

ASSESSMENT OF PRIORITY NON-COMMUNICABLE DISEASES AND INJURIES
(NCDI) INTERVENTIONS AND HUMAN RESOURCING AT SELECTED HEALTH
FACILITIES IN FOUR REGIONS OF ETHIOPIA

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Abstract

Background and Rationale:

Non-communicable diseases and injuries (NCDIs) are now major causes of mortality and morbidity globally. The Ethiopian NCDI Commission launched in 2018, estimated the burden of NCDIs as the causes of 52% of the total mortality and 46% of the DALYs lost. It also selected 218 health interventions for implementation, which will pave the way for Universal Health Coverage. The objective of the study includes to: assess the current delivery of the high-priority interventions for NCDIs at health facilities in Ethiopia to achieve Universal Health Coverage; assess the current staffing and organization of these services at various levels of the health system; identify major barriers to the delivery of recommended interventions; identify additional priority interventions that could be delivered or strengthened; determine what human resources are needed to deliver the additional interventions at First Level hospitals.

Materials and Methods:

A cross-sectional institution-based quantitative study was conducted at 39 purposively selected public health facilities from December 2020 to February 2021 using a structured quantitative survey. The study populations were facility managers and department coordinators. Data were analyzed manually for means, proportions, and we made comparisons between the health facilities.

Results:

A total of 39 health facilities were included in the survey from four Regional States in Ethiopia. It included 6 Referral Hospitals, 11 First Level Hospitals, and 22 Health centers.

The proportion of priority Universal Health Coverage (UHC) interventions for Ethiopia offered by Referral Hospitals (RH), First Level Hospitals (FLH), and Health centers (HC) was 76%, 71%, and 64%, respectively. The proportion of priority NCD and Injury interventions offered were in RH 65% and 81%, FLH 61% and 57%, and health centers 41% and 29%, respectively. The proportion of CMNN interventions offered by RH, FLH, and HCs was 91%, 89%, and 89%, respectively. The proportion of NCDI interventions that were determined to be feasible were 73%, 62%, and 63%, respectively, for RH, FLH, and HCs.

The major barriers in delivering NCDI services in Referral Hospitals were the shortage of medicines, equipment, and diagnostics; for FLH, however, the reasons were a shortage of human resources and medications followed by limited diagnostics; in Health Centers, lack of training of HCWs, lack of drugs and diagnostics were the major bottlenecks. For FLH, a detailed analysis showed that 27 priority NCDI interventions were of medium availability, and 30 priority interventions were of low availability. From these, for medium availability 22 of 27, and for low availability 10 of 30 interventions were highly feasible for implementation. Service integration platforms were deduced by logically rearranging the units and their required inputs.

Discussion and recommendations:

The delivery of priority NCDI interventions is less than priority CMNN Interventions, and this effect is exacerbated as you move from RH to FLH and HC levels. The major barriers in delivering NCDI services in Referral Hospitals were the shortage of medicines, equipment, and diagnostics; for FLH, however, the reasons were a shortage of human

resources and medications followed by limited diagnostics; in Health Centers, lack of training of HCWs, lack of drugs and diagnostics were the major bottlenecks.

In FLH, there were a group of medium and low availability services which were determined to be highly feasible for implementation by HF management. These high feasibility interventions can be introduced by integrating services through shared units, human resources, and other resources in the FLH. The establishment of NCD clinics in Health centers by training available staff on NCDs, Mental Health, and palliative care will help expand NCDI services.

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PART 1: NON-COMMUNICABLE DISEASES ARE EMERGING HEALTH AND SOCIAL PROBLEMS IN ETHIOPIA

Case Vignette

Abebe, a grade 7 student in the local school, was a 14-year-old boy from a small village in northern Ethiopia. He was a clever boy admired by his classmates and teachers. Abebe always arrived at class early after helping his family at home. He always stood first in his class of 30 students.

One day he fainted while they were observing the morning flag ceremony. The teachers took him to the side in the shade of a tree. Someone said, "probably he did not eat breakfast. Give him some Mirinda." They gave him a bottle of Mirinda, and everyone returned to the day's chores. Abebe never returned to school after that.

After several weeks, the School Director found out that Abebe did not get better and was taken to the nearest health center. The health center could not diagnose his health problem. He was then reportedly taken to the nearest hospital, which was located 130 km away. There, he was diagnosed with diabetes and was started on intravenous fluids and insulin injections. His father was forced to buy the medicines from a private shop at a staggering price.

The father said Abebe was found dead in his hospital bed at night several hours after being given some injections in the evening. The nurses did not check him timely. They were told he died of low blood sugar due to the medicines he took early in the evening.

Argument and overview of the thesis

Non-communicable diseases have emerged as the top causes of morbidity and mortality in Ethiopia; hence, our health services need to be redesigned to tackle their impacts

adequately. The health system needs to be redesigned to be people-centered, accessible geographically, and affordable financing, and responsive with acceptable quality.

In this essay, the author is going to argue that Non-communicable diseases (NCDs) are now important causes of morbidity (suffering and disability), impoverishment, and mortality (death) in Ethiopia. Hence it is high time to prioritize NCDs and their risk factors in the national health policy, strategic planning, and service expansion and improvement. The first section deals with what NCDs are and shows how the NCDs have become so important in Ethiopia. The second section describes the country's history and the health system in Ethiopia and its context to the NCD burden and its failure to address NCDs. The final section discusses why we need to redesign the health system and how.

Introduction and Background

What are Noncommunicable Diseases, and why are they important

The Global Burden of Disease (GBD) Study, which started in 1990 with support from the World Bank Group and housed in the Institute of Health Metrics and Evaluation of the University of Washington, is a global research collaboration.¹ It studies the burden of mortality and disability from major diseases, injuries, and risk factors. In its reports, the GBD Study classifies diseases and health conditions into three-level 1 broad categories. These are group I: Communicable, Maternal, Neonatal, and Nutritional diseases (CMNN); group II: Non-Communicable Diseases (NCDs); and group III: Injuries.¹ Chris Murray, who is the founder of the Global Burden of Disease Study, puts the reason behind the classification was based on the theory of epidemiological transition where mortality from group I conditions (CMNN) was thought to decline with development more quickly than groups II conditions (NCDs) and group III conditions (injuries).²

The CMNN group contains many diseases and conditions that arise from reproductive, infectious, and nutrition-related causes. Probably the GBD study group lumped

these groups of health conditions together for historical reasons. CMNN conditions attracted governments, donors, and the public based on the call to action for the same by the Alma Ata declaration of 'Health for All' in 1978.³ The declaration proposed primary health care as a vehicle to deliver the promise of health for all. Many organizations and governments attempted to implement components of the recommendations in the declaration. For example, the "selected primary health care" strategy of UNICEF of the 1980s and 1990s was entirely focusing on CMNN conditions, which is remembered for its famous acronym "GOBI-FFF" .⁴ GOBI-FFF stood for Growth monitoring, ORS for diarrhea, Breastfeeding, Immunization, Female education, Family spacing, and Food supplementation, some of CMNN program components.⁵

On the other hand, even though the concept of "non-communicable diseases" has been in the literature for more than 70 years, NCDs attracted little attention in the global health and development platform except for some initiatives by WHO in the 1970s and 1980s. The World Development Report by the World Bank in 1993, based on the GBD of study, has shown NCDs as emerging health problems even though CMNN conditions were the major problems of lower-income countries. NCDs became the focus of WHO in the early 2000s, where it started to appear in its documents and initiatives.^{6,7} But, it was only after the Political Declaration of the UN High-level Meeting of the General Assembly on the Prevention and Control of Noncommunicable Diseases in 2011 that countries started to notice the potential impact of NCDs.⁸

A Non-communicable disease (NCD) is a medical condition or illness that is, by definition, non-infectious and non-transmissible from person to person. It is said to have a prolonged course that "does not often resolve spontaneously, and for which a complete cure is rarely achieved."⁹

Since all health conditions other than the CMNN conditions and injuries are non-communicable diseases, this group's list is very long. However, the World Health Organization selected four NCDs for its global strategy, reasoning that these four NCDs cause 80% of the premature deaths due to NCDs.⁹ These NCDs are cardiovascular diseases, cancers, chronic respiratory diseases, and diabetes. The four NCDs share common modifiable behavioral risk factors: tobacco use, harmful alcohol use, physical inactivity, and consumption of an unhealthy diet.¹⁰ The World Health Organization (WHO) estimates, "80% of the cases of premature heart disease, stroke, and type 2 diabetes and 40% of cancers could be prevented."⁹

Despite the varying prevalence of these four risk factors globally, this behavioral model assumes that they are the major contributors to the aforementioned major NCDs' occurrence.^{10,11} Evidence is, however, accumulating that non-communicable diseases are beyond behavioral risk factors.¹² NCDs result from a complex interplay of genetic, physiological, infectious, environmental, social, and behavioral factors through the life course.¹³ For instance, according to the GBD study, only 30% of NCDs are attributable to known risk factors in Ethiopia.¹⁴ It is worth mentioning that infections and infestations, indoor and outdoor air pollution, and malnutrition are essential factors in the causation of NCDs in Ethiopia.¹⁵

Hence, other NCDs besides the four major NCDs advocated by the WHO are equally important, especially for lower-income countries. These other NCDs include mental health problems, rheumatic heart disease, chronic liver disease, peptic ulcer disease, musculoskeletal, dermatologic conditions, neurologic diseases, thyroid disorders, and chronic kidney diseases.^{12,13}

The Burden of NCDs Globally, Sub-Saharan Africa and Ethiopia

Non-communicable diseases are by far the leading causes of death worldwide. According to the 2018 World Health Organization (WHO) Global NCD report, NCDs were responsible for 71% of the 57 million deaths globally in 2016.¹⁶ Most significantly, about three-quarters of the premature adult deaths, defined as death in age groups 30-70 years, were due to NCDs.¹⁶ This high premature mortality demystifies the notion that NCDs are solely a problem for older populations.¹¹ The majority of this premature mortality from NCDs occurred in low-income and low middle-income countries.¹⁶

The burden of NCDs is rising in Sub-Saharan Africa over the past two decades.¹⁷ Population growth, population aging, decreasing fertility, growing tobacco and alcohol use, reduced physical activity, and unhealthy diets drive this rise. Indoor and outdoor air pollution also contribute to the rising burden. Reductions in deaths from critical infectious diseases like tuberculosis, pneumonia, diarrheal diseases, HIV, and malaria, and the reduction in child mortality also drive NCDs' shift as significant causes of death in these countries.¹⁷

According to Bollyky et al., "the burden of premature non-communicable diseases is growing quickly in lower-income countries [like Ethiopia].¹⁸ This growth is fastest in countries with little forecasted change in health spending and with health systems that are not well equipped to manage and treat non-communicable diseases."¹⁸

There were 700,000 deaths in Ethiopia in 2016, based on 2018 WHO Global NCD report, of which 39 % was due to NCDs, 12% to injuries, and 49% to communicable, maternal, perinatal, and nutritional (CMNN) conditions.¹⁶ For comparison, in 1990, there were 844,000 deaths, and deaths due to NCDs, Injuries, and CMNN were 21%, 8%, and 71%, respectively, showing a considerable shift in the causes of death over the past 25 years.¹⁴ Some describe this phenomenon as evidence of an "epidemiologic transition" in Ethiopia. In the context of this epidemiological transition, a triple burden of disease is

already emerging with the mix of persisting burden of infectious diseases and an increasing burden of non-communicable diseases and injuries.¹⁹

The Lancet Commission on Reframing NCDs and Injuries for the Poorest Billion (Lancet NCDI Poverty Commission) was launched in January 2016 aiming to address the inequity due to NCDIs affecting people living with extreme poverty, and has been working with a group of low-income countries from Africa, Asia, and the Caribbean and has launched its report in September 2020.¹²

The Ethiopia NCDI Commission is a member of the global commission and has produced its report in November 2018. The report has shown a very similar burden of NCDIs in Ethiopia, as discussed in the WHO report.²⁰ Cardiovascular diseases and cancer were the highest causes of mortality among the NCDIs. More than half of the NCDI mortality occurs before age 40, and two-thirds of deaths occur before age 50.²⁰ The same report also showed NCDIs were the cause of about half of the loss in Disability Adjusted Life Years in Ethiopia in 2016. Similarly, about 60 % of the DALYs lost due to NCDIs in Ethiopia occurred before age 40. This high rate of premature mortality (death occurring in those aged 30–69 years) and morbidity from NCDs is unlike that seen in high-income countries where the NCD burden is primarily in the elderly population.¹²

Cardiovascular diseases and diabetes are among the top NCD causes of morbidity and mortality in Ethiopia.²¹ Based on the National NCD STEPS Survey conducted in Ethiopia in 2015, the prevalence of hypertension was 16%, of which 60% were not previously detected.²² The survey also demonstrated the prevalence of diabetes in adults to be 3.2%.²² The International Diabetes Federation,²² in its ninth report in 2019, also estimated a similar prevalence of DM with 2 million people living with diabetes among 20–79-year-olds in Ethiopia.²³ A review of smaller studies conducted in Ethiopia showed that diabetes, particularly Type 2 diabetes, remains undiagnosed.²⁴ Even among those who

were diagnosed, only about a third had their blood sugar controlled. Patients were found to have high rates of chronic diabetes complications.²⁴ The burden of type 1 DM is disproportionately high in Ethiopia due to the high level of malnutrition, poverty, and weak health systems in timely detecting and managing this debilitating and rapidly fatal form of diabetes.²⁵

Cancer is another common and severe NCD in Ethiopia. Based on projections from the Addis Ababa Cancer Registry, an estimated 67,000 people develop cancer annually in Ethiopia, from which 47,000 die annually.²⁶ Two-third of the incident cases occurred in females while the rest were in males. The most prevalent adult cancers in Ethiopia were breast cancer, cancer of the cervix uteri, and colorectum. Additionally, non-Hodgkin lymphoma, leukemia, and cancers of the prostate, thyroid, lung, stomach, and liver are common cancers.²⁷ Many of the patients with cancer present at advanced stages of the illness, and worse, cancer treatment was delayed even after arrival to the cancer center.²⁸

Chronic respiratory illnesses are now one of the important and emerging health problems in Ethiopia.¹⁵ There is a shortage of clean energy sources; hence biomass fuels are utilized almost universally for cooking.²⁹ There is now an emerging industrial sector predisposing many working-age Ethiopians to clouds of dust and fumes. The cement industry, the horticulture industry, and the cobblestone industry are some of the culprits. Smoke, dust, and fumes from these fuels and industries cause many acute and chronic respiratory illnesses.³⁰ It also predisposes to infections like TB, pneumonia, and cardiac diseases. The chronic sequelae of respiratory infections, which is rampant starting from early childhood, is another cause of chronic respiratory diseases.

Common mental disorders, which comprise depression and anxiety disorders, are the most prevalent mental health problems affecting at least one in five Ethiopian

individuals. More severe mental health disorders like severe depression (6.8%) schizophrenia (0.5%), bipolar disorder (0.5%) and epilepsy (0.52%) are less common. However, their tremendous burden to the patient, the family, and the community makes them one of the country's priority health problems.³¹

Infection-related NCDs are ubiquitous and significant causes of suffering and death globally and in Ethiopia. For example, in sub-Saharan Africa, based on Coates et al. estimates, NCDs burden attributable infectious causes was higher than to each of the common behavioral and metabolic risk factors.³²

The prevalence of Hepatitis B and Hepatitis C viruses is very high, and because of that, chronic liver diseases and liver cancer are also highly prevalent in Ethiopia.^{33,34} *Helicobacter pylori* is a bacterial infection that causes peptic ulcer disease and several gastrointestinal cancers. Its prevalence is very high in Ethiopia, explaining the high prevalence of these conditions in Ethiopia.³⁵ Rheumatic heart disease, a chronic sequela of a streptococcal bacterial sore throat, affects more than 500,000 children and young adults in Ethiopia.³⁶ RHD is rare in the western world. Still, in Ethiopia and other Sub-Saharan African countries, it continues to be a significant cause of premature death and suffering. HIV itself is associated with a myriad of non-communicable diseases and cancers.³⁷ Other viral infections like human papillomavirus, Epstein-Barr virus, human herpes viruses are also associated with many cancers.³⁸

Social Suffering as the key feature of Non-communicable Diseases

As has been discussed above, non-communicable diseases are a diverse group of diseases with varied etiologies. Several common properties make them fundamental causes of suffering for the individual, the family, and the community. Many of the NCDs are chronic conditions, which means they stay longer for the individual's life.³⁹ NCDs often involve

organs/systems like the heart, lung, liver, kidneys, or brain, which are vital to the individual's day-to-day functioning and survival.³⁹ Many of the diseases tend to affect several of these organs/systems simultaneously or progressively, further impairing the individual's capacity to function in society, such as earn a living, enjoy life, and pursue happiness.⁴⁰

Arthur Kleinman, Veena Das, and Margaret Lock coined the term "social suffering" to describe the social perspectives of global health.⁴¹ They explained that social suffering is an outcome of political, economic, and institutional power on people and their responses to social problems.⁴¹ Arthur Kleinman further elaborated that "Social suffering conveys the idea that the pain and suffering of a disorder are not limited to the individual sufferer but extends at times to the family and their social networks."⁴² Social suffering explores the nexus between social problems and health conditions. Hence, it helps the global health community understand why it is important to craft policies and interventions to address the interlinked causes of undue suffering.⁴³

The theory of social suffering is well-suited to explain why NCDs are a formidable cause of suffering to individuals and communities in low-income countries like Ethiopia. Many of the NCDs start with mild and trivial symptoms, which the individual often neglects. The individual presents to the health system very late in the course of the illness.¹² This late presentation may be due to fear, stigma, poverty, distance from the health facility, or a concern that the health facility is not well equipped or staffed.⁴⁴ The health facilities may not have the capacity to diagnose the condition. This situation may result in an incurable disease or a disease with multiple complications that could have been prevented. Hence, they often require extended and more expensive and invasive care.⁴⁵ Patients with NCDs are more frequently sick, suffer longer, and require more medical and social care. This care requires a health system, time, finances, people, and more skills. Most of the burden of care frequently falls on the individual and the family, aggravating the toll of suffering. Family members

shoulder the duty of care for loved ones who cannot work due to their illness or disability, resulting in additional lost productivity and wages.⁴⁶

For example, the typical adult patient with diabetes is diagnosed late by about five years. The reasons are many, but the insidious onset of the problem is one. The other factor is that a diagnosis of diabetes has a lot of stigma and fear attached to it, such that many people refuse to accept the diagnosis and hence the care.⁴⁴ Diagnosis of diabetes entails a lifestyle change, taking medications with side effects, fear of disability, and death. Others often perceive diabetes as a failure of the individual to control his/her behavior. This state of affairs means that by the time the individual starts diabetes treatment, he/she has already begun developing chronic complications of diabetes. The chronic complications usually involve either the nerves or the blood vessels. Diabetes's assault on the nerves and the blood vessels may lead to blindness, kidney failure, amputation of lower extremities, or fatal heart disease. These conditions cause much suffering for the individual due to pain, depression, anxiety, limited mobility, breathing difficulties, and other physical and psychological symptoms.⁴⁷

Social suffering also encompasses economic deprivations.⁴⁸ NCDs and poverty create a vicious cycle whereby poverty exposes people to behavioral and environmental risk factors for NCDs' development. Additionally, poverty prevents people from getting the care they need. As a result, NCDs drive families to impoverishment through lost productivity and the high cost of treatment and care.⁴⁹

According to the Ethiopia National Health Accounts 6th report, costs for NCDI services are primarily covered by households out of their meager incomes and often selling their assets.⁵⁰ A companion report on health expenditure also showed the government covered less than a third of the costs related to NCDIs and that donors seem to have no role.

It was also reported that a quarter of household-level out-of-pocket expenditure was spent on NCDs.⁵¹

The costs to the health care system from NCDs are high and projected to increase. However, the impact of NCDs goes beyond increasing the cost of health services. Increased costs to individuals, families, businesses, the government, and the health system add to significant macroeconomic impacts. That is why recently, a consensus is building that investing in non-communicable diseases is not only a health agenda but an economic one.⁵²

Diabetes Mellitus as a showcase for social suffering and medical care failures

The young man in the case vignette had Type 1 diabetes. Diabetes is a metabolic disease where the body cannot produce or utilize a vital hormone called insulin.⁵³ Type 1 diabetes is one of the severest forms of diabetes. It occurs due to the virtual absence of insulin production by the pancreas. Insulin is an important hormone that helps the body to metabolize sugars by the body. When the body's insulin level is low, literally sugar accumulates in the body while "the body starves to death amid plenty." The young man's new-onset type 1 diabetes was not detected timely. It was not managed appropriately because of the complex interplay of poverty, lack of knowledge, lack of equipment and medicines, and human resources to handle such emergencies. This is a manifestation of a health system that fails to address essential lifesaving care.¹⁸ As mentioned, diabetes is one of the diseases contributing to the high burden of death and disability in Ethiopia.

Health services are not adequately tackling the impacts of NCDs in Ethiopia.

The current organization of health services

Health services are mainly delivered by the government, particularly in the country's rural part, where an estimated 80% of the total population resides.⁵⁰ The public health system

in Ethiopia has three tiers: the "primary level" composed of a primary hospital with its catchment health centers and health posts; the "secondary level" comprised of a general hospital and the "tertiary level" consist of a specialized hospital.⁵⁴

In 1993, the Transitional Government of Ethiopia published the country's first health policy articulating a vision for the health care sector development. The policy envisions reorganizing the health system to contribute to the country's overall socio-economic development efforts positively.⁵⁵ This health system reorganization, later called the "Health Sector Development Program (HSDP)," was launched in 1997.⁵⁶

The Health sector development program was implemented in five-year cycles.⁵⁴ The initial four phases focused on decentralized prioritized promotive and preventive health care. The HSDPs also promised to strengthen partnerships between the government and non-governmental organizations to deliver essential primary health care packages to achieve universal primary health care coverage and pledged to increase national health spending.

Implementation of the HSDP resulted in the exponential expansion of the health infrastructure and human resources for health. In 2003, Ethiopia introduced its pioneer community health program called the "health extension program." The Ethiopia Essential Health Service Package was launched in 2005 for uniform implementation. The number of hospitals increased from 96 to 311, health centers from 282 to 3,547 health centers, and health posts from 802 to 16,500 health posts by 2015. The primary health care level coverage has reportedly reached more than 95% by 2015. The country was able to deploy a substantial number of physicians, midwives, and nurses, and an impressive number of (38,000) female health extension workers by the end of 2015.⁵⁴

In so doing, the country had achieved most of the health-related Millennium Development Goals (MDGs). The Life expectancy at birth showed a significant stride from 45 years in 1990 to 65 years in 2015; the under-five mortality dropped from 166 to 67 per

1000 live births (67% reduction), and the maternal mortality ratio declined from 1400 to 412 per 100,000 live births (71% reduction). Family planning coverage increased markedly, and the total fertility rate dropped from 7.7 to 4.6 in the same period. The immunization coverage and skilled delivery improved dramatically. TB mortality dropped by 50%, new HIV infections decreased by 90%, and malaria mortality decreased by 73% in 2015 compared with 1990 levels.⁵⁷

Encouraged by the successes of the HSDP and responding to international and local calls for improving access, quality, and equity of health services, the government developed the health sector transformation plan (HSTP) with multi-stakeholder engagement and collaboration (2015-2020)²⁰.⁵⁴ The HSTP, for the first time, included several new health priorities into the plan. It incorporated a comprehensive method for preventing and controlling non-communicable diseases and mental health conditions for the first time. It also emphasized the need for improving quality, equity, and compassionate and respectful care through the transformation of the health sector.

The health sector enjoyed a relative abundance of funding in the past two decades from international donors and philanthropists. The government built an outstanding reputation in coordinating aid and efficient utilization of resources through the "one plan, one budget, and one report" mechanisms.⁵⁸ However, the domestic health sector financing for health has been slow to grow. The combined government and out-of-pocket investments reached 64% only after 2013/14.⁴⁹ The remaining 36% was still covered by foreign aid that year. Even though the per capita health expenditure grew from 4.5 USD in 1995/6 to 28.7 USD in 2013/14, it is still deficient compared with the WHO threshold of 60 USD per capita for delivering basic health care in low-income settings, and the recommended 86 USD for universal health coverage. The out-of-pocket expenditure on health is very high, leading to the impoverishment of many households.⁵⁰

However, there is good progress in expanding prepayment mechanisms for the non-formal sector (Community Based Health Insurance) to more than 75% of Woredas (Districts), and enrollment rates in these woredas increased to 82%, but the national enrollment coverage is only 37% of the households.⁵⁹

Nevertheless, health service utilization remained very low despite the considerable health services expansion. The reasons for this may be several, but the most important ones include direct and indirect costs to patients during the visits and people being not happy with the often poorly equipped and stocked health facilities.⁵⁰ Different surveys confirmed these findings. The Ethiopia Service Availability and Readiness Survey 2018 showed that the mean availability of selected essential tracer items for delivery of health care was as follows: basic amenities (39%), essential equipment (60%), standard precautions (42%), diagnostics (40%) and essential medicines (28%).⁶⁰ This survey indicates that the health facilities were not generally ready to deliver better quality services. Another survey focusing on household health expenditures showed that households were paying more than a third of the estimated costs of medical visits on average, even for programs assumed to be fully covered by the government and donors.

The situation was even grimmer for non-communicable diseases. In the health policy, non-communicable diseases and mental health problems were considered diseases of affluence and were given secondary status to communicable, maternal, neonatal, and nutritional (CMNN) disorders. This apparent neglect was reflected in the HSDPs, where NCDs and mental health problems were not included in the annual plans. NCDs and Mental health only appeared recently in the HSTP.⁵⁴ Even then, the funding was minimal compared to that allocated to CMNN conditions. As a result, the out-of-pocket expenditure for households with NCDs reaches 70%, which was twice higher than for CMNN conditions.

Health facilities' readiness to deliver preventive and clinical care for NCDs and mental health was much worse than for other health conditions. Even though half of the health facilities claimed to provide diagnosis and management of cardiovascular diseases, diabetes mellitus, and chronic respiratory diseases, only less than half of those who reported delivering the services can do so. The readiness for cancer and mental health care is almost nonexistent in many of the hospitals. Health centers generally do not provide any meaningful clinical services for patients with NCDs.⁶⁰

The current organization of services for NCDs is an outcome of the history of health services

Ethiopians have been suffering from a scourge of physical illnesses and sicknesses and "spiritual afflictions" or "divine possessions." Many of these health problems frequently swept the populations of entire villages or communities.⁶¹ They occurred in the form of epidemics of deadly infectious diseases like smallpox, measles, influenza, typhoid fever, cholera, or malaria, typhus fever, or yellow fever, or at other times may continue affecting the population at unassuming rates. In recent times, Ethiopia suffered an HIV/AIDS epidemic lasting several decades with overall health, social and economic consequences.⁶²

Ethiopia is mostly home to an agrarian or a pastoral community; hence epidemics affecting animals have dire consequences for the population. The first direct reason is that some of these plagues were transmissible to human beings. On the other hand, the death of animals is a blow to the population's livelihood. Hence, epidemics in cattle were followed by protracted famines.⁶³ Additionally, agrarian and pastoral communities depend on the seasonal rain waters, such that some decrease in the rains may lead to starvation. The horn of Africa is also a region very prone to locust invasions. These invasions caused crop failures leading to cycles of famine in the area. The very high levels of stunting and wasting in children and adolescents in the country are a testament to the population's frequent food insecurity.^{64,65}

According to Richard Pankhurst, traditional medicine and surgery have been the mainstay of treatment for these physical ailments or mental afflictions.⁶⁶ He explained, Ethiopians named a wide range of diseases, and traditional healers called "Wogesha" were central to medical care using plant, animal, and insect products for healing. Pankhurst explains that several medical procedures like "purgings, bleeding and cupping, steam baths and immersion in thermal water, counter-irritation, cauterization, inoculation, traditional surgery, bone setting have been practiced and were recorded; in their ancient texts." ⁶⁶

Richard Pankhurst states that the "quest for modern medicine beyond traditional practice started during Emperor Lebningil's reign (1520-1535) when the emperor appealed to the Portuguese King for physicians and surgeons to cure illnesses." ⁶⁷ He explained that the Portuguese sent a "barber-surgeon" named Joao Bermudez for a diplomatic mission, which was later welcomed at the court of the King and served as the personal physician for the King.⁶⁶

Menelik, who reigned as King of Shewa (1865-1889) and later as Emperor of Ethiopia (1889-1913), had a passionate interest in "European" medicine. He invited several foreign countries to send him medical practitioners. French, Italian, German, and Russian missions in Addis Ababa offered medical services to the King and his entourage and making it an essential tool for "medical diplomacy." Many of them remained on his payroll for several years.⁶⁸

The first organized and hospital-based modern medical practice for the public was started immediately after the Battle of Adwa (1896) by Russian physicians and nurses' team. This effort lasted ten years until the Russian mission left the country.⁶⁶

Emperor Menelik established twelve Ministries to modernize his government. The first office tasked with public health was established for the first time within the Ministry of Interior in 1908 as an "office for health services." Following the proclamation on public

health by the emperor, several hospitals were opened in various cities.⁶⁶ The seed of modern medicine was sought during this time.

The successor Emperor Haile Selassie I continued the modernization in medical care, albeit at a slower pace, focusing on establishing hospitals in major towns. This effort was interrupted by the Italian occupation of Ethiopia between 1935-1941.⁶³ Most modern medical strides happened in the post-Italian Occupation Period in Ethiopia.

"The story of medicine is also the story of disease and the story of people affected by the disease," says Kitaw in a recent viewpoint article where he summarized the historical landmarks of modern medicine in Ethiopia.⁶⁹ He divides the post-Italian Occupation medical history of Ethiopia into four periods that, according to him, more or less parallel the political and global changes at the time. The first phase was "the reconstruction phase" (1941-1953), a period of re-establishing and rehabilitating the facilities destroyed during the war period, focusing on the limited number of hospitals and clinics. During this phase, a health proclamation in 1947 and the Ministry of Health establishment in 1948 were notable achievements. The second phase was "the basic health services period" (1953-1974), where health centers became the strategy's center. The health centers were staffed with a team-trained health provider (called the 'Gondar Team'), composed of health officers, nurses, and environmental health agents. This team-based health service model was the first of its kind in Ethiopia. The third phase is "the Primary Health Care period" (1974 -1991), where Health Centers, Health stations, Community Health Agents, and Traditional Birth Attendants became the center of the strategy. The final phase is "the sector-wide approach period," or the Health Sector Development Program (HSDP 1991- current).⁶⁹ This phase is the current health system and has been described above.

Kitaw noted specific pervasive trends in the evolution of the health system in Ethiopia. It includes the priority of preventive medicine, availing comprehensive or integrated health

care, decentralized care, often very ambitious plans in all the periods. Still, the health system remained underfunded domestically and relied heavily on external aid.⁶⁹

In conclusion, the history of medicine in Ethiopia is an odyssey of triumph and failure. The health system has evolved significantly in the last half a century and has helped improve its population's health status. Ethiopia's population grew from a mere 10 million in 1941 to 110 million in 2017 over eight decades.⁷⁰ Simultaneously, the life expectancy at birth doubled from 30 years in 1941 to 65 years in 2017. This happened due to improved education, agricultural productivity and diversity, economic growth, and increasing urbanization. However, the progressive increase in population size and life expectancy at birth is undoubtedly mainly due to improved health services. Nevertheless, the modern health system in Ethiopia is still very young and evolving. It does not yet adequately address care for NCDs and injuries.

The history of health services is related to the country's history and its politics and economics

Ethiopia is the second-most populous country in Africa, next to Nigeria, with more than 80 ethnic groups. Its statehood history spans more than three thousand years, and it is said to be one of the earliest civilizations.⁷¹ To attest to that ancientness are the remains of the Aksumite Kingdom of the 1st century AD, which are still standing in Aksum, a small town in northwestern Ethiopia. This kingdom was said to be a powerhouse around the Red Sea and was trading with India, Persia, Rome, and China.⁷² The Aksumite Kings were the first Christian converts in Africa. Aksum was also notable for its offer of refuge to Muslim pilgrims from Mecca, which were persecuted by the Quraysh, the journey known in Islamic history as "the First Hijra."⁶³

The Zagwe Dynasty (1050-1270), with its center in present-day Lalibela and subsequent replacement with the Solomonic Dynasty in the latter part of the thirteenth

century, were notable for expanding Christianity in Ethiopia. In the 16th century, the Christian kingdoms were at war with Islamic states in the eastern part of the country, supported by Ottoman Turkey. The Christian kingdom was defeated, and the country was briefly under the Islamic rule of "Ahmed Gran" until Atse (Emperor) Gelawdewos re-enacted the Solomonic Dynasty with support from Portugal.⁷¹

Its earliest contact with the world's two major religions has tremendously affected the country for its entire history. Most of the country's history is one of wars and skirmishes between this diverse group of people and the two major religions. Through the centuries, the country attracted several superpowers' imagination and was in a constant battle with one or more of them. Noteworthy were powers like Egypt, Turkey, Italy, and Great Britain, which invaded the country directly in the past 150 years.⁶³ For example, following the Berlin Conference of 1884, where European powers signed the treaty for "the Scramble for Africa," Italy acquired its first colony in East Africa through the annexation of Port of Massawa with the help of the British. Italy continued its pursuit and took Eritrea as a colony, and invaded the rest of Ethiopia by 1896.⁶³

The Italian invasion led to the "Battle of Adowa" in 1896, where an African Army met a well-prepared and armed European colonialist army.⁶³ According to the historian Richard Pankhurst, "Emperor Menelik II of Ethiopia assembled and led an army of Ethiopians and faced the Italian invaders. The battle ended with the summary defeat of Italy. The victor Emperor Menelik II was offered diplomatic ties with Europe. While Europeans continued to draw lines for their colonies in the horn of Africa, Ethiopia largely remained a free country."⁷³

Italy never forgot its defeat at Adowa, and when the Fascist Government of Mussolini took power, it promised to subjugate Ethiopia and build the "Italian East Africa Empire."⁶³ Italy reinvaded and occupied Ethiopia in 1935 and established the Italian East Africa Colony

as promised. The years of conquest are still fresh in the minds of the few people who are still alive today. The Italians used nerve gas and air raids on local populations and were randomly killing the native population. In 1937, Italian soldiers massacred 30,000 people in Addis Ababa following a failed assassination attempt on the life of Italian East Africa's Viceroy, Marshal Rodolfo Graziani, by the Ethiopian Patriot fighters. The Italians were expelled in 1941 by a joint force of Ethiopian Patriots and the British Army. Later, Emperor Haile Selassie I returned from exile and re-established his throne in 1941.⁷¹

The Post-colonial period (1941-1974) was notable for reconstruction, the country's modernization, and governance formalization. Infrastructures on health, education, and transportation grew, albeit at a limited pace. Traditionally the Orthodox Church was the only school of learning for much of Ethiopia's history where only very few had access to the lengthy church education. With Emperor Haile Selassie I's notable expansion of schools, many young people had the opportunity to study in modern schools, which formed the change force in the latter part of the reign of Emperor Haile Selassie I. Another success of the emperor was that he helped establish African Unity in 1963 in Addis Ababa, Ethiopia. Ethiopia was seen as the "torchbearer for freedom fighters" for Africans still under the yoke of colonialism.⁶³

However, by the early 1970s, the country faced economic stagnation, inflation, and severe famine, which led to public unrest in the country. The military toppled the monarch in 1974 through the "Ethiopian Revolution," which was ignited by the student movement, and established a military dictatorship called "the Derge." Even though the Derge promised to transition to civilian rule, it soon became repressive and started the "Red terror" campaign to purge opposition groups. The Soviet Union and Cuba supported the Derge, which made Ethiopia a battleground for the "cold war."⁷⁵

The Soviet Union's influence in Ethiopia was not unnoticed. The USA supported liberation movements from northern Ethiopia (the Tigray People's Liberation Front and the Eritrean People's Liberation Front), which plunged the country into yet another protracted bloody war. These rebel forces finally removed the military government in 1991.⁷⁵

The Ethnic-based liberation armies formed the Ethnic-based federal government of Ethiopia, and they also successfully separated Eritrea from Ethiopia. The country stabilized, and "growth and development and poverty reduction" became the day's agendas. Unfortunately, in 1998, Eritrea invaded Ethiopia following a failed closed-door negotiation on an apparent minor border dispute. This invasion resulted in a bloody war between the two countries, estimated to have claimed more than 100,000 lives. A two-decade protracted diplomatic deadlock followed, termed a "no-war, no-peace" situation between them. History seems to be repeating itself again and again for millennia.⁷⁶

The country largely remained at the edge and always on war through the constant power struggle between regional lords with foreign powers' helpful hands (for religious, colonial, ideologic, or strategic purposes). The status quo drained the country's resources, made trade relations and technological advancements severely limited.

The country's economy largely depended on agriculture, the export of raw materials, and unfinished goods. Productivity was limited by war, inconsistent rains, overgrazing, locust invasions, traditional farming methods, and over-cultivation of the limited arable land, which is primarily situated in the country's plateaus. The lowlands remained largely uncultivated and uninhabited for much of the millennia until very recently due to hostile weather conditions, constant raids by armed groups, and deadly diseases.⁷⁷

The legacy of colonialism, the cold war, the ever-insinuating neocolonialism, the civil wars, the non-ending ethnic conflicts, the proxy-wars due to the Nile Geopolitics, and the interface between Islam and Christianity has left the country bereft with a broken socio-

economic system and political instability. This led the country to have no meaningful infrastructure, including roads, electricity, schools, health facilities, and clean water until very recently.

Despite its glorious past, abundant natural resources, industrious people, and rich culture, the world often associates Ethiopia with famine, deprivation, and poverty, according to the historian Bahru Zewde.⁷⁸

Concluding why health services need to be redesigned

Back to the Argument

Non-communicable diseases have emerged as the top causes of morbidity and mortality in Ethiopia; hence, our health services need to be redesigned to tackle their impacts adequately. However, the health system's current organization is based on the age-old primary care model that heavily focuses on preventing and caring for communicable diseases, maternal and neonatal (CMNN) health conditions, neglected tropical diseases (NTDs), and nutritional disorders. These health programs have several things in common: all are almost vertical programs, heavily donor-driven and adored by the international health hegemony, and are structurally reliant on low-level acute care or campaign-based prevention and care delivered by trained volunteers.

What do the current efforts look like to respond to NCDs?

Ethiopia has a three-tiered health system, with a tremendous increase in public and private health facilities in the past two decades.⁵⁴ The human health resource deployed is also increasing year by year, even though the diversity, skillset, and the number of health care workers are not catching up with the expanding population and the emerging new health facilities.⁷⁹ The retention of skilled human resources is also a gargantuan task. Medical

equipment and supplies are other critical components of health care that are often missing from Ethiopian health facilities. The availability of quality-assured and affordable medicines is at the center of health care but is frequently absent from the public and usually even private pharmacies. Surveillance systems and monitoring are the backbones of health service delivery. Financing and resource allocation are the heart of any health service. System organization and governance are the brains of health care. As has been described, all these components are ailing in Ethiopia.⁸⁰ So, an effective system to address the looming burden of NCDs and an inclusive (geography, cost barriers, community response) health service is sought.

How can a unique biosocial approach help redesign services?

NCD prevention and care require a complex interplay of the health system, the family, the individual, and the community with a chronic integrated, comprehensive care model with sustainable financing and a robust surveillance system. As is known, even though the contribution of the individual in the fight against NCDs is undeniable, there are social forces beyond the individual, the family, and the community that is in play and limiting the capacity of the individual and the community in tackling this emerging epidemic in Ethiopia. This has been described as "structural violence" by Paul Farmer, a leading medical anthropologist.⁸¹

Hence interventions limited to behavioral modification of individuals are not adequate unless mitigation of the deep-rooted structural violence is progressively and adequately addressed. Part of this solution should be moving away from the notion that prevention through education is an alternative to the comprehensive and responsive health system, proper and democratic political representation, equitable distribution of resources, and people-centered health planning.

A strategic framework for global health delivery, termed as the "care delivery value chain," has been suggested by Kim, Farmer, and Porter in a recent publication, explaining the need for integrating delivery systems and external context.⁸² This framework describes the current approach to address individual health problems in an ad-hoc manner is not the most effective approach. Instead, it proposes a system-level analysis to understand the complex processes for high-value care interventions, integrated services to harness infrastructure and personnel, alignment to the local context by understanding structural and other bottlenecks, and equitable investment to address poverty.⁸²

Concluding with what this project will attempt to do

The Ethiopia NCDI Commission in 2018, using cost-effectiveness analysis, priority to the worse-off, and financial risk protection criteria, recommended a total of 90 highest priority and 70 high priority NCDI interventions to achieve Universal Health Coverage in Ethiopia.⁶⁰ The Lancet NCDI Poverty Commission Report entitled “*The Lancet NCDI Poverty Commission: bridging a gap in universal health coverage for the poorest billion*” launched in September 2020 proposes Integrated Care Teams (ICT) in the delivery of priority NCDI interventions.¹² The framework mentioned above proposes untangling the complexities of delivering high-quality priority NCDI interventions to understand the care delivery value chain. This requires defining the overall level of delivery and the organization of the care within facilities.

This quantitative survey tries to understand those key components and inputs to design effective and equitable NCDI services as recommended by the NCDI commission and endorsed by the Ethiopia Essential Health Service Package 2019.⁸³ The objective of the study includes to: assess the current delivery of the high-priority interventions for NCDIs at health facilities in Ethiopia to achieve Universal Health Coverage; assess the current staffing and

organization of these services at various levels of the health system; identify major barriers to the delivery of recommended interventions; identify additional priority interventions that could be delivered or strengthened; determine what human resources are needed to deliver the additional interventions at First Level hospitals.

PART 2: ASSESSMENT OF PRIORITY NON-COMMUNICABLE DISEASES AND INJURIES (NCDI) INTERVENTIONS AND HUMAN RESOURCING AT SELECTED HEALTH FACILITIES IN FOUR REGIONS OF ETHIOPIA

Introduction

Non-communicable diseases are by far the leading causes of death worldwide. According to the 2018 World Health Organization (WHO) Global NCD report, NCDs were responsible for 71% of the 57 million deaths which occurred globally in the year 2016.¹⁶ Most importantly, about three-quarters of the premature adult deaths were due to NCDs, the majority of which occurred in low income and low middle-income countries.¹⁶ NCDs, which were assumed to be the diseases of the affluent, the elderly, the rich, and western society, are also becoming major causes of morbidity and impoverishment in these settings.¹¹

Based on the 2018 WHO Global NCD report, there were 700,000 deaths in Ethiopia in 2016, of which 39 % was due to NCDs, 12% to injuries, and 49% to communicable, maternal, perinatal, and nutritional (CMNN) conditions.¹⁶ For comparison, in 1990, among the 844,000 deaths the same year, the corresponding estimates for these conditions were 21%, 8%, and 71%, respectively, showing a considerable shift in the causes of death towards NCDs in the past 25 years.¹⁴ Some describe this phenomenon as evidence of an "epidemiologic transition" in Ethiopia. In the context of this epidemiological transition, a triple burden of disease is already emerging with the mix of persisting burden of infectious diseases and an increasing burden of non-communicable diseases and injuries.¹⁹

The Ethiopia NCDI Commission report (it is part of the Global *Lancet* NCDI Poverty Commission) has shown very similar results to the WHO report discussed above.²⁰ Cardiovascular diseases and cancer were the highest causes of mortality among the NCDIs.

More than half of the NCDI mortality occurs before age 40, and two-thirds of deaths occur before age 50. The same report also showed NCDIs were the cause of about half of the loss in Disability Adjusted Life Years (DALYs) in Ethiopia in 2016. Similarly, about 60 % of the DALYs lost due to NCDIs in Ethiopia occurred before age 40.²⁰ This high rate of premature mortality (death occurring in those aged 30–69 years) and morbidity from NCDs is unlike that seen in high-income countries where the NCD burden is primarily in the elderly population.¹¹

The Ethiopia NCDI commission reported that access to NCDI care is severely limited, and when available is often incomplete, inconsistent, and of low quality. This care additionally exposes households to high out-of-pocket expenditure, leading them to impoverishment. The same Commission using cost-effectiveness analysis, priority to the worse-off, and financial risk protection criteria selected and adapted from DCP3 and WHO, a total of 375 essential Universal Health Coverage interventions for implementation; among which 218 are health facility-based interventions.⁸⁴ These interventions are recommended to be delivered by different levels of the health system.⁸⁵

Many strategic documents were prepared, and several surveys were conducted on the health status of the population and service delivery. However, several information gaps need to be clarified for effective implementation of the Priority UHC interventions recommended by DCP3 and the Ethiopia Essential Health Service Package 2019.⁸³ To mention some of the information gaps: how much of the interventions are currently being delivered at each level, by whom and where are those services offered, is there a difference in service delivery between NCDs Vs. CMNN Vs. Injury; and if the designated health facilities are not providing the services, what were the bottlenecks, and what additional services can be added were some of them.

Therefore, a more rigorous study is needed that can fill the existing knowledge gap. We conducted a structured facility-based survey to close this gap.

Methods

Study design and setting: The study design is a descriptive cross-sectional quantitative survey of selected health facilities to study the delivery of recommended priority NCDI interventions.

Study population: The study populations were facility managers and department coordinators working at different health facilities-Referral hospitals, First Level hospitals, and Health centers in four selected regions of Ethiopia.

Inclusion and exclusion criteria: A purposive sampling methodology with a maximum variation approach was used as the primary sampling approach.⁸⁶ Health facilities from the three biggest regions (Amhara, Oromia, and SNNPR) and one developing region (Afar) were included to account for representativeness and ensure equity. Six Zonal Administrations from four Regional States were selected purposively. One Referral Hospital (RH) per zone was then selected. Two First Level Hospitals (FLH) were included from each Zonal Administration by lottery method. For each FLH, two Health Centers (HC) were chosen purposively, considering performance and patient load. We included 11 FLHs and 22 corresponding HCs in the survey from a planned 16 FLHs and 32 HCs. The informants were health facility managers or their delegates who are health workers working in the HFs. Health facilities in unstable areas were excluded.

Procedures for recruitment, enrollment, and consent: The Survey questionnaire has four components: Facility Overview, Health Care Worker (HCW) Categories available, Units available in the facility, and Priority Interventions List. The priority interventions list for

Ethiopia was adapted from the Disease Control Priorities 3rd edition (DCP3) Essential Universal Health Coverage (UHC) interventions. The generic DCP3 Essential UHC Interventions is composed of 218 health facility-based interventions.⁸⁷ The generic list was compared with the Ethiopia NCDI commission report recommendations and the Ethiopia Essential Health Service package 2019. The student PI and the Senior Research Associate at Harvard Medical School selected and adapted the list. Several interventions were not relevant to Ethiopia, and some interventions solely assigned by DCP3 to the community level were delivered mainly by HCs and FLHs in Ethiopia. Finally, 214 interventions were selected for Referral Hospitals, 170 interventions for FLH, and 78 Interventions for Health centers. The selected facilities were visited, and the facility managers were briefed and shown the EPHI IRB Approval (local) and the approved study proposal. Then, they were invited to participate in the study. Most of the HF managers agreed to participate themselves. Those who could not participate delegated someone who closely knows the operations and services offered by the HF. The participants signed informed consent and received a copy.

Key procedures and measures: The participants were given a briefing about the method of data collection. Data were collected by a structured questionnaire designed for the HF type. The survey questionnaire was developed based on the Essential Universal Health Coverage Interventions recommended by the DCP3 project of the World Bank and was adapted as described above. The PI and Research Assistants collected data on whether a given intervention is being provided, and if being offered where in the health facility the service is provided (e.g., which ward(s) or clinic(s)), what practitioner(s) work in these wards, and what cadre(s) have primary responsibility for delivering the care). When services are not being provided, the possible reasons (bottlenecks) were identified.

The PI reviewed the filled questionnaire for any errors or omissions for each health facility surveyed, and he contacted the sites to clarify or rectify errors.

Data analysis (or statistical methods): Means/proportions, mode, and range were calculated. Comparisons were made between health facilities on their catchment population, annual outpatient visits, staffing pattern, and the extent of priority interventions. Then the data were pooled by health facility type. Graphs were used to visualize trends. Further analysis of services offered by First Level Hospitals was made using information collected and pooled from survey respondents on how additional priority NCDI services could be expanded by integration into existing units or new ones recommended.

Ethical considerations

An IRB approval was obtained from Harvard Medical School, Boston, USA, and Ethiopian Public Health Institute, Addis Ababa, Ethiopia. The data collection was on data related to service availability, and there were no significant ethical risks to the participants. Participants, after explanations, signed consent formats.

Results

A total of 39 health facilities were included in the survey from four Regional States in Ethiopia. It included 6 Referral Hospitals (RH), 11 First Level Hospitals (FLH), and 22 Health centers (HC). The plan was to enroll 4 RHs, 16 FLH, and 32 HCs. The response rate was 75%. The remaining sites were not surveyed due to insecurity and time constraints.

The mean catchment population and annual outpatient visits for Referral Hospitals were 3,066,667 and 146,076; for First Level Hospitals 261,220 and 36,416; and for Health Centers 39,151 and 24,045, respectively.

The proportion of priority Universal Health Coverage (UHC) interventions for Ethiopia offered by Referral Hospitals (RH), First Level Hospitals (FLH), and Health centers (HC) was 76%, 71%, and 64%, respectively (Table 1).

Table 1: What proportion of Priority UHC Interventions are offered at Health Facility level

HF Type	Number of Health Facility	Priority Interventions for Ethiopia	# Offered by Health Facility	%
Referral Hospital (n=6)	6	214	163	76%
First Level Hospital (n=11)	11	170	121	71%
Health Center (n=22)	22	78	50	64%

When disaggregated by Global Burden of Diseases (GBD) Level 1 Category of diseases, the proportion of priority NCD and Injury interventions offered were by RH 65% and 81%, for FLH 61% and 57%, and health centers 41% and 29% respectively. The proportion of CMNN interventions offered by RH, FLH, and HCs was 91%, 89%, and 89%, respectively (Table 2).

Table 2: What proportion of Priority NCDI* Interventions are offered by HFs.

GBD 1 Category	Referral Hospital		First Level Hospital		Health Center	
	Priority Interventions (n=6)	Av. # Offered (%)	Priority Interventions (n=11)	Av. # Offered (%)	Priority Interventions (n=22)	Av # Offered (%)
NCD	110	71(65%)	77	45(58%)	32	13(41%)
Injury	27	22(81%)	23	13(57%)	7	2(29%)
CMNN	69	63(91%)	63	56(89%)	36	32(89%)
Cross-Cutting	8	7(88%)	7	5(71%)	3	3(100%)
NCDI	137	93(68%)	100	58(58%)	39	15(38%)

**NCDI-Noncommunicable diseases and Injuries*

It was also noted that those HCs who have opened NCD Clinics deliver more NCDI care than those who do not have NCD clinics (average 22 versus 15 NCDI interventions).

From the list of priority interventions not offered by health facilities, health facility managers were asked if it is feasible to provide additional services in the next year. The proportion of NCDI interventions that were determined to be feasible were 73%, 62%, and 63%, respectively, for RH, FLH, and HCs (Table 3).

Table 3: What proportion of NCDI Interventions are feasible to be delivered by Health Facilities.

Intervention	Average in Referral Hospitals	Average in First Level Hospitals	Average in Health Centers
NCDI Not offered	44	42	24
NCDI Reported as Feasible	32	26	15
Proportion Feasible	73%	62%	63%
Total # of Priority NCDI Interventions	137	100	39

On the other hand, among priority NCDI interventions, Emergency OPD, Surgical Unit, and Internal Medicine Units were the most frequent units delivering the services in referral hospitals. While in FLHs, Emergency OPD, Inpatient Department, Adult OPD, and Operation Room were the units that provided the majority of the NCDI interventions. In HCs, Adult OPD, NCD Clinic, and Emergency OPD offered most services (Table 4).

Table 4: Units in HFs Offering Priority NCDI Services.

Referral Hospitals(n=6)		First Level Hospitals(n=11)		Health Centers(n=22)	
Units	# of Priority Interventions	Units	# of Priority Interventions	Units	# of Priority Interventions
EOPD/ICU	38	EOPD	35	Adult OPD	9
Surgical OPD, OR, Surgical Ward, Minor OR	34	IPD	30	NCD Clinic	9
MOPD/Medical Referral/Medical Ward	30	OPD	26	EOPD	4
Gyn OPD, Ward, Gyn Referral	9	OR	15	ANC	1
Ped OPD,/Pediatric Ward	7	NCD Clinic	13	YFS	1
Psychiatry Clinic	7	MCH	9	Immunization Unit	1
Average # NCDI Interventions offered by HFs	93		58		15

When we looked at the health care categories involved in providing those priority NCDI interventions, they differ by level of care. Internists and subspecialists; Surgeons, Pediatricians, Orthopedic surgeons, gynecologists, and psychiatry professionals were primary decision-makers for Referral Hospitals. For FLH, General Medical Practitioners, Integrated Emergency Surgical Officers (IESO), and Psychiatry Professionals were the decision-makers in the care. The Health Officers followed BSC Nurses and Midwives were the primary decision-makers in the health centers (Table 5).

Table 5: Health Care Worker involved in the delivery of priority NCDI Interventions

Referral Hospitals (n=6)		First Level Hospitals (n=11)		Health Centers (n=22)	
HCW Category	Average # Intervention by HCW Category	HCW Category	Average # Intervention by HCW Category	HCW Category	Average # Intervention by HCW Category
Internist (Plus other subsp.)	31	General Practitioner	31	Health Officer	10
Surgeon (Plus other Subsp.)	23	Integ.Emergency Surgical Officer	20	BSC Nurse	3
Pediatrician	15	Psychiatry Professional	4	MW BSC	2
Orthopedic Surgeon	12	MW BSC	2		
Gynecologist	9	BSC Nurse	1		
Psychiatry professional	7				
Dental Surgeon	3				
Ophthalmologist	3				

When we analyzed the bottlenecks for delivering the priority NCDI interventions, the reasons fall into one or more of the six WHO framework for health system strengthening categories shown in Table 6 below.⁸⁸ For Referral Hospitals, the reasons were more of shortage of medicines, equipment, and diagnostics; for FLH, however, the reasons were a shortage of human resources and medications followed by limited diagnostics, while the reasons for health centers were lack of training of HCWs, lack of drugs and diagnostics (Table 6).

Table 6: Common reasons for not offering NCDI Services

Bottle Necks	# of priority interventions affected in RH	# of priority interventions affected in FLH	# of priority interventions affected in HCs
1. Space/Infrastructure	25(57%)	13(31%)	10(42%)
2. Equipment	36 (82%)	24(57%)	14(58%)
3. Budget	33(75%)	15(36%)	7(29%)
4. HR	32((73%)	34(81%)	23 (96%)
5. Diagnostics	38 (86%)	27 (64%)	17 (71%)
6. Medicines	40 ((91%)	31 (74%)	21 (88%)
# of interventions affected	44	42	24

For those interventions that the HF managers determined to be feasible for implementation, the managers were requested to fill significant inputs required to expand their services. Table 7 shows pooled results compiled from the HFs managers on what is required to expand their NCDI services in the short term.

Table 7: What would it take to initiate those services that were not being offered but were determined to be feasible?

Building Block	RH	FLH	HC
Space/ Infrastructure	Open Spaces for Specialist Services	Establish ICU's	Establish NCD Clinics
Equipment	Equipment for cardiology, nephrology, gastroenterology, Orthopedics	Avail Equipment for ICU and EOPD and Surgical services	Avail Quality Assured BP Apparatus, Glucometers with test strips
Budget	Avail enough budget	Avail enough budget	Avail enough budget
HR	Hire Subspecialists like Orthopedic Surgeon, oncologist, nephrologist, pediatric surgeon, pathologist	Hire Surgeon, Internist, Psychiatry professional, Dental Surgeon, and cataract surgeon	Training on NCDs, Mental Health and Palliative care. Hire Dental technicians
Diagnostics	Lab tests: Coagulation Profile, HBA1C, Chemistry, hormonal assays, troponin, viral load. Imaging: CT, MRI, Echo, Doppler U/S, ECG	Lab tests: Coagulation Profile, Chemistry, HBA1C. Imaging: CT Scan, Echocardiography, Doppler U/S, ECG	Avail point of care tests: U/A, FBS, HBA1C, HBV, HCV tests
Medications and Consumables	Avail Medicines and consumables	Avail Medicines and supplies for NCDs, Surgery, MNS, and Palliative care	Avail Medicines for NCDs, MNS, and Palliative care

We requested three independent physician experts to determine what tentative units can deliver all the selected 214 interventions for RH, 170 interventions for FLH, and 78 interventions for HCs. After the survey, those interventions that were not offered but determined to be feasible were assigned a tentative unit. The proportion of interventions assigned to tentative units is shown in the table below (Table 8).

Table 8: Tentative Units for Priority NCDI Service Expansion in HFs

Units	Average # of feasible NCDI Interventions for RH (n=32)	Units	Average # of feasible NCDI Interventions for FLH (n=26)	Units	Average # of feasible NCDI Interventions for FLH (n=24)
Medical OPD, Med. Ward, Med. Ref. Clinic	12	Medical OPD, Medical Ward, NCD Clinic	11	Adult OPD	8
Surgical Ward, OR	6	Surgical Ward, OR	10	EOPD	6
Oncology Unit	6	EOPD	4	ANC Clinic	5
EOPD, ICU	5	Dental Clinic	3	Youth Friendly Clinic	5
Pediatric Opd, Ped Ward	4	Eye Clinic	2	Under 5 Clinic	2
ENT Unit	4	Psychiatry Unit	2	Inj. and Dressing Unit	2
Gastroenterology Unit	2			Family Planning	1

A deep dive into the First Level Hospitals was done to identify further interventions that can be introduced using service integration as the lens of the analysis. Initially, all the 100 priority NCDI interventions were tallied for all FLHs. Then the availability was stratified as low (<33%), medium (33-67%), or high (>67%). Then for those interventions with low and medium availability, feasibility was analyzed and was decided as low(<67%) or high (<

67%). The analysis was described using a modified CONSORT Flow diagram, as shown in the figure below.⁸⁹

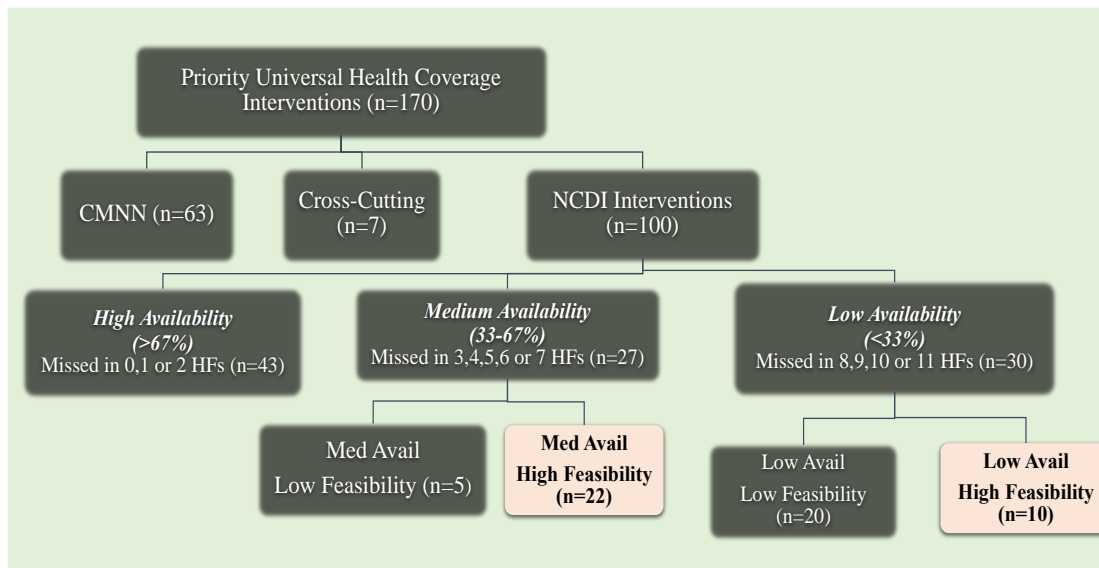


Figure 1: Availability-Feasibility Matrix for NCDI interventions at First Level Hospitals

As shown in the flow diagram, 27 priority NCDI interventions were of medium availability, and 30 priority interventions were of low availability. Again, further analysis showed that most medium-availability services were feasible for immediate introduction (22 of 27). Only a third (10 of 30) of those with low availability NCDI interventions were highly feasible for implementation.

In computing the modality of implementation, the units/ departments in the FLH were used as the basis for further analysis. The necessary inputs were pooled from the responses to make a coherent recommendation for implementation. The complete list of the selected high impact, highly feasible priority NCDI interventions are shown in Table 9.

Table 9: High Impact Highly Feasible First Level Hospital Priority NCDI Interventions

Tentative Units	What would it take for your facility to initiate this service in the next year?	Intervention Name	Level 2 Cause Name	# of HFs with reported unavailability	# of HFs which reported to be feasible	Proportion feasible	Availability versus Feasibility Cluster
EOPD, Medical ICU, IPD (Medical Ward)	Avail Hire Internist, Establish ICU, Doppler Ultrasound, Echocardiography, ECG Coagulation Profile, Avail Medications	Acute management of stroke with aspirin blood pressure medications, and aspiration precautions	Cardiovascular diseases	5	4	80%	Moderate Availability, High Feasibility
		Management of atrial fibrillation patients at high risk of stroke with warfarin or other anticoagulants	Cardiovascular diseases	11	11	100%	Low Availability, High Feasibility
		Management of acute critical limb ischemia with unfractionated heparin	Cardiovascular diseases	11	11	100%	Low Availability, High Feasibility
		Management of venous thromboembolism requiring warfarin	Cardiovascular diseases	9	9	100%	Low Availability, High Feasibility
Medical OPD, IPD (Medical Ward)	Avail Hire Internist, Avail medicines (including Methotrexate), Avail Laboratory tests (including Hepatitis Viral load testing).	Management of moderate to severe rheumatoid arthritis with low-dose corticosteroids and generic disease-modifying antirheumatic drugs (including methotrexate).	Musculoskeletal disorders	3	3	100%	Moderate Availability, High Feasibility
		Management of severe psoriasis	Other non-communicable diseases	6	6	100%	Moderate Availability, High Feasibility
		Assess for eligibility, initiation and monitoring of antiviral treatment for hepatitis B	Digestive diseases	11	8	73%	Low Availability, High Feasibility
		Assess for eligibility, initiation and monitoring of antiviral treatment for hepatitis C	Digestive diseases	11	8	73%	Low Availability, High Feasibility
IPD (Psychiatry Corner)	Avail Hire psychiatry professional, Avail Medications, Open Psychiatry corner in Inpatient Department	Inpatient treatment of severe depression with suicidality with first generation antidepressants	Mental and substance use disorders	4	4	100%	Moderate Availability, High Feasibility
		Inpatient treatment of acute psychosis with first generation antipsychotic medications	Mental and substance use disorders	4	4	100%	Moderate Availability, High Feasibility
Immunization Unit	Avail HBV Vaccine	Hepatitis B vaccination of high-risk populations, including healthcare workers.	Cirrhosis and other chronic liver diseases	7	6	86%	Moderate Availability, High Feasibility
Surgical OPD, OR, IPD (Surgical Ward)	Avail Hire Surgeon, Avail Ultrasound and other diagnostics, FNA Cology and Biopsy, Avail equipment and supplies	Appendectomy	Digestive diseases	3	3	100%	Moderate Availability, High Feasibility
		Removal of gallbladder, including emergency surgery	Digestive diseases	6	6	100%	Moderate Availability, High Feasibility
		Hernia repair, including emergency surgery	Digestive diseases	5	5	100%	Moderate Availability, High Feasibility
		Colostomy	Digestive diseases	6	6	100%	Moderate Availability, High Feasibility
		Management of bowel obstruction	Digestive diseases	3	3	100%	Moderate Availability, High Feasibility
		Repair of perforations (e.g., perforated peptic ulcer, typhoid ileal perforation)	Digestive diseases	3	3	100%	Moderate Availability, High Feasibility
		Management of osteomyelitis, including surgical debridement for refractory cases	Musculoskeletal disorders	4	4	100%	Moderate Availability, High Feasibility
		Early detection of breast cancer with clinical exam, ultrasound and breast biopsy in women presenting with breast complaints.	Neoplasms	3	3	100%	Moderate Availability, High Feasibility
		Fracture reduction	Injuries	3	3	100%	Moderate Availability, High Feasibility
		Irrigation and debridement of open fractures	Injuries	3	3	100%	Moderate Availability, High Feasibility
		Trauma laparotomy	Injuries	4	4	100%	Moderate Availability, High Feasibility
		Medical management with of acute critical limb ischemia with amputation as a last resort	Cardiovascular diseases	10	10	100%	Low Availability, High Feasibility
		Placement of external fixator and use of traction for fractures	Injuries	11	11	100%	Low Availability, High Feasibility
Trauma-related amputations	Injuries	9	9	100%	Low Availability, High Feasibility		
Dental Clinic	Avail Hire Denatal Surgeon, Avail Equipments and Supplies	Treatment of dental caries	Other non-communicable diseases	6	6	100%	Moderate Availability, High Feasibility
		Dental extraction	Other non-communicable diseases	5	5	100%	Moderate Availability, High Feasibility
		Drainage of dental abscess	Other non-communicable diseases	6	6	100%	Moderate Availability, High Feasibility
Physiotherapy Unit	Avail Hire Physiotherapist, Avail equipment and supplies	Mobilization activities following acute injury or illness	Injuries	3	3	100%	Moderate Availability, High Feasibility
		Exercise programs for upper extremity injuries and disorders	Injuries	5	5	100%	Moderate Availability, High Feasibility
Eye Clinic	Avail Hire Optometrist, Ophthalmic nurse or cataract surgeon and Avail equipment and supplies	Retinopathy screening (on-site or via telemedicine consultation)	Other non-communicable diseases	10	10	100%	Low Availability, High Feasibility
		Vision tests and provision of ready-made glasses on-site by eye specialists	Other non-communicable diseases	8	8	100%	Low Availability, High Feasibility

Strengthening the three units in FLHs (Emergency care services, Chronic Medical Care services, and Surgical Care services) will help expand priority NCDI services by an additional 22 interventions. The strengthening required is to hire additional HCW categories like an internist, a surgeon, a dental surgeon, and a cataract surgeon and avail the essential equipment, diagnostics, medications, and consumables.

Discussion

The delivery of high-priority Universal Health Coverage (UHC) interventions by all levels of the health facilities is suboptimal. From a total of 214 High-priority UHC interventions to be delivered by Referral Hospitals, overall, only 76% were offered by the study sites. However, when the interventions were disaggregated by the Global Burden of Disease (GBD) Level 1 category, the delivery of NCD (65%) and Injury (81%) interventions were much worse than CMNN (91%) interventions. When the same analysis was made in First Level Hospitals (FLH) from a recommended list of 170 high-priority UHC interventions, the overall availability (71%) was lower than in RH. Provision of NCD (58%) and Injury (56%) interventions were lower compared to CMNN conditions (89%). The availability of NCD and Injury services was worse in HCs compared with RH and FLHs. From a list of 78 interventions recommended for HCs, NCD and Injury Service availability was 40% and 28%, respectively, compared with interventions for CMNN conditions (89%).

At the Referral Hospital level, outpatient and inpatient services were more specialized with the different interventions delivered by a specialist team of units. In First Level Hospitals, even though there are inpatient and outpatient services, the level of specialization is limited with surgical, medical, pediatric corners in the inpatient department. The maternal health services are by far more organized, with all Maternal and Child Health services in one corner of the hospital. However, in health centers, services are more integrated and are

delivered through the three service outlets, i.e., Adult Outpatient, Maternal and Child Health, and emergency services.

The most essential Health Care Worker categories involved in delivering High-Priority UHC interventions in HCs were Health Officers, Nurses, and Midwives, with some facilities having one or more General Medical Practitioners. On the other hand, FLHs have more categories of health cadres in delivering their services. General Medical Practitioners, Integrated Emergency Surgical Officers, Nurses, and Midwives are pillars of clinical care. The picture is entirely different in RH, where more types of specialists and subspecialists are found even though there are still differences among sites. Some have one or more subspecialists in the major areas like surgery, internal medicine, and other cross-cutting specialties like pathologists, radiologists, etc.

The major barriers in delivering NCDI services are generally similar, falling into one or more of the six building blocks and infrastructure. However, the specifics differ at the three levels of care. For Referral Hospitals, the reasons were more of shortage of medicines, equipment, and diagnostics; for FLH, however, the reasons were a shortage of human resources and medications followed by limited diagnostics, while the reasons for health centers were lack of training of HCWs, lack of drugs and diagnostics.

Several of the interventions that are not being currently offered can be delivered if some of the barriers are addressed systematically. Analysis of the bottlenecks at the RH level has shown that the focus should be on strengthening units by procuring more equipment, hiring subspecialists, availing diagnostics, including imaging, and ensuring an uninterrupted supply of medications and consumables.

A deeper dive into NCD and Injury Service Delivery at FLHs (Figure 1) has shown two clusters of priority NCDI interventions to expand these services. These are Low Availability-High Feasibility and Medium Availability-High Feasibility interventions. The proportion of

low availability interventions that are feasible to be delivered is lower than medium availability interventions underscoring the importance of service integration to deliver additional services.

First Level Hospitals have weak acute care services, and they lack ICUs. Suppose FLHs can hire an internist, establish better organized acute care corners and an ICU, and avail themselves the necessary diagnostics and medical supplies. In that case, they can expand their NCDI services by additional four interventions. The same internist can help in strengthening the chronic care for NCDIs and can provide additional four interventions. On the other hand, hiring a general surgeon to the team in addition to the Integrated Emergency Surgical Officers (IESOs) currently working in FLHs is vital in expanding surgical and injury services in FLH. It has been shown that fourteen additional interventions can be provided with the addition of the surgeon to the team and availing necessary equipment, consumables, and medicines. Additionally, by hiring a psychiatry nurse, a dental surgeon, and a cataract surgeon, FLHs can help solve low access to critical mental health, dental health, and eye health services.

A closer look at table 9 has shown that many of these interventions are for severe NCDIs. The current recommended five-by-five strategy by the WHO PEN package for primary care omits these groups of NCDIs. Hence these findings pave the way for introducing the PEN-Plus package of interventions if UHC is to be achieved.¹²

This survey has also shown that Health Centers with dedicated NCD corners delivered more NCDI services than those that do not have. Opening NCD Clinics entails dedicating a separate space or allocating the same space for other services but a differing schedule. Additionally, training their available health care workers on NCDs, Mental Health, palliative care, and injuries can help expand their NCDI services. Here too, the availability of essential medications and diagnostics is critical.

The consequences of the systematic neglect and failure to deliver NCDI services compared with CMNN conditions cause social and medical suffering for the patient and the family. However, with careful analysis of the situation, it is possible to identify the needs, the key barriers, the potentials available for integration of services, and identification of high-impact interventions that can be introduced by mobilizing locally available resources.

Strengths and limitations

This survey is the first of its kind to directly study individual interventions recommended by the DCP3 Essential UHC package. Previous studies like Ethiopia SARA 2018 and ESPA Plus 2014 in Ethiopia focus on a group of conditions like CVD, MCH, Malaria, or TB; hence they lack the depth to answer which specific recommended intervention in each programmatic category is available or being offered. Therefore, this survey can serve as the basis for future in-depth studies on delivery priority interventions in more health facilities or more settings.

The limitation of the study stems from its methodology. Its methodology is a purposive sampling methodology with a maximum variation approach. Hence it is not a systematic representative study. The other limitation is that the services were not objectively observed, instead was based on the expert informant. So it may be prone to desirability bias. These may limit its generalizability.

Conclusions

The findings in this study showed that delivery of priority NCDI interventions is less than priority MNCH Interventions, and this effect is exacerbated as you move RH to FLH and HC levels. The major barriers in delivering NCDI services in Referral Hospitals were the shortage of medicines, equipment, and diagnostics; for FLH, however, the reasons were a

shortage of human resources and medications followed by limited diagnostics; in Health Centers, lack of training of HCWs, lack of drugs and diagnostics were the major bottlenecks.

There are groups of priority NCDI interventions at the first-level hospital level that are not usually available, but that facility leadership believe are highly feasible. These are interventions for emergency cardiovascular conditions, chronic care for medical conditions, common emergency surgical conditions, and injuries. Dental health and eye health conditions were also deemed feasible for inclusion.

These medium and low-availability but high-feasibility NCDI interventions have some common elements that could be targeted for strengthening, including the unit for delivery (e.g., Emergency OPD, Surgical Ward and OR), human resource (internists, surgeons, or enhanced training for their mid-level equivalents), complexity/titration of medications, diagnostic/imaging platforms (i.e., CT scan, ultrasound), or laboratory platforms. The way forward is "integrating" these interventions in the target units with shared spaces, equipment, and other resources; FLHs may be able to get shared efficiencies through their investments.

In health centers opening NCD Clinics by training the available mid-level staff on NCDs, Mental Health, and Palliative Care and availing point of care diagnostics and essential medicines will hugely improve NCDI service delivery.

Further in-depth study is recommended to understand and design inclusive, comprehensive, and affordable NCDI care to realize UHC in Ethiopia.

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