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Research Article

Keywords: Universal health Coverage, Service Coverage index, health systems, Ethiopia

Posted Date: April 22nd, 2026

DOI: https://doi.org/10.21203/rs.3.rs-9312615/v1

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Additional Declarations: No competing interests reported.

Progress towards Universal Health Coverage in Ethiopia: National achievement and regional disparities

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Abstract

Background: Regular and timely measurement provides the basis for evaluating how effectively health systems are advancing toward universal health coverage (UHC). In Ethiopia, comprehensive and recent assessments that measure UHC progress across both national and subnational levels remain limited. This study aims to estimate Ethiopia's UHC Service Coverage Index for 2024 at national and regional levels and identify regional disparities.

Methods: UHC service coverage was estimated using WHO's UHC measurement framework. The UHC Service Coverage Index (SCI) was computed using standard 14 tracer indicators, categorized into four domains consistent with global UHC monitoring framework. Data from 2024 national surveys and administrative sources were used. Estimation of the UHC SCI was computed from geometric mean of tracer indicators. Sub-national analysis was done to determine regional disparity in UHC progress

Results: The overall UHC SCI for Ethiopia in 2024 was 44%, substantially far from Ethiopia's target of 58% by 2026 and global target of 80% by 2030. It ranges from 23% in Somali region to 64% in Addis Ababa. By domain, the national UHC SCI for infectious diseases was 66%, ranging from25% in Somali to 71% in Dire Dawa. Reproductive, maternal, neonatal and child health (RMNCH) domain scored 53%, ranging from 17% in Somali to 78% in Addis Ababa. The national service capacity and access domain scored 39%, and the non-communicable diseases (NCDs) scored the lowest at 27%.

Conclusion: The UHC SCI of Ethiopia was found to be low in 2024 and highlights both progress and critical gaps in the delivery of essential health services. The overall and domain specific UHC SCI scores differs at sub-national levels. Ethiopia has achieved progress in infectious disease control and RMNCH, but significant gaps persist in NCDs and service capacity and access. The low performance in NCDs, along with capacity challenges such as limited health workforce density and uneven facility readiness constrains the country's journey toward equitable and comprehensive health coverage. There are substantial regional disparities, urban administrative areas demonstrating markedly higher service coverage compared to rural settings. Addressing these inequities will require integrated and context-specific strategies that simultaneously strengthen health system capacity, improve geographic access, expand NCD management, and address underlying socioeconomic and cultural barriers.

Key terms: Universal health Coverage, Service Coverage index, health systems, Ethiopia

Introduction

Universal Health Coverage (UHC) has become a central goal of global health and development agendas [1]. The UHC aims to ensure that all people have access to the full range of quality health services without financial hardship, covering a full continuum of essential health services, from health promotion to prevention, treatment, rehabilitation and palliative care across the life course [2]. The United Nations General Assembly, as part of the Sustainable Development Goal (SDG) for health, calls on all countries to ensure UHC by 2030 [3], and UHC is widely recognized not only as a marker of health system performance, but also as a driver of human capital development, economic productivity, and social equity [4]. Globally, while significant improvements have been made in expanding service coverage, the pace of progress remains uneven, often leaving the most vulnerable populations behind [5]. As countries strive to accelerate progress toward the SDGs, robust measurement of UHC attainment has gained prominence for tracking improvements in service coverage, financial protection, and equity across populations [5].

Ethiopia has integrated UHC principles into its long-term development agendas, most notably through the successive implementation of the Health Sector Transformation Plans (HSTP-I and II) and the Health Sector Development and Investment Plan (HSDIP) [6,7, 8]. The country has made substantial investments in health system strengthening over the past two decades that aimed at expanding equitable access to essential health services. Central to this is the strengthening of Primary Health Care (PHC), through an innovative community-based service delivery platform, the Health Extension Program (HEP), expansion of PHC infrastructure, and ongoing health financing reforms such as Community-Based Health Insurance (CBHI) are the government commitments towards UHC. These efforts have contributed to notable improvements in key health outcomes, including expanded coverage of several essential helath interventions and reductions in maternal and child mortality [9, 10].

Despite this progress, Ethiopia continues to face significant challenges in achieving UHC and have persistent gaps in service coverage. In addition, disparities in access to and service utilization exist across regions across the country due to overarching barriers including diverse geographic features, socio-economic status, and demographic contexts, including agrarian, pastoralist, and urban settings, create varying health system capacities and service readiness [9, 11, 13]. These

differences highlight the importance of examining UHC progress not only at the national level but also across subnational administrative units.

Timely measurement of UHC is essential for tracking progress, identifying gaps, and ensuring accountability in achieving targets. To support global and national UHC monitoring efforts, the WHO and the World Bank developed a standardized framework based on two key dimensions: service coverage and financial protection [5]. The UHC Service Coverage Index (SCI) is a composite measure derived from tracer indicators and provides a comprehensive assessment of access to essential health services. Complementing this, financial protection is measured through indicators such as catastrophic and impoverishing health expenditures [2, 12]. While national-level UHC estimates provide an overall picture, they often mask substantial subnational variations. Understanding these disparities is critical for targeted policy interventions and for advancing equitable progress toward UHC.

Although several studies have assessed aspects of health service coverage or financial protection in Ethiopia, comprehensive assessments that measure UHC progress across both national and subnational levels remain limited. Existing measurements often rely on disparate data sources, focusing on selected service domains. Only few studies comprehensively assessed Ethiopia's progress towards UHC service coverage index [13,14,15]; however, these studies are conducted several years ago [13, 14] or lack subnational analysis [14, 15]. In addition, UHC SCI measurement indicators are currently updated by WHO to include effective coverage indicators than the previously used proxy indicators and Ethiopia has recently undergone new national surveys that provide latest data sources to compute UHC SCI [5]. Therefore, this study aims to assess progress towards UHC in Ethiopia by measuring service coverage at both national and subnational levels using methodologies aligned with global monitoring frameworks. By examining variations across regions and health service domains, the study seeks to provide evidence that can support policy makers and health system planners in identifying priority gaps and guiding strategies to accelerate equitable progress toward UHC.

Methods

Study design and measurement framework

This study employed a cross-sectional design using secondary data to monitor progress toward UHC in Ethiopia at both national and subnational levels. The study was guided by the World Health Organization (WHO) and the World Bank that developed two core indicators for UHC monitoring: the UHC SCI and the financial protection indicators related to catastrophic and impoverishing health expenditures. This study used UHC SCI as a composite metric from 14 tracer indicators across four domains: reproductive, maternal, newborn, and child health (RMNCH); infectious diseases; non-communicable diseases (NCDs); and service capacity and access [5].

Study setting

This study was conducted in Ethiopia, a low-income country located in the Horn of Africa with a rapidly expanding health system and a strong policy commitment toward achieving UHC. Ethiopia has a population of about 135 million [16] and has a decentralized federal governance structure that provides administrative autonomy to regional governments in planning and implementing health services.

Administratively, Ethiopia is divided into 12 regional states and two city administrations. The 12 regional states include Tigray, Afar, Amhara, Oromia, Somali, Benishangul-Gumuz, Central Ethiopia, South Ethiopia, Sidama, Southwest Ethiopia, Gambela and Harari Region; and the two city administrations include Addis Ababa, and Dire Dawa. These administrative units vary substantially in terms of population size, geographic characteristics, socioeconomic development, and health system capacity.

Ethiopia's health system is organized as three-tier structure consisting of primary, secondary, and tertiary levels of care. The primary health care level forms the foundation of the health system and includes health posts, health centers, and primary hospitals organized into primary health care units (PHCUs) that serve defined catchment populations. A key component of Ethiopia's PHC strategy is the HEP, which deploys trained health extension workers to deliver essential

preventive and promotive health services at the community level. The secondary level of care consists of general hospitals and Tertiary level of care is provided by comprehensive specialized hospitals [6-8].

Indicators

The UHC service coverage refers to the average coverage of essential health services measured using a set of tracer interventions that reflect service use across different domains. In this study, the UHC SCI was computed using the standard 14 tracer indicators, categorized into four domains consistent with the global UHC monitoring frameworks: (1) reproductive, maternal, newborn and child health (RMNCH); (2) infectious diseases; (3) non-communicable diseases (NCDs); and (4) service capacity and access.

The RMNCH domain indicators includes four tracer indicators: demand satisfied for family planning (DSFP), antenatal care (ANC) coverage of four or more visits, pentavalent (DPT3) vaccination third dose coverage, and the proportion of children with suspected pneumonia for whom treatment was sought. The infectious diseases domain comprises tuberculosis treatment coverage, the proportion of people living with HIV (PLHIV) receiving antiretroviral therapy (ART), and the proportion of the population sleeping under ITN. The NCDs domain consists of three indicators: hypertension treatment coverage, diabetes mellitus treatment coverage, and the prevalence of tobacco-non-use. The service capacity and access domain includes hospital bed density, health workforce (HWF) density, and International Health Regulations (IHR) core capacity indicators. A summary of all tracer indicators by domain is provided in Table 1.

Data sources

The study utilized multiple up-to-date and nationally representative data sources to ensure comprehensive measurement of the UHC tracer indicators. Data for RMNCH indicators were obtained from the 2024/25 Ethiopian Demographic and Health Survey (EDHS), a nationally representative household survey that provides detailed information on health service utilization, particularly for RMNCH services [17]. For NCD tracer indicators including hypertension treatment, diabetes treatment, and tobacco non-use, the 2024 National STEPS Survey, a nationwide assessment of NCD risk factors and disease prevalence [18]. The tracer indicator for Insecticide-treated Net (ITN) utilization was sourced from the 2024 national ITN Survey [19].

Indicators related to tuberculosis, HIV/AIDS treatment coverage, water, sanitation and hygiene (WASH) services, as well as hospital bed access, were derived from Ethiopia's Routine Health Management Information System (HMIS)/DHIS2 platform [20]. Data on health workforce density were obtained from the National Human Resource Information System (HRIS) report, while the tracer indicator for International Health Regulations (IHR) core capacities was measured using the 2024 State Party Self-Assessment Annual Report (SPAR) [21].

189 *Table 1: UHC service coverage tracer indicators, their description and data sources*

Domain	Program category	Indicator – short name	Description	Data source
RMNCH	Family planning	FP	Percentage of women of reproductive age (15−49 years) who have their need for family planning satisfied with modern methods	EDHS 2024/25
	Pregnancy care	ANC	Percentage of women aged 15-49 years with a live birth in a given time period who received antenatal care four or more times	EDHS 2024/25
	Child immunization	DPT3	Percentage of infants receiving three doses of diphtheria-tetanus-pertussis containing vaccine	EDHS 2024/25
	Childcare seeking	Pneumonia	Percentage of children younger than 5 years with symptoms of acute respiratory infection in the 2 weeks preceding the survey for whom advice or treatment was sought from a health facility or provider	EDHS 2024/25
Infectious Diseases	Tuberculosis	TB	Percentage of incident TB cases that are detected and treated	HMIS/DHIS2 2024/25
	HIV/AIDS	ART	Percentage of adults and children living with HIV currently receiving antiretroviral therapy	HMIS/DHIS2 2024/25
	Malaria	ITN	Percentage of population in malaria-endemic areas who slept under an insecticide-treated net the previous night	LLN Survey 2024
	Water, Sanitation and Hygiene	WASH	Percentage of population using at least basic sanitation services	HMIS/DHIS2 2024/25
NCDs	Hypertension	HP	Coverage of treatment (taking medicine) for hypertension among adults aged 30-79 years with hypertension	STEPS survey 2024
	Diabetes	DIAB	Coverage of treatment (taking medication) for diabetes among adults aged 30 years and over with diabetes	STEPS survey 2024
	Tobacco non-use	Tobacco	Age-standardized prevalence of adults >=15 years currently not using any tobacco product (smoked and/or smokeless tobacco) on a daily or non-daily basis	STEPS survey 2024
Service Capacity and access	Hospital access	Bed density	Hospital beds density, relative to a maximum threshold of 18 per 10,000 population	HMIS/DHIS2 2024/25
	Health workforce	HWF density	Health workers (medical doctors, nursing and midwifery personnel and health officers) per capita, relative to a combined maximum threshold	HRIS report 2024/25
	Health security	IHR	International Health Regulations (IHR) core capacity index, which is the average percentage of attributes of 13 core capacities that have been attained	SPAR assessment/EPHI

190

Data Analysis

Estimation of the UHC Service Coverage Index

The UHC SCI summarize the coverage of essential health services across multiple domains and was reported on a scale from 0 to 100, with higher scores indicating better performance. The computation followed a two-step approach. First, domain -specific scores were calculated using the tracer indicators assigned to each domain. Second, the overall UHC SCI was derived from the four domain scores. The geometric mean was applied to all stages of the analysis to reduce the influence of extreme values and to appropriately reflect the multiplicative relationship among different components of service coverage. The geometric mean was computed as the nth root of the product of the n coverage indicators, expressed either as percentages or decimals, depending on the indicator format.

RMNCH Domain: The RMNCH domain score was calculated as the geometric mean of four tracer indicators: family planning coverage (FP), antenatal care (four or more visits), DTP3 immunization coverage, and care-seeking for suspected pneumonia among children under five years.

$$\boldsymbol{RMNCH = \sqrt[4]{(FPxANCxDPT3XPneumonia)}}$$

Infectious diseases (ID) domain: The infectious diseases domain score was calculated as the geometric mean of four tracer indicators: tuberculosis (TB) treatment coverage, ART coverage for people living with HIV, utilization of ITN, and access to basic water and sanitation (WASH) services.

$$\boldsymbol{ID = \sqrt[4]{(TB \times ART \times ITN \times WASH)}}$$

NCDs domain - The NCD domain score was calculated as the geometric mean of three tracer indicators: treatment coverage for hypertension (HP), treatment coverage for diabetes (DIAB), and tobacco non-use.

$$\text{NCD} = \boldsymbol{\sqrt[3]{(HP\ x\ DIAB\ x\ Tobacco)}}$$

Service capacity and access (SCA) domain - This SCA domain reflects the health system's readiness and capacity to deliver essential services. The domain score was calculated as the geometric mean of three tracer indicators: Hospital bed density (Hosp), health workforce (HWF) density, and International Health Regulations (IHR) core capacity.

$$\text{SCA} = \sqrt[3]{(\boldsymbol{Hosp\ x\ HWF\ x\ IHR})}$$

Overall UHC SCI: The overall UHC SCI was calculated as the geometric mean of the four domain scores, producing a composite measure that reflects service coverage across the health system.

$$\boldsymbol{UHC\ SCI} = \sqrt[4]{(\boldsymbol{D_{RMNCH} \times D_{ID} \times D_{NCD} \times D_{SCA}})}$$

Rescaling and standardization of indicators: Some indicators were not originally measured on a 0–100 coverage scale and were therefore rescaled to ensure comparability across tracer indicators. The indicators were rescaled and standardized using WHO-recommended benchmarks:

- **Tobacco non-use:** Derived from the prevalence of tobacco use and reverse scaled. The prevalence of non-use of tobacco was rescaled using a value of 30%, which indicates a realistic range of prevalence levels for the indicator. It was rescaled using the following formula:

  $$\text{Tobacco non-use} = (X - 30) / (100 - 30) \times 100$$

- **Health workforce density:** This was rescaled based on the WHO benchmark threshold of 4.45 health workers per 1,000 population, representing the minimum density required to deliver essential health services.

  $$\text{Rescaled HWF density} = (X / 4.45) * 100.$$

- **Hospital bed density:** The indicator was computed relative to a threshold value of 18 hospital beds per 10,000 population. It was rescaled using a benchmark of 18 beds per 10,000 population.

  $$\text{Rescaled hospital bed density} = (X / 18) * 100.$$

These rescaled transformations ensured that all tracer indicators were expressed on a standardized 0–100 scale, allowing meaningful aggregation within and across domains.

Subnational analysis: Subnational analyses were conducted to assess regional variations in service coverage. The UHC SCI was calculated separately for each of Ethiopia's regions and city administrations using the same methodology applied at the national level. This allowed identification of geographic disparities in health service coverage and provided insights into subnational progress toward UHC, the minimum and maximum information presented in Sparked lines. Heatmaps generated using Microsoft Open Software (Microsoft 365) were employed to illustrate regional disparities in the UHC SCI across four domains: RMNCH, IDs, NCDs, and SCA. Regional progress toward UHC was visualized using a standardized color-coded scheme. Regions shaded in red represent very low performance (<30.0%) and require urgent and sustained support across all UHC domains. Orange-shaded areas indicate low performance (30.0–49.9%), calling for intensified follow-up to accelerate improvements. Yellow-shaded areas denote moderate performance (40.0–49.9%) and require close monitoring to sustain momentum. Regions shaded in green demonstrate relatively high performance (≥50%), where efforts should focus on maintaining and further strengthening progress toward UHC targets.

The summary of how calculation for UHC domains and sub-domains was done is described in figure 1.

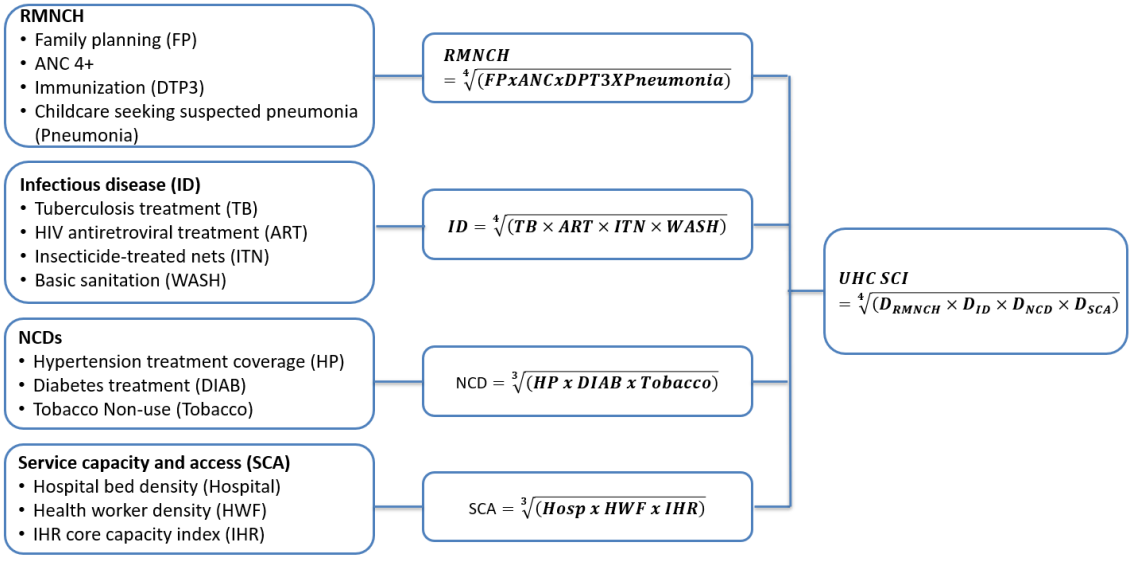


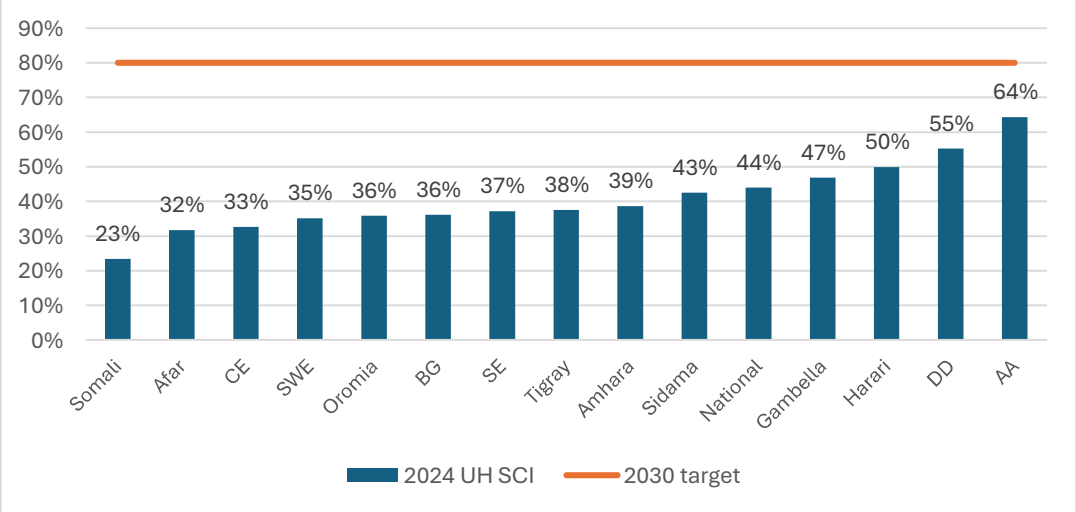
Fig 1: Calculation of UHC domains and overall UHC SCI

Results

The findings of this study were presented by first highlighting the overall national and regional UHC SCI achievements using bar charts and summary tables, followed by a detailed breakdown of sub-domain performance across the regional states of Ethiopia.

Overall UHC Service Coverage

Ethiopia's overall UHC SCI in 2024 was 44%, with substantial regional disparities. The subnational estimates revealed a wide variation in UHC SCI, ranging from 23% in the Somali Region State to 64% in Addis Ababa, representing a gap of 41 percentage points between the highest and lowest performing regions. Urban administrative regions demonstrated comparatively higher performance, with Addis Ababa (64%), Dire Dawa (55%), and Harari (50%). In contrast, predominantly pastoralist regions, such as Somali (23%) and Afar (32%), showed markedly lower coverage. Most regions, including Amhara (39%), Tigray (38%), Oromia (36%), Benishangul Gumuz (36%), South Ethiopia (37%), Southwest Ethiopia (35%), and Central Ethiopia (33%), scored below the national average, clustering within a narrow range of 30–40% [Table 2]. These findings highlight that national progress in UHC service coverage represents uneven performance at the subnational level with overall performance largely driven by the comparatively stronger results observed in urban regions [Fig 2].



AA: Addis Ababa; BG: Benishangul Gumuz; CE: central Ethiopia; DD: Dire Dawa; SE: South Ethiopia; SWE: Southwest Ethiopia

Fig 2: UHC service coverage index at national and regional levels, 2024

Table 2: UHC service coverage at national and regional levels, 2024, Ethiopia

Domain	Tracer Indicator	Somali	Afar	CE	SWE	Oromia	BG	SE	Tigray	Amhara	Sidama	Gambella	Harari	DD	AA	Sparklines	National
RMNCH	FP	7%	41%	45%	83%	67%	67%	55%	55%	74%	79%	63%	59%	57%	77%		68%
	ANC	13%	46%	59%	48%	48%	57%	47%	57%	62%	42%	49%	47%	69%	95%		53%
	DTP3	19%	31%	31%	29%	32%	35%	27%	50%	50%	46%	27%	48%	56%	88%		40%
	Pneumonia*	56%	53%	71%	53%	60%	81%	43%	57%	56%	56%	58%	56%	56%	56%		56%
	RMNCH SCI	**17%**	**42%**	**49%**	**50%**	**50%**	**57%**	**42%**	**55%**	**60%**	**54%**	**47%**	**52%**	**59%**	**78%**		**53%**
Infectious Diseases (ID)	TB	100%	94%	65%	63%	95%	63%	65%	100%	61%	100%	100%	100%	100%	100%		92%
	ART	35%	50%	76%	67%	81%	80%	93%	80%	95%	85%	81%	75%	83%	100%		89%
	ITN**	56%	94%	56%	68%	38%	76%	46%	70%	61%	60%	95%	44%	61%	NA		61%
	WASH	2%	8%	51%	47%	44%	16%	36%	3%	46%	42%	10%	18%	49%	26%		38%
	ID SCI	**25%**	**43%**	**61%**	**61%**	**60%**	**50%**	**56%**	**36%**	**64%**	**68%**	**53%**	**49%**	**71%**	**64%**		**66%**
NCDs	HP***	12%	12%	12%	12%	12%	12%	12%	12%	12%	12%	12%	12%	12%	12%		12%
	DIAB	11%	19%	3%	17%	16%	6%	16%	23%	16%	30%	22%	43%	26%	42%		17%
	Tobacco non-use	94%	61%	95%	97%	92%	86%	97%	99%	98%	100%	91%	89%	88%	97%		95%
	NCDs SCI	**23%**	**24%**	**15%**	**27%**	**26%**	**18%**	**27%**	**30%**	**27%**	**33%**	**29%**	**36%**	**30%**	**37%**		**27%**
Service capacity & access (SCA)	Hospital bed	24%	18%	18%	12%	19%	21%	28%	27%	18%	18%	49%	82%	100%	88%		23%
	HWF density	37%	29%	36%	29%	24%	51%	34%	41%	27%	40%	91%	55%	55%	100%		36%
	IHR	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		69%
	SCA SCI	**30%**	**23%**	**25%**	**19%**	**21%**	**33%**	**31%**	**33%**	**22%**	**27%**	**67%**	**67%**	**74%**	**94%**		**39%**
Overall UHC SCI	**Overall UHC SCI**	**23%**	**32%**	**33%**	**35%**	**36%**	**36%**	**37%**	**38%**	**39%**	**43%**	**47%**	**50%**	**55%**	**64%**		**44%**

AA: Addis Ababa; BG: Benishangul Gumuz; CE: central Ethiopia; DD: Dire Dawa; SE: South Ethiopia; SWE: Southwest Ethiopia

*Pneumonia: The national average is used for AmharaSomali, Harari, AA and DD

**ITN: National Average used for Amhara and DD

***HP - The national average is used for regions

UHC Service Coverage by domain

The domain-specific analysis revealed substantial variation across the four UHC service categories and across the Regional States in Ethiopia. The highest score was for infectious diseases (66%), followed by RMNCH (53%). Low service coverage was for service capacity and access and NCDs that scored 39% and 27% respectively. The low performance in NCDs and service capacity substantially pulled down the overall UHC service coverage index despite relatively better performance in infectious disease services and RMNCH.

RMNCH domain:

The national RMNCH service coverage index was 53%. The lowest performing indicator was DPT3 coverage (40%), followed by ANC4 + coverage (53%), care seeking for pneumonia (53%) and family planning (68%). The Regional States RMNCH service coverage index ranged from 17% in Somali region to 78% in Addis Ababa [Fig 3].

Infectious diseases domain:

The national service coverage index for infectious diseases was 66%, driven by strong coverage of TB treatment (92%), ART (89%), and ITN utilization (61%), while WASH coverage was low (38%). The regional service coverage index for infectious diseases ranges from 25% in Somali region to 71% in Dire Dawa [Fig 3].

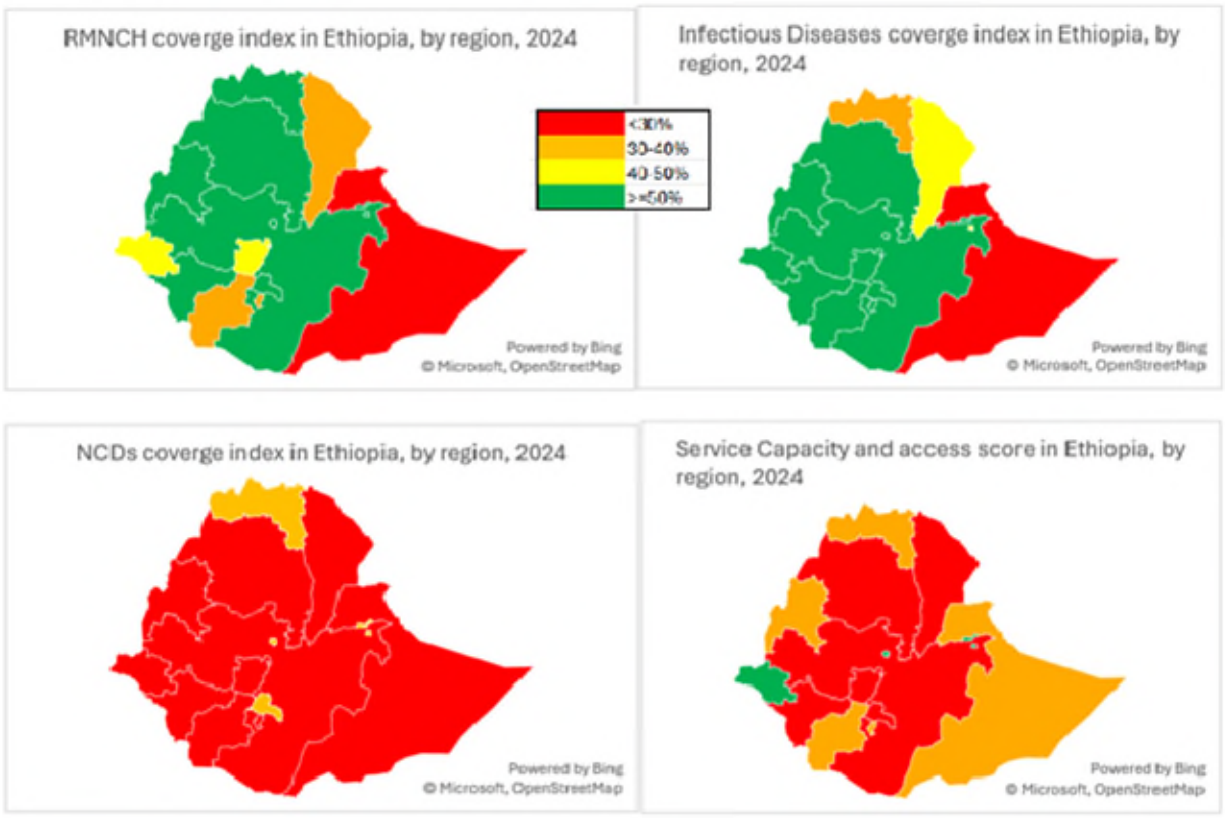


Fig 3: Map of domain level UHC service coverage scores by region, 2024

Noncommunicable diseases domain:

The national NCD services coverage showed the lowest among all the domains, with a score of 27%. Coverage of hypertension and diabetes was 12% and 17% respectively, while tobacco non-use was high (95%). The regional NCDs service coverage index ranges from 15% in Central Ethiopia Regional State to 37% in Addis Ababa [Fig 3].

Service capacity and access domain

The national service capacity scored 39%, with the lowest coverage for hospital bed density (23%), followed by health workforce density (36%) but with a high score for IHR capacity (69%). The regional States service capacity and access index ranged from 19% in Southwest Ethiopia to 94% in Addis Ababa [Fig 3].

Discussion

Low overall UHC service coverage

This study estimated UHC SCI for 2024, along with its component sub-indices, using 14 tracer indicators consistent with the global UHC monitoring framework. The result demonstrates that UHC service coverage remains inadequate, with an overall UHC SCI of 44%. This figure is substantially below both the global Sustainable Development Goal (SDG3) 3.8 target of 80% by 2030 and Ethiopia's national target of achieving 58% UHC service coverage by 2026 [8]. This finding was also substantially lower than the world average (71%), the average for Low- and Middle-Income Countries (LMICs) average of 63% and Sub-Saharan Africa regional average of 50% [5]. Despite the low level of coverage, the trend over time suggests gradual improvement. Eregata et al reported a UHC SCI of 34.3% in 2015, indicating an increase of approximately 10 percentage points over nine years period up to 2024 [13]. Similarly, Hogan et. al modelling placed Ethiopia's UHC SCI at 39% [14]. Our estimate was higher than WHO's 2021 modelled estimate of 33% [5]. These differences likely reflect variations in methodological approaches and data sources. with the WHO estimate may be due to differences in data sources. Unlike global models that rely on imputed or extrapolated values, our study utilized recent, country specific empirical data collected through national surveys conducted in 2024. This reliance on direct, up-to-date data sources likely explains the observed divergence from WHO's modelled estimates.

Differences in performance across domains/program areas

The study found substantial variation across the four UHC service coverage indices, with relatively higher performance in the infectious diseases and RMNCH domains but markedly lower scores in NCDs and service access and capacity domains.

The stronger performance in infectious diseases and RMNCH likely reflect Ethiopia's longstanding investments and policy prioritization in these areas. Over the past two decades, Ethiopia has implemented comprehensive national strategies and programmatic frameworks, supported by the Health Extension Program (HEP), sustained donor partnerships and strengthened surveillance and monitoring systems. These efforts have expanded access to and utilization of essential RMNCH and infectious disease prevention and control services. Evidences show that HEP has contributed to improved coverage of key interventions and contributed to reductions in

infectious disease burden and maternal and child mortality, particularly in rural and underserved communities [22 -24]. Likewise, Ethiopia's HSTP I, HSTPII and HSDIP have emphasized promotive and preventive health services such as immunization, hygiene and sanitation promotion, and early disease detection, creating an enabling environment for sustained investments in communicable disease control [25]. Several studies indicate that RMNCH gains are closely linked to the expansion of PHC services and HEP implementation [23-28]. However, the literature also underscored persistent challenges that continue to limit performance. These include demand-side-barriers such as limited awareness, cultural norms and gender related constraints [29, 30]; as well as significant geographic inequalities, particularly in pastoralist, remote and conflict affected regions [31]. In addition, gaps in the quality of care including inadequate facility readiness, shortage of skilled providers and weak referral systems remain major impediments [32, 33]. Targeted disease-specific programs including national HIV/AIDS and tuberculosis prevention and control initiatives integrated with the PHC system, have been effective in improving case detection, treatment outcomes, and patient adherence, resulting in notable reductions in incidence and mortality [34-38].

Despite relatively high national level performance in infectious diseases and RMNCH, the study revealed wide regional disparities. For infectious diseases, scores ranged from 25% in somali region to 71% in Dire Dawa, while RMNHC scores varied from 17% in Somali to 78% in Addis Ababa. These findings align with previous evidence documenting persistent geographic inequalities, coverage gaps and access challenges in regions affected by pastoral mobility, insecurity and weak infrastructure.

Overall, the findings highlight the need to reinforce PHC and HEP to maintain and expand integrated health services. Furthermore, reprioritization of strategies is required to address structural imbalances across the domains. The relative success of infectious disease and RMNCH program should be interpreted as evidence of broader health system resilience; rather, it reflects selective prioritization and substantial external funding that have disproportionately strengthened these areas compared to others. Strengthening neglected domains particularly NCDs and service capacity will be critical for Ethiopia's progress towards equitable UHC.

NCDs Domain

This study demonstrated that the NCD domain performs substantially lower than the other UHC service coverage domains, largely driven by low service utilization for hypertension and diabetes treatment, two key indicators of NCD coverage. This finding was consistent with previous studies by Eregata et al, and Yibeltal et al [13,15]. The weak performance in the NCD domain is likely attributable to Ethiopia's historical emphasis on communicable diseases, resulting in limited integration of NCD services within the PHC system. Resource constraints including inadequate diagnostic capacity, shortage of essential medicines, and insufficient number of trained health workers have further hindered the scale-up of NCD care [39 - 41]. According to the Global Burden of Diseases (GBD) Study, the proportion of deaths attributed to NCDs increased from 18.7% in 2000 to 46.7% in 2023 [42], reflecting a rapid epidemiological transition. Despite the rising burden, NCDs received formal prioritization in Ethiopia's revised national health policy only recently in 2023 [43]. Low public awareness and the asymptomatic progression of many NCDs further contributed to delayed care seeking and limited-service uptake [44,45]. In addition, chronic under-investment in NCD screening at the PHC level has restricted routine screening and early detection efforts. The literature shows that NCD programs have historically received less than 10% of the domestic health budget, a disproportionate allocation given their substantial contribution to morbidity and mortality [46, 47].

Collectively, these factors reveal a systemic mismatch between Ethiopia's emerging health needs and the current service delivery models. The persistently low performance of the NCD domain reflects both structural underfunding and limited integration of chronic disease management into PHC. To close the gap, Ethiopia must prioritize NCD interventions, ensure meaningful integration of NCD services within PHC platforms and significantly increase funding to match the magnitude of the country 's epidemiological transition.

Service access and capacity

In this study, Ethiopia's service capacity and access domain was found to be low (39%), highlighting persistent challenges in health system readiness and equitable access to essential services. This finding was consistent with previous studies reporting that Ethiopia's ability to deliver essential

health services remains limited, particularly in rural and pastoralist regions [48, 49]. Several factors are likely to contribute to the weak performance of this domain. A key factor was the insufficient and uneven distribution of health workforce. This study showed that density of core health professionals was 16.2 per 10,000 population, far below the WHO recommended threshold of 44.5 to achieve SDG3. Other reports confirm that the density of doctors, nurses, and midwives in Ethiopia fall significantly short of WHO standard, with particularly pronounced shortages in remote and pastoralist regions [48].

Another factor was inadequate health facility infrastructure. This study revealed that only 4.2 hospital beds per 10,000 population were available, substantially lower than a minimum benchmark of 18 beds per 10000 population. Similar studies have shown that many health facilities lack essential infrastructure including basic amenities, functional diagnostic equipment, laboratory supplies, essential medicines, and other critical inputs required for service readiness, even in settings where facilities are physically present [48, 50]. These gaps directly undermine the capacity of the health system to provide timely and quality care.

Geographic disparities further compounded the problem. This study revealed that service capacity and access scores were highest in urban administrative regions such as Addis Ababa, Dire Dawa and Harari, whereas rural agrarian and pastoralist regions such as Afar, Oromia, Amhara scored substantially low. Several studies supported this pattern. Urban centers tend to host higher-capacity hospitals, better equipped health facilities and more specialized services, while rural and pastoralist areas face long travel distances, limited facility density, poor referral linkages, and infrastructural constraints that impede access to essential services.

Evidence showed that improvements in service capacity and access are critical for advancing overall PHC progress. Studies indicate that investments in this domain generate measurable gains across other UHC components because capacity and access serve as foundational enablers of effective service delivery [51-53]. Weaknesses in this domain constrain the performance of all others regardless of progress in specific disease programs making it a structural barrier to achieve UHC in Ethiopia.

Overall, the results underscore the urgent need for comprehensive investment in health system inputs, including the health workforce, infrastructure, equipment, and essential commodities.

436 Strengthening these foundational elements is essential for improving service readiness and
437 ensuring meaningful progress toward universal health coverage.

438 **Regional Distribution of UHC Service Coverage Index**

439 Sub national analysis revealed marked regional disparities in overall UHC service coverage,
440 ranging from 23% in Somali to 64% in Addis Ababa. The national average of 44% therefore masks
441 substantial inequalities, with urban administrative regions consistently performing better than
442 rural, agrarian and pastoralist regions. Addis Ababa exhibited the highest UHC service coverage
443 (64%), followed by Dire Dawa (55%), Harari (50%), Gambella (47%), and Sidama (43%). The
444 findings of this study are consistent with the broader literature demonstrating that progress
445 toward UHC is often uneven within countries, particularly in low- and middle-income settings.
446 In contrast, the lowest coverage levels were observed in Somali (23%), Afar (32%), Central
447 Ethiopia (33%), and Benishangul-Gumuz (36%). These regions continue to face persistent
448 structural and contextual barriers such as pastoralist mobility, recurrent conflict and
449 displacement, sparse facility distribution, and shortages of trained health professionals all of which
450 constrain service availability, readiness, and utilization. These findings are consistent with a study
451 by Tarekegn et al., which showed that the performance and capacity of primary health care in
452 Ethiopia are significantly higher in urban settings compared to pastoralist regions [48]. These
453 inequities highlight the need for targeted policy responses that reflect Ethiopia's geographic and
454 livelihood diversity.

455 The substantial regional disparities documented in this study align with the broader literature
456 showing that progress towards UHC is often uneven within countries, especially in low – and
457 middle-income settings [13,31,48, 54]. Multiple interrelated factors such as health system capacity
458 constraints, socioeconomic, geographic, inequalities, sociocultural norms and contextual
459 vulnerabilities systematically disadvantage pastoralist and remote populations relative to residents
460 of well-resourced urban administrative areas [55]. These areas highlight the need for targeted
461 policy responses that reflect Ethiopia's geographic and livelihood diversity.

462 Reducing these disparities will require a more equity-oriented approach to health system
463 strengthening. Priority should be given to underserved and hard-to-reach regions, particularly
464 pastoralist communities, through adaptive service delivery models such as mobile health clinics,

community-based outreach, and context-appropriate task-shifting strategies. Strengthening health infrastructure, improving supply chain reliability, and enhancing recruitment and retention of health workers in remote areas are also critical for improving service readiness. Moreover, expanding financial protection mechanisms and increasing targeted investments in disadvantaged regions will be essential to reduce access barriers and ensure that no population group is left behind in Ethiopia's pathway to UHC.

Strengths and limitations of the study

The strengths of this study include its assessment of UHC SCI both national and subnational levels, enabling the identification of regional disparities in progress toward UHC. The study also utilized up-to-date data from the 2024 national surveys and routine HMIS, enhancing the relevance and timeliness of the findings. However, several limitations should be noted. First, the analysis focused solely on the service coverage component of UHC and did not include financial protection due to the unavailability of recent data on financing. Second, the absence of subnational data on IHR indicator limited the construction of the SCA component of the UHC SCI, which was therefore calculated using only two tracer indicators for that specific domain. Finally, although the findings provide important insights, contextual factors specific to Ethiopia may limit their generalizability to other low- and middle-income countries.

Conclusion

Ethiopia's 2024 UHC Service Coverage Index of 44% highlights both notable progress and persistent gaps in essential health service delivery, with strong performance in infectious disease control and RMNCH contrasted by major deficiencies in NCD care, service capacity, and access. Large regional disparities favoring urban administrative areas over pastoralist and remote regions underscore systemic inequities driven by uneven workforce distribution, limited facility readiness, and infrastructural constraints. These findings signal the need for accelerated, equity-focused investments, particularly in strengthening NCD services within primary health care and addressing the structural barriers faced by underserved regions. Achieving meaningful progress toward UHC and SDG 3.8 by 2030 will require coordinated and multisectoral actions to expand

system capacity, ensure more equitable resource allocation, and institutionalize regular UHC index monitoring to guide evidence-based planning and decision-making.

Acronyms

AA: Addis Ababa; ANC4+: Antenatal Care 4 or more visits; ART: Antiretroviral Therapy; BG: Benishangul Gumuz; CBHI: Community Based Health insurance; CE: Central Ethiopia; DD: Dire Dawa: DFPS: Demand Satisfied for Family Planning; DIAB: Diabettes; DPT3: Diphtheria Pertusis -Tetanus Containing vaccine; EDHS: Ethiopia Demographic and health Survey; EPHI: Ethiopia Public Health Institute; FP: Family Planning; GBD: Global Burden of Diseases; HEP: Health Extension program; HSDIP: Health Sector Development and Investment Plan; HSTP: Health Sector Transformation Plan; HMIS: Health Management Information System; HRIS: Human Resource Information System; HP: Hypertension; HWF: Health Workforce; IHR: International Health regulation; ITN: Insecticide Treated Nets; LMICs: Low and Middle Income Countries: NCDs: Non-Communicable Diseases; PHC: Primary Health Care; PHCU: Primary Health care Units; PLHIV: People Living with HIV/AIDS; RMNCH: Reproductive, Maternal, Neonatal and Child Health; SCA: Service Capacity and Access; SCI: Service Coverage Index; SDG: Sustainable Development Goal; SE: South Ethiopia, SPAR: State Party Self-Assessment Annual Report; STEPS: STEPwise Approach to NCD risk factor surveillance; SWE: Southwest Ethiopia; TB: Tuberculosis; UHC: Universal Health Coverage; UN: United Nations; WASH: Water, Sanitation and Hygiene; WHO: World Health Organization

Declaration

Ethical approval and consent to participate:

The study used publicly available secondary, de-identified national datasets. No individual consent was required. The study was approved by the institutional Review Board of the Ethiopian Public Health Association (Ref No: EPHA/OG/130/26), as part of the broader protocol for SDG3 research project. It was conducted in accordance with the declaration of Helsinki. All the studies' data acquisition was done through permission from the Ministry of Health of Ethiopia. The collected data had been kept confidential anonymously through de-identification of names and other personal identifiers from record/sheet.

Consent for publication: NA

Availability of data and materials: All related data are presented fully within the manuscript, and available upon reasonable request to the lead author and the corresponding author.

Competing interests: The authors declare that they have no conflict of interest.

Funding: This study was financially supported by the Gates Foundation [Grant INV-080087]. But the funder has no role in the interpretation of the finding, which is the full responsibility of the authors.

Authors' contributions: SMT, MM, MDA and DG have been involved during the inception of the study and analysis design. SMT carried out data acquisition and data analysis. SMT, MDA, AS and HW were involved in data quality assurance measures and interpretation of findings. SMT developed the first draft manuscript. MM, AS, MDA, HW, AT, TA, DG, BB, YA, SS, SY, HM, MT, MDM and MM reviewed the draft manuscript and gave high-level critical comments. All authors have reviewed the manuscript critically for important intellectual content and approved the final manuscript for submission.

Acknowledgements: We would like to acknowledge the Ministry of Health-Ethiopia, Amref Health Africa in Ethiopia, and the Gates Foundation for the overall support and technical guidance.

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