



ADDIS ABABA UNIVERSITY
COLLEGE OF HEALTH SCIENCE
SCHOOL OF PUBLIC HEALTH

ASSESSMENT OF THE AVAILABILITY AND DISTRIBUTION OF
HEALTH SERVICES FOR MANAGING COMMON NON-
COMMUNICABLE DISEASES IN ETHIOPIA

BY

REKIK ASHEBIR

A THESIS SUBMITTED TO THE GRADUATE PROGRAM OF ADDIS ABABA
UNIVERSITY, COLLEGE OF HEALTH SCIENCE, SCHOOL OF PUBLIC HEALTH IN
PARTIAL FULFILMENT FOR THE DEGREE OF MASTERS OF PUBLIC HEALTH IN
EPIDEMIOLOGY AND BIOSTATISTICS SPECIALITY

JUNE, 2025

ADDIS ABABA, ETHIOPIA.

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BY: REKIK ASHEBIR

ADVISORS

1. MENGISTU YILMA (PhD)
2. ADAMU ADDISSIE (PhD)

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APPROVAL SHEET

**ADDIS ABABA UNIVERSITY
COLLEGE OF HEALTH SCIENCES
SCHOOL OF PUBLIC HEALTH**

**Assessment of the Availability and Distribution of Health Services for Managing
Common Non-Communicable Diseases in Ethiopia**

I undersigned agree to accept all responsibilities for the scientific and ethical conduct of this research project and declare that this thesis is my original work in partial fulfilment of the requirement for the Master of Public Health in Epidemiology and Biostatistics.

Name of principal investigator: Rekik Ashebir

Date: June 09, 2025

Signature: -



Approval of primary advisor

This thesis work has been submitted with the approval as university advisor

Name of the Advisor: Mengistu Yelma

Date: June 09, 2025

Signature:



APPROVAL BY EXAMINATION BOARD

This Thesis by Rekik Ashebir is accepted in its present form by the board of examiners as satisfying thesis requirements for the review for the degree of Masters of Public Health in Epidemiology and Biostatistics.

Name of internal examiner: _____

Date: _____ **Signature:** _____

Name of external examiner: _____

Date: _____ **Signature:** _____

Name of primary advisor: _____

Date: _____ **Signature:** _____

Name of chairperson: _____

Date: _____ **Signature:** _____

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TABLE OF CONTENTS

ACKNOWLEDGEMENT	i
LIST OF TABLES	iv
LIST OF FIGURES.....	v
ACRONMYS AND ABBREVIATIONS	vi
ABSTRACT	vii
INTRODUCTION.....	1
1. Background	1
2. Statement of the problem	2
3. Rationale and Significance.....	3
LITERATURE REVIEW.....	4
1. Non-communicable diseases	4
2. Non-communicable diseases burden	4
3. Service Provision for NCDs	5
4. Factors associated with NCD Service availability	6
5. The Service Provision Assessment (SPA).....	7
CONCEPTUAL FRAMEWORK	9
OBJECTIVES	10
General objective.....	10
Specific objectives.....	10
METHODS	11
1. Study Setting	11
2. Data sources	11
3. Study design	11
4. Source Population.....	12
5. Study Population	12
6. Sample size determination.....	12
7. Data collection.....	12

8. Eligibility Criteria.....	13
9. Study variables	13
10. Data quality assurance.....	13
11. Data Management.....	14
12. Data analysis.....	14
ETHICAL CONSIDERATION	16
RESULT	17
1. General characteristics of surveyed health facility.....	17
2. NCD service availability	18
2. NCD Service readiness evaluation	26
3. Factors associated with NCDs service availability	31
DISCUSSION	33
STRENGTH AND LIMITATIONS OF THE STUDY	37
CONCLUSION	38
RECOMMENDATION	39
REFERENCE	40
ANNEXES	45
ANNEX A: Data request letter	45
ANNEX B: SPA consent form.....	46
ANNEX C: SPA questionnaire forms (Data Extraction Tool).....	47
ANNEX D; Curriculum Vitae	54

LIST OF TABLES

Table 1 Percentage of facilities assessed, by region, facility type, residence, and managing authority, Ethiopia, in 2014 and 2021/22.....	17
Table 2. General NCD service availability by facility type, residence, and managing authority in 2014 and 2021/22.....	19
Table 3 Service availability for cardiovascular disease by facility type, residence, and managing authority in 2014 and 2021/22.....	20
Table 4 service availability for chronic respiratory diseases by facility type, residence, and managing authority in 2014 and 2021/22.....	22
Table 5 Service availability for Diabetes mellitus by facility type, residence, and managing authority in 2014 and 2021/22	24
Table 6 Service availability for cancer by facility type, residence, and managing authority in 2014 and 2021/22.....	25
Table 7 Readiness score for cardiovascular diseases by facility type and region.....	27
Table 8 Service readiness score for chronic respiratory diseases by facility type and region .	28
Table 9 Service readiness score for diabetes mellitus by facility type and region.....	29
Table 10 Service readiness score for cancer by facility type and region	30
Table 11 Logistic regression result on NCDs service availability	32

LIST OF FIGURES

Figure 1: Conceptual frame work health service availability and distribution for non-communicable diseases	9
Figure 2. General NCD service availability across all regions in 2014 and 2021/22	18
Figure 3. Service availability for cardiovascular diseases by region	21
Figure 4 Service availability for chronic respiratory diseases by region	23
Figure 5 the national average service readiness score for common NCDs in 2014 and 2021/22	31

ACRONMYS AND ABBREVIATIONS

EPHI	-----	Ethiopian Public Health Institute
SPA	-----	Service Provision Assessment
ESPA	-----	Ethiopian Service Provision Assessment
ESPA+	-----	Ethiopian Service Provision Assessment Plus
IRB	-----	Institutional Review Board
LMICs	-----	lower and middle-income countries
MoH	-----	Ministry of Health
NCDs	-----	non-communicable diseases
NDMC	-----	National Data Management Centre for health
PHC	-----	primary health care
SARA	-----	Service Availability and Readiness Assessment
SNNP	-----	Southern Nations Nationalities and People
UHC	-----	Universal Health Coverage
WHO	-----	World Health Organization
WHO-PEN	-----	WHO Package of Essential Non-communicable Disease Interventions
DM	-----	Diabetes mellitus
CVD	-----	Cardiovascular Disease
NGO	-----	Non-Governmental Organization
CRD	-----	Chronic Respiratory Diseases

ABSTRACT

Background: Non-communicable diseases (NCDs) are the leading cause of preventable deaths globally, accounting for 39% of deaths in Ethiopia, where the health system is still underprepared to address them. Thus there is a need to have more evidence on health service coverage for responding to growing challenges of managing NCDs.

Objective: This study aims to assess the availability, distribution and readiness of health services for managing common NCDs in Ethiopia.

Methods: A secondary analysis of the 2014 and 2021/22 Ethiopian Service Provision Assessment Survey were done to examine the availability and distribution of health services facilities and its change in over the two periods. Service readiness score and logistic regression was also evaluated to predict if there is association between structural factors and NCD service availability. Data was analyzed using STATA statistical software. The 95% CI and P values were considered to determine the significance level.

Result: The general service availability for NCDs was 100%, 90%, 88%, 87.2%, 83.36%, 81.95%, 77%, 69.06%, and 54.22% in Harari, Addis Ababa, Somali, Benishangul, Amhara, Oromia, Afar, and Gambella regions, respectively, whereas it increased across all regions except in Benishangul-Gumuz (52.9%) and Harari (80%). The service availability for cardiovascular disease, chronic respiratory disease, diabetes mellitus and cancer were 90.6%, 94.2%, 69.6%, and 27.8% in 2014 while it were 94.5%, 93.7%, 69.6% and 32.8% in 2021/22. The mean service readiness significantly increased for cardiovascular diseases (23.9% to 41.3%), chronic respiratory diseases (32.6% to 44.0%), diabetes (20.1% to 38.3%), and cancer (29.4% to 41.3%) between 2014 and 2021/22. Hospitals, urban facilities, and government owned facilities are significantly more likely to provide NCD services.

Conclusion and recommendation: Even though, high proportion of facilities provide NCDs service (over 90% for CVD, diabetes and respiratory diseases) the actual readiness measured by tracer items remains lower (about 41–44%). Access to cancer services continues to lag significantly at 32.8%. There are also disparities across regions. Efforts need to be made to strengthen the quality of service and for regions showing low coverage.

Key Words: Non-communicable Diseases, Service Availability, Service Readiness

INTRODUCTION

1. Background

Non-communicable diseases (NCDs) are now representing the leading cause of preventable deaths across the world with a higher burden in low and middle-income countries (1,2). In Ethiopia, 39% of deaths are due to NCDs, yet the health system is underprepared (3,4). Moreover, the evidence describing, the service availability and distribution for this diseases at national and regional levels is poorly documented making it difficult to track progress. This will make the intervention process more difficult (5).

The WHO Global Action Plan (2013–2020) plans to improve the health systems to tackle major NCDs including cardiovascular disease, diabetes, chronic respiratory disease, and cancer through improving access to affordable, effective treatments and strengthening the healthcare workforce (2,5). Moreover achieving universal health coverage (UHC) is a vital to improve NCD outcomes, reduce inequalities, and ease socio-economic impact. Quality services and innovative strategies are essential for effective NCD prevention and control, with integrated, people centered primary care playing a key role especially in developing countries (7).

Availability, distribution, and quality of health services for the management of NCDs are critical components of healthcare systems, especially in low and middle-income countries including Ethiopia, where the burden of NCDs continues to rise. This encompasses the infrastructure, resources, and capabilities required at health facilities to effectively deliver NCD care (8). Understanding the capability of healthcare facilities to deliver NCD services is essential to ensure that healthcare resources align with population health needs. Therefore this study is designed to assess the service availability and distribution for common NCDs in Ethiopia using the 2014 and 2021/22 Ethiopia Service Provision Assessment (ESPA) survey.

2. Statement of the problem

Despite the growing burden of NCDs in Ethiopia, significant gaps remain in the availability and delivery of health facilities to provide essential services for their prevention, diagnosis, and management (5). Existing data on NCD service availability, including diagnostic tools, trained personnel, and essential medications, are fragmented and insufficient to provide a comprehensive understanding of the country's capacity to respond effectively to these challenges. Moreover, there is limited evidence on the geographical and facility-level disparities in NCD service availability, which hinders targeted interventions to address unmet needs.

While studies such as the 2015 STEPS survey have highlighted the prevalence of NCD risk factors in Ethiopia, corresponding data on health system readiness and service delivery are outdated or incomplete. The absence of up to date, evidence based data on the availability of resources and services at health facilities limits the ability to identify specific gaps in infrastructure, workforce, and supplies. For this, there is a need to have more evidence on the health service availability and quality for responding to the growing challenges of managing non-communicable diseases.

For high-impact health interventions, it is crucial to measure the dimension of health system performance. To track progress and results it is important to have evidence on health service availability and factors for effective health service provision by exploring elements such as availability of service, quality of coverage, and accessibility with regard to the prevention and control of NCDs by exploring the availability of health facilities for chronic NCDs; the availability of trained human resources, essential medicines and technologies for common NCDs; the availability of key NCD medications and diagnostic tools within health facilities (5,9). It is crucial for detailed evaluation of service availability at country level to identify gaps in infrastructure, trained personnel, essential medications, diagnostic equipment and other technologies that are necessary for providing services for NCDs. It will provide valuable awareness into potential gaps between healthcare resources and actual population needs.

3. Rationale and Significance

In Ethiopia, the evidence describing, service availability and distribution of NCDs is poorly documented making it challenging to track the progress. This will make the intervention process more difficult. It is reported to be scant, and inconsistent, making it impossible to report precise estimates. Only a few studies based on the Service Availability and Readiness Assessment (SARA) have descriptively assessed NCD service availability in recent years(5,9,10). However, there is a lack of detailed empirical research comparing service quality and the factors influencing NCD service availability and its distribution across the country.

Therefore, this study is designed to assess the service availability, distribution and quality for non-communicable diseases and to identify risk factors that affect effective health service coverage for common NCDs in Ethiopia using the 2014 and 2021-22 Ethiopia Service Provision Assessment (ESPA) survey. The SPA survey is more comprehensive as it employs several independent methods to assess service capacity and quality. It provides detailed baseline data and is nationally representative, offering disaggregated findings by level of care, type of institution, and geographic location. The findings of this study will be a guide for more effective resource allocation and to ensure prioritization for the prevention and treatment of NCDs. It will have significance to health professionals and policymakers with useful information about health service coverage for common NCDs and aid the development of effective delivery of the service and quality improvement strategies. It also provides guidance to the affected entities on how to ensure quality and will provide critical information for strengthening healthcare services to address the growing burden of NCDs. Equipped with data on service gaps and needs, policymakers will be able to develop more targeted interventions, improve healthcare infrastructure, and ultimately enhance the quality and accessibility of NCD services in Ethiopia. This will contribute to an improved healthcare system that supports better health outcomes and quality of life for individuals with NCDs.

LITERATURE REVIEW

1. Non-communicable diseases

Non-communicable diseases (NCDs) are chronic conditions that are not transmitted between individuals. They typically progress slowly, last for long periods, and are often incurable. NCDs place a heavy burden on individuals, communities, and economies, and result from a combination of genetic, physiological, environmental, and lifestyle factors (11,12). The major categories of NCDs include cardiovascular diseases (e.g., heart attacks, heart failure, and strokes), cancers, chronic respiratory conditions like chronic obstructive pulmonary disease and asthma, and diabetes (13). NCDs also encompass a broad spectrum of health conditions, including liver, kidney, and gastrointestinal diseases; endocrine, blood, and nervous system disorders; skin diseases; genetic conditions; injuries; mental health disorders; and various forms of disability (14).

2. Non-communicable diseases burden

The burden of non-communicable diseases is arising, making them the leading cause of preventable deaths worldwide. NCDs are accountable for 41 million deaths yearly, accounting for 74% of all deaths world widely. 5.5 million deaths occur in the region of the Americas. In lower and middle-income countries (LMICs) including the African region, the burden of NCDs is rising and is projected to surpass that of communicable diseases in terms of mortality and morbidity by 2030 (3). NCDs are the leading cause of premature mortality with 86% of these early deaths happens in low and middle-income countries. Most deaths occur due to common non-communicable diseases such as; cardiovascular diseases, cancers, chronic respiratory diseases, and diabetes mellitus respectively. Together, these four disease groups account for over 80% of premature NCD deaths worldwide (1,2). Noncommunicable diseases counting cardiovascular diseases, chronic respiratory conditions, cancer, and diabetes are the leading cause of death globally, taking 41 million lives annually, which accounts for 71% of all deaths and over 54% of global DALYs (15).

In Ethiopia, the prevalence of common NCDs is estimated to range from 29% to 35%. This includes 5% for diabetes mellitus, 13.4% -32.2% for cardiovascular conditions, 4% -18% for cancer-related mortality, and 1%- 18% for respiratory conditions (16). According to National Data Management Centre for Health (NDMC) data, NCD is the major cause of mortality in

Ethiopia with an estimated rate of 55 (95% UI: 502-605) per 100 thousand population, Every hour an estimated of 25 Ethiopians are dying of NCD and majority of these deaths were resulted from cardiovascular diseases, chronic respiratory diseases, diabetes, kidney disease, digestive diseases, cancer, and neurological disorders. A 2019 GBD study by Awdew et al., presented a high burden of NCD-related mortality and disability in Ethiopia; 202 million new cases, and 219,000 deaths were exhibited in 2019. The overall, NCD prevalence is estimated for 63.2% of total cases in Addis Ababa, 59.8% in Harari, and 55% in Somali regional states. Whereas deaths due to common NCD accounted for 55% of total deaths in Addis Ababa, including 51% in Tigray, 45% in Harari, 43% in Amhara, 42% in Dire Dawa, and 29-33% in Somali, Benishngul Gumuz and Afar regional states (17). A population-based cross-sectional study conducted in Northwest Ethiopia revealed the most commonly reported NCDs including 32.2% Heart disease and 31.9% hypertension, followed by 27.7% asthma, 4.9% diabetes mellitus, and 3.2% cancer cases (18).

3. Service Provision for NCDs

The WHO 2030 Agenda for Sustainable Development identifies NCDs as a major challenge to sustainable progress. It calls on governments to implement bold national strategies aimed at reducing premature mortality from NCDs by one-third through prevention and treatment by 2030 (13). The WHO Package of Essential Noncommunicable Disease Interventions (WHO-PEN) outlines intervention mechanisms to address major NCDs within primary healthcare systems. These interventions target the detection, diagnosis, treatment, and management of cardiovascular diseases, diabetes, and chronic respiratory conditions, and also guidance for the early diagnosis of cancer (19). WHO also recommends the accessibility of essential medicines for at least 80% of the total population (20). Ethiopia is also committed to reduce premature deaths due to NCDs by 25% by 2025. The country has also worked toward achieving SDG target 3.4 and Universal Health Coverage (UHC) through primary health care to reduce one third of premature mortality due to NCDs (21). The Ethiopian Ministry of Health annual reports indicate that access to primary health care has grown from 50.7% in 2000 to over 90% by 2021–22. The outpatient attendance rate also rose from 0.27 to 1.44 visits per capita during this period (22). Ethiopia developed and implemented a National Strategic Plan for the Prevention and Control of Major NCDs by primarily focusing on strengthening the primary health care system to address NCDs (23).

To ensure health service coverage, it is important to assess health system outputs, implementation outcomes, human and institutional behaviors, and the interaction of various system factors (24). One of NCDs prevention strategy focuses on screening, early detection, and management during regular outpatient visits especially in LMICs by the provision of appropriate, equitable, and affordable healthcare services. To achieve universal health coverage (UHC) and Sustainable Development Goals in health is the most effective and competent way to deliver NCD services in low resource settings (25). Health sector preparedness and the ability of health institutions to implement a particular intervention will have an impact on the growing problems of NCDs and their underlying risk factors (26,27). Service availability reflects a health facility's ability to provide essential care, requiring basic infrastructure, essential equipment, infection control measures, diagnostics, and medicines. This capacity is assessed by evaluating critical elements such as trained personnel, clinical guidelines, diagnostic tools, equipment, and disease specific medicines and supplies (8,22). The measurement of health service availability is a health metrics, and it is a core component in public health, especially in low and middle-income countries. Health service coverage surveys are done in line with procedures and principles developed by WHO and the International Health Facility Assessment Network (24). In Ethiopia, the health system is structured in a three-tier system to deliver services, including NCD services, across different levels of healthcare facilities. These facilities are classified into primary, secondary, and tertiary levels, with specific roles in the prevention, diagnosis, and management of NCDs (28). Health facilities in Ethiopia that provide NCD services include hospitals, health centers, and clinics. However, the availability of NCD services varies widely between facilities, and the majority of health facilities have low availability (9).

4. Factors associated with NCD Service availability

To deliver NCD services screening, diagnosis, training, standard guidelines and tools, NCD medicines and technologies are key factors to ensure the quality of NCD service(29). Screening and diagnosis of NCDs including measurements of blood pressure and blood glucose, can indicate the suspected presence of NCDs in high-risk individuals and screening of high risk cases through health care infrastructure is effective and feasible (25). Capacity development of the workforce is also important to ensure the quality of NCDs service provision. Providing training following standard protocols and access to NCD medicines and technologies ensures the availability of healthcare services for the diagnosis and management

of NCDs (30,31). Enhancing information and communication technology (ICTs) is also found to be essential for integrated NCD service delivery (32).

A study conducted in Pakistan which is a low and middle-income country, revealed limited availability of healthcare services due to a shortage of training, guidelines, and promotional materials. It revealed that only 32% of basic health units provided services for NCD diagnosis or management, with the highest availability observed for diabetes mellitus (72%), cardiovascular disease (52%), and chronic respiratory disease (40%). Notably, no services for cancer were available at these basic health units (33). A cross sectional study in Kenya found that 93.8% of facilities provided services for chronic respiratory diseases, 82.2% for diabetes, 65.1% for cardiovascular diseases, and only 24.4% offered cervical cancer screening. These differences highlight disparities by disease type and facility level, reflecting a mismatch between available resources and population health needs (34). Another study based on the 2014–2015 Tanzania Service Provision Assessment survey presented among 1,188 health facilities assessed, 52.1%, 64.8%, and 60.9% offered services for diabetes, hypertension, and chronic respiratory diseases, respectively, and only a small proportion of these facilities had treatment guidelines (33.2%) or trained staff for non-communicable disease (NCD) services (10.4%)(35).

In Ethiopia the overall, service availability of the health facilities to provide NCDs is deficient. In 2016, among all health facilities offering services for NCDs, the service availability for chronic respiratory disease, cardiovascular disease, diabetes mellitus, and cervical cancer was 45%, 41%, 22%, and 2%, respectively (9). Whereas in 2018, the service availability for chronic respiratory disease, cardiovascular disease, and diabetes mellitus were 53%, 49%, and 37% respectively cervical cancer screening being the least accessible service in the nation. NCD service availability between regions and facility types was significantly different. (36). According to the ESPA report, only 36%, 49%, 53%, and 9% of health facilities provided diagnostic and treatment services for diabetes, cardiovascular diseases, chronic respiratory diseases, and cervical cancer, respectively. The overall readiness scores for these services are low, ranging from 18% for chronic respiratory disease diagnosis and management to 5% for cervical cancer diagnosis. (4).

5. The Service Provision Assessment (SPA)

The Service Provision Assessment (SPA) is a health facility survey designed to gather data on the availability and quality of a broad range of services within a country's health system. It evaluates quality of care through measures of structural quality such as infrastructure and human resources and process quality, including service delivery and patient experience. The SPA also assesses the availability of diagnostic and treatment services for diabetes, cardiovascular, and chronic respiratory diseases, along with the presence of essential medicines, clinical guidelines, supplies, and equipment for managing non-communicable diseases (4). The Ethiopia Service Provision Assessment (ESPA) surveys, conducted in 2014 and 2021-22 by the Ethiopian Public Health Institute (EPHI), provide evidence on the availability, quality and readiness of health services across the country. These nationally representative surveys include both public and private health facilities that offer preventive and curative services.(22,37)

CONCEPTUAL FRAMEWORK

This study's conceptual framework is based on literature review about factors that affect service availability, distribution and readiness for NCDs. The current study assesses the service availability, distribution, and readiness of the Ethiopian health sector with regard to the prevention and control of NCDs and their risk factors by exploring the availability of health facilities for chronic NCDs; the availability of trained human resources, clinical guideline, and technologies for common NCDs; the availability of key NCD medications and diagnostic tools within health facilities. It also assesses the distribution of health facilities based on geographical location, facility types and managing authority. This study will support the intervention process by providing data-driven insights on how resource allocation can be optimized to strengthen health facility service delivery for NCD management. It helps to look at potential differences in service capacity within public and private health facilities and also with their regional distribution across the country. It also helps to identify factors associated with service provision that may impact the quality of health facilities to deliver effective NCD care.

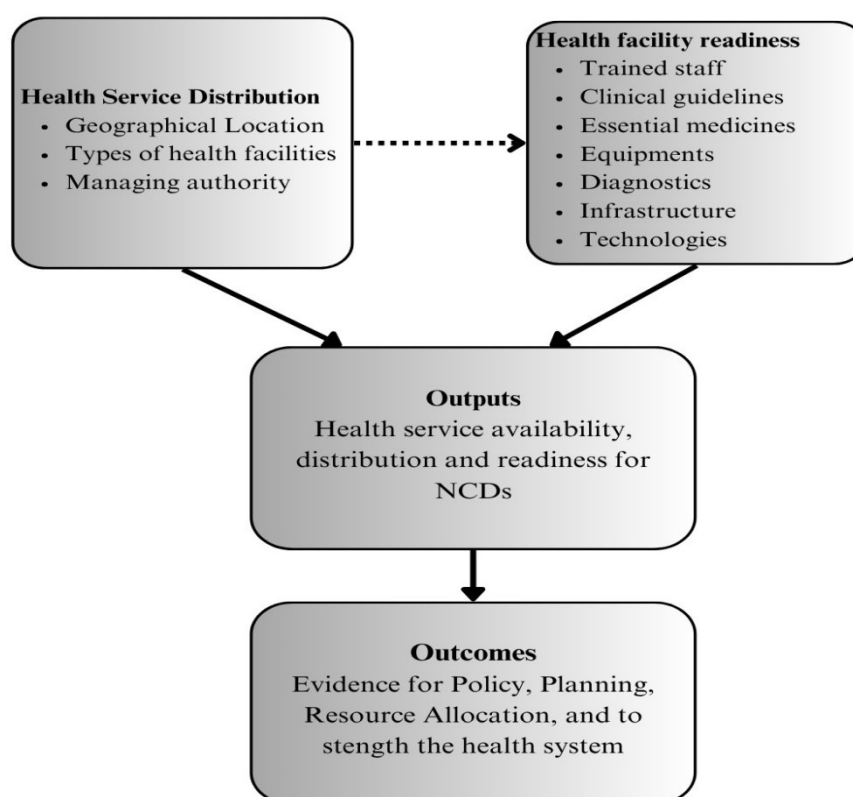


Figure 1: Conceptual frame work health service availability and distribution for non-communicable diseases

OBJECTIVES

General objective

- To assess the availability and distribution of health facilities for the management of common non-communicable diseases in Ethiopia

Specific objectives

- To examine the availability of health service for common NCDs.
- To assess the service readiness for each common NCDs.
- To identify major factors associated with service availability for common NCDs.

METHODS

1. Study Setting

The study is conducted using data from the Ethiopia Service Provision Assessment (ESPA) surveys conducted in 2014 and 2021/22. The ESPA is a nationally representative, facility-based survey designed to assess the availability and readiness of health services in Ethiopia. The study setting includes all types of health facilities sampled in the ESPA, including hospitals, health centers, and clinics, from both public and private sectors (22,37). Health posts were excluded from the analysis since they are not expected to perform these NCDs services.

2. Data sources

This study used data from the 2014 Ethiopia Service Provision Assessment Plus survey and the 2021-22 Ethiopia Service Provision Assessment survey. The surveys were undertaken by the Ethiopian Public Health Institute (EPHI). Service Provision Assessment (SPA) is a data collection instrument for health service coverage that is used to evaluate the standard of healthcare services provided at the healthcare facilities: hospitals, clinics, health centers, and health posts (22,37).

The survey aimed to gather information on healthcare service delivery and assess the readiness of health facilities to provide quality care in Ethiopia. The ESPA questionnaires include data on service availability and readiness, covering areas such as the types of services provided, basic amenities, equipment, medicines and supplies, diagnostics, trained personnel, and clinical guidelines. Information was gathered from health facilities across all regions of Ethiopia; though, health facilities in the Tigray region were not included in the 2021-22 ESPA because of the conflict in the region during the data collection period, and Sidama was not included in the 2014 SPA+ as Sidama was part of SNNP. The reason to use SPA is because both data sets are nationally representative and have validated questionnaires i.e. the questionnaires were expert reviewed and tested in real setting (22,37).

3. Study design

The current study is analysis using the 2014 ESPA+ and the 2021-22 ESPA survey data, they were a health facility based cross-sectional surveys done using SPA tool developed by

Demographic and health survey (DHS) program with United States Agency for International Development (USAID). The Surveys were conducted at health facility at a single time to see health facility availability and readiness. The SPA includes a standard set of survey instruments: a facility inventory questionnaire and health worker interviews. The Provider Interview Questionnaire gathers information on the educations, training, and management experience of health workers who deliver the services (22,37).

4. Source Population

The source population for this study comprises all health facilities in Ethiopia that were eligible for inclusion in the Ethiopia Service Provision Assessment (ESPA) surveys conducted in 2014 and 2021/22. These include public and private health facilities providing preventive and curative services.

5. Study Population

The study population comprises the health facilities that were surveyed in the Ethiopia Service Provision Assessment. These include a nationally and regionally representative sample of public and private health facilities, such as hospitals, health centers, and clinics.

6. Sample size determination

The ESPA sample size was determined using a combination of census data and random sampling methods, including a census of hospitals and a stratified random sample of other health facility types. Equal-probability systematic sampling was applied. In the 2014 SPA+, a total of 1,165 health facilities were included, comprising 214 hospitals, 292 health centers, 292 health posts, and 367 clinics (37). Similarly, where the 2021-22 ESPA included 1,407 health facilities, consisting of 413 hospitals, 310 health centers, 328 health posts, and 356 clinics (22).

7. Data collection

The ESPA employed various data collection instruments, including the Facility Inventory Questionnaire, Provider Interviews, and client exit interviews, to evaluate health service availability, readiness, client perception, feedback, and accountability in Ethiopia. It assessed the capacity of facilities to deliver services by examining the presence of essential equipment,

infrastructure, and support systems such as logistics, infection control, and quality assurance. Facility characteristics like staff training, supervision, service delivery protocols, and availability of client education materials were also reviewed. Observations of service delivery processes were conducted to evaluate adherence to standards of care. (22,37).

8. Eligibility Criteria

8.1. Inclusion criteria

- For this study, all health facilities apart from health posts were included in the analysis. Data related to non-communicable disease (NCD) services, including general NCD service availability, and service availability for cardiovascular diseases, chronic respiratory diseases, and cancer, were analysed. The geographical distribution of facilities by region, facility type, managing authority, and location (urban or rural) was also considered. Additionally, information on the availability of disease-specific training, clinical guidelines, and essential medicines was included to assess the service readiness score for each noncommunicable disease.

8.2. Exclusion Criteria

- All health posts and regions like Tigray, South Nation Nationality and peoples (SNNP) and Sidama were excluded from the analysis to ensure consistency between the 2014 and 2021/22 SPA datasets.

9. Study variables

9.1. Dependent variable

- Health service availability for NCDs

9.2. Independent Variables

- Geographical distribution of health facilities
- Types of health facility
- Trained staff
- Clinical guidelines
- Essential medicines

10. Data quality assurance

For both ESPA+ and ESPA 2021-2022 Primary training was delivered by qualified trainers. The training included role plays, mock interviews, practical demonstrations, lectures, and classroom discussions. There was field practice for two days to familiarize participants with

paper questionnaires and tablet computers for data entry and collection. After the training, teams were assembled, with team leaders ensuring all questionnaires were completed. EPHI supervised all the fieldwork, with regional and central coordinators. Pre-tests were also conducted to identify any translation errors and potential problems in questionnaires (22,37).

11. Data Management

From the 2014 and 2021/22 SPA dataset variables specifically related to NCD service availability and readiness were mined. To ensure the consistency of two datasets regions, for purposes of comparability, regions not consistently covered under both surveys i.e. Tigray, Sidama, and Southern Nations, Nationalities, and Peoples (SNNP) were excluded from the analysis. Likewise, regions name were also standardised between the two datasets by recoding in order to ensure uniform regional classifications. Health posts were excluded from the analysis because these facilities do not normally provide NCDs related health service. The research therefore covered only hospitals, clinics, and health centers.

To simplify interpretation and to ensure sufficient sample sizes across categorical independent variables were recoded as follows; Facility type: Specialty and higher clinics were merged and coded as "higher clinic". Primary, general, and referral hospitals were merged and reclassified as "hospital. Likewise for managing authority government/public facilities, military, prison, and federal police-owned facilities were merged and coded as "governmental". Variables indicating whether a facility provided diagnosis and/or management for NCDs in general and for each of the four common NCDs responses were, recoded as 1 if the facility provided the service and 0 if it did not. NCD service readiness was measured using a service score calculated as the mean percentage availability of disease specific training, clinical guidelines, and essential medicines, by recoding as 1 if available and 0 if not available.

12. Data analysis

Data related to NCD services were extracted for analysis. For merging the two data sets a common identifier facility _id is used after ensuring the same variable name and type. NCD service availability was assessed based on whether a facility offered diagnosis and/or management for NCDs in general, as well as for each of the four common NCDs specifically.

Data analysis includes stratification by region, NCD type, facility type, and other relevant factors.

The services availability for common NCDs was summarized using descriptive statistical methods, with categorical variables presented in tables and graphs. NCD service readiness was measured using a service score calculated as the mean percentage availability of three tracer items: the availability of disease specific training, clinical guidelines, and essential medicines. A Logistic regression model was employed to assess the association between service availability and factors influencing service quality. General service availability was used as dependent variable and facility type, managing authority, residence (urban/rural), and region were the independent variables. The dependent variable was coded as 1 "available" and 0 "not available". For regression analysis, categories from region Addis Ababa, from facility type hospital, from residence urban and from managing authority: government-owned facilities were used as reference. All assumptions were verified, and statistical analyses were performed using STATA software.

ETHICAL CONSIDERATION

Ethical approval for this study was obtained from the Research Ethics Committee of the School of Public Health, Addis Ababa University. A formal letter of cooperation was requested from the Ethiopian Public Health Institute (EPHI) to access Ethiopia Service Provision Assessment (ESPA) survey row data. The use of secondary data adhered to ethical guidelines, ensuring that confidentiality and data protection measures were upheld.

The requested data were handled with the utmost care and confidentiality, strictly used for academic purposes, and aligned with the ethical standards set by both Addis Ababa University and EPHI. A data-sharing agreement was signed between the principal investigator and National Data Management and Analytics Center for Health, at EPHI.

RESULT

1. General characteristics of surveyed health facility

A total of 1,343 health facilities were included in the analysis comprising both 745 health facilities from the 2014 SPA+ and 851 facilities from the 2021/22. Out of this health facilities 61.9% are located in Urban and 38.1 were from rural in the 2014 SPA survey whereas 58.05% were from urban and 42.86% were located in the rural in 2021/22. The number of hospitals, health centers, and clinics were 157, 226 and 362 in 2014 and 319, 242 and 290 respectively in 2021/22 survey year. Oromia region have the highest number of health facilities (24%in 2014 and 28.1% in 2021/22) whereas Amhara region (18.924%in 2014 and 22.9% in 2021/22) and Addis Ababa City administration (17.2%in 2014 and 12.7% in 2021/22). In 2014, over half (52.9%) of the health facilities in this analyses were private health facilities but in 2021/22 the majority of facilities visited were governmental. Health center constituted the largest proportion (30.3%) in the 2014 however in 2021/22 38%, Hospitals accounts 37.5% of all facilities (Table 3)

Table 1 Percentage of facilities assessed, by region, facility type, residence, and managing authority, Ethiopia, in 2014 and 2021/22.

Year	2014		2021/22	
	Number of facilities	Percentage	Number of facilities	Percentage
Residence				
1. urban	461	61.9	638	58.05
2. rural	284	38.1	213	42.86
Total	745	100	851	100
Managing authority				
1. Government	333	44.7	497	58.4
2. Private	394	52.9	332	39
3. NGO	18	2.4	22	2.6
Total	745	100	851	100
Region/ City Administration				
1. Afar	50	6.7	54	6.3
2. Amhara	141	18.9	195	22.9
3. Oromia	185	24.8	239	28.1
4. Somali	55	7.4	68	8
5. Benishangul gumuz	47	6.3	57	6.7
6. Gambella	49	6.6	53	6.2
7. Harari	37	5	34	4
8. Addis Ababa	128	17.2	108	12.7

9. Dire Dawa	53	7.1	43	5.1
Total	745	100	851	100
Facility Type				
1.Hospita	157	21.1	319	37.5
2. Health Center	226	30.3	242	28.4
3. Higher Clinic	51	6.8	25	2.9
4.Midum Clinic	131	17.6	161	18.9
5. Lower Clinic	180	24.2	104	12.2
Total	745	100	851	100

2. NCD service availability

2.1.General NCD service availability

In 2014, the general service availability for NCDs was 100%, 90%, 88%, 87.2%, 83.36%, 81.95%, 77%, 69.06%, and 54.22% in Harari, Addis Ababa, Somali, Benishangul, Amhara, Oromia, Afar, and Gambella regions, respectively. Government health facilities (90.3%) provided more general NCD services than privately owned and NGO-owned health facilities. Urban facilities (87.85%) also provided more NCD services than rural facilities (74.69%).

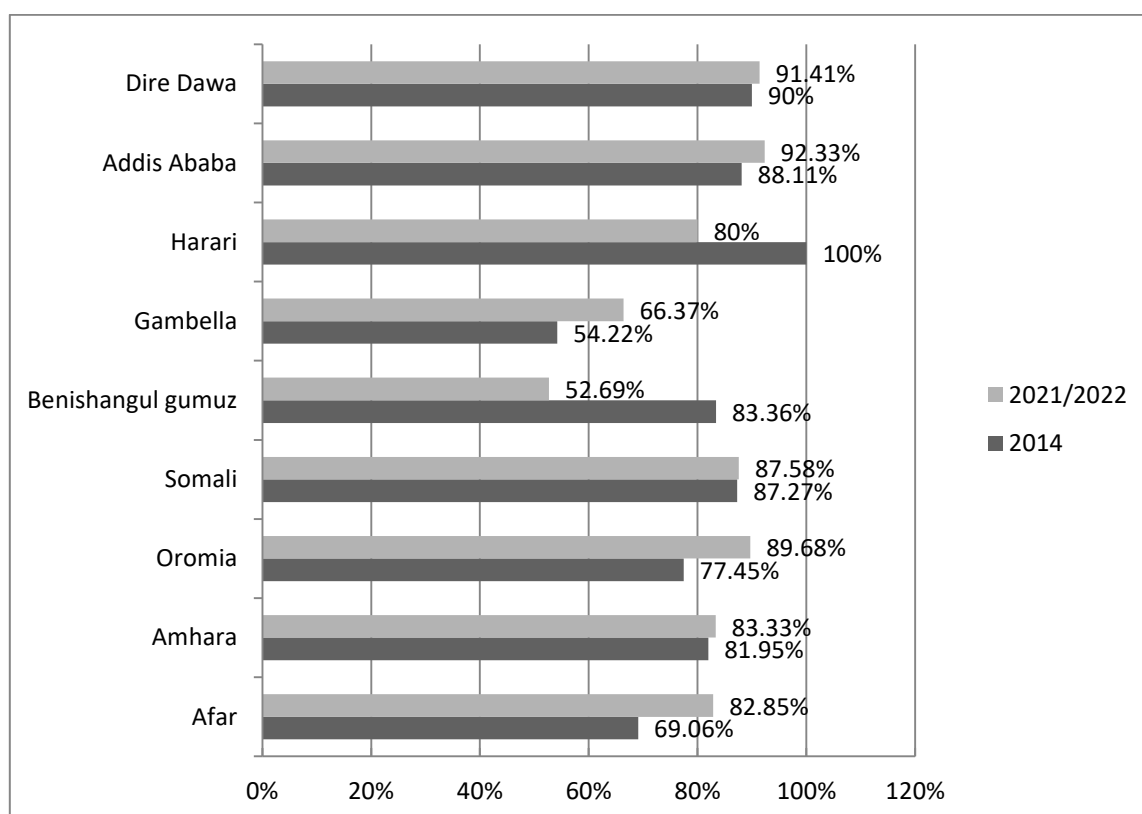


Figure 2. General NCD service availability across all regions in 2014 and 2021/22

In 2021/22, the general NCD service availability increased across all regions and city administrations except in Benishangul-Gumuz (52.9%) and Harari (80%), where a decline in

service availability was observed (see Figure 1). The general service availability was higher in government owned facilities than private and NGOs. Facilities located in urban areas give more service than rural facilities and almost all hospitals give General NCD service in both 2014 and 2021/22 (See table 4).

Table 2. General NCD service availability by facility type, residence, and managing authority in 2014 and 2021/22.

Year	2014		2021/22	
	NCD service availability (%)	total number of facilities	NCD service availability (%)	total number of facilities
Managing authority				
1. Government	90.63	327	96.12	423
2. Private	68.44	308	77.12	249
3. NGO	43.54	18	82.81	18
Total	80.21	653	86.38	690
Urban/rural				
1. urban	87.85	408	89.77	478
2. rural	74.69	245	82.26	212
Total	80.21	653	86.38	690
Facility type				
1. Hospital	97.36	154	98.58	281
2. Health Center	90.11	221	95.75	202
3. Higher Clinic	87.65	41	98.69	16
4. Medium Clinic	97.69	109	93.44	107
5. Lower Clinic	55.34	128	58.81	84
Total	80.21	653	86.38	690

2.2.Service availability for Cardiovascular Diseases (CVD)

In 2014 only 68.5% of health facilities owned by NGOs have diagnosis and or treatment for CVD but in 2021/22 all facilities owned by NGOs gives CVD service. In 2014 all higher clinics were giving service for CVD, however the service reduced into 77% in 2021/22. The survey indicated hospitals give more CVD service (98% in 2014 and 99.6% in 2021/22) than other health facility type. Relatively lower clinics give the lowest service in both 2014 and 2021/22 survey records. (See table 5)

Table 3 Service availability for cardiovascular disease by facility type, residence, and managing authority in 2014 and 2021/22

Year	2014		2021/22	
	CVD service availability (%)	total number of facilities	CVD service availability (%)	total number of facilities
Managing authority				
1. Government	92.11	302	98.25	406
2. Private	88.49	241	89.82	206
3. NGO	68.48	13	100	11
Total	90.59	556	94.5	623
Urban/rural				
1. urban	88.55	370	93.67	443
2. rural	92.33	186	95.59	180
Total	90.59	556	94.5	623
Facility type				
1. Hospital	97.95	150	99.64	277
2. Health Center	91.62	196	98.08	187
3. Higher Clinic	100	36	77.89	15
4. Medium Clinic	95.95	103	93.82	95
5. Lower Clinic	81.54	71	85.88	49
Total	90.59	556	94.5	623

All facilities who have non communicable disease diagnosis and treatment service in Dire Dawa have also Cardiovascular disease (CVD) service in both 2014 and 2021/22 survey. The service availability for CVD in Benishangul gumuz was 85.7% in 2014 and it increased in to 100 percent in 2021/22. Gambella region have the lowest CVD service than all other regions.

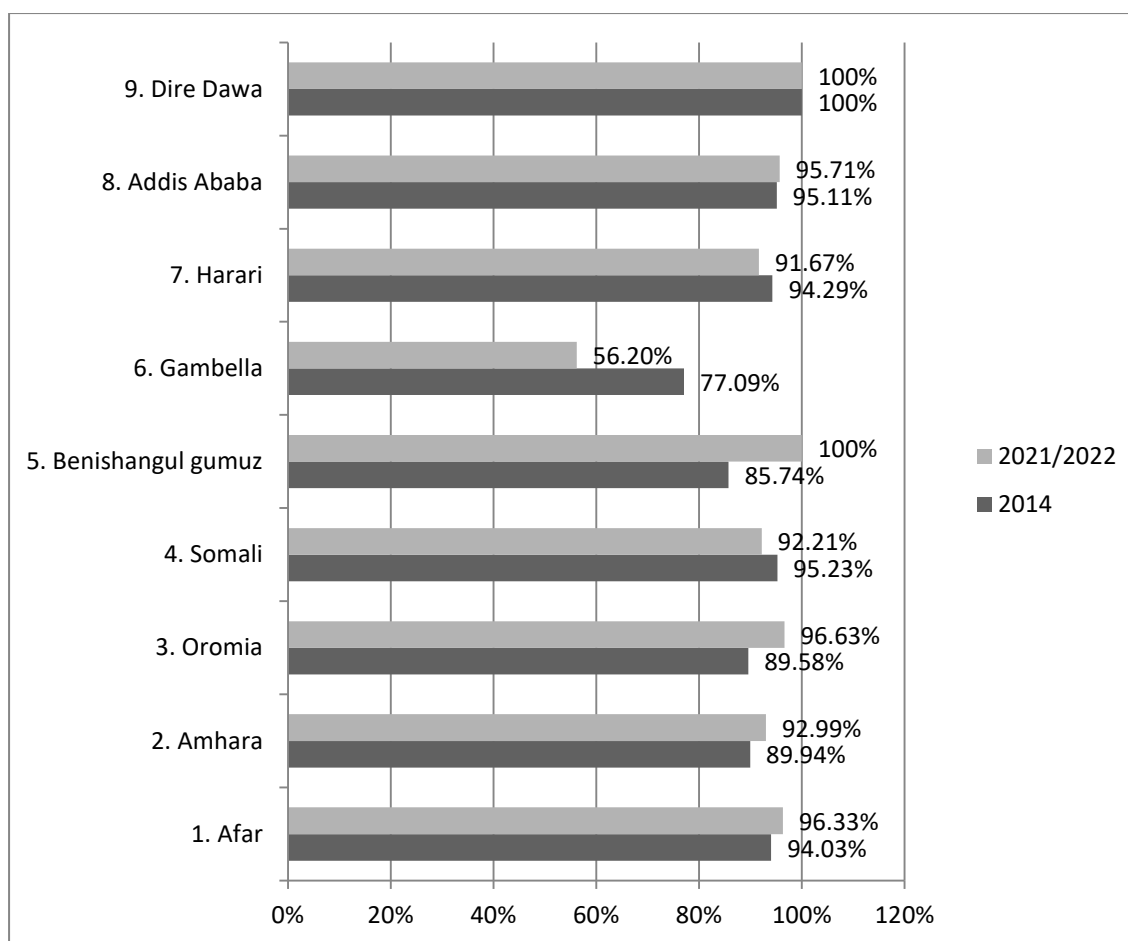


Figure 3 Service availability for cardiovascular diseases by region

2.3. Service availability for chronic respiratory diseases (CRD)

Among health facilities across the region that provide general NCD service, the percentage of facilities capable of diagnose and/or manage chronic respiratory diseases such as COPD, Asthma, chronic bronchitis in patients are presented in table 6. Health facilities owned by NGOs and hospitals have higher percentage of health service for chronic respiratory diseases.

Table 4 service availability for chronic respiratory diseases by facility type, residence, and managing authority in 2014 and 2021/22

Year	2014		2021/22	
	CRD service availability (%)	total number of facilities	CRD service availability (%)	total number of facilities
Managing authority				
1. Government	98.42	302	94.39	406
2. Private	87.35	241	92.78	206
3. NGO	100	13	100	11
Total	94.21	556	93.75	623
Urban/rural				
1. urban	93.29	370	94.61	443
2. rural	94.99	186	92.61	180
Total	94.21	556	93.75	623
Facility type				
1. Hospital	98.64	150	100	277
2. Health Center	98.64	196	93.7	187
3. Higher Clinic	97.44	36	87.66	15
4. Medium Clinic	95.04	103	99.31	95
5. Lower Clinic	80.4	71	83.42	49
Total	94.21	556	93.75	623

The service availability for chronic respiratory disease in Gambella and Dire Dawa were 100% in 2014 however it reduces to 76.8% in Gambella in 2021/22. However, by 2021/22, it had declined to 76.8% in Gambella. Notably, all NGO-owned facilities continued to provide diagnostic and/or treatment services for chronic respiratory conditions.

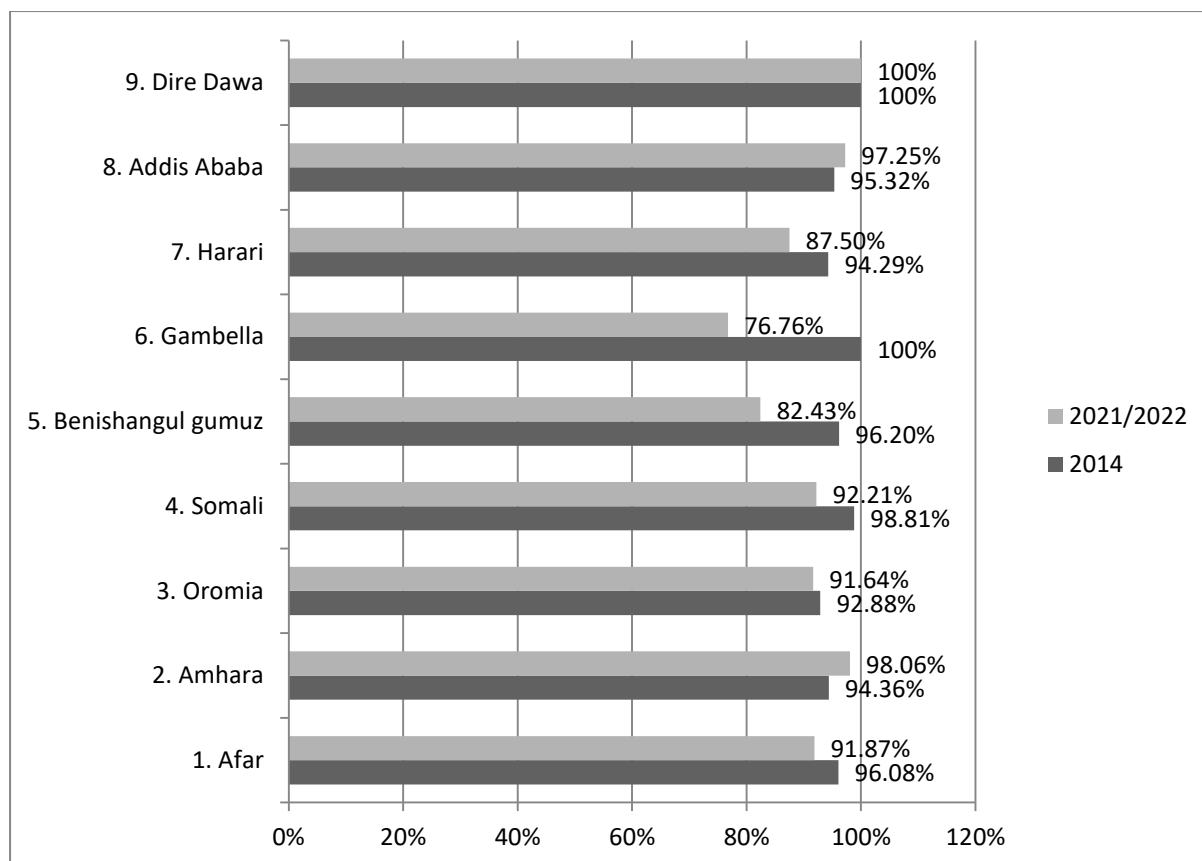


Figure 4 Service availability for chronic respiratory diseases, by region

1.1. Service availability for Diabetes mellitus (DM)

Disease specific service availability was assessed among health facilities which give general NCD service. Dire Dawa (100%), Addis Ababa (99.8%) and Harari (97.1%) showed the highest service availability while Gambella (33.3%), Benishangul gumuz (52.9%) and Oromia (53.0%) show lowest service for diabetes mellitus among all facilities giving service for NCD in 2014. In the 2021/22 survey, all health facilities providing NCD services in Amhara, Addis Ababa, and Dire Dawa offered diagnosis, treatment, or both for diabetes mellitus.

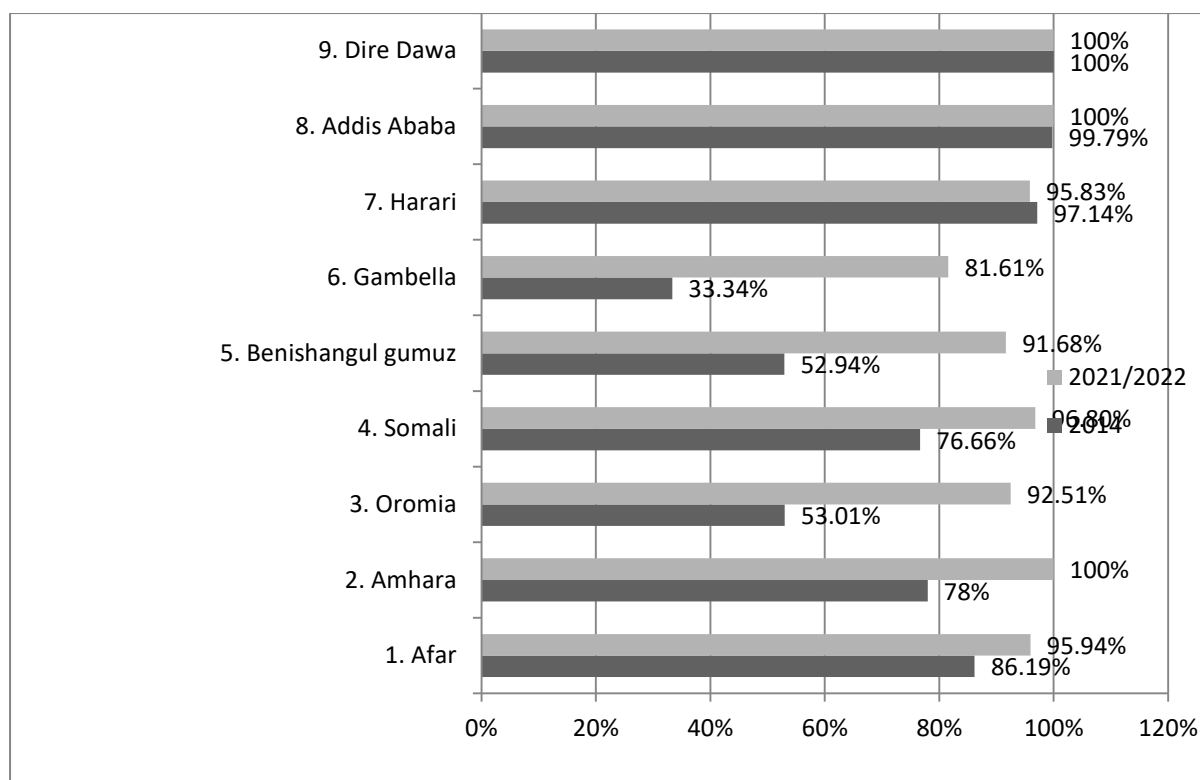


Figure 5. Service availability for Diabetes mellitus, by region

Additionally, all NGO-owned health facilities and higher clinics provided DM services in both the 2014 and 2021/22 surveys.

Table 5 Service availability for Diabetes mellitus by facility type, residence, and managing authority in 2014 and 2021/22

Year	2014		2021/22	
	DM service availability (%)	total number of facilities	DM service availability (%)	total number of facilities
Managing authority				
1. Government	68.13	302	93.56	406
2. Private	71.51	241	97.87	206
3. NGO	100	13	100	11
Total	69.6	556	95.59	623
Urban/rural				
1. urban	81.98	370	98.69	443
2. rural	59.09	186	91.47	180
Total	69.6	556	95.59	623
Facility type				
1. Hospital	99.32	150	100	277
2. Health Center	66.3	196	92.76	187
3. Higher Clinic	100	36	100	15

4. Medium Clinic	99.13	103	99.92	95
5. Lower Clinic	49.76	71	94.37	49
Total	69.6	556	95.59	623

1.2.Service availability for Cancer

The percentage of health service availability for cancer from NCD service giving facilities is lower compared to other NCDs. The service availability in hospitals and higher clinics were higher than other facility type in both 2014 and 2021/22, whereas lower clinics have fewer services for the diagnosis and treatment of NCDs.

Table 6 Service availability for cancer by facility type, residence, and managing authority in 2014 and 2021/22

Year	2014		2021/22	
	Cancer service availability (%)	total number of facilities	Cancer service availability (%)	total number of facilities
Managing authority				
1. Government	31.47	302	32.51	406
2. Private	21.77	241	32.93	206
3. NGO	36.81	13	43.55	11
Total	27.8	556	32.86	623
Urban/rural				
1. urban	32.04	370	37.41	443
2. rural	24.19	186	26.85	180
Total	27.8	556	32.86	623
Facility type				
1. Hospital	72.71	150	72.2	277
2. Health Center	30.37	196	28.87	187
3. Higher Clinic	73.43	36	51.21	15
4. Medium Clinic	28.63	103	36.93	95
5. Lower Clinic	3.53	71	20.85	49
Total	27.8	556	32.86	623

Compared to other common NCD service availability, cancer service availability were low in all cities. Dire Dawa (75.5%, 68.9%), Addis Ababa (58.2%, 40.36%) and Harari (29.17%, 62.9%) have higher service availability for diagnosis and/or treatment of cancer in 2021/22 and 2014. Afar (16.2%, 5.14%), Gambella (13.6%, 4.5%), and Benishangul gumuz (8.7%, 16.2%) have lowest service availability for Cancer.

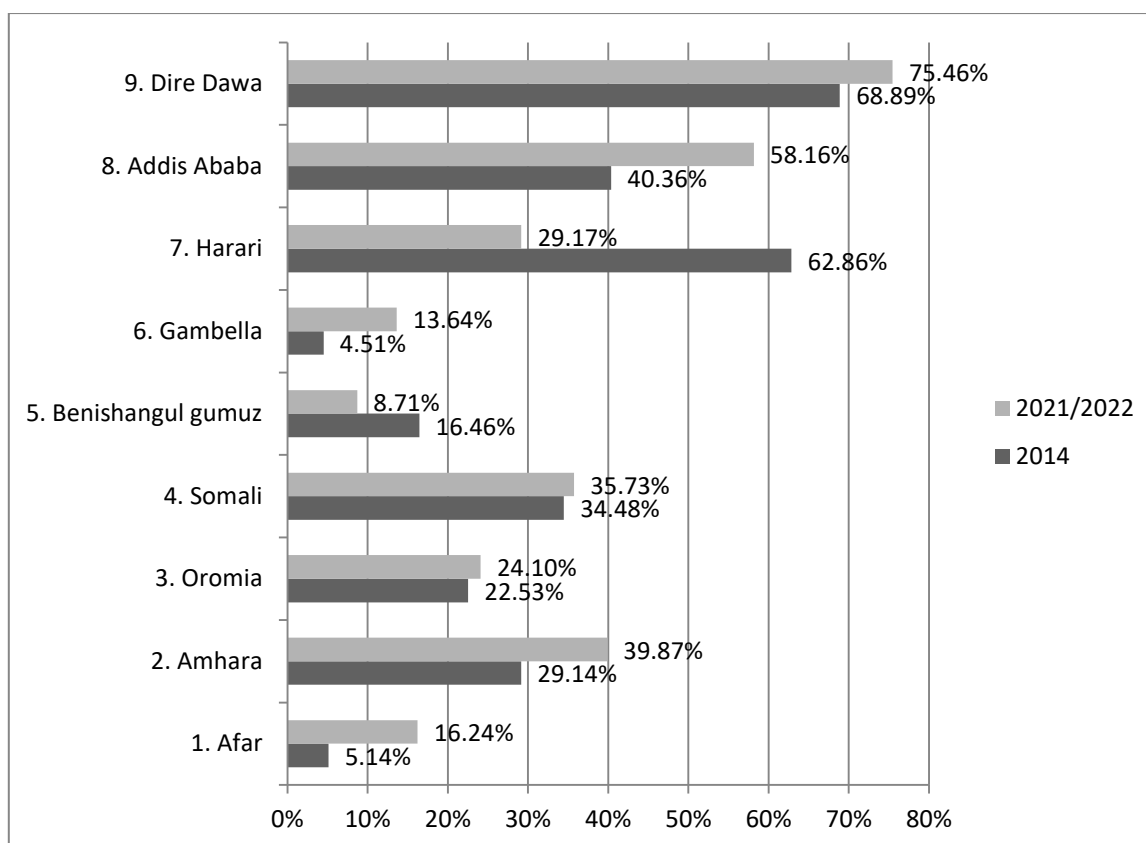


Figure 6. Service availability for cancer, by region

2. NCD Service readiness evaluation

The service readiness score for each non-communicable disease (NCD) included in the survey was assessed based on the presence of key tracer items. These included the availability of disease-specific guidelines, essential medicines, and trained staff for the specific disease. The assessment was conducted among health facilities that provided diagnosis and/or management services for the respective NCDs

2.1. Cardiovascular disease service readiness

The service readiness for cardiovascular disease was assessed by calculating the mean percentage score of three tracer items; the availability of guideline, relevant training and essential medicine for CVD. The national mean service readiness score for cardiovascular disease improved significantly, from 23.94% (95% CI 21.30–26.58) in 2014 to 41.30% in 2022 (CI 37.50–45.09). Hospitals displayed the highest improvement, increasing from 42.67% to 63.04%. This increase is statistically significant. Medium clinics showed a major change from 8.39% to 32.65%, suggesting major gains in service improvement.

All regions showed an increase in CVD service readiness from 2014 to 2022, showing large improvements in Addis Ababa (from 17.5% to 47.24%), Amhara (from 22.71% to 47.60%), and Benishangul-Gumuz (from 22.66% to 48.55%). Service readiness in Gambella improves significantly (from 8.68% to 31.42%)

Table 7 Readiness score for cardiovascular diseases by facility type and region

	2014 Mean (95% CI)	2021/22 Mean (95% CI)
Facility Type		
Hospital	42.67% (39.93–45.41)	63.04% (60.05–66.03)
Health Center	33.73% (30.83–36.63)	54.09% (49.59–58.59)
Higher Clinic	12.83% (5.98–19.68)	10.56% (–2.20–23.33)
Medium Clinic	8.39% (4.37–12.41)	32.65% (26.84–38.46)
Lower Clinic	3.62% (0.31–6.93)	9.74% (3.46–16.02)
Region		
Afar	23.53% (17.72–29.33)	44.70% (35.39–54.01)
Amhara	22.71% (17.85–27.56)	47.60% (39.52–55.68)
Oromia	27.31% (23.03–31.59)	36.28% (30.73–41.83)
Somali	28.69% (23.02–34.36)	41.42% (31.90–50.94)
Benishangul-Gumuz	22.66% (14.06–31.27)	48.55% (29.38–67.71)
Gambella	8.68% (1.98–15.39)	31.42% (18.09–44.74)
Harari	18.18% (11.25–25.11)	40.91% (26.36–55.46)
Addis Ababa	17.50% (12.38–22.61)	47.24% (39.46–55.03)
Dire Dawa	23.70% (17.31–30.09)	44.88% (31.76–58.00)
Total	23.94% (21.30–26.58)	41.30% (37.50–45.09)

2.2. Chronic respiratory disease service readiness

There is a significant increase in CRD service readiness in 2021/22 in hospitals (45% to 61.8%), health center (from 40.6% to 56%) and medium clinic (19.3% to 34%) compared to 2014 survey data. There is no significant change lower clinic with lowest service readiness.

National average service readiness score increased from 32.62% (CI: 29.66–35.58) in 2014 to 43.95% (CI: 39.90–48.01) in 2021/22. Amhara (30.9% to 40.4%), Benishangul gumuz (29.1% to 51.2%), Dire Dawa (29.6% to 44.2%) and Addis Ababa (24.6% to 49.4%) showed a substantial increase in chronic respiratory disease service readiness.

Table 8 Service readiness score of chronic respiratory diseases by facility type and region

	2014 Mean (95% CI)	2021/22 Mean (95% CI)
Facility Type		
Hospital	45.04% (41.86–48.22)	61.85% (58.92–64.79)
Health Center	40.67% (37.17–44.16)	56.04% (51.49–60.59)
Higher Clinic	19.97% (10.07–29.86)	9.72% (–1.81–21.26)
Medium Clinic	19.25% (13.64–24.86)	34.02% (26.86–41.18)
Lower Clinic	15.52% (9.40–21.63)	21.81% (8.91–34.70)
Region		
Afar	27.00% (21.57–32.43)	37.81% (27.44–48.17)
Amhara	30.90% (26.57–35.23)	48.93% (40.36–57.49)
Oromia	37.18% (31.78–42.58)	39.59% (33.63–45.55)
Somali	31.99% (26.74–37.25)	48.39% (38.73–58.05)
Benishangul-Gumuz	29.09% (19.98–38.21)	51.23% (34.11–68.35)
Gambella	28.83% (20.04–37.63)	34.50% (24.36–44.65)
Harari	31.31% (21.61–41.02)	41.27% (29.68–52.86)
Addis Ababa	24.61% (18.28–30.93)	49.36% (40.26–58.46)
Dire Dawa	29.63% (23.72–35.54)	44.23% (32.66–55.79)
Total	32.62% (29.66–35.58)	43.95% (39.90–48.01)

2.3.Diabetes mellitus service readiness

Hospitals (47.7% to 66.2%), Health centre (26% to 48%) and medium clinics (7% to 32%) showed rise in DM service readiness. Higher clinics showed a decline (19.97% to 9.72%) even though it is not statistically significant. Most regions show statistically significant improvements in DM service readiness. Regions like Addis Ababa (19.4% to 46.7%), Amhara (17.7% to 44.1%) and Benishangul gumuz (12.8% to 46.6%) showed an improvement in DM service readiness (Table 9).

Table 9 Service readiness score for diabetes mellitus by facility type and region

	2014 Mean (95% CI)	2021/22 Mean (95% CI)
Facility Type		
Hospital	47.68% (44.37–51.00)	66.19% (63.14–69.23)
Health Center	25.99% (21.65–30.32)	48.15% (42.94–53.36)
Higher Clinic	13.71% (5.58–21.84)	8.82% (–1.12–18.75)
Medium Clinic	7.03% (3.22–10.83)	32.03% (25.68–38.37)
Lower Clinic	6.68% (1.22–12.14)	14.98% (8.31–21.65)
Region		
Afar	20.15% (13.06–27.24)	42.10% (30.66–53.53)
Amhara	17.75% (12.98–22.53)	44.12% (36.22–52.02)
Oromia	23.14% (16.97–29.31)	32.69% (27.52–37.87)
Somali	24.91% (17.56–32.26)	36.65% (27.00–46.31)
Benishangul-Gumuz	12.76% (4.19–21.33)	46.65% (28.83–64.48)*
Gambella	19.70% (2.50–36.91)	21.72% (12.35–31.10)
Harari	15.69% (8.88–22.50)	44.93% (31.81–58.05)
Addis Ababa	19.39% (13.88–24.90)	46.66% (36.93–56.40)
Dire Dawa	20.74% (13.52–27.97)	44.88% (32.37–57.39)
Total	20.11% (17.15–23.07)	38.25% (34.55–41.95)

2.4. Cancer service readiness

There was a significant increase in cancer service readiness in hospital (40.4% to 59.2%) and health center (36.4% to 54.5%), whereas, higher clinics and lower clinics have lower service readiness for cancer diagnosis and treatment in both 2014 and 2021/22 SPA data.

Based on this study service readiness criteria the national average cancer service readiness score increased from 29.41% (CI: 25.67–33.16) in 2014 to 41.30% (CI: 34.09–48.51) in 2022. Addis Ababa, Harari, Amhara, Somali, and Dire Dawa health service readiness improved significantly in 2021/22 while there was low service readiness in Benishangul gumuz and Gambella and yet there was no improvement in 2021/22 survey.

Table 10 Service readiness score of cancer by facility type and region

	2014 Mean (95% CI)	2021/22 Mean (95% CI)
Facility Type		
Hospital	40.39% (37.28–43.50)	59.17% (55.50–62.84)
Health Center	36.36% (32.96–39.76)	54.55% (45.94–63.15)
Higher Clinic	13.89% (2.00–25.78)	12.05% (–3.12–27.23)
Medium Clinic	5.65% (0.39–10.92)	29.65% (14.67–44.63)
Lower Clinic	1.17% (–1.63–3.96)	10.64% (–2.53–23.81)
Region		
Afar	44.44% (26.54–62.35)	31.46% (12.52–50.41)
Amhara	32.35% (26.25–38.45)	44.30% (33.69–54.91)
Oromia	34.54% (29.73–39.35)	35.78% (20.81–50.75)
Somali	26.41% (19.14–33.68)	38.92% (27.95–49.88)
Benishangul-Gumuz	26.59% (10.89–42.29)	18.75% (–10.85–48.35)
Gambella	33.33% (fixed value)	19.13% (1.73–36.54)
Harari	16.67% (9.65–23.68)	38.10% (29.41–46.78)
Addis Ababa	17.33% (8.56–26.10)	48.47% (33.68–63.25)
Dire Dawa	23.66% (17.51–29.80)	43.68% (29.04–58.32)
Total	29.41% (25.67–33.16)	41.30% (34.09–48.51)

In general the national average service readiness score increased from 23.94% (95% CI 21.30–26.58) in 2014 to 41.30% in 2022 (CI 37.50–45.09) for cardiovascular diseases; from 32.62% (95% CI: 29.66–35.58) in 2014 to 43.95% (95% CI: 39.90–48.01) in 2021/22 for chronic respiratory diseases; from 20.11% (CI:17.15-23.07) in 2014 to 38.25% (CI:34.55-41.95) for diabetes mellitus from 29.41% (CI: 25.67–33.16) in 2014 to 41.30% (CI: 34.09–48.51) for cancer in 2022 (Figure-5).

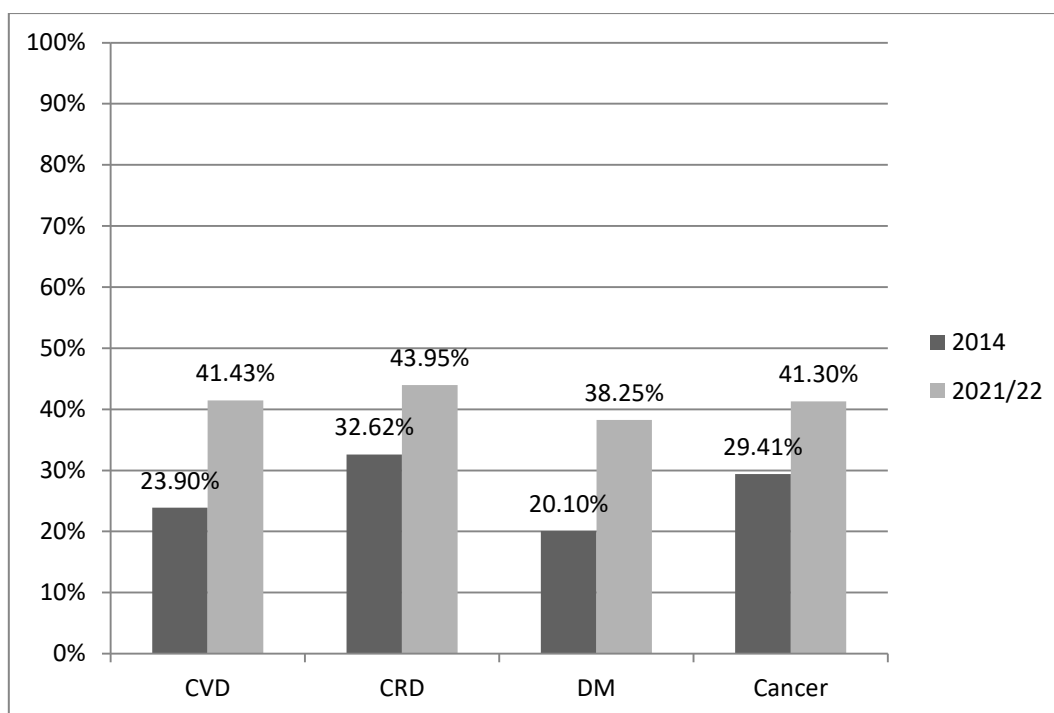


Figure 5 the national average service readiness score for common NCDs in 2014 and 2021/22

3. Factors associated with NCDs service availability

To analyse and predict the relationship between factors including facility type, health service location, region and managing authority are associated with NCD service availability. Logistic regression was performed using hospital, urban, Addis Ababa, and government as a reference respectively. Harari region was excluded from the analysis because of small sample size which is not enough for comparison. As shown in the logistic regression result (table 11), hospitals provide more NCD service. Health centers (89%) and clinics (71%) less likely to provide NCD service than hospitals. Compared to facilities located in urban area, rural health facilities have 70% less likely to offer NCD service which is statistically significant. Thus urban facilities are significantly higher odds of offering NCD service. Compared to private facilities government facilities have 95% higher likely to give NCD service than private owned. There was no significant difference between regions on NCD service availability except Afar, Gambella and Harari. Afar (84%) and Gambela (71%) have significantly lower odds of NCD service compared to Addis Ababa.

Table 11 Logistic regression result on NCDs service availability

NCD Services	Odds Ratio	Robust Std. Err.	z	P> z	[95% Conf. Interval]
Facility type (Hospital)					
Health center	1.1187639	0.0991928	2.25	0.024	1.013812 – 1.235017
Clinic	1.2031179	0.1076726	2.01	0.044	1.0058336 – 1.4381746
Residence (Urban)					
2. rural	2.0004027	0.1341431	2.75	0.006	1.1274239 – 3.7001169
Managing authority (Government)					
Private	0.6020138	0.1222521	-2.80	0.004	0.4064228 – 0.8912137
Region (Addis Ababa)					
Amhara	0.812001	0.3460187	-0.72	0.471	0.2444233 – 1.913622
Oromia	1.429816	0.8964346	0.43	0.663	0.2862364 – 7.137716
Somali	0.4322934	0.2700144	-1.35	0.176	0.1074203 – 1.674656
Benishangul_Gumuz	1.2319364	0.4366634	0.63	0.530	0.6229401 – 2.434103
Gambella	2.0937019	1.156508	1.23	0.218	0.6661694 – 6.583996
Afar	1.604425	1.150034	0.71	0.480	0.3736093 – 6.893268
Dire Dawa	1.663234	1.181804	0.64	0.519	0.2761345 – 2.157893
_cons	4.5110078	0.4204372	51.28	0.000	3.831024 – 5.074

DISCUSSION

This study aims to assess the service availability and readiness for common NCDs in Ethiopia using a data from the 2014 and 2021/22 Ethiopian Service Provision Assessment survey. In the 2014 SPA the general service availability for NCDs ranges from 54.2% in Gambella to 100% in Harari. By 2021/22 it had increased across all regions and city administrations except in Benishangul gumuz (52.9%) and Harari (80%) where a decline was observed. General NCD service availability was higher in government facilities compared to private and was greater in urban than rural areas. Nearly all hospitals provided general NCD services in both 2014 and 2021/22. From all other facilities across the regions NCDs service provision in facilities located in Gambella was the least. All health facilities in Dire Dawa and all NGO owned facilities offer service for the three common NCDs; cardiovascular disease (CVD), chronic respiratory diseases (CRD), and Diabetes mellitus (DM) in both 2014 and 2021/22 survey. Cancer service availability was low across all regions and city administrations ranging from 4.5% in Gambella to 68.9% in Dire Dawa, in 2014 and from 8.7% in Benishangul gumuz to 75.5% in Dire Dawa in 2021/22.

23.9%, 32.6%, 20.1% and 29.4% of health facilities in 2014 and 94.5%, 93.7%, 95.6% and 32.7% in 2021/22 of health facilities claimed to provide service of CVD, CRD DM, and Cancer respectively. The mean service readiness for the four common NCDs increases from 23.9%, 32.6%, 20%, and 29.4% for CVD, CRD DM, and Cancer in 2014 to 41.3%, 44%, 38.3% and 41.3% respectively in 2021/22.

There have been very few assessments conducted before in Ethiopia to evaluate the availability and quality of health facilities for NCDs. Apart from a limited number of reports based on a Service Availability and Readiness Assessment (SARA) comprehensive evaluations are scarce. The SPA and SARA are similar service assessment tools with similar objective and methodologies. Therefore the result of this study will be compared with the findings from available SARA survey report. Previous studies have also shown disparities in NCDs service availability, a study by Theodros et al., on the 2016 SARA survey showed in Ethiopia, 22% of health facilities reported providing diabetes services, 41% offered cardiovascular disease care, 40% provided chronic respiratory disease services, and only 2% reported offering cervical cancer services (9). A study using SPA and SARA indicate the services available for diabetes was (59%, 22%

and 36%); for cardiovascular diseases (73%, 41% and 49%); chronic respiratory diseases (76%, 45% and 53%) between 2014 to 2018 in Ethiopia (10).

When comparing the findings of this study with data from other low- and middle-income countries, notable differences emerge. A cross-sectional survey of 258 health facilities conducted between 2019 and 2020 in Kenya reported that 93.8% offered services for chronic respiratory disease, 82.2% for diabetes mellitus, 65.1% for cardiovascular diseases, and only 24.4% provided cervical cancer screening. These disparities were due to the type and level of health facilities (34). Similarly, the 2014–2015 Tanzanian Service Provision Assessment, which evaluated 1,188 health facilities, found that 52.1% offered diabetes care, 64.8% provided hypertension services, and 60.9% delivered chronic respiratory disease services, with service availability differing by facility type and geographic location(35). a study conducted in Pakistan to investigate the health service availability and readiness toward NCDs using the SARA survey tool revealed that only eight (32%) out of 25 health facilities provide service for NCDs. Diabetes mellitus was the condition with the highest service availability (72%), followed by cardiovascular disease (52%), and chronic respiratory disease (40%). Additionally, there were no cancer services available (33). Whereas in the current 2021/22 SPA survey the availability of services for chronic respiratory and cardiovascular diseases had increased to 93.7% and 94.5%, while diabetes services rise from 69.6% to 95.6% compared to the 2014 SPA+ survey. However, the availability of cancer services was still quite low at 32.8%. Government-run institutions showed 95% more service availability than private ones, while urban facilities continuously performed better than rural ones. There were clear regional differences, with Afar and Gambella performing noticeably worse than Addis Ababa and Dire Dawa. These trends demonstrate the growth of NCD services across the country as well as on going differences in fair distribution among regions and facility types.

Between 2014 and 2018, the mean availability of tracer items for diabetes (37%, 53%, and 48%), cardiovascular diseases (36%, 41%, and 42%), chronic respiratory diseases (26%, 27%, and 27%), and cancer diseases (6%, 72%, and 51%) at the national level (10). Whereas in this study, the assessment of service readiness using; the availability of disease specific guideline, training and essential medicine also showed significant progresses. National cardiovascular diseases service readiness level increased from 23.9% to 41.3%, while chronic respiratory diseases show comparable increases from 32.6% to 44.0%. Hospitals consistently achieved the highest readiness scores across all disease

categories, while lower level clinics have less service readiness score. Regions like Benishangul gumuz and Gambella showing minimal improvement in service readiness than other regions. These suggest that although service provision has been increasing, many facilities still lack essential components like trained staff, guidelines, and medicines necessary for comprehensive NCD care.

The logistic regression analysis also indicated key factors of NCD service provision. Facility type is the strongest indicator, with hospitals being significantly more likely to offer services compared to other health facilities such as health centers and clinics. Geographic location showed a higher urban service delivery, while rural facilities display 70% lower odds of providing NCD services. Government ownership was associated with much better service availability compared to private sectors. Region differences occurred mainly with Afar and Gambella signifying low service availability compared to Addis Ababa. These findings indicates how structural characteristics of the health system have unequal access to NCD services, with rural populations and those lower level or private facilities being particularly have less service availability and readiness.

According to WHO fact sheet, there are four main types of NCD: cardiovascular diseases (CVDs) leading to at least 19 million deaths each year, cancers causing 10 million deaths each year, chronic respiratory diseases responsible for 4 million deaths annually and diabetes resulting in over 2 million deaths per year in 2021(13). The NCD National strategic action plan of Ethiopia is prepared in line with Global Action plan on Control of NCDs 2013-2020 and the SDGs 2030 to prioritize NCDs which could be main priority to control public health threat (23). Moreover excellence health provision and advanced methods are important requisites for prevention and control of non-communicable diseases (38). Thus this study attempts to show the general and disease specific service availability for these four common NCDs across the country. It also assesses the readiness of the service using key indicators including disease specific guideline, relevant training and essential medicines. The SPA collects information on service availability and quality of care. It is more comprehensive, assessing not only the reported presence of an item but also verifying its actual existence and functionality on the day of the survey.

Despite the countries achievements in the prevention and control of communicable, maternal and child health diseases the prevention and control of NCDs seems to be neglected. Although there is a measurable progress in NCD service coverage in Ethiopia, evidence from the 2014 and 2021/22 SPA survey reveals that significant gaps persist in

both the availability and quality of NCD services. Even though many health facilities claimed to provide NCDs service the mean availability of tracer items for service was less indicating that more than half of the facilities which deliver an NCD service are not well prepared to give the service. The quality and regional distribution of the service is also uneven.

STRENGTH AND LIMITATIONS OF THE STUDY

This study is based on the 2014 and 2021/22 SPA surveys, which are comprehensive survey, assessing not only the reported presence of an item but also verifying its actual existence and functionality on the day of the survey, thus the finding of this analysis accurately reflect the reality on the ground.

However regions such as Tigray, South Nation Nationality and peoples (SNNP) and Sidama were excluded from the analysis to maintain consistency between the 2014 and 2021/22 SPA datasets. This exclusion will limit the representativeness of the finding at national wide. Moreover, the data on basic supplies and equipment were not included in NCDs service sore analysis, because the data on basic supplies and equipment in the 2021/22 SPA were not comparable with those in 2014 SPA+ survey. This limitation will affect the scope of the findings related to the readiness of NCD services.

CONCLUSION

Although there is a measurable progress in NCD service coverage in Ethiopia, evidence from the 2014 and 2021/22 SPA survey reveals that significant gaps persist the readiness of NCD services. The readiness and regional distribution of the service remain uneven. Even if, high proportion of facilities reporting the provision of NCDs (over 90% for CVD, diabetes and respiratory diseases services) the actual readiness measured by tracer items such as guidelines, training and essential medicines remains lower (about 41–44%). Access to cancer services continues to lag significantly at 32.8%. There are also regional disparities with Afar and Gambella consistently underperforming compared to Addis Ababa and Dire Dawa.

RECOMMENDATION

Efforts need to be made to strengthen NCD service availability in lower level facilities, rural areas, which consistently lag behind urban and governmental health facilities in providing NCD services. Moreover, priority should be given to regions showing a decline or persistently low coverage to achieve equitable access.

Training, resource allocation such as essential medicine and guidelines specific to the diseases is important to improve service quality. Additionally, greater attention is needed to strengthen cancer service across the country. Both the 2014 and 2021/22 surveys provide limited coverage of non-communicable diseases (NCDs) compared to communicable diseases and maternal and child health services. Thus, a nationwide survey on NCD service is also needed to provide a comprehensive assessment of the strengths and weaknesses in the service delivery setting for common non-communicable disease service and to ensure data driven health planning across all regions.

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ANNEXES (12 PAGES)

ANNEX A: Data request letter



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School of Public Health

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Department of Epidemiology &
Biostatistics

ጥር 23 ቀን 2017 ዓ.ም
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ጉዳይ: ትብብር ስለ መጠየቅ

በአዲስ አበባ ዩኒቨርሲቲ፣ የሕብረተሰብ ጤና ት/ቤት የሁለተኛ ዓመት ኢ.ፒ.ዲ.ሚ.ዎሎ-ጂ ኤንድ ባዮስታቲስቲክስ የማስተርስ ተማሪ የሆነችው ረቂቅ አሸብር የመመረቂያ ጽሑፋን “Assessment of availability and distribution of health service for non communicable diseases in Ethiopia.” በሚል ርዕስ ለመስራት በዝግጅት ላይ ትገኛለች። ስለሆነም በትምህርት ክፍሉ የድጋፍ ደብዳቤ እንድንጽፍላት በጠየቀችው መሰረት በእናንተ በኩል አስፈላጊው ትብብር እንዲደረግላት ስንል እየጠየቅን ለሚደረግላት ትብብር ከወዲሁ እናመሰግናለን።

ከሰላምታ
የ/ር. አፄጌብ ጌታቸው
የትምህርት ክፍሉ ኃላፊ
Addis Ababa University
School of Health Sciences
Department of
Epidemiology and
Biostatistics



+251-11-8-553827

Public health@aau.edu.et

aau.edu.et

SEEK WISDOM , ELEVATE YOUR INTELLECT, AND SERVE HUMANITY

ANNEX B: SPA consent form

CONSENT																			
FIND THE MANAGER, THE PERSON IN-CHARGE OF THE FACILITY, OR THE MOST SENIOR HEALTH WORKER RESPONSIBLE FOR CLIENT SERVICES WHO IS PRESENT AT THE FACILITY. READ THE FOLLOWING GREETING: Good day! My name is _____. We are here on behalf of Ethiopian Public Health Institute (EPHI) and the Federal Ministry of Health (FMOH) conducting a survey of health facilities to assist the government in knowing more about health services in Ethiopia. Now I will read a statement explaining the study. Your facility was selected to participate in this study. We will be asking you questions about various health services. Information collected about your facility during this study may be used by the EPHI, FMOH, organizations supporting services in your facility, and researchers, for planning service improvement or for conducting further studies of health services. Neither your name nor the names of any other health workers who participate in this study will be included in the dataset or in any report; however, there is a small chance that any of these respondents and facility name and location may be identified later. Still, we are asking for your help in order to collect this information. You may refuse to answer any question or choose to stop the interview at any time. However, we hope you will answer the questions, which will benefit the services you provide and the nation. If there are questions for which someone else is the most appropriate person to provide the information, we would appreciate if you introduce us to that person to help us collect that information. Data collection will take place (August – December, 2021), data will be released on July 2022 Datasets from this study will only be available for legitimate research purposes If you have any question regarding the survey please contact: Fikreselassie Getachew, CO Principle Investigator, EPHI, Addis Ababa, Ethiopia, Cell No.0913210444 At this point, do you have any questions about the study? Do I have your agreement to proceed?																			
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EXPLAIN TO THE RESPONDENT AT THE START OF THIS INTERVIEW THAT THERE ARE QUESTIONS ON MANAGEMENT MEETINGS AND QUALITY ASSURANCE ACTIVITIES THAT REQUIRE LOOKING AT RECORDS OF THOSE MEETINGS AND ACTIVITIES. IT WILL THEREFORE BE HELPFUL IF RECORDS PERTAINING TO MANAGEMENT MEETINGS AND QUALITY ASSURANCE ACTIVITIES ARE GATHERED, IF THEY ARE NOT READILY AVAILABLE AT THE LOCATION WHERE YOU ARE CONDUCTING THE INTERVIEW. EXPLAIN ALSO THAT THERE IS A SUBSECTION ON HEALTH STATISTICS (NUMBER OF OUTPATIENT VISITS AND INPATIENT DISCHARGES) FOR THE IMMEDIATE PAST ONE COMPLETE MONTH. IT WILL BE HELPFUL TO ALSO START GATHERING SUCH INFORMATION IF INFORMATION IS NOT READILY AVAILABLE WHERE THE INTERVIEW IS BEING CONDUCTED. NOTE!!!! THANK THE RESPONDENT AT THE END OF EACH SECTION OR SUBSECTION BEFORE PROCEEDING TO THE NEXT DATA COLLECTION POINT

ANNEX C: SPA questionnaire forms (Data Extraction Tool)

Inventory Questioner

Facility Identification	Code	
Type of facility (country specific)	006*	
Referral hospital	01	
General hospital	02	
Primary hospital	03	
Health center	04	
Higher clinic	06	
Medium clinic	07	
Lower clinic	08	
Managing authority (ownership)	007*	
Government/public	1	
Other governmental (military, prison, federal police)	2	
Private-for-profit	3	
NGO(mission/faith-based , non-profit)	4	
Urban/rural	008	
Urban	1	
Rural	2	
Facility operational status	008a*	
Fully functional: no construction or expansion	1	
Fully functional: currently under expansion	2	
Partially functional: currently under expansion	3	
Not functional: currently under construction	4	
Not functional: reason unknown	5	

MODULE 1: GENERAL INFORMATION AND SERVICE AVAILABILITY

SECTION 1: GENERAL SERVICE AVAILABILITY AND INPATIENT SERVICES

SERVICE AVAILABILITY

Code		Yes (1)	No (2)
14*	Diagnosis or management of non-communicable diseases, specifically diabetes, cardiovascular diseases, chronic respiratory conditions, chronic renal diseases, cancers.		

MODULE 1: GENERAL INFORMATION AND SERVICE AVAILABILITY

SECTION 8: DIAGNOSTICS

SECTION 9: MEDICINES AND COMMODITIES

900	CHECK Q210	FACILITY STORES MEDICINES	FACILITY STORES NO MEDICINES GO TO NEXT SECTION
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SECTION 9.1: GENERAL MEDICINES AND SUPPLY ITEMS

ASK TO BE SHOWN THE MAIN LOCATION IN THE FACILITY WHERE MEDICINES AND OTHER SUPPLIES ARE STORED. FIND THE PERSON MOST KNOWLEDGEABLE ABOUT STORAGE AND MANAGEMENT OF MEDICINES AND SUPPLIES IN THE FACILITY. INTRODUCE YOURSELF, EXPLAIN THE PURPOSE OF THE SURVEY AND ASK THE FOLLOWING QUESTIONS
I would like to know if the following medicines are available today in this facility. If any of the medicines I mention is stored in another location in the facility, please tell me where in the facility it is stored so I can go there to verify.

	903* Are any of the following medicines for the management of non-communicable diseases available in the facility/location today? CHECK TO SEE IF AT LEAST ONE IS VALID (NOT EXPIRED)	(A) OBSERVED AVAILABLE		(B) NOT OBSERVED		
		AT LEAST ONE VALID	AVAILABLE NONE VALID	REPORTED AVAILABLE NOT SEEN	NOT AVAILABLE TODAY/DK	NEVER AVAILABLE
01	AMITRIPTYLINE (Depression)	1	2	3	4	5
02	AMLODIPINE TABLETS (CCB for high blood pressure)	1	2	3	4	5
03	ATENOLOL (Beta-blocker, Angina/hypertension)	1	2	3	4	5
04	BECLOMETHASONE INHALER	1	2	3	4	5
05	BETAMETHASONE INJECTION	1	2	3	4	5
06	CAPTAPRIL / LISINAPRIL (Vaso-dilatation, cardiac hypertension)	1	2	3	4	5
07	DEXAMETHASONE INJECTION	1	2	3	4	5
08	DIAZEPAM INJECTION (Anxiety/muscle relaxant/anticonvulsant)	1	2	3	4	5
09	ENALAPRIL CAPSULE/TABLET (A.C.E INHIBITOR)	1	2	3	4	5
10	OTHER A.C.E INHIBITOR	1	2	3	4	5
11	EPINEPHRINE / ADRENALINE INJECTION	1	2	3	4	5
12	FUROSEMIDE (DIURETIC)	1	2	3	4	5
13*	THIAZIDE DIURETIC (HYDROCHLOROTHIAZIDE DIURETIC)	1	2	3	4	5
14	GLIBENCLAMIDE (Oral treatment for type-2 diabetes)	1	2	3	4	5
15	GLUCOSE INJECTABLE SOLUTION, 10% OR 50%	1	2	3	4	5
16	HEPARIN INJECTION	1	2	3	4	5
17	HYDROCORTISONE INJECTION	1	2	3	4	5
18	INSULIN INJECTIONS - LENTE [DIABETES]	1	2	3	4	5
19	ISOSORBIDE DINITRATE	1	2	3	4	5
20	METFORMIN TABLETS	1	2	3	4	5
21	NIFEDIPINE TABLETS/CAPSULES (CCB for high blood pressure)	1	2	3	4	5
22	OMEPRAZOLE / CIMETIDINE (Gastro-esophageal reflux)	1	2	3	4	5
23	PREDNISOLONE	1	2	3	4	5
24	SALBUTAMOL INHALER (Bronchospasms/Chronic asthma)	1	2	3	4	5
25	SIMVASTATIN / ATOVASTATIN (High cholesterol)	1	2	3	4	5
26*	ANTACID TABLET/SUSPENSION	1	2	3	4	5
27*	HYDRALAZINE INJECTION	1	2	3	4	5
28*	HYOSCINE BUILBROMIDE INJECTION/TABLET	1	2	3	4	5
29*	WARFARIN TABLET	1	2	3	4	5
30*	METHYL DOPA TABLET	1	2	3	4	5
31*	SALBUTAMOL TABLET/SUSPENSION	1	2	3	4	5
32*	FLOUXETINE (Depression)	1	2	3	4	5
33*	SERTRALLINE (Depression)	1	2	3	4	5
34*	CHLORPROMAZINE INJECTION	1	2	3	4	5
35*	CHLORPROMAZINE TABLET	1	2	3	4	5
36*	STELAZINE	1	2	3	4	5
37*	HALOPERIDOL INJECTION	1	2	3	4	5
38*	HALOPERIDOL TABLET	1	2	3	4	5
39*	OLANZAPINE	1	2	3	4	5
40*	RISPERIDOL	1	2	3	4	5
41*	CARBAMANEPINE	1	2	3	4	5
42*	SODIUM VALPROATE	1	2	3	4	5
43*	PHENOBARBITOL	1	2	3	4	5
44*	PHENYTOIN	1	2	3	4	5
45*	DIAZEPAM INJECTION	1	2	3	4	5
46*	DIAZEPAM TABLET	1	2	3	4	5
47*	ARTANE	1	2	3	4	5
48*	THIAMINE INJECTION	1	2	3	4	5
49	ASPIRIN CAPRULES/TABLETS	1	2	3	4	5

MODULE 3: SERVICE-SPECIFIC READINESS

SECTION 23: NON-COMMUNICABLE DISEASE

2300	Check Q102.14	Chronic disease services available from facility	Chronic disease services not available from facility	
DIABETES				
2301	Do providers in this facility diagnose and/or manage diabetes.	Yes, diagnose only. ..1 Yes treat only.2 Yes, diagnose and treat3 No4		2310
2302	Do you have the national guidelines for the diagnosis and management of diabetes available in this service area?	YES.....1 NO2		2304
2303*	May I see the national guidelines?	OBSERVED.....1 REPORTED, NOT SEEN.....2		2305A
2304*	Do you have any other guidelines for the diagnosis and management of diabetes available in this service area?	YES.....1 NO.....2		2305A
2305	May I see the other guidelines?	OBSERVED.....1 REPORTED, NOT SEEN.....2		
2305 A*	As a provider of diabetes services, have you personally received any training in diabetes any time during the past 24 months?	YES1 NO2		
2305 B*	Has any other provider(s) of diabetes services in this facility received any training in diabetes at anytime during the past 24 months?	YES1 NO2 DON'T KNOW8		
CARDIO-VASCULAR DISEASES				
2310	Do providers in this facility diagnose and/or manage cardiovascular diseases such as hypertension in patients?	YES, DIAGNOSE ONLY.....11 YES, TREAT ONLY22 YES, DIAGNOSE AND TREAT33 NO44		2320

2311	Do you have <i>the national guidelines</i> for the diagnosis and management of cardio-vascular diseases available in this service area?	YES.....1 NO.....2	2313
2312*	May I see the national guidelines for the diagnosis and management of cardio-vascular diseases?	OBSERVED.....1 REPORTED, NOT SEEN.....2	2314A
2313*	Do you have <i>any other guidelines</i> for the diagnosis and management of cardio-vascular diseases available in this service area?	YES.....1 NO.....2	2314A
2314	May I see the other guidelines?	OBSERVED.....1 REPORTED, NOT SEEN.....2	
2314A*	As a provider of cardio-vascular diseases services, have you personally received any training in cardio-vascular diseases any time during the past 24 months?	YES.....1 NO.....2	
2314B*	Has any other provider(s) of cardio-vascular diseases services in this facility received any training in cardio-vascular diseases at anytime during the past 24 months?	YES.....1 NO.....2 DON'T KNOW.....8	
RESPIRATORY			
2320	Do providers in this facility diagnose and/or manage chronic respiratory diseases such as COPD, Asthma, chronic bronchitis in patients?	YES, DIAGNOSE ONLY.....1 YES, TREAT ONLY.....2 YES, DIAGNOSE AND TREAT.....3 NO.....4	2324C
2321	Do you have <i>the national guidelines</i> for the diagnosis and management of chronic respiratory diseases available in this service area?	YES.....1 NO.....2	2323
2322*	May I see the national guidelines for the diagnosis and management of chronic respiratory diseases?	OBSERVED.....1 REPORTED, NOT SEEN.....2	2324A
2323*	Do you have <i>any other</i> guidelines for the diagnosis and/ management of chronic respiratory diseases available in this service area?	YES.....1 NO.....2	2324A
2324	May I see the other guidelines?	OBSERVED.....1 REPORTED, NOT SEEN.....2	
2324	As a provider of chronic	YES.....1 NO.....2	

A*	respiratory diseases services, have you personally received any training in chronic respiratory diseases any time during the past 24 months?		
2324 B*	Has any other provider(s) of chronic respiratory diseases services in this facility received any training in chronic respiratory diseases at anytime during the past 24 months?	YES 1 NO 2 DON'T KNOW 8	
RENAL			
2324C	* Do providers in this facility diagnose and/or manage chronic renal diseases ?	YES, DIAGNOSE ONLY..... 1 YES, TREAT ONLY 2 YES, DIAGNOSE AND TREAT 3 NO 4	2324J
2324D *	Do you have the national guidelines for the diagnosis and management of chronic renal diseases available in this service area?	YES..... 1 NO..... 2	2324F
2324E *	May I see the national guidelines?	OBSERVED..... 1 REPORTED, NOT SEEN..... 2	2324H
2324F *	Do you have any other guidelines for the diagnosis and management of chronic renal diseases available in this service area?	YES..... 1 NO..... 2	2324H
2324G	May I see the other guidelines?	OBSERVED..... 1 REPORTED, NOT SEEN..... 2	
2324H	* As a provider of chronic renal diseases services, have you personally received any training in chronic renal diseases any time during the past 24 months?	YES 1 NO 2	
2324I*	Has any other provider(s) of chronic renal diseases services in this facility received any training in chronic renal	YES 1 NO 2 DON'T KNOW 8	

	diseases at anytime during the past 24 months?		
2324C	* Do providers in this facility diagnose and/or manage chronic renal diseases ?	YES, DIAGNOSE ONLY.....1 YES, TREAT ONLY 2 YES, DIAGNOSE AND TREAT ..3 NO 4	2324J
CANCER			
2324J*	Do providers in this facility diagnose and/or manage cancer diseases in patients?	YES, DIAGNOSE ONLY..... 1 YES, TREAT ONLY2 YES, DIAGNOSE AND TREAT ... 3 NO 4	2324Q
2324k *	Do you have <i>the national guidelines</i> for the diagnosis and management of cancer diseases available in this service area?	YES..... 1 NO..... 2	2324M
2324L *	May I see the national guidelines for the diagnosis and management of cancer diseases?	OBSERVED..... 1 REPORTED, NOT SEEN..... 2	2324O
2324M *	Do you have <i>any other guidelines</i> for the diagnosis and management of cancer diseases available in this service area?	YES..... 1 NO..... 2	2324O
2324N	* May I see the other guidelines?	OBSERVED..... 1 REPORTED, NOT SEEN..... 2	
2324O	* As a provider of cancer diseases services, have you personally received any training in cancer diseases any time during the past 24 months?	YES1 NO 2	
2324P *	Has any other provider(s) of cancer diseases services in this facility received any training in cancer diseases at anytime during the past 24 months?	YES 1 NO 2 DON'T KNOW 8	
MENTAL ,NEUROLOGICAL AND SUBSTANCE USE DISORDERS			
2324Q*	* Do providers in this facility diagnose and/or manage mental ,nerological and substance use disorders in patients?	YES, DIAGNOSE ONLY..... 1 YES, TREAT ONLY2 YES, DIAGNOSE AND TREAT 3 NO 4	2330

2324R*	Do you have the national guidelines for the diagnosis available in this service area? and management of mental ,nerological and substance use disorder	YES..... 1 NO 2 s	2324T
2324S*	May I see the national guidelines for the diagnosis and management of mental,nerological and substance use disorders	OBSERVED..... 1 REPORTED, NOT SEEN..... 2	2324V
2324T*	Do you have any other guidelines for the diagnosis and/ management of mental,nerological and substance use disorders available in this service area?	YES..... 1 NO 2	2324V
2324U*	May I see the other guidelines?	OBSERVED..... 1 REPORTED, NOT SEEN..... 2	
2324V*	As a provider of mental health services, have you personally received any training in mental illness any time during the past 24 months?	YES 1 NO 2	
2324W*	Has any other provider of mental health services in this facility received any training in mental illness at anytime during the past 24 months?	YES 1 NO 2 DON'T KNOW 8	

ANNEX D; Curriculum Vitae

1. Rekik Ashebir

PERSONAL INFORMATION

Name: Rekik Ashebir Muluye

Date of Birth: 05/11/1987

Gender: Female

Nationality: Ethiopian

Addis Ababa, Ethiopia

+251-963-381182

rekikp@gmail.com

EDUCATION

MPH in Epidemiology and Biostatistics

Addis Ababa University.
Addis Ababa, Ethiopia

2023 - Now

B.SC. Medical Laboratory Technology

Addis Ababa University.
Addis Ababa, Ethiopia

2005 - 2008

LANGUAGE

English: Competent

Amharic: Proficient

Chinese: Beginner

PROFILE

Graduate student in Epidemiology & Biostatistics, equipped with a comprehensive background in public health program design, implementation, and evaluation. Proven ability to analyze and communicate epidemiological data for strategic decision-making, and knowledge of health diagnostics and laboratory procedures. Have graphic designing skill for delivering high-level presentations and reports for decision-makers, with a good experience working in a group projects in a collaborative spirit and valued team contributions and willing to adapt in an overcoming challenges. Committed to advancing healthcare accessibility and outcomes for communities in Ethiopia through innovative, sustainable public health strategies.

WORK EXPERIENCE

Researcher I 2015 - 2023
Ethiopian Public Health Institute | Addis Ababa, Ethiopia

Assistant and Junior Researcher 2009 - 2015
Ethiopian Public Health Institute | Addis Ababa, Ethiopia

REFERENCES

Wakgari Deressa (PhD)

Professor of Epidemiology & Public Health|School of Public Health, Addis Ababa University| Addis Ababa, Ethiopia

Email: wakgari.deressa@aau.edu.et

Dr. Paulos Niggussie (PhD)

Pathologist| Enloe Medical Center | Chico, CA, USA

Email: Paulosnig@gmail.com

SKILLS

- Data analysis using Excel, SPSS, Graphpad, STATA ...
- Experiment design
- Research program planning
- Basic Graphic designing skill using Adobe, Canva
- Performing Diagnostic laboratory assay

TRAINING

1. Biostatistics for Health Research. November 4-8, 2019, ICMR-NIE, **Chennai, India.**
2. Scientific Ethics and Good Clinical Practice. May 7, 2018. **Addis Ababa, Ethiopia**
3. Project planning, monitoring and evaluation. Ethiopian Management Institute. January 29, 2018. **Addis Ababa, Ethiopia.**
4. Grant Development and Management. September 20, 2018 **Addis Ababa, Ethiopia.**
5. Managerial and leadership skill. Ethiopian Management Institute. February 3, 2018. **Addis Ababa, Ethiopia**
6. Quantitative Research Methods. Ethiopian Public Health Institute. May, 2017. **Addis Ababa, Ethiopia.**
7. ISO 9001:2015 Quality management Systems requirements and application training. Ethiopian Public Health Institute. December 2016. **Addis Ababa, Ethiopia.**
8. Merck millipore biosciences Asia forum. Imaging flow. April, 2015. **Beijing, China.**
9. 5 th small animal molecular imaging symposium. April, 2013. **Beijing, China.**

MEMBERSHIP

- Ethiopian Medical Laboratory Association

PUBLICATIONS

- **Muluye RA**, Bian Y, Wang L, Alemu PN, Cui H, Peng X, Li S. Placenta Peptide Can Protect Mitochondrial Dysfunction through Inhibiting ROS and TNF- α Generation, by Maintaining Mitochondrial Dynamic Network and by Increasing IL-6 Level during Chronic Fatigue. *Front Pharmacol*. 2016 Sep 27;7:328. DOI:10.3389/fphar.2016.00328.
- **Muluye RA**, Bian Y, Alemu PN. Anti-inflammatory and Antimicrobial Effects of Heat-Clearing Chinese Herbs: A Current Review. *J Tradit Complement Med*. 2014; 4(2): 93-98. doi: 10.4103/2225-4110.126635
- **Rekik A Muluye** and Yuhong Bian. Mechanism of Mitochondrial Dysfunction during Chronic Fatigue. *Int J Phys Med Rehabil*. 2017, 5:3. DOI: 10.4172/2329-9096.1000405.
- **Rekik Ashebir Muluye**, Asfaw Meressa Berihun, Abey Abebe, et al. Evaluation of In Vivo Antiplasmodial and Toxicological Effect of *Calpurnia aurea*, *Aloe debrana*, *Vernonia amygdalina* and *Croton macrostachyus* Extracts in Mice. *Medicinal Chemistry Volume 11:5* . 2021. ISSN: 2161-0444
- Ashenafi E, Abula T... **Muluye RA**. Analgesic and Anti-Inflammatory Effects of 80% Methanol Extract and Solvent Fractions of the Leaves of *Vernonia auriculifera* Hiern. (Asteraceae). *Journal of Experimental Pharmacology* 2023, 15:29-40
- Selamawit Belete, Kaleab Asres, Yonas Bekuretsion, Rekik Ashebir, Melese Shenkut Abebe, and Girma Seyoum. Toxic Effect of Khat in Rat Embryos and Fetuses. *BioMed Research International*. Volume 2021, <https://doi.org/10.1155/2021/9933389>
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- Li Wang, Xin-bo Song, Huan-tian Cui, Shan-shan Man, Wei Li, **Rekik A. Muluye**, Yu-hong Bian et al. Antifatigue effects of peptide isolated from sheep placenta. *Chinese Herbal Medicines* 10 (2018) 279-284. DOI: 10.1016/j.chmed.2018.06.
- Sileshi Degu, Negero Gemedu, Abiy Abebe, Asfaw Berihun, Eyob Debebe, Bihonegni Sisay, Hirut Gemedu, **Rekik Ashebir**, et al., In vitro antifungal activity, phytochemical screening and thin layer chromatography profiling of *Impatiens tinctoria* A. Rich root extracts. *Journal of Medicinal Plants Studies* 2020; 8(5): 189-196
- Yirga ST, Mersa A, Sisay B, **Ashebir R**, Aklilu B, et al. Ethnomedicinal Uses of Ethiopian Traditional Medicinal Plants Used To manage some of Human Helminthic and Parasitic Disease: A Review. *J Tradit Med Clin Natur*, 2022; 11: 306.
- Sameson Taye, **Rekik Ashebir**, Biruktawit Girma, Firhiwot Teka, Worku Gemech and Kidst Yirsaw. Development of Knowledge, Attitude and Practice of Ethiopian Traditional Medical Practitioners Through a Compressive Training Addis Ababa, Ethiopia. *J Tradit Med Clin Natur* 2021, 10:4
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- Abera T, **Ashebir R**, Basha H, et al. Phytochemical-constituents, safety and efficacy of commonly used medicinal plants for the treatment of malaria in Ethiopia-a review. *Pharm Pharmacol Int J*. 2019;7(6):284-295. DOI: [10.15406/ppij.2019.07.00266](https://doi.org/10.15406/ppij.2019.07.00266)
- Abera T, Debebe E, **Ashebir R**, Abebe A, Basha H, Kasahun T and Sisay B. A Review on Phytochemical Constituents, Safety and Efficacy Study of *Thymus schimperii* and *Thymus serrulatus*. *J Clin Exp Pharmacol* 9: 263. doi: 10.35248/2161-1459.19.9.263.
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- Asfaw Meresa, Worku Gemechu, Hirut Basha, Netsanet Fekadu, Firehiwot Teka, **Rekik Ashebir** and Ashenif Tadele. Herbal Medicines for the Management of Diabetic Mellitus in Ethiopia and Eritrea. *American Journal of Advanced Drug Delivery*. 2017; 5(01) 040-058.

2. MENGISTU YILMA

Summary of Mengistu Yilma Dilnessie's Curriculum Vitae

Personal Information	Mengistu Yilma Dilnessie, born July 16, 1978, is an assistant professor of public health currently based at Addis Ababa University, School of Public Health.
Educational Background	Pursuing a Ph.D. at Addis Ababa University, School of Public Health. Holds a Master of Public Health (MPH) in Health Informatics (2012) and a BSc in Environmental Health (2008), both from the University of Gondar.
Work Experience	Assistant Professor of Public Health at Addis Ababa University since 2021. Extensive roles in data management, health system mentorship, and national health surveys. Held positions in health extension program coordination, HMIS leadership, and consultancy in various health research and training projects.
Key Skills and Expertise	Proficient in statistical software such as SPSS, STATA, Python, and others. Experienced in health data analysis, capacity building, and system improvement.
Research and Publications	Authored more than 15 articles on public health topics, including HIV/TB co-infection, COVID-19, maternal and child health, and healthcare worker practices. Active in systematic reviews and predictive modeling for infectious diseases.
Professional Memberships and Voluntary Service	Member of associations like the Ethiopian Public Health Association and Ethiopian Health Informatics Professionals' Association. Volunteered in HMIS data management at Black Lion Specialized Hospital.
Awards and Grants	Recipient research grants, including from the Global Health Research Group and Addis Ababa University. Recognized for best poster presentations at professional conferences.
Current Projects	Co-PI in behavioral science research and data manager for Global Health Research on pediatric gastrointestinal infections.
Contact	mengistu.yilma@aau.edu.et / newmany55@gmail.com .