ADDRESSING THE IMPACT OF NONCOMMUNICABLE DISEASES AND INJURIES IN ETHIOPIA:

FINDINGS AND RECOMMENDATIONS FROM THE NONCOMMUNICABLE DISEASES AND INJURIES (NCDI) COMMISSION OF ETHIOPIA

A Collaboration with the Global Lancet Commission on Reframing NCDIs for the Poorest Billion

Full Report

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Federal Democratic Republic of Ethiopia
Ministry of Health

ETHIOPIA
NCDI
COMMISSION

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FOREWORD

Ethiopia is one of the fast-growing economies in Africa with a vision to reach a middle-income status by 2035. Realization of this vision will require a healthy and productive population. Improving the health status of the population is among the key priorities of the Government of Ethiopia. As a result of its robust health policy and innovative strategies, the country has made huge strides in increasing universal access to health services through rapid expansion of primary health care that resulted in impressive gains in health status of the population. Most of these health gains are related to achievements in communicable, maternal, childhood and nutritional disorders.

Despite substantial strides made in improving population health status in Ethiopia, still a lot is required in creating a health system that can withstand all adversities. Ethiopia is still one of the countries with a very high morbidity and mortality from triple burden of diseases consisting of Group I diseases: Communicable, maternal, neonatal and nutritional diseases (unfinished MDG agendas); Group II Diseases: Noncommunicable diseases, mental, neurological and substance use disorders; and Group III conditions: Injuries. According to 2016 estimates, noncommunicable diseases and injuries represented 46% of the total disease burden in Ethiopia, which is expected to rise rapidly in the coming decades along with economic development, urbanization and life style changes. There are ongoing efforts to curtail the epidemic of noncommunicable diseases and injuries (NCDI) in the country but the magnitude of the problem calls for a multi-sectoral mechanism and a considerable increase in our effort to control and avert these conditions.

The Federal Ministry of Health (FMOH) of Ethiopia was approached by The Lancet NCDI Poverty Commission to form a national NCDI Commission to review the major NCDs, Mental Health, and Injury epidemiologic situation in the country from the perspective of policy, burden of disease, access to services, quality of care, financing, identify cost-effective priority interventions, and to recommend policy directions, and financing mechanisms for expanding NCDI services. The Ethiopian NCDI Commission was established in August 2016. The Commission conducted an extensive review of available literatures and consultations that led to the production of this report.

The recommendations included in this report calls for actions from several sectors emphasizing the importance of multi-sectoral collaboration in the fight against NCDIs. It is my sincere belief that all the stakeholders including the health sector, other sectors and partners will find the report very useful in understanding the burden of NCDIs in the country and will take the necessary steps to tackle the formidable health challenge that the country is facing.

I would like to thank all who have contributed to the successful completion of this report.

Kebede Worku (MD, MPH)

State Minister of Health,

Federal Democratic Republic of Ethiopia

ETHIOPIA NONCOMMUNICABLE DISEASES AND INJURIES (NCDI) COMMISSION

The Global Lancet Commission on "Reframing Noncommunicable Diseases and Injuries (NCDIs) for the Poorest Billion" was launched in 2015, aiming to achieve a better understanding of how NCDIs affect those living in extreme poverty, how NCDIs can be addressed in low income settings, and provide recommendations that can be applied to both international and national settings. The Commission is working with a group of low- and middle-income countries with heavy concentrations of people living in extreme poverty.

With the support of the global Lancet Commission, National NCDI Commissions and Groups were established in eleven low and middle-income countries (Afghanistan, Ethiopia, Haiti, India, Kenya, Liberia, Malawi, Mozambique, Nepal, Rwanda, and Tanzania) in order to obtain real world experience that can inform how NCDIs can systematically be addressed in policies so that the poor are not left behind, and to learn from differences and similarities between the countries' approach to this policy challenge.

Goals of the National Commission

Ethiopia NCDI Commission was established in August 2016 and aimed to generate local evidence on the epidemiology of NCDIs, suggest a package of NCDI interventions that should be prioritized for scale-up or implementation in Ethiopia**,** document best practices in integrating NCDI interventions with primary health care and develop pro-poor pathways for NCDI services that can inform national and health sector strategic and operational planning. Further, it aimed to inform global partnerships and investments by development partners. Currently, the Ethiopian Federal Ministry of Health's Strategic Action Plan for NCDs for the coming five years is under development, making this exercise a timely endeavor.

Objectives of the Ethiopia NCDI Commission

The general objectives of the Ethiopia NCDI Commission are as follows:

1. To provide baseline epidemiological and socioeconomic situational analysis of NCDI in relation to poverty.
2. To explore priorities, delivery platforms and integration of services for NCDI.
3. To determine fiscal space, resource needs and financing for programs targeting NCDI.
4. To critically examine current policy, advocacy and communication environment in the context of NCDIs.

Composition and Structure

The National Commission chair was from the Federal Ministry of Health of Ethiopia (FMOH). Members of the Commission constituted of FMOH, specialized agencies on health research, faculty from local universities, individual experts and patient advocates from civil societies. Under the National Commission, four working groups were established to address the following four thematic areas:

Group 1: Poverty, Disease Burden, and Risk Factors;

Group 2: Impact of Integrated Interventions on Health, Poverty, and Priority Setting;

Group 3: Financing, Medicines, and Technologies and;

Group 4: History, Advocacy, and Governance.

Figure 1: Partial View of the First Meeting of the National NCDI Commission of Ethiopia, August 9, 2016.

Members of the Global Lancet NCDI Poverty Commission closely supported the national team.

Table: Members of the Ethiopia NCDI Commission, Affiliation and Responsibilities

COMMISSIONER NAME	AFFILIATION AND/ OR EXPERTISE	RESPONSIBILITY
Dr. Mahlet Kifle	Former Director General, Minister's Office, FMOH	Chair-person and Co-Writer
Prof. Abraham Haileamlak	Consultant Pediatrician, Jimma University and Senior Advisor, Minister's Office, FMOH	Chair-person and Co-Writer
Dr. Wubaye Walelgne	Internist, Senior Advisor, Minister's Office, FMOH	Secretary, Research Coordinator and Co-Writer
Dr. Molla Gedefaw	Former NCD Case Team Coordinator, FMOH	Co-Chair and Contributor
Dr. Solomon Tessema	Pediatrician, Health Economist, Addis Ababa University (AAU)	Principal Writer and Contributor
Dr. Dejuma Yadeta	Consultant Internist and Cardiologist, AAU	Contributor
Dr. Mathewos Assefa	Consultant Internist and Oncologist, AAU	Contributor
Dr. Abebaw Fekadu	Consultant Psychiatrist, AAU	Contributor
Prof. Aklilu Azazh	Consultant Internist and Emergency Medicine, AAU	Contributor
Dr. Amsalu Bekele	Consultant Internist and Pulmonologist, AAU	Contributor
Mr. Wondu Bekele	Mathiwos Wondu-YeEthiopia Cancer Society	Contributor and Advocacy Expert
Mrs. Misrak Tarekegn	Ethiopian Diabetes Association	Advocacy Expert
Dr. Awoke Misganaw	Clinical Assistant Professor, IHME, University of Washington	Epidemiologist
Dr. Alemayehu Bekele	Public health specialist, Ethiopian Public Health Association	Contributor
Dr. Taye Tolera	Director General, Armauer Hansen Research Institute	Member
Dr. Yoseph Mamo	Internist, Jimma Univerisity, THET Project	Member
Prof. Mengesha Admassu	International Institute of Primary Health Care, EPHI	Member
Dr. Meiraf Tadesse	Health Economist, Consultant	Member

Figure 2: Members of the National NCDI Commission of Ethiopia, August 9, 2016

Summary of the Key Activities of the Commission

Ethiopia NCDI Commission ("the Commission") was established on August 9, 2016. The Commission has a Secretariat (Chairperson, Co-Chair and a Secretary) all from FMOH and selected members as shown above. The Secretariat was based at the FMOH, Ethiopia, and it was financially and technically supported by the University of Bergen, Norway and by the Department of Global Health and Social Medicine, Harvard University, USA. The Commission assigned working groups and identified core team members. The National Commission met five times while the working groups and core team members met more frequently based on need. The National Commission reviewed the progress of working groups regularly. Feedbacks and comments were sought from commissioners and other selected experts and were incorporated in the draft report. Furthermore, the final report was widely circulated, a validation workshop was conducted and enriched before publication and launching.

ACKNOWLEDGEMENTS

The Ethiopia NCDI Commission report is a combined effort of the Federal Ministry of Health (FMOH) of Ethiopia, local academic institutions, individual experts, and local patient and professional associations. The FMOH gratefully acknowledge all members of the national NCDI Poverty Commission and collaborators who volunteered their time and knowledge for the development of this report. The overall coordination provided by the Office of the Minister, the secretariat of the commission and the NCDs Case Team of the Diseases Prevention and Control Directorate are also highly appreciated.

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- Dr. Kunuz Abdela, MPH (Cancer Control Team, FMOH)
- Professor Markos Tesfaye (Psychiatrist, St. Paul Hospital Millennium Medical College)
- Dr. Fissehaye Alemseged (Epidemiologist, Jimma University),
- Dr. Helen Yifter (Endocrinologist, AAU),
- Dr. Tedla Kebede (Endocrinologist, AAU),
- Tsehaynesh Tiruneh, Cataract Surgeon, MPH (Eye Health Team, FMOH)

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Professor Abraham Haileamlak
Chairperson, Ethiopia NCDI Commission
Senior Policy and HRH Advisor @ Minister's Office
Ministry of Health,
Ethiopia

ACRONYMS

AAU	Addis Ababa University
AIDS	Acquired Immuno-deficiency Syndrome
ASIR	Age-standardized Incidence Rate
HBV	Hepatitis B-Virus
HCV	Hepatitis C-Virus
CIR	Crude Incidence rate
COPD	Chronic Obstructive Pulmonary Disease
CMNN	Communicable, Maternal, Neonatal and Nutritional
CVDs	Cardio-vascular Diseases
DALYs	Disability-adjusted Life Years
DCP	Disease Control Priorities
DM	Diabetes Mellitus
EDHS	Ethiopia Demographic and Health Survey
FCTC	Framework Convention on Tobacco Control
FIGO	International Federation of Gynecology and Obstetrics
FMoH	Federal Ministry of Health
GBD	Global Burden of Disease
GDP	Gross Domestic Product
HAAD	Health-adjusted Age at Death
HIV	Human Immuno-deficiency Virus
HEP	Health Extension Program
HEWs	Health Extension Workers
HPV	Human Papilloma Virus
HSDP	Health Sector Development Program
HSTP	Health Sector Transformation Plan
ICD	International Classification of Diseases
ICU	Intensive Care Unit
IHD	Ischemic Heart Disease
IHME	Institute of Health Metrics and Evaluation
IMF	International Monetary Fund
IPD	In-patient Department
LMICs	Low-and Middle-Income Countries
MDG	Millenium Development Goals
MNS	Mental, Neurological and Substance Use
MoH	Ministry of Health

NCDs	Noncommunicable Diseases
NCDIs	Non-communicable Diseases and Injuries
NGOs	Non-governmental Organizations
NHA	National Health Accounts
NHL	Non-Hodgkins Lymphoma
OOP	Out-of-Pocket
OPD	Out Patient Department
PHC	Primary Health Care
RHD	Rheumatic Heart Disease
RMNCH	Reproductive Maternal Neonatal Child Health
RTA	Road Traffic Accident
SARA	Service Availability and Readiness Assessment
SCC	Squamous Cell Carcinoma
SDG	Sustainable Development Goals
SSA	Sub-saharan Africa
TASH	Tikur Anbessa Specialized Hospital
TB	Tuberculosis
UHC	Universal Health Coverage
USD	US Dollars
WB	World Bank Group
WHF	World Heart Federation
WHO	World Health Organization
WHR	World Health Report
YLD	Years Lived with Disability

EXECUTIVE SUMMARY

Ethiopia is one of the fastest growing economies in Africa, and the nation is undergoing a rapid economic transformation. The triple burden of communicable, non-communicable diseases and injuries is a challenge to health as well as to national socio-economic development and social welfare. In 2016, NCDIs comprised of 52% of the mortality (46% of death and disability combined) amongst the Ethiopian population.

Ethiopia has a large and diverse burden of NCDI risk factors, which may vary by socioeconomic factors. Tobacco, alcohol, and khat use are on the rise in Ethiopia. Obesity, hypertension, low physical activity, raised total cholesterol, and high fasting plasma glucose, while present in all socioeconomic strata, are most prominent in wealthier groups. Environmental risk factors, such as indoor air pollution, may be more prevalent in rural, poorer populations. As of 2015, there was a high burden of common NCDIs, such as hypertension (with a prevalence in the adult population ranging between an estimated 16%-27%) and diabetes (estimated 3.2%-8% of the adult population), as well as less common but more severe NCDIs, such as rheumatic heart disease and cancers in women. In 2015, an estimated 65,000 cancer cases occurred in Ethiopia, two-thirds of whom were women. Severe mental health disorders such as depression, bipolar disorder and schizophrenia are also common in Ethiopia. In a predominantly rural area of Ethiopia, mental illness comprised of 11% of the total burden of diseases, with schizophrenia and depression included in the top ten most burdensome conditions. Furthermore, injuries particularly road traffic accident, fall and interpersonal violence are responsible for a substantial portion of mortality and morbidity in Ethiopia. Eye health problems are also major cause disability in Ethiopia. Cataract is responsible for nearly 640 thousand cases of blindness and for an additional 1.25 million people with low vision in the country. Digestive tract diseases, surgical conditions, and musculoskeletal disorders also played a large role in morbidity and mortality from NCDIs.

There exists a lack of access to quality health services for NCDIs, with only 54% of all health facilities ready to provide general NCD services, and even lower availability of specific services for diabetes (22%), cardiovascular disease (41%), chronic respiratory disease (45%) and cervical cancer (2%). Combined with low awareness and high stigma, many patients do not receive services – for example, 60% of patients with high blood pressure in Ethiopia were never diagnosed and among identified cases, only 28% were taking medications and of those,

74% had poorly controlled hypertension. Similarly, most individuals (84%) with high fasting blood sugar level were undiagnosed, particularly in rural areas, and among those diagnosed, only 24% achieved blood sugar control. In more complex diseases, most patients with conditions such as rheumatic heart disease, epilepsy, cancer, and mental health problems were unrecognized or diagnosed at advanced stages.

In addition to the health impact, the economic impact of NCDIs is also dramatic and increasing. Overall, 23% of total out-of-pocket expenditures in Ethiopian households are due to NCDs. Kidney failure accounted for 10% of all out-of-pocket expenditures, the second highest proportion of all conditions, and significant household spending goes to other NCDs, such as mental disorders (6%), cancers (5%), diabetes (2%), and injuries (2%). Among patients with cardiovascular diseases in Addis Ababa who sought care in health facilities, 27% had experienced catastrophic health expenditures, and was even higher in low-income households of patients residing outside Addis Ababa.

However, despite this urgent and pressing need, only scarce resources are going towards NCDIs. Despite comprising 46% of the estimated 2016 total disease burden, which is expected to increase even more in the next couple of decades, only 10% of the total health spending in 2013/14 went towards NCDIs. Until 2010, the national health sector strategy had not recognized the need for response to NCDIs, and until 2015, there had not been specific budget allocation for these chronic diseases.

The experts of this commission identified 90 interventions for NCDIs that are highly cost-effective, promote equitable access to health services for the most vulnerable, and provide optimal financial risk protection for Ethiopians. Our Commission estimates that these practical and much needed interventions can be implemented and scaled to achieve 30% coverage for the population over the next five-year period, and 80% coverage by 2030, through introduction and integration into existing services at the community, health center, primary hospital, and referral hospital level. This would also require introduction and enforcement of key policy and legal instruments. Overall, by the year 2023, the annual additional cost of this package is estimated at 550 million USD, corresponding to 4.7 USD per capita. Assuming 20% allocation to NCDIs with conservative estimates of GDP growth, government total health expenditure, external funding, and out-of-pocket spending reductions, at the end of the first five-year period (2023), there would be only US$ 2.4 extra per capita for NCDI services. This is far less than the estimated per capita cost of US$ 4.7 (needed in the year 2023) for the highest priority NCDI

services. However, with more aggressive targets for the above parameters, an additional US$ 4.5 governmental allocation for NCDIs could be feasible. Such investments in heath, besides other benefits such as protecting families from financial risks and therefore from impoverishment, have substantial health benefits. Implementation of the high priority NCDIs packages up to target coverage of 30% for the next five-year period would avert an estimated 13,000 deaths (2% of all premature deaths) in Ethiopia. The work performed by the Commission demonstrates that it is possible to approach priority setting in a systematic way and achieve substantial health gains also in resource constraint settings.

Given the data presented in this report on the burden of NCDIs in Ethiopia and high priority interventions that could prevent significant mortality and disability, and reduce out of pocket spending, our group recommends several key actions that can be taken to achieve these results. We list the most important recommendations here:

1. Financing

Allocate more of the gains from economic growth to health. Move government spending on health rapidly to 5% of GDP. Mobilize additional resources from improved efficiency, improved taxation, sin taxes (tobacco, alcohol), and consider a sugar-sweetened beverage tax. Plan for reduced external funding (at least in relative terms) as the country transitions to lower-middle-income country (LMIC) status. Reduce out-of-pocket to maximum 20% of total health expenditures. Development partners need to engage in generating evidence and supporting the implementation of cost-effective and equitable interventions for NCDIs, based on country needs, in order to maximize aid effectiveness

2. Health policy, planning and oversight

Establish a national multi-sectoral committee that guide and organize NCDI efforts and led by the Prime Minister or Deputy Prime Minister. Strengthen the NCDs prevention and control units at the federal level and establish similar units at regional level. Revise the Essential Health Service Package by the end of 2018: move high priority NCDI services from cost-recovery to cost sharing and/or cost-exemption funding schemes. Commensurate with available resources, expand NCDI services towards realization of UHC. Implement high priority multi-sectoral interventions as discussed in section 4.

3. Service integration

Low resource countries like Ethiopia can prevent and manage NCDIs by integrating into existing platforms a high priority package of interventions that is cost-effective, target the

worse off, and provide financial risk protection. Implement scale-up of health personnel as planned in HSTP, with special emphasis on resource needs for NCDI services. Develop, train and implement top eleven clinical guidelines for NCDI services (Treatment of childhood cancer, Early treatment of breast cancer, Basic palliative care, Treatment of acute pharyngitis in children to prevent rheumatic fever, Depression: basic psychosocial support and anti-depressant medication, Psychosis: basic psychosocial support and anti-psychotic medication, Epilepsy: follow-up and anti-epileptic medication, Treatment for substance use disorder (alcohol and tobacco), Primary prevention (statins and antihypertensive) for those with absolute 10-year risk of CVD >10%, Management of acute heart failure with diuretics and non-invasive positive pressure ventilation, Detection and treatment of asthma).

4. Targets, monitoring and evaluation

Track NCDIs progress against national targets (based on the 9 voluntary global targets recommended by WHO). Refine existing NCDI indicators and expand to include the 9 targets and other priority NCDIs in future revisions of HIS in order to monitor the epidemiology and service coverage of NCDIs. Mobilize and track domestic and external resources for NCDI prevention and control. Improve NCDI subaccounts in next round of National Health Accounts report.

5. Education and advocacy

Achieving global as well as local commitment and action against NCDIs requires sustained advocacy. Alongside actions directed towards changing social, environmental and economic conditions that impact health, mobilizing and educating the public on healthy lifestyle will substantially contribute to the prevention of NCDIs.

SECTION 1: BACKGROUND AND POLICY CONTEXT

BACKGROUND

A growing body of evidence suggests that the burden of NCDs and their risk factors is increasing in sub-Saharan Africa (SSA) [37].

Non-communicable diseases and injuries (NCDIs) have become a major public health problem in Ethiopia accounting for an estimated half of the total annual mortality and 46% of total national disease burden in 2015 [1]. Factors linked to the rising burden of NCDIs, such as, demographic, economic, and social changes as well as the political environment, differ from one setting to another (both within country and between countries), thus calling for a context specific understanding of the epidemiology of NCDIs and tailored strategies to respond to the growing problem [2]. A 2017 study by Bollyky *et al* found that Ethiopia is one of the countries experiencing the most rapid shift in NCD burden when compared to similar low-income sub-Saharan African countries such as Nigeria and Kenya, yet the least prepared [3]. The study projects the Ethiopian NCD burden (injuries not included) to rise to about 65% by 2040.

Ethiopia has an estimated population of more than 105 million in 2017 [4]. It is a low-income country with GNI per capita, (Atlas method, current US$) of $740 in 2017 based on World Bank Poverty and Equity Data Portal (http://povertydata.worldbank.org/poverty/country/ ETH). The Ethiopia poverty headcount ratio at USD 1.90 a day (2011 PPP) was 26.7% in 2015 according to World Bank 2016 report. The level of poverty is even worse if we take more composite poverty indices like the Multi-Dimensional Poverty Index (MPI) which includes parameters like education, health and living standard into account in addition to income. In urban areas, 4.4 million people (27% of urban population) were among the poorest billion, however in rural areas, 66.4 million people (90% of rural population) were among the poorest billion with the national MPI being 79.2% (Alkire & Robles, 2016).

The major driver of the economy is agriculture, which employs more than 80% of the population [5]. The literacy rate stands at a national average of 50% (UNESCO 2015). According to the World Bank, Ethiopia is one of the fastest growing economies in the world. Following current trends, the country is expected to become a LMIC by 2025 [6]. Communicable, maternal, neonatal, and nutritional (CMNN) conditions remain staggering public health problems in the country. In 2016, CMNN diseases accounted for 54% of the total

disease burden [1]. Furthermore, natural disasters such as drought and disease outbreaks are frequent phenomena.

Health services are mainly delivered by the government (Ethiopia NHA 6th report), particularly to the rural part of the country, where an estimated 82% of the total population resides (Ethiopia Central Statistic Authority 2015 report). In the past couple of decades, major health care reforms were introduced, resulting in exponential expansion of infrastructure and human resources that led to a significant improvement of the health status of the people [6]. Through health extension workers and large improvements in population health, primary health access has now reached 95% (Health and health related indicators 2013/2014). By the end of 2015, the country had achieved most of the MDGs except for the reduction of gender inequality and maternal mortality ratio (Assessment of Ethiopia's progress towards the MDGs 2015, National Planning Commission and UN-Ethiopia). Life expectancy at birth increased from 51 years in 2000 to 65 years in 2015, and over the same period, the child mortality rate before the age of five years decreased from 145 to 59 deaths per 1000 live births [6]. The Sustainable Development Goals, and particularly the Goal for Health (SDG3), now present new challenges to achieve Universal Health Coverage and reduce NCD mortality by one third by 2030.

Despite the above achievements, the 2013/2014 total health expenditure as a percentage of total government budget lies at 6.7%, far from the Abuja declaration of 15% [7, 8]. According to the recent National Health Accounts (NHA-6), the per-capita health expenditure in Ethiopia in 2013/2014 was $28 USD, far less than the recommended $86 USD required to deliver a package of basic services in low-income countries [9]. According to the Ethiopian Sixth National Health Accounts report, health care remains mainly financed by international aid (36%), followed by out-of-pocket expenditure (33%), and government expenditure (30%) [7]. Despite HIV/AIDS, TB and Malaria contributing only to an estimated 8.2% of the total disease burden in 2016 in Ethiopia, more than 20% of the national health expenditure was allocated for these conditions [1, 7]. This is in sharp contrast to the significant estimated NCDI 2016 disease burden of 46% that received only 15% of the total health spending in 2013/14; and the NCDI burden is expected to increase even more in the next couple of decades [1, 7]. National Health Accounts indicate that most of the OOP expenditure is for non-exempted services like NCDIs. Therefore, Government health spending on NCDIs is expected to be much lower than 10%. About 95% of the NCDIs spending was made on curative (therapeutic and rehabilitative) care services [7].

Generally, NCDs do not appear as one of the major priority areas at national level. Even when they do, they lack adequate funding from both internal and external sources. There is a wide prevailing misconception among policy makers, providers and the community that NCDs are disease of the "affluent" and old age while evidence indicates otherwise [10,11]. The Essential Health Services Package for Ethiopia (EHSP), the mechanism in use to prioritize health care services, classified NCDs as non-priority services and has not been revised since its introduction in 2005 (EHSP for Ethiopia 2005, FMOH).

POLICY CONTEXT

In the early 1993 Ethiopian health policy, development of promotive and preventive health care as the main priority through democratization and decentralization of health care delivery were the main pillars. Despite the main priorities being the prevention and control of communicable diseases, epidemics, and diseases related to nutritional and poor living conditions, this policy also indicated that appropriate attention should be given to environmental health, occupational health, mental health, and the prevention of chronic diseases. Furthermore, it emphasized the provision of equitable and similar standard of health care to all segments of the population, with special consideration to the most vulnerable. The policy gives room to look into the prevention and control of NCDs. However, it positioned NCDs as diseases related to affluence and aging [10]. The 1993 health policy was translated into action through the Ethiopian Health Sector Development Program (HSDP), which spanned for 20 years (1995-2015) with five-year cycles, and the recently launched Health Sector Transformation Plan (HSTP) [12-15].

Response to NCDs at service delivery level has developed in the past years, beginning as a series of pilot projects in a fragmented manner. One example of this was the 2009 introduction of a cervical cancer-screening project for HIV positive women [16]. Surgical campaigns for cataract, rheumatic heart disease, and other NCDs were also conducted sporadically through support from different partners and stakeholders. The 2011 introduction of the Addis Ababa City population-based cancer registry, administered through "Tikur Anbessa Specialized Hospital," was a commendable action to generate evidence on NCDs. Basic and advanced NCD care has also been increasingly provided at different tiers of the health care system, though were not guided by national strategies, standards and treatment protocols.

The prevention and control of NCDs appeared in the Health Sector Development Program (HSDP), for the first time, in the third cycle from 2005-2010 [13]. Blindness prevention and

control program was listed as one of the priority disease programs with four priority conditions: cataract, trachoma, glaucoma, and childhood blindness. The HSDP-III also recognized the need for a non-communicable diseases' strategy, with major emphasis on injuries and violence, mental and neurological disorders, cardio-vascular diseases, diabetes mellitus, chronic obstructive pulmonary diseases, and cancers.

Slightly preceding the HSDP-IV, the first policy document specific to NCDIs was developed in 2010, titled the "National Strategic Framework for the Prevention and Control of NCDs" [17]. This document serves to guide the development of appropriate programs and to address NCDs and generate commitment and consensus among relevant stakeholders at national level [17]. The Strategic Framework had a vision of a "healthy and productive society free from preventable chronic diseases through promoting healthy diet and physical activity and strengthening curative and rehabilitative services" [17]. The Strategic Framework was designed based on the principle that priorities should be guided by evidence on disease burden, socioeconomic impact and cost-effectiveness. The Strategic Framework facilitated the establishment of a functional unit for the prevention and control of NCDs, and the inclusion of NCDs in the national health sector development program IV.

Following the Framework, the NCDs program was managed by assignment of focal persons for the different disease conditions such as; eye health, mental health, injury, etc., similar to other disease control arrangements, as the Federal Ministry of Health (FMoH) organizational structure then was based on geography rather than on disease programs.

HSDP-IV recognized NCDIs as one of the major contributors for the national disease burden in Ethiopia and also acknowledged that NCDIs were not given adequate attention in the previous HSDP cycles. The plan outlined specific targets and initiatives to halt the rising burden of NCDIs. However, there were no indicators included for NCDIs as part of the fifty-one key indicators in the results framework at national level [14]. Further, costing of the plan mainly focused on the MDG priority disease areas, excluding the above-mentioned initiatives to address NCDIs.

In 2013, an operational NCDs prevention and control team was established under the disease prevention and control directorate. In February 2015, the first National Strategic Action Plan for the Prevention and Control of NCDs (2014-2016) was launched [18]. The Plan placed a major emphasis on the four by four strategy, which was adopted from the WHO Global Action Plan for the Prevention and Control of NCDs [18]. In addition, its included costing helped

guide the implementation of NCDs program. However, it was not a multi-sectoral plan, as recommended by the WHO.

Parallel to the development of the Strategic Action Plan, initiatives to integrate NCDs prevention and control interventions with primary health care were started. Furthermore, other disease specific strategies and plans were developed, such as the National Mental Health Strategy, the National Cancer Control Plan, and guidelines and training materials to integrate the management of NCDs in the primary health care were initiated [19-22]. The National Cancer Committee was established with the leadership of the First Lady of Ethiopia and the Minister of Health, which helped the advancement of the cancer control initiatives. Ethiopia's Framework Convention on Tobacco Control (FCTC) was ratified in January 2014 and some regions like Tigray took steps to enforce the legislation. Currently, more than 70 facilities provide cervical cancer screening services and the expansion of comprehensive cancer care facilities (with chemotherapy and radiotherapy) services is on progress. In 2015, a national STEPs survey was conducted for the first time to better understand the prevalence of risk factors for NCDIs [23]. NCD prevention and control was integrated in the second generation Health Extension Program (HEP) in 2014 [24]. There are ongoing efforts to integrate the diagnosis and management of diabetes and hypertension in primary health care facilities. In 2016, the national five-years (2016-2020) flagship initiative, Saving Lives through Safe Surgery (SaLTS), was launched [25].

NCDs were considered as one of the major disease control priorities in the Health Sector Transformation Plan 2015/16-2019/20, with elaborate strategies and costed interventions [15]. It stated the prevention of the four main risk factors for NCDs (namely physical inactivity, unhealthy diet, alcohol consumption, tobacco use) as the main strategy. Twelve indicators out of the total 176 indicators were included to monitor the epidemiology and service coverage of NCDs. Five indicators are routinely monitored through the National Health Management Information System annually which captures morbidity and mortality data from inpatient department (IPD) and outpatient department (OPD) registers. As the IPD and OPD disease classifications were not standardized (meaning that they do not follow the WHO ICD10 disease classifications), it was often difficult to get meaningful information from the service level disease reports or compare the report with other settings.

Apart from the above listed policies, strategies and plans specifically designed to address NCDIs, Ethiopia had invested significantly on Health System Strengthening that directly or

indirectly improves health care delivery for people affected with NCDIs. Access to primary health care throughout the country with coverage of primary health care reached more than 95% [15]. Further, huge investments were made to expand tertiary and secondary facilities and diagnostic capabilities. Capacity building through training of increased number of health care works at all levels and expanding basic curative health care services through task shifting were also the main priorities for the past couple of decades. This investment to expand the health system at all levels is expected to facilitate the integration of NCDIs interventions to existing services.

Despite these efforts, there are major gaps in the policies and implementation of NCDIs prevention and control program. Even though the NCDs prevention and control unit was established at the federal level, it was not replicated at the regional states, which play the major role in decision-making and implementation of the NCDIs initiatives. Anecdotal information indicates there still prevails a huge misconception towards NCDIs both from the community and providers side. There is a lack of awareness of their magnitude and that they affect the poor and the disadvantaged. The current strategy was adopted from the WHO global strategy, which gives major emphasis to the "4x4 strategy without adequate contextualization to the countries' setting (Global Action Plan for the prevention and control of NCDs 2013-2020, WHO 2013). Further, the plan is not multi-sectoral and there is no coordination mechanism among the different sectors to address cross cutting challenges. There is also a significant challenge in mobilizing resources and creating momentum for NCDIs both from the government and development partners. The country is also facing challenges with the unfinished agenda of the MDGs with substantial quality and equity gaps in health service delivery, coverage and utilization mismatch, and use of evidence for decision-making. Scale-up of NCDIs services must not replace other high-priority services targeting communicable, maternal and nutritional disorders.

Currently, there is greater global momentum in the prevention and control of NCDIs. There is a concerted worldwide effort towards elimination of avoidable blindness: VISION 2020-the right to sight [26]. NCDs were among health targets of the Sustainable Development Goals, with health target 3.4 aiming a one third reduction of premature mortality from NCDs by 2030 [27]. The United Nations General Assembly is preparing for third High-level Meeting on the prevention and control of NCDs in 2018, which is expected to embark on a comprehensive review of the global and national progress made in curtailing premature deaths from NCDs

[28]. Moreover, the commencement of community-based insurance in Ethiopia and the government's endeavor to launch social health insurance could serve as an important platform for health system strengthening and improve delivery of quality care for NCDs including injuries. Overall the moment is ripe in the fight against NCDs.

SECTION 2: EPIDEMIOLOGY OF NON-COMMUNICABLE DISEASES AND INJURIES AND THEIR RISK FACTORS IN ETHIOPIA

INTRODUCTION

The development of low-and middle-income countries (LMIC) is going to be severely affected with an epidemic of non-communicable diseases (NCDs) such as ischemic heart disease, stroke, diabetes, major depressive disorders, and chronic respiratory diseases [29]. Currently, an estimated more than 80% of the burden of NCDs is shouldered by LMIC [11]. In fact, these diseases pose multitudes of challenges-health, social, and economic in these countries [2]. Policies and strategies have been crafted to deal with the challenges of NCDs globally, as well as nationally [2, 18].

Unfortunately, however, the current global NCD policy has not yet benefitted the poorest people in LMIC. Despite a United Nations High-Level meeting on NCDs in 2011, and the inclusion of NCDs under Target 3.4 of the Sustainable Development Goals, Global developmental assistance for health has stalled over the past 4 years. Within global health-focused developmental aid, the small percentage allocated to NCDs has largely been spent in high-and middle-income countries and on tobacco control [30].

Therefore, there is an urgent need to produce evidence to show that current global, as well as national, policies have failed to benefit the poor, especially in LMICs. Policies and strategies need to be reframed so as to benefit those who are hard hit by NCDs. These strategies should complement the existing World Health Organization (WHO)-supported agenda focused on prevention of emerging behavioral risk factors and their associated diseases. This report's presented findings on the epidemiology of NCDs and injuries and their risk factors in Ethiopia from systematically reviewed literature and local evidence aims to help re-frame the current global, as well as national, policies in LMICs.

MATERIALS AND METHODS

A systematic review was undertaken to identify studies that estimated the prevalence of cardiovascular diseases, cancer, diabetes mellitus, mental illnesses, eye disorders, chronic respiratory diseases and their risk factors in Ethiopia. The following databases were searched: MEDLINE/PubMed, Cochrane Libraries, HINARI, Google Scholar, EMBASE, World Bank,

WHO Regional Databases, and local journals, including grey literature. Grey literature was searched from Addis Ababa, Gondar and Jimma University Libraries, and Ethiopian Federal Ministry of Health.

Search terms included various combinations of: 'cardiovascular diseases,' 'stroke,' 'hypertension,' 'myocardial infarction,' 'rheumatic heart disease,' 'heart disease,' 'diabetes mellitus,' 'neoplasm,' 'cancer,' 'asthma,' 'chronic obstructive pulmonary diseases,' 'mental illnesses,' 'depression,' 'bipolar disorders,' 'schizophrenia,' 'psychosis,' 'eye disorders,' 'burden of disease,' 'non-communicable diseases,' combined with the term 'smoking,' 'tobacco,' 'alcohol,' 'khat chewing,' 'risk factors,' 'overweight,' 'obese,' 'air-pollution,' 'physical exercise,' 'diet,' 'hepatitis virus infection,' and 'Ethiopia.'

We included articles published from 1990 to 2017 that had clear objectives and methodologies and addressing injuries or one or more of the major NCDs (cardiovascular diseases, cancer, diabetes mellitus, mental illnesses, eye disorders and chronic respiratory diseases) and their risk factors (tobacco, alcohol, khat, overweight/obesity, physical activity, diet, air pollution, hepatitis virus infection), articles published in English language; and for which an abstract and /or full texts were obtained for this review.

We developed a data abstraction form and piloted it on 10 randomly selected articles. It was then revised and tested on another 10 randomly sampled articles for further refinement. The form included the following information: title, author, year of publication, year of data collection, study design, study setting (hospital or community, urban/rural, or mixed), region, sample-size and sampling procedure, data-collection procedures, age range of the study participants, prevalence (and/or number of cases) of NCDs and injuries, diagnostic criteria, prevalence of risk factors.

We summarized the evidence for each NCD, injuries and their risk factors. When several prevalence studies on similar populations were found, we used a weighted average. In this review, community- and institution-based and some hospital-based studies were used to show population prevalence while mortality and hospitalization studies were used to indicate disease severity and outcome.

RESULTS

In total, 206 studies met the inclusion criteria. The majority of study authors were from four Universities in the country. The total studies were distributed across disease areas, with: 60 on

risk factors, 8 on mortality, 43 on cardiovascular diseases, 22 on diabetes, 10 on cancer, 21 on mental and neurologic disorders, 24 on chronic respiratory disease and other conditions, and 18 on injuries (Figure 3).

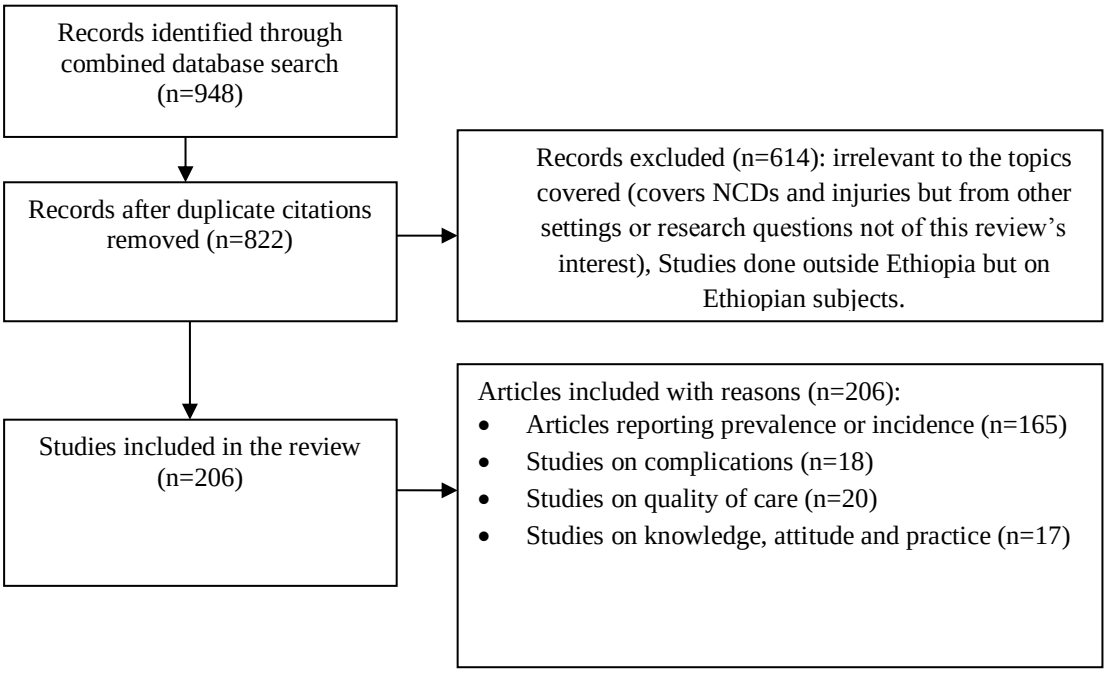

Figure 3: Flow diagram of studies reviewed, screened and included.

1. BURDEN OF NON-COMMUNICABLE DISEASES AND INJURIES (NCDI) IN ETHIOPIA

Evidence on the burden of diseases and their risk factors is important to understand the overall epidemiological profile of diseases in a country, as such data could help health care planners and decision makers in prioritizing health care interventions. Several data sources could be utilized in the assessment of disease burden. Universal and compulsory vital events registration is an important resource on causes of death and for assessing pattern of mortality but such data is not available in Ethiopia. Furthermore, population-wide burden of disease assessments are scarce in Ethiopia. Therefore, we used cause of death data from mortality surveillance sites. Based on such data from three demographic surveillance sites representing both a rural community and a burial mortality surveillance data from the capital city Addis Ababa, we present the weighted average of the causes of death disaggregating into NCDs, communicable diseases, injuries and others among urban and rural residents (Table 1) [31-36]. Based on two studies in 2012 and 2013 that had further disaggregation by disease type, we found that

cardiovascular diseases and cancer represented 55% - 60% of NCDs and Injuries related mortality in Ethiopia [32, 33].

Table 1: NCDI related mortality by area of residence

(Study sources are provided in the text)

Area of residence	Non-communicable diseases (NCDs)	Communicable, Maternal, Neonatal and Nutritional (CMNN) Diseases	Injuries	Others
Urban	52.2%	40.1%	6%	1.6%
Rural	34%	36.8%	11.4%	17.9%

Similarly, the 2016 Global Burden of Diseases Study showed that NCDs and injuries accounted for an estimated 52% of total deaths (for all ages and both sexes) in Ethiopia as shown in figure 4 below [1].

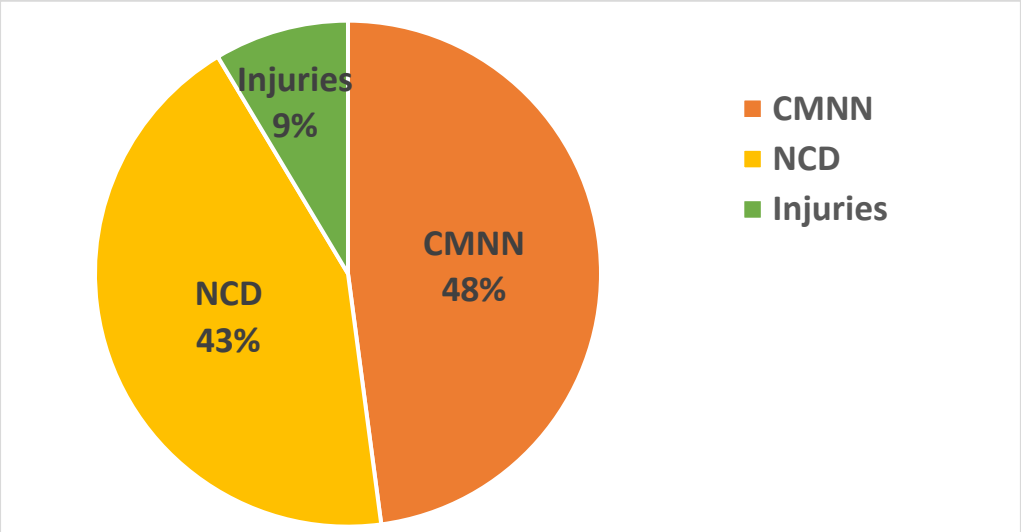

Figure 4: Causes of death in Ethiopia 2016, all ages and both sexes(n=677,269) (Source: IHME)

In this same study, Cardiovascular diseases and cancer contribute to an estimated 54% of the NCDs and injury mortality (see Figure 5) [1].

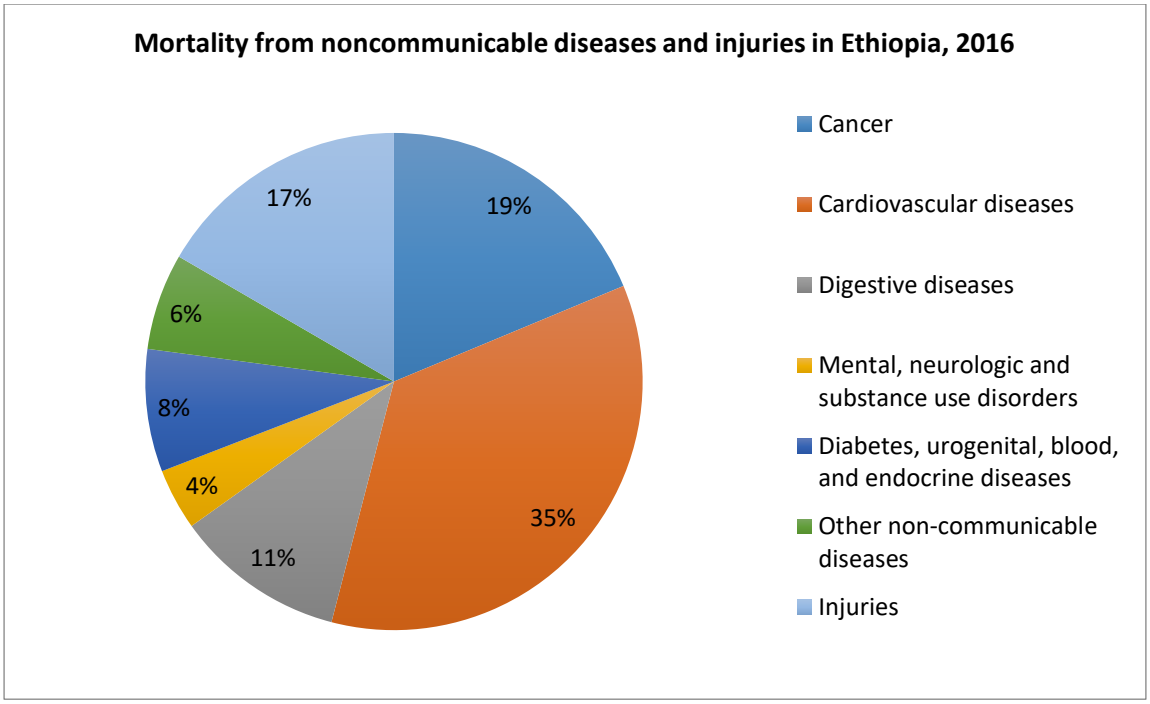

Figure 5:Distribution of Mortality and Injuries in Ethiopia 2016, all ages and both sexes (Source: IHME)

The causes of death differ by age groups, with most deaths due to communicable, maternal, neonatal, and nutritional (CMNN) disorders occurring early in life while deaths due to NCDs tend to occur later in life (Figure 6). Still, most (70%) of the NCDs mortality in Ethiopia occurred in individuals < 70 years of age [1].

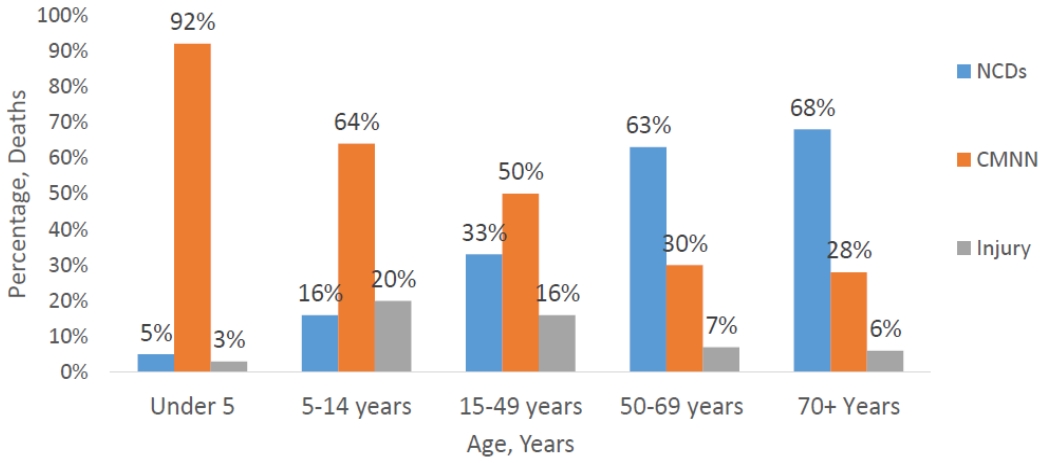

Figure 6: Mortality distribution by cause and age in Ethiopia, 2016 (Source: IHME):

Presenting disease burden using mortality data underestimates conditions that are less likely to cause death but result in significant disabilities, suffering and loss of productivity such as mental disorders. The 2016 Global Burden of diseases study data also showed that NCDIs contribute to a substantial amount of the total DALYs lost in Ethiopia (46%) [1].

Communicable, maternal, neonatal, and nutritional (CMNN) disorders are the major contributors (54%) of the total DALYs lost (Figure 7) [1].

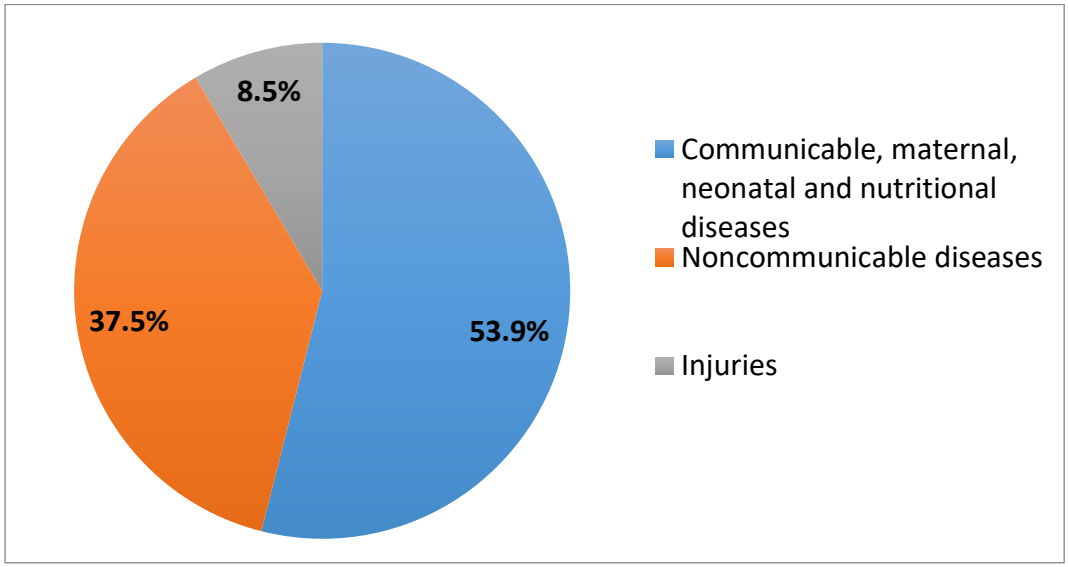

Figure 7: Disease burden (deaths and disability combined = DALYs) for all major conditions and injuries for all ages in Ethiopia, 2016 (Source: IHME)

Figure 8 below shows the burden of NCDIs in Ethiopia using disability-adjusted life-years (DALYs) disaggregated by the major causes. Among the NCDIs, cardiovascular diseases, injuries, cancer and mental illness contribute the highest loss of DALY's.

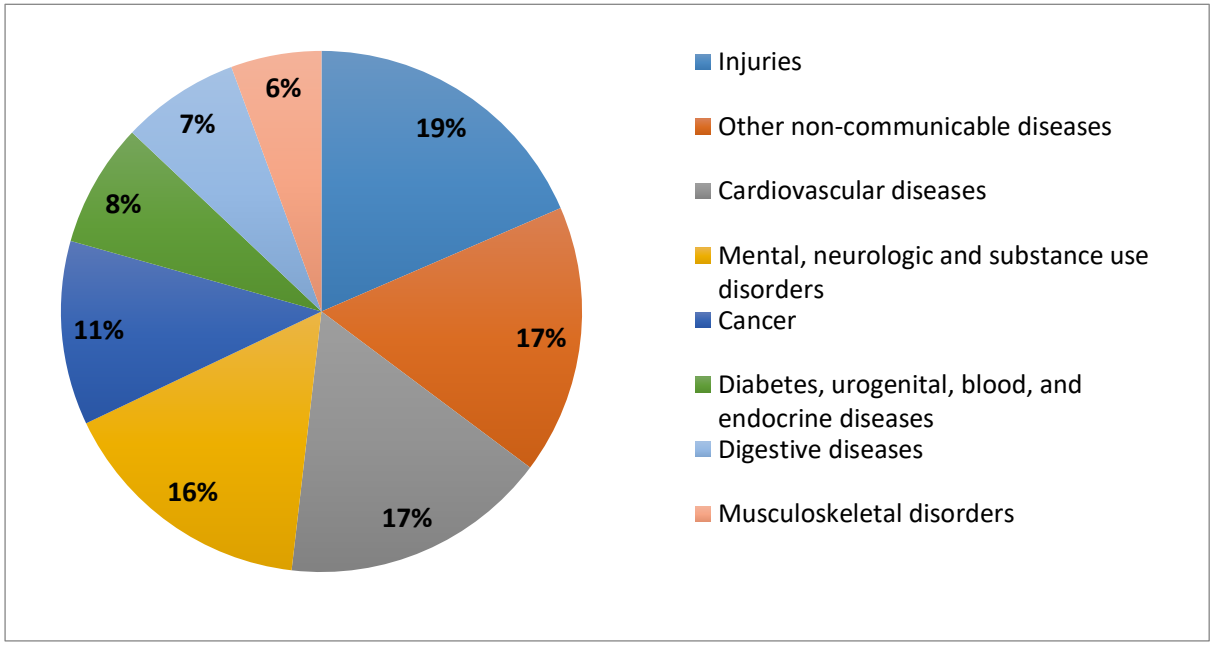

Figure 8: Distribution of DALYs for major NCDs and injuries in Ethiopia for all ages, 2016 (Source: IHME).

2. PREVALENCE OF RISK FACTORS FOR NCDIs

Global Burden of Diseases, Injuries and Risk factors study 2015 has identified 79 behavioral, environmental and occupational, and metabolic risks or cluster of risks and 388 risk-outcome pairs for all disease conditions and injuries globally [78]. This study has identified household air pollution, high blood pressure, high ambient particulate matter pollution and high fasting plasma glucose among the top ten NCD risk factors in Ethiopia [78]. However, GBD 2016 review showed only 34% of NCDs disease burden (DALYs) were attributable to identifiable risk factors in Ethiopia as shown in the figure below (Figure 9).

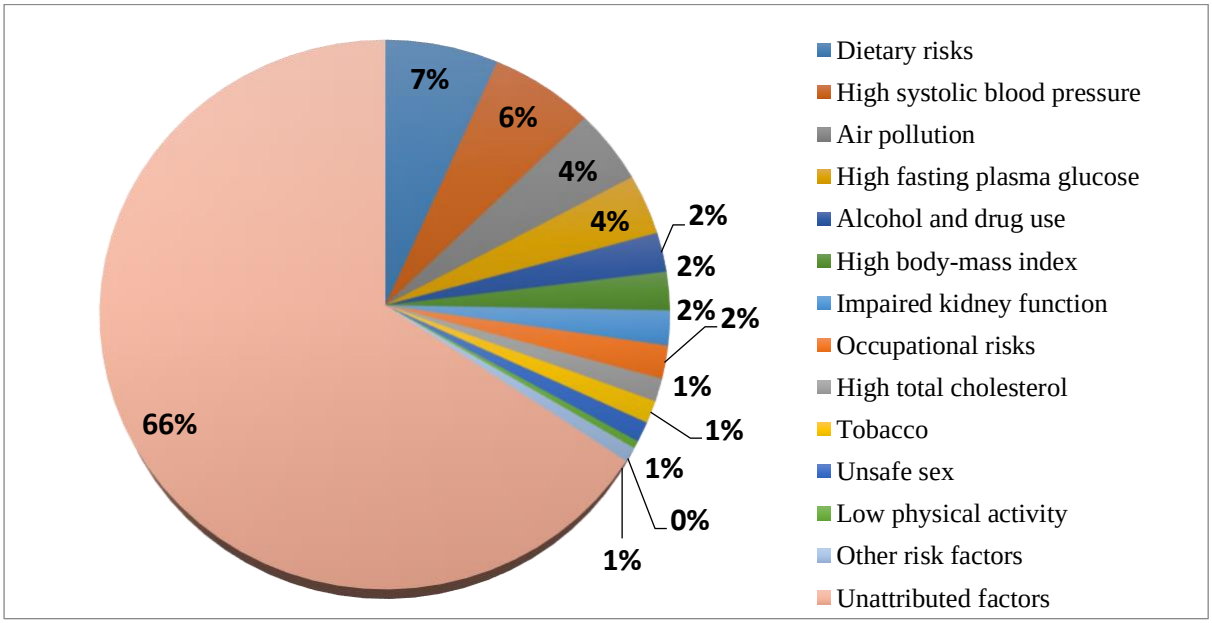

Figure 9: Distribution of risk factors for DALYs due to NCDIs in Ethiopia for all ages, and both sexes,2016 (Source: IHME).

A literature review of the major risk factors in Ethiopia is presented in the following paragraphs.

2.1. TOBACCO USE

Tobacco use is a well-established major risk factor for NCDs such as cardiovascular diseases (CVDs), respiratory diseases and cancer [38]. In order to assess the prevalence of tobacco use in Ethiopia, we used data from seven institutions and four community-based studies of which one was on a nationally representative sample through the 2015 National NCD STEPS Survey [23, 39-48]. According to the 2015 National NCD STEPs Survey in Ethiopia, the prevalence of current smokers was 4.2% with large variations between men and women (7.3% compared to 0.4%) [23]. Institution and community-based surveys revealed a prevalence of 8.1% and 5.8% respectively (13.8% in men and 0.3% in women, based on disaggregation from the four

community studies) [39-48]. According to the 2016 Ethiopian Demographic and Health Survey (EDHS, 2016), the prevalence of tobacco use was higher among the poor where the lowest two quintiles are 2.2 times more likely to use compared to the richest two quintiles (Table 2) [49].

Table 2: Prevalence of risk factors for NCDs in Ethiopia by gender, area of residence and wealth status.

(Study sources are provided in the text).

Risk factors	**Study area/type**	**Male**	**Female**	**Urban**	**Rural**	**Total**	**Distribution by wealth quintile (Q)^**
Prevalence of tobacco use (current)	Institution based (age: 15-30 years)*	—	—	—	—	8.1%	Q_1=6.6% Q_2=4.4% Q_3=5.1% Q_4=1.8% Q_5=3.2%
	Community based (age: 15-64 years)*	13.8%	0.3%	—	—	5.8%	
	STEPs Survey, 2015 (age: 15-69 years)	7.3%	0.4%	4.3%	3.9%	4.2%	
Prevalence of alcohol consumption	Institution based (age: 14-30 years)*	—	—	—	—	24%	Q_1=34.6% Q_2=37.1% Q_3=38.9% Q_4=40.7% Q_5=48.9%
	Community based (age: 15-64 years)*	—	—	—	—	25%	
	STEPs Survey, 2015 (age: 15-69 years)	46.6%	33.5%			40.7%	
Prevalence of Insufficient Physical activity	STEPs Survey, 2015 (age: 15-69 years)	8.6%	19.4%	—	—	13.6%	Q_1=16% Q_2=12% Q_3=8% Q_4=7% Q_5=26%
Prevalence of overweight or obesity	Institution based (age: 5-19 years)*	—	—	—	—	8.5%	Q_1=2.3% Q_2=2.4% Q_3=2.4% Q_4=3.3% Q_5=17.1%
	Community based (age: 25-64 years)*	—	—	—	—	13.7%	
	EDHS, 2005 (age: 15-49 years, women)	—	3.7%	—	—	—	
	EDHS, 2011 (age: 15-49 years, women and 15-59 years, men)	2.2%	4.7%			3.4%	
	EDHS, 2016 (age: 15-49 years, women and 15-59 years, men)	3.5%	7.6%	17.8%	2.3%	5.7%	
	STEPs Survey, 2015 (age: 15-69 years)	4.4%	8.8%	12.7%	3.4%	6.3%	
Prevalence of raised blood cholesterol~	STEPs Survey, 2015 (age: 15-69 years)	3.9%	6.8%	7.1%	4.8%	5.2%	Q_1=4.2% Q_2=3.3% Q_3=6.1% Q_4=6.7%

Risk factors	Study area/type	Male	Female	Urban	Rural	Total	Distribution by wealth quintile (Q)^
Prevalence of khat consumption (Current)	Institution based*	—	—	—	—	18%	Q_1=17.7% Q_2=19.1% Q_3=16.5% Q_4=11.9% Q_5=12.7%
	Community based*	—	—	—	—	21%	
	STEPs Survey, 2015 (age: 15-69 years)	21.1%	9.4%			15.8%	
Prevalence of Household Biomass Fuel Use	Ethiopia Welfare Monitoring Survey, 2011			87.4%	99.6%	95%	Q_1=99.3% Q_2=99.2% Q_3=94.2% Q_4=87.7% Q_5=75.9%
	Community based*			80%	99.7 %	91%	
	EDHS 2016			71%	98.8%	93%	
*The rates are weighted averages. ^The disaggregation by wealth quintiles is based on the average from STEPs Survey, 2015 and distribution from EDHS, 2016 and WHS, 2003. Wealth quintile (Q) = Q_1 is poorest; Q_2 second poorest; Q_3 middle; Q_4 second richest; Q_5 richest. ~Disaggregation by wealth quartiles is from the STEPs survey.							

2.2. ALCOHOL CONSUMPTION

According to WHO Global Status Report on Alcohol 2004, Alcohol consumption and alcohol-use disorders are associated with several chronic diseases and injuries, and account for 3.8% of global mortality and 4.6% of disability-adjusted life years lost globally [50]. We assessed the prevalence of current alcohol consumption using ten institutions, two community-based studies, and the National NCD STEPs Survey [23, 42-45, 51-58]. Most institutional studies involved high school and university students. Institution-and community-based studies revealed current alcohol consumption prevalence of 24% and 25%, respectively. The 2015 Ethiopian STEPs Survey showed a higher prevalence of current alcohol consumption, i.e. 40.7% (46.6% among men and 33.5% among women). The odds of alcohol consumption increased with age [47, 58]. According to the EDHS 2016, the prevalence of lifetime alcohol abstainers was higher among the poor but frequency of alcohol drinking was lower among wealthier quintiles (Table 2) [49]. Five studies also reported alcohol use disorder with an average prevalence of 5% (range 3% to 39%), the rate was higher among men in all of the studies [59-63].

2.3. KHAT CONSUMPTION

Khat, also known as qat or chat, comes from the Catha edulis, a flowering plant native to the Horn of Africa and the Arabian Peninsula. Khat contains the alkaloid cathinone, an amphetamine-like stimulant, which is said to cause excitement, loss of appetite, and euphoria.

In 1980, the World Health Organization (WHO) classified it as a drug of abuse that can produce mild to moderate psychological dependence, although the WHO does not consider khat addiction to be seriously problematic [64].

According to the WHO review, among factors associated with NCDs is khat consumption [64]. Khat chewing appears to predispose individuals to psychological and physical health problems such as disturbance of mood, aggressive behavior, and elevation of blood pressure and pulse rate with subsequent increased cardiovascular risk [64, 65]. Furthermore, khat and alcohol use have been found to be associated with risky behaviors, such as unsafe sex with predisposition to sexually transmitted infections such as HIV infection and road traffic injuries and the risk of high blood pressure [66-71]. Additionally, Khat chewing ceremony is accompanied by a prolonged sitting, consumption of sweet drinks and sugar, tobacco smoking and alcohol drinking which are all risk factors for NCDs [64].

Institution based studies on current khat use, mostly among higher education students, showed a prevalence of 18% (range: 6.3% to 33.1%) [40-43, 53, 54, 61, 70, 72-77]. The average for two community-based studies was 21% [69, 75], while the National NCD STEPs survey showed a prevalence of 15.8% with a higher prevalence among men (Table 2) [23]. The wealthier quintiles were more likely to abstain from khat consumption (Table 2).

2.4. PHYSICAL INACTIVITY AND UNHEALTHY DIET

Regular physical activity decreases the risk of major NCDs. Globally, physical inactivity caused to 5% of the premature mortality (more than 1.6 million deaths) in 2015 [78].

Sufficient consumption of fruits and vegetables is also known to help prevent major diseases such as CVDs, diabetes and certain cancers [78]. Insufficient fruit and vegetable consumption is estimated to cause 15% deaths worldwide (nearly 5 million deaths), most either due to ischemic heart disease (51%) or stroke (39%) [78].

According to the 2015 National NCD STEPS Survey 5.8 % of the population has insufficient physical activity based on WHO criteria, however, if seen closely 42.5% of the population doesn't engage in vigorous physical activity in Ethiopia[23]. It was also found that insufficient physical activity was more prevalent among women (19.4%) than men (8.6%) [23]. A 2003 WHO World Health Survey in Ethiopia found that the wealthiest quintile was the least likely to indulge in physical activity (Table 2) [79].

There is low fruits and vegetables consumption in Ethiopia with an average usage of less than 1.5 days per week [23]. Almost 98% of individuals don't consume fruits and vegetables in accordance to WHO recommendations [23]. Ethiopia's 2015 STEPs Survey found that wealthier individuals were more likely to consume fruits and vegetables than the poor [23].

2.5. PREVALENCE OF OVERWEIGHT AND OBESITY

Overweight and obesity are major risk factors for NCDs such as CVDs, diabetes and cancers and caused an estimated 3.4 million deaths worldwide in 2010 [80, 81]. Several school-based studies in Ethiopia among children 5-19 years old revealed a prevalence of overweight and obesity of 8.5% and 1.5% respectively [82-88]. A 2015 community-based survey among adults aged 25-64 years in the Northern part of Ethiopia showed a prevalence of overweight and obesity of 13.7% and 3.1%, respectively [89]. The 2015 STEPs survey (15-69 years old) showed a prevalence of 6.3% overweight or obese and 1.2% obesity rates [23]. Obesity and overweight rates were higher among those residing in urban areas and in females. There is an increasing trend over time in both overweight and obesity rates in Ethiopia, in which wealthier quintiles were most affected (Table 2) [49, 90, 91].

2.6. INDOOR AIR POLLUTION AND HOUSEHOLD BIOMASS FUEL USE

Air pollution is a significant cause of morbidity and mortality [92]. The level of air pollution is associated with an increased risk of respiratory tract infections, exacerbations of inflammatory lung conditions, cardiac events, stroke, eye disease, tuberculosis, cancer, and hospital admissions [92]. The amount of exposure in terms of the number of people, duration and intensity is far greater in developing countries, where approximately 76% of all the global particulate matter indoor air pollution occurs [92]. Based on review of six studies conducted in urban and rural communities in Ethiopia and EDHS 2016, the prevalence of household biomass fuel use ranges from 60% in Addis Ababa (urban) to 100 % in rural communities [93-98]. In Ethiopia, women and girls including young children are disproportionately exposed to indoor air pollution [95, 97-99]. While cigarette smoking is the leading preventable cause of chronic obstructive pulmonary disease (COPD) in developed countries, household air pollution from inefficient burning of solid fuels may be the leading preventable cause among women and children in developing countries [99, 100].

2.7. HEPATITIS VIRUS INFECTIONS (LIVER CIRRHOSIS AND HEPATOCELLULAR CARCINOMA)

Hepatitis B and C viruses are major causes of chronic hepatitis infections. These infections are the leading causes of Liver Cirrhosis and Hepatoma globally [101]. In 2015, there were 257 million persons (3.5% of the population) infected with hepatitis B virus (HBV) and 71 million persons (1% of the population) infected with hepatitis C virus (HCV) worldwide according to the WHO [101]. Nearly 1.3 million deaths worldwide in 2015 were due to infection with HBV and HCV [101]. Most of these deaths, 56% and 37% were due to cirrhosis and hepatocellular carcinoma, respectively [101]. In 2015, the global prevalence of HBV and HCV infections in the general population was 3.5% and 1%, respectively [101]. The prevalence of HBV was higher (6.1%) in the African region, while HCV prevalence was 1% [101]. A meta-analysis of studies on the prevalence of HBV in Ethiopia revealed a prevalence of **7.4%** (ranging between 5.2% and 11% among different study subgroups) with a 5.7% prevalence rate among recent studies conducted between 2010 and 2015 [102]. The same analysis showed an HCV prevalence of **3.1%** (ranging between 2.3% and 5.5% among different study subgroups), with the highest pooled rate (3.7%) reported in studies conducted between 2010 and 2015. HBV and HCV infections were more prevalent among lower- and middle- socioeconomic groups than upper socioeconomic strata [103]. Most patients in Ethiopia (85% - 95%) do not know their HBV and HCV infection status and fewer than 5% access treatment [103]. Due to limited access to treatment and preventive measures, the burden of liver cirrhosis is increasing in SSA and most (>53%) is attributable to HBV and HCV infections [101, 104]. Based on GBD study cirrhosis of the liver is the 6th highest cause of mortality (5%) among NCDs in Ethiopia in 2015 [1]. A study conducted in a tertiary health facility in Addis Ababa among patients with hepatocellular carcinoma showed confirmed HBV or HCV infections in 48% of the cases [105].

2.8 BIOCHEMICAL RISK FACTORS

One of the known risk factors for cardiovascular and metabolic morbidities is high blood cholesterol level. The 2015 STEPs survey in Ethiopia showed 5.6% of the population included in the survey had raised total blood cholesterol level, 3.5% in males and 8.3 % in females [23]. Disaggregation by area of residence and wealth showed higher blood cholesterol level among wealthier quartiles and urban residents (Table 2).

Salt consumption and renal salt excretion were also assessed in the national NCD STEPs Survey. Mean salt intake in Ethiopian population was estimated as 8.3g/day. Overall, 96.2% of the study participants (97.5% in men and 95.3% in women) had more salt intake than the WHO recommendations (5g/day) [23].

3. PREVALENCE OF MAJOR NCDIs IN ETHIOPIA

3.1. RAISED BLOOD PRESSURE

Hypertension is a leading global risk factor for CVDs such as stroke, coronary heart disease, congestive heart failure, peripheral arterial diseases and renal failure [106]. Hypertension was a major risk factor in 69.3% of stroke patients in Tikur Anbessa Specialized Hospital (TASH) [107]. Other studies at TASH and Jimma Hospital showed that hypertension with hypertensive heart disease is the second most common diagnosis in the cardiac clinics of these hospitals [108, 109]. We identified several studies on the prevalence of raised blood pressure among different population groups in Ethiopia. Community-based studies showed a prevalence of 26.5% (27.9% in men and 25.2% in women) among urban residents in Ethiopia [110-115]. Four of the community-based studies were disaggregated by area of residence (urban vs. rural) with an average prevalence of 16.1% (21.8% urban and 13% rural) [115-118]. The STEPs survey also showed a 16 % prevalence of raised blood pressure; 15.7% and 16.5% among men and women, respectively [23]. A prevalence of 21% (24% among men and 15% among women) was found in four studies involving civil servants, factory workers and university students (Table 3) [119-122]. There was no marked variation in levels of raised blood pressure among different wealth quartiles (Table 3).

Several studies showed limited access to quality health care services among patients identifies as having raised blood pressure. Most of the cases (on average 60%, range 37% to 84%) with high blood pressure were never diagnosed as having hypertension [110, 111, 114, 117, 118, 121-123, 125]. Among those cases identified as having raised blood pressure, only 28.4% were taking medications. Men (32.7%) were more likely to take medications than women (23.9%) [124]. Despite medications and follow-up, majority of patients (74%) had poorly controlled hypertension [110, 111, 114, 117].

3.2. RHEUMATIC HEART DISEASE

Unlike developed nations where rheumatic heart disease (RHD) has been virtually eliminated, it remains an important public health problem in sub-Saharan Africa (SSA) including Ethiopia [126-129]. There are few recent studies on the prevalence of RHD among children and young

adults (4-25 years of age) using echocardiography as a screening tool [130-133]. Three of the studies were school-based and showed a weighted average of 17 definite cases per 1000 population based on World Heart Federation Criteria (range: 14-23 per 1000 population) [130, 131, 133]. One community-based study on a predominantly rural population in Ethiopia revealed a prevalence of 37.5 definite cases per 1000 population (Table 3) [132]. RHD was the major cause of cardiovascular morbidity (in 46.6% of cases) among admitted patients and those under follow-up in tertiary facilities in Ethiopia [108, 109, 134, 135]. Patients with symptomatic RHD face a very high mortality rate. A follow-up of 43 patients enrolled in a secondary prevention program in Northwestern part of Ethiopia showed a 12.5% annual mortality rate that was in sharp contrast with the annual mortality rate of 1.5% used to estimate worldwide annual mortality from RHD [136, 137]. The mean age at death of these patients was 22 years [136]. The 2010-2012 Global Registry of RHD (REMEDY Study), of which Ethiopia was also a part, showed that RHD patients were young, predominantly female, and had high prevalence of major cardiovascular complications [137]. The 2010-2012 REMEDY Study also found a suboptimal utilization of secondary antibiotic prophylaxis, oral anti-coagulation, and contraception (for reduction of pregnancy-related complications) in the study population, as well as variations in the use of percutaneous and surgical interventions by country income level [137]. In a 1990-1996 study at Tikur Anbessa Teaching Hospital, RHD was the second most common risk factor for stroke in people ages 15-44 years old after hypertension [138].

3.3. ATHEROSCLEROTIC (ISCHEMIC) CVDs

Globally, Atherosclerosis related to behavioral and biologic risk factors is the most common cause of cardiovascular abnormality [139]. Ischemic heart disease (IHD), the principal component of atherosclerotic CVDs, was the leading cause of death in all the WHO regions except the African region in 2002 [139]. IHD ranked eighth among the leading killers in SSA, just behind cerebrovascular diseases in both men and women [140, 141]. In 2005, the WHO estimated that IHD caused approximately 361,000 deaths in the African region, and current projections suggest that this number will nearly double by 2030 [142]. Importantly, in people aged >60 years, IHD is already the leading cause of death in men and the second leading cause of death in women in the African region [142]. Population-based studies on the prevalence of IHD in Ethiopia is lacking. Earlier 2001 and 2006 hospital-based studies in intensive care units (ICU) of major referral hospitals in Ethiopia showed a rise in acute complications of NCDs, like stroke and myocardial infarction [143, 144].

3.4. STROKE

While the incidence of stroke is declining in high-income countries, its incidence is increasing in LMIC where the majority of stroke mortalities occur [145, 146]. We could not find any study assessing the prevalence of stroke in Ethiopia. A 2005 study on mortality among admitted stroke patients at referral hospital level in Ethiopia showed a prevalence of 45% [147]. Several studies conducted in various parts of Ethiopia assessed the prevalence of the types of strokes among admitted hospital patients [107, 147-154]. The weighted average of these studies showed that ischemic stroke (55%) is only somewhat more common than hemorrhagic stroke (44%) [147-154]. In a study done from 1997-2010 in Ontario and British Columbia, Canada among diverse population groups (South Asian, Chinese and white patients), more than 85% of the strokes were due to ischemic etiologies [155]. Even though there was variability between studies, the average of eight studies showed that more males than females were affected in Ethiopia with a male-to-female ratio of 1.28 to 1 [147-154].

3.5. RAISED BLOOD GLUCOSE

A recent 2017 publication reported that the prevalence of diabetes mellitus (DM) is increasing at an alarming rate among adult populations within Sub-Saharan Africa, reaching as high as 22% in some countries [156]. This is a grim prospect, as health systems are not ready to handle the epidemic. Furthermore, DM has been shown to be a risk factor for other chronic conditions, such as heart disease, stroke and kidney failure [106]. Evidence suggests that the prevalence of DM is increasing in Ethiopia as well [157]. Several studies, some institution and hospital-based and other community-based, have assessed the prevalence of raised blood glucose in Ethiopia with differing results, ranging from 1.3% to 8.3% [23, 158-166]. Hospital-based studies among patients with HIV (four studies) or tuberculosis (one study) had the highest prevalence (6.3% to 8.3%) [158-162]. From 2012-2014, a prevalence of 1.3% (5.4% urban and 0.3% rural) was observed in a three years pooled data amongst outpatient visitors of Ayder Referral Hospital in Northern Ethiopia [163]. A community-based study conducted among urban and rural residents in the Northwestern part of Ethiopia showed an overall prevalence of 3.5%, with a higher prevalence of 5.6% among urban women [164]. Three institution-based studies among urban residents revealed an average prevalence of 6% (5% to 6.5%) [121, 165, 166]. The STEPs survey showed a prevalence of 3.2% among both urban and rural residents, 3.3% and 3% among men and women, respectively (Table 3) [23]. Most individuals (84%, ranging from 44% to 99%) especially those living in rural areas with high fasting blood sugar level, did not know about their diabetes [23, 121, 164, 166]. Among those who were diagnosed with diabetes and

put on anti-diabetes management, on average only 24% (ranging from 18% to 33%) achieved fasting blood sugar control [167-172]. One study from January to February 2013, assessed glycemic control in adults over the age of 18 presenting to the University of Gondor Referral Hospital using the glycosylated hemoglobin test (HbA1C) [173]. This study found that most (65%) of the diabetic patients overall had poor glycemic control, with 83% of Type 1 DM and 57% of Type 2 DM cases with poor glycemic control [173]. Between 2010 and 2015, hospital-based studies measuring the prevalence of complications of DM found neuropathy (11-35% of cases), retinopathy (11-34% of cases), nephropathy (2-32% of cases), foot ulcer (2-39% of cases), and impotence to be the most common forms of diabetes complications in their study populations [174-177].

Table 3: Prevalence of NCDs in Ethiopia.

(Study sources are provided in the text).

NCD	Study area/type	Urban			Rural			Total	Wealth quartile*
		Male	Female	Total	Male	Female	Total		
Raised blood pressure	Institution-based (age: 18-64 years)*	23.9%	14.7%	21%	—	—	—	21%	Q_1=18.1% Q_2=14.6% Q_3=15.0% Q_4=17.6%
	Community-based, only urban (age: >15years)*	27.9%	25.2%	26.5%	—	—	—	26.5%	
	Community-based, both urban and rural (age: >15 years) *	22%	21	21.3%	15%	11%	13%	15.8%	
	STEPs survey (age: 15-69 years)			19.7%			14.9%	15.8%	
Rheumatic heart disease	School-based: (age: 4-24 years)*							17 per 1000	
	Community-based: (age: 6-25years)*							37.5 per 1000	
Raised blood glucose	Hospital-based (age:15-89 years)	—	—	—	—	—	—	7.8%	Q_1=2.9% Q_2=2.2% Q_3=2.6% Q_4=3.3%
	Community-based, both urban and rural (age: >35years)*	4.3%	5.6%	5.1%	1.7%	2.6%	2.1%	3.5%	
	Institution-based (age: >18 years)*	5.9%	6.1%	6%				6%	
	STEPs survey (age: 15-69 years)			3.2%			3.2%	3.2%	

*Disaggregation by wealth quartiles are based on 2015 STEPs survey results. For rheumatic heart disease, disaggregated data by wealth is not available.

3.6. CANCER

Over the past two decades, the incidence of cancer has increased in most countries worldwide, owing to a growing and aging population as well as risk factors like smoking, obesity, and dietary patterns [178, 179].

Mortality studies in Ethiopia from 2006-2009 and 2010-2011, respectively, showed the burden of cancer in the adult population is increasing [32, 34]. Based on the population-based cancer registry in Addis Ababa, nearly 65,000 cancer cases were estimated to occur nationally in 2015 [180]. Two-thirds of the incident cases occurred in females (43,000) while the rest were in males (22,000), creating a female-to-male ratio of 2:1. The most common cancers in women were breast, cervix uteri, ovary, colorectal, leukemia, thyroid, NHL, skin, uterus and liver (Table 4) [180]. The top ten cancers in men were colorectal, Non-Hodgkin's lymphoma (NHL), prostate, leukemia, lung and bronchus, urinary bladder, stomach, liver, skin and connective & soft tissue (Table 4) [180]. Breast cancer was the most common cancer diagnosis, constituting an estimated 23% of all cancers (among both women and men) in Ethiopia in 2015, followed by cervical cancer [180]. Even though there is some variation in the incidence of breast cancer among regions of Ethiopia, recent 2015 cancer registry evidence suggests that its incidence is increasing in Ethiopia [180, 181]. In a study at Addis Ababa University Hospital from June 2005 to December 2010, (78%) of the breast cancer cases had ductal histology and 65% are estrogen receptor-positive [182].

Hospital-level studies from 1998-2010 and 2008-2012, respectively, have shown that early detection and appropriate treatment have had a positive impact on the outcome of most cancers [183, 184]. Yet these studies also show that most patients with cancer in Ethiopia seek care at a very late stage [180, 183, 184]. In a hospital-based study from June 2005 to December 2010 involving nearly 13,000 cancer cases, only 10% of patients presented in stage I or II on their initial visit to the center [182]. Similarly, a 2008-2012 study at Tikur Anbessa Hospital in Addis Ababa found that 47% of patients with cervical cancer presented with FIGO stage IIb-IIIa [184]. Late presentation affects the survival probability of patients with cancer [184, 185]. Two survivorship studies, a 2008-2012 study with patients with cervical cancer and a 2005-2010 study with patients with breast cancer, showed that, overall, patients had guarded survival after cancer diagnosis in Ethiopia [184, 185]. In the 2005-2010 study in female patients with breast cancer, the distant metastasis-free survival after 2 and 5 years among the 1,070 diagnosed patients were 74% and 46%, respectively [185]. The majority of patients had received advanced

treatment, with 82% receiving a modified radical mastectomy and 70% receiving a full six cycles of chemotherapy [185].

Table 4 : Age-standardized incidence rates (ASIR) per 100,000 population and estimated number of cases in 2015 for the most common cancer types in Ethiopia in Adults (15+)

Men			Women		
Type of cancer	*ASIR per 100,000*	*Estimated number of cases*	*Type of cancer*	*ASIR per 100,000*	*Estimated number of cases*
Colorectal	9.0	2632	Breast	43.3	13987
NHL	6.6	2305	Cervix uteri	22.0	6047
Prostate	6.4	2269	Ovary	8.1	2436
Leukemia	6.3	1386	Colorectal	7.1	2137
Lung & bronchus	3.5	966	Leukemia	5.5	1886
Urinary bladder	3.4	905	Thyroid	4.7	1653
Stomach	3.2	891	NHL	4.1	1374
Liver	2.8	860	SCC of skin	3.8	1171
SCC of skin	2.7	808	Uterus	3.2	961
Connective & soft tissue	2.3	764	Liver	3.1	809
All types of cancers	70.0	21,563	All types of cancers	139.3	42,722

In 2015, nearly 4,000 cancer cases were expected in the age group below 15 years in Ethiopia [180]. Leukemia was the most common cancer in children 0-14 years of age, representing nearly 30% of all cancers in children, followed by NHL, Wilm's tumor and Retinoblastoma (Table 5) [180]. Despite advances in the treatment of childhood cancers with approximately 80% now reaching a 5-year survival rate, the prognosis for childhood cancer cases in Ethiopia remains very poor due to poor diagnostic and treatment capacity [186, 187].

Table 5: Estimated number of childhood cancer cases nationally in 2015 in Ethiopia.

Type of cancer	*No. of cases*	*Percent*	*Crude Incidence Rate per 100,000 population*
Leukemia	1069	29%	2.6
Non-Hodgkin Lymphoma	501	14%	1.2
Wilm's tumor	365	10%	0.9
Retinoblastoma	311	8%	0.8

Type of cancer	*No. of cases*	*Percent*	*Crude Incidence Rate per 100,000 population*
Hodgkin's Lymphoma	271	7%	0.7
Bone and cartilage	271	7%	0.7
Rhabdomyosarcoma	176	5%	0.4
Brain and nervous system	122	3%	0.3
Neuroblastoma	108	3%	0.3
Liver	54	1%	0.1
All other types	460	12%	1.1
Total	3707	100%	9.0

3.7. MENTAL, NEUROLOGICAL AND SUBSTANCE USE (MNS) DISORDERS

As the 2012/2013-2015/2016 FMOH National Mental Health Strategy shows, mental illnesses have now been recognized as important public health problems in Ethiopia [188]. Most population-based studies regarding the prevalence of mental and neurologic disorders such as depression, bipolar disorders, schizophrenia and epilepsy were conducted in Butajira district, one of the surveillance sites some 130 km from the capital city [189-194]. Fekadu *et al* (2007) and Deyessa (2008) reported a prevalence of depression among 15-49 year olds of 2.2% and 4.4% (only in women), respectively [189, 190]. Another study, which used data from the 2003 Ethiopian National Health Survey (ENHS), reported a depression prevalence of 9.1% in adults age 18 or over, with a prevalence of 8.7% among surveyed men and 9.5% in women [195]. From January to December 2012, Kebede et al (2003) found a reported prevalence of **schizophrenia** in 4.7 cases per 1000 population in a community-based cross-sectional study of adults aged 15 to 49 in semi-urban and rural locations outside of Addis Ababa [191]. In a door-to-door district-level screening, Negash et al (2005) found a prevalence of **bipolar disorders** of 0.5% in adults aged 15 to 49, with a prevalence of 0.6% in males and 0.3% in females [192]. In a predominantly rural community in Ethiopia, mental illnesses (schizophrenia and depression included in the top ten most burdensome conditions) accounted for over 11% of the burden of diseases [196].

In a December 2003 study in a small town in southern part of Ethiopia, only 15% of the community members recognized major depression as a mental health problem [197]. On the contrary, a person with schizophrenia was perceived as suffering from mental health problems

by 74% of the respondents [197]. According to this and a second 2003 study, employment and education status seems to play a role on seeking appropriate and early treatment [197, 198]. In fact, Negash (2005) reported that less than 10% of patients with severe mental illness had contact with a psychiatric treatment facility [192]. In a 1998-2001 cohort study, the majority of patients with severe mental illnesses were found to have suffered from poor outcomes and had excess mortality risks, with standardized mortality ratios twice that of the general population; this was higher both for men and patients with schizophrenia [199]. Patients in this study with severe mental illnesses died about three decades prematurely, mainly from infectious causes (49.6%); other common causes of death included suicide, accidents, and homicide [199].

Reports from the WHO in 2004 and a 1987-2007 systematic review show Epilepsy as the most common neurologic disorder in developing nations where access to treatment is limited [200, 201]. In a 1986-1988 community-based study in Butajirta district, Tekle-Haimanot (1990) found an epilepsy prevalence of 5.2 cases per 1000 population [193]. Another study in the same community from 1983-1990 found an incidence of 64 cases per 100,000 inhabitants, 72 for males and 57 for females, with highest incidence in the 0-9 age group (94 per 100,000) followed by 10-19 years (74 per 100,000) [202]. Alemu et al (2006) found a higher prevalence, 2.9%, in an isolated society, the Zay Society, in Ethiopia [194]. Across a number of studies between 1983-1985, 2008-2010, and in 2014, respectively, the most common clinically identified form of epilepsy reported was the generalized tonic-clonic seizure, found in 46%-98% of cases within the study populations [202-204]. On electroencephalographic examination in Derese et al's (2010) 2008-2010 study, most patients (64%) with epilepsy had focal epileptiform discharges with or without secondary generalization [203]. In a hospital-based study conducted among epileptic patients in the capita who received neuroimaging, Mengitsu et al (2014) abnormal intracranial structural lesions were demonstrated in 35.9% of cases [205]. A number of studies have associated untreated epileptic seizures with physical injury, psychosocial morbidity, poor education performance, unemployment and increased mortality [202, 206, 207]. In Berhanu et al's (2004) two-year follow-up study of epilepsy patients in health facilities, 48% of patients who continued follow-up unto two years or more had been seizure free for at least one year [2008]. However, Berhanu et al (2004) found that 51% and 62% defaulted from treatment at 1 year and 2 years follow-up, respectively [208]. In both a 1986-1988 study and a 2005 study, respectively, 87-98% of individuals with epilepsy living in rural areas of Ethiopia were untreated and most (90%) were unaware of the availability of medical

treatment [193, 206]. A 2014 hospital-based study revealed poor seizure control in 45% of epilepsy patients [204].

As has been described in the risk factors section of this report above, the prevalence of tobacco use in its different forms, alcohol use, and khat use is very high and is rising alarmingly, especially among the youth and productive segment of the community.

3.8. CHRONIC RESPIRATORY DISEASES

Chronic respiratory diseases (CRDs), which are diseases of the airways and other structures of the lungs, are among the leading cause of morbidity and mortality worldwide [209**]**. Of all the CRDs, the most common include asthma and chronic obstructive pulmonary disease (COPD) [209]. In Ethiopia, the most prevalent CRDs include bronchial asthma, COPD, pulmonary malignancy, occupational lung diseases and chronic interstitial lung diseases [CITE]. A retrospective 2016 study conducted in Addis Ababa on patterns of respiratory diseases seen at chest clinic of a tertiary care hospital over a one year period showed that 28.3% were due to asthma, 18.5% had a diagnosis of post TB complications, 16.6% were managed for active tuberculosis, 9.7% had a diagnosis of lung mass, and 7.4% presented with pleural diseases [210].

3.8.1. ASTHMA

Asthma affects people of all ages and the most common symptom is wheezing [CITE]. In 2015, asthma affected 358 million individuals with 0.4 million deaths worldwide, most of whom from low-and middle-income countries (LMIC) where its prevalence is quickly increasing [209, 211]. According to 2015 GBD estimates, over 80% of global asthma deaths occur in LMIC [209]. The incidence of asthma is increasing in Africa, where it tends to be severe because of inadequate treatment [212]. The prevalence of asthma in Ethiopia is not well known, as nationwide prevalence studies are lacking and existing studies were institution-based or community-based and may not be representative. We have summarized available studies in Table 6 below [213-218]. Based on these studies spanning 1995-2012, the estimated prevalence of asthma in Ethiopia across the study populations was between 1.5% and 3%. Melaku et al (1999) found that most children with asthma are unaware of their problem and remained untreated [215].

Table 6 : Prevalence of asthma and asthma symptoms in Ethiopia

Year of study [citation]	Study site	Study type	Study population	Prevalence of asthma/wheezing in the last 1 year
1995 [213]	ISAAC (Addis Ababa) PHASE I	Children (13-14 years)	2,951	Asthma=2.8% Wheezing=10.4%
1997 [217]	Jimma (urban and rural areas)	Adult/Children	9,844 urban 3,032 rural	Asthma=3.6% (urban) vs. 1.3% (rural) Wheezing=3.3% (urban) vs. 1.2% (rural)
1997 [216]	ISSAC (Gondar)	School children	3,365	Asthma =2.2%Wheezing=16.2%
2001 [218]	Jimma (urban and rural areas)	Children (1-4 years)	7,155	Wheezing= 3.4% (4.4% in urban, 2.0% in rural)
2002-2003 [214]	WHS	Adults (18-45 years)		Asthma =2% Wheezing=5.5%
2007 [213]	ISSAC (Addis Ababa) PHASE III	Children (13-14 years)	3,195	Asthma=2.1% Wheezing =9.1%

3.8.2. CHRONIC OBSTRUCTIVE PULMONARY DISEASE (COPD)

In 2015, COPD affected 175 million people and killed 3.2 million individuals worldwide; over 65% of these deaths occurred in LMICs [209]. Major risk factors for COPD are tobacco smoke and ambient particulate matters, followed by household air pollution [209]. Even though the prevalence of smoking is low in Ethiopia, exposure to indoor air pollution is very high especially for women and children, as previously explained [CITE].

The burden of COPD in Africa is not well known and data on the prevalence of COPD in Ethiopia is scarce. Of the 42 cases of chronic cor pulmonale in a 2004 study in a Addis Ababa tertiary care facility, chronic bronchitis and emphysema were the third most common under lying cause (28.5%), following bronchial asthma (36%) and chronic fibrocavitary tuberculosis (31%), and followed by interstitial lung disease (12%) [219].

Among 144 adult patients with a clinical diagnosis of obstructive airway disease seen in 2013 at the Tikur Anbessa Specialized Hospital Chest Clinic, subsequent spirometry evaluation was conducted for 56% of the cases [220]. Asthma and COPD were the primary diagnosis among 86% and 14% of the patients, respectively, and, among those who had spirometry, 55.8% of asthmatics and 63.6 % of patients with COPD were found to have an obstructive

ventilatory defect [220]. Among patients with COPD, 40% were smokers at some point in their lives, and 40% were females [220].

3.9. INJURIES

According to the WHO, injuries are the cause of more than 5 million deaths globally each year, accounting for 9% of the world's casualties [221]. The burden of injuries is disproportionately high in LICs, where 90% of injury deaths occur [221]. Injury can result from intentional or unintentional causes. Unintentional injuries include: road traffic accidents (RTA), burn, fall, poisoning, drowning, animal bite, and mechanical injuries. Intentional injuries include homicide, firearm injuries, and self-harm. Besides the recent 2015 STEPs Survey, population-wide prevalence studies on injuries have been scarce in Ethiopia. According to the STEPs Survey, 2.7% of respondents were involved in a road traffic crash as a passenger, driver, or pedestrian, of which 18% suffered serious injuries [23]. Furthermore, 2.6% of STEPs survey respondents had serious non-road traffic injuries, most due to accidental fall (40.2%), followed by cut (31.5%), and animal bite (11.7%) [23]. The same survey also revealed that 1.5% of the respondents had been involved in a violent injury that requiring medical attention. The other common injury in Ethiopia is a burn injury [23]. A 1998-1999 community-based study in an urban in Ethiopia found: 1.2% annual incidence of burn injury, higher among children less than 5 years of age (4.8%); 81% of the burn injuries occurred at home; the most common was a scald burn (59%), followed by flame (34%); 9.4% had developed sequels with 1% fatalities [222].

Several health facility-based studies conducted to assess the distribution of the types of injuries in Ethiopia were analyzed [223-235]. These studies showed that 61% were unintentional injuries, 31% intentional and the rest were unspecified injuries (see Table 7 for more details).

Table 7 : Distribution of types of injuries in Ethiopia: hospital-based data

(Study sources are provided in the text).

RTA	Homicide	Fall	Machine injury	Burn	Fire arm	Self harm	Animal bite	Poison	Drowning
31.3%	24.4%	16%	5.9%	5.1%	5%	2.1%	1.3%	1%	0.6%

RTAs are the commonest causes of fatal and serious injuries in Ethiopia. According to police report in 2015/16, road crash fatalities of 62 per 10,000 vehicles occurred in the country [235]. However, police or hospital reports could underestimate the real rate due to underreporting

[236]. The burden of injuries differed by cause, age, gender and area of residence. Most of (75.5%) the victims of RTA in 2015 were pedestrians [23]. A systematic review of the literature from 1960-2013 showed that the involvement of pedestrians has been disproportionately high in the bigger cities, while in the rural areas the proportion of occupants and pedestrians is nearly equal [237]. A recent 2014 study on RTA in southern part of Ethiopia showed that there is a changing trend in the causation, with an increased amount of accidents caused by motorcycles and tricycles [238]. More than two-thirds of serious RTA occurred among men, while rural women were more likely to suffer from fall accident [238]. Ethiopia's STEPs Survey reported that violent injuries were more common among young men [23].

3.10. EYE HEALTH PROBLEMS

In Ethiopia, the prevalence of blindness and low vision are one of the highest in SSA and contribute to more than 3% of the global blindness burden [239]. According to the 2006 national survey on blindness, low vision and trachoma, the prevalence of blindness and low vision was 1.6% and 3.7%, respectively; this was one of the highest prevalence rates in the world [239]. It is estimated that 87% - 91% of blindness and low vision in Ethiopia is avoidable, meaning that it is either preventable or treatable [239]. The main causes of blindness in the 2006 national survey were: cataract (49.9%), trachoma (11.5%), other corneal opacities (7.8%), refractive errors (7.8%), and glaucoma (5.2%) [239]. Similarly, the major causes of low vision were: cataract (42.3%), refractive errors (33.4%), and trachoma (7.7%) [239]. Estimates show that nearly 640,000 people are blind and an additional 1.25 million people have impaired vision due to cataracts, nearly 150,000 are blind due to trachoma, more than 50,000 are blind due to glaucoma, and nearly 1 million people have low vision due to refractive errors [239].

3.11. SURGICAL PROBLEMS

According to the 2015 Disease Control Priorities (DCP3) report's conservative estimates, surgical conditions account for 11% of the total global burden of disease and 25 million DALYs in Africa [240]. Injuries account for the largest burden of surgical diseases worldwide (38%), followed by malignancies (19%), congenital anomalies (9%), complications of pregnancy (6%), cataracts (5%), and perinatal conditions (4%) [241]. Ozgediz et al (2008) reported that the highest ratio of surgical DALYs per 1,000 people has been observed in Africa [241]. These estimates, however, have not included some of the common surgical conditions, such as acute abdominal emergencies and surgical infections.

Injuries, especially RTA, interpersonal violence, and falls, accounted for a large burden of emergency surgical admissions in Ethiopia, accounting for 27% of all emergencies in a 2005-2006 Addis Ababa public health facility study and 33% of patients visiting the Emergency Department at an Addis Ababa hospital in 2013 [227, 228]. According to facility-based data from a 1994-1997 study at an Addis Ababa hospital, malignancies and cholelithiasis constituted 21.5% and 10.3% of all surgical admissions, respectively [242]. In later studies, the most common cause of non-traumatic abdominal surgical emergencies was perforation peritonitis (27.1% in a 2012-2014 study of patients complaining of non-traumatic acute abdomen at a hospital outside of Addis Ababa [248]; 39.7% in 2015-2016 hospital study [243]), acute appendicitis (simple and complicated combined) (34.6% of patients with surgically treated acute abdomen in a referral hospital outside of Addis Ababa from 1998-2002 [244]; 52% in a 2000 Addis Ababa referral hospital [247]; 24.5% of patients admitted and operated for acute abdominal pain at a hospital in Butajira from 2004-2006 [249]; 28% of patients admitted to an Addis Ababa referral hospital from 2010-2012 for abdominal surgical emergencies [243]; 54.2% in a 2012-2014 study of patients complaining of non-traumatic acute abdomen at a hospital outside of Addis Ababa [248]), intestinal bowel obstruction (54.9% of patients with surgically treated acute abdomen in a referral hospital outside of Addis Ababa from 1998-2002 [244]; 26% in a 2000 study in a Addis Ababa referral hospital [247]; 34.9% of patients admitted and operated for acute abdominal pain at a hospital in Butajira from 2004-2006 [249]; 17% of patients admitted to an Addis Ababa referral hospital from 2010-2012 for abdominal surgical emergencies [243]); 18.7% in a 2012-2014 study of patients complaining of non-traumatic acute abdomen at a hospital outside of Addis Ababa [248]), perforated peptic ulcer disease (3.9% of patients with surgically treated acute abdomen in a referral hospital outside of Addis Ababa from 1998-2002 [244]; 9% in a 2000 study in a Addis Ababa referral hospital [247]) [243-249]. In a 2011-2013 study of patients admitted with intestinal obstruction at a hospital outside of Addis Ababa, 30.9% of small bowl obstruction was caused by intussusceptions [246].

In the 2010-2012 tertiary hospital study in Addis Ababa, the overall morbidity and mortality rates in patients presenting with abdominal surgical emergencies were 30% and 18% respectively [243]. For patients admitted with intestinal obstruction at a hospital outside of Addis Ababa between 2011-2013, a mortality rate of 2.5% was reported [246]. In a 2012-2014 study of patients complaining of non-traumatic acute abdomen at a hospital outside of Addis Ababa, a 4.2% overall case fatality was observed [248].

In a five-year study published in 2006, pediatric surgeries represented 31% of all surgeries at a referral hospital in Addis Ababa [250]. This study observed pediatric surgical problems to most commonly be due to congenital anomalies (37%), trauma (17.1%), and inflammatory conditions (16.8%) [250]. Acute appendicitis and foreign body aspiration/swallowing represented 12% and 6% of the surgical procedures in children, respectively [250]. In a 2004-2005 study at a rural hospital, intussusception was observed as the other common cause of abdominal surgical emergency in children [252]. A later 2011-2014 Addis Ababa referral hospital study reported intussusception as a frequent cause of bowl obstruction in infants and toddlers, with peak age of occurring between 4 and 8 months [251]. In a 2011- 2014 Addis Ababa referral hospital study of neonates admitted and treated, the most frequently identified congenital anomaly was gastrointestinal lesions (86.2%), abdominal wall defects (15.5%), esophageal atresia with or without fistula (12.6%), craniospinal defects (11.8%), head and neck malformations (4.6%), and musculoskeletal conditions (3.7%) [253]. In a 1999-2000 study of pediatric cases treated as cases of appendicitis, a mortality rate of 0.68% was reported [254]. In a 2006-2010 study of children under age 15 years with intraoperative diagnosis of acute appendicitis, a postoperative mortality rate of 0.62% was observed [255]. In patients admitted to an Addis Ababa referral hospital in 2015 with intussusception, an operative mortality rate of 4.6% was observed [251]. For congenital anomalies, the surgical outcome of neonates admitted and treated at an Addis Ababa referral hospital from 2010-2014 for conditions like Hirschsprung's disease was much favorable (<1% mortality) than that of esophageal atresia (73% mortality) [253].

DISCUSSION AND CONCLUSIONS

Summary of the literature review has revealed that the burden of NCDIs is a staggering health, social and economic burden in Ethiopia. Data from the GBD study shows that 52% of the mortality and 46% of total disease burden (measured as Disability-Adjusted Life Years) were attributable to NCDs and injuries in 2016 in Ethiopia [1]. In the literature review, the commission found a comparable finding to the 2016 GBD estimations. The mortality rates due to NCDs and Injuries as disaggregated by urban and rural residence were 58.2% and 45.4% respectively. However, our analysis was based on mortality data that spanned between 2006 and 2012 and could underestimate the current NCDs and injuries burden in Ethiopia.

Assessment of risk factors for NCDs in Ethiopia showed mixed findings. The rates of current tobacco use, current alcohol consumption, low physical activity, and overweight or obesity

among men were 7.3%, 46.6%, 8.6%, and 4.4%, respectively while the respective rates in women were 0.4%, 33.5%, 19.4%, and 8.8%. In neighboring east African countries such as Kenya, Tanzania and Uganda, 2015 NCD risk factors were higher than in Ethiopia, with the following ranges across these countries: current tobacco use (15.2% - 23% in men and 1.5% - 4.1% in women), low physical activity (10% - 70% in men and 11.7% - 90.8% in women), and overweight or obesity (9.3% - 17.5% in men and 24.7% - 38.5% in women) [37, 256]. However, lower rates of current alcohol consumption were reported in Kenya, Tanzania and Uganda than in Ethiopia and 16% of the Ethiopian population was reported to consume khat [23, 37, 256]. Though there is no current strong evidence associating khat use with NCDs, evidences suggest that its consumption is related to alcohol use, tobacco use, and risky behaviors such as unsafe sex and RTA [67-70, 72]. In terms of diet, a NCD risk factor, fruit and vegetable consumption was reported to be low in Ethiopia, with an average consumption 1.5 days per week, compared to Kenya's average 2.5 and 5 days per week consumption [256]. Dietary conditions were the leading risk factors for both sexes accounting for 11.7% of the total DALYs for both sexes in 2016 [1]. One of the modifiable risk factors for the development of major NCDs such as cardiovascular disease and diabetes is elevated total blood cholesterol [78]. The average rate of raised total cholesterol in Ethiopia in 2015 (5.2%) was less than what was reported in Kenya the same year in STEPs Surveys (10%) [23, 256]. Exposure to indoor air pollution is very high, increasing the risk of acute and chronic respiratory conditions particularly for women, girls and children in Ethiopia. According to GBD 2016, household air pollution is the third leading risk factor in Ethiopia [1].

Disaggregation by wealth quintiles revealed that current tobacco and khat use and indoor air pollution were higher in Ethiopia among poorer quintiles [49]. Higher rates of daily tobacco use were also reported among poorer quintiles [49]. Higher rates of current alcohol consumption were reported among wealthier quintiles [49]. Additionally, low physical activity, overweight/obesity and raised total cholesterol rates were much higher in the wealthiest quintile, with overweight/obese rate in the wealthiest quintile 6.6 times higher than the average rates for the other four quintiles [49]. The GBD 2015 risk assessment has also shown that low physical activity, high body mass index, raised total cholesterol and high fasting plasma glucose increased with socio-demographic index [78]. Even though the overall rate of overweight/obesity in Ethiopia is low (6.3%), even when compared to other neighboring African countries, it is important to highlight the increasing trend especially among women in general and young children in urban areas and the need for early intervention [23].

The prevalence of hypertension in Ethiopia was reported as 16%, with variation by area of residence and prevalence higher among urban dwellers (22% urban versus 13% rural) [23]. Between the two sexes, there was no marked difference in hypertension rates in Ethiopia. High blood pressure was also among the leading risk factor identified by GBD 2016 in Ethiopia [1]. Higher hypertension rates were observed in Uganda (22.5%) and Kenya (23.8%) in 2015 than in Ethiopia (9.3%) [37, 256, 23]. Hospital-based studies from 1985-2000 and 1988-1997 of intensive care unit (ICU) admissions noted a rise in the rates of stroke and myocardial infarction in Ethiopia in these years [143, 144]. Hypertension, diet low in fruit/vegetable, other behavioral and metabolic risk factors are important contributors for these complications. Forty-four percent (44%) of the strokes in Ethiopia were hemorrhagic stroke. Besides preventive measures, rigorous systolic blood-pressure control measures through intensive-treatment could significantly reduce risk of death and nonfatal major cardiovascular events in patients at risk for cardiovascular events but without diabetes [257].

Echocardiography-based studies based on World Heart Federation (WHF) criteria in Ethiopia showed a national RHD prevalence of 1.7% in school children and young adults 4-25 years of age, with an additional 0.5% meeting the criteria for borderline disease [131, 134]. This was higher than a GBD 2015 Cause of Death Ensemble model's <10 cases per 1000 population estimate for RHD prevalence in eastern sub-Saharan Africa, though this was not disaggregated by age [258]. The high rate of this largely preventable disease requires an effective control strategy, especially targeting the poor in Ethiopia.

The prevalence of raised blood glucose rate is high in Ethiopia, ranging from 3.5% to 8% in different population groups and with a reported prevalence of 3.2% per the 2015 Ethiopian STEPs survey. Despite using the same STEPs diagnostic criteria, a lower prevalence of diabetes mellitus (1.9%) was found in Kenya and Tanzania and southern Uganda, (between 1%-4%); Ethiopia's reported prevalence was 3.1% [37, 256, 23]. The lower prevalence of precursors for diabetes mellitus, such as overweight and obesity, in Ethiopia compared to neighboring countries requires further assessment of the prevalence of diabetes mellitus and associated factors [23]. However, the prevalence of diabetes mellitus is increasing in SSA, including Ethiopia [259]. Untreated diabetes can lead to various vascular complications that can affect different organ systems [106]. Furthermore, diabetes is closely associated with other cardiovascular risk factors, such as hypertension and hypercholesterolemia, which interact to worsen the risk of morbidity and mortality [106]. Therefore, effective management of diabetes

requires an interconnected and broad-based health system.

Cancer, especially breast and cervical cancers, is a staggering public health problem in Ethiopia [1]. The burden of cancer in general, and in breast cancer in particular, is increasing in Ethiopia. Most cancer patients in Ethiopia present at a very late stage, which results in poor outcomes. Scale-up of cost-effective preventive, screening, and treatment approaches targeting the most common cancers in Ethiopia could ameliorate morbidity and improve cancer survival.

Mental and substance use disorders are the leading cause of disability, accounting for 19% of all years lived with a disability (YLD) in Sub-Saharan Africa in 2010 [260]. The burden of mental health disorders in Ethiopia is also high, accounting for 19% of all years lived with a disability (YLD) in 2015 [1]. According to a 1998 study in urban and rural areas of Ethiopia, mental disorders (schizophrenia and depression included among the top ten causes) accounted for over 11% of the burden of diseases [196]. The prevalence of depression ranged between 2.2% to 9.1%, higher than reported in a 2004 study in Maseno, Kenya (0.7%) [261]. Prevalence of bipolar disorders and schizophrenia in Ethiopia were 0.50% and 0.47%, respectively. Patients with severe mental illness not only suffer from disabilities but also have excess mortality risk, dying about three decades prematurely. Similarly, the prevalence of epilepsy in Ethiopia is high (0.52%). Mental health services in Ethiopia are poorly resourced and generally accessible to only the most severely ill. Most mental health facilities, especially inpatient settings, are located in urban areas and mental health care provided at primary health care (PHC) facilities and social workers based in the community are scarcely available in Ethiopia. The 2012-2015 national Mental Health Strategy's aim to expand care at PHC and community level is critical in narrowing the gap in access to care especially for poor rural residents in Ethiopia [188].

Our analysis of available data, mostly from tertiary centers in the capital, showed that surgical conditions are among the commonest causes of admissions. Most surgeries were for injury related problems, malignancies, acute abdominal surgical emergencies for adults and congenital abnormalities and acute abdominal surgical emergencies in children [250, 251, 253]. Hospital-based data is not a reliable source to estimate the burden of surgical health problems, as many patients with surgical conditions may not seek care [262]. According to global estimates, one of the highest needs for surgical procedures globally is in Eastern sub-Saharan Africa, with a reported 6,145 procedures per 100,000 population [263]. Evidence suggests that most essential surgical procedures are cost-effective and feasible to implement [240]. The large

burden surgical conditions, attractive cost-effectiveness of interventions, and the feasibility to scale-up essential surgical procedures makes it one of a potential priority investment in our setting [240].

Ethiopia is facing a growing burden of NCDs, such as ischemic heart disease, stroke, diabetes, major depressive disorders, cancer and chronic respiratory diseases [1]. This occurs in the face of a severely under-resourced and inequitable health system, both in trained health man-power and finances, that is already overwhelmed by communicable, maternal and nutritional disorders. Curving the threat posed by NCDs and injuries requires an equitable, health outcome-focused and accelerated expansion of health systems [2]. Strategic options include the expansion of access to treatment as well as the promotion of health and prevention of diseases. Even though some of the options are the responsibilities of the Federal Ministry of Health, most are under the jurisdiction of Ministries outside of the health sector, calling for a concerted multi-sectoral approach. Mayosi (2016) recommends integrated implementation of ten key population-level interventions (for NCDs) of proven cost-effectiveness that are well suited to low-income settings like Ethiopia [264]. A multidrug regimen for hypertensive individuals is identified as one of the priority interventions for scale-up. Other interventions include legislation on food items such as salt and saturated fats, measures to increase physical activity, and efforts to expedite tobacco control. In South Africa, where national preventive programs for NCDs have been implemented, mortality from myocardial infarction and stroke was observed to fall between 1989 and 2010 [265, 266]. The large burden of rheumatic heart disease in Ethiopia necessitates a large-scale implementation of comprehensive primary and secondary prevention program. Furthermore, strengthening a district-based primary healthcare system and monitoring and surveillance for quality of care and burden of disease are among the suggested 'Best Buys' for NCDs care in low-income settings [264].

Besides NCDs, injuries also contribute to a significant morbidity and mortality in Ethiopia [1]. Among these injuries, the most prevalent are road traffic accidents and interpersonal violence, both of which are largely preventable [1]. For road traffic injuries, the following interventions that could be implemented to ameliorate the burden of injury in Ethiopia: road safety campaigns, improved infrastructure, enforcement of seat belts and helmets, alcohol test for drivers, pedestrian and bicycle lanes (urban areas), expansion of public transport [2]. For interpersonal violence, the following interventions that could be implemented: community and personal interventions, alcohol and drugs control, employment and housing policies, gender education, and police education and enforcement [2].

During this review, we have identified gap in the availability of local data on the burden of some key NCDs. In general, availability of data on the major NCDs and injuries is mixed. Some conditions such as hypertension and diabetes mellitus have relatively rich local data while data on stroke and ischemic heart disease were scarce. Besides expanding access to essential interventions for all segments of the population, research to characterize disease burden, quality of care, intervention outcome should be given adequate focus.

In summary, the fight against NCDs and injuries requires the involvement and commitment of the government and all stakeholders including the community. The Federal Ministry of Health has a critical leadership role in spearheading the government's commitment.

SECTION 3: EXISTING SERVICES FOR NONCOMMUNICABLE DISEASES AND INJURIES

Ethiopia has a three-tiered health system, with tremendous increase in the number of public and private health facilities in the past two decades. In 2014, more than 16,440 Health Posts, 3,547 Health Centers and 311 Hospitals (including private facilities) were available [15]. Effective health service delivery requires more than increasing mere access to health facilities; high quality performance is also needed [267]. Health facility assessments (HFA) or health facility surveys (HFS) provide objective information of the preparedness of health facilities to provide the services required by the population.

The 2014 Ethiopian Service Provision Assessment Survey Plus (ESPA+, 2014) showed that, among all health facilities that offer services for non-communicable diseases, there is the following service coverage: 76% for chronic respiratory disease, 73% for cardiovascular diseases, 59% for diabetes, 32% for mental health, and 23% for cancer 23% [269]. The 2014 ESPA+ found that government facilities are most likely to provide mental health services (41%) and cancer services (29%) out of any specialty services [269]. Low numbers of health facilities had NCDs guidelines available: 15% of health facilities had chronic respiratory diseases diagnosis and management guidelines, 12% of health facilities had diabetes guidelines, 11% had cardiovascular diseases guidelines and 7% had cervical cancer guidelines [269].

The 2016 Ethiopian Service Availability and Readiness Assessment Survey (SARA, 2016) provides information on the availability of essential medicines, diagnostic and infrastructure resources, and the readiness of health facilities to provide basic health-care interventions for noncommunicable diseases (NCDs) [268]. 2016 SARA indicated that only 54% of all health facilities, including public and private, were ready to provide general NCDs health services [268]. As expected, health facilities in bigger cities like Addis Ababa, Dire-Dawa, and Harar were found to have better amenities for delivering general health services [268]. Referral hospitals had a higher general health service readiness index [268]. When mean availability of tracer items for diagnostic capacity and essential medicines were assessed, the situation was sparse, with only 39% and 26% of health facilities fulfilling the service availability index for all relevant domains [268].

Overall, among all health facilities offering NCDs services, the 2014 ESPA+ found that: no facilities had all thirteen of the required diabetes screening, diagnostic, and management items but 53% had 7 of the 12 required items, 1% of facilities had all 12 required cardiovascular disease screening, diagnostic, and management items but 41% had 6 of the 12 items, no facility had all eleven required chronic respiratory disease items but approximately 3 out of 10 (30%) had 6 of the 11 items, and 5 out of 10 (50%) facilities had all four required cervical cancer services items, with 72% of facilities on average having two out of the four items [269]. Per the 2016 SARA, availability of diagnostic, treatment, and management for these NCD areas was observed at 22% for diabetes, 41% for cardiovascular disease, 45% for chronic respiratory disease, and 2% for cervical cancer (Table 8) [268].

The 2014 ESPA+ reported low availability of staff trained in the diagnosis and treatment of chronic respiratory diseases, cardiovascular diseases, diabetes, and cancer were only 9%, 8%, 6%, and 4%, respectively [269]. The 2016 SARA found higher trained staff availability, with 10% of facilities with staff trained in diabetes, 7% with staff trained in cardiovascular disease, 8% in chronic respiratory disease, and 61% in cervical cancer [268]. Overall, service availability was found to be better for hospitals than health centers [268, 269].

The availability of basic surgical services, such as incision and drainage of abscesses, wound debridement, acute burn management, suturing, closed treatment of fracture, cricothyroidotomy, male circumcision, hydrocele reduction, chest tube insertion, closed repair of dislocated joint, biopsy of lymph node or mass or other, and removal of foreign body also had a similar picture, with the 2016 SARA showing only 52% health facilities offering any one of these services [268]. As expected, almost all hospitals offered some form of comprehensive surgical services as well as basic surgical services, particularly in capital city facilities, while the majority of health centers and private clinics offered minimal basic surgical care [268].

The 2014 ESPA+ reported that only 3% of health facilities offered blood transfusion services, with most limited to hospitals in the big cities [269]. The 2016 SARA reported an increase, with 4% of health facilities offered blood transfusion services, but a continued prevalence of the services in general hospitals (between 82-96%) compared to health centers and medium clinics (between 1-8%) [268]. Of facilities that offered basic surgical services, only 41% fulfilled the service readiness index and none had all the 17 tracer items [268]. Hospitals were found to have better blood transfusion service readiness (>80%) than health centers (1-8%) and

private clinics (~3%). Among facilities that offer blood transfusion services, the ESPA+ 2014 and SARA 2016 reported that 45% and 56%, respectively, were reported to have blood transfusion readiness [269, 268]. A summary of the SARA 2016 report is depicted in table 8 below and in figures 10 and 11.

Table 8 : Access and readiness of health facilities for NCDIs services in Ethiopia (Source: SARA, 2016 [268])

NCDIs Services	Reported Availability in HFs, except HPs (n=547)	Availability in Health Center vs. G. Hospital	Average Readiness in HF except HPs	Criteria for Readiness
Diabetes	22%	*16% vs. 90%*	53 %	7of 13 tracer items
Cardiovascular Diseases	41%	*50%vs. 92%*	41 %	6 of 12 tracer items
Chronic Respiratory Diseases	45%	*55% vs. 92%*	27% (n=372)	6 of 11 tracer items
Cervical Cancer	2%	*2% vs. 38%*	72 % (n=81)	2 of 4 tracer items
Basic Surgical Services	52%	*48% vs 96%*	41%(n=380)	9 of 17 tracer items
Comprehensive surgical services	NA	*0 vs. 97%*	72% (n=32)	9 of 17 tracer items
Blood transfusion	35%	*1% vs. 96%*	56% (n=193)	4 of 7 tracer items

Moreover, we have illustrated in Section Two of this document that the burden of noncommunicable diseases, including mental health problems and injuries, is huge and the poor are mostly disproportionately affected with higher morbidity and mortality rates, except for some people with high risk factors. Besides poor health outcomes, poorer and rural households are less likely to access care and more likely to suffer from catastrophic health expenditures when seeking health care services [49, 270, 271].

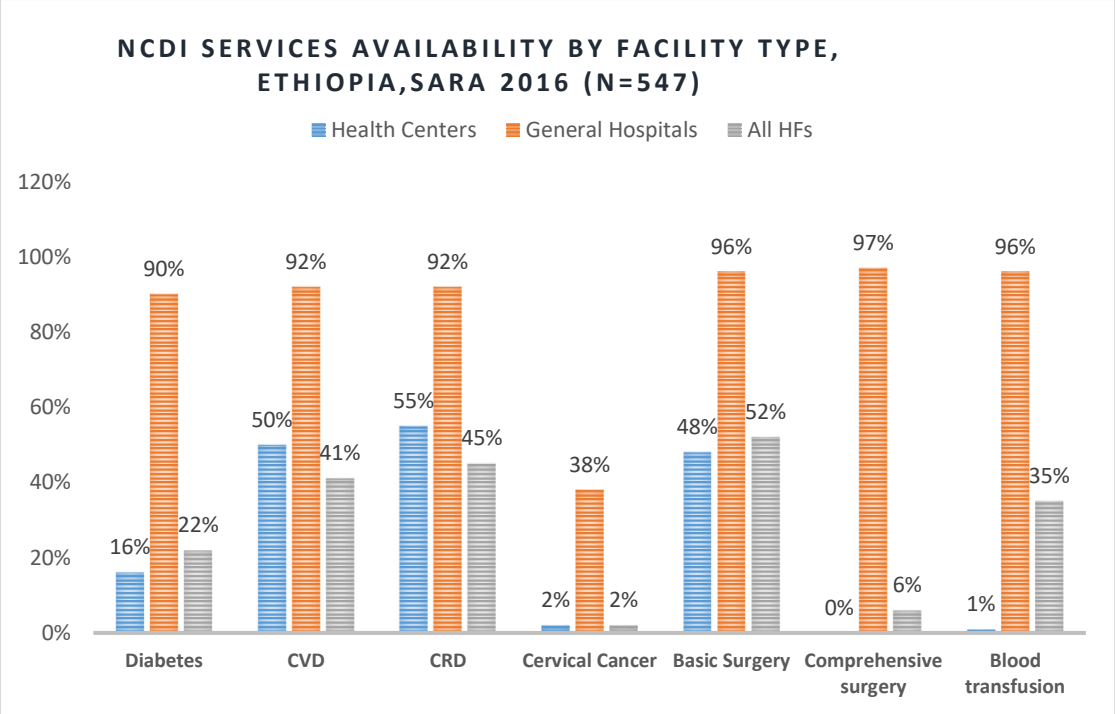

Figure 9: NCDI Services availability by Facility type, Ethiopia SARA Report 2016

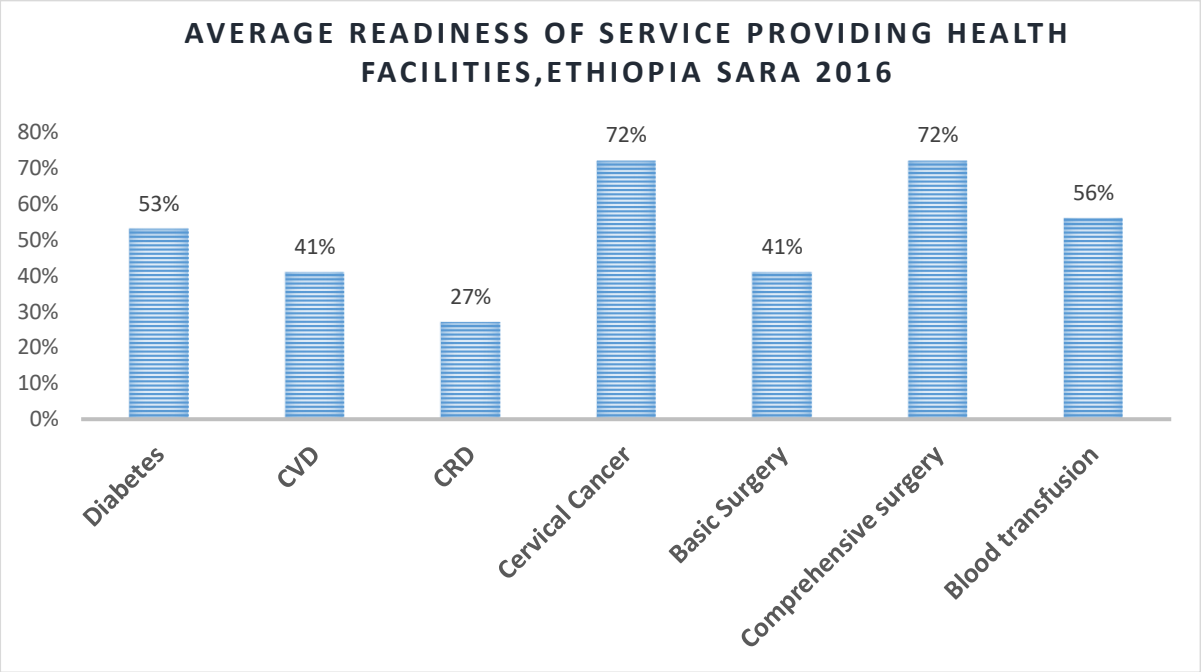

Figure 10: Average Readiness of service providing health facilities, Ethiopia Sara Report 2016.

The 2015/16 Ethiopian National Household Health Service Utilization and Expenditure Survey estimated household health expenditures and utilization using a cross-sectional analysis of 9,986 households [272]. Of the total sample, 10% of individuals reported being ill in the four weeks preceding the survey [272]. Among those who reported illness, 10% were due to NCDs

and 11% had at least one chronic condition, such as cancer, diabetes, kidney disease, or a mental disorder [272]. However, only 53% of those reporting illnesses sought care in health facilities [272]. The following four main reasons were reported as barriers for seeking healthcare: lack of money, considering illness not serious, self-medication at home, and long distance to facility [272].

Overall, government healthcare providers were responsible for the majority of outpatient services provided in the country, at a reported 77% in rural and 63% in urban areas [272]. Rural residents were more likely to use health centers and health posts, while urban residents were more likely to use government hospitals, private hospitals, and private clinics [272]. About half of outpatient healthcare seekers indicated that proximity of the provider to their homes influenced their choice of outpatient facility [272]. Additional main factors reported to influence patients' choice of outpatient health service providers included availability of medicines (9%), good counseling by staff (7%), low waiting time (6%), qualification of staff (5%), and whether the facility accepted patients with fee waivers (5%) [272]. Out-of-pocket (OOP) payments at the point of service delivery could hinder access to health services, especially to the poorest segments of the population. More than 60% of individuals living in both rural and urban areas received inpatient care from government hospitals and the majority of outpatient visits (73%) were made at the nearest public or private facility [272]. Proximity of the facility to one's home (26%), availability of medicines (15%), and provision of exempted service (11%) were some of the key reasons for choosing the facility they visited [272]. The main reported reasons for bypassing the nearest facility were: unavailability of medicines (33%), unqualified staff (17%), facility was closed at the time (14%), long waiting time (10%) and unfriendly staff (9%) [272].

According to the recent National Health Accounts (NHA 6th report), most of the NCDI services in Ethiopia were financed by Out Of Pocket (OOP) expenditures from households (see Figure 12 below) [7]. Government was responsible for nearly 30% of NCDIs expenditure, while the contribution of donors for such services was negligible at only 1% [7].

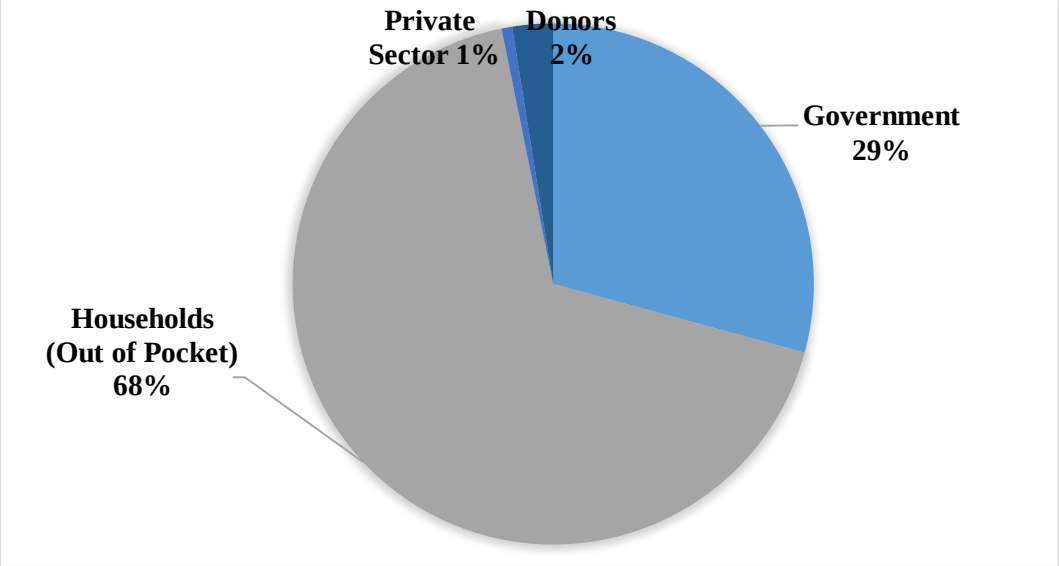

Figure 11: Existing financing arrangements for NCDIs services in Ethiopia [6th NHA, 2017]

In summary, when service readiness was considered, availability of trained staff, guidelines, basic equipment, and essential medicines were very low for NCDI services. The situation is worse for health centers than hospitals. In general, recent assessments have shown that access to quality health services and utilization of services are significantly below appropriate minimum standards and population estimated need. The low quality of available services, poor access to health facilities, financial hurdles in access to care, and lack of awareness by the community are important contributors for low utilization of NCDI services in Ethiopia.

As a comprehensive set of coverage indicators for NCDI services are yet routinely collected, we are not able to provide exact figures of access to high quality NCDI services in the population. However, since the 2014 ESPA+ and 2016 SARA show low availability and readiness, this Commission estimates average effective coverage for NCDI services to be below 10%, acknowledging that there may be substantial variation between urban and rural settings and between service types.

SECTION 4: ESSENTIAL INTERVENTIONS FOR NON-COMMUNICABLE DISEASES AND INJURIES

NUTS AND BOLTS OF THE NATIONAL PRIORITY SETTING PROCESS IN THE COMMISSION

One of the key recommendations from WHO's NCD action plan is to "Strengthen the health system at all levels, emphasizing primary care, and define and finance a national set of NCD services, interventions, and health promotion focusing on prevention, early detection, curative, rehabilitative, and palliative cares" [11]. This section summarizes how the NCDI Commission has selected and defined essential NCD and injury interventions for immediate scale-up. The Commission builds on WHO recommendations of a Package of Essential Noncommunicable disease (PEN) interventions for primary health care in low-resource settings as well as recent evidence from the Disease Control Priorities reporting [273, 274]. We list 90 clinical services and population-based preventive interventions as well as 23 policies, laws, and intersectoral interventions. If the highest priority NCDI services are scaled up to 30% coverage over the next five years, the extra cost per capita is estimated to be less than US$ 5. Section 6 discusses how these steps can be financed.

A task faced by many low- and middle-income countries (LMICs) is to identify high priority interventions for noncommunicable diseases and injuries (NCDIs) and introduce or scale up these interventions in a fair order. The gap between health needs for NCDIs and what is economically feasible to provide is a substantial challenge for LMICs; so also for Ethiopia. Health care for chronic diseases has largely been neglected in comparison to interventions that prevent, diagnose, and treat malnutrition, infections, and maternal and childhood diseases. A typical view is that such care has to wait to be introduced into health systems until countries can afford them and there is universal coverage of e.g. skilled deliveries and vaccines. However, this may be mistaken or even unfair. Meeting needs fairly, or in a fair order, should build on evidence for all conditions and risk factors and systematically follow principles of fair priority setting in health that can be endorsed by everyone [275].

Targets on injury prevention, mental health, substance use disorders, and reduction of premature mortality from NCDs are included in the health goal of the Sustainable Development Goals 2016-2030 [27]. In 2015, NCDIs accounted for 40-87% of the total disease burden in LMICs, yet access to NCDI interventions remain low in many LMICs [276]. As discussed in

Section 2, 44% of the total disease burden in Ethiopia in 2015 was due to NCDIs [1]. Interventions for NCDIs in a partly publicly funded health system such as Ethiopia's is important, as these conditions are often chronic with impaired health-related quality of life over many years and increased mortality. In addition, NCDIs can decrease productivity and impede economic growth in the country as well as impose substantial financial burdens on affected families due to costs of treatment and inability to work [277-279]. NCDIs encompass many different conditions, and a large number of effective interventions could be considered for scale up. Among the available interventions, many are expensive and resource demanding, such as hemodialysis for chronic kidney failure or advanced cancer treatment. This makes NCDIs a difficult field for setting priorities fairly.

The Commission selected high priority services for further scale-up. The next section describes and discusses the priority-setting process used to arrive at key recommendations. The Commission went through four steps, using relevant evidence and information to inform the process.

PRIORITY SETTING FRAMEWORK

There are several frameworks for priority setting, and no size fits all [280]. Fair priority setting builds on values that may differ both between and within countries. Three general principles for prioritizing interventions have been recommended by the World Health Organization (WHO) Consultative Group on Equity and Universal Health Coverage. These principles are presented in Box 1 [275]. In their general form, these principles are widely accepted and are a systematic and theoretically founded alternative to ad hoc priority setting. The principles imply that a fair health system will expand coverage for cost-effective interventions and give extra priority to interventions benefiting the worse off (equity) and to interventions and policies providing high financial risk protection.

Box 1. General principles for intervention prioritization per the WHO Consultative Group on Equity and Universal Health recommendations (2):

1. **Maximization of total population health:**

   For a given budget, one maximizes the total health gained by choosing the interventions that cost the least per healthy life-year gained. These are referred to as the most cost-effective interventions.
2. **Fair distribution, which incorporates priority to the worse off:**

Coverage and use of interventions should be based on need. Moreover, extra weight should be given to the needs of those who are relatively disadvantaged with respect to health prospects, health outcomes, access to health care, or social and economic status (interpreted broadly to include groups facing discrimination and marginalization).

3. **Fair contribution and financial risk protection:**
   Contributions for needed coverage and interventions should be based on ability to pay and should not depend on individuals' health risks or the severity of their condition. Moreover, impoverishment due to ill health, associated expenditure, and loss of earnings should be minimized.

In order to apply these principles when expanding a health system to new types of interventions and diseases, one needs to have as much evidence as possible on cost effectiveness, need, distribution, and financial burden. However, even with good evidence and estimations available at a global level, the interpretation of the evidence and actual priorities are highly context dependent and thus must take place internally within countries. Reasonable policy makers are likely to disagree on important and difficult priority dilemmas encountered during the scale-up of NCDI interventions. In response to this, the Commission tried to follow fair and legitimate processes for decision-making [281]. Fair processes are open and transparent about the evidence and criteria used, inclusive by ensuring broad stakeholder involvement, and have mechanisms for critical assessment, complaints and revision [282]. In addition, at a national level, one needs to zoom down from general principles of priority setting in health to concrete and contextualized priority decisions such as, for example: Should treatment of bipolar disorder have priority over treatment for breast cancer, and which patients (breast cancer stage 1 or stage 4) should have highest priority?

THE PRIORITY SETTING PROCESS

The goal of the process was to suggest interventions for NCDIs that should be prioritized for implementation or scale-up over the next five years. The Commission prioritized NCDI interventions in a four-step process, outlined in Figure 13. First, priority-relevant evidence from national and international studies was collected, critically reviewed, and supplemented with expert judgements. Second, the Commission used this evidence, along with the WHO principles, to rank interventions into three categories according to their priority. Third, the Commission Technical Secretariat costed the interventions categorized by the Commission as highest priority interventions with the OneHealth Tool [283]. Fourth, based on cost estimates,

fiscal space analysis, and budget scenarios (described in Section 6), the Commission revised the list to fit within the budget, using the WHO principles. For example, the Commission realized early-on that scale-up to target levels of 80% was unrealistic given fiscal constraints and availability of health personnel. Targets were therefore set to 30% effective coverage over the first five-year period, with further scale up to 80% by 2030. These steps are described in the following sections.

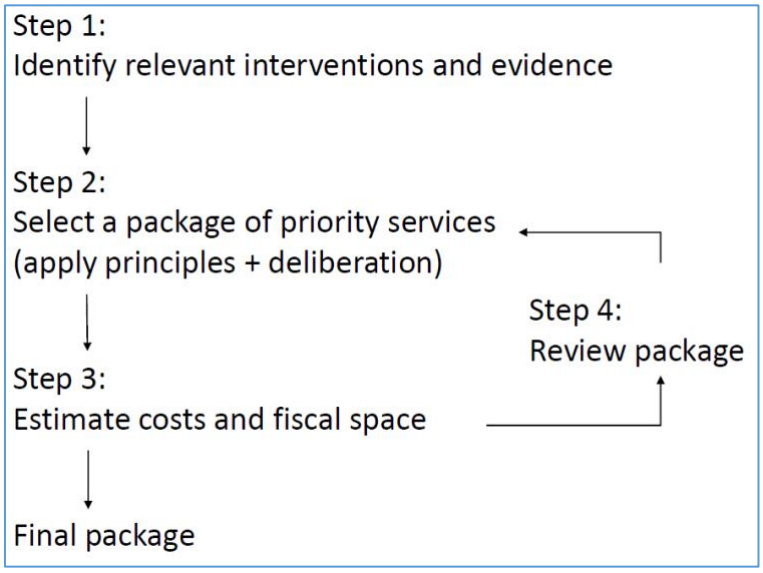

Figure 12: The main steps of the process for selecting highest priority NCDI interventions

Step 1: Identification of relevant interventions and evidence.

First, a list of interventions was identified and evidence on cost-effectiveness was considered. The list of interventions to consider for implementation or scale-up in the Ethiopian setting was made based on evidence from national publications, WHO, and the Disease Control Priorities Project (DCP3). DCP3 has synthesized and published cost-effectiveness estimates and proposed essential packages and highest priority packages for all interventions relevant for LMIC, including NCDI interventions in areas such as: mental health, cancer, cardiovascular diseases, chronic lung diseases, surgery, as well as other interventions, laws, regulations, and diagnostic procedures [284-287]. The Commission modified this list by adding interventions they considered relevant in the Ethiopian context. Evidence on cost-effectiveness was extracted from DCP3 publications, and supplemented with country-specific estimates from Ethiopia when available [288, 289].

Second, evidence that identified the worse off in health was considered. Interventions that are not cost effective may still be considered important to scale up, e.g. because such a scale-up

would benefit those who are worse off in terms of health. Being worse off in terms of health is defined relative to the patient's lifetime health [290]. People living in poverty and having severe diseases are more likely to have poorer health than others, and this is captured by a concern for the worse off. A long life with, e.g., multiple disabilities for many years may be worse than getting, e.g., prostatic cancer late in life. Health-adjusted age at death (HAAD) was used to estimate disease severity and was estimated by condition using the freely available results from the 2015 Global Burden of Disease Study (GBD) [1]. Both life years and quality of life are included when counting disease specific HAAD, given all interventions currently provided. All-cause mortality and rates of prevalence, incidence, cause-specific mortality, years of life lost (YLL), and years lived with disability (YLD) were obtained by age group for each NCDI. Data on the Ethiopian population by age was obtained from the United Nations Population Division (UN Population Revision, 2015 Edition). Details of the HAAD method are published elsewhere [291].

Third, to identify the "worse off" in terms of poverty, we estimated the difference in condition-specific disease burden between the Ethiopian populations and high-income country populations. A condition in which this difference was found to be significant was interpreted as a condition that disproportionally affects the poor. Conditions and corresponding interventions that represent a large financial risk were identified by the Commission's expert judgement, due to data limitations.

Step 2: Selection of a package of priority interventions

Building on the principles for fair priority setting, the Commission developed a framework for priority setting that aims to meet the need for NCDI interventions in a fair order. All interventions identified as relevant were categorized using this framework. The framework divides interventions in three categories, based on the cost effectiveness of the intervention, with extra priority to the worse off (the most severe conditions and conditions that are more common among the poor), and with extra priority for high financial risk protection. The three categories were described as follows:

1. *Highest priority NCDI interventions*: Highest total of lives saved or healthy life years gained for a given budget (cost effectiveness ratio < 0.5 x GDP per capita), weighed for priority to the worse off in health, the worse off in poverty, and financial risk protection.

2. *High priority NCDI interventions*: High total of lives saved or healthy life years gained for a given budget (cost effectiveness ratio 0.5-1.0 x GDP per capita), weighed for priority to the worse off in health, the worse off in poverty, and financial risk protection.
3. *NCDI interventions to be implemented at a later stage:* Low total of lives saved or health life years gained for a given budget (cost effectiveness ratio > 1.0 x GDP per capita), not targeting the worse off in health or poverty, low financial risk protection.

The categories were used for a first approximation, and then discussed and adjusted according to expert opinion within the Commission. The highest priority NCDI interventions were then selected for costing, with respect to budget impact and potential for service integration primarily at primary care level, but also at higher levels when or as needed.

Step 3: Estimation of costs and fiscal space

Cost by intervention was estimated using OneHealth Tool Version 4.5 using the software's default data on cost of drugs and supplies and the default population model for Ethiopia [283]. The OneHealth Tool also provides default assumptions on the number of interventions needed, personnel time needed, number of drugs needed, etc. A rough description of this method and its underlying assumptions can be found below.

The Commission used the default interventions with the default assumptions whenever possible, except for mental, neurological, and substance use disorders where the default assumptions were adapted to the Ethiopian setting as recommended by an expert group. Additional data sources were used when no or insufficient information about an intervention was provided in the OneHealth Tool (e.g. estimates of prevalence and population in need of the interventions were based on data on prevalence or incidence from GBD 2015[1], supplemented by expert judgements when needed). Unit costs presented in a literature review published as appendices to DCP3 publications were used when cost data was not available in the OneHealth Tool. All costs are estimated per case for acute conditions and per year for each patient for chronic conditions.

The number of interventions the health system needs to provide, and thus the budget impact, depend on both the number of individuals in need of the intervention and the coverage level of the intervention. The population in need was estimated from the total number affected by the condition, and the proportion of those who needed the specific intervention. In the model, most

interventions were scaled up by 25 percentage points over the period 2018-2022. Program costs (such as training, supervision, and construction of new facilities) are not included in our first cost estimates. Therefore, the Commission added 10% to the total cost estimated to account for programme costs, mostly for training and supervision.

RESULTS OF THE PRIORITY SETTING PROCESS (STEP 1-3)

An initial list of 235 interventions was identified as relevant for the Commission to consider for implementation or scale-up. Of these interventions, evidence on cost effectiveness was available for 80 interventions. Tables 9-12 list delivery platform and evidence on cost effectiveness. Only the interventions classified as highest priority interventions by the Commission are listed in the tables. The costs are listed as annual incremental cost, which is the annual additional cost of introducing or scaling up the intervention. Screening for cervical cancer and treatment of pharyngitis in children to prevent rheumatic heart disease are examples of very cost-effective interventions with cost effectiveness ratios below $100 USD (2012) per DALY averted. Acute management of stroke and peritoneal dialysis were placed among the least cost effective of the considered interventions, with cost effectiveness ratios above $30,000 USD (2012) per DALY averted. Multi-sectoral interventions that are designed to reduce population level behavioral and environmental risk factors (e.g. tobacco and alcohol use, air pollution, excessive sugar consumption, and others) are presented in Table 13. Many of these were policy interventions, which fall into four broad categories: taxes and subsidies; regulations and related enforcement mechanisms; built environment and informational. Some of these intersectoral interventions could be cost saving, and others could potentially generate more resources for health. Therefore, we have not included the cost of implementing these interventions in this report.

Table 9: Incremental cost of scaling up cancer interventions and their cost effectiveness, listed by delivery platform, 2019-2023**.**

Interventions	*Investment across implementation years (in $1,000 USD)*					*Cost effectiveness (USD per DALY)*	*Delivery platform*
	2019	*2020*	*2021*	*2022*	*2023*		
HPV vaccine to prevent cervical and anal cancer	$891	$1,793	$2,714	$3,664	$4,648	$242	Community
Hep B vaccine to prevent liver cancer	$5,076	$10,438	$16,076	$21,969	$28,095	$68	Health centre
Visual inspection with acetic acid (VIA) and cryotherapy for precancerous lesions	$1,200	$2,498	$3,910	$5,422	$7,052	$75	Health centre
Diagnosis without screening for breast cancer	$35	$71	$109	$149	$191		District hospital
Breast cancer treatment: Stage I	$20	$43	$67	$93	$121	$230	Referral/specialized hospital
Cervical cancer treatment: Stage I	$184	$377	$580	$794	$1,019	$789	Referral/specialized hospital
Emergency surgery for obstruction, colon cancer	$5	$10	$15	$21	$26	$47	District hospital
Treat selected cancers in paediatric cancer units/hospitals (Leukaemia, retinoblastoma)						Not available	Referral/specialized hospital
Basic palliative care, breast cancer	$39	$85	$133	$184	$238	N/A	Community
Basic palliative care, cervical cancer	$43	$89	$140	$194	$251	N/A	Community
Basic palliative care, colon cancer	$2	$3	$5	$7	$9	N/A	Community
Total cost of cancer interventions	**$7,494**	**$15,406**	**$23,748**	**$32,496**	**$41,649**		
Cost per capita (USD per capita)	$0.07	$0.14	$0.21	$0.28	$0.35		

Table 10: Incremental cost of scaling up interventions for diabetes, cardiovascular and chronic respiratory diseases and their cost effectiveness listed by delivery platform, 2019-2023.

Interventions	*Investment across implementation years (in $1,000 USD)*					Cost Effectiveness (USD per DALY)	Delivery platform
	2019	*2020*	*2021*	*2022*	*2023*		
Encourage adherence to medications	$13	$28	$44	$61	$80	$152	Community
Community based opportunistic screening for CVD	$644	$1,334	$2,072	$2,860	$3,702		Community
Primary prevention for those with absolute risk of CVD>10%	$4,591	$9,440	$14,555	$19,978	$25,719	$67-177	Health center
Treatment of cases with established ischaemic heart disease (secondary prevention)	$320	$662	$1,027	$1,416	$1,831		Health center
Treatment of cases with established cerebrovascular disease (secondary prevention)	$194	$402	$624	$861	$1,115		Health center
Treatment of cases with acute pharyngitis to prevent rheumatic fever	$35	$71	$109	$148	$189	$12	Health center
Treatment of cases with rheumatic heart disease (with benzathine penicillin)	$13	$26	$41	$56	$72		Health center
Management of diabetes mellitus type 2	$21,137	$43,803	$68,029	$93,852	$121,288		Health center
Revascularization or amputation for limb ischemia						$18	District hospital
Management of acute heart failure with diuretics and non-invasive positive pressure ventilation						$13	District hospital
Insulin management of diabetes mellitus type 1	$2,301	$4,663	$7,097	$9,610	$12,213		District hospital
Asthma: Low-dose inhaled beclometasone + SABA	$16,104	$32,768	$49,982	$67,738	$86,042		District hospital
COPD: Exacerbation treatment with antibiotics	$77	$164	$261	$368	$486		District hospital
Cardiac surgery for rheumatic heart disease	$1,008	$2,066	$3,177	$4,343	$5,567		Referral/specialized Hospital
Total cost of all interventions for CVD and diabetes	**$46,438**	**$95,429**	**$147,017**	**$201292**	**$258,307**		
USD per capita	$0.44	$0.87	$1.31	$1.75	$2.19		

Table 11: Incremental cost of scaling up interventions for mental, neurological, and substance use disorders and their cost effectiveness listed by delivery platform, 2019-2023.

Interventions	*Investment across implementation years (in $1,000 USD)*					*Cost effectiveness (USD per DALY)*	*Delivery platform*
	2019	*2020*	*2021*	*2022*	*2023*		
Dietary supplement of folic acid and iron to pregnant women	$17	$35	$55	$76	$100		Community
Identification of children with MNS disorders in schools	$21	$43	$66	$91	$117		Community
Safer storage of pesticides in the community/households						$85	Community
Home visits to reduce the risk of postpartum depression	$17	$35	$56	$78	$103		Community
Psychosocial care for peri-natal depression	$10	$21	$33	$47	$61		Health center
Depression: Basic psychosocial care and anti-depressant medication for first episode of moderate-severe cases and episodic and/or maintenance treatment for recurrent cases	$1,879	$3,903	$6,074	$8,391	$10,853	$437	Health center
Anxiety: Basic psychosocial treatment and anti-depressant medication for anxiety disorders (moderate-severe cases)	$751	$1,542	$2,373	$3,245	$4,156	$437	Health center
Psychosis: Psychosocial support and anti-psychotic medication	$658	$1,214	$1,656	$1,969	$2,141	$1,499	Health center
Bipolar disorder: Psychosocial support, advice, and follow-up for bipolar disorder, plus mood-stabilizing medication	$6,547	$14,243	$23,166	$33,396	$45,006	$1,168	Health center
Pesticide intoxication management	$6	$12	$20	$27	$36		Health center
Epilepsy: Follow-up and anti-epileptic medication	$893	$1,794	$2,706	$3,630	$4,565	$115	Health center
Alcohol use disorders: Diagnosis, management of withdrawal, relapse prevention with medication	$1,411	$2,886	$4,434	$6,061	$7,767		District hospital
Management of opioid withdrawal	$22	$44	$68	$93	$120		District hospital
Electroconvulsive therapy for severe or refractory depression							Referral/specialized Hospital
Total cost of all MNS-interventions	**$12,231**	**$25,773**	**$40,708**	**$57,106**	**$75,025**		
USD per capita	$0.11	$0.24	$0.36	$0.50	$0.64		

Table 12: Incremental cost of scaling up essential surgical interventions and their cost effectiveness listed by delivery platform, 2019-2023.

Interventions	*Investment across implementation years (in $1,000 USD)*					*Cost effectiveness (USD per DALY)*	*Delivery platform*
	2019	*2020*	*2021*	*2022*	*2023*		
Essential surgical interventions) *						< $500	
• **Pre-hospital care of injuries[$]**							
• **Management of injuries**							
• **Management of general emergency surgical conditions**							
• **Management of obstetric and gynecologic surgical emergencies**							
• **Management of congenital surgical problems**							
• **Cataract surgery**							
Total cost of essential surgical interventions	**$22,377**	**$45,865**	**$70,526**	**$96,424**	**$123,622**		
USD per capita	$0.21	$0.42	$0.63	$0.84	$1.05		
• **[*]For further details, see National Five Years Safe Surgery Strategic Plan, 2016-2020**							
• **[#]Pre-hospital care for injuries is not included in the costing of essential surgical interventions.**							

Table 13: Multi-sectoral and policy interventions for the prevention of Noncommunicable Diseases and Injuries

Risk factors/disease	Interventions	*Policy category*	*Responsible sectors in Ethiopia*
Tobacco use	Raise taxes on tobacco	Tax and subsidies	Finance
	Bans on tobacco advertisement, promotion and sponsorship	Regulation and enforcement	FMHACA, EBA
	Smoke free indoor work places and public spaces	Regulation and enforcement	FMHACA, Law enforcement
	Health information and warnings	Health education and information (HEI)	MoH, Media, Education
	Implement a population-based public health program to increase physical activity	HEI and built environment	MoYS, MoH, Education, Media
	Replace transfat and saturated fats with polyunsaturated fats	Regulation and enforcement	Trade, Industry, FMHACA

Unhealthy diet and physical inactivity	Impose regulations to reduce salt in manufactured food products	Regulation and enforcement	Trade, Industry, FMHACA
	Increase taxation of sugar sweetened beverage	Tax and subsidies	Finance, FMHACA
	Provide consumer education against excess use of salt and sugar, including product labelling	HEI	MoH, Education, Media
Air pollution	Indoor air pollution: expand access to electricity	Built environment	Mines and energy
	Indoor air pollution: halt the use of unprocessed coal and kerosene as a household fuel	Regulation and enforcement	Education, Media, MoH
	Indoor air pollution: promote the use of low-emission household devices	HEI	Mines and energy
	Emission: regulate transport, industrial and power generation emission	Regulation and enforcement	Transport, EPA
	Public transportation: build and strengthen affordable public transportation system in urban areas	Built environment	Transport
Alcohol use	Raise taxes on alcoholic beverages and enforce restrictions on availability of retailed alcohol	Tax and subsidies	Finance
	Bans on alcohol advertising	Regulation and enforcement	FMHACA, EBA
Injury	Stronger legal framework on occupational health, enforcement of legal framework	Regulation and enforcement	MoLSA
	Occupational Safety and Health training in hazard recognition and control relevant to the work performed (e.g. task based training for hazardous tasks)	HEI	MoLSA
	Enforcing laws on speed limit, seatbelt use, helmet use, number of people on a motorbike, alcohol testing of drivers	Regulation and enforcement	Transport
	Include traffic calming mechanisms into road construction	Built environment	Transport
	Enforce construction standard safety rules	Regulation and enforcement	Construction
	Decriminalize suicide	Regulation and enforcement	Law enforcement
	Control the sale and distributions of means of suicide	Regulation and enforcement	Law enforcement
FMHACA (Food, Medicine, Health Administration and Control Authority, EBA (Ethiopia Broadcast Authority), MoLSA (Ministry of Labour and Social Affairs), EPA (Ethiopian Environmental Protection Authority), MoH (Ministry of Health), MoYS (Ministry of Youth and Sports).			

Some interventions were initially not considered cost-effective by a threshold of 0.5 x GDP per capita, but were ranked higher because the intervention targets the worse off or could provide high financial risk protection. Severity of different diseases was quantified by Health-Adjusted Age at Death by condition (HAAD), as shown in Figure 14. For simplicity, results are only showed for conditions that are targeted by the interventions classified as highest priority by the Commission. Injuries and neural tube defects are among the most severe conditions, both with HAAD below 40, whereas ischemic heart disease and cataract are among the less severe conditions, each with HAAD around 70.

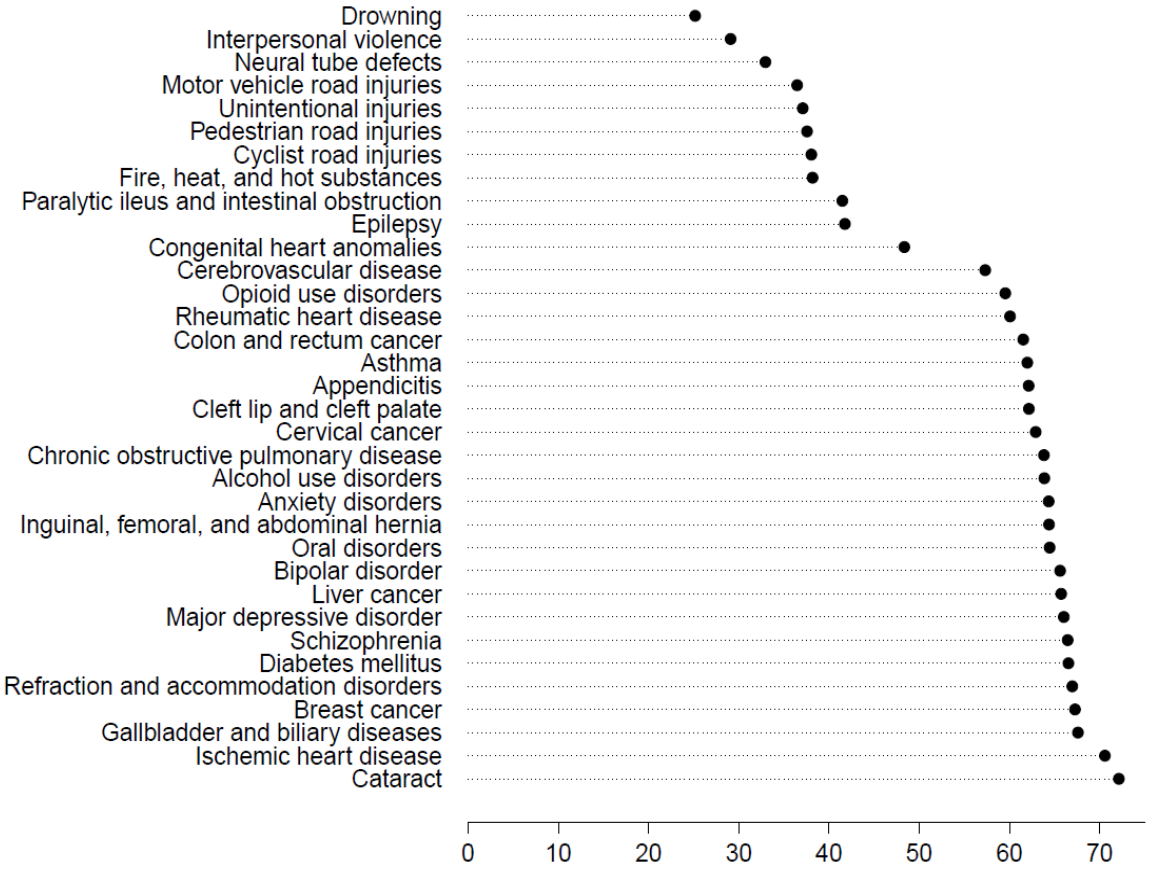

Figure 13: Health-adjusted age at death by condition (HAAD), where HAAD is on the x-axis, and each dot represents the health-adjusted age at death for a corresponding condition.

Through application of the WHO principles and a four-day deliberation, the Commission categorized the 235 interventions in the three pre-defined categories. Around 90 interventions (including essential surgery) were identified as highest priority NCDI interventions that should be scaled-up or implemented in the next five-year period (2019-2023); these interventions are listed in Table 9-13. Around 70 interventions were classified as high priority interventions that should be scaled-up later but before 2030, and around 60 interventions were classified as

interventions to be implemented at an even later stage. The remaining interventions were classified as not relevant, either because they were not considered relevant in the Ethiopian context, or because they were covered by another intervention.

Total annual incremental cost and costs by broad disease categories are presented in Table 14. By the end of 2023, when the scale-up is completed, the annual additional cost of this package is around 550 million USD, corresponding to 4.7 USD per capita.

Table 14: Incremental costs by major category, 2019-2023. Costs are reported in $1,000 USD.

Interventions	*Implementation year*				
	2019	*2020*	*2021*	*2022*	*2023*
Cancer	$7,494	$15,406	$23,748	$32,496	$41,649
Cardiovascular diseases and diabetes	$46,438	$95,429	$147,017	$201,292	$258,307
Mental, neurological and substance use disorders	$12,231	$25,773	$40,708	$57,106	$75,025
Surgery	$22,377	$45,865	$70,526	$96,424	$123,622
Other interventions: Provision of glasses for severe refractive disorders	$127	$258	$392	$529	$668
Total intervention cost	$88,667	$182,731	$282,392	$387,846	$499,271
Programme cost	$8,867	$18,273	$28,239	$38,785	$49,927
TOTAL COSTS	**$97,533**	**$201,004**	**$310,631**	**$426,631**	**$549,198**
Cost per capita (USD per capita)	$0.9	$1.8	$2.8	$3.7	$4.7

In summary, a priority-setting framework was established by the Commission, and as a result of application of this framework and deliberations, a package of 90 interventions (including essential surgery) for NCDs and injuries was identified as highest priority. The additional annual cost for scaling up these interventions is estimated to roughly $550 million USD, corresponding to approximately $4.7 USD per capita. If this package proves to be too expensive to introduce, new rounds of application of priority setting criteria and deliberations may be needed. The work performed by the Commission demonstrates that it is possible to approach priority setting in a systematic way also for NCDI services, although scarcity of context-specific evidence remains a challenge.

ESTIMATED IMPACT OF NCDI INTERVENTIONS ON LIFE EXPECTANCY AND DEATHS AVERTED

A full impact evaluation of scaling up NCDI services was beyond the capacity and timeframe of the Commission. Here, a rough estimate is presented and discussed in the context of SDGs and Universal Health Coverage. We have chosen to estimate impact on two summary measures of population health: life expectancy at birth and premature deaths averted. Life expectancy is a common and easily understood summary measure of population health. It can also be used for benchmarking with other countries. Death averted is another useful indicator relevant for the SDG targets. We look at all premature deaths averted (deaths before age 70), and the NCD target for the SDG (deaths averted in age groups 30-69). To estimate impact, we build on the DCP3 methods and framework developed by Watkins, *et al.* [284].

Summary measures of population health are affected by several factors, including human and economic development, population-based public health interventions, and multi-sectoral policies with health impacts (such as female education, and safer roads), and health services. In our analysis, we only look at health services and among those, the subset we have called NCDI services, noting that fiscal space only allows for an increase of coverage up to 30% for these services within the first five-year period. To enable comparisons, we also provide results for other services.

The first step in our analysis was to establish the baseline that intervention impact will be measured against. For Ethiopia, we chose the UN Population Division medium estimate for population growth and WHO estimates of age specific death rates. We defined the baseline as the number of deaths in 2030 if 2015 death rates would remain unchanged, i.e. that status quo continues and no new interventions are introduced [285]. Due to population growth, there will be more deaths in all age groups in 2030 (Figure15).

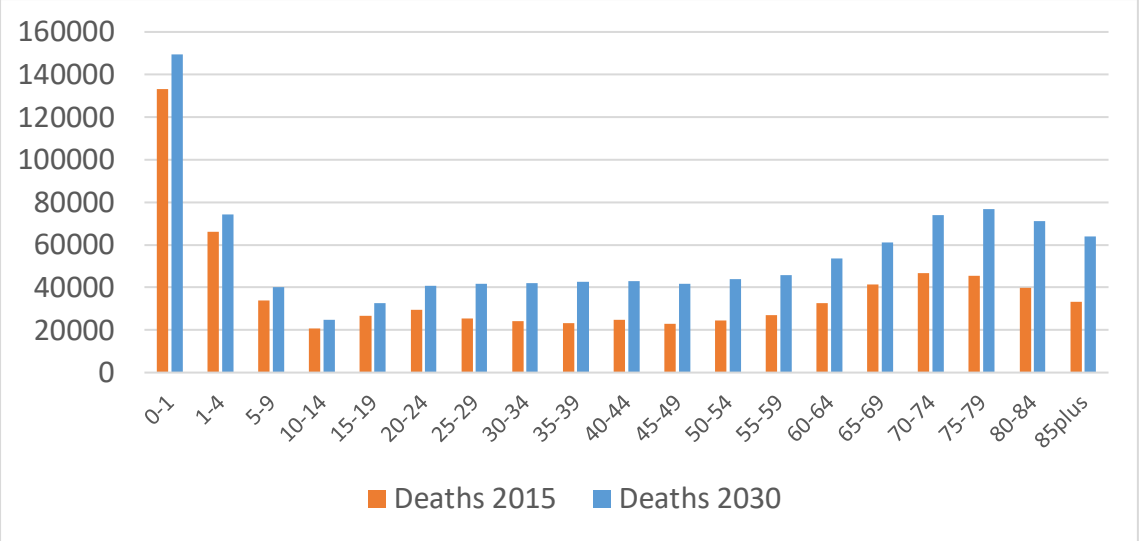

Figure 14: Estimated deaths in Ethiopia (2030), by age, both sexes - if 2015 death rates remain unchanged.

(Source: WHO and UN population Division, 2015 revision)

In the second step, building on the DCP3 model and framework, we estimated the impact of implementing the Highest Priority Package (HPP) or an expanded Essential UHC Package for CMNN and NCDI services (Table 15). These packages are described in Jamison *et al*. [274] The NCDI services listed in Table 9-12 are roughly similar to the ones included in the HPP NCDI package. We assumed that these packages are implemented to 80% coverage by 2030, and we assume high quality of service provision (= 80% efficiency). Therefore, there is some risk of overestimation. For further details, see Watkins *et al* [284].

Table 15: Estimated impact of NCDI services on life expectancy and deaths averted

	Life expectancy, both sexes	Deaths averted, below age 70	Deaths averted, below age 70 (%)	SDG NCD target (deaths averted age 30 - 69)
Baseline*	64.4	-	-	-
HPP CMNN	65.9	81 000	12.7 %	9.8 %
EUHC CMNN	66.0	86 000	13.5 %	13.8 %
HPP NCDI	**65.2**	**41 000**	**6.4 %**	**8.4 %**
EUHC NCDI	65.5	59 000	9.2 %	12.4 %
All essential CMNN + NCDI services	67.1	144 000	22.7 %	26.3 %

* Baseline in 2030, if 2015 death rates remain unchanged. HPP = Highest Priority Package as proposed by DCP3. EUHC = Essential UHC Package as proposed by DCP3. CMNN = Communicable, maternal, neonatal, nutritional. NCDI = Noncommunicable diseases and injuries.

The main results are that the Highest Priority Package for NCDI services alone, when fully implemented, could improve life expectancy at birth from 64.4 to 65.2 (or 0.8 years), and avert

approximately 41,000 premature deaths. This amounts to a 6.4% reduction of all premature deaths by 2030. For the next five-year period, implementation up to target coverage of 30% would avert an estimated approximate 13,000 deaths (2% of all premature deaths).

For comparison, we have also included impacts from the Highest Priority Package for CMNN (which we assume will be implemented by 2030), and the expanded essential UHC packages for CMNN and NCDIs. If all these services are implemented, life expectancy would increase to 67.1, there would be approximately 144,000 premature deaths averted, or a 23% reduction of all premature deaths and 26% reduction of all deaths in ages 30-69. Given the SDG NCD target of 30% reduction of all deaths in ages 30-69 by 2030, this intervention would allow for the near reaching of this SDG NCD target. .

Notice also that these estimates do not include population-based public health interventions and multi-sectoral interventions listed in Table 13. Human and economic development in general is also expected to have an impact on life expectancy and mortality in all age groups. In addition, there are substantial economic benefits from prevention and treatment of NCDIs, but this impact is not included here [274].

In conclusion, full implementation of our proposed high priority NCDI services could save more than 40,000 lives by 2030, and scale-up to 30% coverage by 2023 could save about 13,000 lives. These results should be seen as part of the bigger picture and long-term strategies, in which full implementation of all essential UHC packages could provide substantial health gains and contribute to the achievement of the SDG targets for health.

SECTION 5: INTEGRATION OF NCDI SERVICES INTO THE EXISTING HEALTH CARE SYSTEM

INTRODUCTION

Effective interventions to address NCDs and injuries are available with clear and measurable impact even in low-income settings [10]. The interventions include multi-sectoral population-wide (largely aimed at prevention) and individual level (early detection and treatment) interventions, which are highly cost-effective, equitable, feasible, affordable, and could provide financial risk protection in most resource settings. Many of these interventions could be implemented on an adequate scale using the framework of primary health care (PHC) [10]. Section 4 lists interventions that are cost-effective, target the worse off, and provide substantial financial risk protection. This highest priority package of services is affordable (additional $5.00 USD per capita) to address the most common forms of NCDIs in Ethiopia. Yet, implementation remains a challenge.

The prevention, treatment, and management of chronic diseases entails a core range of interventions: i.e., primary prevention, proactive case finding (e.g., assessment of risk factors and screening), education of both the public and health-care workers, efficient referrals, pharmacological and psychosocial interventions, long-term surveillance, and monitoring and assessment of quality of care [10].

HEALTH SYSTEM STRENGTHENING IS KEY FOR ENSURING UHC FOR NCDS AND INJURIES IN ETHIOPIA

The health care system in Ethiopia was designed to address emergencies and health conditions that require acute care. In recent years, the concept of chronic care has been introduced to PHC facilities through HIV service delivery, from which several implementation lessons have been learned. Some of these lessons are: decentralized care to PHC, multidisciplinary approach in care through task-shifting and task-sharing, simplification of protocols and guidelines, availing standardized essential drugs and diagnostic packages, laboratory networking, harmonized recording and reporting systems, and facilitated referral mechanisms. The main strategies for prevention, treatment, and care of HIV/AIDS—i.e., early detection and monitoring of risk factors, population-based interventions, continuum of care, regular monitoring of treatment adherence, and psychosocial interventions—are well established strategies for chronic care.

According to WHO, a well-functioning health system is one that allows any person, wherever they live and whatever their social and economic circumstances, to access appropriate, high quality PHC services, with referral to secondary and tertiary care when needed without the risk of financial hardship [294]. Successful implementation of interventions targeting chronic diseases depends on a well-functioning national health system, since long-term coordinated and intersectoral responses are needed across a continuum of care. Investment in a health system approach to noncommunicable diseases including mental health and injuries in Ethiopia should be the way forward as fragmented disease-based approaches will not enable the country to respond to these emerging health problems.

Substantial constraints are anticipated across each of the six key health system components during NCDI services integration and scale-up, details of which are presented as follows:

1. Leadership and Governance

Ensuring that strategic-policy frameworks exist and are combined with effective oversight, coalition building, provision of appropriate regulations and incentives, attention to system design, and accountability are key aspects of leadership and governance. Recognizing the growing burden of noncommunicable diseases in Ethiopia, the Federal Ministry of Health, established an operational NCDs Prevention and Control team under the Disease Prevention and Control Directorate in 2013. The first National Strategic Action Plan for the Prevention and Control of NCDs (2014-2016) was launched in February 2015, with a major emphasis on the four by four ("4x4") strategy that focuses on the reduction of risky behaviors, adopted from the WHO Global Action Plan for the Prevention and Control of NCDs [18]. Even though the NCDs Prevention and Control Unit was established at the federal level, it was not replicated at the regional states, which play a major role in decision-making and implementation of the NCDs initiatives. Further, the plan is not multi-sectoral and there is no coordination mechanism among the different sectors to address cross-cutting challenges.

Therefore, we recommend the establishment of NCDIs Prevention and Control Unit at regional level. Given the broad risk factors and impact of NCDIs on Ethiopian society, and the fact that prevention and control of NCDIs requires the involvement and commitment of the government and all stakeholders including the community, a call is made for the establishment of a national multi-sectoral committee on NCDIs. Chaired by the Prime Minister or Deputy Prime Minister, this multi-sectoral Committee on NCDIs would be tasked with guiding and organizing NCDI efforts.

2. Health financing

A good health-financing system raises adequate funds for health, in ways that ensure people can use services and are protected from financial hardship or impoverishment associated with health care service out of pocket costs. This report discusses issues related to financing NCDI interventions in Ethiopia in Section 6, where it also presents concrete recommendations for improved funding.

3. Health workforce

A well performing health workforce is one that works in ways that are responsive, fair, and efficient in order to achieve the best health outcomes possible, in view of available resources and circumstances—i.e., there are sufficient numbers and mix of staff, fairly distributed and the staff is competent, responsive, and productive. Integration of NCDI services in the existing services will require additional resources, including staffing, training, and standard treatment guidelines. Integration at all levels requires task sharing/shifting from one cadre to another, the developing of multidisciplinary provider teams, and paying attention to both facility-level and community-level services. Effective teams include health extension workers, pharmacists, nutritionists, peer educators, and other cadres, as well as doctors and nurses. As the health workforce is scarce, it will be one of the key anticipated challenges during implementation of integration of NCDI services into the existing services. According to unpublished data from the FMoH, the health care worker (Nurse, Midwife, Health Officer, Doctor) to population density in 2017 in Ethiopia was 0.96 per 1,000, which is far less than the recommended 4.45 per 1,000 needed to meet the SDGs health targets. Besides shortage of human resources, inadequate knowledge and skill on NCDI cases management are among the expected health workforce challenges during decentralization of NCDI services. The shortage will be more pronounced due to staff attrition, in which trained staff leave institutions with their NCDIs skills; this threatens to lead to compromised case management and the inconsistent completion of client NCD risk assessment forms, which may make long-term monitoring of NCD risk factors difficult.

Even though the general rate of health work force relative to the population is low, recent studies suggests that there is much to be gained by improving the efficiency of health facilities in Ethiopia [295, 296]. A study conducted in 2013/2014 on health centre efficiency showed that Ethiopia has a low average number of outpatient equivalent visits per clinical staff per day at 3.7, compared to Kenya (7 outpatient equivalent visits per medical staff per day in 2015) and

Ghana (4 outpatient equivalent visits per medical staff per day in 2011) [295]. Furthermore, health centers in Ethiopia were generously staffed, with a high average number of clinical staff of 26 compared to the minimum requirement of 12, pointing to a potential overstaffing problem relative to patient volume [295]. The generous staffing and the low efficiency could potentially be utilized for NCDIs service delivery in Ethiopia, with additional efforts to address challenges related to quality improvement. Considering these facts and other health workforce related challenges, the NCDI Commission recommends: to provide targeted trainings on NCDI prevention, diagnosis and management to available staff aiming at continuous professional development; and to develop and utilize user friendly clinical guidelines, treatment protocols, and standard operating procedures. The long-term solution should include scaling-up transformative high-quality education and lifelong learning so that all health workers have the skills that match the health needs of populations and can work to their full potential.

More specifically, progressive scale-up of NCDI services could start with training of health personnel on the top eleven clinical NCDI guidelines to be implemented and monitored systematically. The Commission recommends the following eleven guidelines[1] based on four criteria – disease burden, cost effectiveness, equity, and feasibility:

1. Treatment of childhood cancer
2. Early treatment of breast cancer
3. Basic palliative care
4. Treatment of acute pharyngitis in children to prevent rheumatic fever
5. Psychosis: Basic psychosocial support and anti-psychotic medication
6. Depression: Basic psychosocial support and anti-depressant medication
7. Epilepsy: Follow-up and anti-epileptic medication
8. Treatment for substance use disorder (alcohol and tobacco)
9. Primary prevention (statins and antihypertensive) for those with absolute 10-year risk of CVD>10%
10. Management of acute heart failure with diuretics and non-invasive positive pressure ventilation
11. Detection and treatment of asthma: Low dose inhaled beclometasone + short acting beta antagonists (SABA)

If successful, these interventions can be used as models for integrating other NCDI into existing service delivery platforms.

[1] Some of the guidelines, e.g. for CVD and Palliative care already exist.

4. Medical products, vaccines, technologies

A well-functioning health system ensures equitable access to essential medical products, vaccines, and technologies of assured quality, safety, efficacy, scientific rigor, and cost-effective use. Section 3 of this report discussed availability of equipment and medical products needed for NCDI services. Hence the Commission recommends the Federal Ministry of Health to revise the National List of Essential drugs and technologies mandated to be available at primary health facility level (Health Post, Health Centre and District Hospital levels). The regulatory agency, FMHACA, needs to register the medical products, vaccines, and technologies and should develop a permissive guideline that will allow midlevel healthcare workers to prescribe a selected set for patients with NCDs, including mental illnesses, injuries, and risk factor prevention. Additional post-marketing surveillance should be done routinely to assure quality and safety of the products. The national procurement agency, PFSA, should select, quantify, procure, and stock the selected medicines, vaccines and technologies and avail these items to health facilities on request. In addition, a system should be put in place in which appropriate forecasting can be done and utilization tracked so that supply interruptions and wastage of life saving products can be avoided. The Regional Health Bureaus and Woreda Health Offices should put a mechanism in place for financing these products and technologies. The health facility level drugs and therapeutic committees (DTCs) should be strengthened and appropriate technologies should be introduced for proper requesting and reporting of the products. Healthcare workers should be trained to follow rational prescribing and dispensing practices based on national guidelines, with adherence support to patients and clients as the main focus. Finally, the health insurance coverage of the population should be expanded to allow access to essential drugs and diagnostics without unduly pushing families into catastrophic health expenditure and impoverishment.

5. Health Information management, surveillance and research

A well-functioning health-information system (HIS) is one that ensures the production, analysis, dissemination, and use of reliable and timely information on health determinants, health-systems performance, and health status. The Ethiopia HIS follows the “one report” principle as stipulated in the Health Harmonization Manual [15]. All institutions and stakeholders are expected to report according to the standard reporting format, based on the common set of indicators and one monitoring calendar.

The Commission recommends that the MoH adopt the WHO's 9 voluntary global targets for NCDs to track progress in the implementation of NCD interventions through routine monitoring, surveillance and research. The HSTP has included the following twelve sets of indicators for NCDIs monitoring in Ethiopia [15]:

a) Proportion of women age 30-49 years screened for cervical cancer
b) Prevalence of NCDs risk factors, disaggregated by type (raised blood sugar, raised blood pressure, tobacco use, harmful use of alcohol, insufficient physical activity, low fruit and vegetable consumption, current khat consumption, mean salt intake, overweight and obesity)
c) Detection of new cases of asthma/100,000 population/year
d) Number of new and repeat cases of rheumatic heart disease detected
e) Treatment of cases with rheumatic heart disease (with benzathine penicillin)
f) Morbidity attributed to injuries disaggregated by type (RTA, others)
g) Prevalence of viral hepatitis (HBV and HCV)
h) Proportion of HCV patients diagnosed who received treatment
i) Rate of cataract surgery/1,000,0000 population/year
j) Proportion of eligible population who received mental health services disaggregated by disease type (psychosis, depression, bipolar disorder, epilepsy)
k) Proportion of eligible population treated for substance use disorder disaggregated by substance type (tobacco, alcohol)
l) Proportion of Woredas (District) with mental health services.

Though most of the indicators could be captured by the routine HIS, some require population surveys such as the EDHS or STEPs survey. The HSTP has included the above important indicators to track care and burden of NCDIs, yet it fails to capture select critical NCDs in Ethiopia, such as indoor air pollution, chronic obstructive pulmonary diseases, surgical conditions, and cancer beyond cervical cancer. Future revisions of HIS should thus consider including indicators for these conditions. For cancer in particular, given the increasing burden of cancer in Ethiopia, the population-based cancer registry in Addis Ababa should be strengthened and expanded to other regions of the country to include the rural population.

6. Service delivery

High quality health services are those that deliver effective, safe, high-quality individual and population-wide health interventions to those who need them, with minimum waste of

resources. Integration of NCDIs services along with communicable, maternal, childhood and nutritional intervention using PHC facilities as the main delivery platform is the key strategy in the path to UHC [15]. Integration is about delivering holistic care by coordinating the efforts of multiple stakeholders and agencies. Integrating services to primary care have multiple benefits: cost-effectiveness, equity and social justice, provision of services that are coherent, uniform, and of high quality; in addition, healthcare workers' motivation, skill, and competence aids success. This report discusses these issues and makes concrete recommendations for the integration of essential NCDI services according to delivery platforms.

NCDI services can, and should, be integrated with existing services, beginning with primary care. They can be added to the Ethiopian Essential Health Service Package (EHSP). Three key factors will influence their integration into existing services and delivery platforms.

First, the services' current inclusion in the Essential Health Service Package (EHSP) should be considered. Ethiopia's EHSP was defined in 2005 by outlining what types of services were included and the degree to which such services were provided at varying levels of service provision (community, health center/post, district-level hospital) [297]. The package should be available to all Ethiopians, irrespective of income, gender, place of residence, or other sociodemographic variables. These promotive, preventive, curative, and rehabilitative interventions are considered to be the minimum that people can expect to receive through the various health delivery mechanisms and facilities within their reach. The scope of the EHCP is limited to the provision of essential services at the health post, health center and district hospital levels. Since its creation, more services have been added and mandated to be provided free of charge or substantially subsidized. New NCDI services, though, have not yet been explicitly added to the package have also been initiated.

Second, the potential of the new NCDI services to be exempted from co-payment, or partly funded by cost sharing, should be considered. As Figure 16 below shows, the essential healthcare package is classified into three categories of services and depicts how they are to be financed:

- First, there are the "Exempted Services" that should be free of charge;
- Second, the "Essential Health Services Package" that is financed by cost sharing;
- Third, the "High cost Services," which are financed on cost recovery.

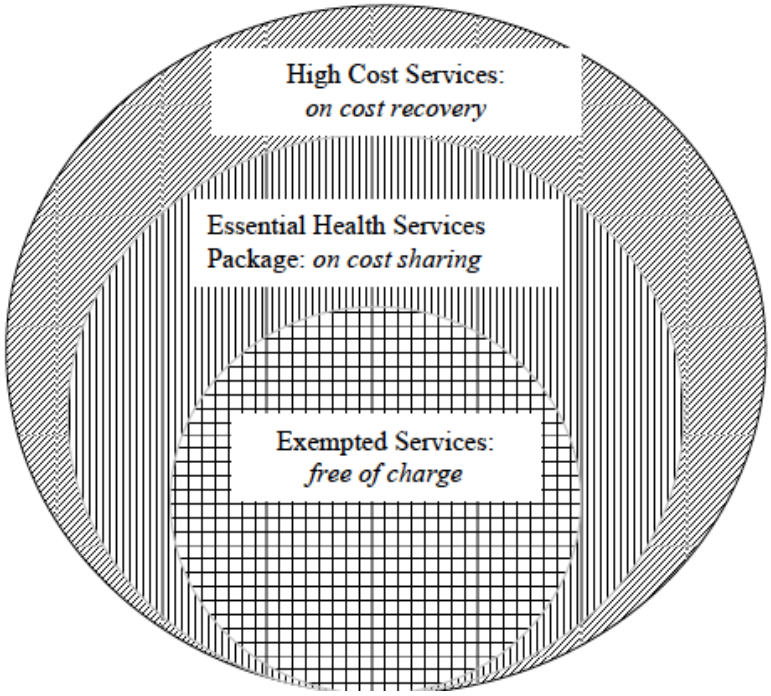

Figure 15: Current financing arrangements of the health sector, including Ethiopia's Essential Health Services Package. (Source: EHSP for Ethiopia 2005).

For each of the high priority NCDI services, classification into a funding mechanism must be made.

Third, health planners need to know whether integration of this new service will require new personnel, training of existing personnel, and the development of new clinical guidelines. Thus, the Commission recommends that specific plans are made in collaboration between the federal and regional level, taking health personnel needs, training, and guidelines requirements into account.

In the following section, the Commission lists new NCDI services and suggest the delivery platform at which they could be integrated. Some of these services are already partly implemented at higher levels of specialization, but task-shifting and decentralization could happen over time.

Community services (Health Extension Workers)

New NCDI services that could be integrated into the existing community-based platform are listed in Table 16. Some are already part of the essential packages; others are not. Whether second generation health extension workers would be able to absorb these new services needs comprehensive discussion. All services delivered at community level are exempted services.

Table 16: NCDI services that could be delivered at community level by health extension workers.

Platform	High priority NCDI services	Included* in 2005 EHSP or later?	Requires new guidelines and training?
Community services (Health Extension Workers)	Basic palliative care	No	Yes
	HPV vaccine	Yes	Yes
	Use of community health workers for encouraging adherence to medications	No	Yes
	Community based opportunistic screening for CVD	No	Yes
	Home visits or group sessions to reduce the risk of postpartum depression	No	Yes
	Identification of children with MNS disorders in schools	No	Yes
	Dietary supplement of folic acid and iron to pregnant women	Yes	No
	Safer storage of pesticides in the community and farming households	No	Yes
	Occupational safety and health training in hazard recognition and control relevant to the work performed (e.g. task-based training for hazardous tasks)	No	Yes

* Means explicitly included as high priority and funded by the government.

Most of the NCDI interventions listed in Table 16 require the development of new training manuals and guidelines.

HEALTH CENTERS

The most important platform for new NCDI services is most likely the health center, which will play an expanded role. Some of these services are already part of essential packages and some are not. Expansion here will require substantial expansion of personnel, training and development of guidelines, as recommended in HSTP (Table 17).

Table 17: NCDI services that could be delivered at health centers

Platform	High priority NCDI services	Included in 2005 EHSP or later?	Exempted service or cost sharing?	Requires new guidelines and/or training?
Health centres	Hepatitis B vaccine to prevent liver cancer	Yes	Exempted	Partly
	Primary prevention for those with absolute risk of CVD > 10%	No	Cost sharing	Yes

	Treatment of cases with established ischaemic heart disease (IHD) and post MI	No	Cost sharing	Yes
	Treatment of those with established cerebrovascular disease and post stroke	No	Cost sharing	Yes
	Treatment of acute pharyngitis (children) to prevent rheumatic fever	No	Cost sharing	Yes
	Treatment of cases with rheumatic heart disease (with Benzathine penicillin G)	No	Cost sharing	Yes
	Management of diabetes mellitus type 2	Yes	Cost sharing	Yes
	Visual inspection with acetic acid (VIA) and cryotherapy for precancerous lesions	Yes	Exempted	Yes
	Psychosocial care for peri-natal depression	No	Exempted	Yes
	Depression: Basic psychosocial treatment and anti-depressant medication of first episode moderate-severe cases	No	Cost sharing	Yes
	Anxiety: Basic psychosocial treatment and anti-depressant medication for anxiety disorders (moderate-severe cases)	No	Cost sharing	Yes
	Psychosis: Basic psychosocial support and anti-psychotic medication	No	Cost sharing	Yes
	Pesticide intoxication management	No	Cost sharing	Yes
	Follow-up and anti-epileptic medication	Yes	Cost sharing	Yes
	Dental procedures: Drainage of dental abscess and extraction	No	Cost sharing	Yes
	Maternal mental health services	Yes	Cost sharing	Yes
	Visual impairment: eyelid surgery for trachoma	Yes	Cost sharing	Yes

FIRST LEVEL (PRIMARY) HOSPITALS

First level hospitals are also part of the primary health care system. Many of the suggested high priority NCDI services are already partly implemented, but scale-up, funding, and health personnel training needs to be reconsidered (Table 18).

Table 18: NCDI services that could be delivered at primary hospitals

Platform	High priority NCDI services	Included in 2005 EHSP or later?	Exempted service or cost sharing?	Requires new guidelines or/and training?
First level hospital	Diagnosis without screening for breast cancer	No	Cost sharing	Yes
	Visual impairment: Cataract surgery	Yes	Cost sharing	Partly implemented
	Insulin management of diabetes mellitus type 1	Yes	Cost sharing	Partly implemented
	Management of alcohol withdrawal	Yes	Cost sharing	Yes
	Essential surgery: Appendectomy, bowel obstruction, colostomy, gallbladder disease, hernia, C/S, Cataract surgery, ectopic pregnancy, hydrocelectomy, urinary obstruction, repair of perforations, drainage of superficial abscess	Yes	Cost sharing	Partly implemented
	Injuries: Trauma laparotomy, trauma-related amputations, tube thoracotomy, escharotomy/fasciotomy, management of fractures, suturing lacerations, burr hole, skin grafting	Yes	Cost sharing	Partly implemented
	Provision of glasses for severe refractive disorders	No	Cost sharing	Yes
	Revascularization for acute, critical limb ischemia, if available, otherwise amputation.	No	Cost sharing	Yes
	Management of acute heart failure with diuretics and non-invasive positive pressure ventilation	No?	Cost sharing	Partly implemented
	Diagnosis and management of acute psychoses	Yes	Cost sharing	Partly implemented

GENERAL AND SPECIALIZED HOSPITALS

Only a few new specialized NCDI services need to be provided at this level (Table 19).

Most services delivered at referral and specialized hospitals are currently offered with cost recovery, as they are expensive.

Table 19: NCDI services that could be delivered at referral and specialized hospitals

Platform	High priority NCDI services	Included in 2005 EHSP or later?	Cost recovery, exempted service or on cost sharing?	Requires new personnel and new guidelines and training?
General and specialized hospitals (second- and third-level)	Breast cancer treatment: Stage I-II	No	Cost recovery	Yes
	Cervical cancer treatment: Stage I-II	No	Cost recovery	Yes
	Cardiac surgery for rheumatic heart disease	No	Cost recovery	Yes
	Congenital: Repair of anorectal malformations and Hirschsprung's Disease, cleft lip and palate, club foot, shunt for hydrocephalus, congenital heart disease	No	Cost recovery	Yes
	Treat selected cancers in pediatric cancer units/hospitals (Leukemia, retinoblastoma)	No	Cost sharing	Yes
	Electroconvulsive therapy for severe or refractory depression	No	Cost sharing	Yes
	Management of refractory psychosis with clozapine	No	Cost sharing	Yes
	Hearing aids for children with severe hearing loss	No	Cost recovery	Yes
	Opportunistic screening and treatment for glaucoma	No	Cost recovery	Yes

In general, as more resources for health become available, the mix of interventions should expand and there may be a shift in the financing options. For highest priority services (listed in Table 19), the Commission recommends shifting to no or low co-payment. Funding options and scale-up scenarios are further discussed in Section 6.

POPULATION-BASED INTERVENTIONS, POLICIES, LAWS, AND REGULATIONS

NCDIs can be prevented by implementation of population-based interventions, policies, laws, and regulations (Table 13). The suggested interventions have not been costed, since they in many cases are cost saving, and require changes in polices rather than new expenditures [274, 298].

SECTION 6: FISCAL SPACE, RESOURCE GENERATION AND MOBILIZATION, FINANCING

FISCAL SPACE AND BUDGET EXPANSION

In Section 1 of this document, we described how, despite NCDIs being a cause to 52% of the mortality (46% of the total disease burden) in Ethiopia, only 10% of the health spending has been allocated to the prevention and care of NCDIs. Furthermore, about 95% of the NCDIs spending was made for curative care services. In addition, the 6th report of the National Health Accounts indicates that most of the OOP expenditure in health is for non-exempted services, like NCDIs. Recognizing the meager resources allocated to combat NCDIs and the overall healthcare financing challenges, the government must be committed to increase expenditure on health and other social services to achieve universal health coverage and poverty reduction [15, 299]. Ethiopia recognizes the obligation to devote the maximum available resources to health from domestic sources, and not simply rely on international assistance, in order to achieve the progressive realization of UHC [300].

Fiscal space can be understood simply as the "budgetary room" that can allow governments to devote resources to specific services or activities without endangering the sustainability of government's financial position [301].

Two terms have to be clearly distinguished: total government health expenditures (GHE), which includes only government spending and external funds to the government, and total health expenditure (THE), which also includes household direct expenditures (out-of-pocket = OOP), other private expenditures (employers, NGOs and others), and external resources for health (development aid). The budgetary room is largely determined by two factors: the level of total government expenditure and the percentage of total government expenditure devoted to health. By carefully defining reasonable assumptions and targets, projections for fiscal space can be made.

BUDGETARY ROOM FOR EXPANDING TOTAL HEALTH EXPENDITURE

The Commission created three possible scenarios for budget expansion that includes NCDI services; they are named "base case," "medium" (fairly realistic scenario), and "best case"

(optimistic scenario). Note that these scenarios build on assumptions about economic growth; they should not be seen as a prediction about what will happen, but rather as possible targets given a certain percentage of economic growth. Long-term predictions about growth are highly uncertain.

The three variants for possible targets and budget expansion paths for total (THE) and government health expenditures (GHE) that would be compatible with a commitment to move towards UHC are illustrated in Figure 17 a-c.

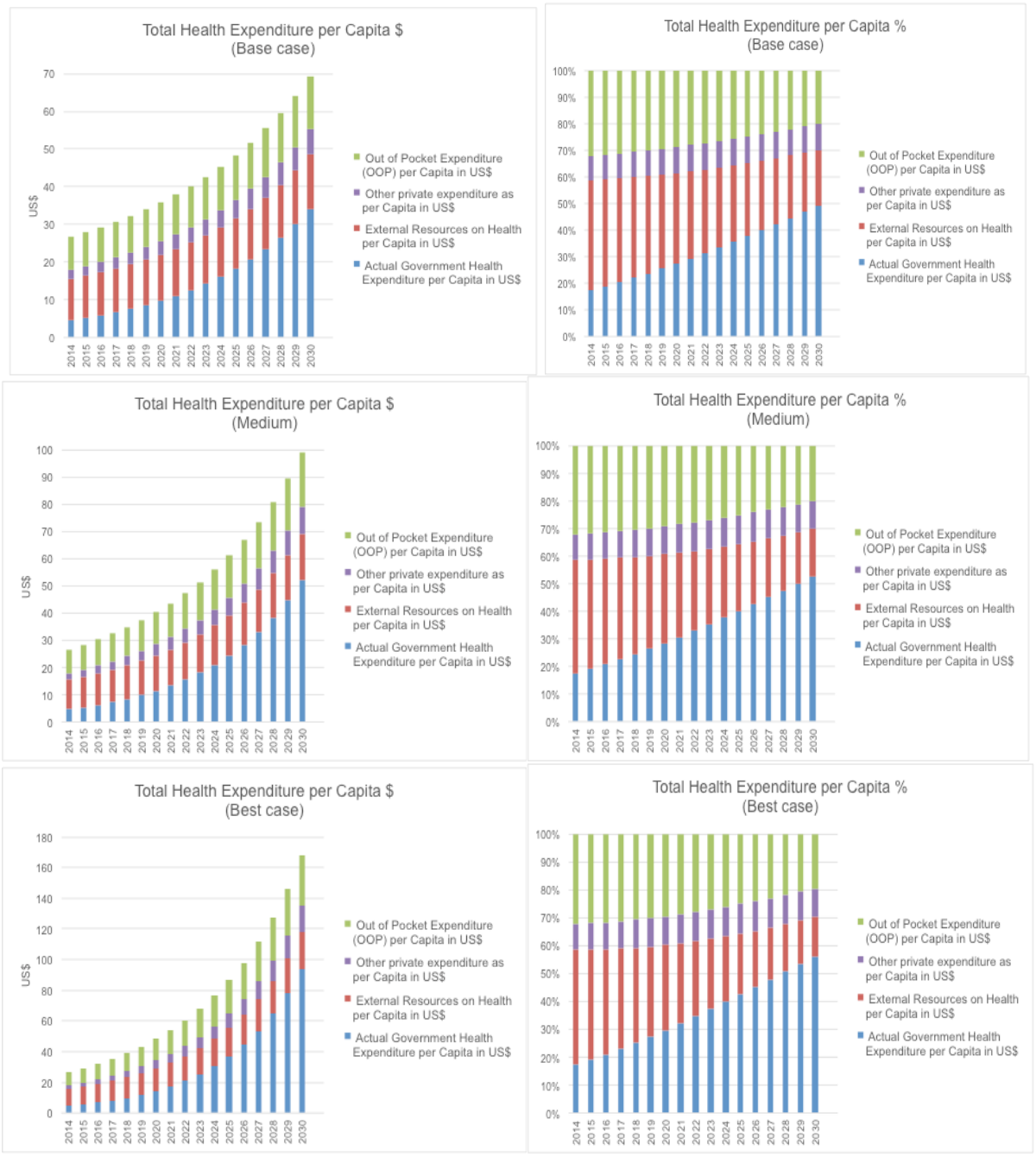

Figure 16 a-c: Total health expenditure per capita projections, 2014 – 2030. (left: in US $; right: in percent).

The underlying assumptions and targets for these scenarios are as given in Table 20. We used data for Ethiopia for the year 2014 from WHO's Global Health Observatory on health expenditures as a baseline for our projections, and we calculated up to year 2030 [300].

Table 20:Assumptions for health expenditure projections

Assumptions and targets	Base case	Medium	Best case
GDP growth*	3.5 %	5.0 %	7.0 %
Increase in *actual* government total health expenditure to x % of GDP	4.0 %	5.0 %	6.0 %
Change in external funding for health to % of *total* government expenditure	30 %	25 %	20 %
Out-of-pocket expenditure to % of total health expenditure	20.0 %	20.0 %	20.0 %
Other private health expenditures as % of total health expenditure	10.0 %	10.0 %	10.0 %

* Estimate

We justify our assumptions and targets as follows:

- ***Economic growth (GDP).*** The IMF estimate of 3.5% economic growth for sub-Saharan Africa is chosen for the base case, although prediction for growth in Ethiopia is higher [302]. For the medium variant, we assumed average growth of 5.0% per year. The Lancet Commission on Investing in Health projected a real GDP growth per year at 4.5% for low-income countries, 4.3% for lower-middle-income countries, and 4.2% for upper-middle-income countries from 2011 to 2035 [303]. Although in the last decade Ethiopia has had higher economic growth (around 10%), few countries can sustain such growth over time. We therefor assume 5% to be a realistic assumption. Our own extrapolations of World Bank Economic prospects beyond 2019 (7.0% on average) are used for the best case [303].
- ***Increase in actual government total health expenditure to 5% of GDP***. This target is in line with recommendations from several key international organizations [304]. In their analysis of the relationship between government spending on health and a range of indicators related to the goal of universal health coverage, McIntyre *et al* (2013) recommend a target of domestic government spending on health of at least 5% of GDP per capita in low income countries [9]. Some LMICs and many HICs have higher growth. We assume this target of 5% to be met by 2030 in the medium variant, while 4% is used in the base case, and a more ambitious target of 6% is used in the best case. A target of domestic government spending of at least 5% is in line with the HSTP [15].

- ***Reduction of out-of-pocket expenditure to 20% of total health expenditure***. This target is in line with recommendations from WHR 2010, which are based on estimates of unacceptable risks of catastrophic health expenditures if OOP exceed 20% [292]. According to the latest National Health Account (NHA VI, 2017), household expenditures are presently 33% [7]. OOP does not affect government spending directly, but should decrease in relative terms when government spending for health increases. Currently, according to NHA VI, most (approximately 70%) of NCDIs services are paid OOP [7]. The highest priority package of NCDI services would basically be funded by the government and will shift some of the spending patterns from OOP to pooled resources.
- ***No change in other private health expenditures***, in relative terms (approx. 10%) is assumed.
- ***Relative reduction of external funding for health*.** Though we assume relatively stable external funding for health in absolute terms, our target is a relative decrease. Development partners recognize the need to sustain the substantial health improvement seen in Ethiopia since the early 1990s. Although this support is likely to continue for years to come, especially for CMNN services, Ethiopia's transition towards a middle-income country means that the relative proportion of external funding for health will decrease. We assumed a reduction external funding as a proportion of total government expenditure (GHE) to the level of 30% in the base case and 25% in the medium variant. In the best case, based on optimistic growth projections, we allowed for a decrease in external funding to 20% of THE. The best case would yield an estimated more than US$ 110 per capita (government and external funding (THE)) and could cover most of an essential high priority package for all services (Figure 13c).

Figure 17c displays how a growth in total government health expenditures (including external funding) up to almost US $120 in 2030 is possible if all targets are met (best case), while a growth of up to US $70 is more realistic (medium variant). This is a bare minimum of what would be required to fund essential health care packages for CMNN services under UHC, excluding NCDIs [9]. In the base case, even this goal is hard to achieve.

BUDGETARY ROOM FOR EXPANDING HEALTH EXPENDITURE FOR NCDIS SERVICES

The budgetary room for expanding the public financing of NCDI services will be based on policy choices. In line with HSTP projections, the burden of NCDIs (discussed in section 2), and experiences from other countries, it is not unreasonable to assume that the relative fraction

of public NCDI expenditure should increase to 30% of total public expenditure on health in 2030 (including external resources). This target is only possible under the best case. In the base case, we set the target to 20%, and to 25% in the medium variant. Note that 30% spending on NCDI may seem high, but this presupposes that funding for CMNN also increases substantially (70% funding of CMNN in the best case amounts to more than US $80 per capita). With these assumptions and targets, we get possible budget expansion paths for NCDI services as illustrated in Figure 18 a-c.

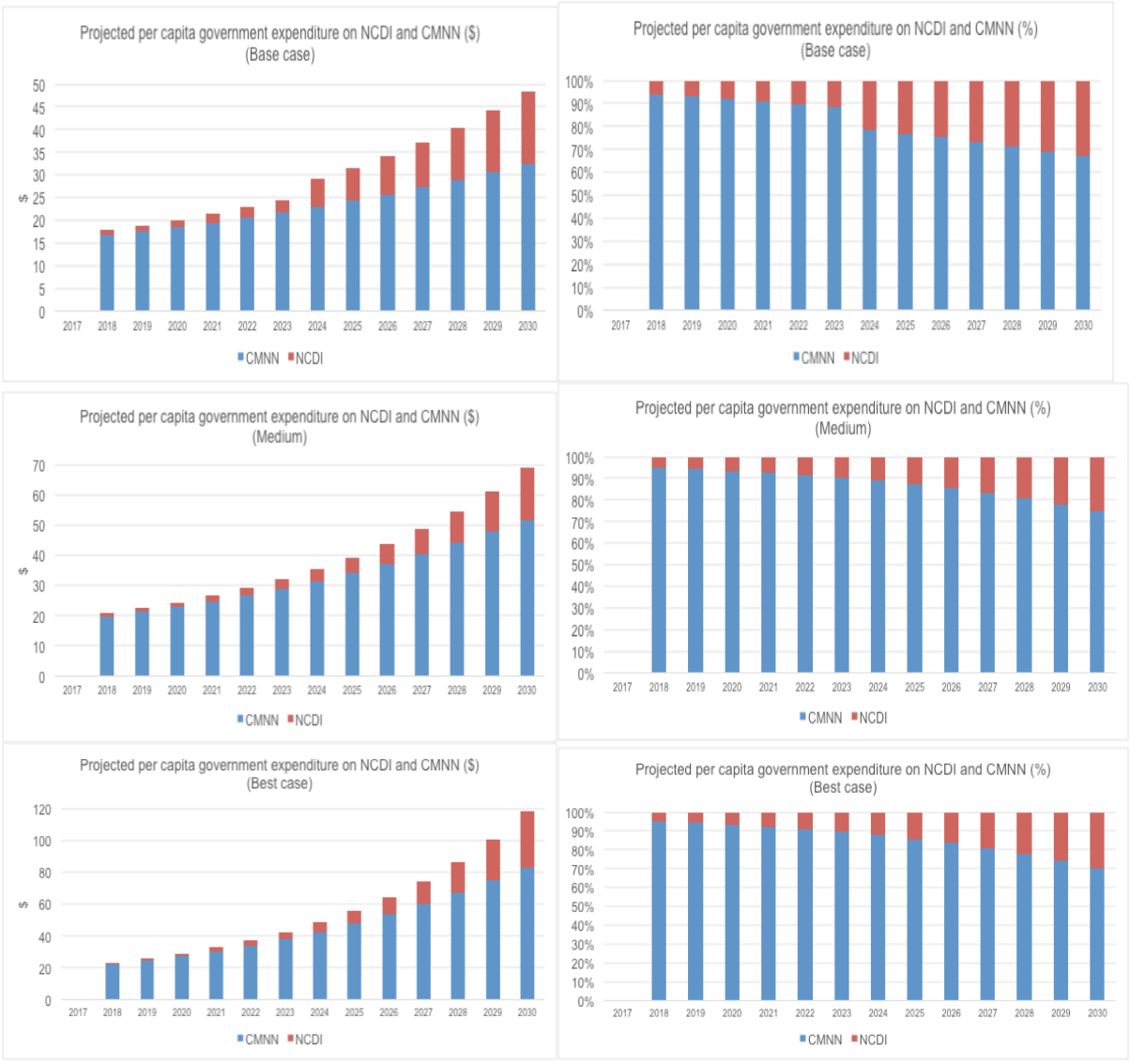

Figure 17 a-c: Projected per capita government expenditure on NCDI and CMNN (2017-2030) – assuming total budget expansion as illustrated in Figure 13.

In per capita US$, the expansion up to 2030 is as given in Table 21.

Table 21: Possible budget expansion for NCDIs (US$ per capita) for the first five years (2019-23) and up to 2030.

Budget Expenditure Scenarios	Annual Budget Expansion									
	2018	2019	2020	2021	2022	2023	.	.	2029	2030
Base case										
• **NCDI $**	$1.0	$1.2	$1.4	$1.7	$2.0	$2.4			$7.9	$9.7
• **CMNN $**	$18.5	$19.5	$20.6	$21.8	$23.2	$24.7			$36.4	$38.8
• **Increment for NCDI $**	$1.0	$0.2	$0.2	$0.3	$0.3	$0.4			$1.5	$1.8
Medium										
• **NCDI $**	$1.0	$1.3	$1.6	$2.0	$2.5	$3.1			$13.4	$17.3
• **CMNN $**	$19.7	$21.2	$22.8	$24.7	$26.7	$29.0			$47.9	$51.7
• **Increment for NCDI $**	$1.0	$0.2	$0.3	$0.4	$0.5	$0.6			$3.0	$3.9
Best case										
• **NCDI $**	$1.2	$1.5	$2.0	$2.6	$3.4	$4.5			$26.0	$35.4
• **CMNN $**	$22.1	$24.4	$27.1	$30.2	$33.8	$37.8			$74.7	$82.6
• **Increment for NCDI $**	$1.2	$0.3	$0.5	$0.6	$0.8	$1.1			$6.8	$9.4

From Table 21 we see that in the base case, at the end of the first five-year period (2023), there is only US $2.4 extra per capita for NCDI services from the government budget. This is far less than the estimated extra per capita cost of US $4.7 (needed in the year 2023) for the highest priority NCDI services identified in Tables 9 to 13 above. Even the best case (optimistic) scenario would just secure enough fiscal space (US $4.5) for the highest priority package of NCDI services.

Choosing targets is not easy and should be based on available fiscal space for increased health expenditures, projected NCDI burden, and the effectiveness of interventions. Additional substantial health investment should therefore come from other sources, ideally from health insurance, not out of pocket.

RESOURCE GENERATION AND MOBILIZATION

In addition to economic growth, other ways to increase fiscal space for government expenditures up to 5-6 % of GDP are possible. These include increased mobilization of domestic resources, intersectoral reallocations, and efficiency gains [294].

As for **increased mobilization** of domestic resources, one particularly important option for countries to consider is improved taxation and other forms of revenue collection. This could include increased taxation of tobacco and alcohol. Such an increase is likely not only to increase

revenue, although only to a degree for tobacco since consumption is low, but also to improve future population health.

With respect to **intersectoral reallocations**, a related strategy is to reduce or eliminate energy subsidies and other unwarranted subsidies. This can, among other things, increase the fiscal space for public spending on high-priority health services. Other types of innovative financing should also be explored [305].

As for **efficiency gains**, there are many promising strategies to be pursued. The 2010 Word Health Report lists ten leading causes of inefficiencies that could be addressed: underuse of generic drugs (instead of brand-name drugs) and higher than necessary prices for medicines; use of substandard and counterfeit medicines; inappropriate and ineffective use of medicines; overuse or supply of equipment, investigations, and procedures; inappropriate or costly staff mix and unmotivated workers; inappropriate hospital admissions and length of stay; inappropriate hospital size (low use of infrastructure); medical errors and suboptimal quality of care; waste, corruption, and fraud; and inefficient mix or inappropriate level of strategies [294].

Of all these options, the Commission in particular recommends improved taxation on income and other forms of revenue collection, increased taxation of tobacco and alcohol (sin taxes), sugar-sweetened beverage tax, eliminate energy subsidies and other unwarranted subsidies, other types of innovative financing, and exploring all potential efficiency gains.

SECTION 7: KEY FINDINGS AND RECOMMENDATIONS

Summary of the key findings and recommendation by the National NCDI Commission of Ethiopia are presented below.

KEY FINDINGS:

- **NCDIs comprise a large burden of disease in Ethiopia.** NCDs and Injuries are major public health problems in Ethiopia, particularly affecting children, women, the population's productive age group, the poor, and the underprivileged. Approximately half of all deaths and disability are now attributable to NCDIs in Ethiopia according to a review of the primary literature and results from the Global Burden of Disease Study 2016. The proportion of deaths due to NCDIs is roughly similar in both urban and rural settings. The pattern of diseases affecting the Ethiopian population is diverse unlike the global targets which largely focus on four major diseases (cardiovascular disease, type 2 diabetes, chronic respiratory diseases, and cancers) where diseases like RHD, Cirrhosis of the liver following HBV and HCV infections, Cancers like breast cancer and cervical cancer, hemorrhagic strokes, heart failures due to VHD, motor vehicle injuries, atypical type 1 DM dominate the epidemiology. NCDIs in Ethiopia occur at young ages.
- **Ethiopia has a large and diverse burden of NCDI risk factors, which may vary by socioeconomic factors.** Most of the NCDI disease burden cannot be attributed to individual lifestyle choices. GBD 2016 review showed only 34% of NCDs disease burden (DALYs) were attributable to identifiable risk factors in Ethiopia. Risk factors such as tobacco, alcohol, and Khat use are on the rise in Ethiopia, and may lead to a substantial portion of NCDs. While the overall rate of obesity is low in Ethiopia, it is over six times higher in the wealthiest quintile as compared other socioeconomic groups. Hypertension, low physical activity, raised total cholesterol, and high fasting plasma glucose were also associated with wealthier socioeconomic groups. The environmental risk factor of indoor air pollution was the second most important risk factor, and was more prevalent in rural populations.
- **There is a high burden of common NCDIs, such as hypertension and diabetes.** The national prevalence of hypertension is now 16%; there has also been an increase in prevalence rates of stroke and myocardial infarction. The prevalence of raised blood glucose now ranges from 3.2-8%. Lifestyle factors play a key role in the prevention and management of these two conditions.

- **There is also a high burden of other NCDIs, which requires increased attention.** The rate of rheumatic heart disease, 17.0-37.5 cases per 1,000 school children and young adults, is much higher than regional estimates, and disproportionately affects the poor. There are an estimated 65,000 new cancers each year, affecting females twice as often than males, and predominantly breast and cervical cancers. Mental health disorders, injuries, digestive diseases, eye health, surgical conditions, and musculoskeletal disorders also play a large role in morbidity and mortality from NCDIs.
- **NCDI services and their utilization are limited in Ethiopia.** Only 54% of all health facilities (combined public and private) are ready to provide general NCD health services. Availability is even lower for specific NCD conditions, including diabetes (22%), cardiovascular disease (41%), chronic respiratory disease (45%), and cervical cancer (2%). Readiness of trained staff and guidelines are extremely scarce, and the availability of essential diagnostics and medications are also major limitations. The availability of services in rural areas and primary levels of the health care system were lower than urban cities and referral centers, which indicates the risk of diminished service access for the poorest quintiles of the population. This is further aggravated by the low awareness on the burden of NCDIs and their risk factors by the community, health workers, and policy makers.
- **NCDIs have a dramatic impact on out-of-pocket expenditures in Ethiopia**. Of those reporting recent illness in household surveys, 10% were due to NCDs and 11% reported having a chronic illness. These percentages represented significant increases since the previous household survey and conveyed the increasing impact of NCDs on Ethiopian households. Overall, 23% of total out-of-pocket expenditures were due to NCDs. Kidney failure accounted for 10% of all out-of-pocket expenditures, which was the second highest proportion of all conditions measured – only intestinal worms comprised a higher share of out-of-pocket expenditures. Mental disorders (6%), cancers (5%), diabetes (2%), and injuries (2%) were other large drivers of overall out-of-pocket expenditures for Ethiopian households.
- **Current investment in NCDIs is low.** Despite the large burden of disease (approximately half of morbidity and mortality) and economic impact comprised by NCDIs, the National Health Account demonstrates that only 10% of total health expenditure is currently allocated to NCDIs. Overall, total government expenditure on health is 6.7% of the total budget, which is far short of Abuja Declaration.

- **There are proven interventions that can address these NCDIs.** The Commission initially considered 230 interventions for implementation or scale-up, and evidence on cost effectiveness, severity of the disease on affected individuals, and equity between Ethiopia and higher-income countries for each intervention was reviewed and categorized. The interventions were then ranked in three priority-categories after application of general principles proposed by the World Health Organization and deliberation within the Commission. The annual additional cost after scaling-up 90 interventions classified in the highest priority group by 2023 was estimated to be $550 million USD, corresponding to $4.70 USD per capita.
- **These interventions would require integration into existing services.** Health system strengthening is key to ensure UHC for NCDIs in Ethiopia, including in the areas of leadership and governance, health financing, health workforce, medical products/vaccines/technologies, information, and service delivery. Of the prioritized NCDI interventions, 9 could be integrated at the community level, 17 at health center level, 10 at primary hospital level, and 9 at referral hospital level. Less than one-third (31%) of these interventions are included in the 2005 EHSP and most (84%) would require new guidelines and training. Very few (8%) of the facility-based interventions are cost exempt for the patient. Most of the intersectoral interventions would require either new regulations or improved enforcement.
- **However, resources may still be limited.** A growth in total health expenditures (including external funding) of up to US $120 per capita by 2030 is not unreasonable, if aggressively pursued; this would be the minimum of what would be required to fund essential health care packages under UHC. A majority of this expansion would be from actual government expenditure for health. Assuming 20% allocation to NCDIs with conservative estimates of GDP growth, government total health expenditure, external funding, and out-of-pocket spending reductions, there would be only US $2.40 extra per capita for NCDI services at the end of the first five-year period (2023). This is far less than the estimated per capita cost of US $4.70 (needed in the year 2022) for the highest priority NCDI services. However, with more aggressive targets for the above parameters, an additional US $4.50 could be feasible. The work performed by the Commission demonstrates that it is possible to approach priority setting in a systematic way and achieve substantial health gains also in resource constraint settings.

- **NCDI policies are emerging in Ethiopia, though may require more focus.** The National Strategic Framework for the Prevention and Control of NCDs (2010) and the HSDPIV were the first to emphasize the role of NCDIs, and the HSTP accelerated these efforts. However, lack of regional-level governance and accountability, lack of multi-sectoral engagement, overdependence on global normative guidance, pervasive misconceptions about NCD, sluggish mobilization of resources, and an unfinished MDG agenda have slowed the national response to NCDs.
- **Available data for NCDIs is poor:** routine monitoring of NCDI data in Ethiopia is weak, with poor capacity to generate and use locally available data. Furthermore, studies on NCDIs are meager.

RECOMMENDATIONS:

The Commission agrees on the following key forward-looking recommendations, which could lead to substantial improvements for the health and wellbeing of Ethiopians who currently, or in the future, may suffer from the burden of NCDs and injuries:

1. ***Policy, planning and oversight:***
    - Establish a national multi-sectoral committee on NCDIs, chaired by the Prime Minister or Deputy Prime Minister, to guide and organize NCDI efforts
    - Strengthen the NCDs Prevention and Control Unit at the federal level
    - Establish NCDs Prevention and Control Units at regional level
    - Revise the Essential Health Service Package by the end of 2018: move high priority NCDI services from cost-recovery to cost-sharing and/or cost-exemption funding schemes. Commensurate with available resources and expand NCDI services towards realization of UHC.
    - Protect the implementation of public health policies for NCDI prevention and control from interference by vested interests through comprehensive legislation and enforcement of national laws and regulations.
2. ***Finance:***
    - Allocate an increased percentage of gains from economic growth to health; move government spending on health rapidly towards 5% of the GDP
    - Mobilize addition resources, from improved efficiency, improved taxation, sin taxes (tobacco, alcohol), and a specific consider sugar-sweetened beverage tax

- Move towards allocating 30% of total government spending (GHE) to NCDIs by 2030
- Plan for reduced external funding (at least in relative terms) as the country develops economically and transitions to lower-middle-income country status
- Reduce out-of-pocket to a maximum of 20% of total health expenditures
- Harmonize community-based health insurance, and if possible social health insurance, with public health sector priorities
- Development partners need to engage in generating evidence and supporting the implementation of cost-effective and equitable interventions for NCDs and Injuries, based on country needs, in order to maximize aid effectiveness

3. *Service integration*

- Strengthen the health system at all levels, emphasizing primary care, and finance the national set of NCDI services, interventions, and health promotion focusing on prevention, early detection, curative, rehabilitative, and palliative care
- Low resource countries like Ethiopia can prevent and manage NCDs and Injuries by integrating a high priority package of interventions into existing platforms; the package's interventions should be cost-effective, target the worse off, and provide financial risk protection
- Implement scale-up of health personnel as planned in HSTP, with special emphasis on resource needs for NCDI services
- Strengthen the training of health workforces and the scientific basis for decision-making through NCD-related research and partnerships
- Develop, train, and implement the top eleven clinical guidelines for NCD and injury services (treatment of childhood cancer, early treatment of breast cancer, basic palliative care, treatment of acute pharyngitis in children to prevent rheumatic fever, psychosis: basic psychosocial support and anti-psychotic medication, epilepsy: follow-up and anti-epileptic medication, treatment for substance use disorder (alcohol and tobacco), primary prevention (statins and antihypertensive) for those with absolute 10-year risk of CVD>10%, management of acute heart failure with diuretics and non-invasive positive pressure ventilation, and detection and treatment of asthma)

4. *Strategic Information, Target setting, monitoring and evaluation*

- Strengthen integrated national surveillance systems for NCDIs, including vital registration systems capable of reporting cause of death, cancer registries, and risk factor monitoring
- Refine existing NCDI indicators and expand to include other priority NCDIs in future revisions of HIS in order to monitor the epidemiology and service coverage of NCDIs
- Track results of NCDIs interventions through monitoring and reporting on the attainment of the 9 national targets (based on the 9 global targets; details are found in Section 5 of this report).
- Mobilize and track domestic and external resources for NCDI prevention and control. Improve NCDI subaccounts in next round of National Health Accounts report.

5. Education and advocacy

Achieving global as well as local commitment and action against NCDIs requires sustained advocacy. Alongside actions directed towards changing social, environmental and economic conditions that impact health, mobilizing and educating the public on healthy lifestyle will substantially contribute to the prevention of NCDIs. Advocate for improved NCDI resources and services

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