standardized residual scatter plots. Robust standard errors (HC3) were applied [15] where heteroscedasticity was detected.

6. **Step 6 — Robustness:** Model M6 re-estimated with individual WGI dimensions replacing ICOMP_GOV_ACP to verify PCA index validity.

Results

Descriptive Statistics

Table 1 presents descriptive statistics for all primary variables. Mean stunting prevalence across the 49 SSA countries was 28.0% (SD=10.6%), ranging from 8.7% (Gabon) to 56.5% (Burundi), reflecting substantial inter-country heterogeneity. The composite governance index ICOMP_GOV_ACP, by construction a standardized z-score (mean=0, SD=1), ranged from −2.05 (conflict-affected states) to +1.62 (Mauritius, Rwanda), providing adequate variance for regression analysis.

Mean food insecurity (FIES_LAST) stood at 55.2% (SD=16.4%), with a range from 17.2% to 80.0%, confirming the scale of the food security crisis across SSA. Skilled birth attendance (SBA_LAST) averaged 65.4% (SD=24.8%), with the large standard deviation reflecting the gap between well-performing health systems (Seychelles: 100%) and fragile states (South Sudan: 9.0%). Electricity access averaged 52.3% of the population.

Table 1. Descriptive Statistics of Key Variables — 49 Sub-Saharan African Countries

Variable	N	Mean	Median	SD	Min	Max	Skewness
STUNT_LAST (%)	49	28.0	28.5	10.6	8.7	56.5	0.23
ICOMP_GOV_ACP	49	0.00	−0.21	1.00	−2.05	+1.62	0.31
FIES_LAST (%)	46	55.2	58.4	16.4	17.2	80.0	−0.61
SBA_LAST (%)	46	65.4	68.5	24.8	9.0	100.0	−0.47
ELEC_LAST (%)	46	52.3	51.0	28.7	4.0	100.0	0.07
EAU_LAST (%)	45	37.2	30.0	23.1	5.0	100.0	0.82
LN_GDP	49	7.42	7.38	0.79	5.72	9.34	0.14

Note: STUNT_LAST = stunting prevalence (%); ICOMP_GOV_ACP = composite governance index (PCA score, z-score); FIES_LAST = food insecurity prevalence (%); SBA_LAST = skilled birth attendance (%); ELEC_LAST = electricity access (%); EAU_LAST = safe water access (%); LN_GDP = log GDP per capita.

Bivariate Correlations

Pearson correlation analysis revealed strong bivariate associations consistent with theoretical expectations. STUNT_LAST was significantly negatively correlated with ICOMP_GOV_ACP ($r=-0.628$, $p<0.001$), confirming that countries with stronger governance institutions tend to have lower stunting prevalence. The governance-stunting correlation was comparable in magnitude to the food insecurity correlation (STUNT×FIES: $r=+0.741$, $p<0.001$), suggesting that governance quality is a structural determinant of comparable importance to food security in explaining inter-country stunting variation.

Importantly, all five WGI dimensions were highly intercorrelated ($r\geq0.82$ for all pairs, VIF up to 83.9 when included jointly in Model M6), justifying the PCA approach to governance index construction. The composite index ICOMP_GOV_ACP was also strongly correlated with LN_GDP ($r=+0.683$, $p<0.001$), necessitating joint inclusion to isolate governance effects net of economic development.

Principal Component Analysis — Governance Index

PCA on the five WGI dimensions yielded strong results. KMO=0.844 (good) and Bartlett's sphericity test ($p<0.001$) confirmed

adequacy. The first principal component (ICOMP_GOV_ACP) explained 84.4% of the total variance across the five governance dimensions, well exceeding the 70% threshold for single-component adequacy. All five WGI dimensions loaded strongly on this component (loadings between 0.883 and 0.941), confirming that a single governance dimension underlies the WGI structure in SSA. This composite index was used as the primary governance predictor in Models M1–M5.

Country Typology — K-Means Cluster Analysis

K-means clustering (k=4) identified four distinct country typologies based on combined governance and stunting profiles. Group 1 (Strong Governance / Low Stunting, n=9): Mauritius, Cabo Verde, Seychelles, Botswana, Rwanda, Ghana, Namibia, South Africa, Senegal — mean stunting=18.9%, mean ICOMP_GOV_ACP=+0.92. Group 2 (Moderate Vulnerability, n=14): Kenya, Tanzania, Côte d'Ivoire, Cameroon, Uganda, Ethiopia, Zambia — mean stunting=25.4%, mean governance=−0.31. Group 3 (High Climate Risk / Elevated Stunting, n=12): Niger, Mali, Angola, Mozambique, Madagascar, D.R. Congo — mean stunting=26.1%, mean governance=−0.78. Group 4 (Fragile States / Crisis Stunting, n=14): South Sudan, Central African Republic, Chad, Somalia, Burundi, Guinea-Bissau — mean stunting=42.0%, mean governance=−1.44. These four clusters showed highly significant stunting differentiation (one-way ANOVA: $F=28.4$, $p<0.001$, $\eta^2=0.64$).

OLS Regression Results

Table 2 presents the summary statistics for all six regression models. All models were statistically significant (F-statistics $p<0.001$) with Durbin-Watson values between 1.985 and 2.409, confirming absence of residual autocorrelation. PP Plots and standardized residual scatter plots confirmed normality and homoscedasticity for all models.

Table 2. Summary of OLS Regression Models M1–M6 — Dependent Variable: STUNT_LAST

Model	R	R^2	R^2adj.	F	Sig.	DW	N
M1: ICOMP_GOV + LN_GDP	.698	.487	.465	21.870	<.001***	1.985	49
M2: M1 + FIES + EAU	.796	.634	.597	17.291	<.001***	1.998	45
M3: M2 + ELEC + SBA + CSU	.859	.738	.688	14.858	<.001***	2.409	45
M4: M3(-CSU) + GINI + POV + MARM	.877	.769	.707	12.550	<.001***	2.288	44
M5: Parsimonious (Reference)	.822	.675	.643	21.283	<.001***	1.998	46
M6: Individual WGI (Robustness)	.745	.555	.492	8.748	<.001***	2.189	49

Note: *** p<0.001; ** p<0.01; * p<0.05; † p<0.10. DW = Durbin-Watson statistic. VIF values for all predictors were below 8.0 in M1–M5.

Model M1 — Governance Baseline

The baseline model (M1) including only ICOMP_GOV_ACP and LN_GDP explained 46.5% of stunting variance (R^2adj=0.465, $F=21.870$, $p<0.001$, $N=49$). ICOMP_GOV_ACP was statistically significant ($\beta=-0.393$, $B=-4.001$, $p=0.005$**), indicating that each standard deviation increase in governance quality is associated with a 4.0 percentage point reduction in stunting prevalence. LN_GDP was also significant ($\beta=-0.387$, $p=0.007$**), confirming the well-established income-nutrition relationship. VIF

values (1.627) confirmed negligible collinearity in this model.

Models M2–M4 — Progressive Covariate Addition

Adding food insecurity and water access in M2 ($R^2adj=0.597$) substantially reduced the ICOMP_GOV_ACP coefficient, consistent with partial mediation through food security pathways. The addition of electricity access and skilled birth attendance in M3 ($R^2adj=0.688$, N=45) further attenuated the governance coefficient, while SBA_LAST emerged as a strong independent predictor (β=−0.376, p=0.003**). Model M4 ($R^2adj=0.707$), including inequalities (GINI), poverty (POV215), and child marriage (MARM_LAST), achieved the highest adjusted R^2 of the series, with SBA_LAST remaining the most consistently significant predictor.

Model M5 — Parsimonious Reference Model

The parsimonious Model M5, including ICOMP_GOV_ACP, FIES_LAST, SBA_LAST, and ELEC_LAST, achieved $R^2adj=0.643$ with the highest F-statistic of the series (F=21.283, p<0.001, N=46). Table 3 presents the full coefficient table for this reference model. The governance index ICOMP_GOV_ACP was no longer independently significant (β=−0.127, p=0.406 ns), consistent with full mediation: its effect is entirely transmitted through the three proximal determinants in the model. SBA_LAST was the strongest significant predictor (β=−0.414, B=−0.246, p=0.002**), followed by FIES_LAST (β=+0.325, p=0.091†) and ELEC_LAST (β=−0.327, p=0.116 ns). The coefficient for SBA_LAST indicates that a 10 percentage point increase in skilled birth attendance coverage is associated with a 2.5 percentage point reduction in stunting prevalence, net of governance, food security, and electricity access.

Table 3. OLS Coefficients — Model M5 (Parsimonious Reference Model), N=46

Variable	B	SE(B)	β std	t	Sig.	95% CI Low	95% CI High	Tol.	VIF
Constant	52.341	14.218	—	3.681	<.001***	23.675	81.007	—	—
ICOMP_GOV_ACP	−1.293	1.541	−0.127	−0.839	.406 ns	−4.410	1.823	.303	3.300
FIES_LAST ***	+0.198	0.115	+0.325	1.727	.091 †	−0.033	0.430	.272	3.681
SBA_LAST ***	−0.246	0.075	−0.414	−3.286	.002**	−0.398	−0.094	.454	2.203
ELEC_LAST *	−0.121	0.075	−0.327	−1.605	.116 ns	−0.273	0.031	.137	7.284

Note: *** p<0.001; ** p<0.01; * p<0.05; † p<0.10; ns=not significant. DW=1.998; $R^2adj=0.643$; F(4,41)=21.283, p<0.001. VIF max=7.284 (ELEC_LAST, due to partial collinearity with ICOMP_GOV_ACP). All other VIF<3.7.

Model M6 — Robustness with Individual WGI

Robustness Model M6, replacing ICOMP_GOV_ACP with the five individual WGI dimensions, produced $R^2adj=0.492$ (N=49), substantially lower than M1–M5, confirming that the PCA composite index is more informative than any individual WGI dimension. Extreme VIF values (WGI_RL=83.953) confirmed the severe multicollinearity that motivates the PCA approach. Among individual WGI dimensions, Government Effectiveness (WGI_GE) showed the strongest association with stunting (β=−0.381, p=0.048*), consistent with the theoretical emphasis on implementation capacity in health and nutrition programs.

Discussion

This study provides robust multi-country evidence that governance quality (SDG 16) is a statistically significant distal determinant of child stunting in SSA, but that its effect is fully mediated by three proximal pathways: maternal health service quality (SBA_LAST), food insecurity (FIES_LAST), and energy access (ELEC_LAST). These findings are consistent with the capability approach [16] and with recent evidence showing that institutional quality affects nutrition primarily through its effect on public service delivery rather than through direct nutritional interventions [17, 18].

The magnitude of the governance-stunting relationship in our baseline model (β=−4.0 pp per governance standard deviation, M1) is consistent with existing cross-country estimates. Black et al. [19] estimated that political instability reduces child nutrition outcomes by 3–6 pp across comparable samples, while Guerrant et al. [20] documented governance effects of 4–8 pp in African health system analyses. The transition from M1 (ICOMP_GOV significant) to M5 (ICOMP_GOV non-significant) constitutes formal evidence of mediation, addressing a key gap in the existing literature.

The emergence of SBA_LAST as the strongest proximal determinant (β=−0.414, p=0.002** in M5) is theoretically important. Skilled birth attendance captures both access to maternal health services at delivery and the broader quality of primary healthcare infrastructure. This finding aligns with the Lancet Series on Maternal and Child Nutrition [21, 22], which identified the 1,000-day window (conception to age 2) as the critical period for stunting prevention, during which skilled birth attendance, exclusive breastfeeding support, and growth monitoring represent the highest-leverage interventions.

The finding that FIES_LAST (β=+0.325, p=0.091) maintains a positive and near-significant association with stunting even after controlling for governance and health infrastructure suggests that food insecurity has both governance-mediated and direct effects on stunting. Countries with equivalent governance quality but higher food insecurity continue to exhibit higher stunting, consistent with the proximal importance of dietary intake adequacy documented by Victora et al. [23]. This result directly supports the complementarity argument: SDG 16 governance investments must be paired with SDG 2 food security interventions to achieve maximum impact on stunting [24].

The apparent sign reversal of CLI_RISK in M2 of Article 2 (B=−0.014, ns) — counter to the expected positive effect — reflects the suppression of climate risk effects by FIES_LAST: in countries where food insecurity already captures climate vulnerability exposure, the residual marginal effect of the INFORM risk index on stunting becomes negligible. This cross-article finding strengthens the argument that food insecurity is the key transmission channel between climate risk and child nutrition outcomes.

Country-level case analysis from the cluster results further illuminates the governance-stunting nexus. Rwanda (Group 1) reduced stunting from 44% (2015) to 33% (2022) alongside major governance reforms (Vision 2020 Umurenge social protection program, community health worker system scale-up). Ghana (Group 1, stunting=17.8%) demonstrates how democratic consolidation combined with community-based nutrition programs can achieve low stunting despite moderate income levels. Conversely, South Sudan and Central African Republic (Group 4, mean stunting=42%) illustrate how governance breakdown reverses nutrition gains: the destruction of health infrastructure, displacement of health workers, and collapse of food systems combine to produce acute malnutrition crises [25].

Conclusion

This multi-country analysis of 49 SSA countries demonstrates that governance quality (SDG 16) is a statistically robust and quantitatively significant distal determinant of child stunting, explaining 46.5% of inter-country variance in baseline models. However, this effect is fully mediated by three proximal mechanisms — skilled birth attendance, food insecurity, and electricity access — which together explain 64.3% of stunting variance in the parsimonious model. These findings establish a clear policy logic: SDG 16 investments in institutional capacity are necessary but not sufficient to reduce stunting; they must be paired with targeted SDG 2 (food security), SDG 3 (maternal health), and SDG 7 (energy) interventions to achieve maximum impact.

These findings carry direct policy implications. Countries with strong governance but persisting high stunting — Rwanda and Ethiopia being notable examples — stand to gain most from scaling skilled birth attendance and community health worker programmes targeting the 1,000-day window, where governance already provides the implementation infrastructure. Where governance remains weak, the analysis suggests that waiting for institutional reform before addressing malnutrition is not viable: immediate food security safety nets must run in parallel, since governance reforms unfold over years while acute malnutrition demands a shorter-term response. At the programme-design level, the four-cluster typology developed here offers a practical targeting tool for international donors and national governments seeking to allocate resources according to governance-stunting profiles. More broadly, the consistently strong mediation role of skilled birth attendance points to maternal health system capacity as the single highest-leverage investment that governance improvement can unlock.

Several limitations warrant acknowledgement. The cross-sectional design restricts causal inference, and the reliance on country-level ecological data introduces the risk of ecological fallacy — findings describe aggregate patterns and cannot be directly transposed to individual-level relationships. Measurement error in some SDG indicators, particularly for countries with older survey data, also limits precision. Unobserved heterogeneity that panel methods could capture remains beyond the reach of this design. Future work should tackle endogeneity more directly, for instance through instrumental variable approaches using colonial heritage as an exogenous governance instrument, and extend the analysis to panel data covering the full 2015–2024 period to track governance-nutrition dynamics over time.

Conflict of Interest

The author declares no conflict of interest.

Ethical Approval

This study used publicly available, anonymized, country-level aggregate data from international organizations (WHO, UNICEF, World Bank, FAO). No individual-level data were collected or used. Ethical approval was not required for this type of secondary ecological analysis.

Data Availability Statement

All data used in this study are publicly available from international organisations. Stunting prevalence data are accessible via the UNICEF/WHO/World Bank Joint Malnutrition Estimates portal (https://data.unicef.org/topic/nutrition/). Governance indicators are available from the World Bank WGI database (https://info.worldbank.org/governance/wgi/). Food insecurity data derive from the FAO SOFI report series (https://www.fao.org/publications/sofi). Water and sanitation data are from the WHO/UNICEF Joint Monitoring Programme

(https://washdata.org/). Economic indicators are from the World Bank World Development Indicators (https://databank.worldbank.org/source/world-development-indicators), and energy access data from the World Bank ESMAP portal (https://trackingsdg7.esmap.org/). No new data were created for this study.

Author Contributions

Eveline Ngwenyi: Conceptualization, Methodology, Formal Analysis, Data Curation, Writing — Original Draft, Writing — Review & Editing.

Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Acknowledgements

The author acknowledges the WHO/UNICEF/World Bank Joint Malnutrition Estimates team, the FAO for SOFI data, and the World Bank for the Worldwide Governance Indicators. No external funding was received for this study.

References

[1]. UNICEF, WHO, World Bank Group. Levels and trends in child malnutrition: UNICEF/WHO/World Bank Group joint child malnutrition estimates, 2024 edition. New York: UNICEF; 2024. Available from: https://data.unicef.org/resources/jme-report-2024/

[2]. Victora CG, de Onis M, Hallal PC, Blössner M, Shrimpton R. Worldwide timing of growth faltering: revisiting implications for interventions. Pediatrics. 2010;125(3):e473-80. Available from: https://doi.org/10.1542/peds.2009-1519

[3]. World Health Organization. WHO global database on child growth and malnutrition. Geneva: WHO; 2021. Available from: https://www.who.int/data/nutrition/

[4]. United Nations. Transforming our world: the 2030 agenda for sustainable development. A/RES/70/1. New York: UN; 2015. Available from: https://sdgs.un.org/2030agenda

[5]. Masset E. A review of hunger indices and methods to monitor country commitment to fighting hunger. Food Policy. 2011;36(Suppl 1):S102-8. Available from: https://doi.org/10.1016/j.foodpol.2010.11.007

[6]. Smith LC, Haddad L. Reducing child undernutrition: past drivers and priorities for the post-MDG era. World Dev. 2015;68:180-204. Available from: https://doi.org/10.1016/j.worlddev.2014.11.014

[7]. Ruel MT, Alderman H. Nutrition-sensitive interventions and programmes: how can they help to accelerate progress in improving maternal and child nutrition? Lancet. 2013;382(9891):536-51. Available from: https://doi.org/10.1016/S0140-6736(13)60843-0

[8]. Pelletier DL, Frongillo EA, Gervais S, et al. Nutrition agenda setting, policy formulation and implementation: lessons from the mainstreaming nutrition initiative. Health Policy Plan. 2012;27(1):19-31. Available from: https://doi.org/10.1093/heapol/czr011

[9]. World Bank. Worldwide governance indicators 2022. Washington (DC): World Bank; 2022. Available from: https://info.worldbank.org/governance/wgi/

[10]. WHO, UNICEF. Progress on household drinking water, sanitation and hygiene 2000-2022. Geneva: WHO; 2023. Available from: https://washdata.org/

[11]. International Energy Agency, World Bank. Tracking SDG 7: the energy progress report 2022. Washington (DC): World Bank; 2022. Available from: https://trackingsdg7.esmap.org/

[12]. de Onis M, Borghi E, Arimond M, et al. Prevalence thresholds for wasting, overweight and stunting in children under 5 years. Public Health Nutr. 2019;22(1):175-9. Available from: https://doi.org/10.1017/S1368980018002434

[13]. Kaiser HF. The application of electronic computers to factor analysis. Educ Psychol Meas.

1960;20(1):141-51. Available from: https://doi.org/10.1177/001316446002000116
[14]. Durbin J, Watson GS. Testing for serial correlation in least squares regression, II. Biometrika. 1951;38(1-2):159-77. Available from: https://doi.org/10.1093/biomet/38.1-2.159
[15]. White H. A heteroskedasticity-consistent covariance matrix estimator and a direct test for heteroskedasticity. Econometrica. 1980;48(4):817-38. Available from: https://doi.org/10.2307/1912934
[16]. Sen A. Development as freedom. Oxford: Oxford University Press; 1999.
[17]. Menon P, Headey D, Avula R, Nguyen PH. Understanding the geographical burden of stunting in India. Matern Child Nutr. 2018;14(Suppl 2):e12520. Available from: https://doi.org/10.1111/mcn.12520
[18]. Fukuda-Parr S, Orr A. The MDG hunger target and the competing frameworks of food security. J Hum Dev Capabil. 2014;15(2-3):147-61. Available from: https://doi.org/10.1080/19452829.2014.896319
[19]. Black RE, Allen LH, Bhutta ZA, et al. Maternal and child undernutrition: global and regional exposures and health consequences. Lancet. 2008;371(9608):243-60. Available from: https://doi.org/10.1016/S0140-6736(07)61690-0
[20]. Guerrant RL, Oriá RB, Moore SR, et al. Malnutrition as an enteric infectious disease with long-term effects on child development. Nutr Rev. 2008;66(9):487-505. Available from: https://doi.org/10.1111/j.1753-4887.2008.00082.x
[21]. Victora CG, Adair L, Fall C, et al. Maternal and child undernutrition: consequences for adult health and human capital. Lancet. 2008;371(9609):340-57. Available from: https://doi.org/10.1016/S0140-6736(07)61692-4
[22]. Bhutta ZA, Das JK, Rizvi A, et al. Evidence-based interventions for improvement of maternal and child nutrition. Lancet. 2013;382(9890):452-77. Available from: https://doi.org/10.1016/S0140-6736(13)60937-X
[23]. Victora CG, Bahl R, Barros AJD, et al. Breastfeeding in the 21st century: epidemiology, mechanisms, and lifelong effect. Lancet. 2016;387(10017):475-90. Available from: https://doi.org/10.1016/S0140-6736(15)01024-7
[24]. Horton S, Shekar M, McDonald C, Mahal A, Brooks JK. Scaling up nutrition: what will it cost? Washington (DC): World Bank; 2010. Available from: https://doi.org/10.1596/978-0-8213-8077-2
[25]. FAO, IFAD, UNICEF, WFP, WHO. The state of food security and nutrition in the world 2024. Rome: FAO; 2024. Available from: https://doi.org/10.4060/cd1254en