Mortality Determinants and Differentials
(Ethiopia focus plus global lens)

Aynalem Adugna, October 2025

Suggested citation: Aynalem Adugna, Chapter 7, Mortality Determinants and Differentials (Ethiopia focus plus global lens), www.EthioDemographyAndHealth.org, October 2025.

CONTENT

7.1 Framework & Concepts
Determinants model (proximate vs. distal), pathways, confounding/mediation; Ethiopia data landscape.

7.2 Age & Sex Differentials
Infant/child vs. adult vs. older-age patterns; male–female gaps and life-course effects.

7.3 Residence & Region
Urban–rural differences; regional/woreda heterogeneity; pastoralist vs. agrarian settings.

7.4 Socioeconomic Status (SES)
Education, wealth/poverty, occupation/livelihoods; gradients and concentration indices.

7.5 Maternal, Neonatal & Child Health Factors
Birth spacing, parity, ANC/PNC, SBA, immunization; care-seeking and newborn practices.

7.6 Nutrition & Food Security
Child undernutrition (stunting, wasting), maternal nutrition, micronutrients; shocks & seasonality.

7.7 Household & Built Environment
WASH, housing quality, crowding, water source, sanitation, cooking fuel & indoor air pollution.

7.8 Infectious Disease Ecology
Malaria strata, TB, HIV, vaccine-preventable diseases; co-morbidities and co-infections.

7.9 Non-Communicable Disease (NCD) Risks
Hypertension, diabetes, BMI, tobacco, alcohol, physical inactivity; metabolic risk clustering.

7.10 Injuries & External Causes
Road traffic, occupational hazards, falls, drowning, interpersonal violence, self-harm.

7.11 Health System Access & Quality
Geographic/financial access, readiness, referral chains, effective coverage, catastrophic spending.

7.12 Conflict, Displacement & Humanitarian Settings
IDPs/refugees, access disruptions, excess mortality pathways, protection risks.

7.13 Environment & Climate Exposures
Heat, drought, floods, landslides, air quality (PM2.5), altitude; early-warning & resilience.

7.14 Spatial & Multilevel Determinants
Accessibility/time-to-care, remoteness, urban form, neighborhood effects; small-area modeling.

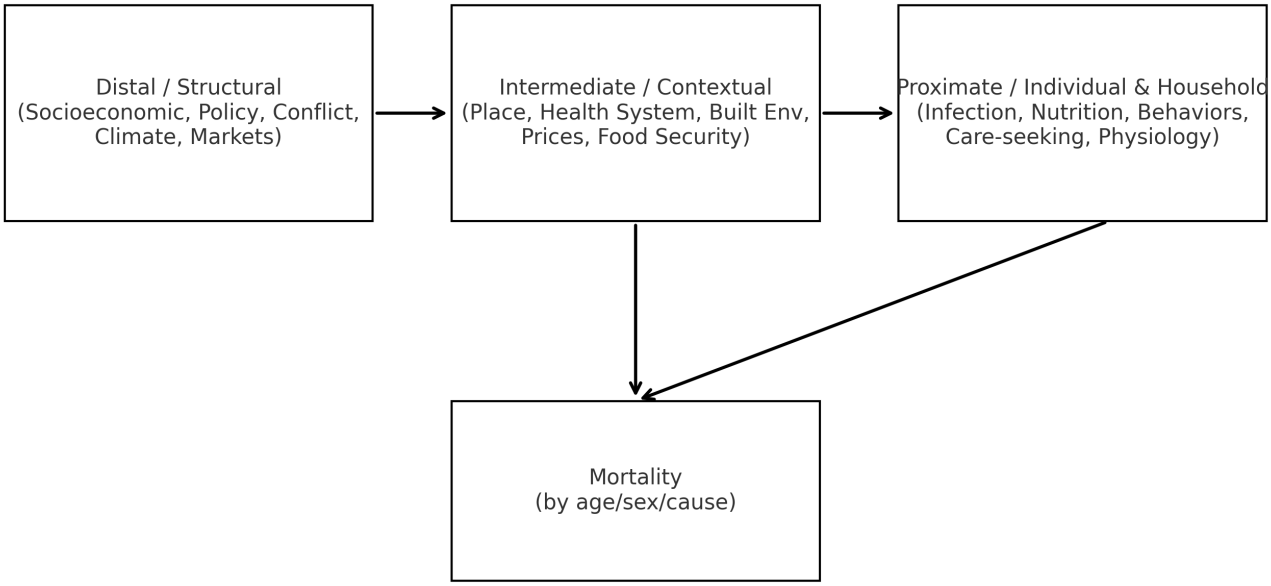
7.15 Decomposition, Attributable Fractions & Policy Levers
AF/PAF estimation, mediation/decomposition, priority interventions & cross-sector co-benefits.

7.1) Framework & Concepts

Purpose. Provide an Ethiopia-centered framework for mortality differentials & determinants across Chapter 7. We structure determinants (distal→intermediate→proximate), clarify confounding/mediation/effect modification, and propose a minimal reporting set.

Figures (conceptual)

Figure 7.1-1. Determinants framework — from structural to proximate factors



Determinants act through proximate pathways; report by equity strata (sex, residence, region, wealth).

Figure 7.1-2. Confounding vs. mediation vs. effect modification

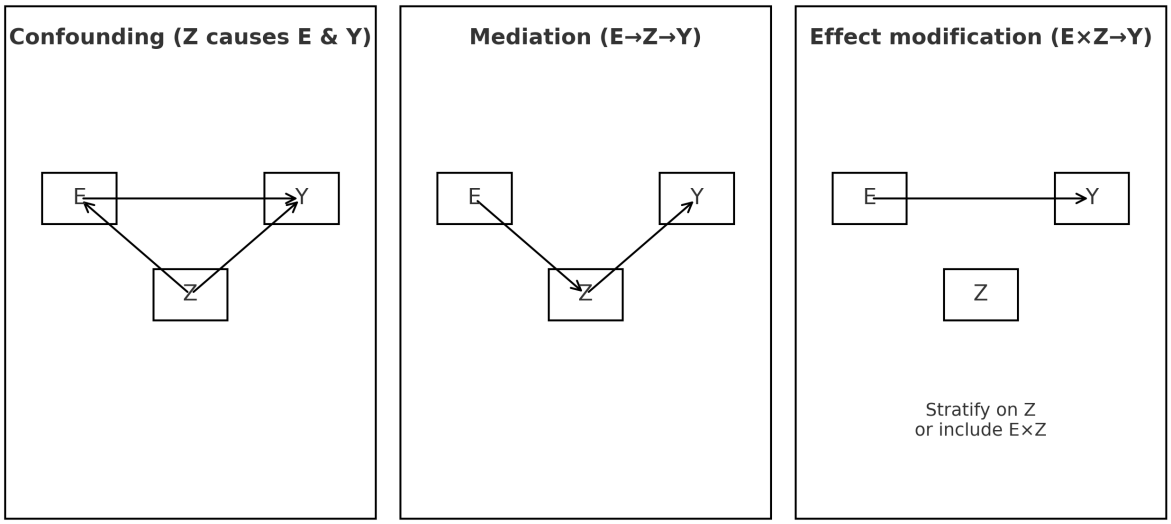
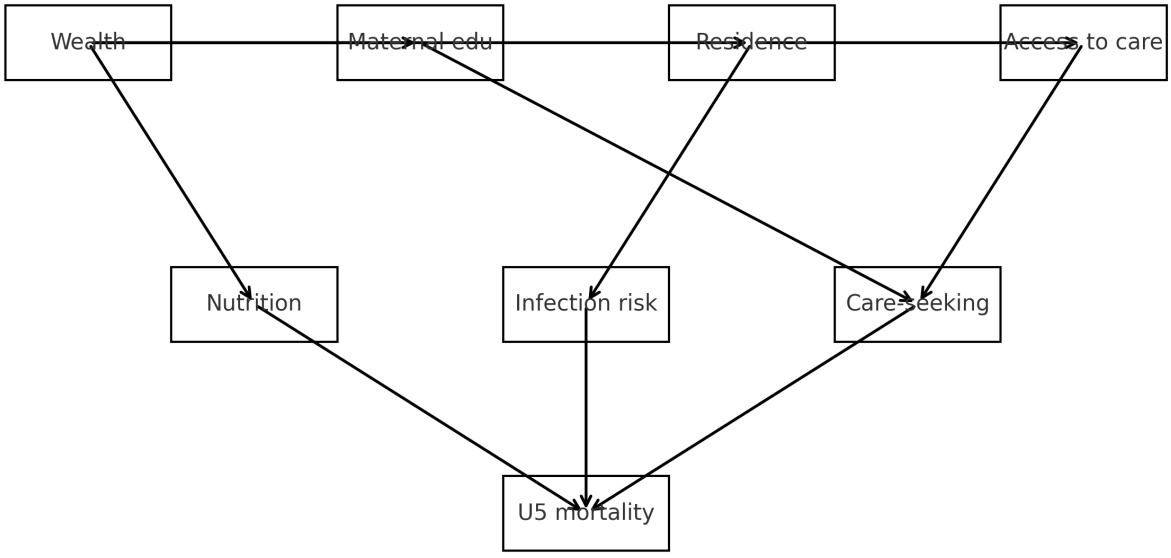


Figure 7.1-3. Simplified DAG for under-five mortality (Ethiopia)



Simplified DAG — identify adjustment set; avoid conditioning on colliders.

Table 7.1-A. Determinants taxonomy (Ethiopia-relevant)

Layer	Examples (Ethiopia-relevant)
Distal / structural	Education policy; economic growth; social protection; conflict; climate shocks; markets; gender norms.
Intermediate / contextual	Region/residence; accessibility; health system readiness; prices; food security; WASH infrastructure.
Proximate / individual	Birth spacing; ANC/PNC; immunization; breastfeeding; nutrition (child & maternal); infections; behaviors; comorbidities.

Table 7.1-B. Analysis concepts — definitions & actions

Concept	Short definition / implication
Confounding	Z related to both E and Y. Adjust/stratify.
Mediation	E→M→Y pathway; report direct/indirect effects.
Effect modification	Effect of E on Y differs by Z; test interactions.
Selection bias / collider	Avoid conditioning on colliders; use DAGs.
Causal identification	Define estimand; pre-specify adjustment set.
Equity lens	Disaggregate by sex, residence, wealth, region, displacement.

Table 7.1-C. Ethiopia data sources

Source type	Notes for determinants work
Surveys	DHS, PMA, MICS; LSMS-ISA; geocoded clusters.
Administrative	CRVS, HMIS/DHIS2, IDSR; facility readiness.
Surveillance	HDSS with Verbal Autopsy; special studies.
Modelled series	WHO GHE, UN WPP, GBD; for comparators.
Geospatial	Travel time, night-lights, elevation, conflict, displacement.

Table 7.1-D. Minimal reporting set

Element	What to include
Indicator definition	Numerator/denominator; window; age/sex.
Stratifiers	Sex; residence; region; wealth; education; displacement.
Model specification	DAG-based adjustment; interactions; FE/RE.
Uncertainty	95% CI; diagnostics; multiple testing.
Sensitivity	Alternate definitions; missing-data handling.
Policy linkage	Targeting implications for Ethiopia.

References — Section 7.1

- Mosley, W.H., & Chen, L.C. (1984). An analytical framework for the study of child survival in developing countries.

- Victora, C.G. et al. (1997). The role of conceptual frameworks in epidemiological analysis.

- Rothman, Greenland & Lash (2008). Modern Epidemiology.

- UNICEF/WHO/World Bank — child mortality estimation methods; DHS/PMA guides.

7.2) Age & Sex Differentials

Purpose. Characterize Ethiopia's age- and sex-specific mortality patterns, using headline indicators (U5MR, 45q15, 20q60), abridged life tables by sex, and sex mortality ratios by age. Figures are templates to be replaced with official series (CSA, MOH-HMIS/CRVS, WHO/UN, HDSS/VA).

Figure 7.2-1. Under-5 mortality by sex

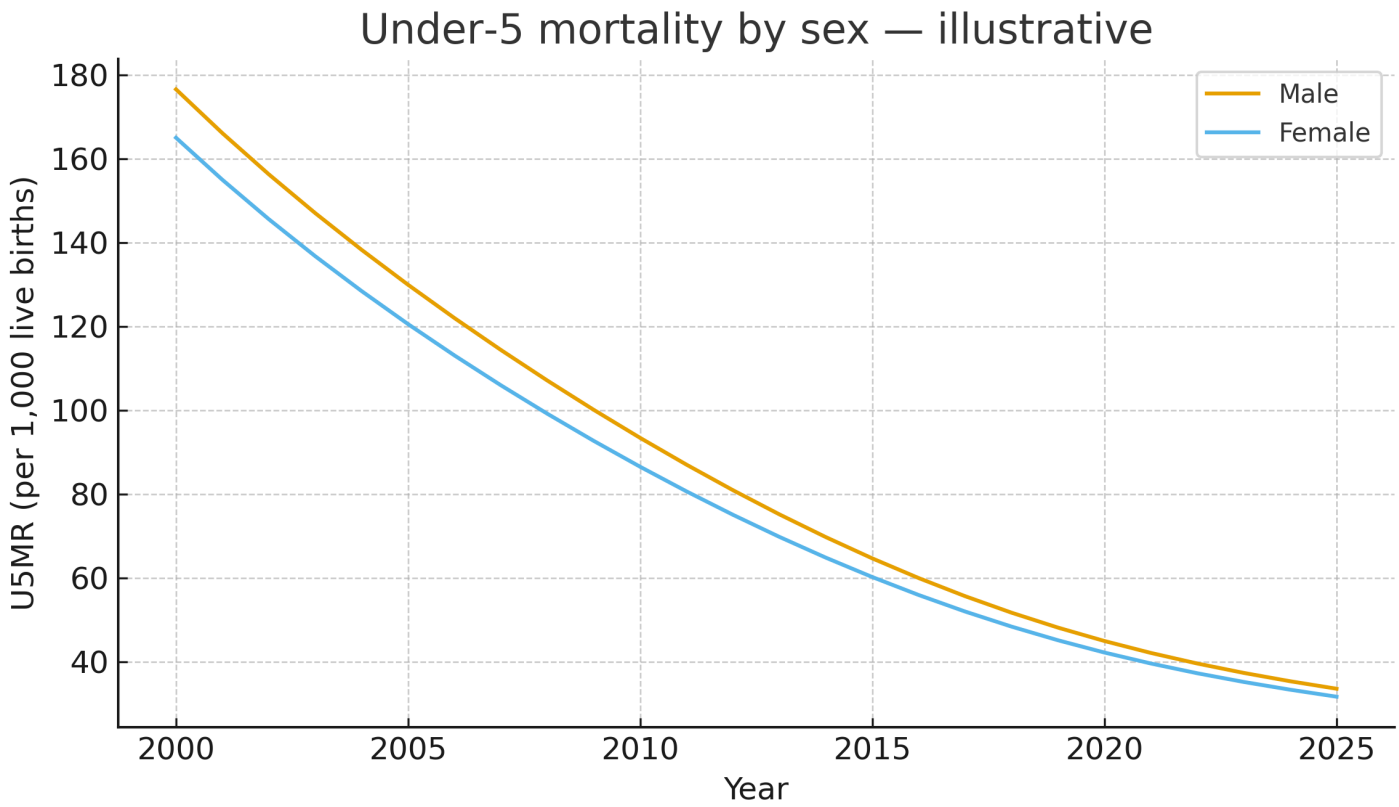


Figure 7.2-2. Adult mortality (45q15) by sex

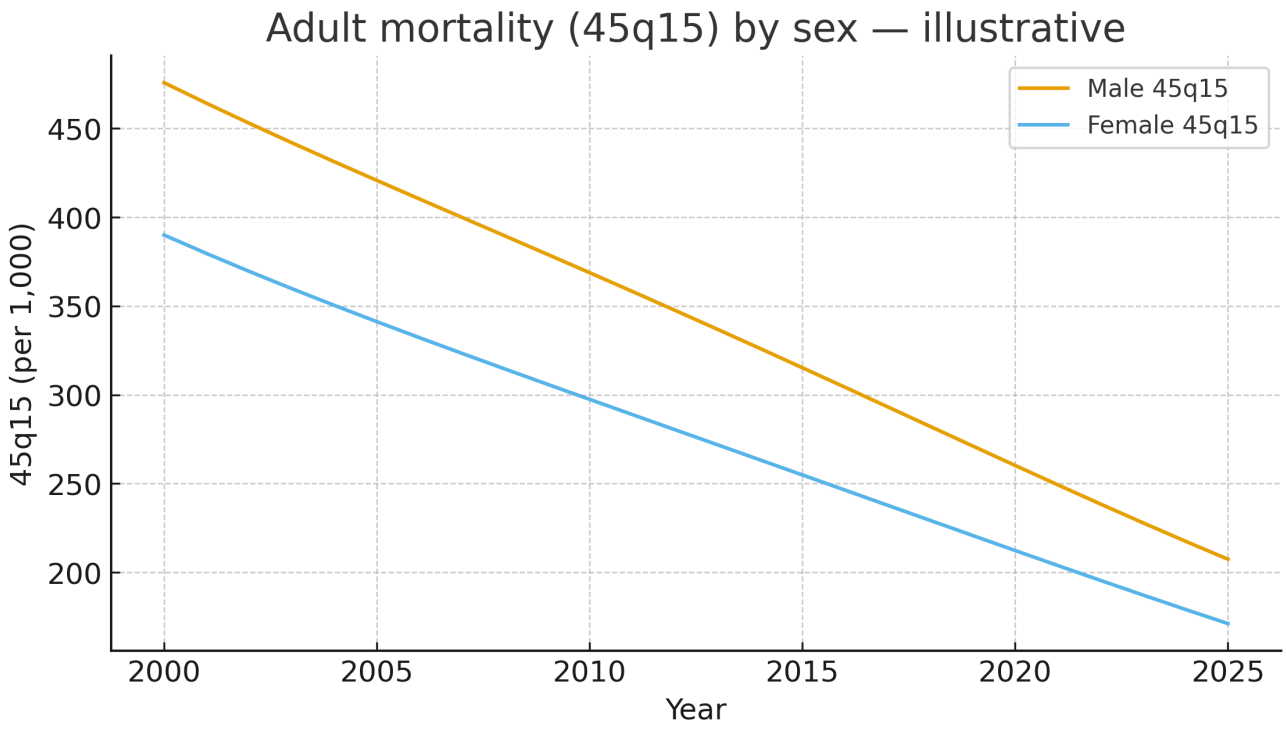


Figure 7.2-3. Older-age mortality (20q60) by sex

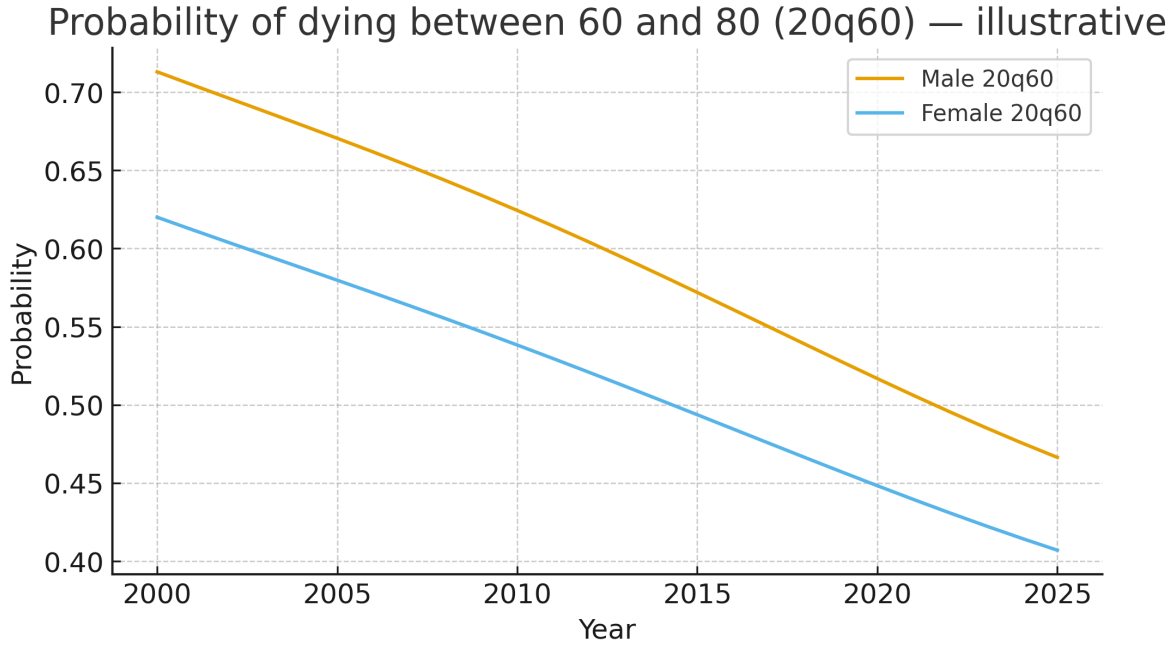


Figure 7.2-4. Life table survivorship l(x) — male vs female

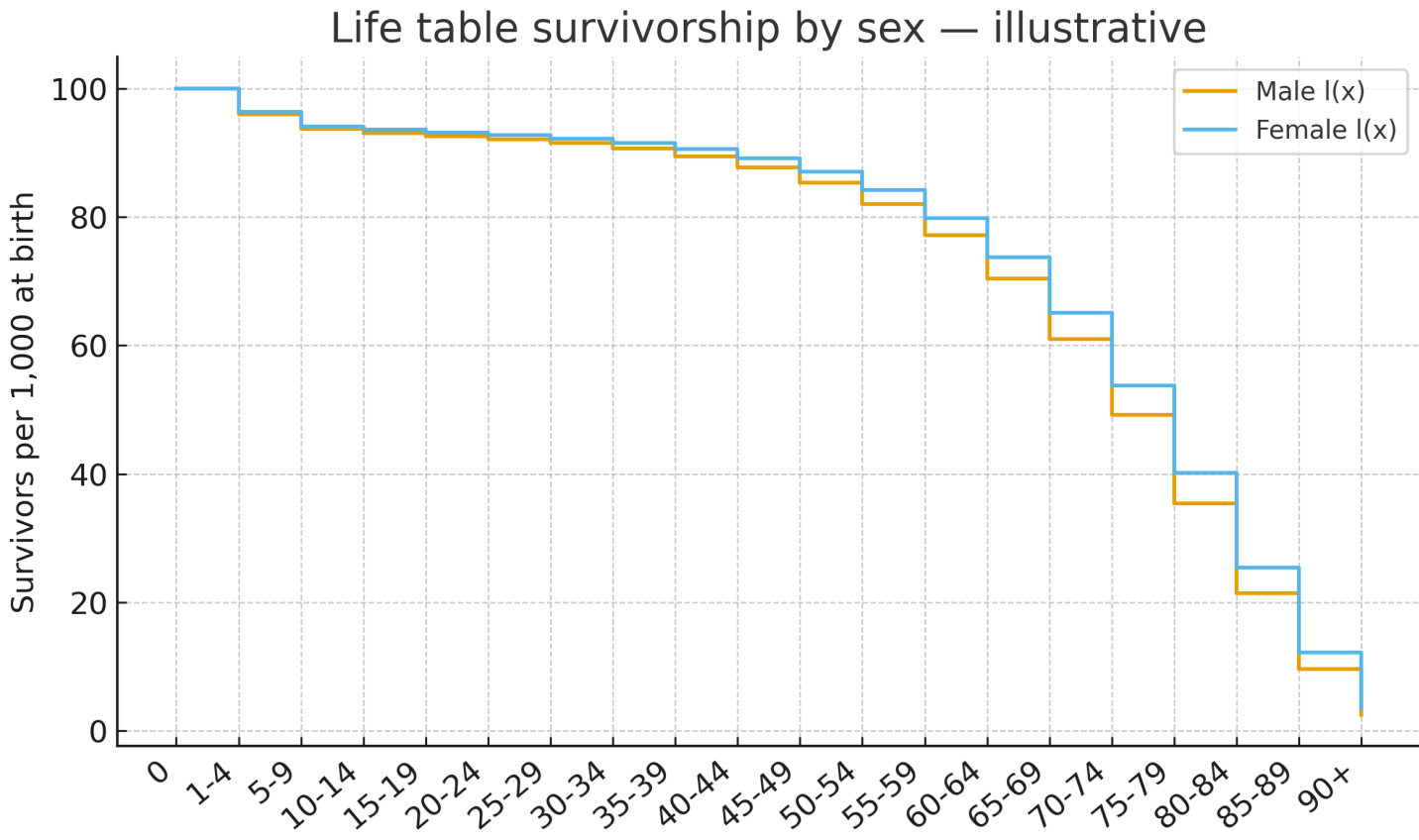


Figure 7.2-5. Sex mortality ratio by age (nMx_M / nMx_F)

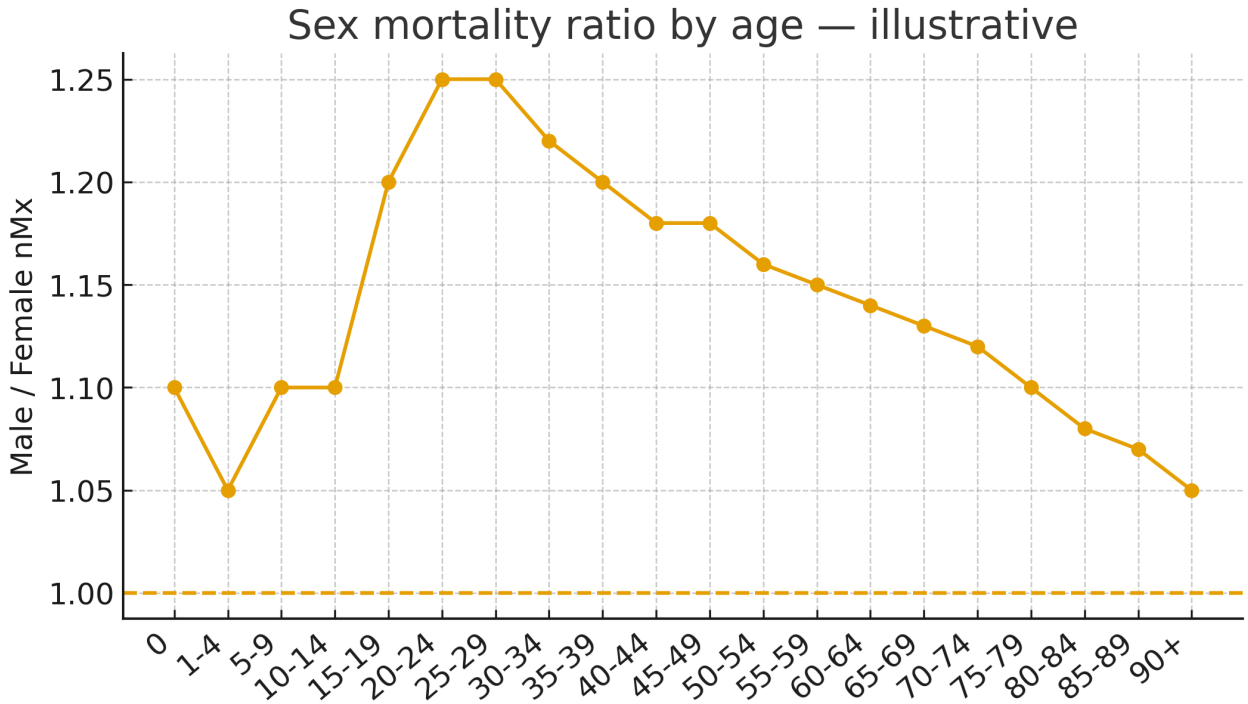


Figure 7.2-6. Survivorship gap by age (female − male)

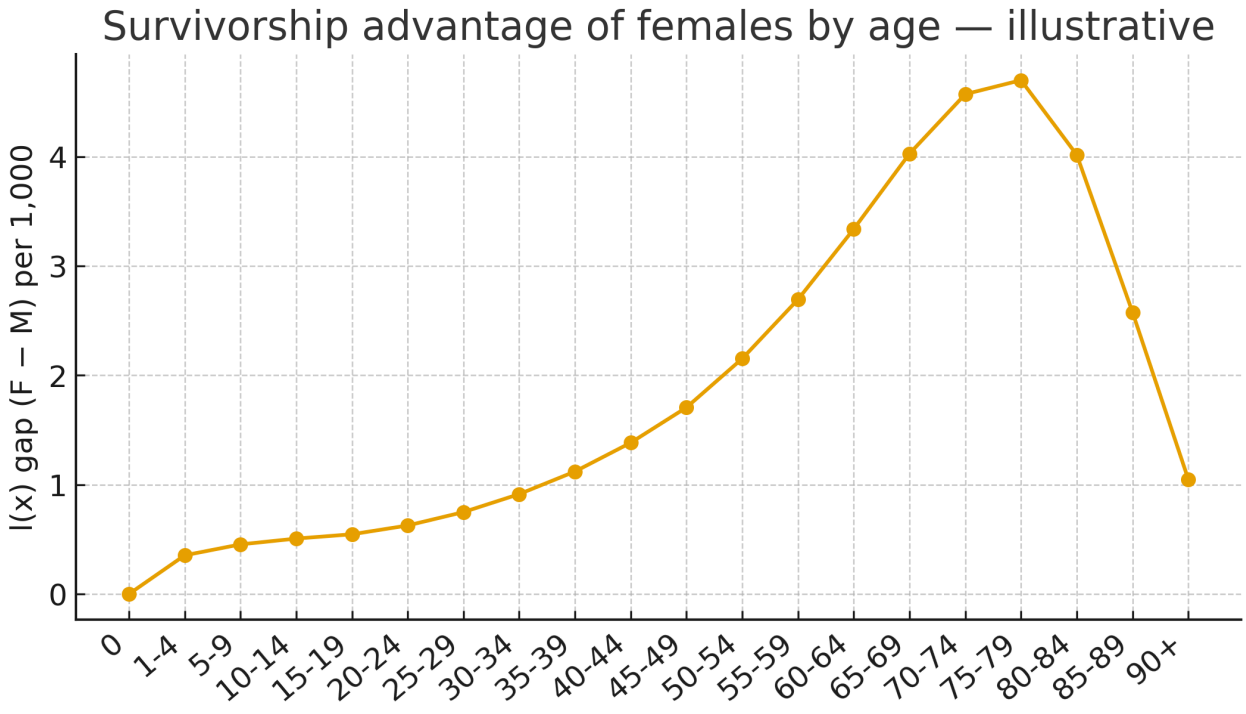


Table 7.2-A. Indicator definitions

Indicator / Concept	Definition / note
U5MR (by sex)	Under-5 deaths per 1,000 live births, male/female separately.
45q15 (by sex)	Probability of dying between 15 and 60 per 1,000, male/female.
20q60 (by sex)	Probability of dying between 60 and 80, male/female.
Abridged life table l(x)	Survivors to age x from radix; shows sex survivorship patterns.
Sex mortality ratio	nMx_male / nMx_female by age; >1 implies male disadvantage.

Table 7.2-B. Latest snapshot (illustrative)

Metric	Value
U5MR male (per 1,000)	33.5
U5MR female (per 1,000)	31.6
U5MR male/female ratio	1.06
45q15 male (per 1,000)	207.4
45q15 female (per 1,000)	171.2
45q15 male/female ratio	1.212
20q60 male	0.466
20q60 female	0.407
20q60 male/female ratio	1.146

Table 7.2-C. Age-specific mortality rates by sex (selected ages)

Age	nMx Female	nMx Male	Male/Female ratio
0	0.038	0.0418	1.1
1-4	0.0058	0.00609	1.05
15-19	0.0009	0.00108	1.2
40-44	0.0046	0.00543	1.18
55-59	0.016	0.0184	1.15
65-69	0.038	0.04294	1.13
75-79	0.09	0.099	1.1
85-89	0.22	0.2354	1.07
90+	0.36	0.378	1.05

Table 7.2-D. Interpretation notes (Ethiopia)

Topic	Interpretation / guidance
Male U5 excess	Biological vulnerability plus injury/infection patterns; check neonatal/infant split.
Adult male disadvantage	Higher external causes and NCD risks; behavior and occupational exposures.
Female advantage narrows at 80+	Competing frailty and cohort effects; verify with CRVS/HDSS life tables.
Data quality	Ensure sex coding completeness; reconcile HMIS/CRVS with survey estimates.
Equity overlays	Report age×sex by residence/region/wealth when sample size permits.

References — Section 7.2

- UN IGME; WHO Global Health Estimates; UN WPP life tables — sex-disaggregated series.

- DHS/PMA Ethiopia reports and microdata — child and adult mortality by sex.

- Preston, Heuveline & Guillot (2000). Demography: Measuring and Modeling Population Processes (sex differentials).

- GBD/IHME documentation on sex-specific mortality and risk factors.

7.3) Residence & Region

Purpose. Summarize Ethiopia's mortality differentials by residence and region, track urban–rural gaps, and relate subnational patterns to accessibility and urbanization. Replace the illustrative values with official DHS/PMA, CRVS/HMIS, WHO/UN/GBD, and small-area model results.

Figure 7.3-1. Urban–rural U5MR over time

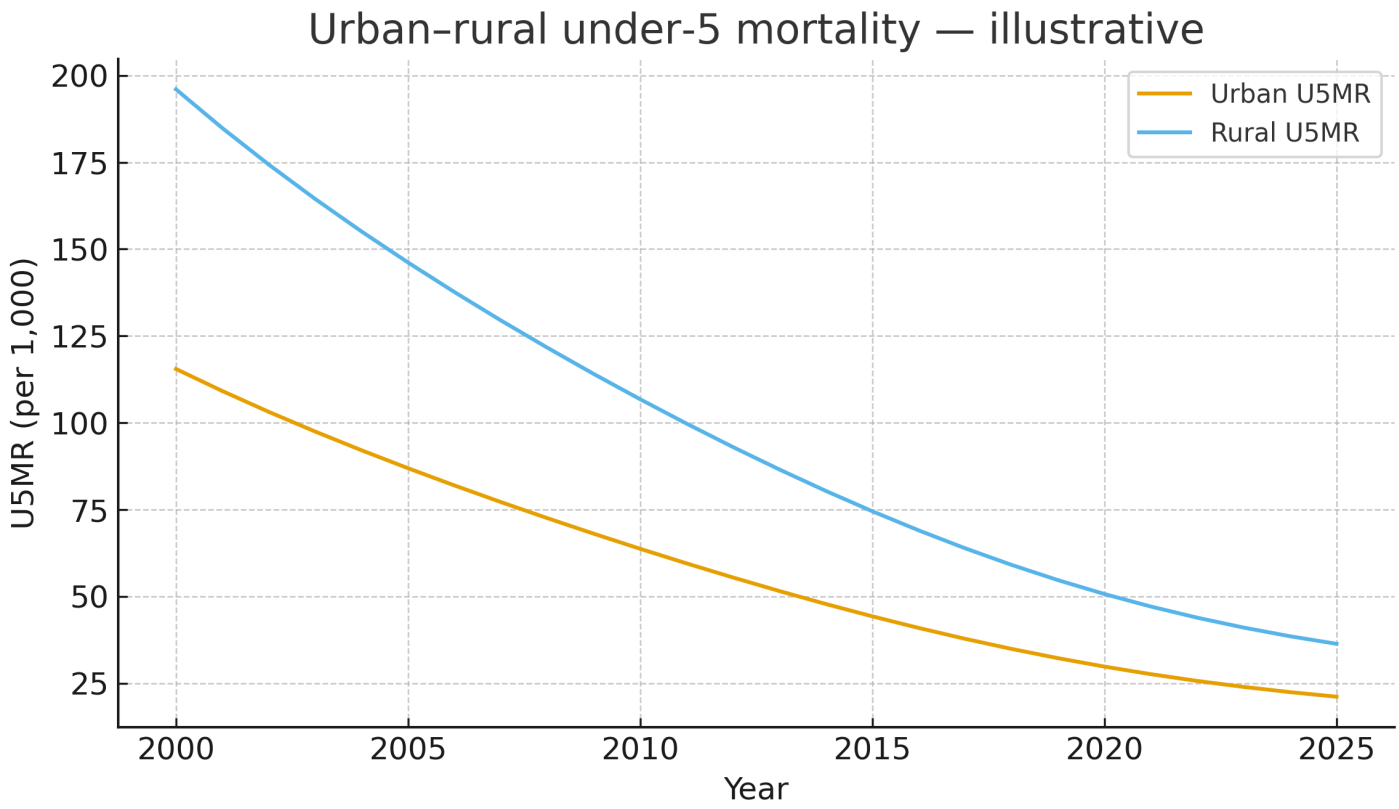


Figure 7.3-2. Urban–rural 45q15 over time

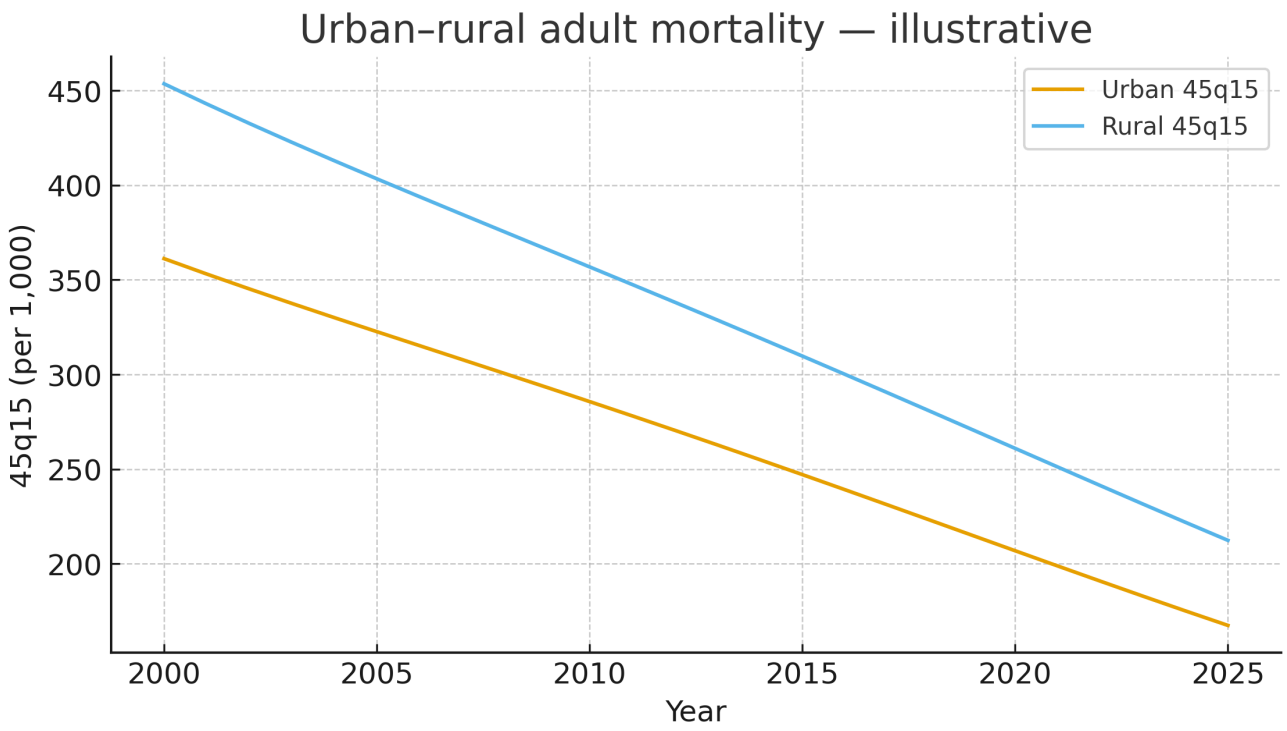


Figure 7.3-3. Regional U5MR (2025)

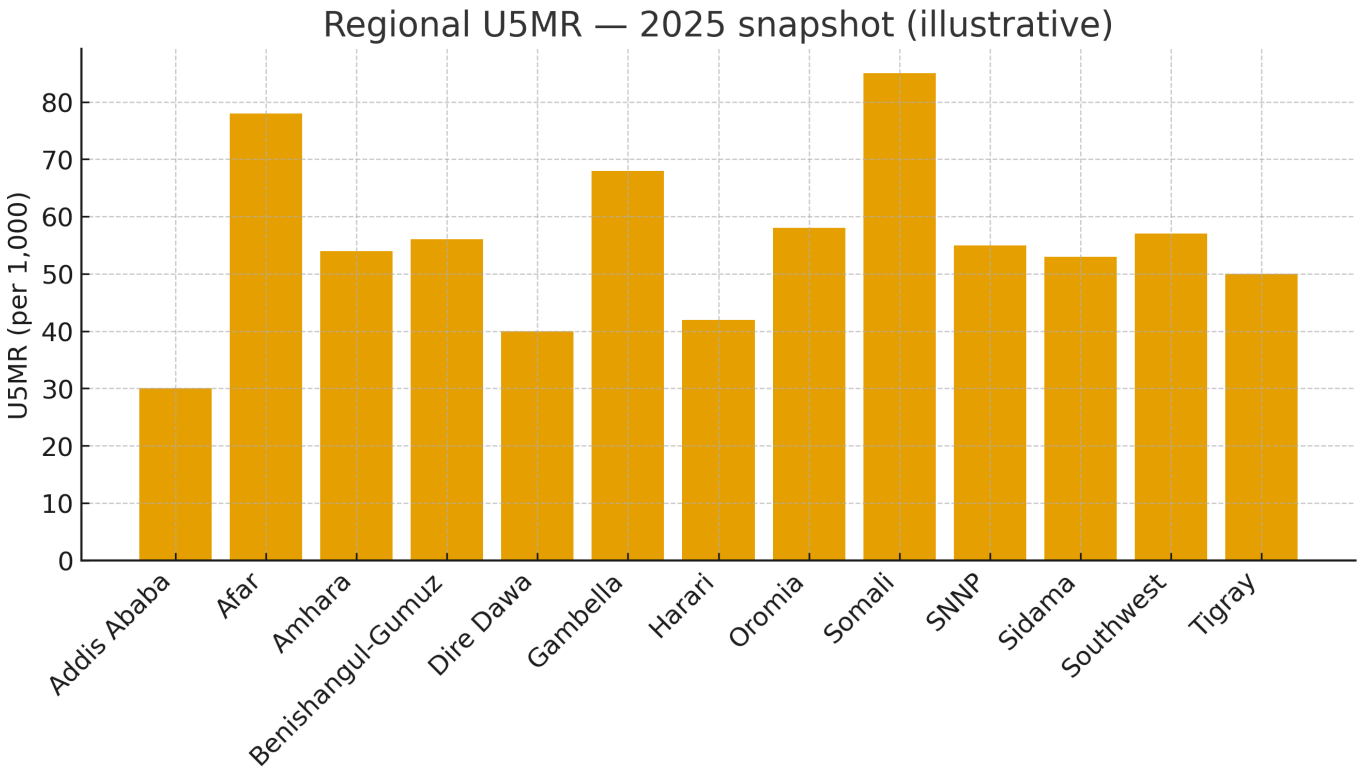


Figure 7.3-4. Regional 45q15 (2025)

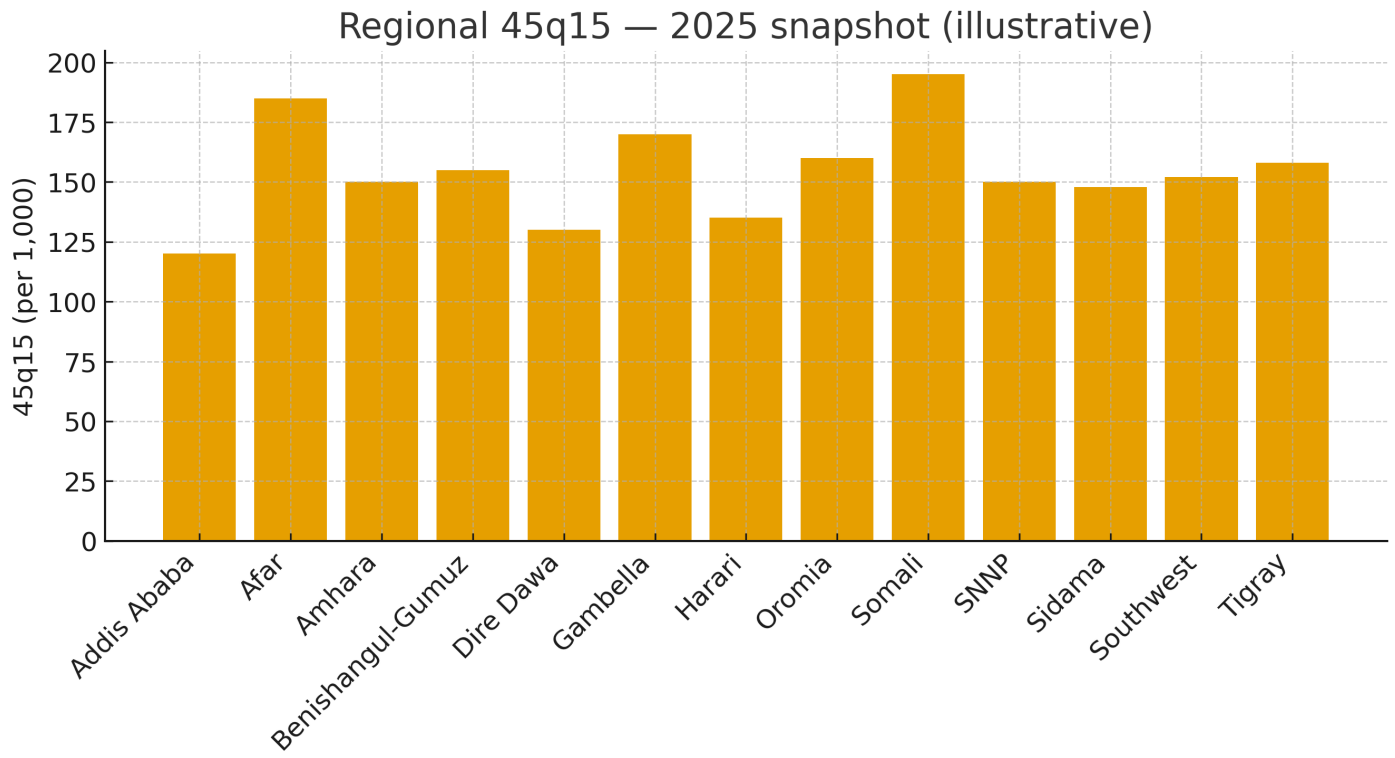


Figure 7.3-5. Decline in U5MR by region, 2010→2025

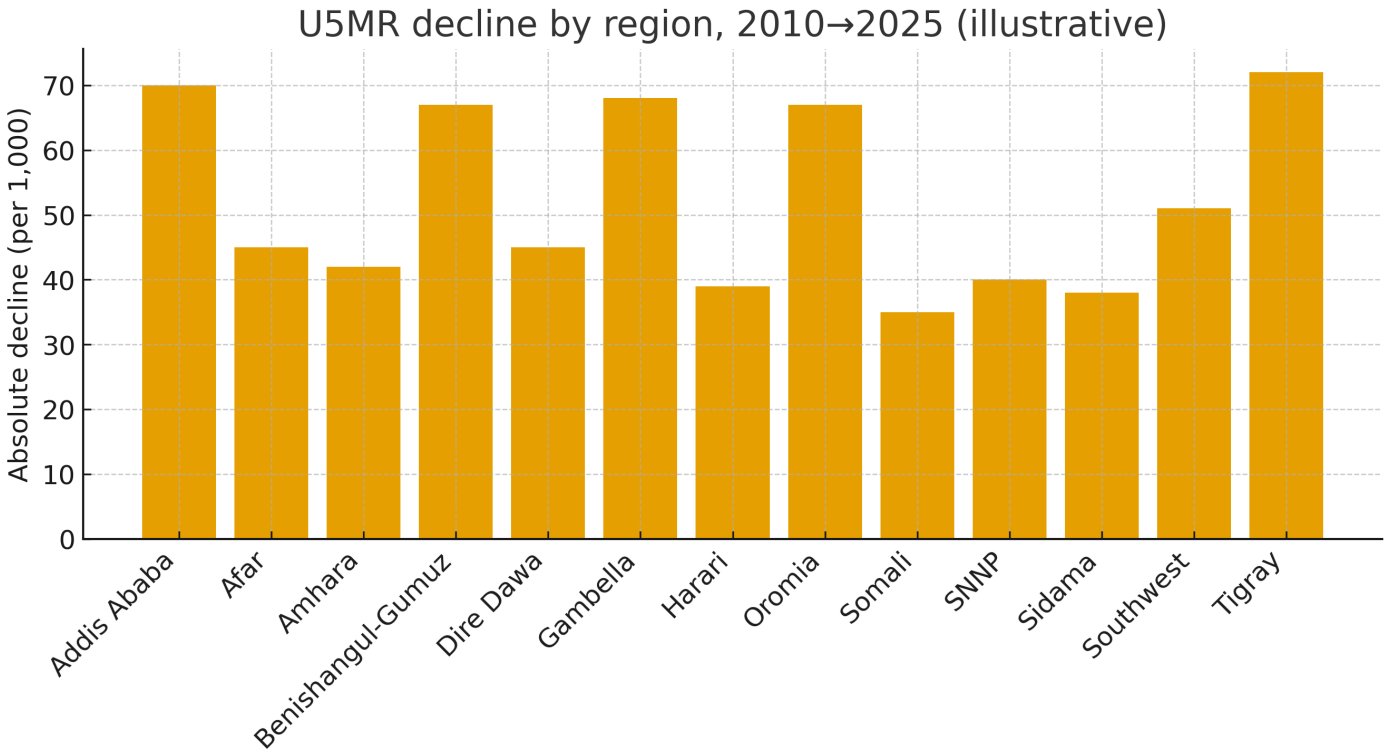


Figure 7.3-6. Accessibility vs U5MR (regional scatter)

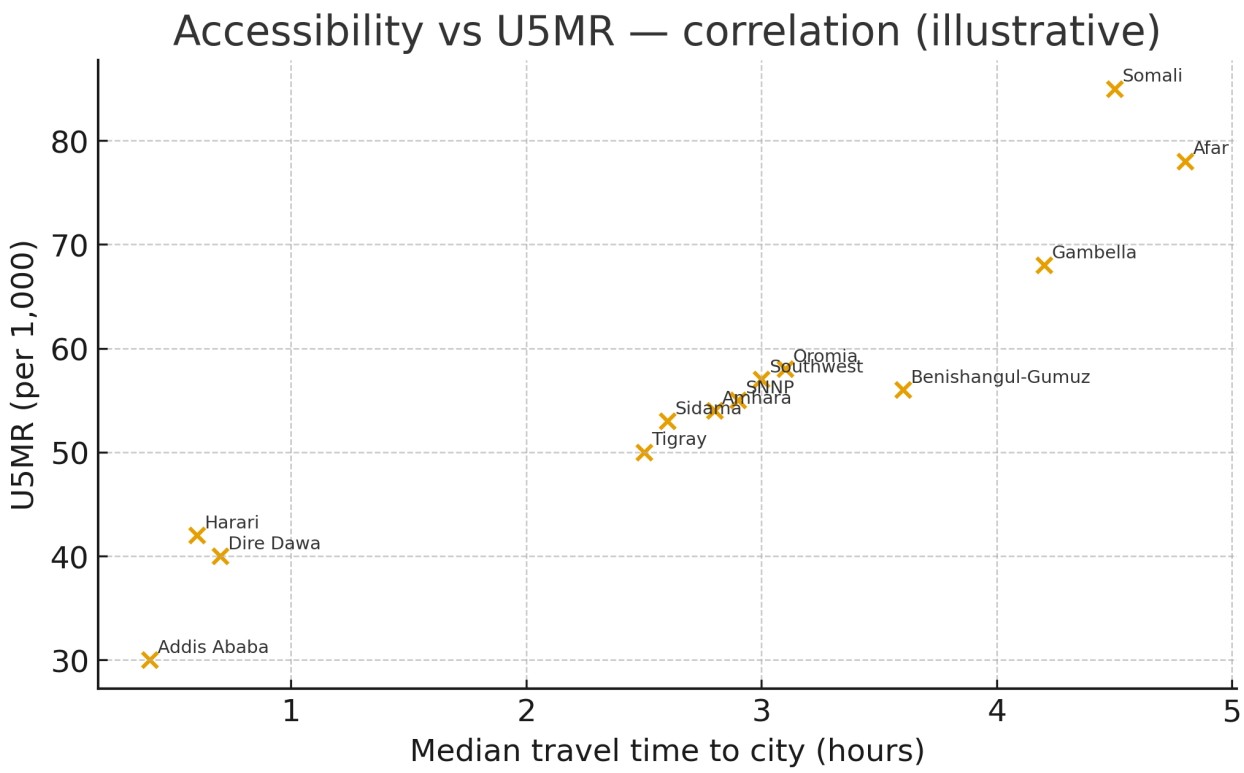


Figure 7.3-7. Urbanization share vs U5MR

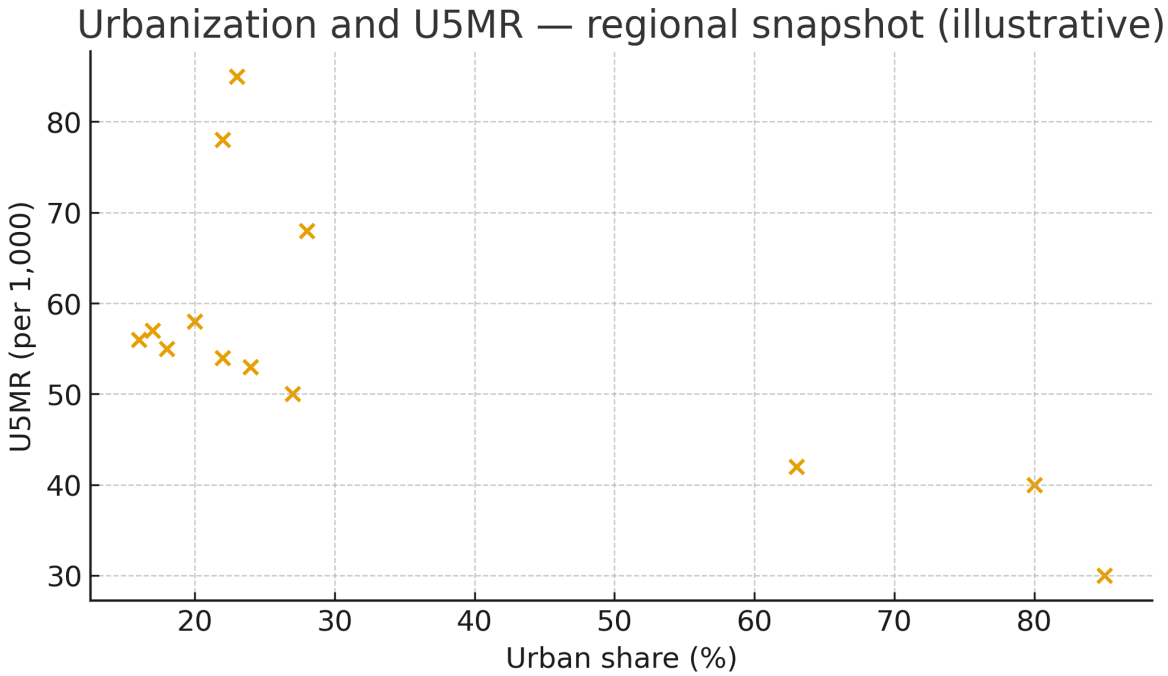


Table 7.3-A. Indicator definitions

Indicator / Concept	Definition / note
U5MR (urban/rural)	Under-5 deaths per 1,000 live births by residence.
45q15 (urban/rural)	Probability of dying 15–60 per 1,000 by residence.
Regional U5MR & 45q15	Subnational estimates; weight by population for national aggregates.
Accessibility	Median travel time to nearest city or facility; lower is better access.
Urbanization share	Percent of population living in urban areas (regional).

Table 7.3-B. Latest urban–rural snapshot (2025)

Metric	Value
U5MR — Urban (2025)	21.2
U5MR — Rural (2025)	36.4
Gap (rural−urban)	15.2
45q15 — Urban (2025)	167.4
45q15 — Rural (2025)	212.3
Gap (rural−urban)	44.9

Table 7.3-C. Regional snapshot (2025)

Region	U5MR (per 1,000)	45q15 (per 1,000)	Population weight
Addis Ababa	30	120	0.045
Afar	78	185	0.018
Amhara	54	150	0.2
Benishangul-Gumuz	56	155	0.018
Dire Dawa	40	130	0.009
Gambella	68	170	0.009
Harari	42	135	0.009
Oromia	58	160	0.336
Somali	85	195	0.055
SNNP	55	150	0.164
Sidama	53	148	0.045
Southwest	57	152	0.027
Tigray	50	158	0.064

Table 7.3-D. U5MR declines by region (2010→2025)

Region	2010 U5MR	2025 U5MR	Absolute decline	Percent decline (%)
Addis Ababa	100	30	70	70.0
Afar	123	78	45	36.6
Amhara	96	54	42	43.8
Benishangul-Gumuz	123	56	67	54.5
Dire Dawa	85	40	45	52.9
Gambella	136	68	68	50.0
Harari	81	42	39	48.1
Oromia	125	58	67	53.6
Somali	120	85	35	29.2
SNNP	95	55	40	42.1
Sidama	91	53	38	41.8
Southwest	108	57	51	47.2
Tigray	122	50	72	59.0

Table 7.3-E. Interpretation notes

Topic	Interpretation / guidance
Accessibility correlation	Correlation(access_hours, U5MR_2025) ≈ 0.94 (illustrative)
Urbanization pattern	Higher urban share generally associates with lower U5MR; verify causality carefully.
Pastoralist vs agrarian	Remote/pastoral areas often face access challenges; tailor service delivery modalities.
Coherence	Population-weighted regional estimates should reconcile to national totals.
Equity tracking	Always disaggregate by sex and wealth within region and residence where sample size allows.

References — Section 7.3

- DHS/PMA Ethiopia — residence and regional mortality differentials.

- UN IGME; WHO Global Health Estimates; UN WPP life tables — subnational pointers where available.

- WorldPop/AccessMod — travel-time/accessibility surfaces for Ethiopia.

- CSA & MOH administrative/HMIS/CRVS releases for regional series.

7.4) Socioeconomic Status (SES)

Purpose. Quantify Ethiopia's mortality differentials by wealth and education, summarize equity metrics (CI/SII/RII), and show intersectionality with region. Replace templates with official DHS/PMA, HMIS/CRVS and small-area outputs.

Figure 7.4-1. SES gradient (wealth quintiles) in U5MR and 45q15

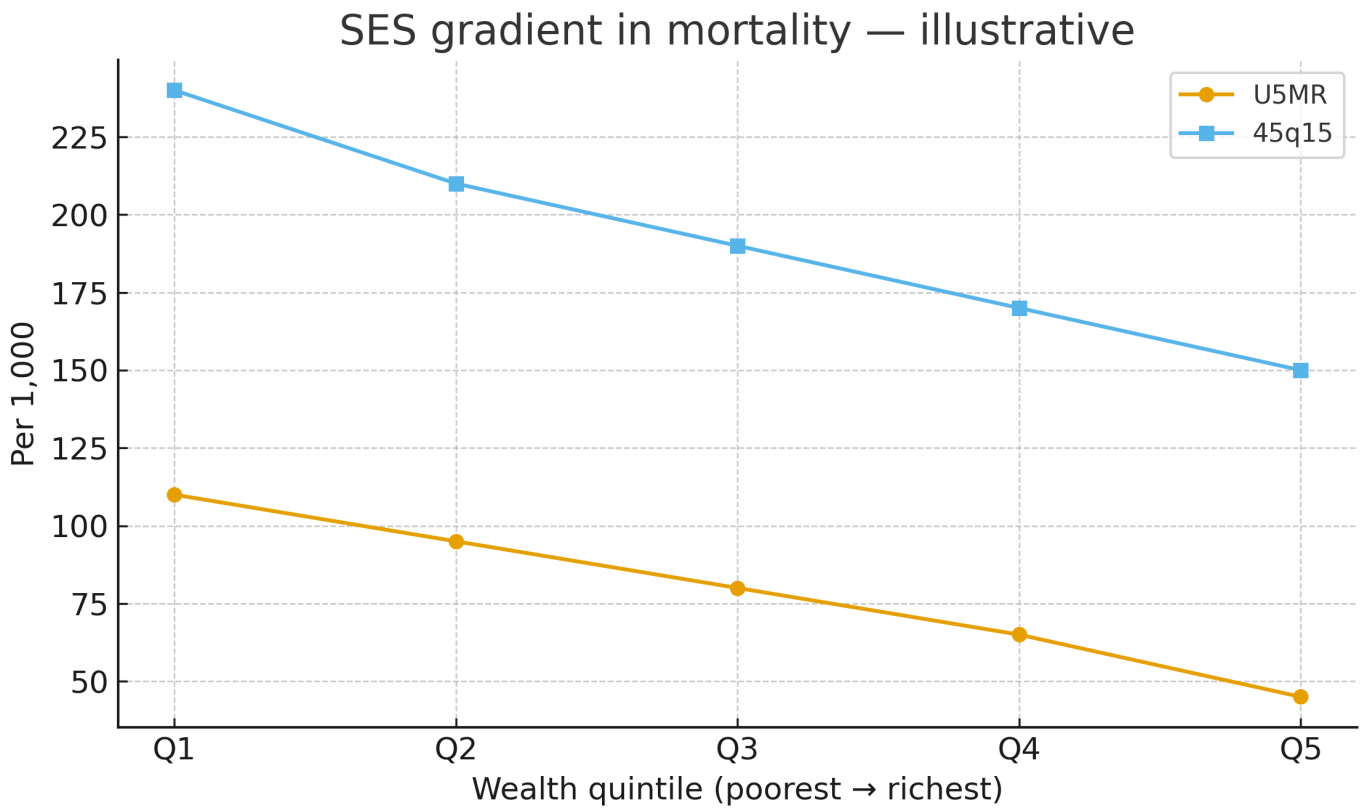


Figure 7.4-2. Maternal education and mortality

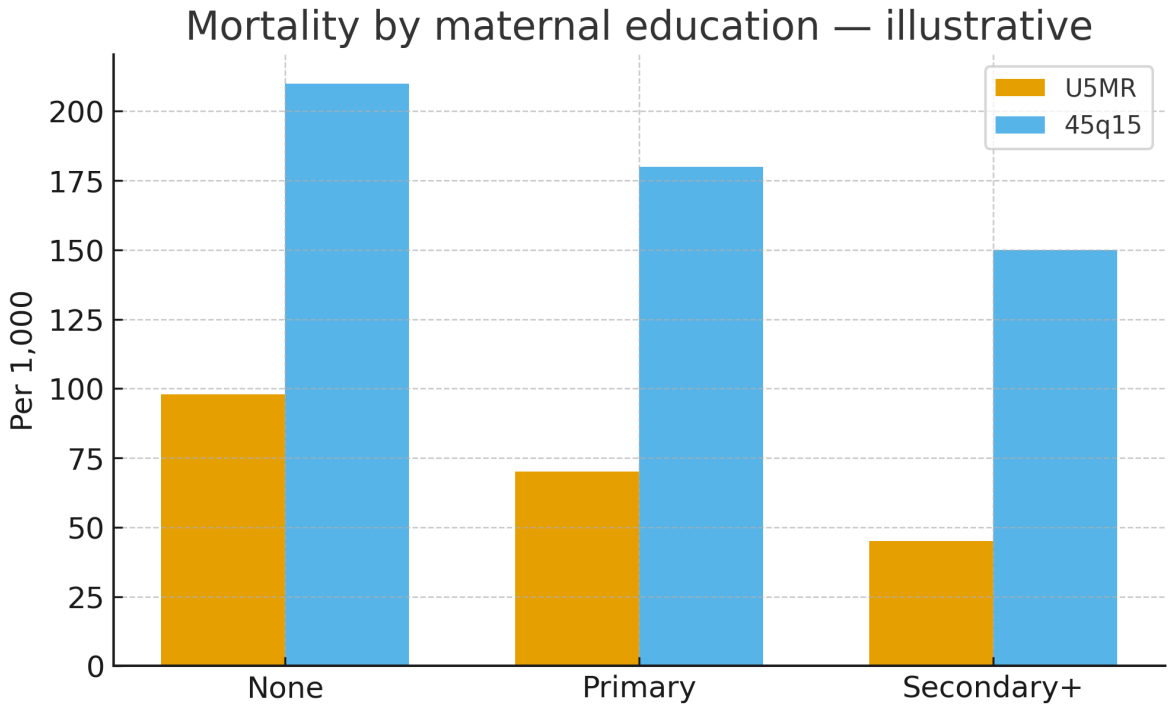


Figure 7.4-3. Concentration curve (U5MR)

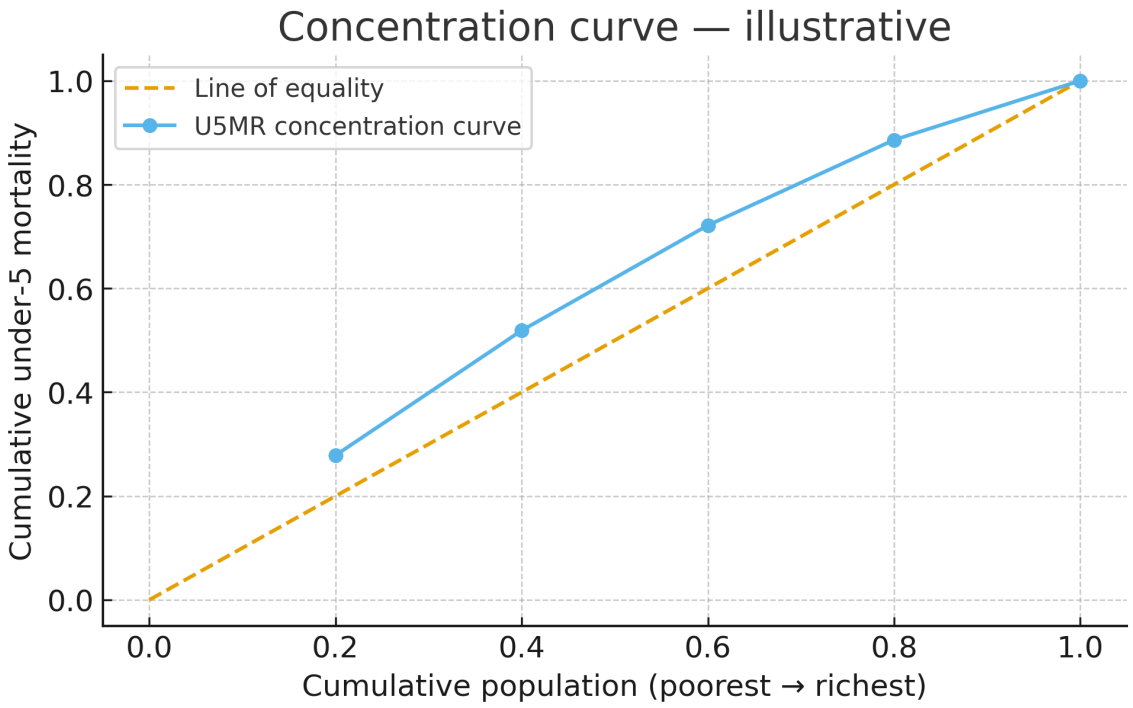


Figure 7.4-4. Intersection heatmap: region × wealth (U5MR)

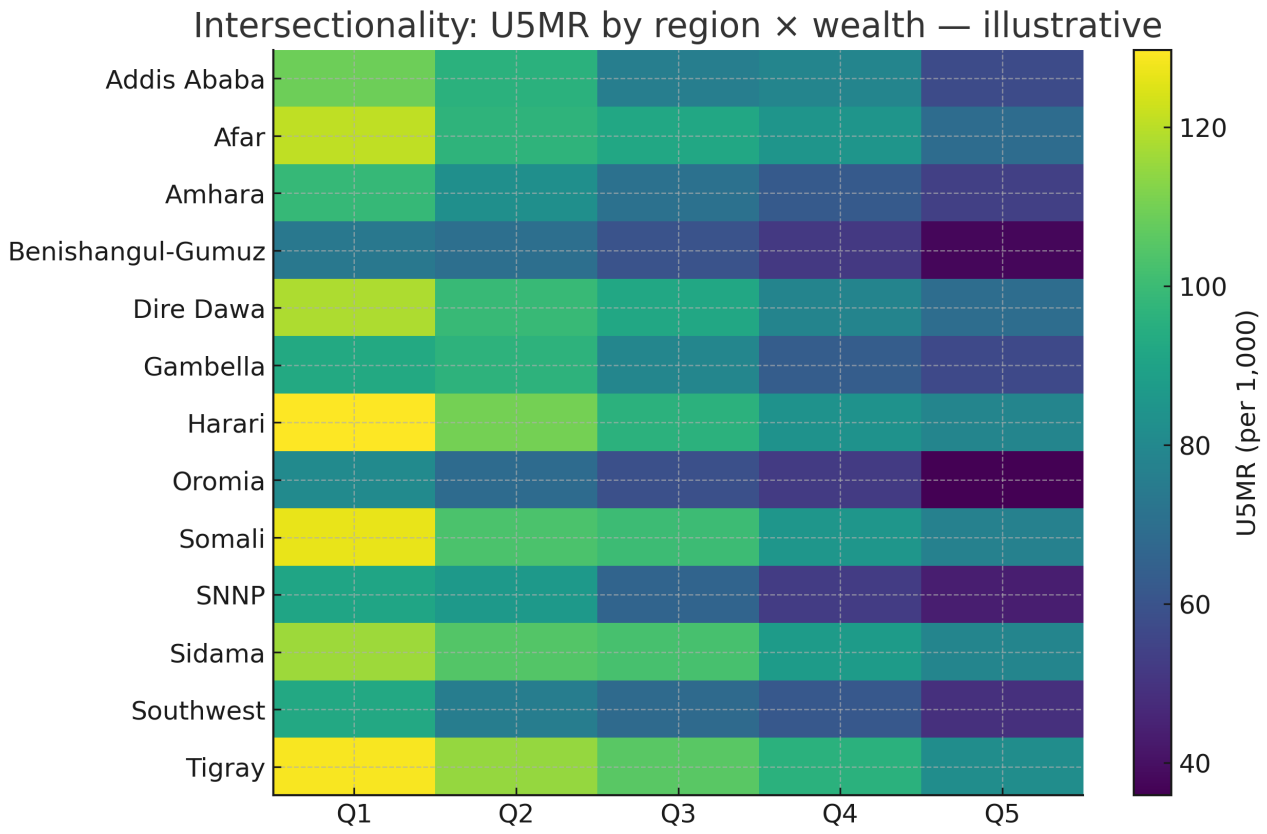


Figure 7.4-5. Adjusted risk ratios for SES covariates

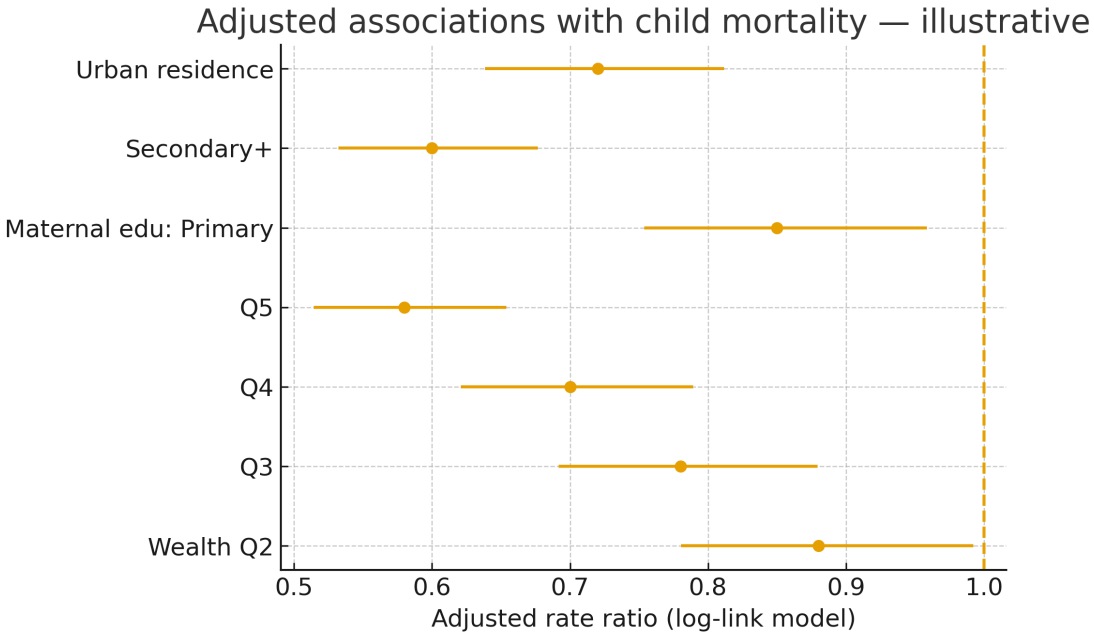


Figure 7.4-6. Catastrophic health expenditure by wealth

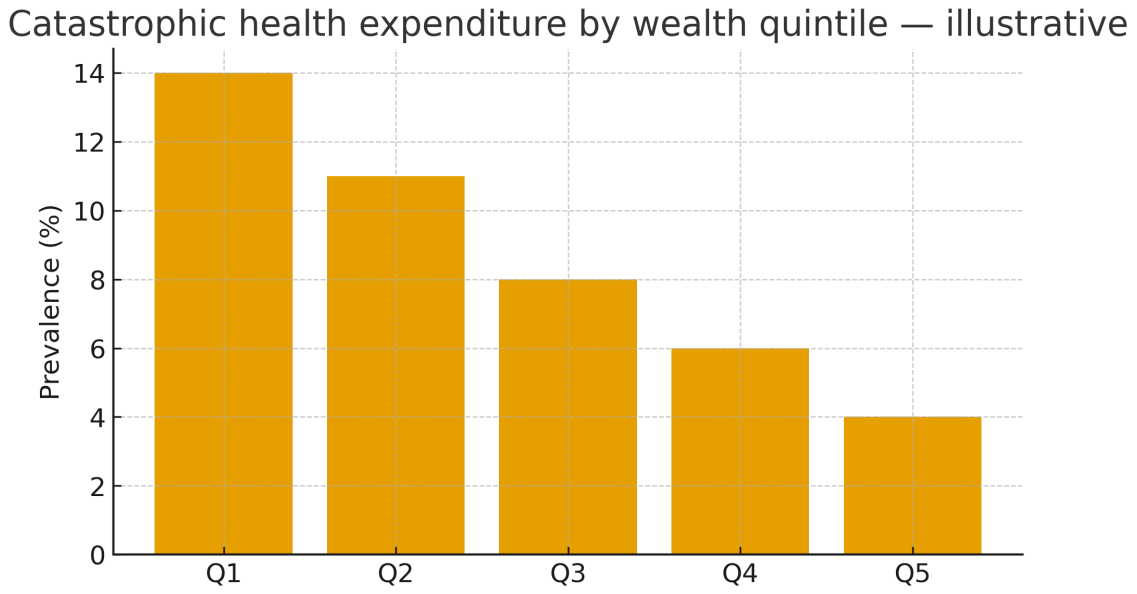


Table 7.4-A. Equity metrics & definitions

Metric / Concept	Definition / note
U5MR / 45q15 (by SES)	Mortality measures disaggregated by wealth, education, occupation.
Concentration Index (CI)	2×area under concentration curve − 1 (negative = pro-poor burden).
Slope Index of Inequality (SII)	Absolute gradient across socioeconomic rank (ridit).
Relative Index (RII)	Relative risk (poorest vs richest or per ridit unit).
Intersectionality	Joint stratification (e.g., region × wealth, sex × wealth).

Table 7.4-B. Latest SES snapshot (illustrative)

Metric	Value
U5MR Q1 (poorest)	110.0
U5MR Q5 (richest)	45.0
Absolute gap (Q1−Q5)	65.0
45q15 Q1 (poorest)	240.0
45q15 Q5 (richest)	150.0
Absolute gap (Q1−Q5)	90.0
Concentration Index (U5MR)	0.106
SII (U5MR)	39.0
RII (U5MR)	2.44

Table 7.4-C. Maternal education snapshot

Education level	U5MR (per 1,000)	45q15 (per 1,000)
None	98	210
Primary	70	180
Secondary+	45	150

Table 7.4-D. Adjusted model summary (toy)

Covariate	Adjusted RR	Lower 95%	Upper 95%
Wealth Q2	0.88	0.78	0.99
Q3	0.78	0.69	0.88
Q4	0.7	0.62	0.79
Q5	0.58	0.51	0.65
Maternal edu: Primary	0.85	0.75	0.96
Secondary+	0.6	0.53	0.68
Urban residence	0.72	0.64	0.81

Table 7.4-E. Policy levers for Ethiopia

Priority lever	Rationale for Ethiopia
Target poorest quintiles for child survival	Expand iCCM, outreach immunization, nutrition support, WASH improvements.
Keep girls in school (secondary+)	Strong association with child survival; co-benefits across determinants.
Financial risk protection	Scale community-based health insurance; reduce catastrophic spending.
Geographic targeting	Combine SES with accessibility to prioritize remote woredas.
Data improvements	Routinely publish SES-disaggregated CRVS/HMIS/DHS indicators; track CI/SII/RII.

References — Section 7.4

- Wagstaff, A., O’Donnell, O., et al. (2007). Analyzing Health Equity Using Household Survey Data.

- Rutstein & Rojas (2006). Guide to DHS Statistics — wealth, equity, and disaggregation.

- WHO / World Bank UHC monitoring — financial risk protection indicators.

- UNICEF/WHO/World Bank — child and adult mortality with SES differentials (where available).

7.5) Maternal, Neonatal & Child Health (MNCH) Factors

Purpose. Summarize MNCH service coverage and their links to mortality in Ethiopia, with practical indicators (ANC4+, SBA, PNC <48h, DTP3, MCV1), spacing/parity risks, and care-seeking timeliness. Replace templates with official DHS/PMA, HMIS/CRVS, EPI, and program data.

Figure 7.5-1. MNCH coverage trends (ANC4+, SBA, PNC, DTP3, MCV1)

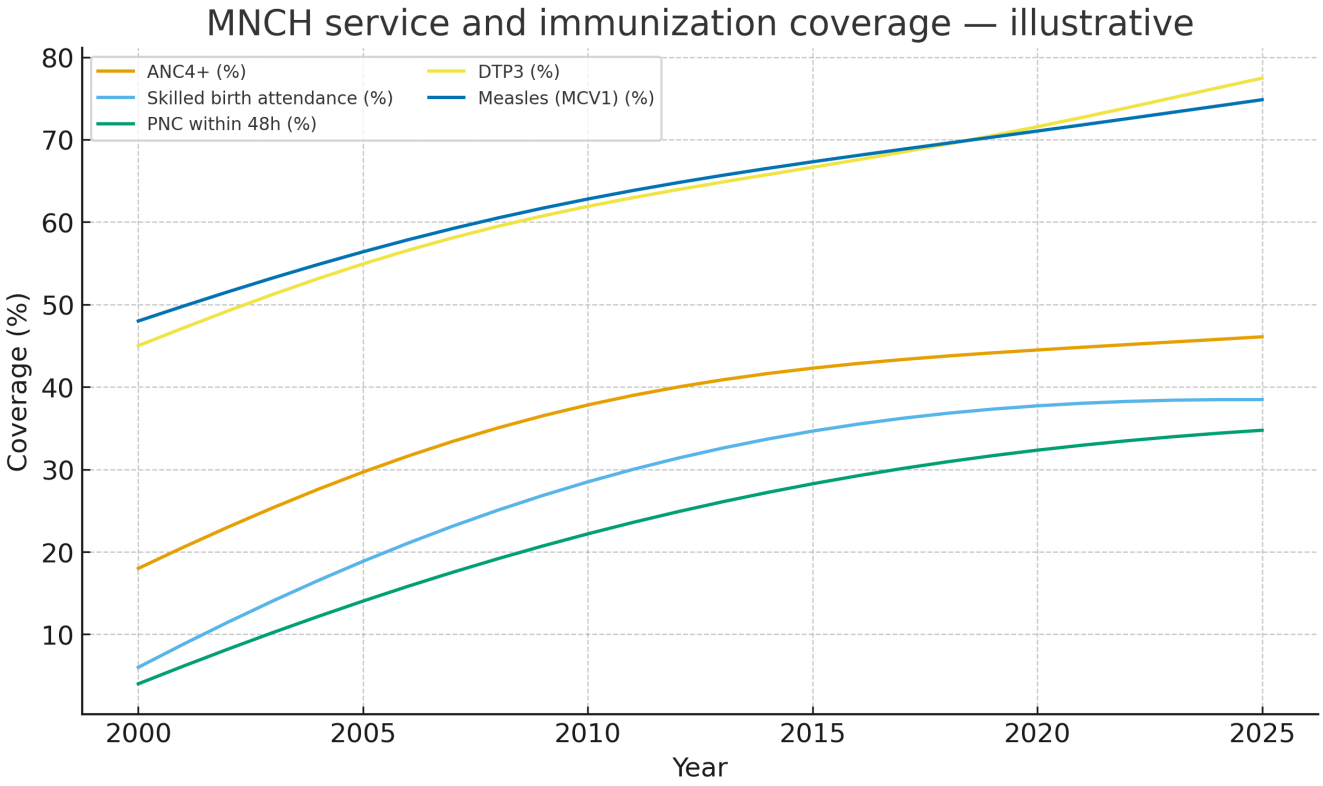


Figure 7.5-2. Composite MNCH coverage vs U5MR

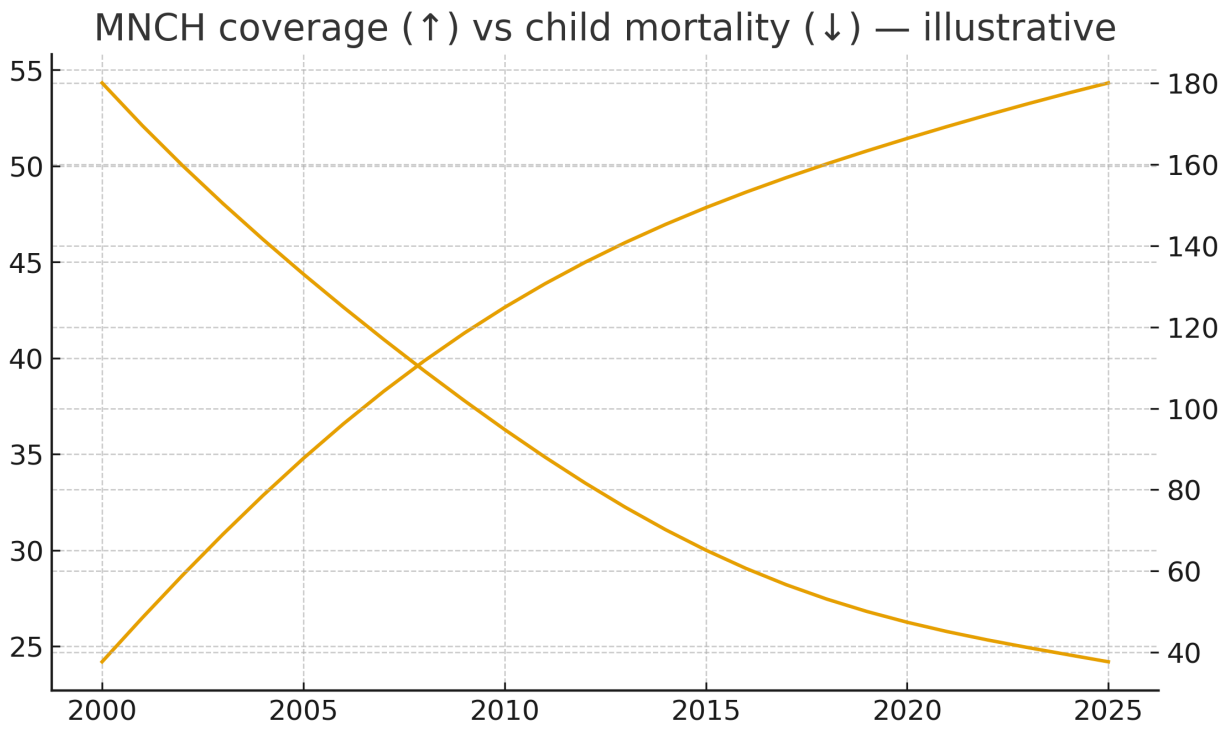


Figure 7.5-3. Birth spacing & neonatal mortality

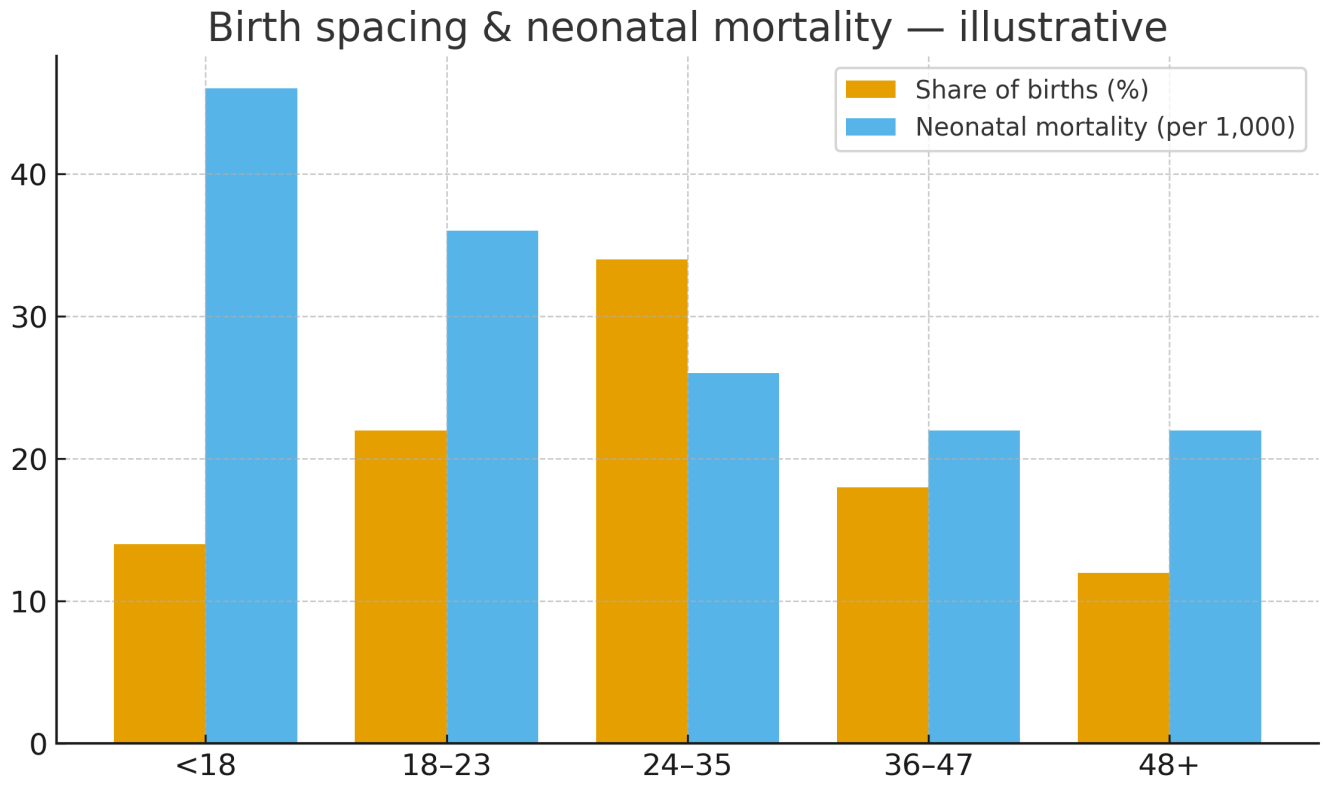


Figure 7.5-4. Parity and neonatal mortality

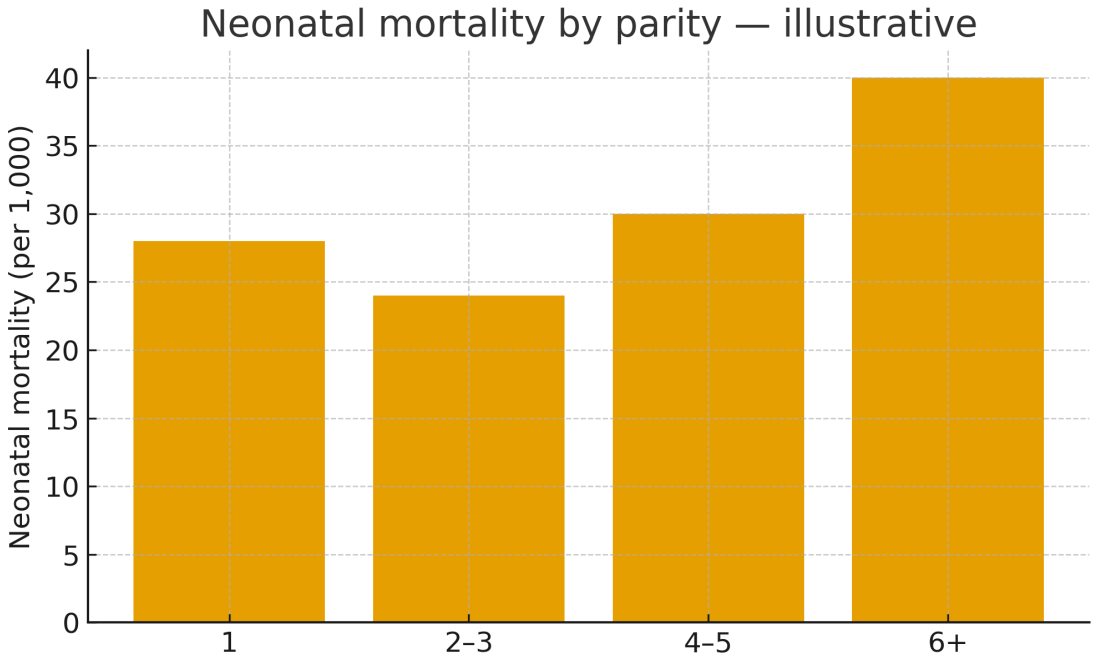


Figure 7.5-5. Care-seeking within 24h (fever/cough)

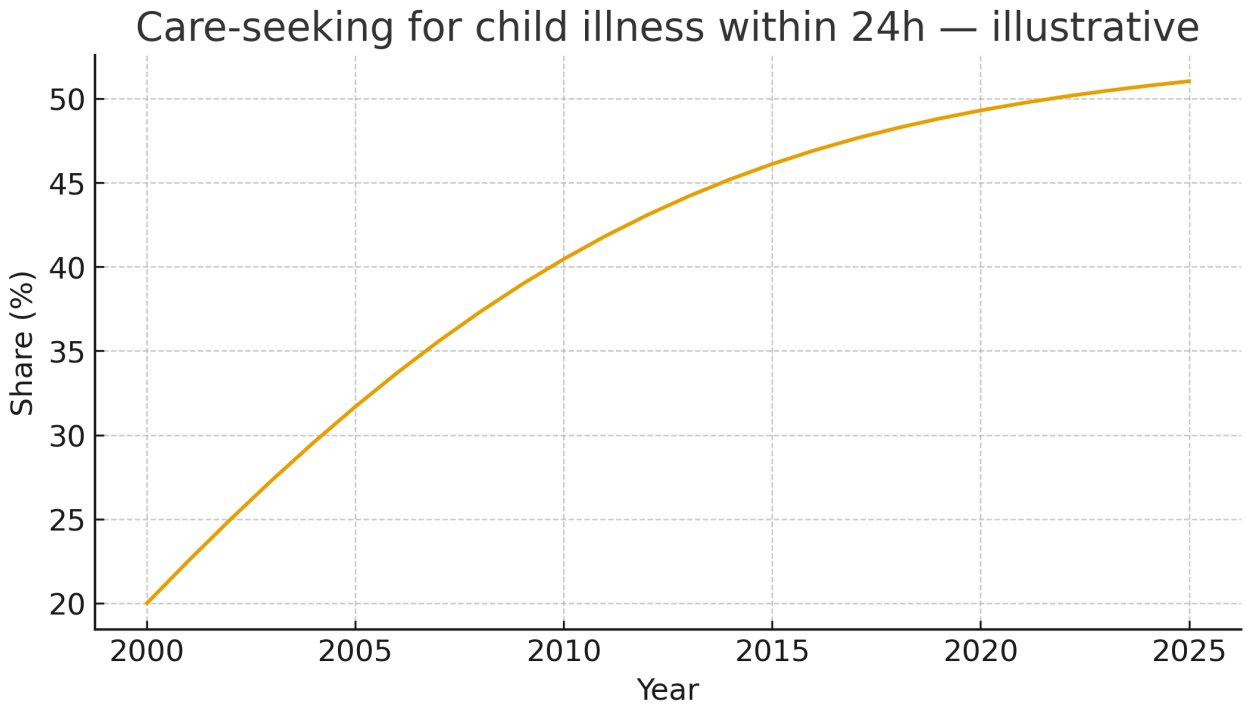


Figure 7.5-6. Skilled birth attendance by region (2025)

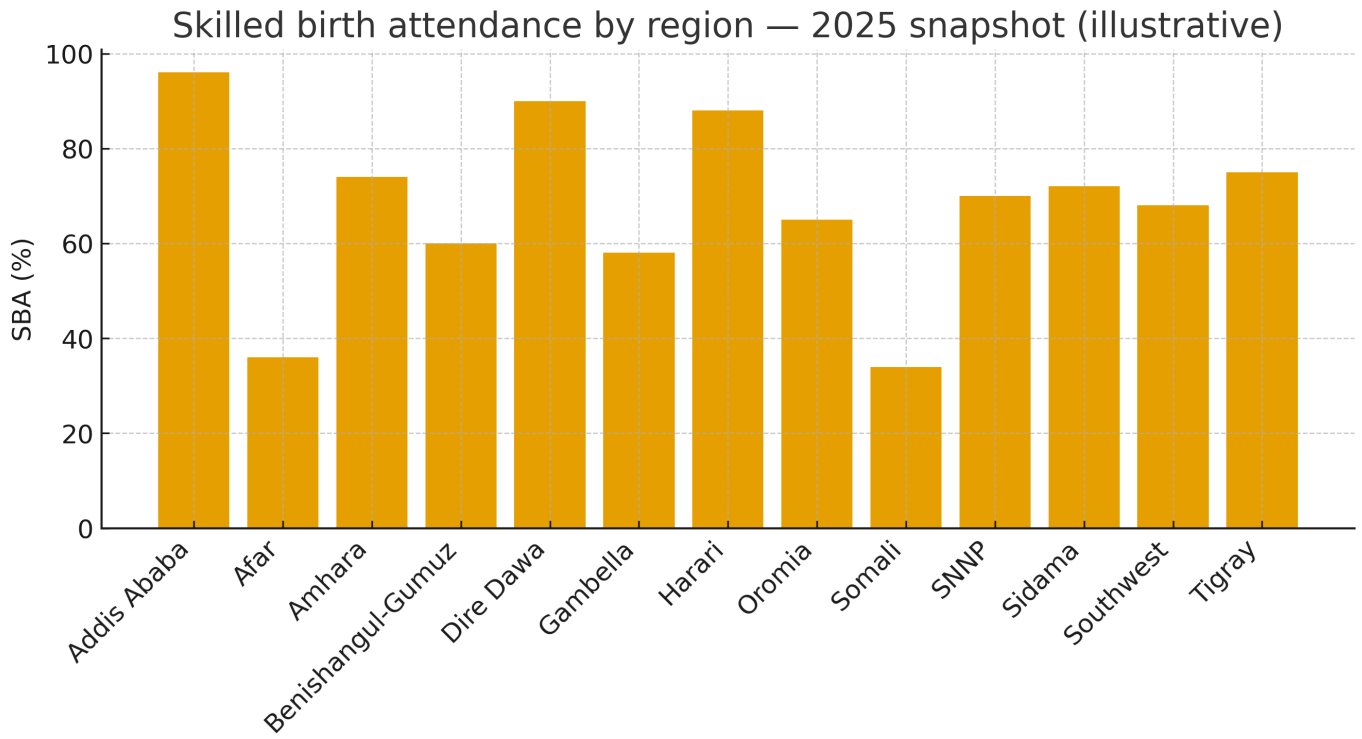
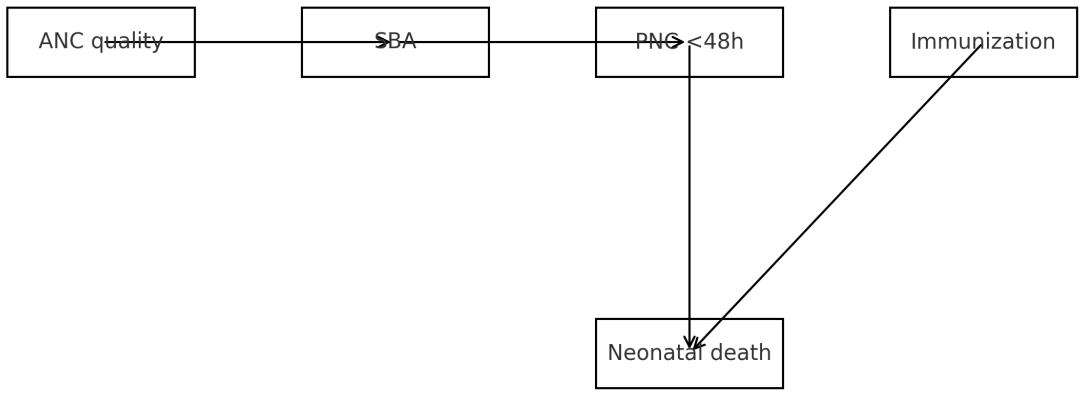


Figure 7.5-7. MNCH causal pathway (schematic)



Schematic pathway — replace with study-specific DAG when analyzing effects.

Table 7.5-A. Indicator definitions

Indicator	Definition / note
ANC4+	At least four antenatal care contacts (or 8 contacts under new WHO model; specify).
SBA	Birth attended by skilled health personnel.
PNC <48h	Postnatal check for mother/newborn within 48 hours of birth.
DTP3 / MCV1	Third dose of DTP; first dose of measles vaccine.
MNCH coverage index	Simple/weighted composite of core MNCH indicators.
Birth interval	Months between consecutive live births among parous women.
Parity	Number of live births to a woman before the index birth.
Care-seeking within 24h	Share of U5 children with illness taken for care within 24 hours.

Table 7.5-B. Latest snapshot (2025, illustrative)

Metric	Value
ANC4+ (%)	46.1
SBA (%)	38.5
PNC <48h (%)	34.7
DTP3 (%)	77.5
MCV1 (%)	74.8
MNCH coverage index (%)	54.3

Table 7.5-C. Birth spacing and neonatal mortality

Birth interval (months)	Share of births (%)	Neonatal mortality (per 1,000)
<18	14.0	46
18–23	22.0	36
24–35	34.0	26
36–47	18.0	22
48+	12.0	22

Table 7.5-D. Adjusted associations (toy RRs)

Covariate	Adjusted RR	Lower 95%	Upper 95%
ANC4+ (yes)	0.78	0.69	0.88
Skilled birth attendance	0.72	0.64	0.81
PNC <48h (yes)	0.8	0.71	0.9
Birth interval 24–35m (vs <18m)	0.68	0.6	0.77
Immunized (DTP3)	0.85	0.75	0.96

Table 7.5-E. Ethiopia program levers

Priority action	Why it matters in Ethiopia
ANC quality & respectful care	Improve content (BP, labs, counseling), continuity, and referrals.
Intrapartum care & BEmONC/CEmONC	Upgrade staffing/readiness; stabilize referral/transport networks.
Immediate newborn care & PNC	Early breastfeeding, thermal care, danger-sign checks, early PNC.
Immunization & outreach	Zero-dose mapping; defaulter tracing; cold-chain reliability.
Family planning for healthy spacing	Expand method mix; youth-friendly services; postpartum FP.
Equity targeting	Mobile/outreach services for pastoralist/remote communities; CHW support.

References — Section 7.5

- WHO recommendations on ANC, intrapartum and PNC; EPMM/ENAP frameworks.

- Ethiopia DHS/PMA, EPI administrative data and survey reports (MNCH coverage, spacing, care-seeking).

- Countdown to 2030 & UNICEF State of the World's Children — MNCH and immunization analyses.

- Demographic literature on spacing/parity and neonatal outcomes (e.g., Rutstein effects).

7.6) Nutrition & Food Security

Purpose. Track Ethiopia's nutrition and food-security determinants of mortality, including child undernutrition (stunting, wasting, underweight), maternal BMI, infant/young child feeding, household food insecurity, IPC shocks, and environmental seasonality. Replace templates with official DHS/PMA, IPC, FSNWG, and program data.

Figure 7.6-1. Child undernutrition trends (stunting, wasting, underweight)

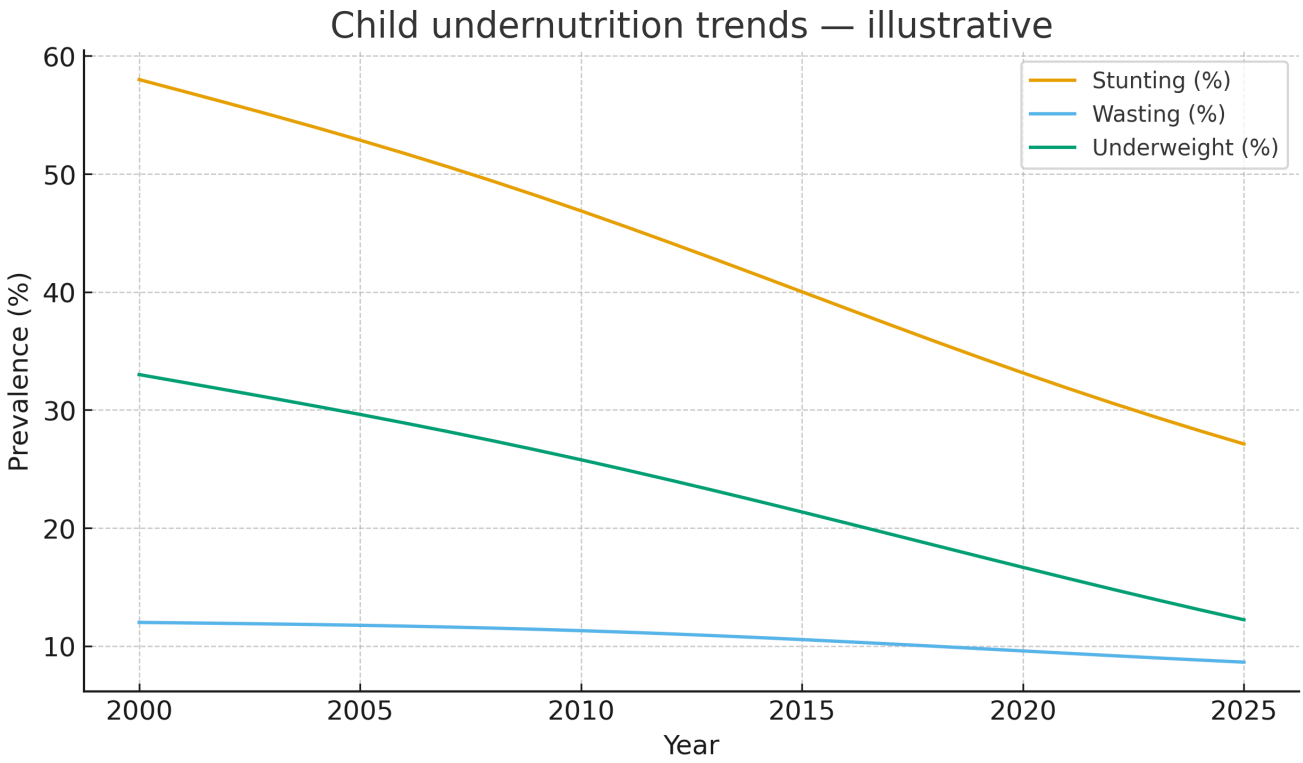


Figure 7.6-2. Maternal BMI tails (underweight vs overweight)

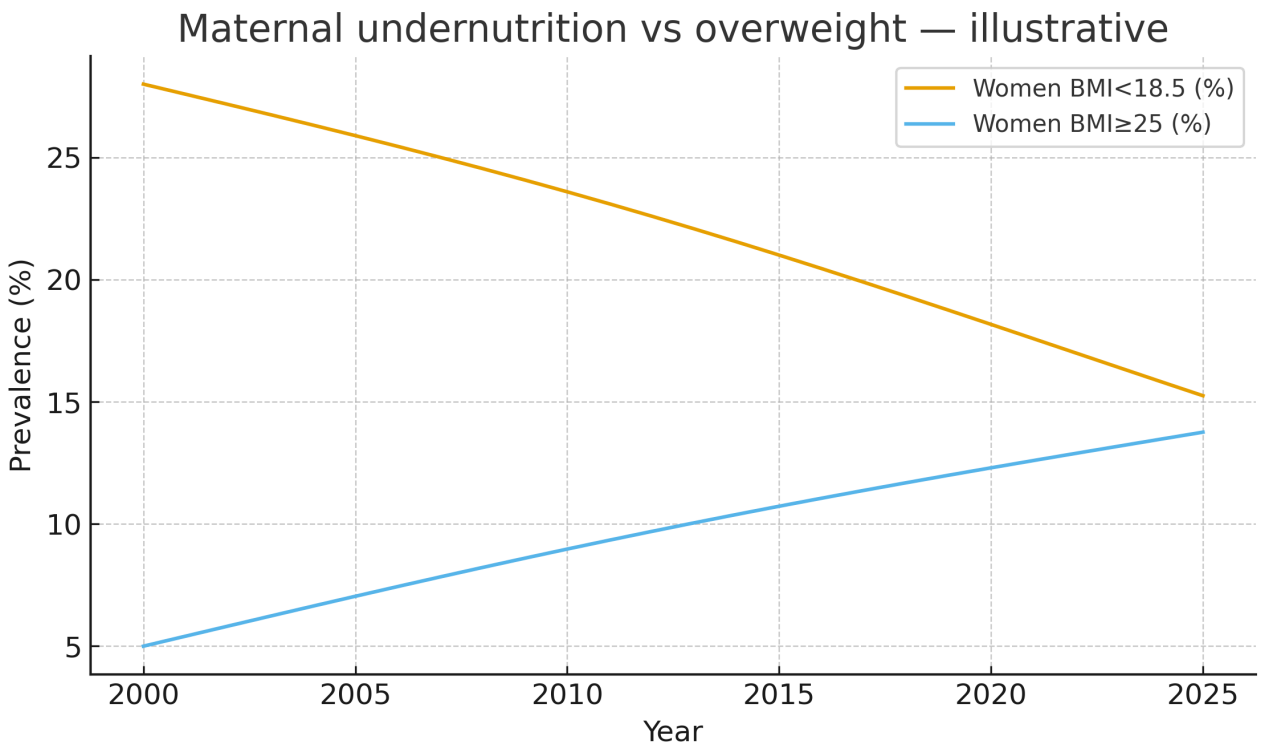


Figure 7.6-3. Diet diversity and minimum acceptable diet (6–23m)

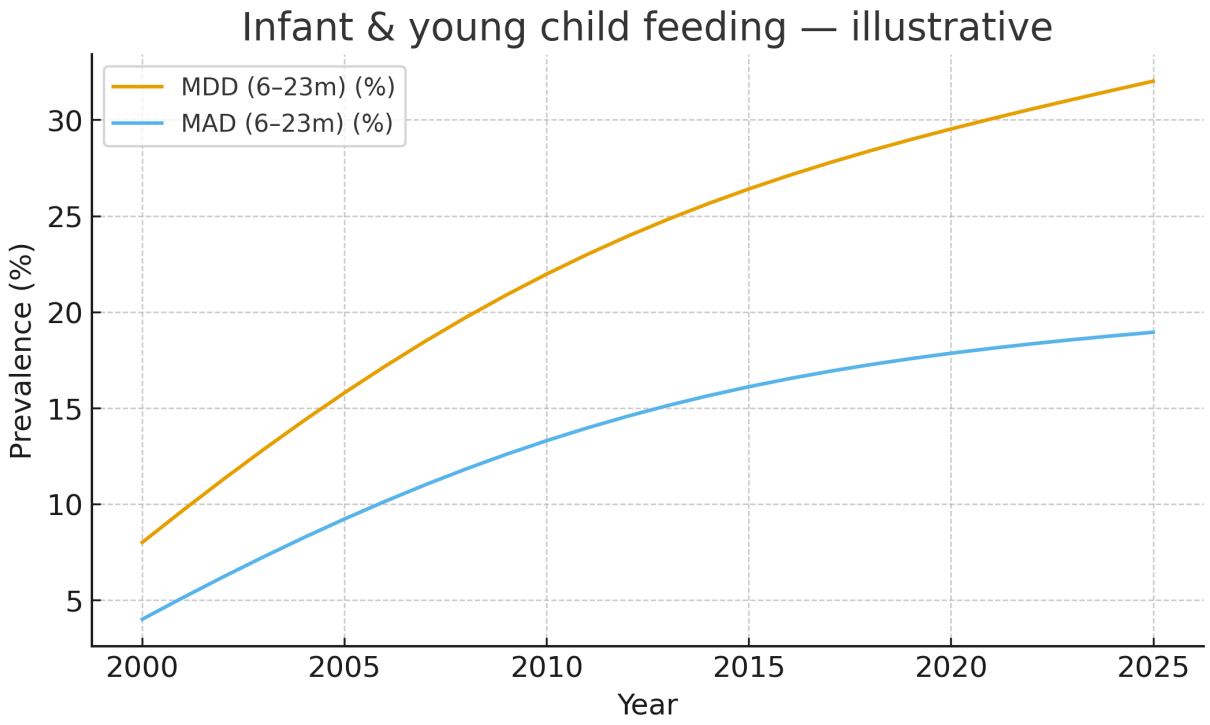


Figure 7.6-4. Food insecurity (FIES) and IPC Phase 3+

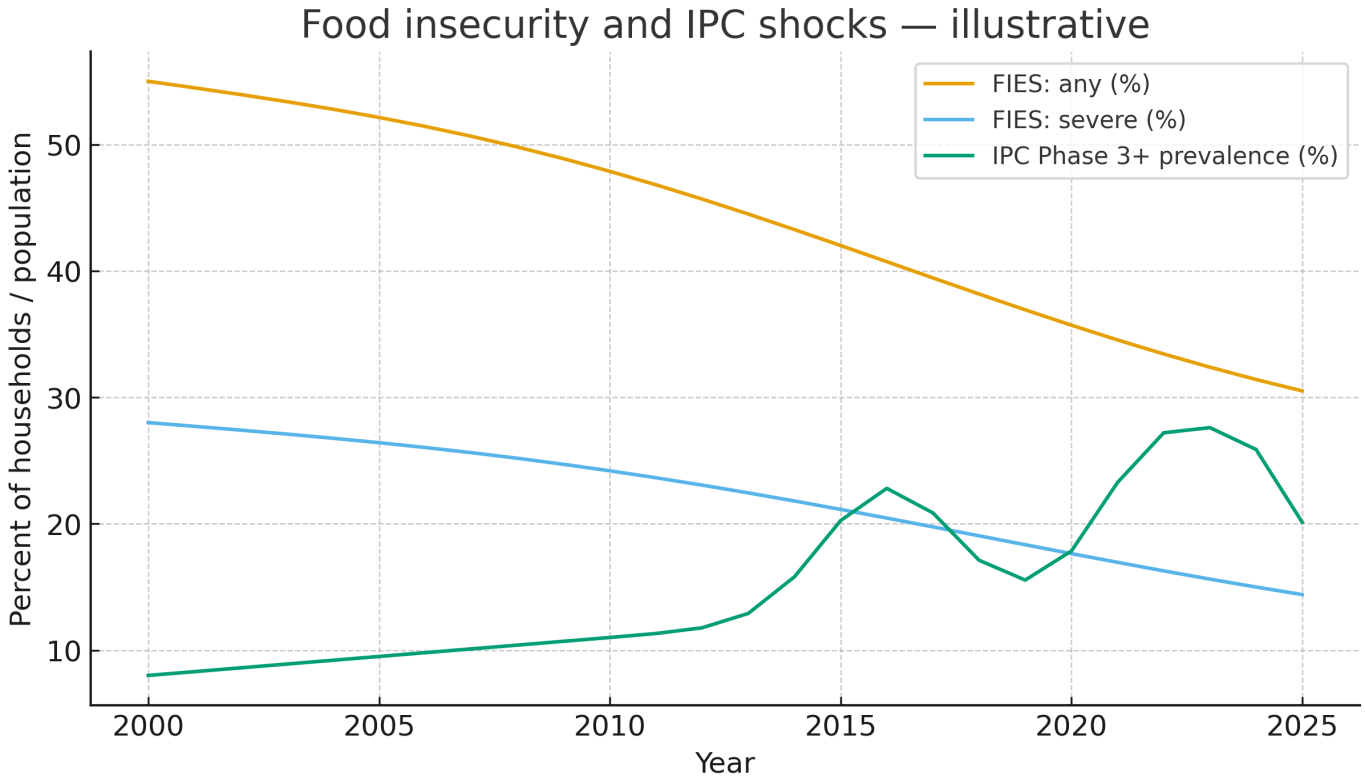


Figure 7.6-5. Monthly wasting seasonality (recent year)

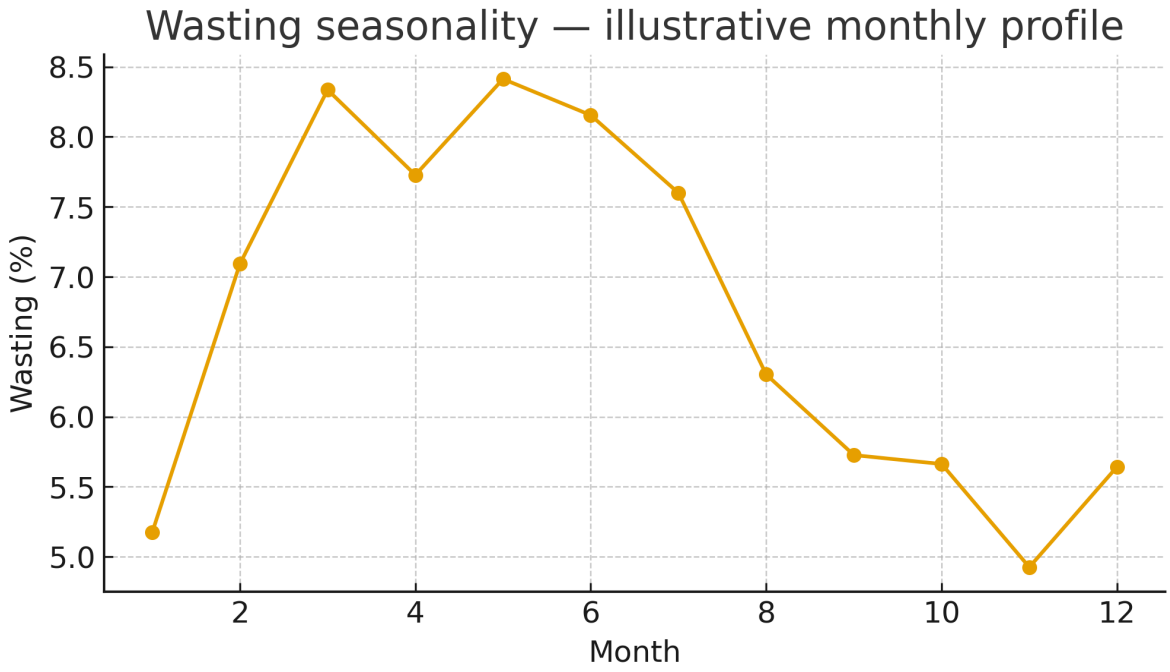


Figure 7.6-6. NDVI anomaly vs wasting (association)

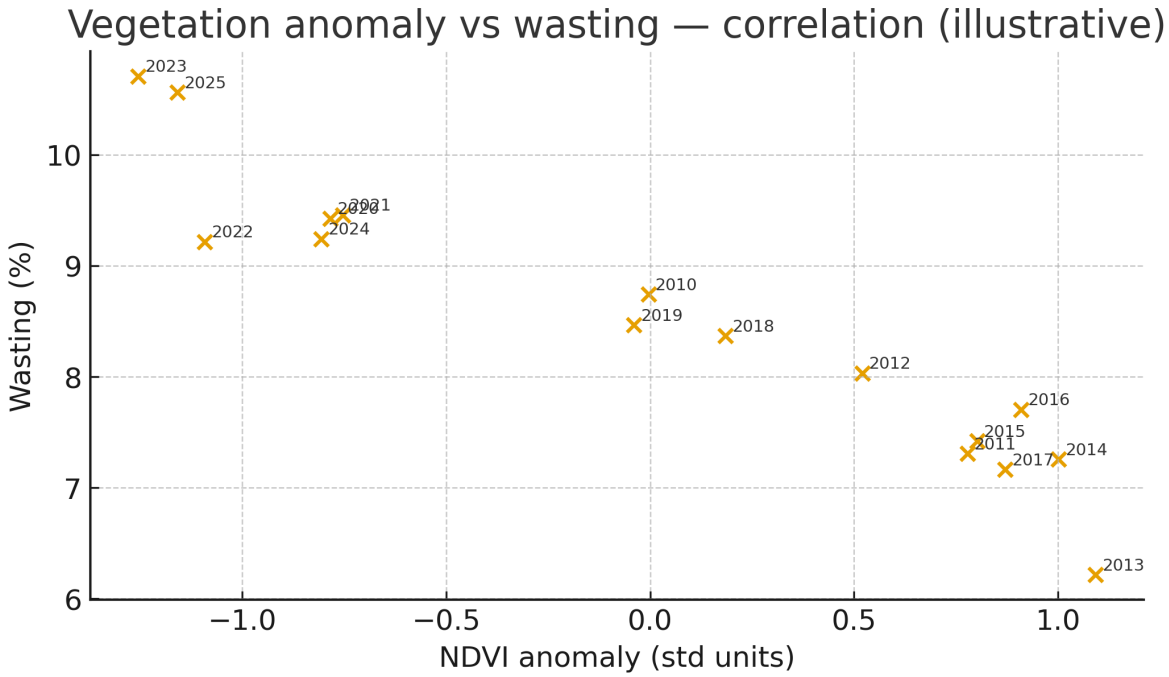


Figure 7.6-7. Regional nutrition & food insecurity snapshot (2025)

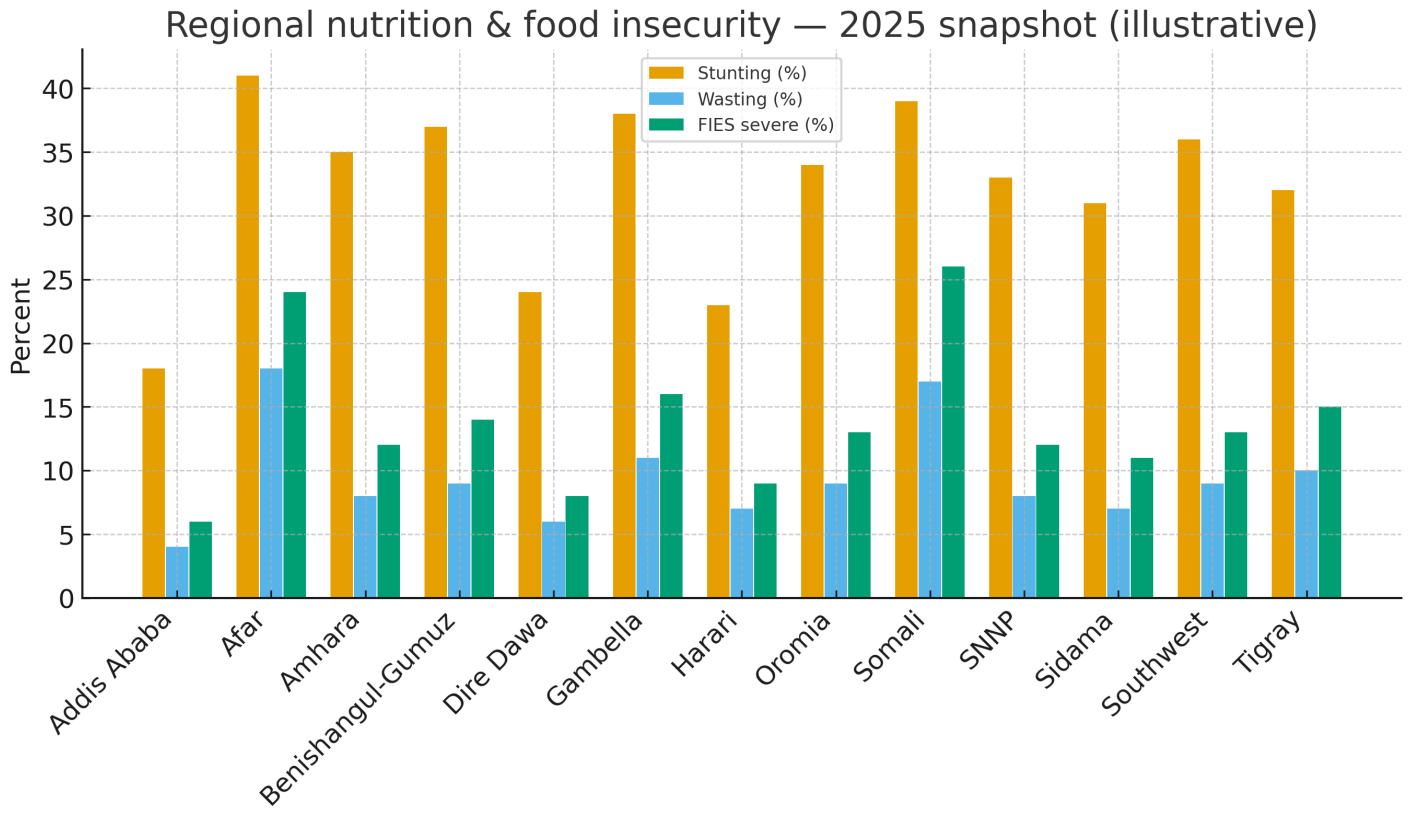


Figure 7.6-8. Regional U5MR vs stunting

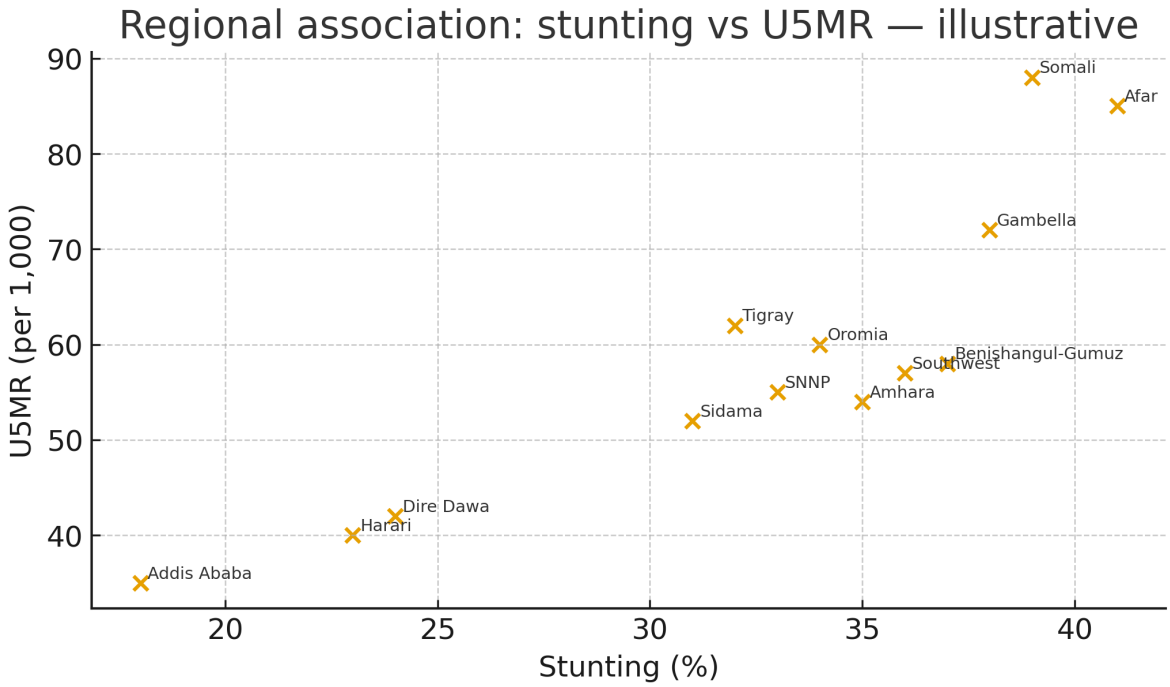


Table 7.6-A. Indicators & definitions

Indicator	Definition / note
Stunting	Height-for-age z<−2 among U5 children.
Wasting	Weight-for-height z<−2 among U5 children.
Underweight	Weight-for-age z<−2 among U5 children.
Women BMI<18.5 / ≥25	Shares of women 15–49 underweight / overweight-obese.
MDD / MAD	Minimum dietary diversity / minimum acceptable diet (6–23 months).
FIES	Food Insecurity Experience Scale (any, severe).
IPC Phase 3+	Share of population in Crisis or worse (acute food insecurity).
NDVI anomaly	Vegetation index deviation from normal; proxy for drought/rainfall shocks.

Table 7.6-B. Latest snapshot (2025, illustrative)

Metric	Value
Stunting (%)	27.1
Wasting (%)	8.6
Underweight (%)	12.2
Women BMI<18.5 (%)	15.2
Women BMI≥25 (%)	13.8
MDD (6–23m, %)	32.0
MAD (6–23m, %)	18.9
FIES any (%)	30.5
FIES severe (%)	14.4
IPC Phase 3+ (%)	20.1

Table 7.6-C. Seasonality profile (recent year)

Month	Wasting (%)
1.0	5.2
2.0	7.1
3.0	8.3
4.0	7.7
5.0	8.4
6.0	8.2
7.0	7.6
8.0	6.3
9.0	5.7
10.0	5.7
11.0	4.9
12.0	5.6

Table 7.6-D. Regional snapshot (2025)

Region	Stunting (%)	Wasting (%)	FIES severe (%)	U5MR (per 1,000)
Addis Ababa	18	4	6	35
Afar	41	18	24	85
Amhara	35	8	12	54
Benishangul-Gumuz	37	9	14	58
Dire Dawa	24	6	8	42
Gambella	38	11	16	72
Harari	23	7	9	40
Oromia	34	9	13	60
Somali	39	17	26	88
SNNP	33	8	12	55
Sidama	31	7	11	52
Southwest	36	9	13	57
Tigray	32	10	15	62

Table 7.6-E. Associations & program notes

Topic	Interpretation / guidance
NDVI–wasting correlation	corr ≈ -0.95 (illustrative); integrate early-warning with nutrition surveillance.
U5MR–stunting correlation	corr ≈ 0.87 (illustrative); underscores multi-sectoral pathways.
Diet diversity gaps	Persistently low MDD/MAD suggest quality constraints, not only calories.
Double burden in women	Undernutrition and overweight coexist; tailor counseling and food environment policies.
Shocks & seasonality	IPC spikes align with wasting jumps; pre-position supplies and cash/food response.

Table 7.6-F. Ethiopia program & policy actions

Priority action	Why it matters in Ethiopia
Nutrition-sensitive social protection	Shock-responsive cash transfers linked to nutrition services.
Food systems & fortification	Staple fortification; diversify diets; reduce post-harvest losses.
Community-based management of acute malnutrition (CMAM)	Scale RUTF supply, screening, and referral capacity.
Water, sanitation & hygiene (WASH)	Reduce enteric infections and environmental enteropathy.
Behavior change & IYCF counseling	Improve feeding frequency, diversity, and responsive feeding.
Early-warning integration	Link climate/market surveillance with IPC and program triggers.

References — Section 7.6

- Ethiopia DHS/PMA/MICS — nutrition modules (child anthropometry, IYCF, women's BMI).

- IPC/FSNWG Ethiopia bulletins — acute food insecurity (Phase 3+).

- FAO/WHO — Food Insecurity Experience Scale (FIES) methods.

- FEWS NET / ICPAC — climate and seasonal outlooks; NDVI/rainfall anomalies.

- UNICEF/WHO — Joint malnutrition estimates and guidance on CMAM/IYCF.

7.7) Household & Built Environment

Purpose. Describe Ethiopia’s household and built-environment determinants of mortality: WASH, housing quality, crowding, and household energy/air pollution. Replace templates with official DHS/PMA/JMP, LSMS-ISA, MOH/HMIS and program data.

Figure 7.7-1. WASH coverage trends

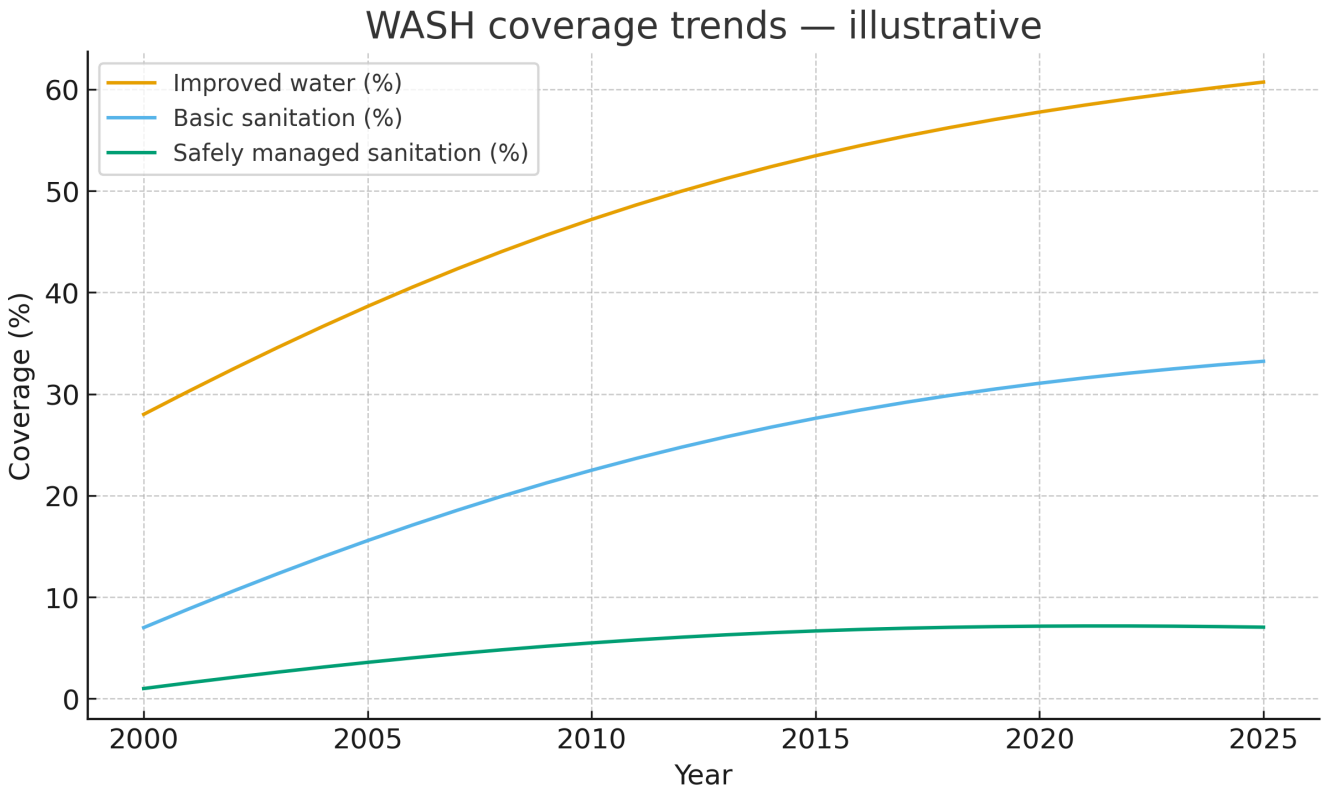


Figure 7.7-2. Household energy & air pollution

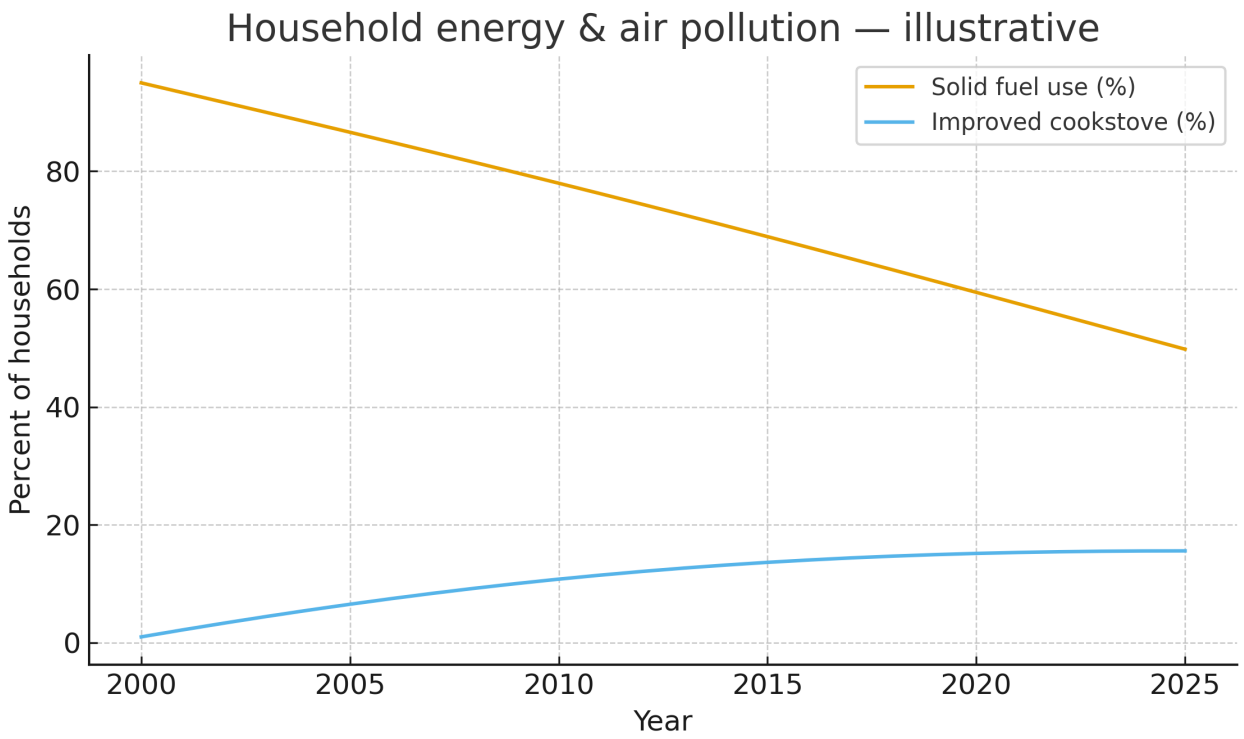


Figure 7.7-3. Crowding & housing quality over time

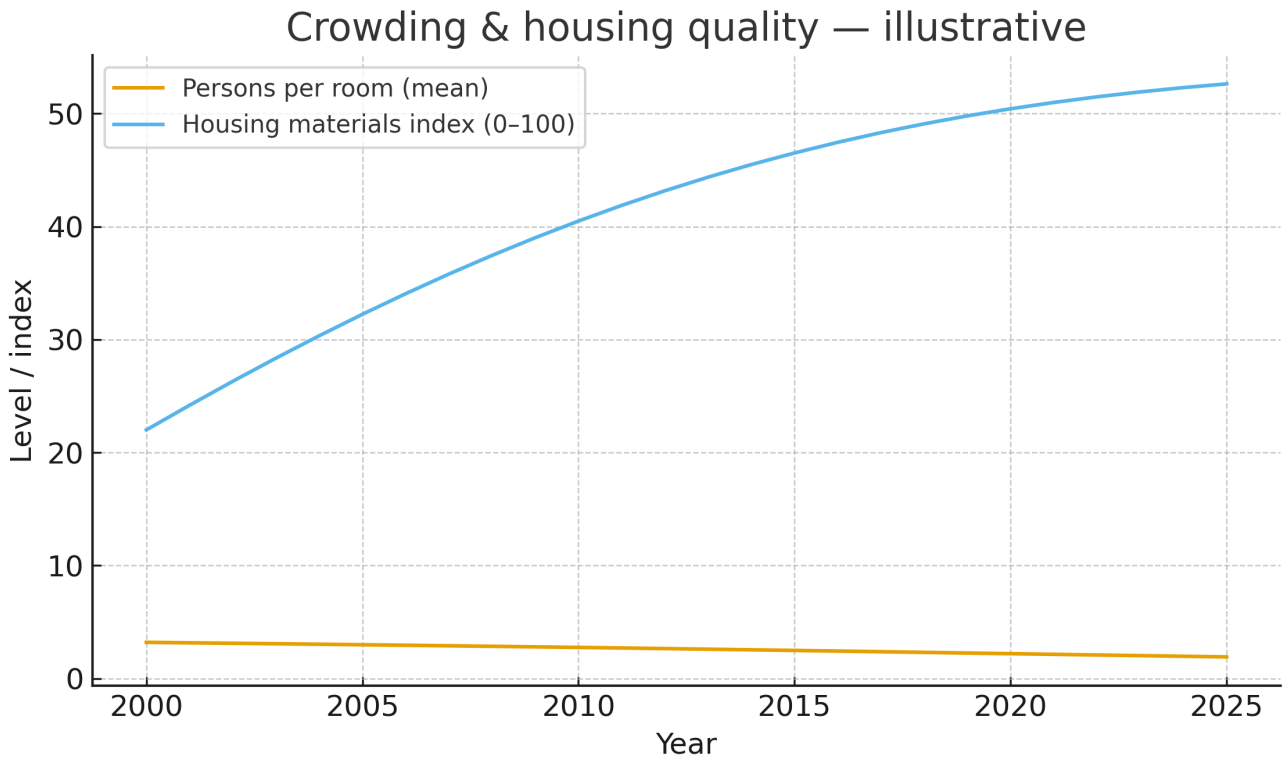


Figure 7.7-4. Regional WASH snapshot (2025)

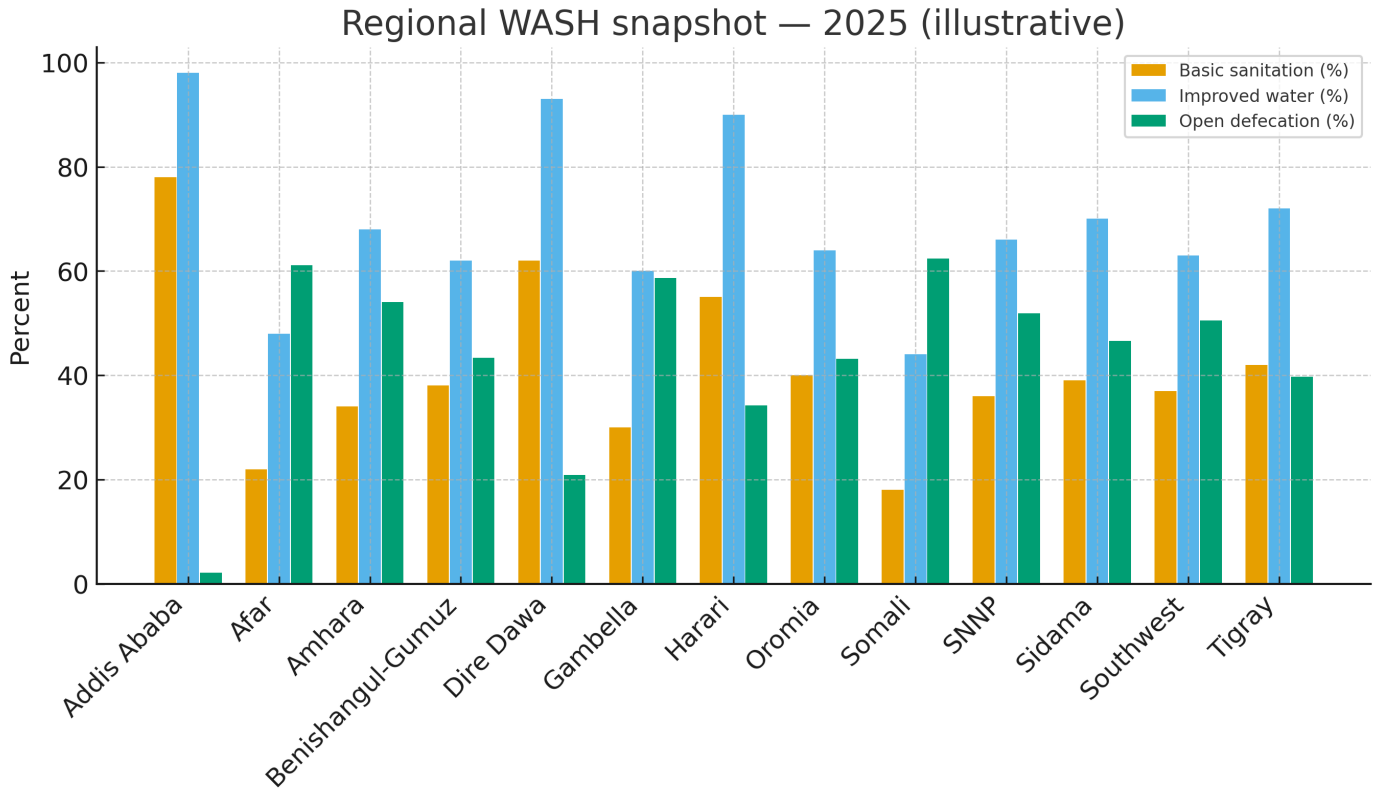


Figure 7.7-5. Solid fuel vs child ARI (2010–2025)

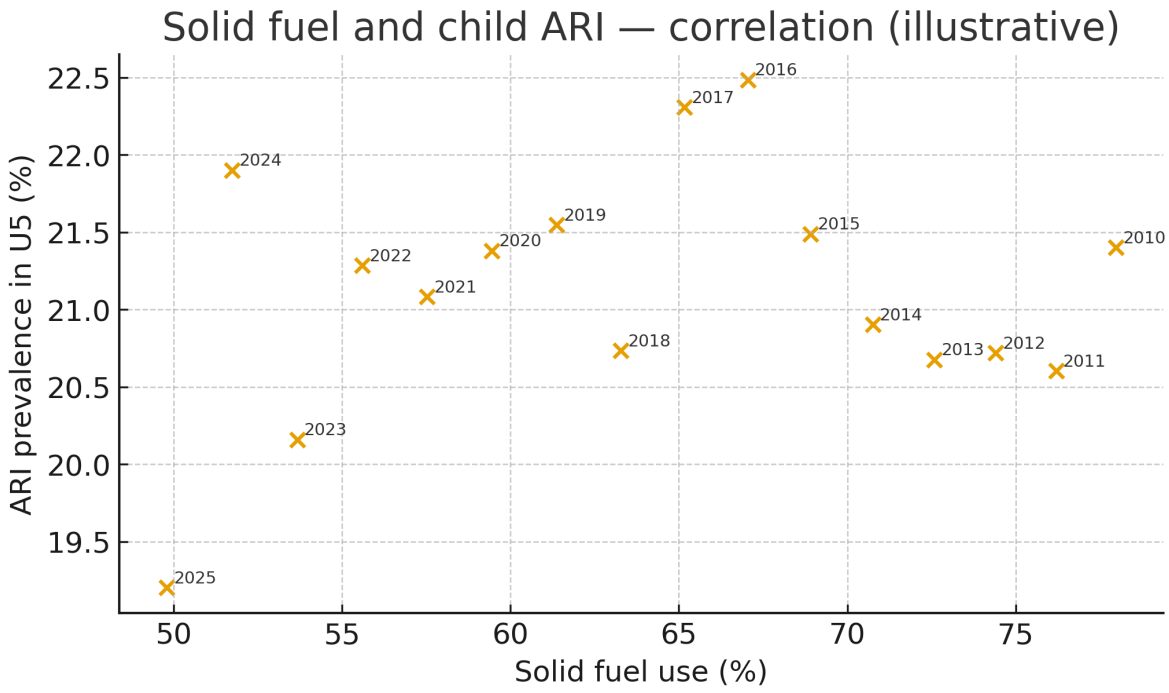


Figure 7.7-6. Crowding vs U5MR — regional

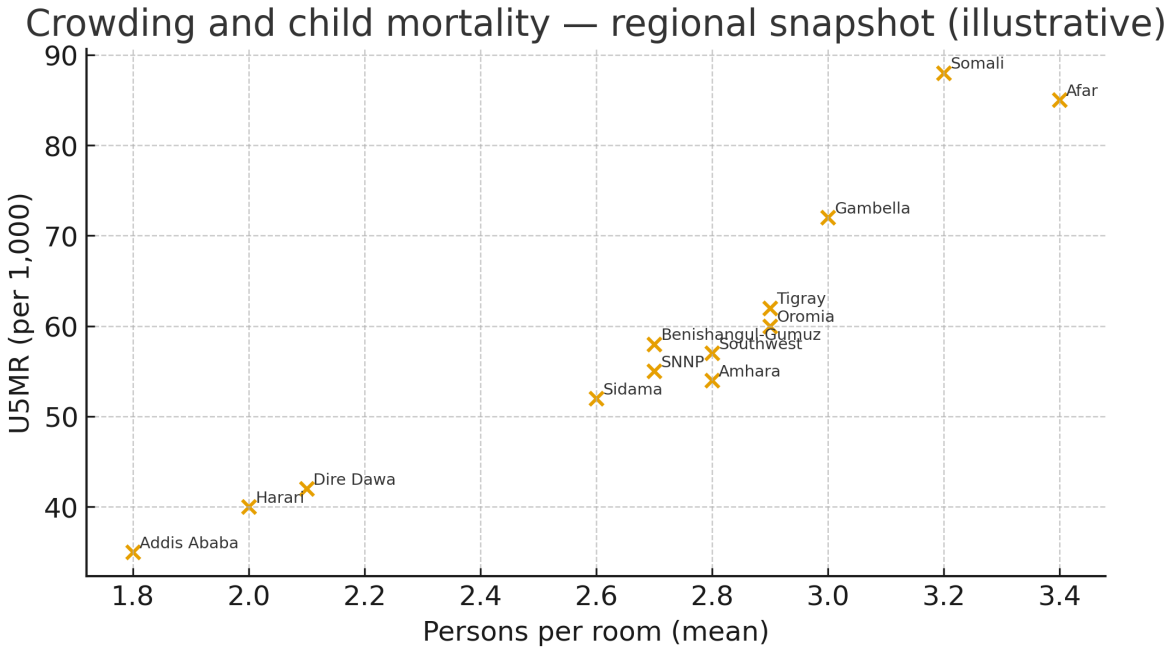


Figure 7.7-7. Built-environment pathway (schematic)

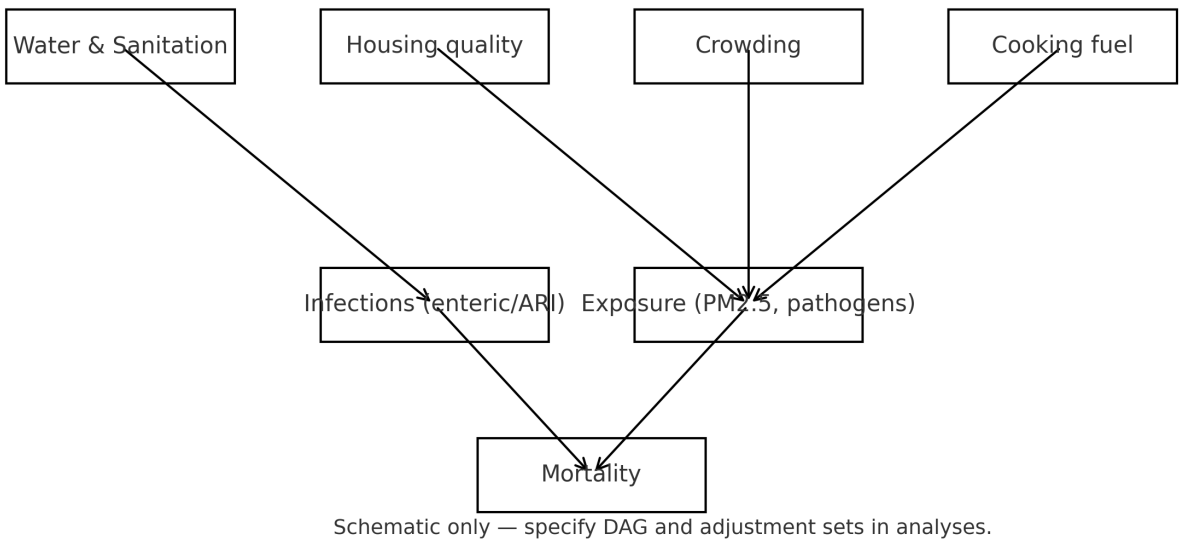


Table 7.7-A. Indicators & definitions

Indicator	Definition / note
Improved water / basic & safely-managed sanitation	JMP definitions; specify Ethiopia classification & data source.
Solid fuel use / improved cookstove	Primary reliance on wood/dung/charcoal vs cleaner energy; ICS as partial mitigation.
Persons per room (PPR)	Overcrowding proxy; bedrooms or all rooms — define consistently.
Housing materials index	Composite of floor/wall/roof; ventilation/windows; lighting.
Open defecation	Share of households practicing OD (JMP).

Table 7.7-B. Latest snapshot (2025, illustrative)

Metric	Value
Improved water (%)	60.7
Basic sanitation (%)	33.2
Safely managed sanitation (%)	7.0
Solid fuel use (%)	49.8
Improved cookstove (%)	15.6
Persons per room (mean)	1.91
Housing materials index (0–100)	52.6

Table 7.7-C. Regional WASH snapshot (2025)

Region	Basic sanitation (%)	Improved water (%)	Open defecation (%)
Addis Ababa	78	98	2.1
Afar	22	48	61.1
Amhara	34	68	53.9
Benishangul-Gumuz	38	62	43.3
Dire Dawa	62	93	20.9
Gambella	30	60	58.6
Harari	55	90	34.2
Oromia	40	64	43.1
Somali	18	44	62.4
SNNP	36	66	51.8
Sidama	39	70	46.6
Southwest	37	63	50.5
Tigray	42	72	39.7

Table 7.7-D. Associations & interpretation notes

Topic	Interpretation / guidance
Solid fuel → ARI	corr ≈ 0.18 (illustrative); supports cleaner energy & ventilation.
Crowding → U5MR	corr ≈ 0.93 (illustrative); consider housing/upgrading policies.
Sanitation & water	Sanitation remains the bottleneck; safely-managed far lower than basic.
Inequality	Large regional gaps; pastoralist/remote areas face largest deficits.
Data consistency	Harmonize JMP vs DHS definitions; reconcile facility vs household WASH where relevant.

Table 7.7-E. Program & policy actions

Priority action	Why it matters in Ethiopia
Rural sanitation acceleration	CLTS+ with supply-side support and safely-managed focus.
Clean cooking transition	Subsidize LPG/electric/biogas where feasible; quality-assured ICS; behavior/ventilation.
Housing & slum upgrading	Materials, ventilation, density management; integrate with urban plans.
WASH in health facilities & schools	Reduce infection risk and improve service quality.
Target remote communities	Mobile services, appropriate technologies (solar pumping, on-site sanitation).

References — Section 7.7

- WHO/UNICEF Joint Monitoring Programme (JMP) for WASH — definitions and Ethiopia estimates.

- Ethiopia DHS/PMA — household WASH, cooking fuel, housing materials, crowding indicators.

- IHME/GBD & WHO — burden of disease attributable to household air pollution (context).

- UN-Habitat & World Bank — housing quality, slum upgrading, built environment guidance.

7.8) Infectious Disease Ecology

Purpose. Summarize infectious disease determinants of mortality in Ethiopia across malaria, TB, HIV and vaccine-preventable diseases, including ecology/coverage trends, seasonality, subnational heterogeneity and program levers. Replace templates with official NMCP/NTLP/HAPCO, IDSR/DHIS2, WHO/UNAIDS/UNICEF indicators.

Figure 7.8-1. Malaria ecology & control vs U5 malaria mortality

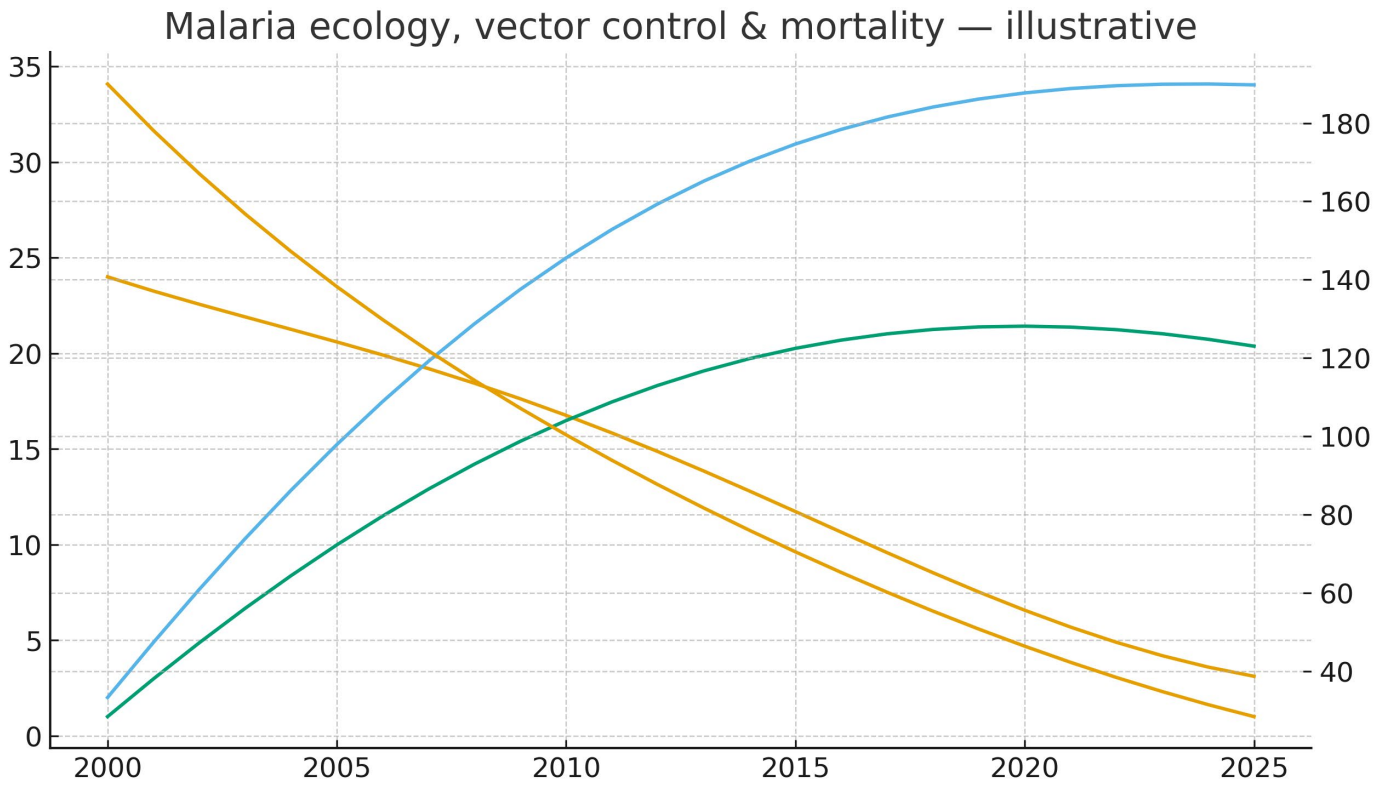


Figure 7.8-2. TB incidence and treatment success

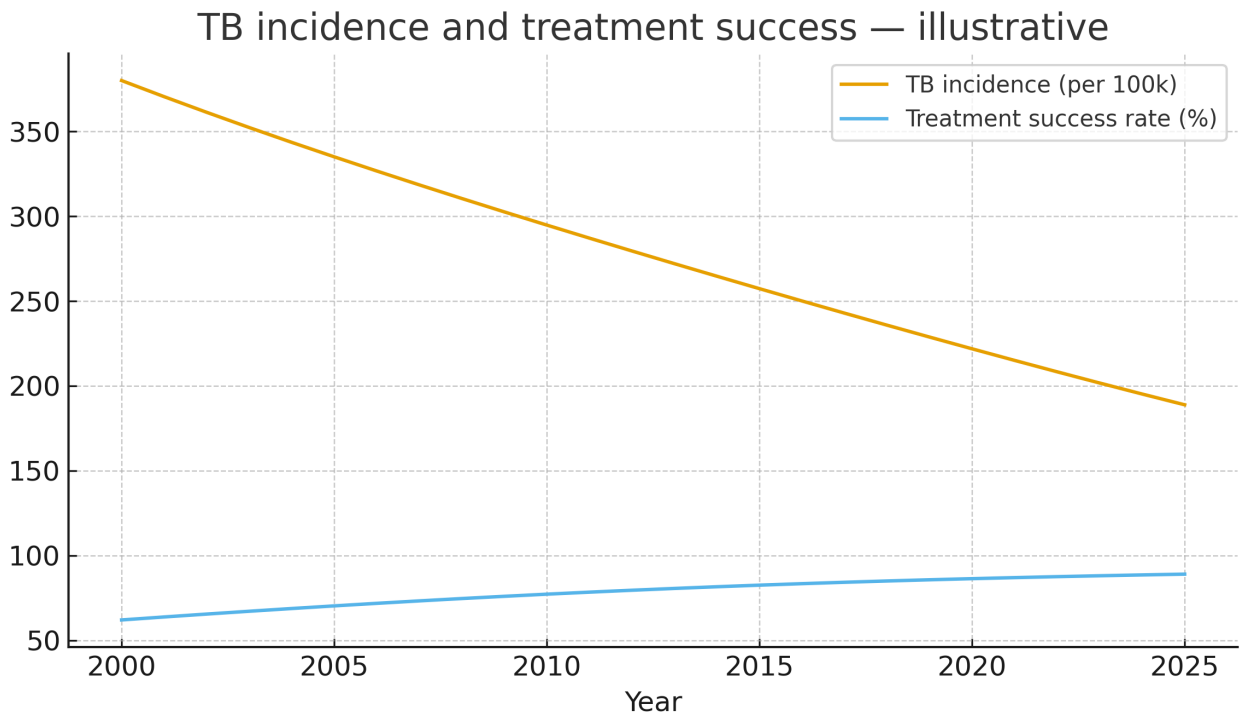


Figure 7.8-3. HIV incidence, ART coverage & AIDS mortality

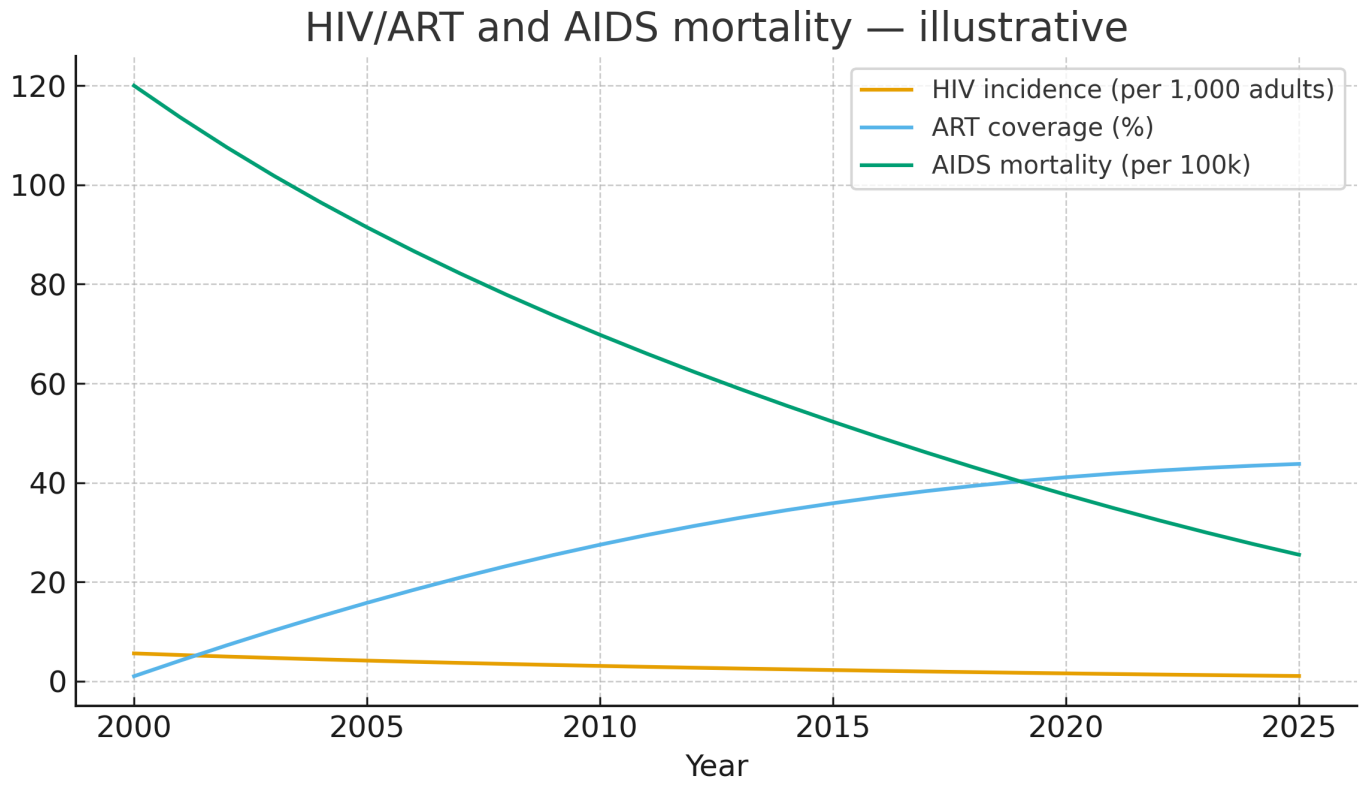


Figure 7.8-4. VPDs: measles incidence vs DTP3

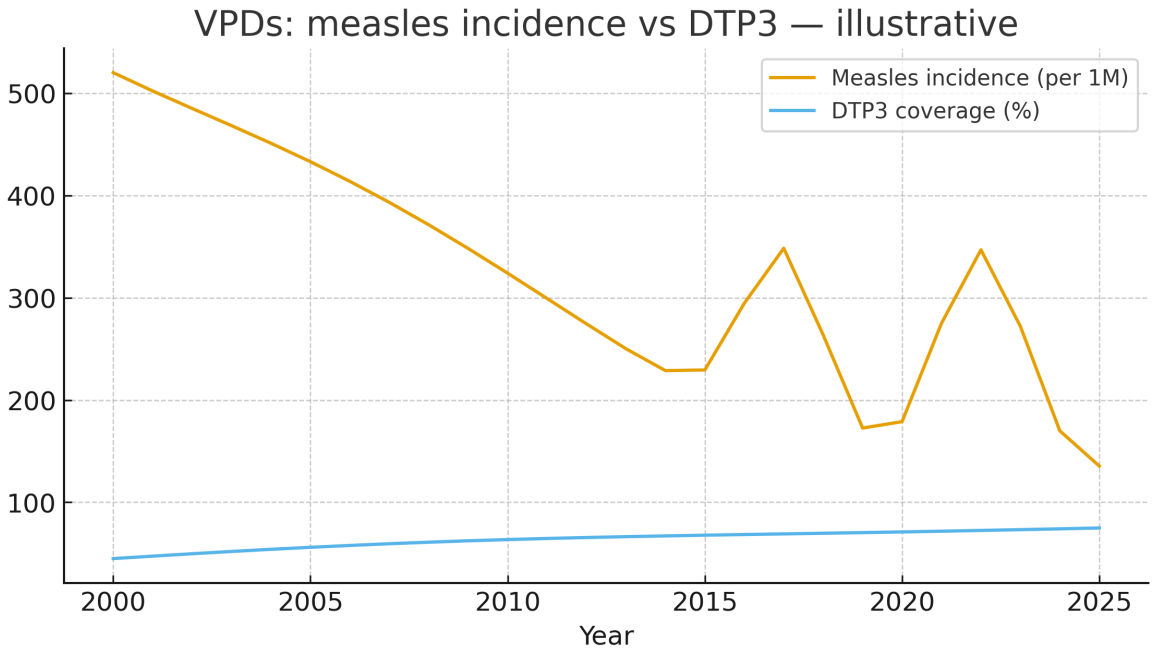


Figure 7.8-5. Regional malaria heterogeneity (2025)

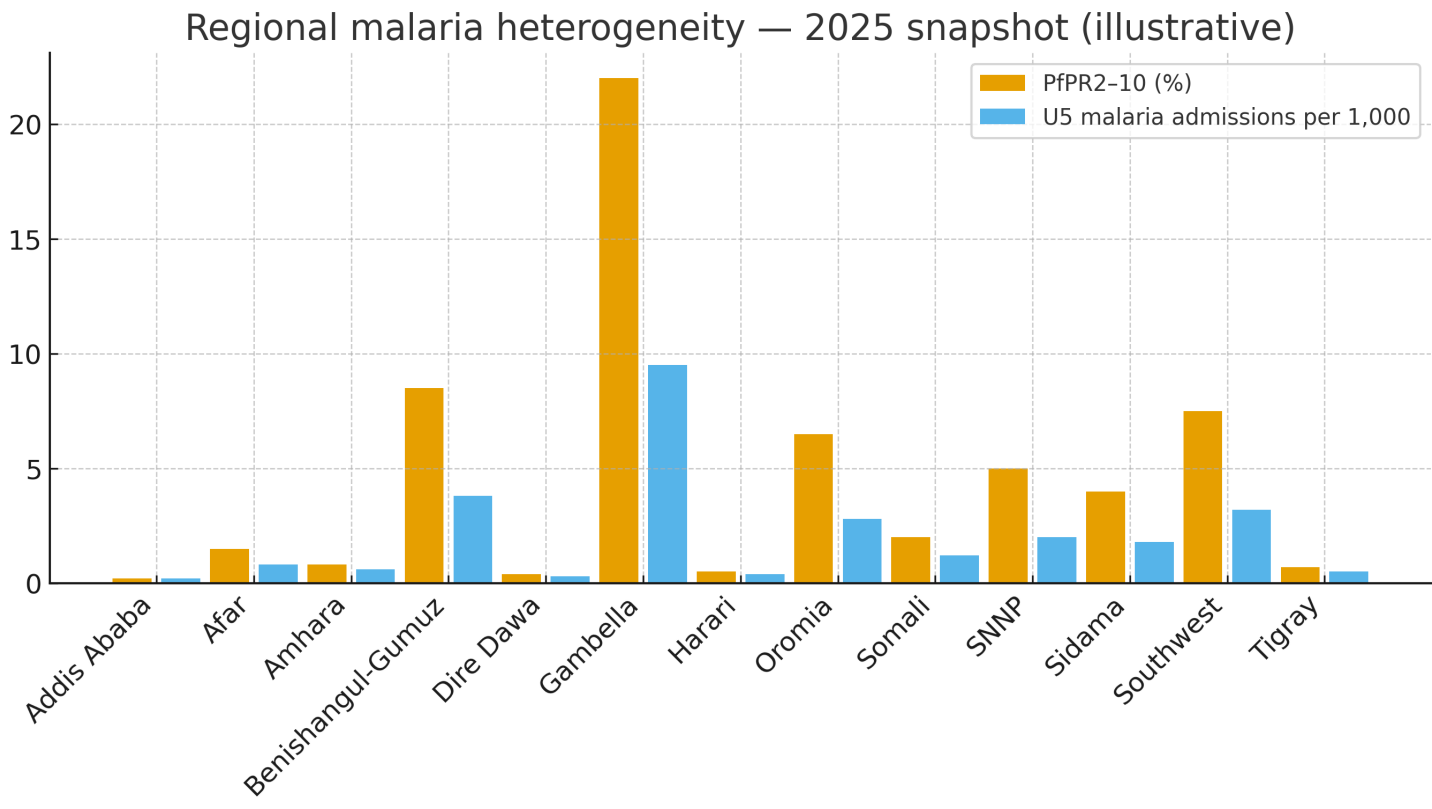


Figure 7.8-6. Malaria seasonality — test positivity

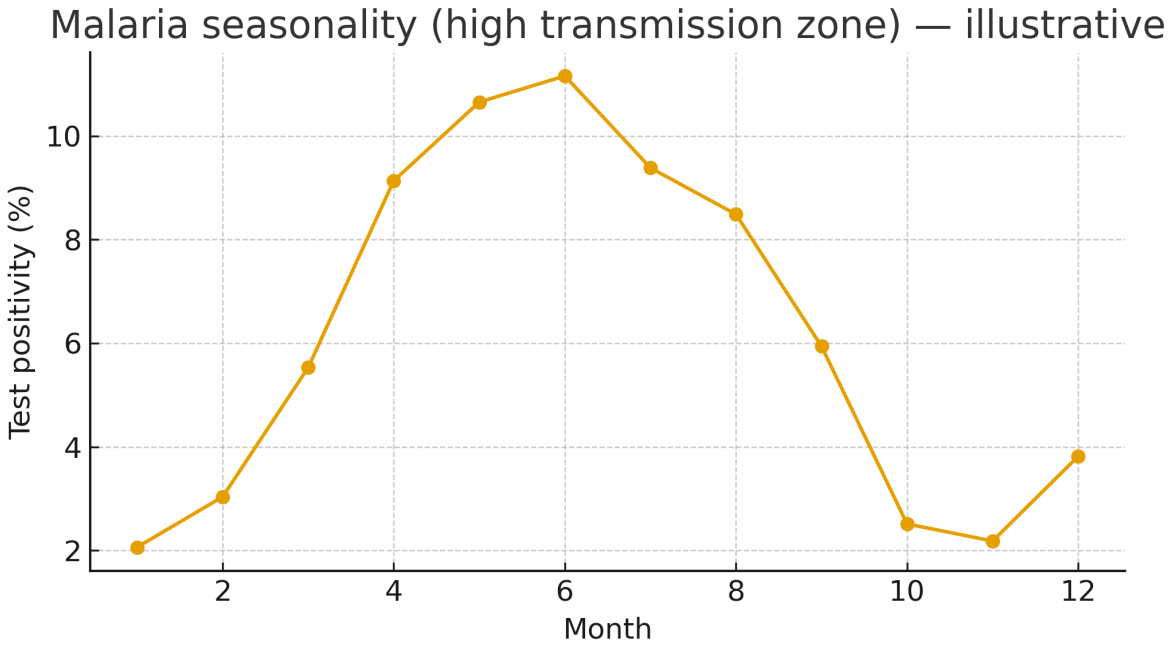


Figure 7.8-7. TB–HIV coinfection share over time

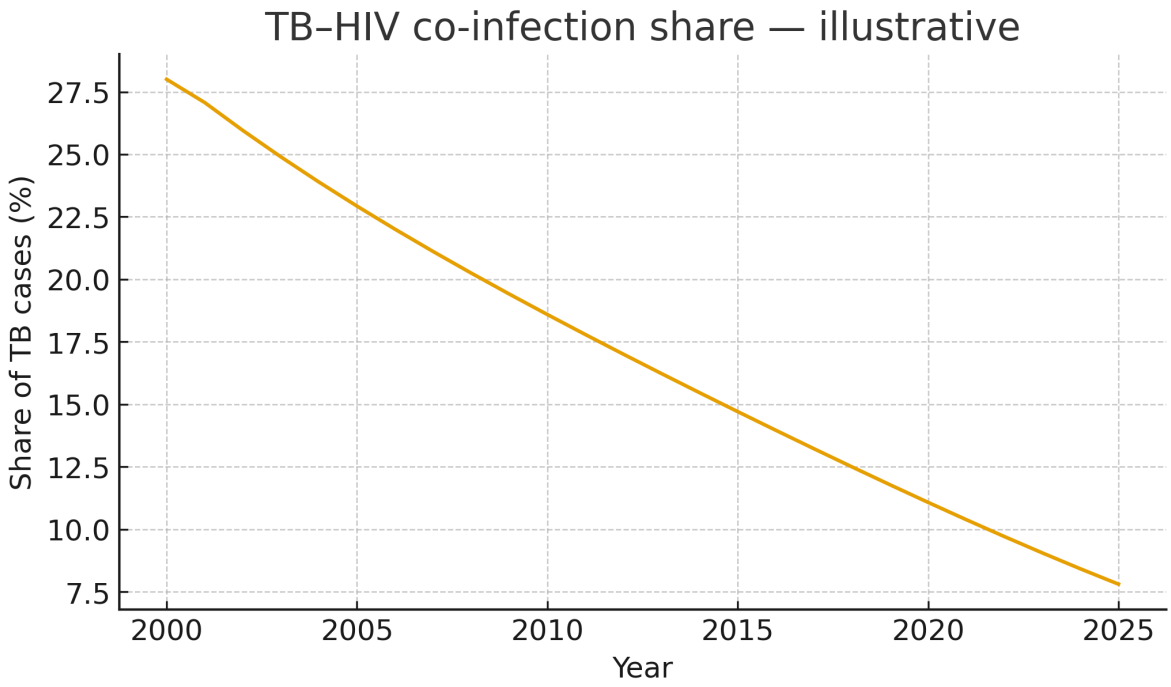


Table 7.8-A. Indicators & definitions

Indicator	Definition / note
PfPR2–10	Plasmodium falciparum parasite rate among children 2–10 — transmission intensity proxy.
ITN / IRS	Insecticide-treated net ownership/use; indoor residual spraying coverage.
U5 malaria mortality	Deaths per 100,000 U5 population attributable to malaria (proxy).
TB incidence / TSR	New cases per 100k; treatment success rate among notified cases.
RR-TB share	Proportion of rifampicin-resistant TB among notified TB.
HIV incidence / ART coverage	New infections per 1,000 adults; % PLHIV on ART.
AIDS mortality	Deaths per 100k population due to HIV/AIDS.
Measles incidence / DTP3	Reported measles per 1M; third dose DTP coverage.
TB–HIV coinfection	Share of TB cases coinfected with HIV.

Table 7.8-B. Latest snapshot (2025, illustrative)

Metric	Value
PfPR2–10 (%)	3.1
ITN coverage (%)	34.0
IRS coverage (%)	20.4
U5 malaria mortality (per 100k)	28.4
TB incidence (per 100k)	188.8
TB treatment success (%)	89.0
RR-TB share (%)	3.71

HIV incidence (per 1,000 adults)	1.04
ART coverage (%)	43.8
AIDS mortality (per 100k)	25.5
Measles incidence (per 1M)	135.5
DTP3 coverage (%)	74.9
TB–HIV coinfection share (%)	7.8

Table 7.8-C. Regional malaria snapshot (2025)

Region	PfPR2–10 (%)	U5 malaria admissions per 1,000
Addis Ababa	0.2	0.2
Afar	1.5	0.8
Amhara	0.8	0.6
Benishangul-Gumuz	8.5	3.8
Dire Dawa	0.4	0.3
Gambella	22.0	9.5
Harari	0.5	0.4
Oromia	6.5	2.8
Somali	2.0	1.2
SNNP	5.0	2.0
Sidama	4.0	1.8
Southwest	7.5	3.2
Tigray	0.7	0.5

Table 7.8-D. Program levers & surveillance actions

Priority action	Why it matters in Ethiopia
Vector control stratification	Align ITN/IRS mixes to PfPR/ecology; target high-risk kebeles.
Case management & diagnostics	mRDT/ microscopy quality; ACT stock reliability; severe-malaria referrals.
TB program quality	Find missing cases; strengthen DST and RR-TB management; improve TSR.
HIV service cascade	Test–link–treat–retain; PMTCT coverage; viral load suppression.
Immunization & outbreak control	Zero-dose mapping; measles SIAs; rapid response to VPD outbreaks.
Integrated surveillance	IDSR/DHIS2 integration; geospatial dashboards; seasonality early-warning.

References — Section 7.8

- Ethiopia NMCP (malaria program) reports; WHO World Malaria Report — PfPR/ITN/IRS guidance.

- National TB Program reports; WHO Global TB Report — incidence, TSR, RR-TB metrics.

- Ethiopia HIV/AIDS Prevention & Control Office (HAPCO); UNAIDS — HIV incidence, ART coverage and mortality.

- FMoH IDSR/DHIS2; WHO/UNICEF — measles/DTP3 and VPD surveillance.

7.10) Conflict, Disasters & Shocks

Purpose. Characterize mortality risks arising from organized violence, displacement, climate and hydrometeorological extremes, and macroeconomic shocks in Ethiopia; and outline service-continuity and recovery levers. Replace with official ACLED/EM-DAT/IOM DTM/FMoH/DHIS2/CSA series.

Figure 7.10-1. Conflict events & fatalities

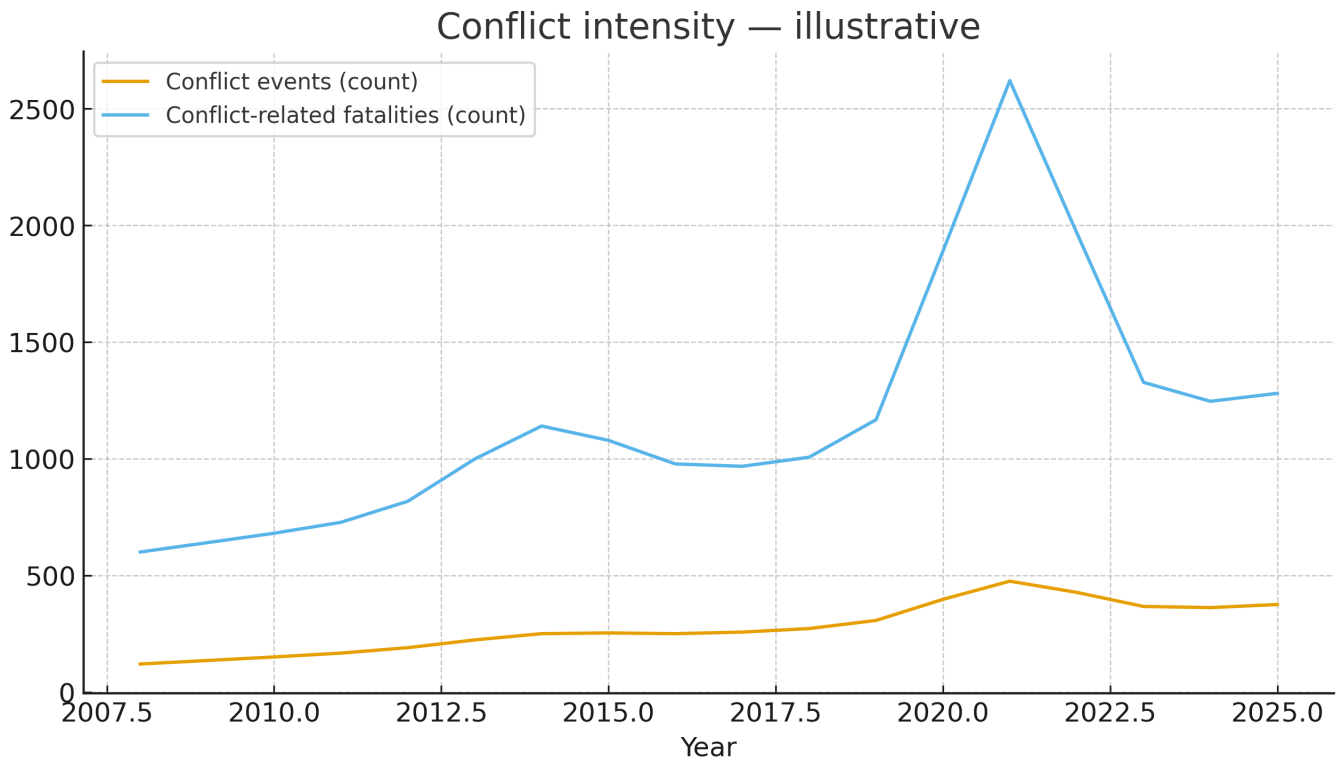


Figure 7.10-2. IDPs and returns

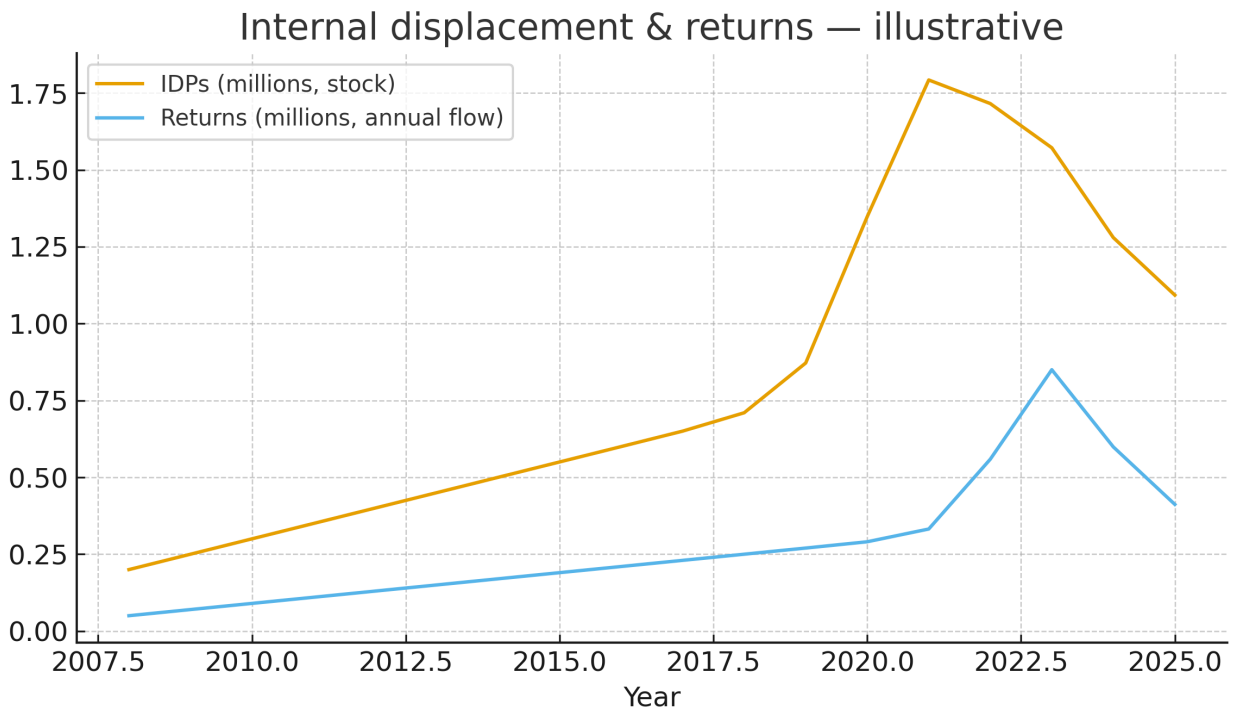


Figure 7.10-3. Droughts (SPEI) and floods

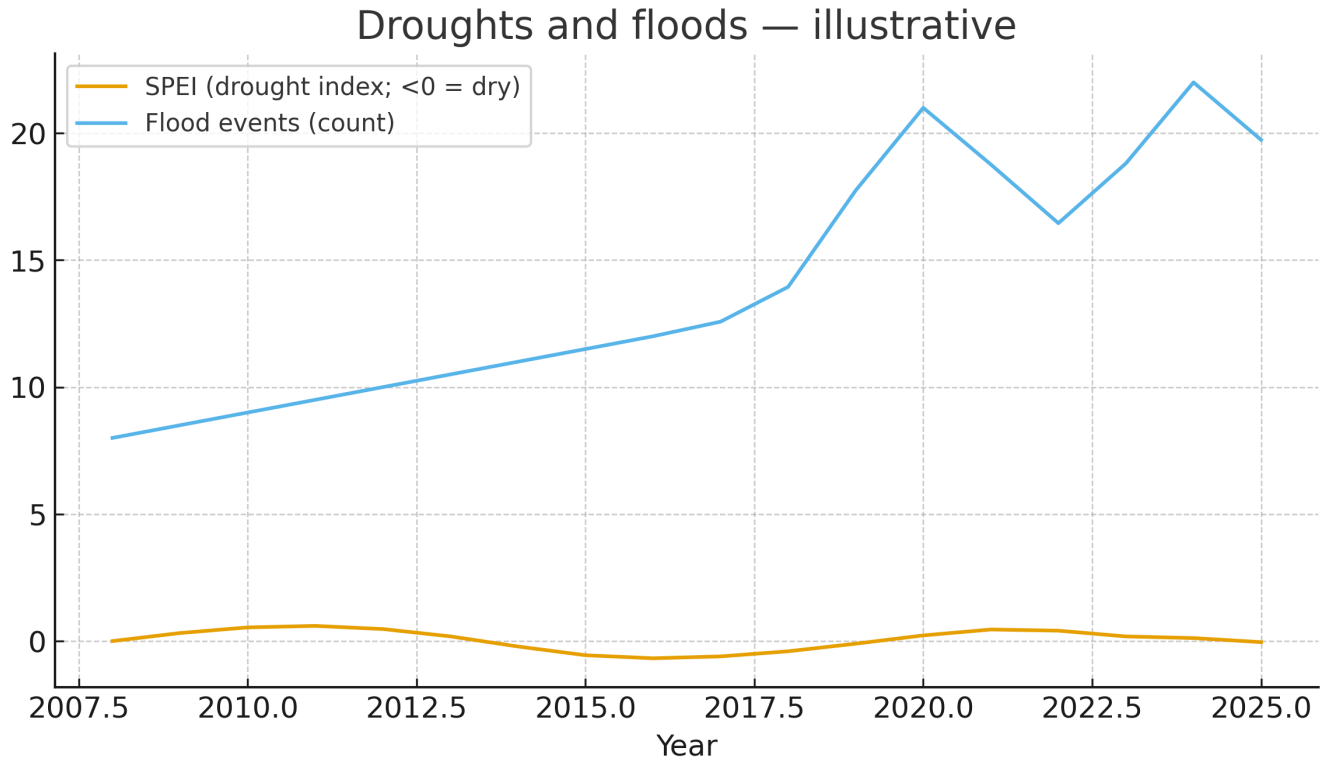


Figure 7.10-4. Food inflation & service utilization

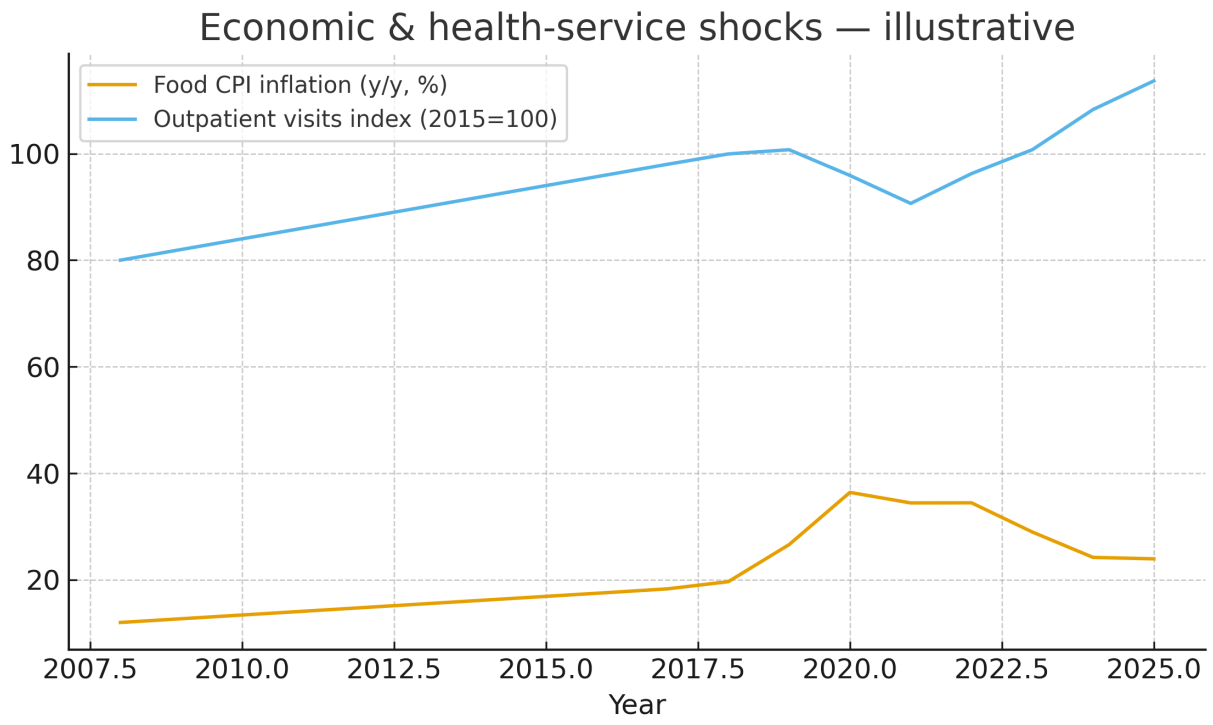


Figure 7.10-5. Combined-shock excess mortality proxy

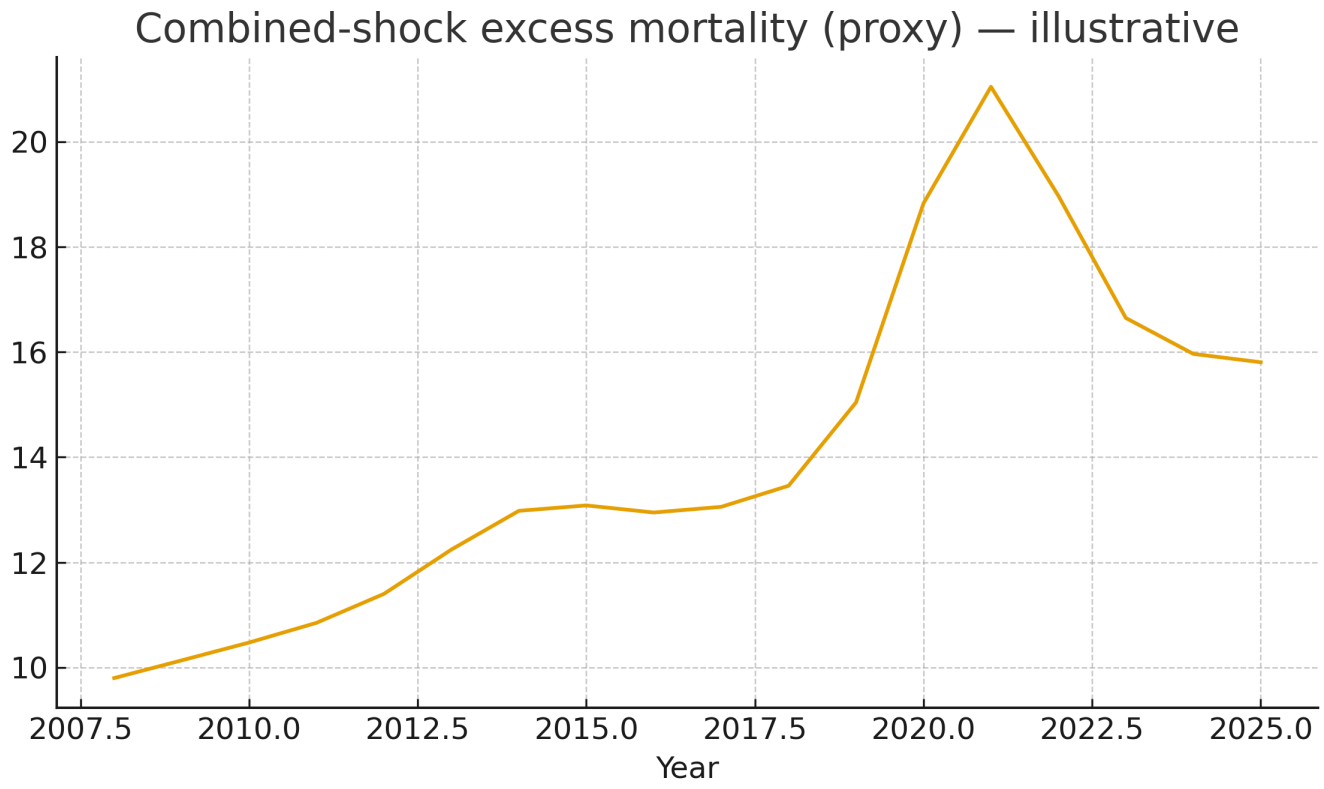


Figure 7.10-6. Regional shocks & recovery (2025)

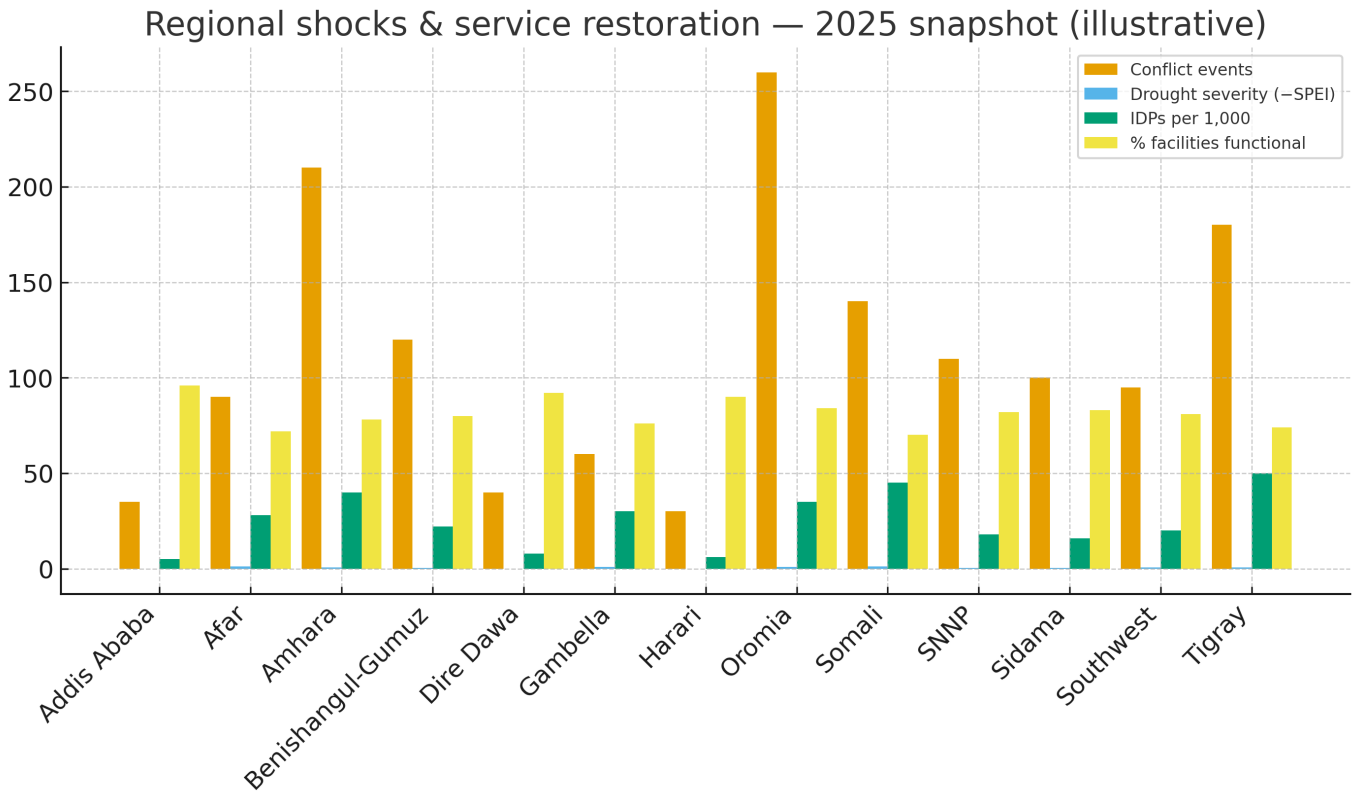


Figure 7.10-7. Outbreaks vs conflict (regional)

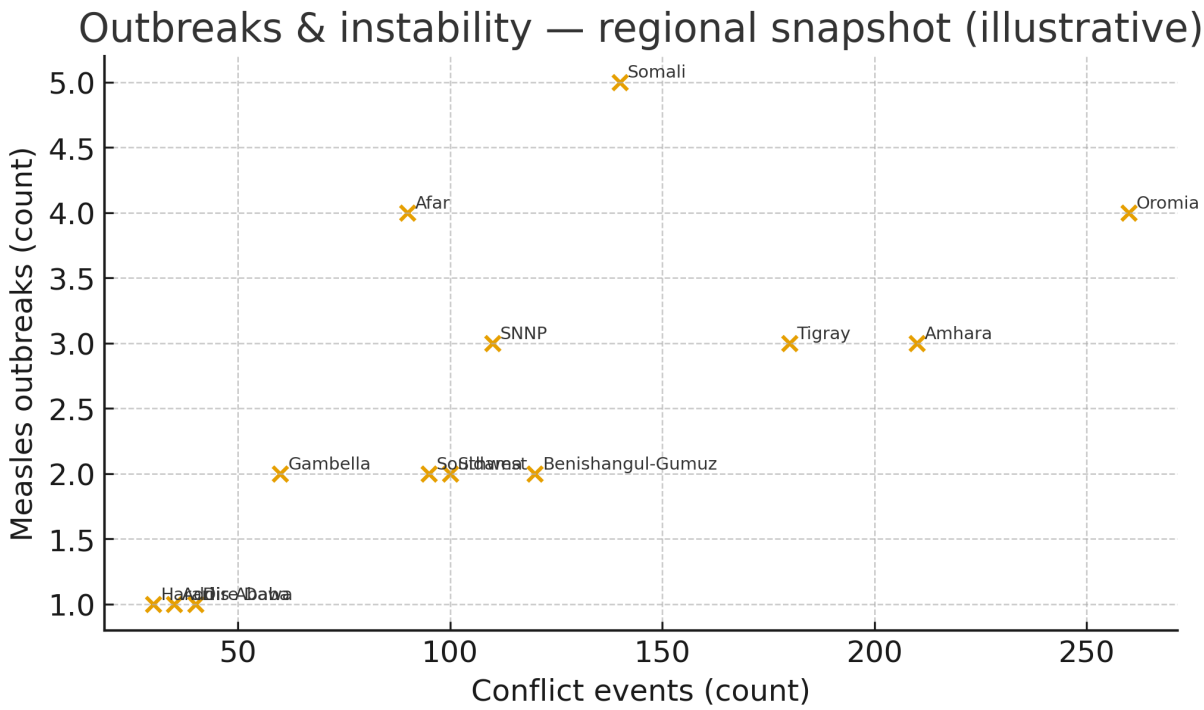


Table 7.10-A. Indicators & definitions

Indicator	Definition / note
Conflict events / fatalities	Annual counts of organized violence and related deaths (e.g., ACLED).
Health-facility attacks	Incidents affecting healthcare delivery.
IDPs / returns	Internally displaced persons (stock) and returnee flows (e.g., IOM DTM).
SPEI / floods	Standardized drought index; annual flood events (EM-DAT or national hydromet).
Food CPI inflation	Consumer price index for food; shock to affordability/nutrition.
Outpatient index	Service utilization proxy (DHIS2/HMIS).
Excess mortality (proxy)	Illustrative function of shocks; replace with modelled or CRVS/HDSS estimates.
Facilities functional	Share of health facilities fully functional (assessments).

Table 7.10-B. Latest snapshot (2025, illustrative)

Metric	Value
Conflict events (count)	375.0
Conflict fatalities (count)	1280.0
Health-facility attacks (count)	22.0
IDPs (millions, stock)	1.09
Returns (millions, annual)	0.41
SPEI (national)	-0.04
Flood events (count)	19.0
Food CPI (y/y, %)	23.9
Outpatient visits index (2015=100)	113.6
Excess mortality proxy (/100k)	15.8

Table 7.10-C. Regional snapshot (2025)

Region	Conflict events	Drought severity (−SPEI)	IDPs per 1,000	Facilities functional (%)	Measles outbreaks
Addis Ababa	35	-0.2	5	96	1
Afar	90	1.1	28	72	4
Amhara	210	0.6	40	78	3
Benishangul-Gumuz	120	0.4	22	80	2
Dire Dawa	40	-0.1	8	92	1
Gambella	60	0.8	30	76	2
Harari	30	-0.0	6	90	1
Oromia	260	0.9	35	84	4
Somali	140	1.3	45	70	5
SNNP	110	0.5	18	82	3
Sidama	100	0.4	16	83	2
Southwest	95	0.6	20	81	2
Tigray	180	0.7	50	74	3

Table 7.10-D. Program & policy levers

Priority action	Why it matters in Ethiopia
Humanitarian–development–peace nexus (HDP)	Coordinate lifesaving and systems recovery; flexible financing.
Health service continuity	Preposition supplies; mobile/temporary clinics; security risk management.
Shock-responsive safety nets	Scale cash/food support tied to IPC/market triggers.
Early warning & surveillance	Link conflict/climate data with HMIS/IDSR for rapid targeting.
Returnee & host support	Reintegrate with WASH, shelter, and primary care; mental health & GBV services.
Data governance	Standardize conflict/disaster indicators; protect sensitive microdata.

References — Section 7.10

- ACLED — conflict events and fatalities; healthcare attacks datasets where available.

- EM-DAT & National Disaster Risk Management Commission — disaster events, floods/droughts.

- IOM Displacement Tracking Matrix (DTM) — IDPs and returnees.

- FMoH DHIS2/HMIS — service utilization; facility functionality assessments.

- CSA & World Bank — price indices; poverty & food security trackers.

7.11) Biodiversity, Protected Areas & Human Pressure

Purpose. Relate biodiversity status, protected areas and human pressure to health by tracking forest cover/loss, protected-area coverage, human footprint, and environmental risk proxies, with subnational heterogeneity and policy levers for Ethiopia. Replace templates with WDPA, Global Forest Watch, WorldPop/HRSL, MODIS/VIIRS NTL and national sources.

Figure 7.11-1. Protected areas, forest cover & forest loss

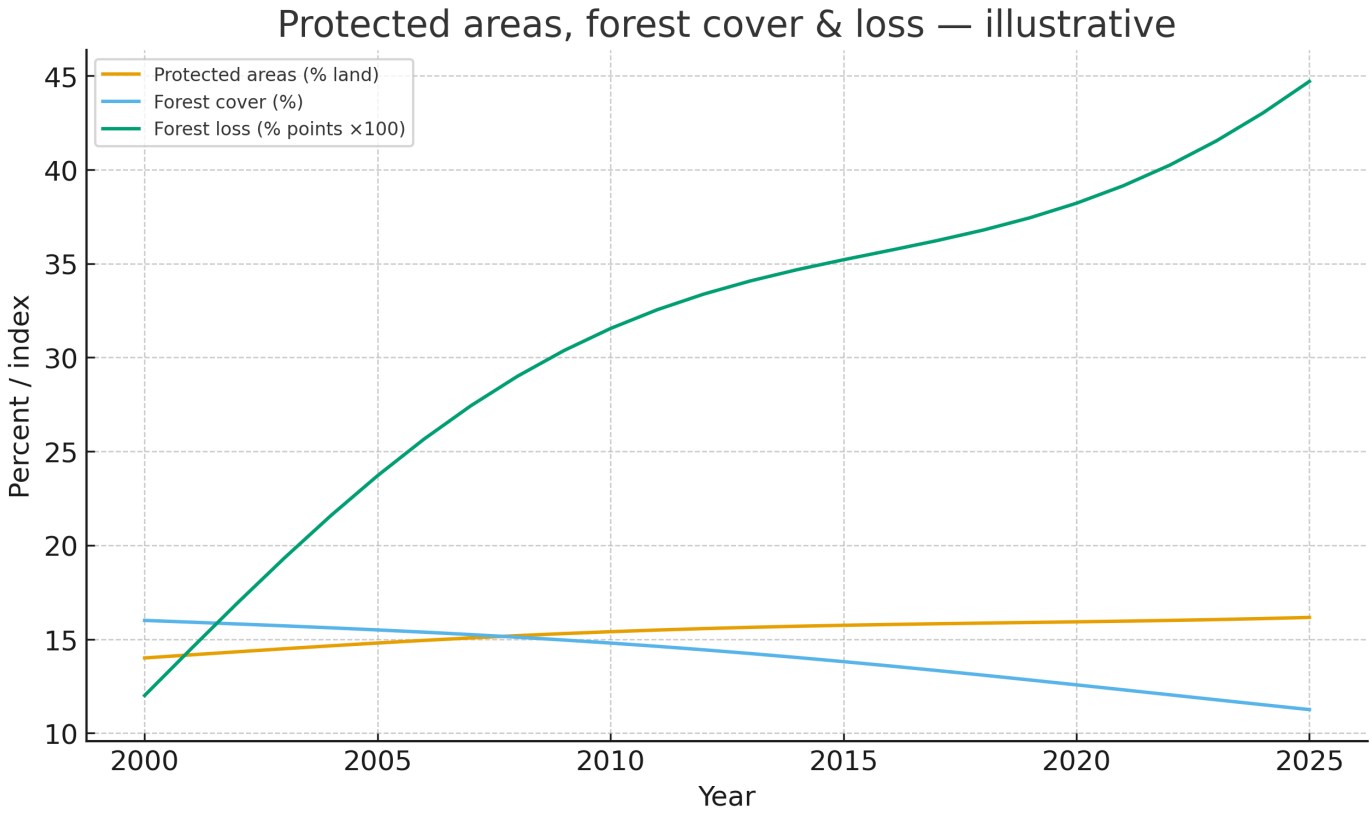


Figure 7.11-2. Human Footprint & night-time lights

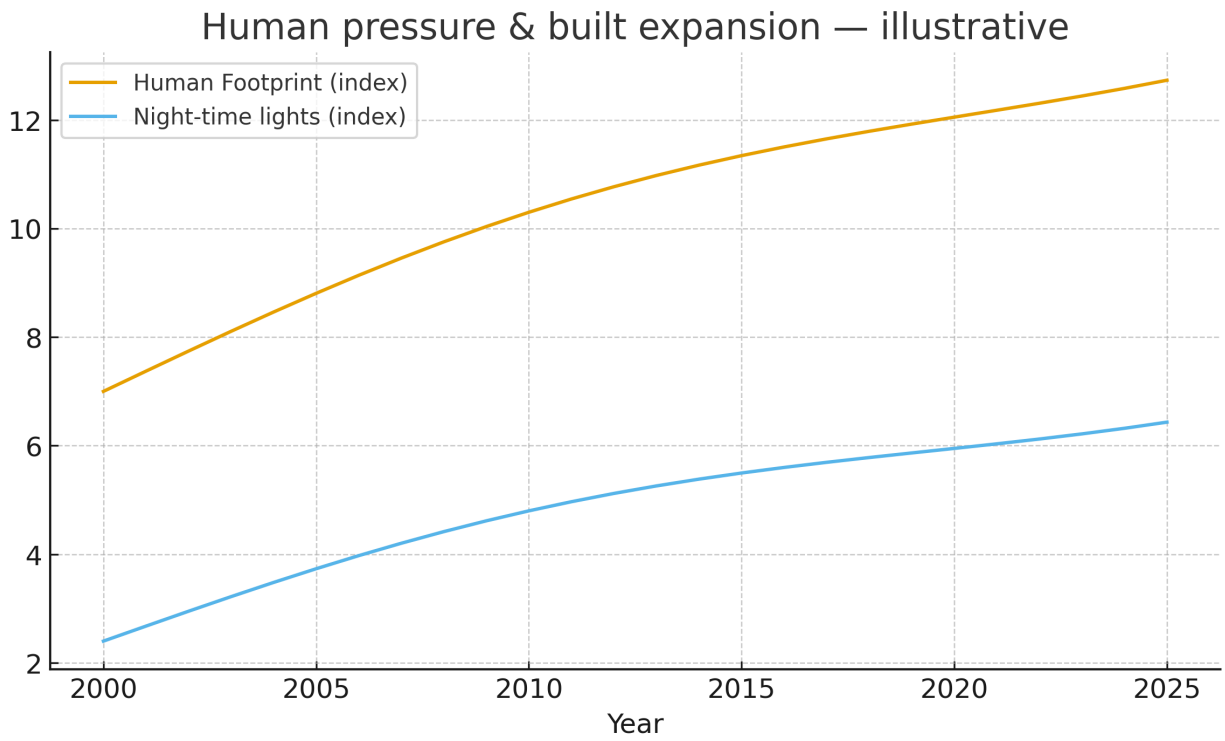


Figure 7.11-3. Population living near protected areas

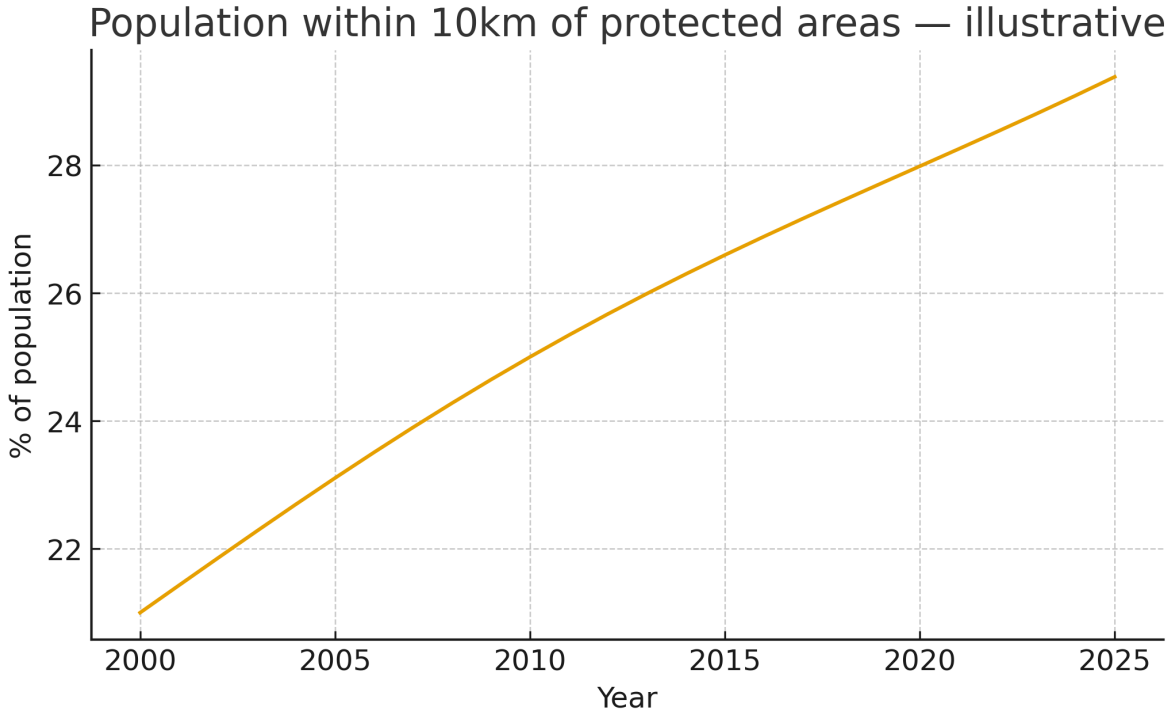


Figure 7.11-4. Regional environment & pressure (2025)

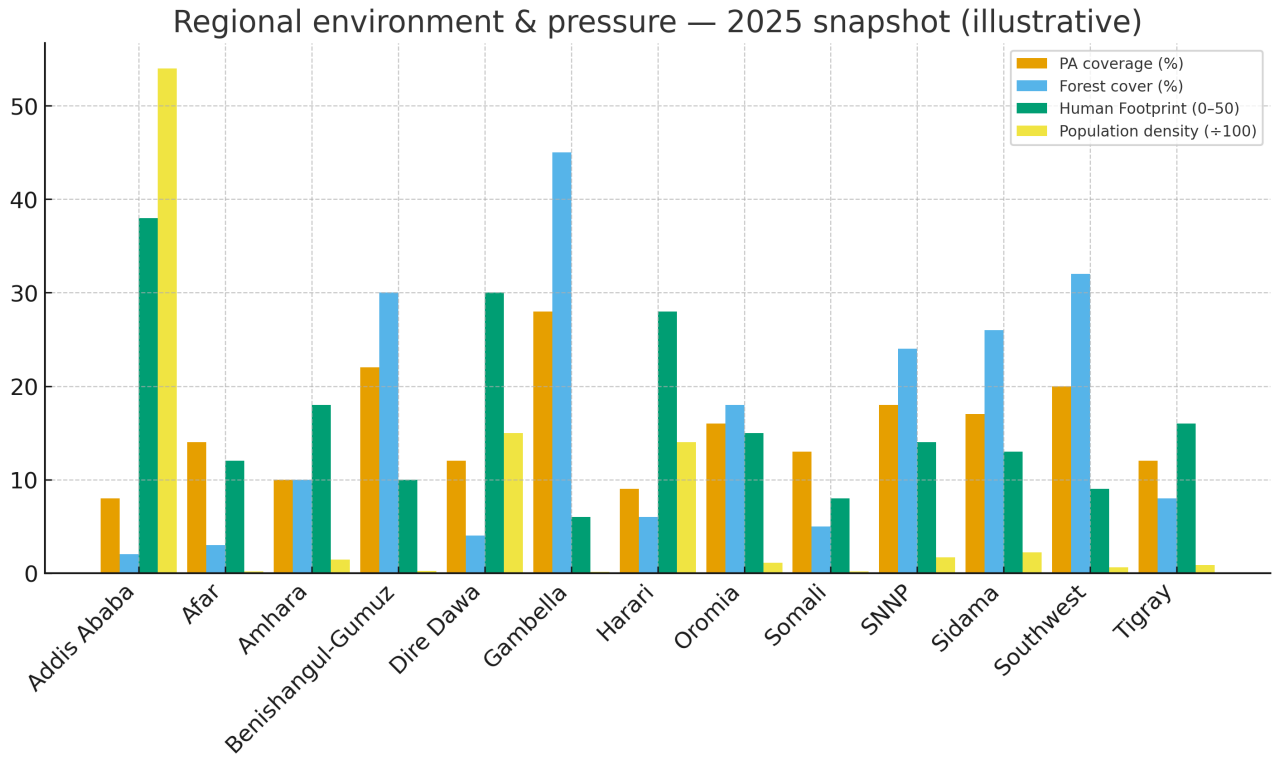


Figure 7.11-5. Forest cover loss, 2010→2025

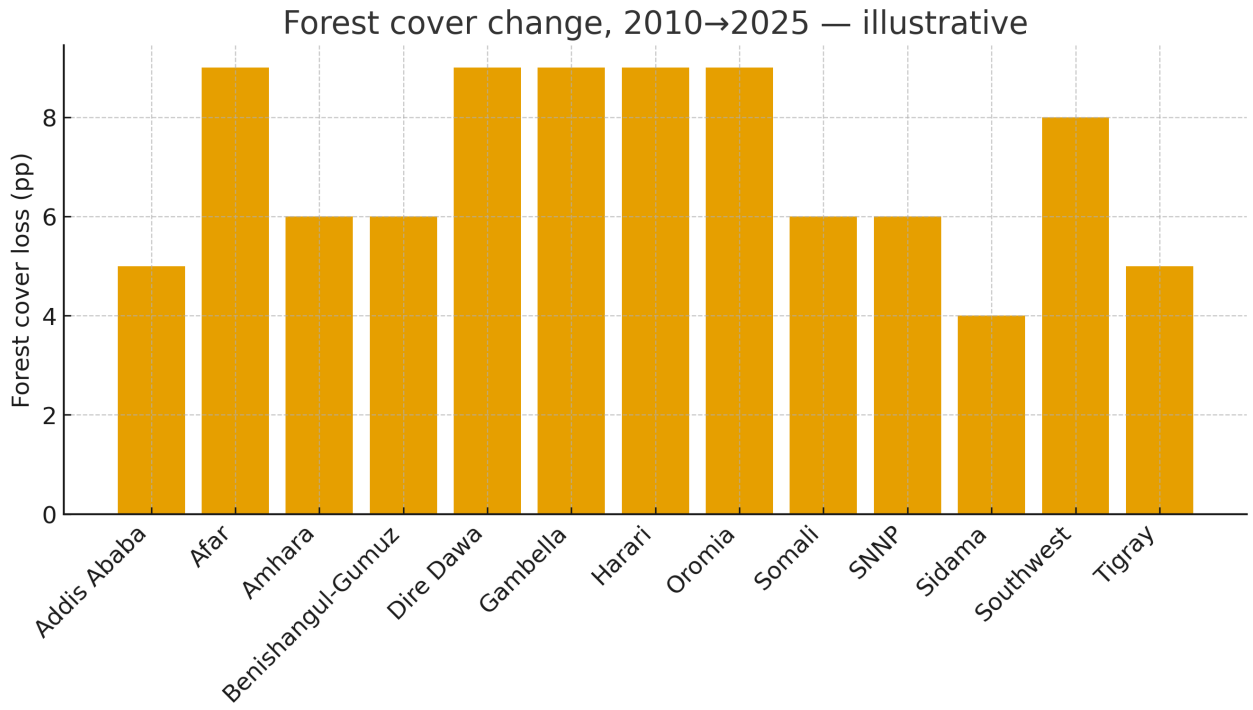


Figure 7.11-6. Human pressure vs forest cover — regional

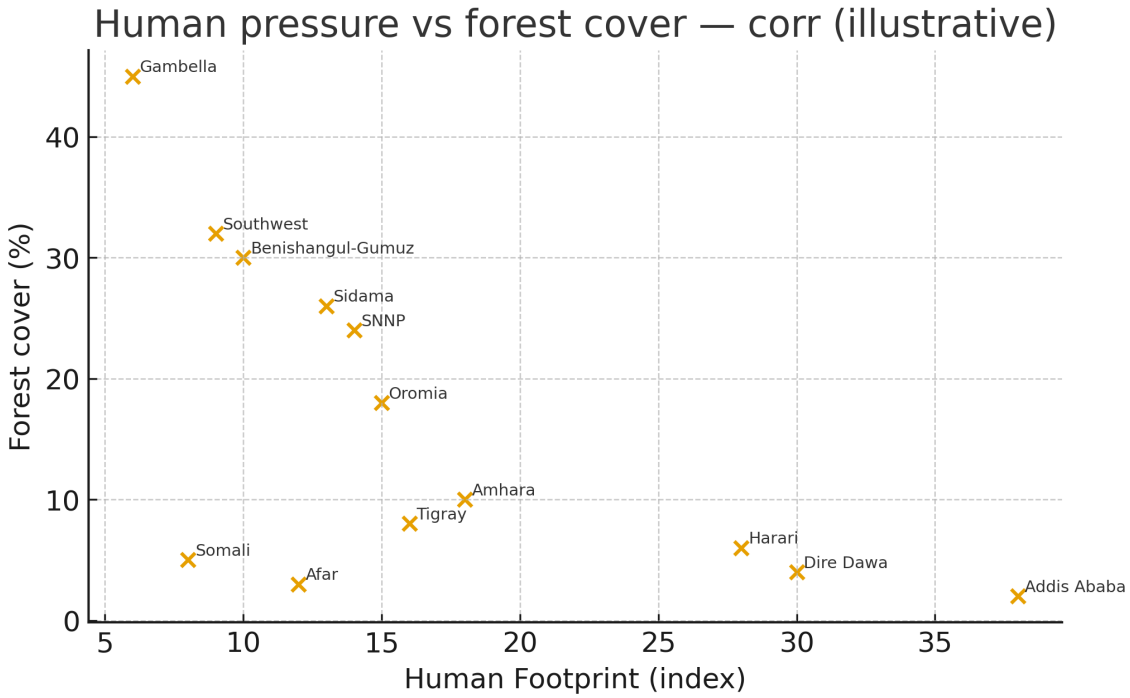


Figure 7.11-7. Environmental risk proxies (PM2.5, heat, flood)

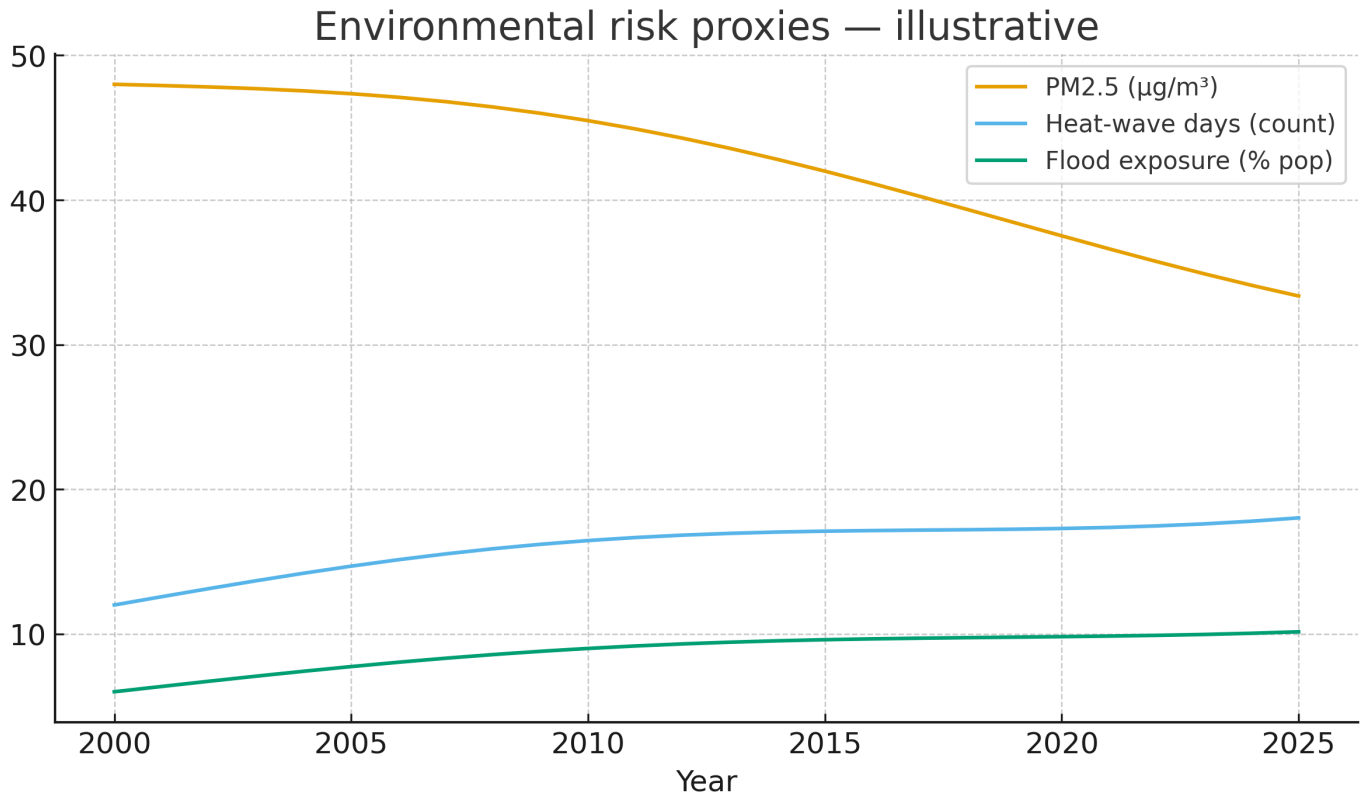


Figure 7.11-8. Pathways schematic

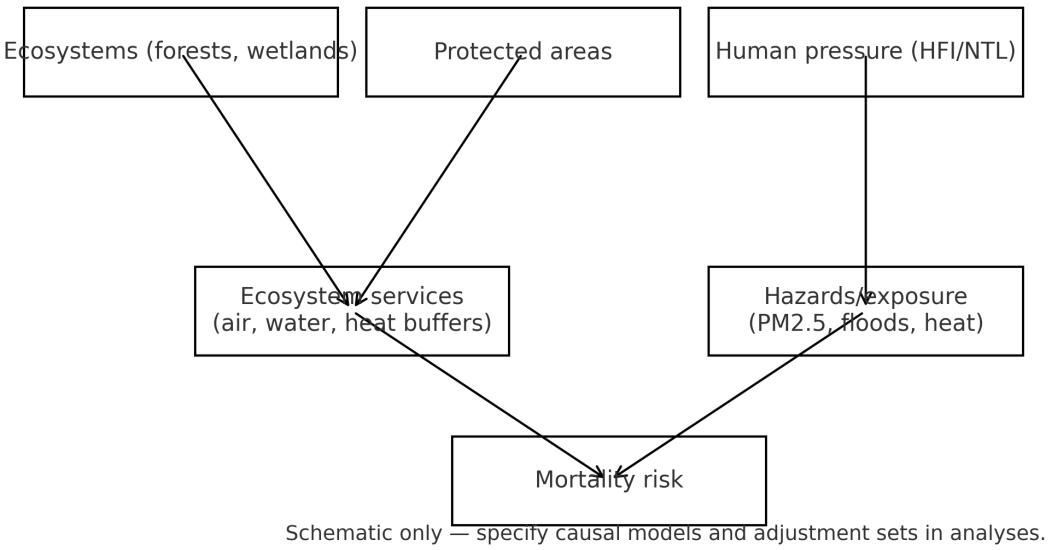


Table 7.11-A. Indicators & definitions

Indicator	Definition / note
Protected area coverage	Share of national/region land in protected status (IUCN I–VI).
Forest cover / loss	Percent land with tree cover; annual loss in percentage points.
Human Footprint Index (HFI)	Composite of built environment, population density, land use, access.
Night-time lights (NTL)	Proxy for built intensity and economic activity.
Population near PAs	% of people living within a buffer (e.g., 10 km) of protected areas.
PM2.5 / heat days / flood exposure	Environmental risk proxies relevant to mortality pathways.

Table 7.11-B. Latest national snapshot (2025, illustrative)

Metric	Value
Protected area coverage (%)	16.2
Forest cover (%)	11.2
Forest loss (% pts/year)	0.447
Human Footprint (index)	12.7
Night-time lights (index)	6.4
Population within 10km of PAs (%)	29.4
PM2.5 (μg/m³)	33.4
Heat-wave days (count)	18.0
Flood exposure (% pop)	10.1
U5MR (per 1,000)	35.3

Table 7.11-C. Regional snapshot (2025)

Region	PA coverage (%)	Forest cover (%)	Human Footprint (0–50)	Population density (/km²)	Population near PAs (%)
Addis Ababa	8	2	38	5400	12.9
Afar	14	3	12	18	13.8
Amhara	10	10	18	144	11.4
Benishangul-Gumuz	22	30	10	22	17.3
Dire Dawa	12	4	30	1500	11.8
Gambella	28	45	6	12	20.3
Harari	9	6	28	1400	10.8
Oromia	16	18	15	110	14.3
Somali	13	5	8	16	14.0
SNNP	18	24	14	170	15.3

Sidama	17	26	13	220	15.1
Southwest	20	32	9	60	16.7
Tigray	12	8	16	85	12.5

Table 7.11-D. Forest change 2010→2025

Region	Forest cover 2010 (%)	Forest cover 2025 (%)	Loss (pp)	Loss (%)
Addis Ababa	7	2	5	71.4
Afar	12	3	9	75.0
Amhara	16	10	6	37.5
Benishangul-Gumuz	36	30	6	16.7
Dire Dawa	13	4	9	69.2
Gambella	54	45	9	16.7
Harari	15	6	9	60.0
Oromia	27	18	9	33.3
Somali	11	5	6	54.5
SNNP	30	24	6	20.0
Sidama	30	26	4	13.3
Southwest	40	32	8	20.0
Tigray	13	8	5	38.5

Table 7.11-E. Interpretation & policy levers

Priority action	Why it matters in Ethiopia
Protect & restore high-service ecosystems	Watersheds, montane forests and wetlands reduce PM2.5, floods and heat.
People–parks interface management	Co-management, community benefits, regulated access to reduce encroachment.
Land-use planning	Direct growth to low-risk zones; integrate NTL/HFI & hazard layers.
Data integration	Link World Database on Protected Areas (WDPA), Global Forest Watch, WorldPop/HRSL, HFI and hazards in DHIS2-adjunct dashboards.
Health co-benefits tracking	Include environmental co-benefit indicators in health planning (e.g., heat action plans).

References — Section 7.11

- UNEP-WCMC World Database on Protected Areas (WDPA) — protected area extents/classifications.

- Global Forest Watch — tree cover and loss; regional trends for Ethiopia.

- Human Footprint / Human Modification datasets — built and access pressures.

- VIIRS/DMSP night-time lights — urban expansion and economic activity.

- WorldPop / HRSL — population near protected areas; exposure overlays.

- Air quality & hydrometeorology sources — PM2.5, heat, flood-risk layers.

7.12) Materials, Waste & Circular Economy

Purpose. Summarize Ethiopia’s materials use, waste systems and circularity, relate mismanagement to health risks, and outline city-level policy levers. Replace templates with official city sanitation plans, EPA/MoUo urban data, WHO/UN-Habitat/World Bank indicators, and SDG reporting.

Figure 7.12-1. Municipal solid waste — generation & service chain

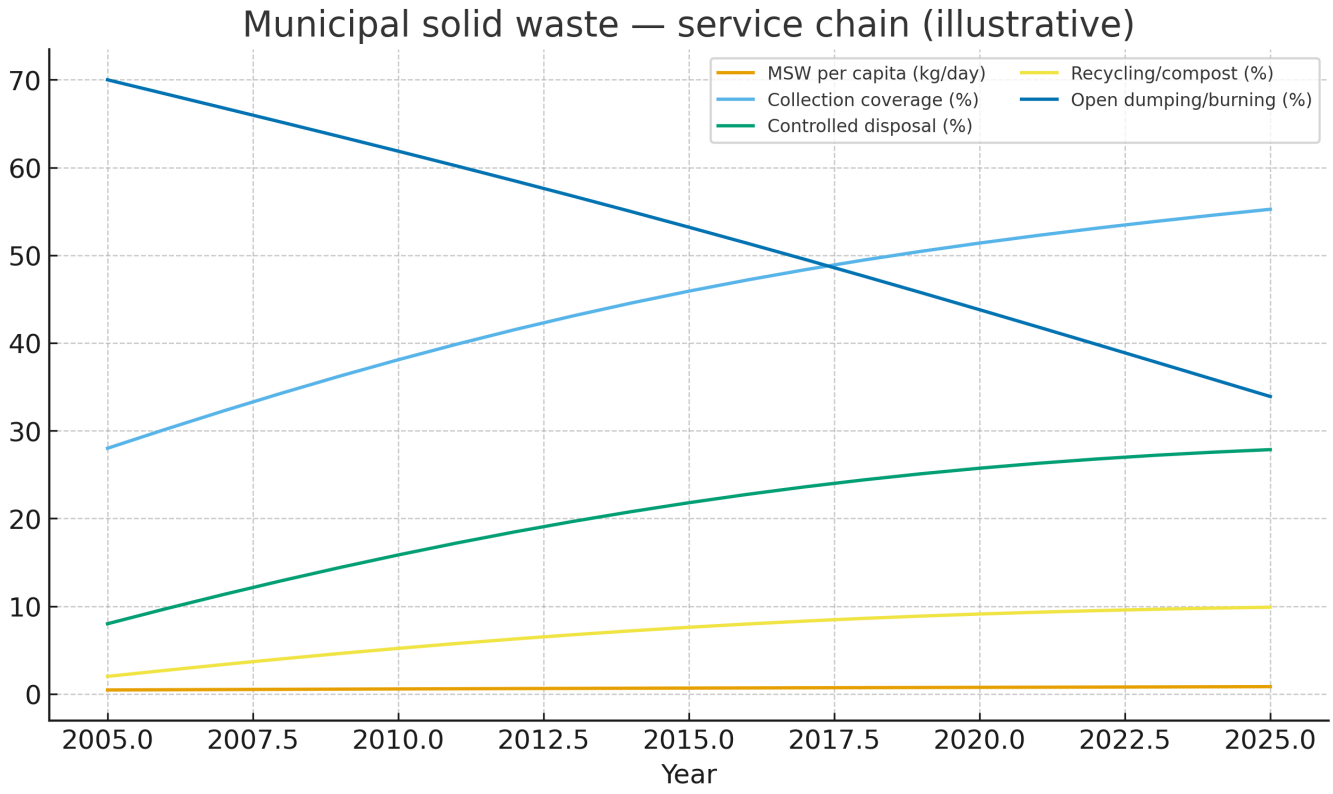


Figure 7.12-2. Healthcare waste — intensity & safe treatment

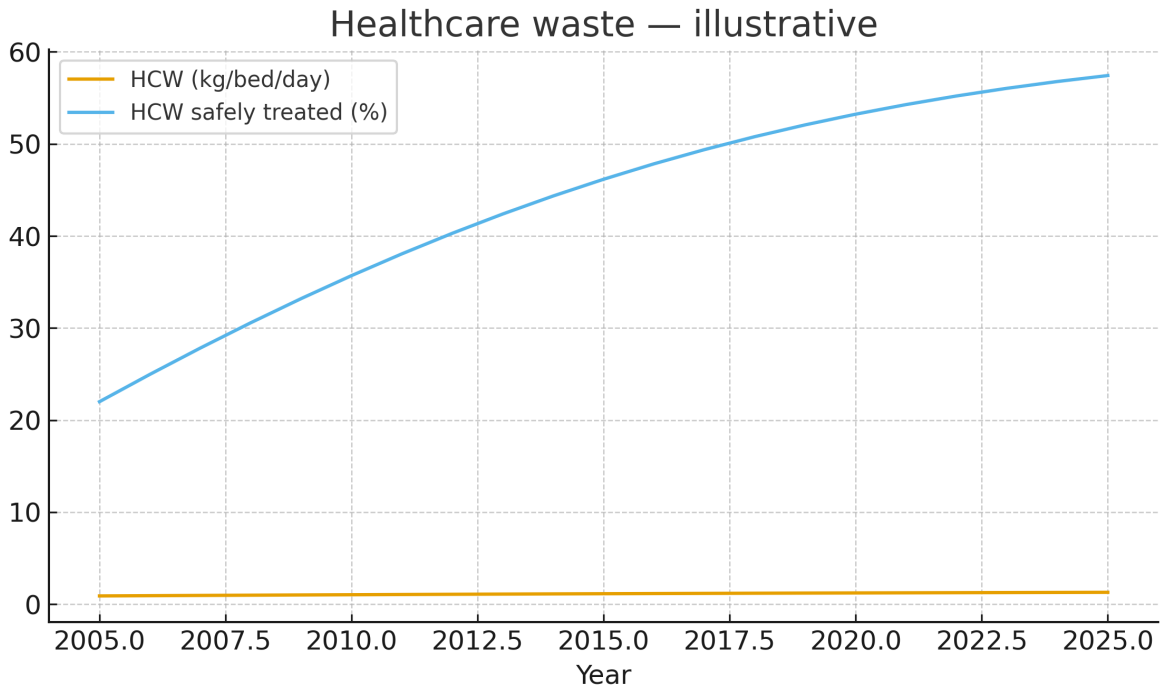


Figure 7.12-3. E-waste — generation vs formal collection

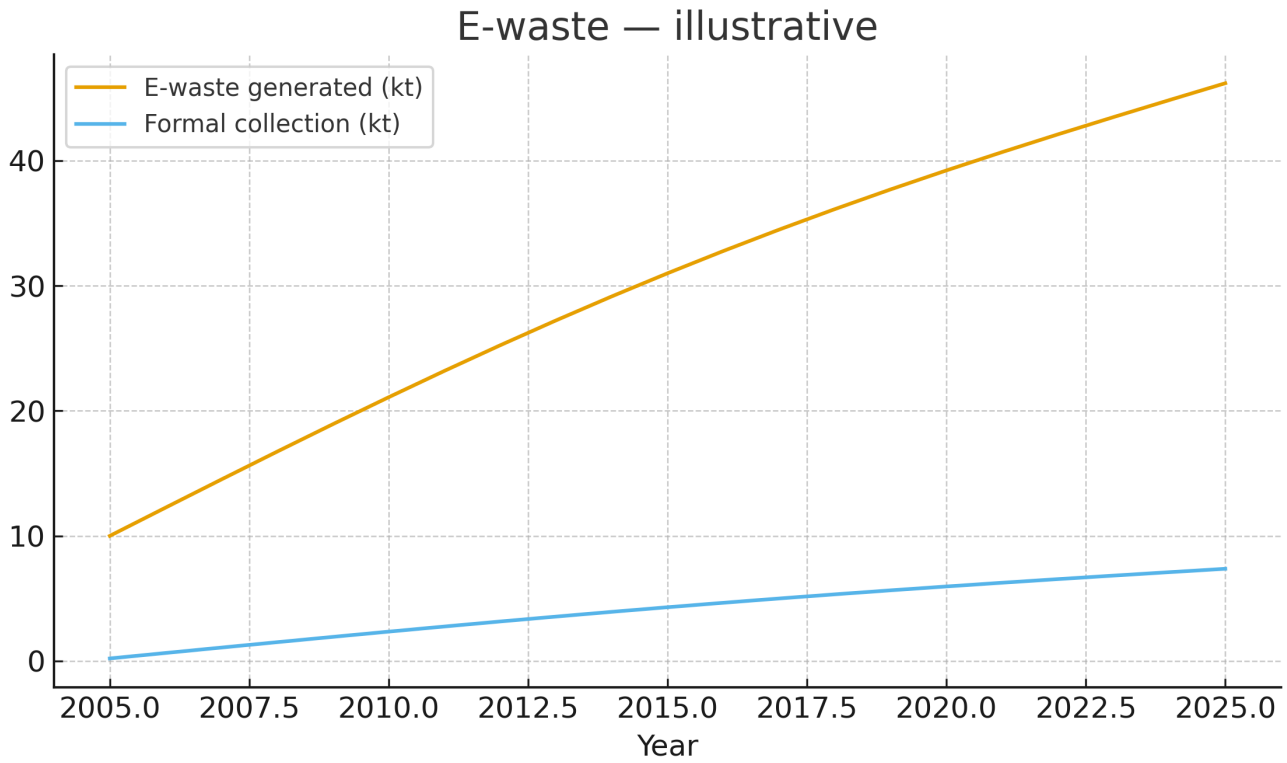


Figure 7.12-4. Material footprint & circularity

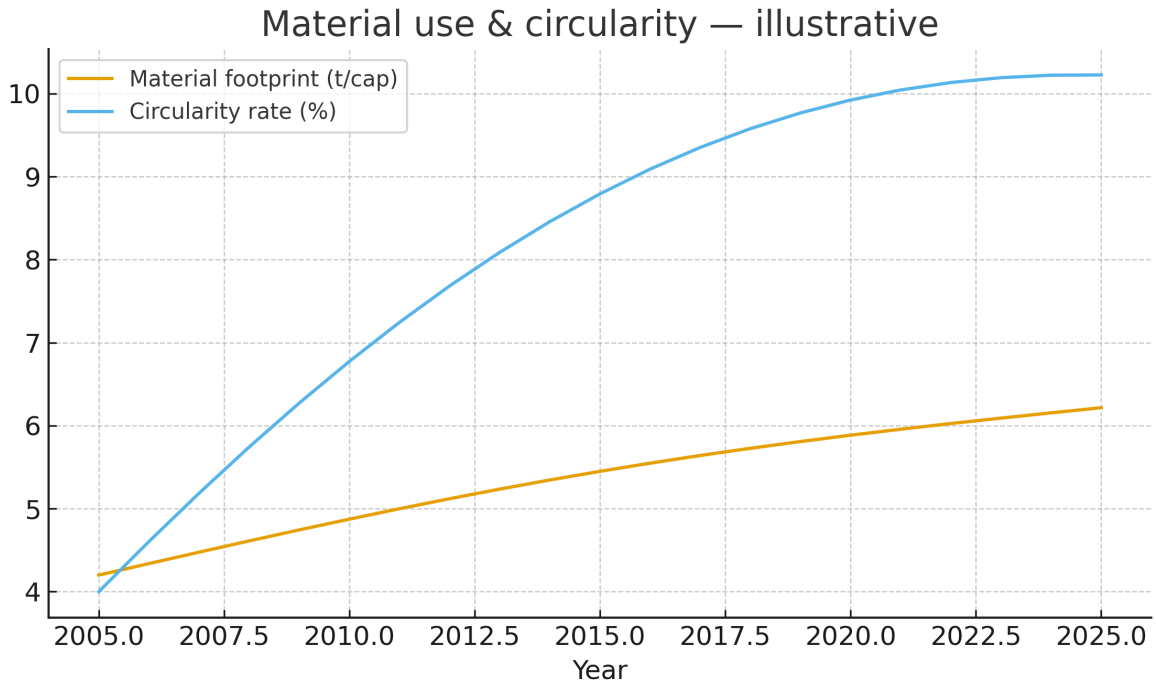


Figure 7.12-5. Regional waste services snapshot (2025)

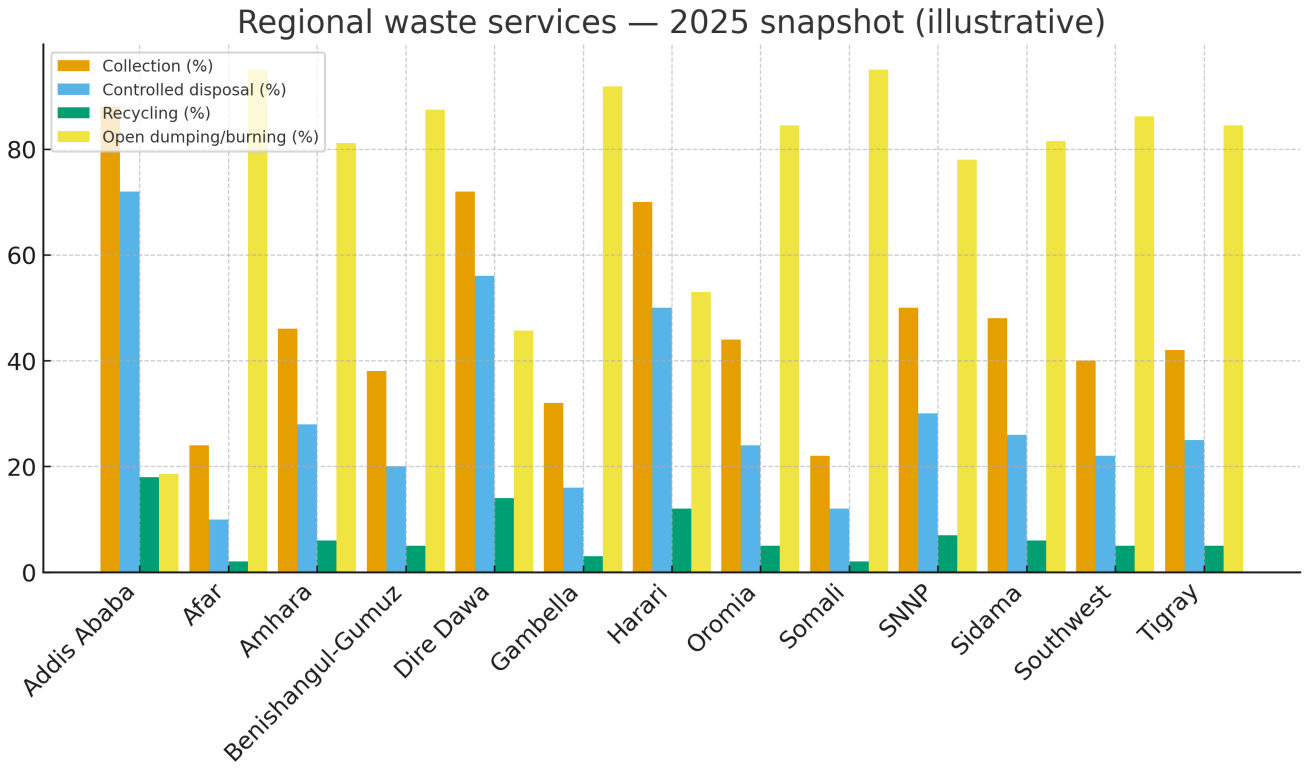


Figure 7.12-6. Waste mismanagement & U5 diarrheal mortality

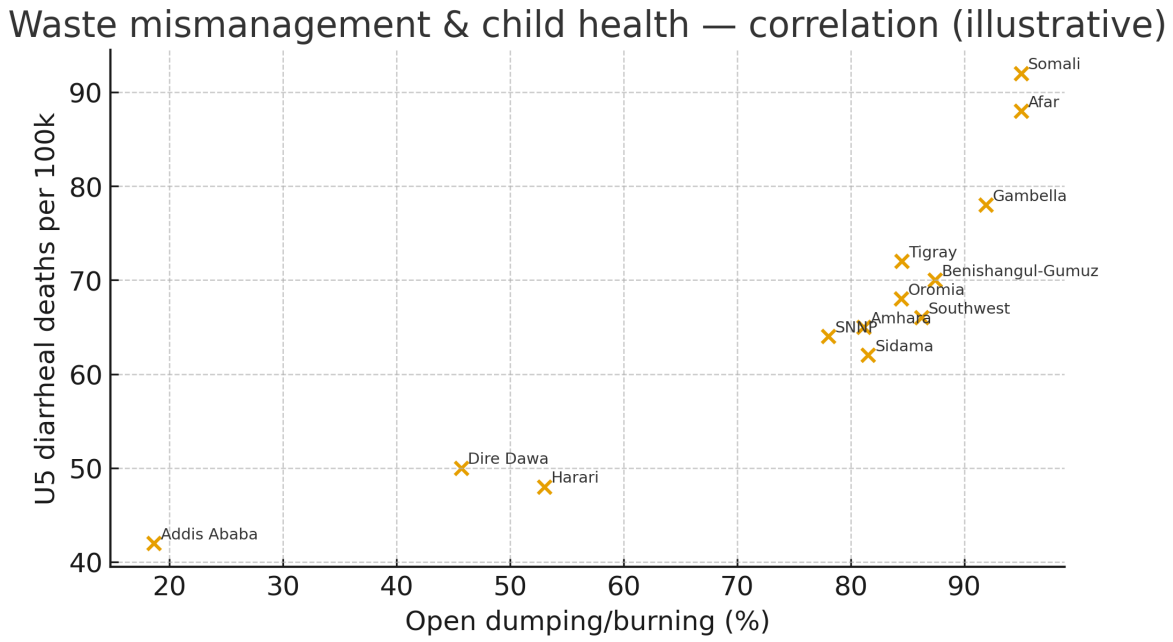


Figure 7.12-7. Population near dumpsites/landfills (2025)

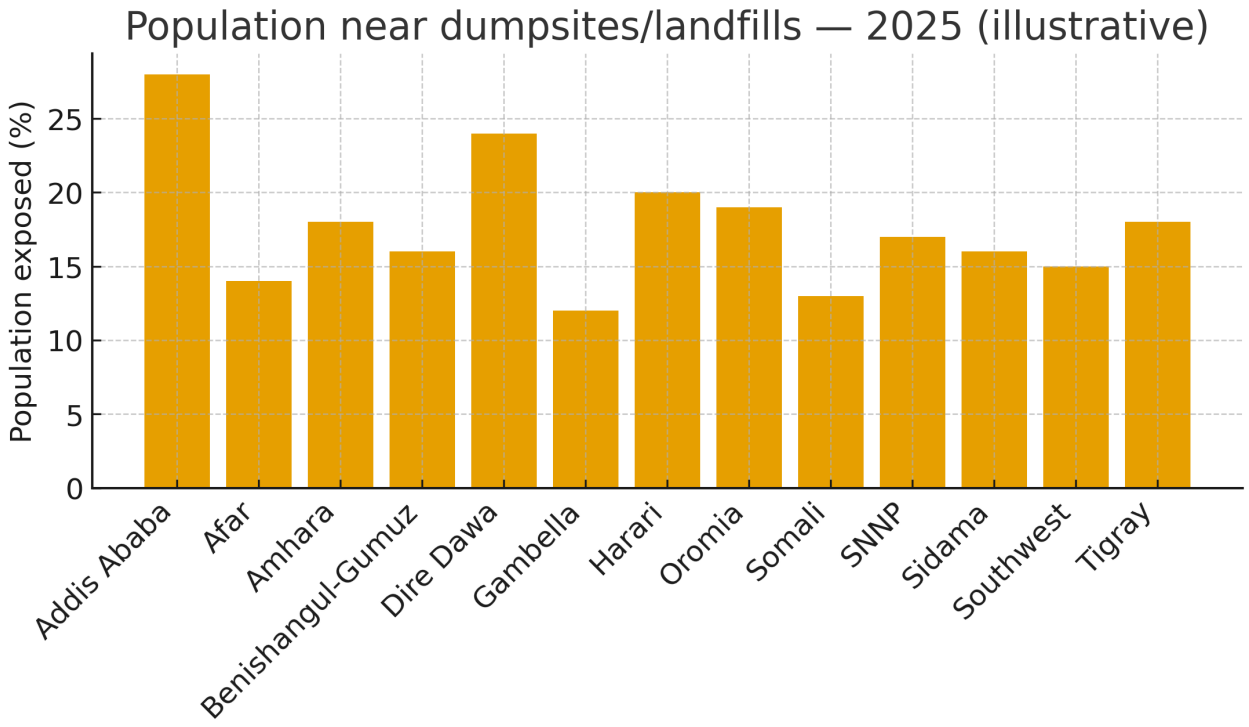


Table 7.12-A. Indicators & definitions

Indicator	Definition / note
MSW per capita	Municipal solid waste generated per person per day (kg).
Collection coverage / controlled disposal	% population served; share of collected waste disposed in sanitary landfills/engineered sites.
Recycling/composting	% of generated MSW recovered for secondary use.
Open dumping/burning	% of generated MSW unmanaged or openly burned.
Healthcare waste (HCW) & safe treatment	Kg/bed/day and % treated via autoclave/incineration with emission controls.
E-waste generation & formal collection	Kt generated and kt formally collected/recycled.
Material footprint & circularity	Domestic material consumption per capita and share from recycled inputs.
Exposure to dumpsites	% population within buffer around dumpsites/landfills (proxy for risk).

Table 7.12-B. Latest national snapshot (2025, illustrative)

Metric	Value
MSW per capita (kg/day)	0.83
Collection coverage (%)	55.2
Controlled disposal (%)	27.8
Recycling/composting (%)	9.9
Open dumping/burning (%)	33.9
HCW (kg/bed/day)	1.29
HCW safely treated (%)	57.4

E-waste generated (kt)	46.2
E-waste formally collected (kt)	7.4
Material footprint (t/cap)	6.2
Circularity rate (%)	10.2

Table 7.12-C. Regional snapshot (2025)

Region	Collection (%)	Controlled disposal (%)	Recycling (%)	Open dumping/burning (%)	Pop. near dumpsites (%)	U5 diarrheal deaths /100k
Addis Ababa	88	72	18	18.64	28	42
Afar	24	10	2	95.0	14	88
Amhara	46	28	6	81.12	18	65
Benishangul-Gumuz	38	20	5	87.4	16	70
Dire Dawa	72	56	14	45.68	24	50
Gambella	32	16	3	91.88	12	78
Harari	70	50	12	53.0	20	48
Oromia	44	24	5	84.44	19	68
Somali	22	12	2	95.0	13	92
SNNP	50	30	7	78.0	17	64
Sidama	48	26	6	81.52	16	62
Southwest	40	22	5	86.2	15	66
Tigray	42	25	5	84.5	18	72

Table 7.12-D. Health links & interpretation notes

Topic	Interpretation / guidance
Open dumping & diarrheal risk	corr ≈ 0.88 (illustrative). Fecal-oral exposure from leachate/vectors.
HCW management	Unsafe treatment risks sharps injuries and dioxins/furans; prioritize emission-controlled options.
E-waste	Informal processing exposes workers to heavy metals; formal collection remains low.
Circular economy	Higher recycling reduces landfill load and upstream emissions.
Equity	Unserved settlements disproportionately exposed; map hotspots for priority action.

Table 7.12-E. Program & policy levers

Priority action	Why it matters in Ethiopia
City sanitation improvement plans	Expand collection, controlled disposal, and separate organics with composting.
Dumpsite risk mitigation	Capping, leachate control, gas management; progressive transition to sanitary landfills.
HCW systems	Segregation at source; safe treatment technologies; monitoring of emissions and ash disposal.
E-waste systems	Extended producer responsibility (EPR); formal refurbish/recycling; safe collection points.
Circular economy enablers	Market development for recyclate/compost; public procurement; design for recycling.
Data systems	Track SDG 11.6.1, 12.4.2, 12.5.1; integrate waste data in city dashboards.

References — Section 7.12

- UN-Habitat & World Bank — solid waste management diagnostics & SDG 11.6.1 guidance.

- WHO — healthcare waste management (Safe management of wastes from health-care activities).

- Global E-waste Monitor — generation and formal collection estimates.

- UNEP International Resource Panel — material footprint & circularity metrics.

- Ethiopia EPA/Municipal sanitation strategies — city waste data and plans.