Republic of Malawi

Ministry of Health

The Malawi Noncommunicable Diseases & Injuries Poverty Commission Report

August 2018

MALAWI NCDI POVERTY Commission

Reframing Noncommunicable Diseases and Injuries for the Poorest Billion

FOREWORD

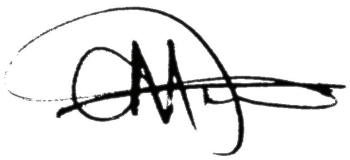
As our world changes, so too does the burden of disease. Globalisation, evolving trade and consumption patterns, and increased access to life-saving medical care are just some of the factors that have transformed the global health landscape. Yet despite recent advances of modern medicine, populations around the world continue to suffer from new and ongoing health conditions. As is the case in many nations, Malawi has a significant and diverse burden of noncommunicable diseases and injuries (NCDI), while still suffering from devastating communicable conditions.

Despite this significant burden that NCDIs inflict on these populations, global policy has yet to accordingly adapt. Too often the emphasis of the NCD dialogue is focused on a limited set of four conditions with well-known behavioural risk factors, known as the "4x4": cardiovascular disease, chronic respiratory disease, cancer, and diabetes, and their accompanying risk factors of tobacco use, unhealthy diets, physical inactivity, and harmful use of alcohol. These conditions are critical to prevent and treat, but they do not present the full picture; in fact, they narrowly account for only a little more than one third of the NCDI burden.

In Malawi, 69% of the NCDI burden of disease is caused, instead, by a number of severe, chronic NCDIs outside of the 4x4 conditions. Similarly, an estimated 79% of the NCD DALY burden and 93% of the injury burden are not attributable to the select metabolic and behavioural risk factors on which we have historically focused and are, instead, attributable to other risk factors, including those due to the environment, poverty, and infectious disease. In addition, the burden of these severe, chronic NCDI conditions generates further problems—contributing to significant death and disability, particularly in the young and in the poor. For example, chronic conditions with infectious roots, such as rheumatic heart disease and Burkitt's lymphoma, cause considerable suffering. Burn injuries and interpersonal violence cause life-long disabilities. Epilepsy and psychotic disorders subject individuals to stigma and discrimination, engendering irreparable damage if left untreated. This suffering is compounded by poverty and barriers in access to diagnosis, treatment, and care. Thus, policies for NCDIs should account for severe conditions outside of the traditional 4x4 and their risk factors, ensuring that the most vulnerable in our population have access to prevention, treatment, and palliative care.

The evidence is clear: NCDIs are increasing worldwide, with ever-greater impacts on the poor and the young. Expanding the breadth and depth of the NCDI agenda is critical if we—as national and global citizens—are to achieve universal health coverage. With an inclusive agenda rooted in equity, we will better understand the true impact and resources needed to address NCDIs for all Malawians. However, multisectoral approaches to NCDIs are needed. Action in the health sector alone will not reach the WHO targets, or bring us closer to Malawi's goal of achieving UHC. The policies, investments, and partnerships required depend on coherent action across government sectors, funders, and partners to address NCDIs. It is time we addressed this, thoroughly, with recommendations that will benefit the majority—and the minority—in Malawi.

Given the evidence and increasing burden, NCDIs must be addressed. As such, the Malawian Ministry of Health readily endorsed the creation of the Malawi NCDI Poverty Commission in 2016. Utilising the expertise and evidence amassed through this Commission, we will work together as partners to address the NCDI crisis in Malawi and beyond. This is a whole-sector and whole-world problem. We must work in unison, as national and global colleagues, to advocate for a response to NCDIs that ensures no one is left behind.



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ACRONYMS & ABBREVIATIONS

ACEi	Angiotensin-converting-enzyme (ACE) inhibitor
ARB	Angiotensin Receptor Blockers
CHAM	Christian Health Association of Malawi
CMST	Central Medical Stores Trust
COPD	Chronic Obstructive Pulmonary Disease
CRD	Chronic Respiratory Disease
CVD	Cardiovascular Disease
DALY	Disability Adjusted Life Year
DCP	Disease Control Priorities
DHS	Demographic and Health Survey
EHP	Essential Health Package
GBD	Global Burden of Disease
GDP	Gross Domestic Product
GNI	Gross National Income
HIC	High-Income Country
HIV	Human Immunodeficiency Virus
HSA	Health Surveillance Assistant
HPV	Human Papilloma Virus
HSSP	Health Sector Strategic Plan
IEC	Information, Education, and Communication
IHD	Ischemic Heart Disease
IHME	Institute of Health Metrics and Evaluation
IHS	Integrated Household Survey
IPV	Interpersonal Violence
KS	Kaposi Sarcoma
LMIC	Low- and Middle-Income Country
MICS	Multiple Indicator Cluster Survey
MOH	Ministry of Health
MPI	Multidimensional Poverty Index
MSM	Men who have Sex with Men
MWK	Malawi Kwacha
NAP	National Action Plan
NCD	Noncommunicable Disease
NCDI	Noncommunicable Disease and Injury
NHA	National Health Account
NTD	Neglected Tropical Disease
PEN	Package of Essential Noncommunicable Disease interventions
PVD	Peripheral Vascular Disease
PWID	People Who Inject Drugs
RCT	Randomised Controlled Trial
RHD	Rheumatic Heart Disease
SADC	Southern African Development Community
SLA	Service Level Agreement
SPA	Service Provision Assessment
STD	Sexually Transmitted Disease
TB	Tuberculosis
THE	Total Health Expenditure
UHC	Universal Health Coverage
UN	United Nations
USD	United States Dollar
WHO	World Health Organization
YLD	Years of Life lived with Disability
YLL	Years of Life Lost

EXECUTIVE SUMMARY

Malawi, a land-locked nation in south-eastern Africa, suffers from a heavy burden of disease. In 2015, estimates suggest that Malawi lost 58,000 disability-adjusted life years (DALYs) per 100,000 population when accounting for all diseases. While much of this burden remains imparted by communicable, maternal, neonatal, and nutritional conditions, there is a growing burden arising from noncommunicable diseases and injuries (NCDIs). In fact, in Malawi, NCDIs account for approximately one third of all deaths and disabilities.

A common misconception demands to be challenged: that NCDIs are typically conditions associated with wealthy, urban, or older populations. In fact, noncommunicable diseases and injuries (NCDIs) contributed to 79.8% of overall global mortality in 2015, with over half of those deaths occurring in low- and middle-income countries (LMICs). Therefore, the need to examine these conditions, their risk factors, and policies surrounding how to prevent and treat NCDIs is critical. The *Lancet* Commission on Reframing Noncommunicable Diseases and Injuries for the Poorest Billion seeks to understand these issues, re-examining the NCDI burden in the poorest parts of our world. NCDIs as a group are estimated globally to contribute to one-third of the disease burden in people living in extreme poverty, with two-thirds of this NCDI burden affecting people under 40 years of age.

Though global rhetoric continues to limit NCDs to four major disorders (cancer, respiratory diseases, diabetes, and cardiovascular diseases), 68.6% of the NCDI burden in Malawi is caused by conditions outside of these, elucidating a complementary and important agenda for Malawians. Mental health and substance abuse, for instance, is the third largest contributor to the NCD DALY burden in Malawi, with other conditions such as musculoskeletal disorders, neurological disorders, digestive diseases, and injuries such as self-harm, road traffic accidents, and unintentional injuries, accounting for a large proportion as well. This burden also disproportionately affects the young in Malawi, with 60.5% of the NCD burden, and 82.0% of the injury burden, affecting individuals under the age of 40.

Despite the global presumption that most NCDIs are related to select metabolic and behavioural risk factors—such as diet, smoking, obesity, or

a sedentary lifestyle—79% of DALYS from NCDs are not explained by these factors in Malawi. Thus, while public health interventions directed towards these lifestyle risk factors are of critical importance for health in general, we must expand our thinking to extend the NCDI agenda beyond these commonly accepted risk factors. Other considerations, such as malnutrition, infections from an early age, or poverty-related social factors must also be addressed as part of a complementary and broader prevention scheme for NCDIs in Malawi.

In Malawi, health care is provided by public, private for-profit, and private not-for-profit organizations. The public-sector hospitals and health centres make up most of the facilities in Malawi and are free-of-charge at the point of use. In general, health financing in Malawi remains largely donor-driven. From 2012 to 2015, for instance, development partner contributions made up just over 60% of total heath expenditure (THE), with the government contributing a further 25% and individuals just under 13%. The situation for NCDIs is dire. From 2012 to 2016, less than 2% of targeted programmatic funding for health was assigned to NCDI conditions. Out-of-pocket spending for patients with NCDI conditions is 34% higher than average household spending for health. Among individuals who report having a chronic NCD, over 40% have been ill within the past two weeks leading to an average of almost 4 days of work lost, and 10% hospitalized in the last year, with almost 40% of those needing to borrow money or sell assets to pay for their hospital stay.

In 2013, the NCD and Mental Health Unit of the Malawian Ministry of Health published the 2012-2016 National Action Plan (NAP) for the prevention and management of NCDs, focusing on four thematic areas: (1) diabetes mellitus, cardiovascular diseases, and chronic lung diseases; (2) cancers; (3) epilepsy and mental health disorders; and (4) injury, trauma, and violence. Advocating integration at the point of delivery, the plan set out to promote interventions for primary prevention, secondary prevention, treatment, follow-up care, and palliative and rehabilitation care. The unit went on to launch the World Health Organization's (WHO) Package of Essential NCD (PEN) interventions, promoted the development of a National Alcohol Policy, and facilitated the introduction of a human papillomavirus (HPV) vaccine for young girls in two districts.

Scale-up is urgently needed however, as the NCDI burden continues to grow and affect all segments of the population, placing ever greater financial burden and morbidity on the poor. Utilizing expert opinion and global burden of disease estimates, the Malawi NCDI Poverty Commission convened to create a list of priority NCDI conditions for Malawi. The 38 priority conditions identified include disorders such as rheumatic heart disease (Voices Box 1), sickle cell disease, chronic kidney disease, and appendicitis. Using cost-effective interventions from the Disease Control Priorities (DCP) network, as well as expert opinion, the Commission identified 54 health interventions and 31 policies to address NCDIs for the poorest in Malawi. The interventions include: mass media and IEC campaigns around issues such as sexual and reproductive health, gender-based violence, healthy diets and physical activity, and tobacco and alcohol use; prevention methods such as HPV vaccinations, hepatitis B vaccinations, and screening services for diabetes, hypertension, and sickle cell disorders in appropriate settings; pharmacological interventions such as chemotherapy, systemic steroid use for acute asthma, nicotine replacement therapy, and diuretic, beta-blocker, ACE-inhibitor, and mineralocorticoid antagonists for chronic heart failure; hospital-based policies and interventions such as burn and wound treatment services, increased availability of blood, oxygen, activated charcoal, and basic antidotes, as well as emergency hospital care, basic rehabilitation services, basic outpatient surgical services, and referral systems for rape victims; and increased specialized services such as surgical care, pathological oncology services, and psychiatric care.

The Commission put these interventions into three phases, prioritizing equity and cost-effectiveness in the first phase, with the projected cost of scale-up at $13.7 USD per capita. Similar scale-up of a high priority package of NCDI interventions from the DCP would avert about an estimated 5,180 deaths between the ages of 5 and 70 in the year 2030, showing a conservative benchmark for the scale of the opportunity. This proposal, rooted in equity, can help move the nation towards universal health coverage. Broadening the definition of NCDIs and their risk factors in Malawi allows the prioritization of potentially unknown, and therefore untreated, conditions that evidence shows affect a large proportion of Malawians. Realization of these intervention and goals set forth by the Malawi NCDI Poverty Commission

will take political will, partner engagement, and a strong understanding of the future burden that NCDIs will cause if left untreated.

This Malawi NCDI Poverty Commission advocates for the reframing of noncommunicable diseases and injuries in Malawi. We hope to use the vast intellectual, academic, clinical, and research resources available to advocate for a pro-poor pathway in preventing treatable disabilities and premature deaths.

1. Background and Policy Context

1.1 MALAWI HEALTH SYSTEM

Malawi is a landlocked country in Southern sub-Saharan Africa with a population of approximately 18.1 million and a GDP of $300 USD per capita.[1] Eighty-three percent of the population lives in rural areas[2], with over half of households living below the poverty line.[1] Malawi's health system is highly dependent on external financing. In 2015, Malawi's total health expenditure (THE) was $39 USD per capita (11.1% of GDP), the lowest in the Southern African Development Community (SADC) region, with just over 60% of health spending coming from external donors.[3] The health system has 4 central hospitals, 23 district hospitals across 28 districts, and a network of health centres through which the bulk of primary care is delivered.[4] Healthcare in public facilities in Malawi is free of charge, and an umbrella group of church-affiliated facilities called the Christian Health Association of Malawi (CHAM) operates 24% of health centres with a patchwork of free services based on current Service Level Agreements (SLAs).[5] With a national HIV prevalence of 9.2% among adults age 15-49, a high burden of acute and chronic infectious disease, and the rising morbidity of NCDIs, Malawi is facing a dual burden of disease.[6]

Malawi's Health Sector Strategic Plan II (HSSPII) provides a guiding document for the delivery of health services in Malawi for 2017-2022 and is based on a commitment by the government of Malawi to address social risk factors and ensure universal coverage of basic healthcare.[4]

1.2 NCDIS IN MALAWI

NCDIs were first recognized in 2011 as part of the Essential Health Package (EHP), which is the minimum package of services mandated to be available at the primary care level.[4-7] The EHP covers conditions affecting most of the population, with a particular focus on the poor.[5] Following the inclusion of NCDs in the EHP, the MOH NCDs and Mental Health Unit was established.

NCDI initiatives in Malawi were originally guided by a National Action Plan for the Prevention and Management of NCDs (2011-2016), which was created by the NCD Unit and launched in December 2013.[8] Until the National Action Plan (2017-2022), many of the documents addressing NCDIs in Malawi focused on the commonly recognised NCDs, a narrower set of conditions comprised of cardiovascular disease, diabetes, chronic respiratory disease, and cancers. This includes strategic documents such as the HSSP I[9] and HSSP II[4] as well as other analyses such as the Service Provision Assessment[5], resource mapping[10], and the National Health Account.[3] The National Action Plan for the Prevention and Management of NCDs' second version, spanning years 2017-2022, expands the emphasis beyond the traditionally recognised NCDs and emphasises an integrated approach, noting that addressing the more broad burden of NCDIs will

be a critical step toward UHC for Malawi.[11]

1.3 EFFORTS TO ADDRESS NCDIS IN MALAWI

Since the onset of the first National Action Plan for NCDIs in Malawi in 2011, there have been key strides in policy and service provision:

- The World Health Organization's Package of Essential Noncommunicable (PEN) Disease Interventions for Primary Health Care in Low-Resource Settings[12] was adapted in 2012 and piloted at Kasungu District Hospital. Thereafter, World Diabetes Foundation provided funding to the Ministry of Health to roll out primary care for patients with hypertension and diabetes. This effort was commenced through trainings and commodity provision in 17 facilities in 16 districts in the north and central regions from 2015 to 2018, with plans to expand to the southern region in the future.[13]
- The WHO STEPS Survey was performed in Malawi initially in 2009 and again in 2017 as part of NCD disease surveillance.[14]
- The Human Papilloma (HPV) vaccine was piloted for adolescent girls for primary cervical cancer prevention in Zomba and Rumphi Districts, and national scale up is planned for 2019.[15]
- The National Alcohol Policy was signed into legislation in March 2017, with an aim to reduce the harmful use of alcohol in Malawi.[16]
- Rollout of One Stop Centres for gender-based violence, including sexual, physical, and emotional abuse, in 20 districts.[17]
- Routine screening of hypertension in HIV patients was incorporated into the new HIV treatment guidelines in 2018.[18]
- Several service provision initiatives implemented by non-governmental organisations across the country, with many focusing on the integration of HIV and NCD care.[19-22] Partners involved in these efforts produced a policy brief in 2016 describing possible delivery models for integrating hypertension care into HIV programs.[23]
- Integrating depression management into HIV care is currently being piloted in two facilities in Lilongwe.
- The Southern Africa Trade and Transport Facilitation Program – Phase 2 (SATTFP- SOP2), financed by the World Bank and implemented by Malawi's Road Authority and Ministry of Health, is supporting multiple road safety interventions. This includes a pilot of Emergency Medical Services (EMS) system to respond to road traffic crash victims along the road stretch of the North-South Corridor (also known as M1 corridor) in Malawi, which involves 12 fully equipped ambulances and training of paramedics.[24]
- The National Cancer Control Strategy 2017-2022 is under development

and will provide a strategic framework to reduce the incidence, morbidity, and mortality of cancer and to improve the quality of life of cancer patients. The key features of this plan include focusing on the entire continuum of cancer care from prevention through palliation. Many stakeholders will be involved in the development and implementation of the national cancer plan, and the strategy aims to enhance coordination of cancer prevention and control and guide effective monitoring and evaluation of cancer interventions.[25]

The Malawi NCDI Poverty Commission is a complementary effort to address the burden of NCDIs in Malawi, aiming to bring together key experts and stakeholders to broaden the NCDI agenda beyond the '4 x 4' (or'big 4'), providing a platform for identifying available data as well as gaps, and helping to provide recommendations on the way forward to address NCDIs in Malawi, with equity and helping the most vulnerable as a key focus.

2. The Malawi NCDI Poverty Commission

2.1 GLOBAL COMMISSION

The global *Lancet* Commission on Reframing NCDs and Injuries for the Poorest Billion ("The *Lancet* NCDI Poverty Commission") was launched in 2015. Driven by an equity agenda, the global Commission is "based on the principle of complementarity" and "aims to rethink global policies, to mend a great disparity in health, and to broaden the current noncommunicable disease agenda in the interest of equity".[26] This global Lancet Commission had four main objectives:

1. Assess the nature of the NCDI burden amongst the poorest billion people in the world;
2. Work with a group of countries to develop actionable pro-poor pathways for expansion of NCDI interventions;
3. Assure that sustainable financing is not a bottleneck to NCDI prevention and treatment among the world's poorest; and
4. Expand the NCD movement and the global health agenda to urgently address NCDIs among the poorest billion.

The *Lancet* Commission invited national partners and stakeholders to establish similar commissions at the national level, particularly in countries with significant populations living in extreme poverty. These national commissions were tasked to advise on the findings of the *Lancet* Commission and provide platforms for potential implementation of global recommendations. Through the Harvard Medical School Program on NCDs and Social Change and Partners In Health NCD Synergies Project, the *Lancet* Commission provided financial and technical support to the establishment and execution of the national commissions.

2.2 MALAWI NCDI POVERTY COMMISSION STRUCTURE

The national Malawi NCDI Poverty Commission was established in November 2016 by the Ministry of Health.[27] Led by co-chairs Dr. Jones Masiye of the Ministry of Health and Dr. Emily Wroe of Partners In Health, the Malawi NCDI Poverty Commission is composed of 26 national members, bringing together experts from a range of domains including government, implementing partners, academic institutions, clinical medicine, epidemiology, economics, and health information systems. Members represented the following institutions in Malawi:

- Ministry of Health, Malawi
- NCD and Mental Health Unit
- Kamuzu Central Hospital
- Mzuzu Central Hospital
- Queen Elizabeth Central Hospital
- Partners In Health
- Malawi Epidemiology and Intervention Research Unit (MEIRU)
- College of Medicine - University of Malawi
- Dignitas International
- Lighthouse Trust
- Baobab Health Trust

Photo 1 – Malawi NCDI Poverty Commission Meeting, November 2016

Photo 2 – Malawi NCDI Poverty Commission Meeting, April 2017

2.3 OBJECTIVES OF THE MALAWI NCDI POVERTY COMMISSION

The general objectives of the Malawi NCDI Poverty Commission are:

1. To provide a situational analysis of the epidemiologic and socioeconomic baseline of the burden of NCDIs, particularly relating to poverty;
2. To estimate the coverage of current NCDI interventions in Malawi;
3. To identify priority NCDI conditions in Malawi and identify cost-effective health interventions to address them; and
4. To advocate for and recommend pro-poor pathways and a multi-sectoral approach to address NCDIs in Malawi to inform health sector planning.

2.4 MALAWI NCDI POVERTY COMMISSION APPROACH

The general process undertaken by the Commission is shown in Figure 1. Briefly, the Commission first undertook an analysis on the baseline data available for NCDIs in Malawi. Subsequently, a rigorous priority setting process using data and expert opinion was utilised to identify priority conditions and then to define key health and policy interventions. Finally, the interventions were costed, and findings summarised to establish key findings and recommendations to inform policy, advocacy, and research. The Commission accomplished this by conven-

ing the large group of Commissioners on several occasions between late 2016 and early 2018, supplemented by smaller consultative meetings with experts.

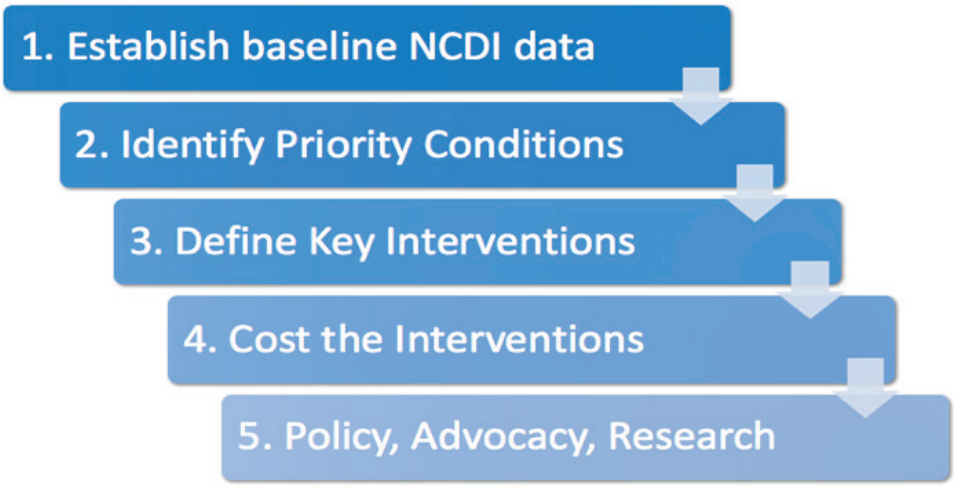

Figure 1 – Malawi NCDI Poverty Commission process

3. Burden of NCDIs in Malawi

3.1 METHODS

3.1.1 Literature Revew

A literature review was undertaken to establish what published literature exists in Malawi around NCDIs. This review aimed to ascertain the kinds of studies published, the disease and population focus of these studies, as well as any other literature related to NCDIs in Malawi specifically. The methodology of the literature review is described elsewhere.[27]

Any studies that focused on NCDI conditions, used Malawi-specific data, and were published between January 1, 2006 and December 31, 2017 were included. Relevant papers were then classified according to article type, physical location, geography (i.e. urban, peri-urban, rural, etc), whether socioeconomic/geographic data were included, outcome type, and how age and sex were reported.

A total of 910 papers were identified through the literature review, of which 130 articles were relevant and included in the results. Figure 2 illustrates the number and type of study found for each cause category.

Of the total 130 articles included, many fell within three major NCDI groups: injuries, neoplasms, and cardiovascular diseases (CVDs)(Figure 2). Far fewer publications focused on other non "4x4" NCDI conditions, such as digestive, neurological, and respiratory disorders, highlighting a lack of research into

specific conditions (Figure 2). For example, in comparison to musculoskeletal conditions—conditions that have a similar DALY burden in Malawi as neurological conditions, for instance—neurological conditions had far fewer articles published at all. While neurological conditions, such as epilepsy (See Voices Box 5), contribute to 4.5% of the total NCDI DALY burden in Malawi, the literature review found just two papers (1.5% of the total relevant literature) that addressed neurological conditions specifically. Similarly, "other NCDs," including conditions such as ulcers, contribute to 20.1% of the disease burden, but again only two papers (1.5%) were found that addressed these "other NCDs" in Malawi. These results suggest that there may be a noticeable gap in research for some NCDI conditions which have significant burdens throughout Malawi.

Additionally, the literature review highlighted some conditions that may have significant impacts on Malawians that are not reflected in the burden of disease estimates. For example, of the 45 papers found in the literature review that related to injuries, 20% (n=9) focused on IPV, and a further 15.5% (n=7) on sexual abuse. In this instance, it is likely that for conditions such as IPV, the literature is pointing to this as a significant priority that needs more action to ensure IPV,

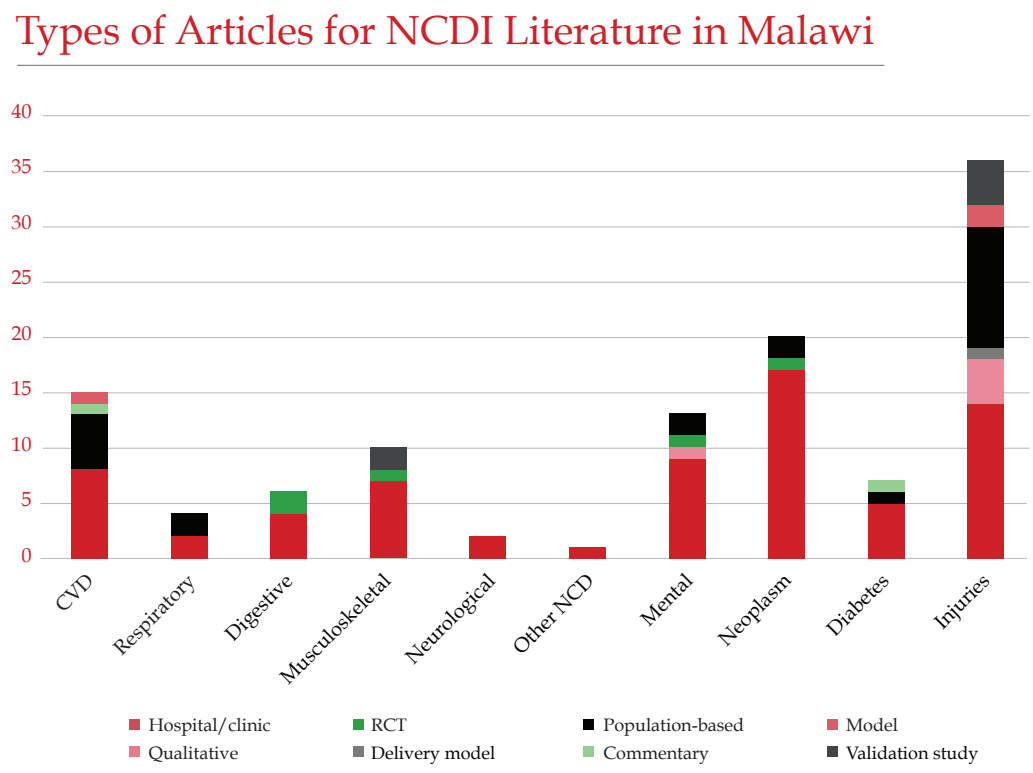

Figure 2 – Types of articles on NCDIs in Malawi published between January 1, 2005 and December 31, 2017

sexual abuse, or other gender-based violent injuries are adequately documented and addressed in Malawi.

As Figure 3 depicts, the literature review also highlighted a lack of broader population-based studies and research conducted in rural populations (Figure 3), which suggests a danger in the generalizability of study outcomes, as key vulnerable groups within Malawi's population may have not been considered in study populations. Though 84% of Malawi's population lives in rural areas, the literature published to date perhaps does not adequately represent these populations, with most data were from central hospitals, district hospitals, or urban clinics. While studies conducted in referral hospitals (located in large urban areas) are useful due to the clinical and research capacity of the hospitals, their findings may skew the data on prevalence, morbidity, and mortality related to NCDIs, as they do not capture segments of the population not readily accessing tertiary care. This literature review finding supports a call for population-based and rural-population focused research so as to ensure that the NCDI burden is well understood equitably across the entire Malawi population.

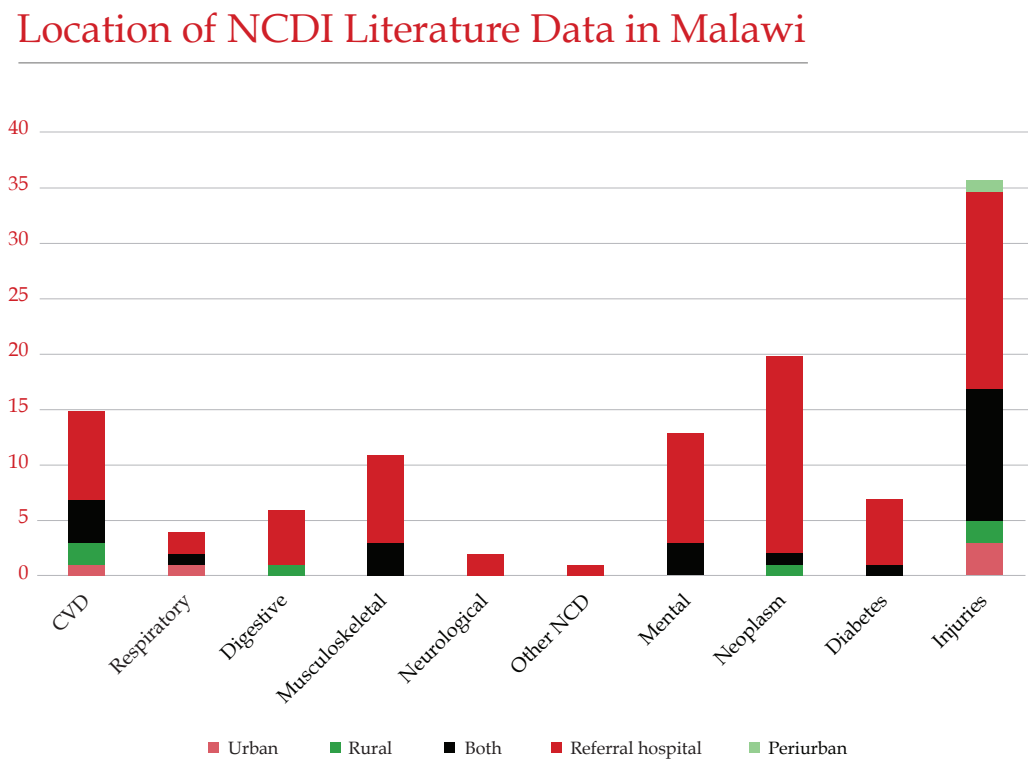

Figure 3 – Literature on NCDIs in Malawi published between January 1, 2006 and December 31, 2017, by NCDI condition and study setting

3.1.2 Global Burden of Disease Study (2015)

The Global Burden of Disease (GBD) initiative began in the early 1990s, when researchers sought to quantify the burden of disease by creating a centralised database for records relating to the mortality and morbidity of diseases worldwide.[29] Global data collected for diseases, injuries, and risk factors was compiled and critically appraised using standardised methods.[30] The results have been reported every few years using standardised metrics, and collaborators now seek to publish annually updated results. The study draws on national, regional, and global data, utilising the expertise of over 2,500 collaborators from 133 countries.[32]

In Malawi specifically, the GBD 2015 estimates compiled 285 records, including Demographic and Health Surveys (DHS), STEPS noncommunicable disease risk factors surveys, Multiple Indicator Cluster Surveys (MICS), Integrated Household Surveys (IHS), as well as research findings from individuals and research groups.[31] Our analysis into the burden of disease for the poorest in Malawi is based on these available GBD estimates for Malawi. In the following situational analysis, we present GBD estimates of the NCDI burden in Malawi, specifically reporting the burden in terms of prevalence and disability-adjusted life years (DALY).

3.1.3 Other Data Sources

Additional data sources were used during the Commission's analysis of the burden of disease in Malawi. These include local datasets such as from the Malawi Epidemiology and Intervention Research Unit (MEIRU)[33], the Service Provision Assessment (SPA)[5], the Fourth Integrated Household Survey[14], and financial data from Resource Mapping[10] and the National Health Account.[3]

3.2 DEFINING THE BURDEN OF NCDIS IN MALAWI

3.2.1 Burden of Disease in Malawi – DALYs

With the increased prevention, treatment, and control of communicable, maternal, neonatal, and nutritional diseases in Malawi, the distribution of Malawi's total DALY burden across all causes has shifted over time. HIV/AIDS specifically, which accounted for 31% of the total DALY burden in 2005, fell to 17% in 2015. NCDs and injuries held an increased proportion of the total burden in 2015, accounting for 25.4% and 6%, respectively, of the total burden of all causes. This means that NCDIs are responsible for approximately 31.3% of the total DALY burden across all causes in Malawi.

Deaths in Malawi by major disease categories

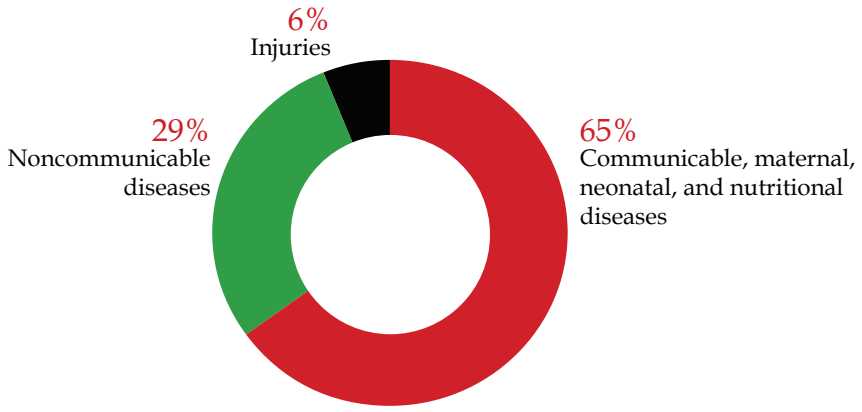

Figure 4a– All-age deaths in Malawi by major disease causes, 2015 (Source: GBD, 2015)

Change in share of DALY burden and deaths due to communicable diseases, noncommunicable diseases, and injuries in Malawi since 1990

Figure 4b– Change in share of DALY burden due to communicable diseases, noncommunicable diseases, and injuries in Malawi since 1990, 2015 (Source: GBD, 2015)

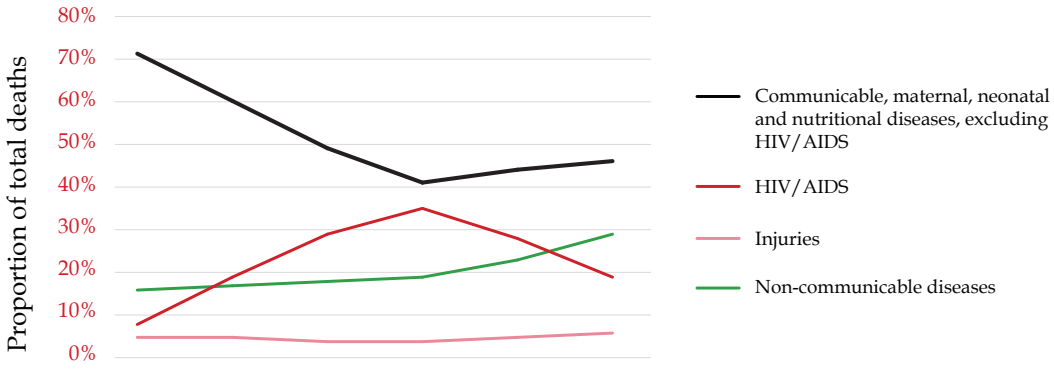

Figure 4c– Change in share of deaths due to communicable diseases, noncommunicable diseases, and injuries in Malawi since 1990, 2015 (Source: GBD, 2015)

Globally, the NCD burden has been attributed to four leading conditions: cardiovascular diseases, cancer, chronic respiratory diseases, and diabetes; these conditions have been classified globally as the 'big four' or the "4X4" NCDs.[35] As Figure 5a shows, GBD Study 2015 estimates show that a percent of Malawi's total DALY burden due to NCDs can be attributed to each of these "big four," including 12.9% due to neoplasms and 11.9% due to cardiovascular diseases.[36] However, these four conditions do not collectively account for the majority of the NCD DALY burden; in fact, they account for only 31.3% of the burden. The remaining majority (68.7%) of Malawi's NCD DALY burden is attributed to conditions outside of these "big four," including neurologic disorders, mental health conditions, and musculoskeletal conditions, digestive disorders, and other NCDs (Figure 5a and 5b).[31,36]

Percent of NCD DALYs in Malawi, by category

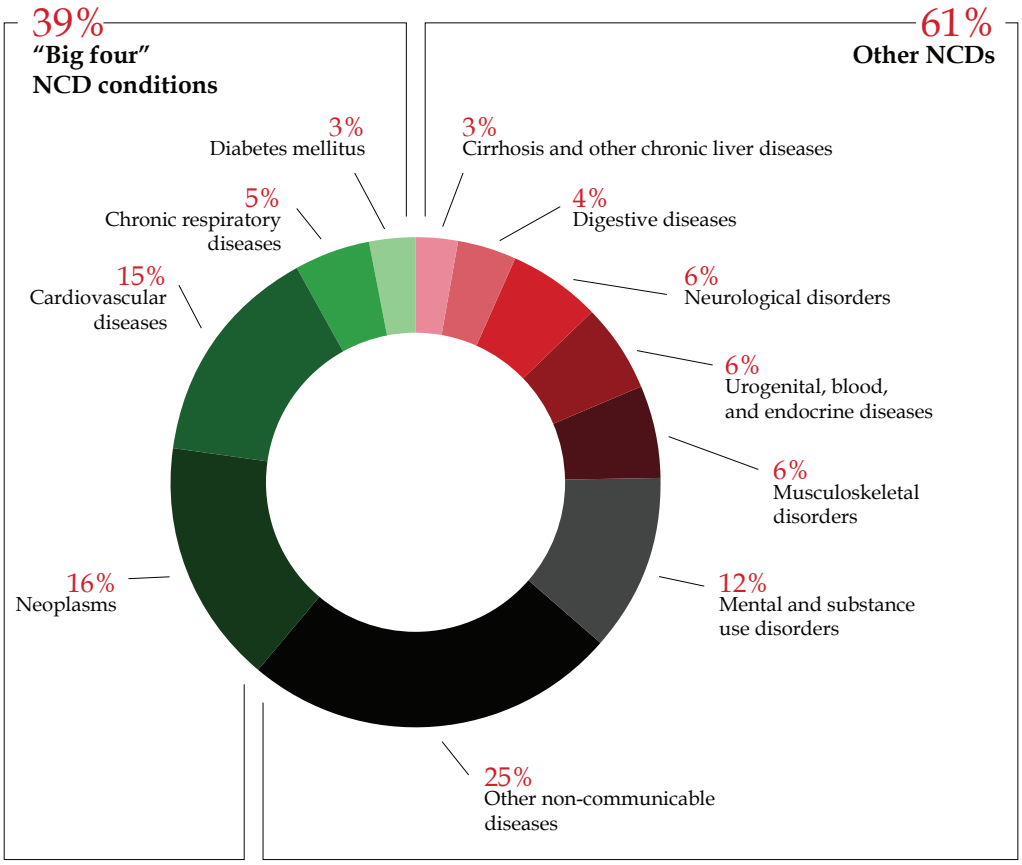

Figure 5a – NCD DALY burden in Malawi in 2015: percentage by 4x4 NCD categories versus other NCD categories (Source: GBD, 2015)

When injuries are included, they account for a greater burden than any of the individual 'big four' conditions, as injuries (combining road traffic injuries, violence, and unintentional injuries) contribute to 19% of the NCDI DALY burden in Malawi.

Percent of NCDI DALYs in Malawi, by condition

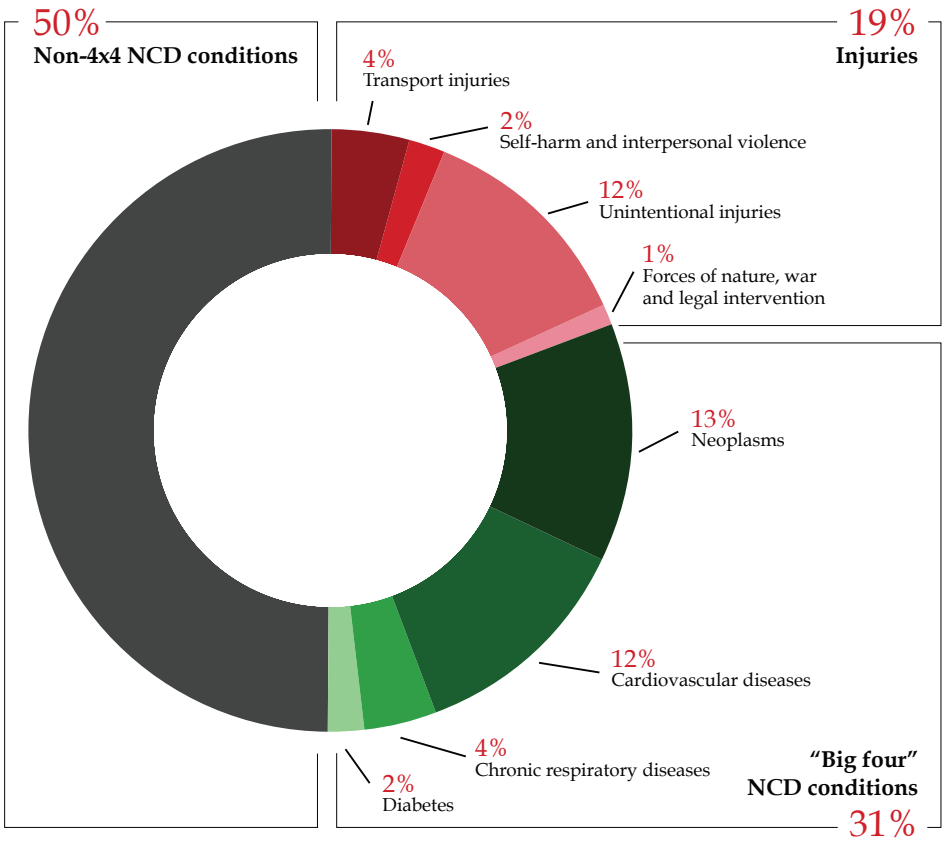

Figure 5b – NCD and Injury DALY burden in Malawi in 2015: percentages by 4x4 NCD conditions, non-4x4 NCD conditions, and injuries (Source: GBD, 2015)

3.2.2 Burden of NCDIs in the Young in Malawi

In Malawi, NCDIs conditions significantly impact the young. In fact, 60.5% of DALYs from all NCDs and 82% of DALYs from injuries, specifically, occur in Malawians under the age of 40 (Figure 6).

DALYs by Age, Malawi 2015

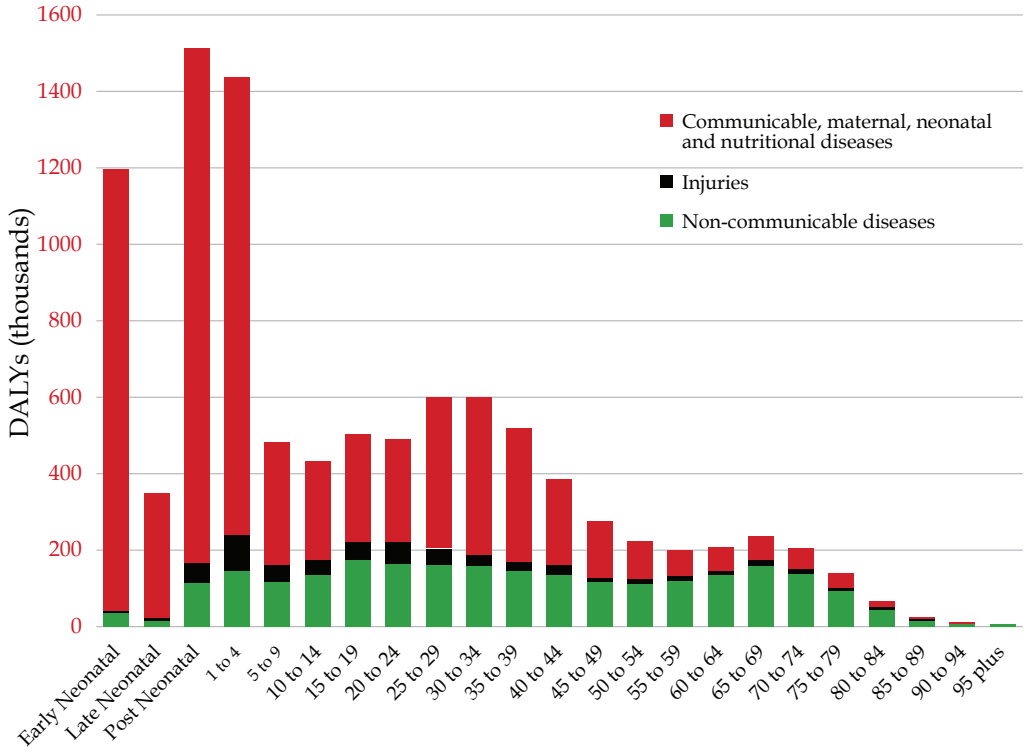

Figure 6 – DALYs in Malawi, by age and condition type, 2015 (Source: GBD 2015)

Individual conditions comprising the contribution of these DALYs by age are shown in Figure 7, demonstrating the diversity of conditions contributing to NCDI DALYs. For example, a significant amount of unintentional injuries is reported in the first few years of life, while both mental health disorders and neoplasms begin to make significant appearances in adolescence.

Contribution to NCDI burden, by age and condition

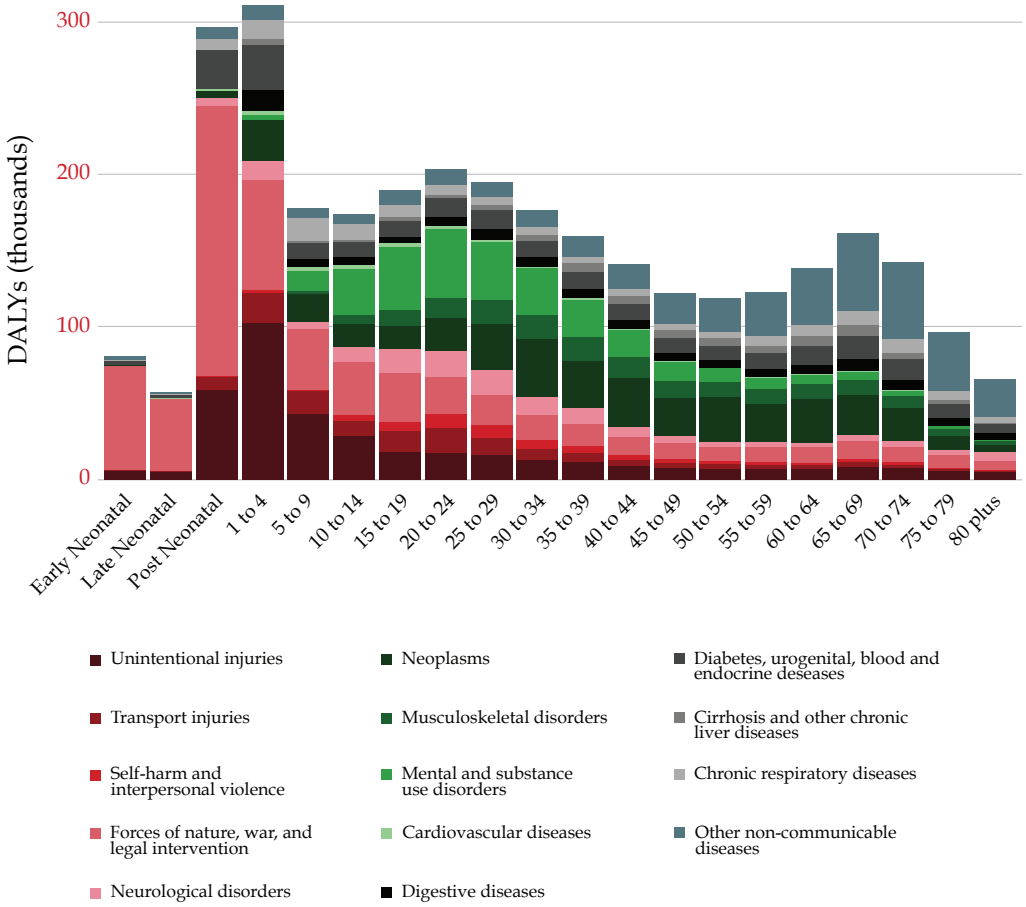

Figure 7 – Contribution to NCDI DALY Burden, by Age and Condition, 2015 (Source: GBD, 2015)

3.2.3 Burden of Disease in Malawi Compared to High-Income Countries

Most conditions cause more DALYs per population in Malawi in comparison to high-income countries.[37,38] Figure 8 illustrates the rates of death and disability for select conditions in Malawi compared to high-income countries. There are significant differences across several conditions common or 'typical' in both settings, such as ischemic heart disease and diabetes, as well as in conditions more common in Malawi, such as oesophageal and cervical cancer, which both cause around 10 times more DALYs than high-income countries. This analysis also shows that, compared to high income countries, epilepsy causes more than twice the DALYs in Malawi (*See Voices Box 5*), rheumatic heart disease almost

four times (*See Voices Boxes 1 & 5*), and both burns and poisonings more than four times the DALYs. In fact, across the board, most conditions are contributing to many more DALYs in Malawi than in high-income settings. The few that were higher in HICs included several mental illnesses, such as schizophrenia (*Voices Box 4*), bipolar disorder, anxiety, and major depressive disorder.

Comparison of Malawi and High-Income Country DALY Rates for 37 Priority Conditions

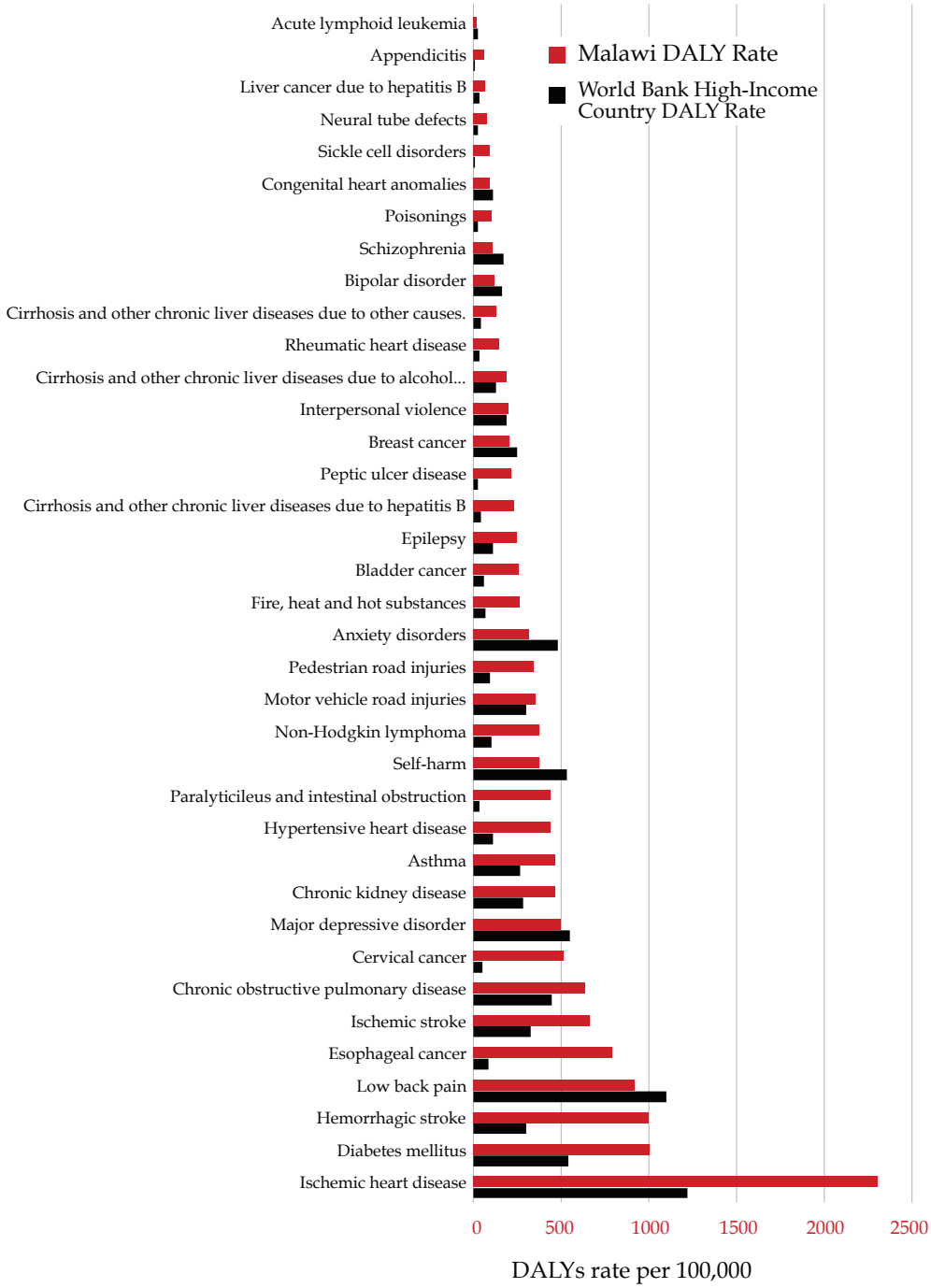

Figure 8 – Comparison of Malawi vs. High-Income Countries, DALY rates for 37 priority conditions, age-standardized, 2015 (Source: GBD, 2015)

In addition, Malawians are more likely to die earlier or lose more years of healthy life than individuals in high-income countries from these NCDI conditions (Figure 9). Severe NCDI conditions, in particular, are impacting the young. For example, children with sickle cell disease lose 78 years of life in Malawi versus 36 in-high income countries. This is similar for epilepsy (58 versus 30 years), rheumatic heart disease (33 versus 12 years), appendicitis (53 versus 18 years), burns (55 versus 22 years), childhood leukaemia (62 versus 32 years), and poisonings (71 versus 34 years).

Comparison of Malawi and High-Income Countries for Years of Life Lost per Death

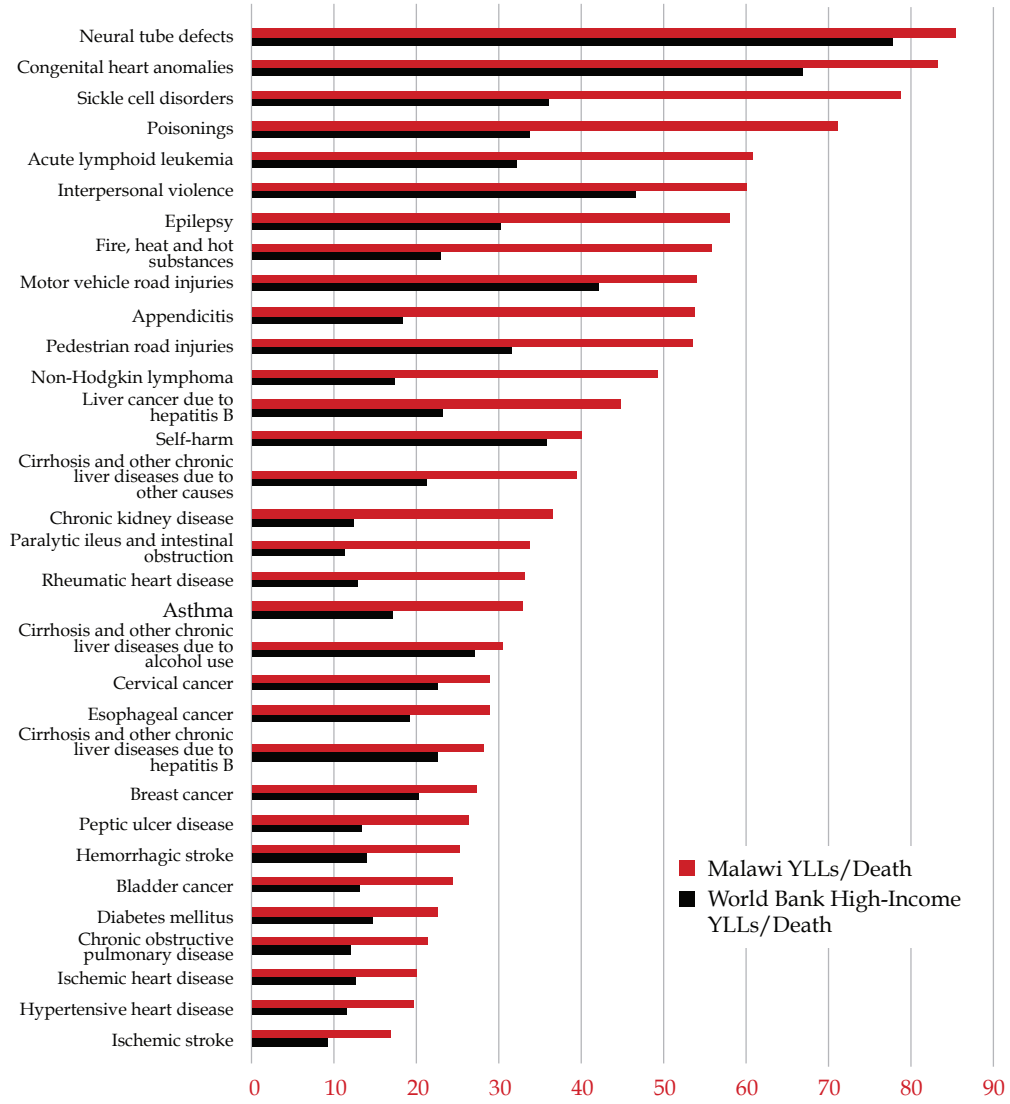

Figure 9 – Comparison of Years of Life Lost in Malawi vs. High-Income Countries, by Condition Type and Disease Category, 2015 (Source: GBD, 2015)

As shown in Figure 10, all diseases- and particularly severe NCDs and injuries- cause an overwhelming loss of life years in Malawi compared to high-income settings. In the figure, those with these severe NCDI conditions are predominately located in the bottom left quadrant and fall farther away from the linear forecast line, showing that people with these diseases are dying far earlier than their counterparts in HICs.

Comparison of Years of Life Lost in Malawi to High-Income Countries, by Condition Type and Disease Category

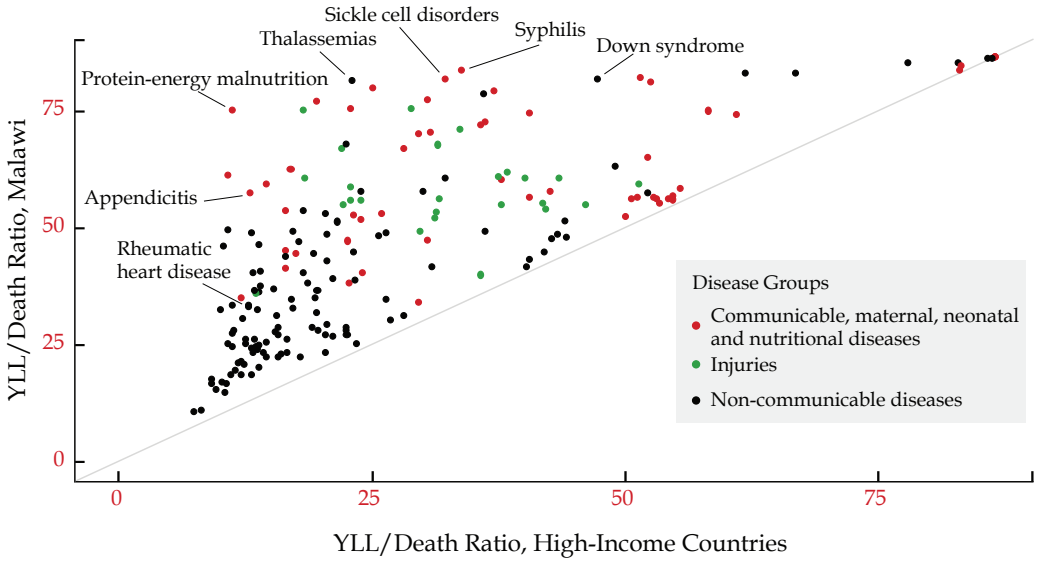

Figure 10 – Comparison of Years of Life Lost in Malawi vs. High-Income Countries, by Condition Type and Disease Category, 2015 (Source: GBD, 2015)

Additionally, when considering equity and the burden of disease amongst the poor, severity of conditions must be examined. Figure 11 shows years of healthy life lost for people with a given disease – combining death and disability rates – compared to the prevalence of that disease. This relationship indicates that there are some conditions, such as sickle cell disease, that are less common but far more severe than other conditions, such as back pain, that have high prevalence but less severity and loss of healthy life years. The less common but severe NCDs should, falling in the top left quadrant of Figure 11, should thus be considered when setting priorities.[39]

Years of Healthy Life Lost in Malawi, by Disease

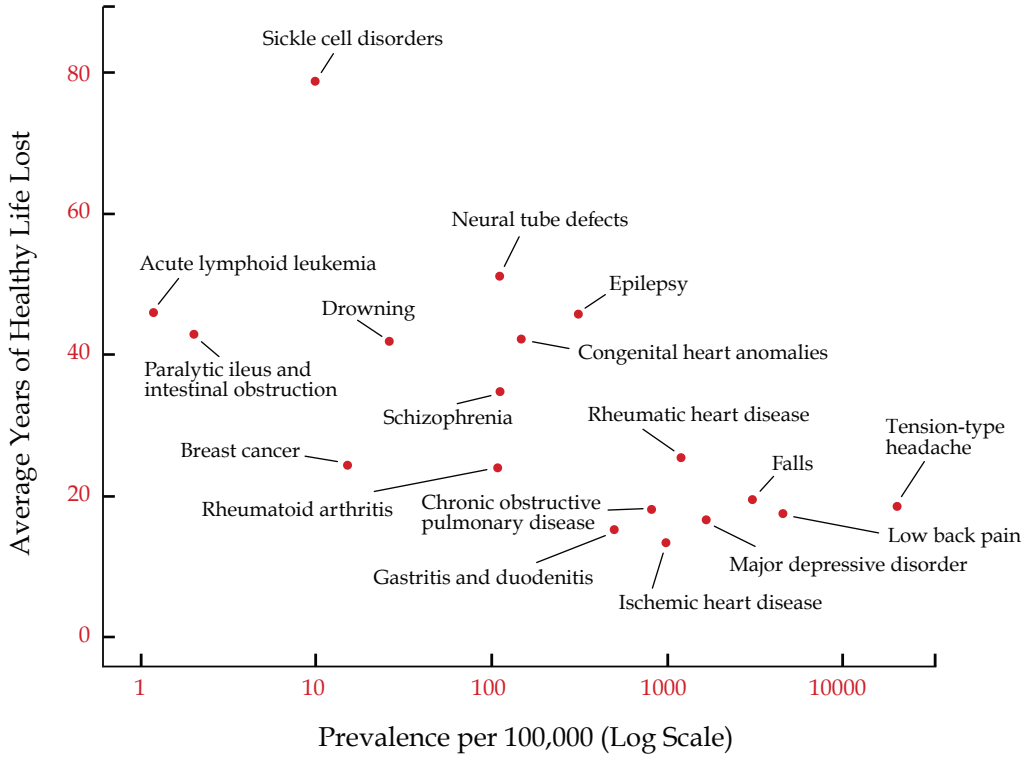

Figure 11 – Years of Healthy Life Lost in Malawi, by Disease, 2015 (Source: GBD, 2015)

3.2.4 Burden of Disease in Malawi: Risk Factors

Globally, the dominant 4x4 narrative of NCD risk factors has attributed NCDIs to behavioural and metabolic risks, including high body mass index (BMI), diet, smoking, alcohol, drug use, low physical activity, high blood glucose, high cholesterol, and elevated blood pressure.[35] While these are important considerations in Malawi, they far from explain the factors to which the majority of NCDs are attributed. As Figure 12 reveals, a remarkable 79% of the overall NCD burden is not attributable to select metabolic and behavioral risk factors, meaning that the remaining majority of the attribution is due to environmental risk factors and factors unattributable to the GBD 2015's selected behavioural and metabolic factors.[35] Appendix 1 displays the GBD Study 2015's 51 selected risk factors in detail.

Percent of Total Malawi NCD DALY Risk Factor Attribution

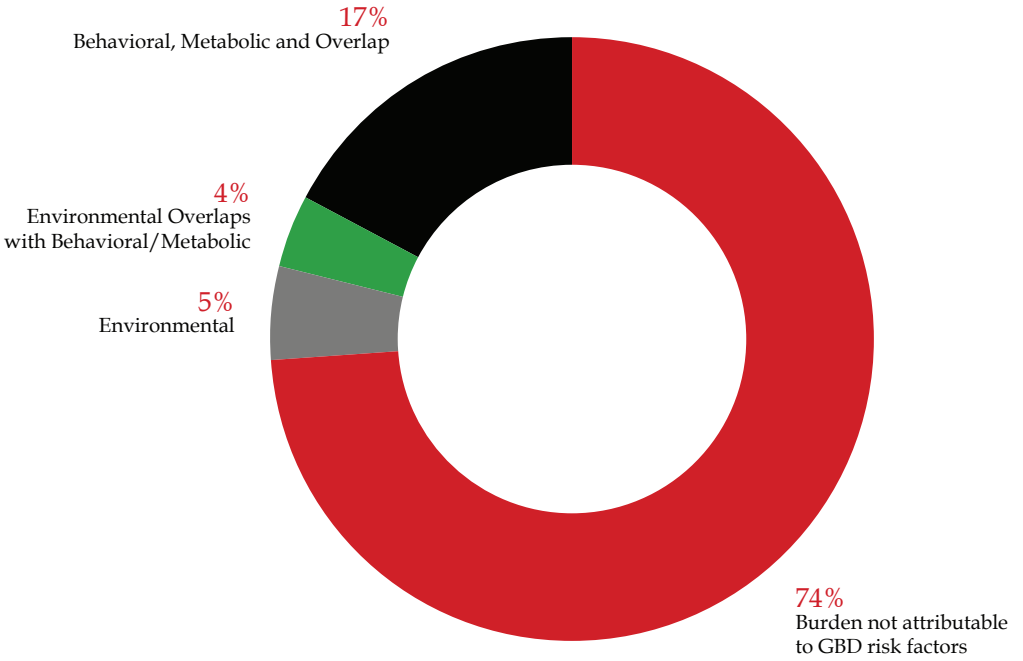

Figure 12 – Percent of NCD DALYs Attributed to Selected GBD Risk Factors, 2015 (Source: GBD, 2015)

Figure 13 shows the NCDI risk attribution broken down by select NCDI conditions, again depicting the majority of NCDI conditions as attributed more so to environmental and non-GBD risk factors such as poverty, infectious disease, and access rather than behavioral and metabolic risks. Examples of such non-4x4 risks include infections such as Hepatitis B virus contributing to liver disease and cancer, childhood meningitis or malaria contributing to epilepsy, or strep infection contributing to rheumatic heart disease.[40] Important environmental risks related to poverty in this analysis include ambient particulate matter pollution from indoor cooking.[37]

Percent of total Malawi NCDI DALY Risk Factor Attribution, by Cause

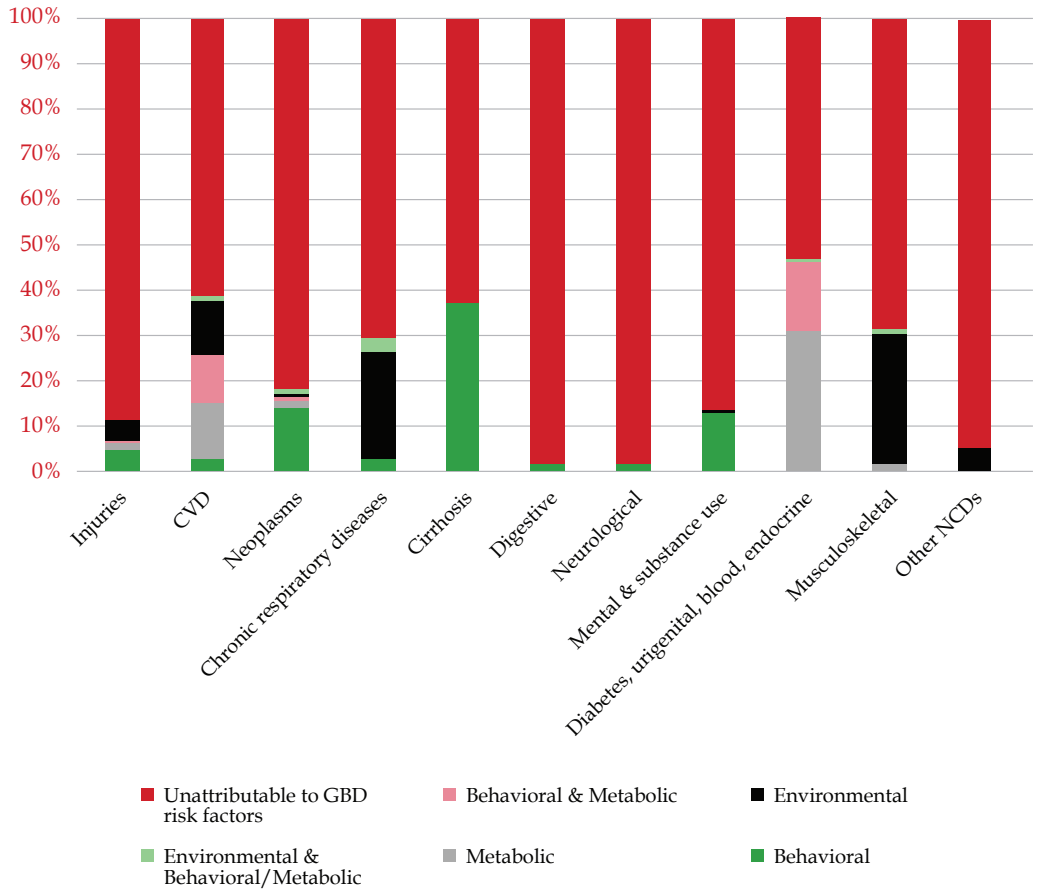

Figure 13 – Percent of Total Malawi NCDI DALY Risk Factor Attribution, by Cause, 2015 (Source: GBD, 2015)

3.3 OVERVIEW OF SPECIFIC CONDITIONS IN MALAWI

The following section provides further analysis of GBD Study 2015 estimates as well as an overview of the literature for specific NCDI conditions in Malawi and key findings from research in Malawi.

3.3.1 Cancers

Cancers account for the greatest burden of the main four NCDs in Malawi.[36] Oesophageal cancer accounts for the highest burden of disease in Malawi (an estimated 2.0% of NCDI DALYs) and the highest percentage of deaths (1.4%), with non-Hodgkin's lymphoma and cervical cancer as the next largest contributors to NCDI burden (0.87% and 0.82%, respectively). There are no estimates on Kaposi sarcoma by GBD. (See Voices Box 3)

Local data for Blantyre, from the Malawi Cancer Registry between 2008-2010, found that the most common cancers registered in men were Kaposi sarcoma (KS) (40.5%), oesophageal (13.3%), non-Hodgkin lymphoma (9.2%), prostate (5.1%), and bladder (3.7%).[41] For women, the most common cancer registered was cervical (34%), followed by KS (16.2%), oesophageal (7.9%), breast (7.3%), and non-Hodgkin's lymphoma (5.2%). Furthermore, for children, the study found that the most common cancer registered was Burkitt lymphoma (32.5%), and then Wilms tumour (11.3%) and KS (11%).[41]

In a paper describing risk factors for cancer patients presenting at the central hospital in Lilongwe, authors found that age, smoking, and HIV were the most important risk factors for the most common cancers.[42] Similar to the results found in Blantyre, the most common cancers presenting were found to be oesophageal (34.5%), cervical (21.9%), KS (10.4%), and breast (7.4%). The study found that for patients with the four listed most common cancers, the majority were younger than 55: specifically, 72% of patients with cervical cancer and 76% of patients with breast cancer were less than 55 years old[42], consistent with the age-distribution of the population.[36]

A study examining KS specifically from 2014-2016 in the cancer registry in Kamuzu Central Hospital found 237 total cases, of which 153 were confirmed HIV-positive and 21 confirmed HIV-negative. Diagnoses were histologically confirmed in 39%, suggesting the majority of KS diagnoses occur by clinical criteria.[43]

3.3.2 Cardiovascular Diseases

Cardiovascular diseases (CVDs) are estimated to account for around 373,423.8 total DALYs lost in Malawi, at a rate of 2,169.3 DALY/100,000 population.[36] Additionally, the burden of CVD in Malawi is characteristically different than in HICs.[38] Figure 14 shows the sub-causes of CVD, and conditions such as rheu-

matic heart disease (See Voices Box 1) and hypertensive heart disease that are estimated to be more common in Malawi.

Comparison of Causes of Cardiovascular Diseases between Malawi and High-Income Countries

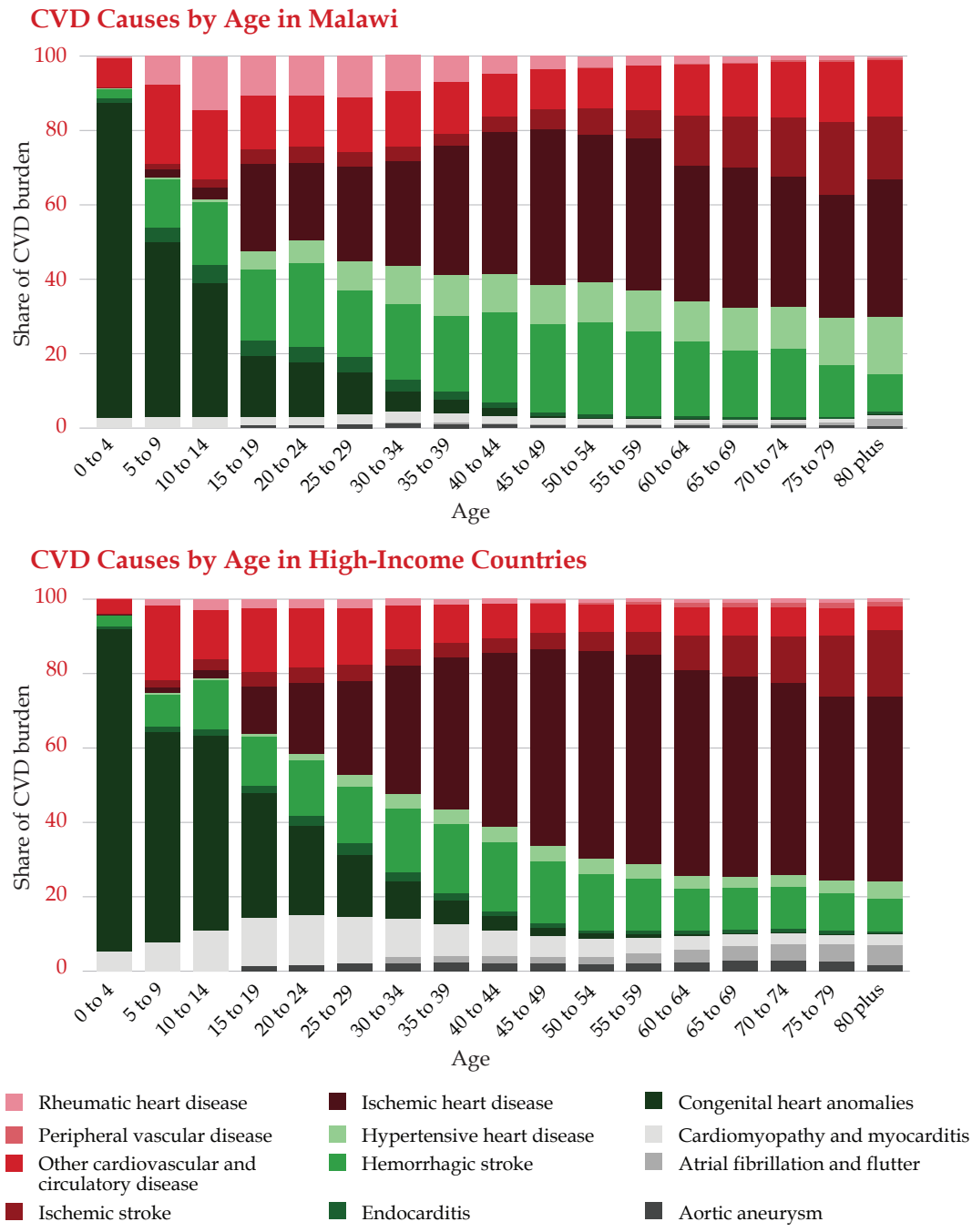

Figure 14 – Comparison of Causes of Cardiovascular Diseases by Age between Malawi and High-Income Countries, 2015 (Source: GBD, 2015; World Bank, 2015)

Though ischemic heart disease is a less common condition, with an GBD 2015 estimated population prevalence of 0.68%, it contributes heavily to the burden of disease. 33.1% of the overall CVD burden and 4% of the overall NCDI DALYs is attributed to ischemic heart disease and the mortality rate is high, causing 37.1% of CVD deaths, 10.3% of overall NCDI deaths, and 3.7% of the overall deaths from all causes in Malawi in 2015. Haemorrhagic stroke, ischemic stroke, and hypertensive heart disease are the next biggest contributors to the burden of disease and mortality in Malawi. According to GBD Study 2015 estimates, rheumatic heart disease (RHD) contributes to an estimated 0.5% of the NCDI DALY burden, with an estimated overall population 0.8% prevalence rate in Malawi. (*See Voices Boxes 1 & 5*) Rheumatic heart disease patients in Malawi lose 2.6 times more healthy years of life than patients in high-income countries with rheumatic heart disease, and this diagnosis causes 3.8-fold more DALYs in Malawi. A 2016 review on echocardiography in heart failure in Malawi suggested that valvular disease, mainly rheumatic, was the most frequent diagnosis among heart failure patients up to 2005, with later studies pointing to incidence of left ventricular failure and pericardial disease.[44]

While the 2009 STEPS survey estimated the prevalence of hypertension to be 32.9% for people between the ages of 25 and 64[14], local data and expert opinion suggest that the prevalence might be closer to 15%-29%.[19,45] A study surveying rural and urban populations in both Lilongwe and Karonga ages 18+ found a 14-16% urban prevalence rate in adults, compared to 13-14% in rural adults.[45] Similarly, a study in Zomba District found higher hypertension prevalence amongst urban HIV patients, with 25.5% prevalence, compared to 21.0% in rural adults.[19]

The risk factors for CVDs are commonly thought to be related to lifestyle factors, such as smoking, obesity, harmful alcohol use, or physical inactivity (i.e. behavioural and metabolic risk factors). However, analysis of risk factor attribution from the GBD estimates that less of the CVD burden in Malawi is attributable to these factors in comparison to high-income countries. In Malawi, 25.6% of the burden of CVDs was found to be *not attributable* to behavioural or metabolic risk factors, compared to only 18.7% in high-income countries.

Studies conducted in Karonga and Lilongwe through the Malawi Epidemiology and Invention Research Unit (MEIRU) show that for hypertension, disaggregation by wealth and rural/urban location reveals significant gaps in risk factors, morbidity, and access to care for the different populations.[45] Tobacco and alcohol consumption have been found to be higher in rural populations, particularly amongst men, whereas obesity, physical inactivity, and raised blood pressure, cholesterol, and fasting blood sugar were higher for urban populations. When stratifying by wealth quintile for household assets, the wealthier the household, the more likely individuals were to be overweight. Increased educational achievement was also associated with being overweight, and women were found

to be more likely to be overweight than men in both rural and urban households. Further study found that individuals from the wealthier households were much more likely to have ever been tested for, or diagnosed with, hypertension and diabetes than poorer individuals; thus meaning that their wealth was found to be disproportionate to their rate of these conditions.[45]

3.3.3 Chronic Respiratory Diseases

Analysis of GBD estimates for chronic respiratory diseases (CRDs) shows a similar pattern to cardiovascular diseases of a higher DALY rate in Malawi compared to high-income countries: the DALY rate for CRDs is lower in Malawi (752.2/100,000) than in high-income countries (1019.9/100,000).[36,38] Asthma has the highest CRDs estimated burden of disease (56.0% of the CRD DALY burden and 2.3% of NCDI DALY) and prevalence (6.1%) for CRDs in Malawi. Despite this the Commission did not locate any population survey data on asthma prevalence in Malawi. The second highest CRD was COPD, comprising 32.5% of the CRD burden, 1.3% of NCDI DALY, and 0.7% prevalence.

Furthermore, the differences in risk factor attribution between Malawi and high-income countries is even more stark than for CRDs, with 94.2% of the disease burden for CRDs in Malawi not attributable to behavioural or metabolic risk factors. This is likely attributable to several conditions related to poverty including indoor burning of solid fuels and a high incidence of pneumonia and tuberculosis. However, more research is needed. Increasing the amount of evidence surrounding risk factors in Malawi for CRDs, particularly in settings of poverty, is therefore crucial to address these diseases and their causative factors.

3.3.4 Diabetes Mellitus

Diabetes accounts for an estimated 2.4% of the NCDI DALY burden in Malawi.[36] According to GBD estimates, the prevalence of diabetes is 1.9% in the total population, for all ages, and contributes to 1.3% of all deaths.

STEP survey on the prevalence of diabetes amongst adults aged 25-64 indicated that the prevalence of raised fasting blood glucose or persons currently taking diabetes medication was 5.6%[14], with more recent data from large urban and rural studies suggest the prevalence is closer to 3.0 and 1.7% respectively.[45]

In terms of known risk factors for diabetes, one study found that obesity, physical inactivity, and raised fasting blood sugar were higher for urban than rural populations.[45] Urban adults were more likely to have been diagnosed as diabetic or to have ever had their blood glucose checked. The prevalence of diabetes increased with wealth quintile, as did ever being tested or diagnosed (whether or not they were found to have diabetes.[45]

The Commission could not locate any specific prevalence estimates or other data for type 1 diabetes in Malawi. (*See Voices Box 2*)

3.3.5 Digestive Diseases

Digestive diseases contribute to an estimated 3.4% of the NCDI burden and 1.8% of deaths.[36] Paralytic ileus and intestinal obstruction contributes the most to the burden of disease (1.1% of NCDI DALY) and the highest percentage of deaths (0.7%), with peptic ulcer disease and gastritis and duodenitis as the second and third largest contributors (0.6% and 0.5%, respectively of NCDI DALY). However, of the total 3.1% prevalence of all digestive diseases, gastritis and duodenitis are by far the most prevalent, at 2.1%.

3.3.6 Injuries

Injuries account for an estimated 19% of all NCDI DALYs in Malawi and contribute to 6.4% of all deaths.[36] The DALY rate for injuries in Malawi is much higher than in high-income countries, with a rate of 782 DALYs/100,000 people compared to 576 DALYs/100,000.[36-38]

In terms of single-category conditions, falls are estimated to make up the largest burden of disease (2.1% of NCDI DALY) and have the second highest prevalence (2.0%).[33] Much of the rest of the burden from injuries comes from road injuries, which, when combined, make up 4.3% of the burden (this includes pedestrian, motor vehicle, motorcyclist, and other road and transport injuries) and account for 1.6% of deaths.

A review of all trauma cases presenting at Mulanje District Hospital, in Southern Malawi, between April 2013 and December 2014 found the average age of trauma patients to be 22.4, with the majority of injuries sustained at home (65.2%).[46] The most common injuries were falls, with a significantly larger proportion of girls and women presenting with falls than boys or men. An earlier 2009 study had also found that women and children were more likely to suffer from falls than men.[47] A study at Kamuzu Central Hospital in Lilongwe found that 30.6% of all trauma cases seen were paediatric (0-16 years), with falls being the most common injury (43%), then burns (11.1%), pedestrian road traffic injuries (9.7%), foreign bodies (7.5%), and assaults (7.2%).[48]

A study in Karonga District identified that the rate of deaths from external causes in Karonga was lowest at age 5–14 years.[41] Adult males had the highest rate of death from external causes; five times the rate in adult females. Drowning, road traffic injury and suicide were the leading causes of death and alcohol consumption contributed to more than one quarter of the deaths from external causes in men. Epilepsy also featured as a risk factor.

In a review of road traffic collisions between 2008 and 2012, 34% of reported collisions resulted in at least one fatality.[49] The average age of fatalities was 32, 82% were male, and pedestrians had the highest odds of mortality (with bicyclists the next highest followed by drivers with the lowest odds). Furthermore, although

there was no statistical difference between where the collisions occurred (urban vs. rural), those that did occur in rural areas where more likely to result in a fatality.[49]

3.3.6 Neurological and Mental Health Disorders

Neurological disorders account for an estimated 4.5% of the NCDI burden in Malawi in 2015, with migraines and epilepsy contributing to the highest burdens of disease (1.7% and 1.6% of NCDI DALY burden, respectively).[36] *(See Voices Box 5)*

Mental health and substance use disorders account for 2.3% of the total DALY burden in Malawi, and 9.4% of NCDI DALY. (See Voice Box 4) According to GBD estimates, major depressive disorder contributes has the highest DALY burden for mental health conditions (3.5% of the NCDI DALY burden) and the highest prevalence (3.2%). Local findings from a health centre in Zomba District discovered that 30% of patients attending an outpatient clinic met the DSMIV criteria for a major or minor depressive episode. However, that same study found that clinical diagnosis of depression was 0% by primary health care clinicians, highlighting both the prevalence of depression and how it is going undiagnosed and unmanaged.[50]

3.4 BURDEN OF DISEASE RELATED TO POVERTY

3.4.1 Poverty in Malawi

Figure 15 shows the proportion of people by district in Malawi considered to be in the poorest billion based on being deprived in at least 5 of the 8 categories in the Multidimensional Poverty Index.[51] Overall, 48.9% of Malawi's population belongs to the poorest billion people in the world.[30] This accounts for 54.8% of people in rural areas and 14.5% in urban settings (Figure 16).[48] The distinction of urban versus rural, defined by the categories in the Demographic and Health Survey (DHS)[2], is broken down by district in Figure 17.

Distribution of the Poorest Billion in Malawi

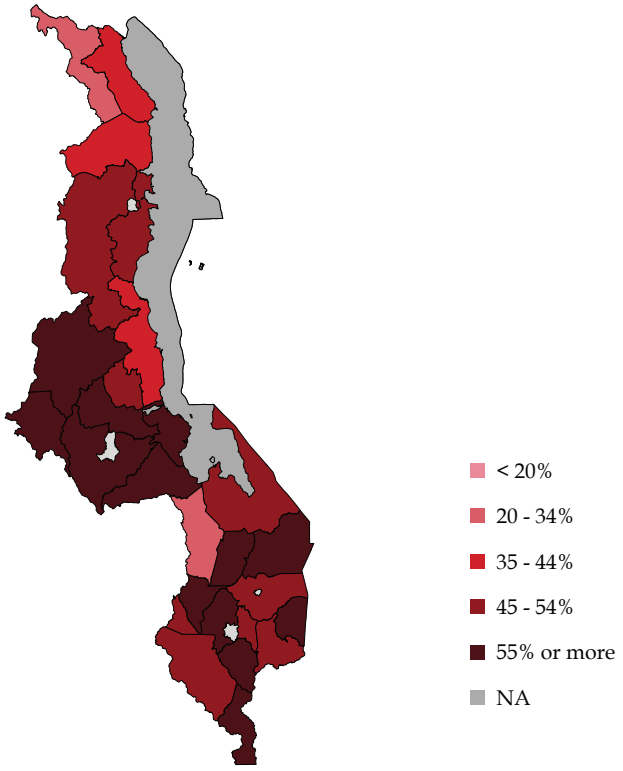

Figure 15 – Distribution of the poorest billion in Malawi by District, 2016. (Source: Malawi DHS, 2015-2016)

Percent of People Living in the Poorest Billion in Malawi, Rural vs Urban

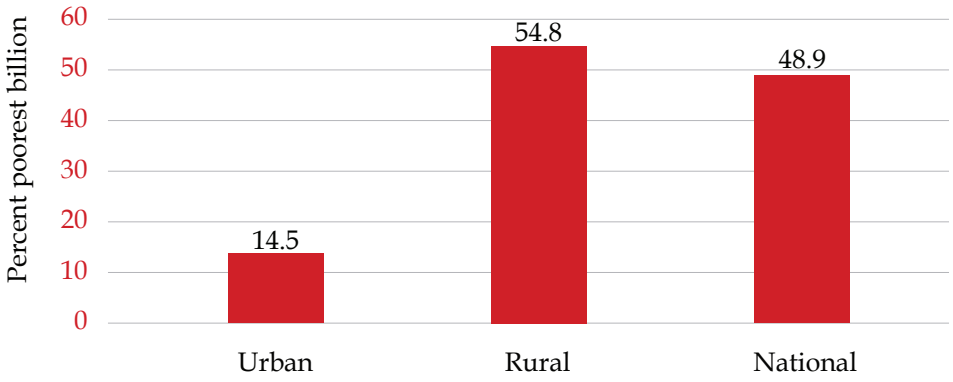

Figure 16 – Percent of people living in the poorest billion in Malawi, rural vs. urban, 2016. (Source: Malawi DHS, 2015-2016)

Distribution of the Poorest Billion in Malawi, by District

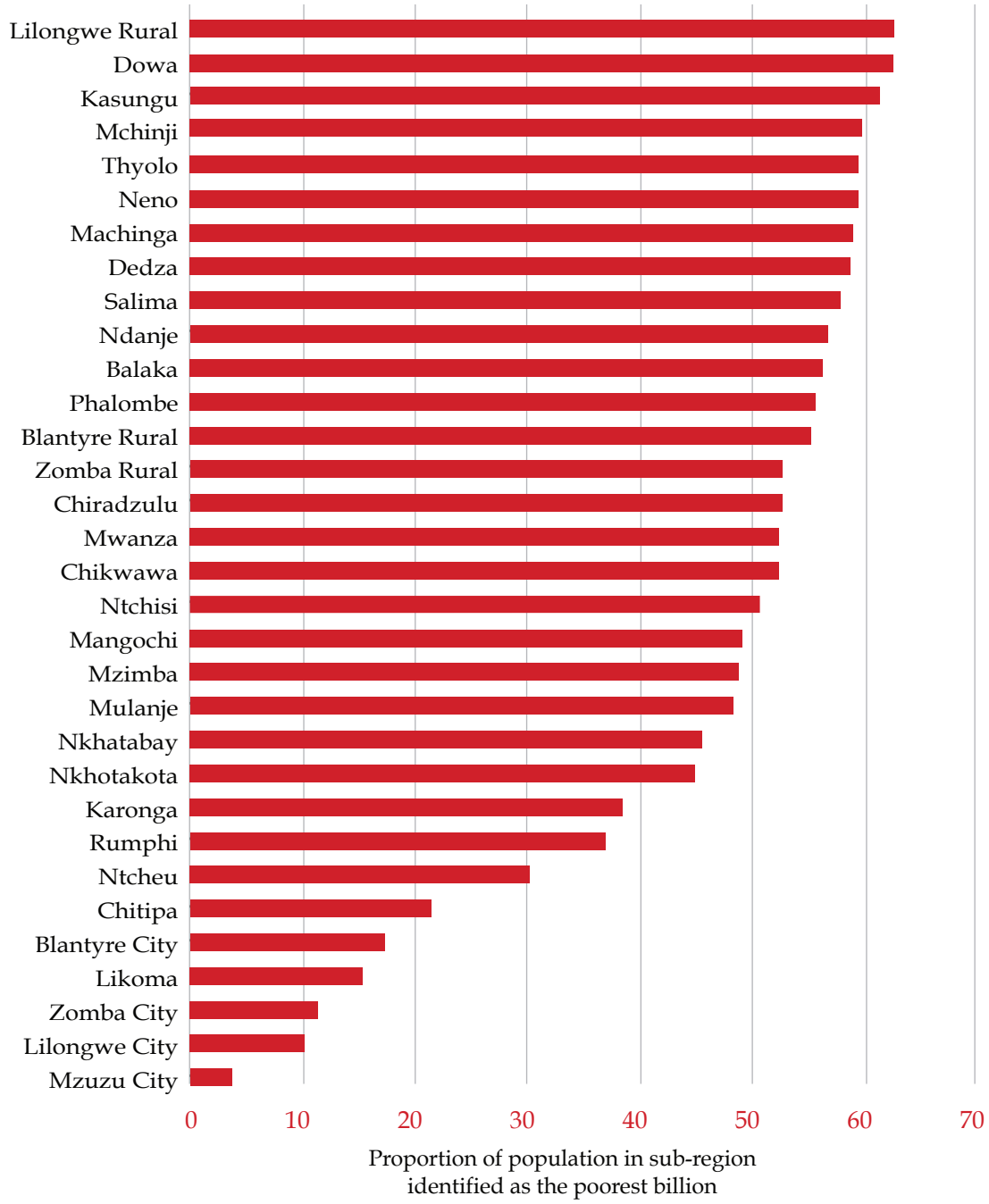

Figure 17 – Distribution of the poorest billion in Malawi by district, 2016. (Source: Malawi DHS, 2015-2016)

3.4.2 NCDIs in the Poor in Malawi

Malawi's fourth Integrated Household Survey (IHS4) (2016-2017), which is a large detailed survey that collected information on poverty, demographics, health, and several other domains in over 12,000 households, is designed to be representative at national, district, urban, and rural levels.[34] Respondents to this survey self-report several health factors including presence of chronic illness and chronic NCDIs, health seeking behavior, recent hospitalization, and health spending. Thus, utilizing the Malawi Health Equity Tool (2017)[52], it is possible to look at the prevalence of self-reported chronic NCDIs by age, gender, wealth quintile, and several other factors.[53]

Table 1 shows characteristics of selected self-reported chronic illnesses, including HIV and several chronic NCDs. The population surveyed is young, with 42% of respondents under the age of 15. (49) Chronic illness was reported in 7% of respondents, including 3% with a chronic NCD. Over 40% of patients with self-reported NCDs had been ill in the past two weeks, with highest reports of recent illness in people with asthma or cancer and with 10% having been hospitalized in the last year. Chronic illness's financial impact is shown through the survey responses, with those ill in the past two weeks from an NCD stopping work for an average of 3.7 days and almost 40% of those hospitalized forced to borrow money or sell belongings to pay for their hospital costs. Costs incurred were also seen for those choosing to see a traditional healer (generally 1% or less, although this was higher for patients with epilepsy who incurred up to 3.5%), with this spending most notable for people with mental illness (*See Voices Box 4*). When selected characteristics of patients with HIV were compared with those with a chronic NCD, it was found that people with self-reported NCDs were more likely to be sick in the previous two weeks and to have spent money on medical expenses within the last month. Differences were not significant regarding the number of days activities were stopped when ill, hospitalization rates, or amounts of money spent on recent medical expenses or hospitalizations.

Figure 18 shows the prevalence of patients self-reporting chronic NCDs, disaggregated by wealth quintiles. A higher percentage of individuals self-reporting diabetes fell within the highest wealth quintile, which could be due to the likelihood that those with higher wealth may have increased access to diagnostic services and treatment. However, epilepsy, mental illness, and tuberculosis appear more common among the poorest quintile than the wealthiest. In respondents with self-reported epilepsy and pregnancy, a notable 37% reported home deliveries. This was drastic when compared to all respondents and those with any NCDs, only 4.4% and 5.3%, respectively, of whom had reported their children to have been delivered at home rather than at a facility.

There are clear limitations to the IHS4 and its data, the main being that it is self-reported illness by respondents rather than a diagnostic population survey,

such as the STEPS Survey. In addition, a high proportion of respondents were young. Furthermore, the list of chronic conditions is not comprehensive, and additional informative data could include information about cardiovascular disease, liver disease, etc. The survey also does include information about injuries including burns, fractures, wounds, and poisonings, which the Commission intends to use to inform future work.

	SELF-REPORTED CONDITIONS							
	All respondents	NCDs	HIV	Diabetes	Epilepsy	Mental illness	Asthma	Cancer
% female	52.0%	49.5%	66.0%	58.3%	45.5%	34.9%	46.4%	35.9%
% of respondents under 15	42.3%	33.7%	6.3%	0.0%	44.9%	24.2%	47.9%	0.0%
% of respondents under 5	13.9%	8.6%	0.8%	0.0%	5.7%	2.1%	15.5%	0.0%
% sick in last two weeks	26.9%	44.2%	37.4%	33.7%	38.9%	32.7%	49.2%	73.2%
% sought treatment formal healthcare system	55.5%	64.4%	67.3%	79.1%	52.0%	54.6%	67.5%	90.1%
Average days activities stoppped because of illness in last 2 weeks	3.1	3.7	4.2	4.2	3.4	5.8	3.7	3.7
% of people who spent money on medical expenses in the past 4 weeks	4.9%	9.9%	5.2%	14.2%	7.0%	6.8%	12.0%	6.9%
% hospitalized in last 12 months	3%	10%	11%	17%	9%	8%	10%	34%
Average cost of hospital stay in last 12 months	6,088	8,042	5,976	12,553	2,070	2,519	9,135	2,504
% borrowed money or sold stuff to pay for hospital costs in last 12 months	39.2%	37.1%	40.0%	28.6%	37.4%	44.9%	38.2%	75.7%
% stayed at traditional healer in last 12 month	0.2%	1.3%	0.8%	1.0%	3.5%	1.3%	0.8%	0.0%
Average total cost of traditional healer stay	3,851	4,939	3,397	1,969	2,761	21,709	1,543	NA
% borrowed or sold assets to pay for traditional healer in last 12 months	36.1%	45.1%	15.0%	0.0%	33.1%	100.0%	54.5%	NA
% originally diagnosed by healthcare worker	84.0%	84.2%	99.7%	100.0%	65.1%	81.2%	90.6%	100.0%
% of children delivered at home	4.4%	5.3%	0.0%	NA	37.4%	0.0%	2.9%	NA

Table 1 – Self-reported chronic illness characteristics, 2016-2017. (Source: IHS4, 2016-2017)

Self-reported chronic illness and NCDI by wealth quintile

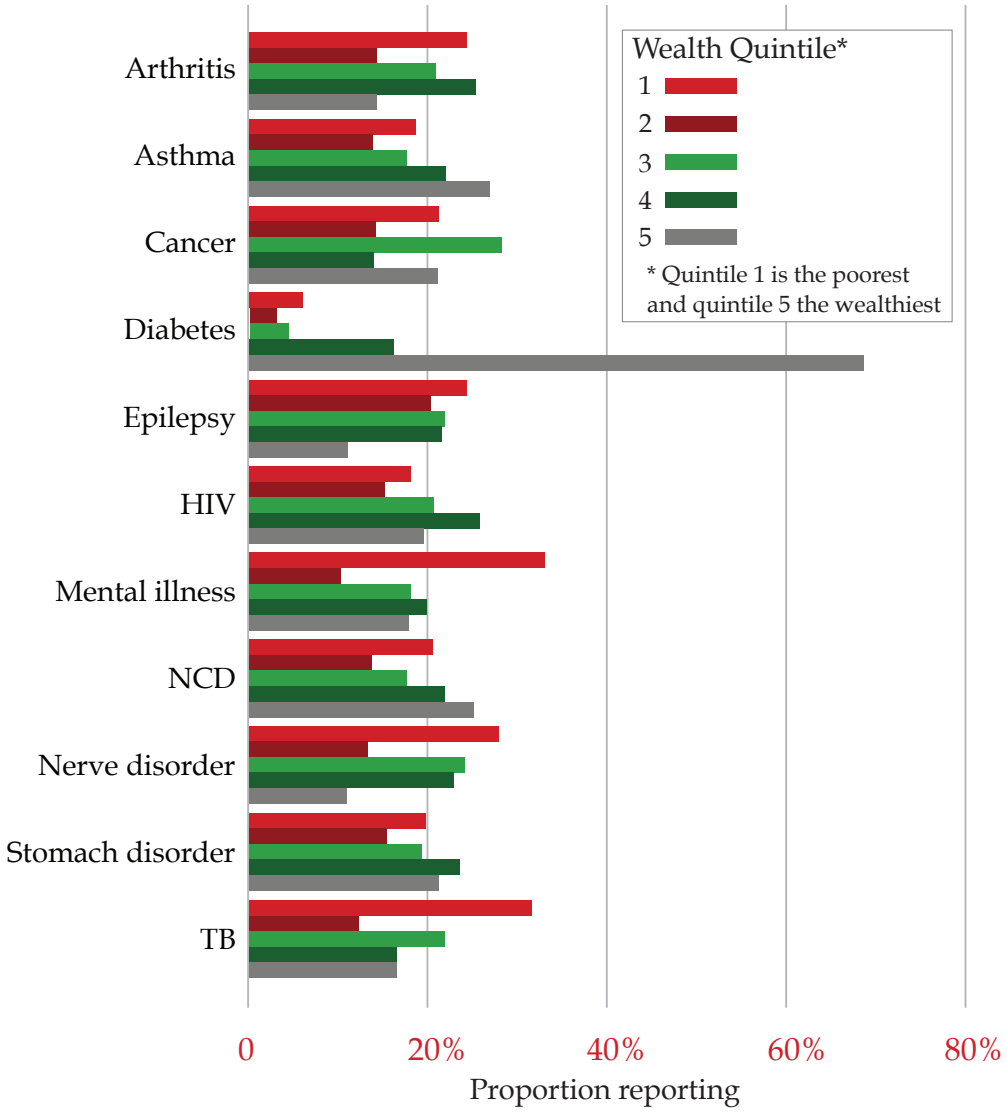

Figure 18 – Self-reported chronic illness and NCDI by wealth quintile, 2016-2017. (Source: IHS4, 2016-2017)

As Malawi strives toward Universal Health Coverage (UHC), avoiding catastrophic health expenditures is a critical consideration. National data supports what the Integrated Household Survey shows. Household out-of-pocket spending in Malawi in the 2014-15 fiscal year was 10.8% of overall spending on health; the out-of-pocket spending on NCDs was 14.7% (Figure 19).[3] This indicates that households cover a higher proportion of costs associated with NCDs, reflecting less pooling or financial risk protection for people with NCDs.

Out-of-Pocket Expenditure, by Conditions

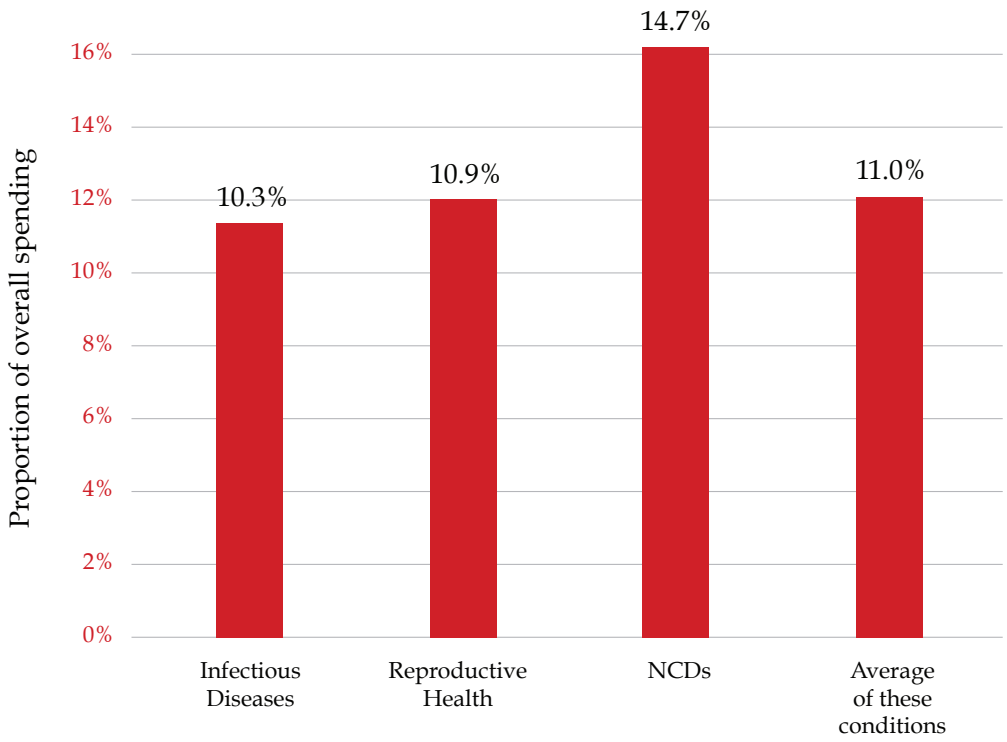

Figure 19 – Out-of-pocket expenditure, by conditions, 2015. (Source: Malawi National Health Accounts, 2015)

3.5 NCDI SERVICE COVERAGE

3.5.1 NCDI Equipment and Medications Availability

The availability of equipment and medications to treat specific NCD and injury conditions, shown in Figures 20 and 21, is based on data from the Malawi Service Provision Assessment (2013-2014) (SPA).[5] Sets of equipment and medication were determined for each condition by combining the medications and equipment needed to provide quality care for the condition; this set is further described in Table 2. If a facility had all essential medications and equipment according to the SPA data, it was considered covered.

Disease Area	Essential Equipment and Medications	
	Diagnosis and chronic care	Acute care
Asthma	Stethoscope, salbutamol inhaler, beclomethasone inhaler, prednisolone	Pulse oximeter, peak flow meter, oxygen, x-ray, salbutamol inhaler, prednisolone, hydrocortisone injection, nebulizer
Hypertension (Stage 1 or 2)	Blood pressure apparatus, stethoscope, at least two classes of anti-hypertensive medications (calcium channel blocker, ACE inhibitor, thiazide diuretic, or beta blocker)	
Hypertension (Stage 3)		Essential equipment and medications for hypertension stage 1 or 2 (above), one additional class of anti-hypertensive medications
Hypertension (Stage 4)		Essential equipment and medications for hypertension stage 1 or 2 (above), two additional class of anti-hypertensive medications
Heart Failure	Adult weighing scale, stethoscope, blood pressure apparatus, ACE inhibitor, beta-blocker, furosemide, ultrasound	
Rheumatic Heart Disease	Essential equipment and medications for heart failure (above), oral penicillin or benzathine penicillin injection, epinephrine injection	
Diabetes Type 1	Serum glucose, insulin	Blood pressure apparatus, serum blood glucose test, renal function testing, intravenous saline, infusion kit for IV fluids, insulin, glucose injection solution
Diabetes Type 2	Serum glucose, metformin or glibenclamide	
Epilepsy	Diazepam tablet or phenobarbitone or carbamazepine	Diazepam injectable
Injury / Surgical Care		Needle holder, scalpel handle and blades, retractor, surgical scissors, nasogastric tube, tourniquet, oxygen, skin disinfectant, suture, ketamine, lidocaine (5%)
Palliative Care	Oral morphine, injectable morphine or injectable pethidine, one non-opioid analgesic (paracetamol, ibuprofen, aspirin, or diclofenac)	

Table 2 – Sets of equipment and medications for NCDI services (Source: Malawi NCDI Poverty Commission)

Figure 20 shows that generally medications and equipment are much more available in urban areas compared to rural settings, though both were limited. For example, while 38% and 33% of urban facilities were considered prepared to treat heart failure and type 2 diabetes, respectively, only a corresponding 15% and 9% of rural facilities were prepared. Most facilities were unprepared for a number of conditions, such as asthma, which had an overall coverage of 3% (7% urban and 1% rural), and acute care for diabetes, which had an overall coverage of 3.3% (7% urban and 1.5% rural). The only condition for which a relatively higher proportion of rural facilities than urban were equipped was for acute epilepsy, though this was driven solely by a higher rural availability of injectable diazepam.

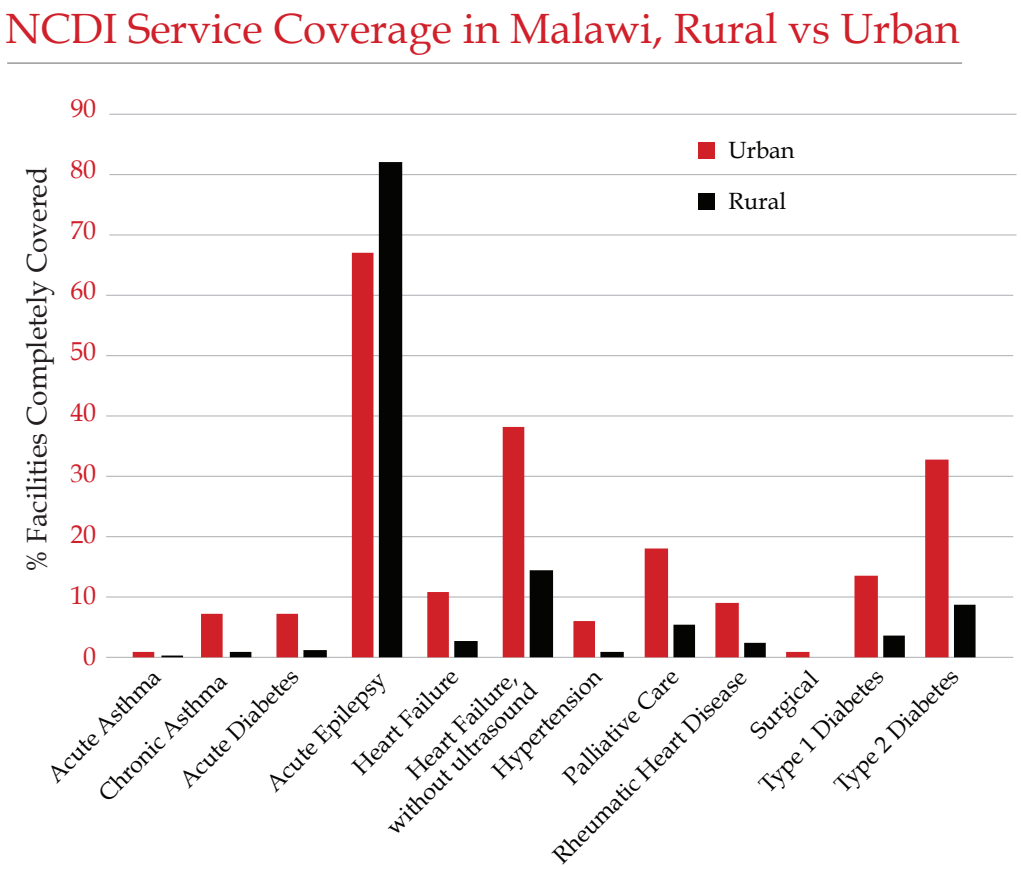

Figure 20 – Availability of sets of medications and equipment for treating NCDIs in health facilities in Malawi, rural vs. urban, 2013-2014 (Source: SPA, 2013-2014)

Figure 21 shows the packages of services by type of facility, demonstrating that central and district hospitals were much more likely to have medications and equipment required to provide care for NCDIs than health centres. However, coverage across NCDIs was not consistent at district hospitals. Patients with acute complications of heart failure or type 1 diabetes – particularly with an acute medical concern - would be less likely to find the care they need at the district hospital level: 21% of district hospitals were equipped to take care of heart

failure, which increased to 25% if ultrasound availability was not a criterion, and a quarter of district hospitals were not prepared to treat type 1 diabetes (Voice Box 2). Additionally, only 17% of district hospitals met the requirements for comprehensive hypertension medications and equipment, including four classes of medications, and only 4% met criteria for asthma treatment; both are core services included in in Malawi's Essential Health Package.[7]

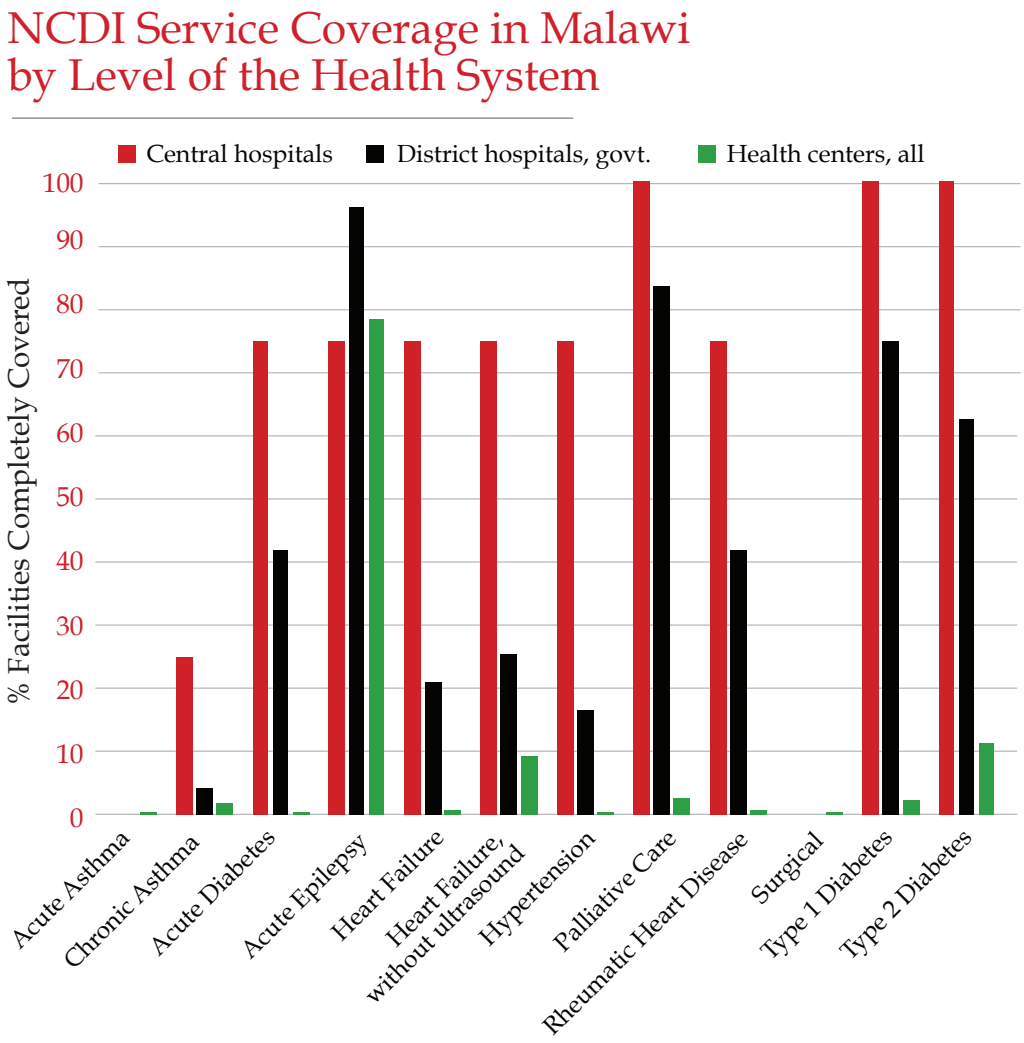

Figure 21 – Availability of sets of medications and equipment for treating NCDIs in Malawi at different levels of the health system, 2013-2014 (Source: SPA, 2013-2014)

3.5.2 Drugs

Medication coverage is a significant concern for common NCDIs, and even more so for severe, chronic NCDIs. The SPA data primarily collects data on the 'big four' conditions, and reveals significant lack of availability of medications, particularly at the health centre level (Figure 22). In addition, district hospitals meet limitations when caring for conditions such as moderate to severe asthma, advanced hypertension, and diabetes. The SPA data suggest that lack of supply and stockouts are a significant problem, but routine data to display this are not available.[10]

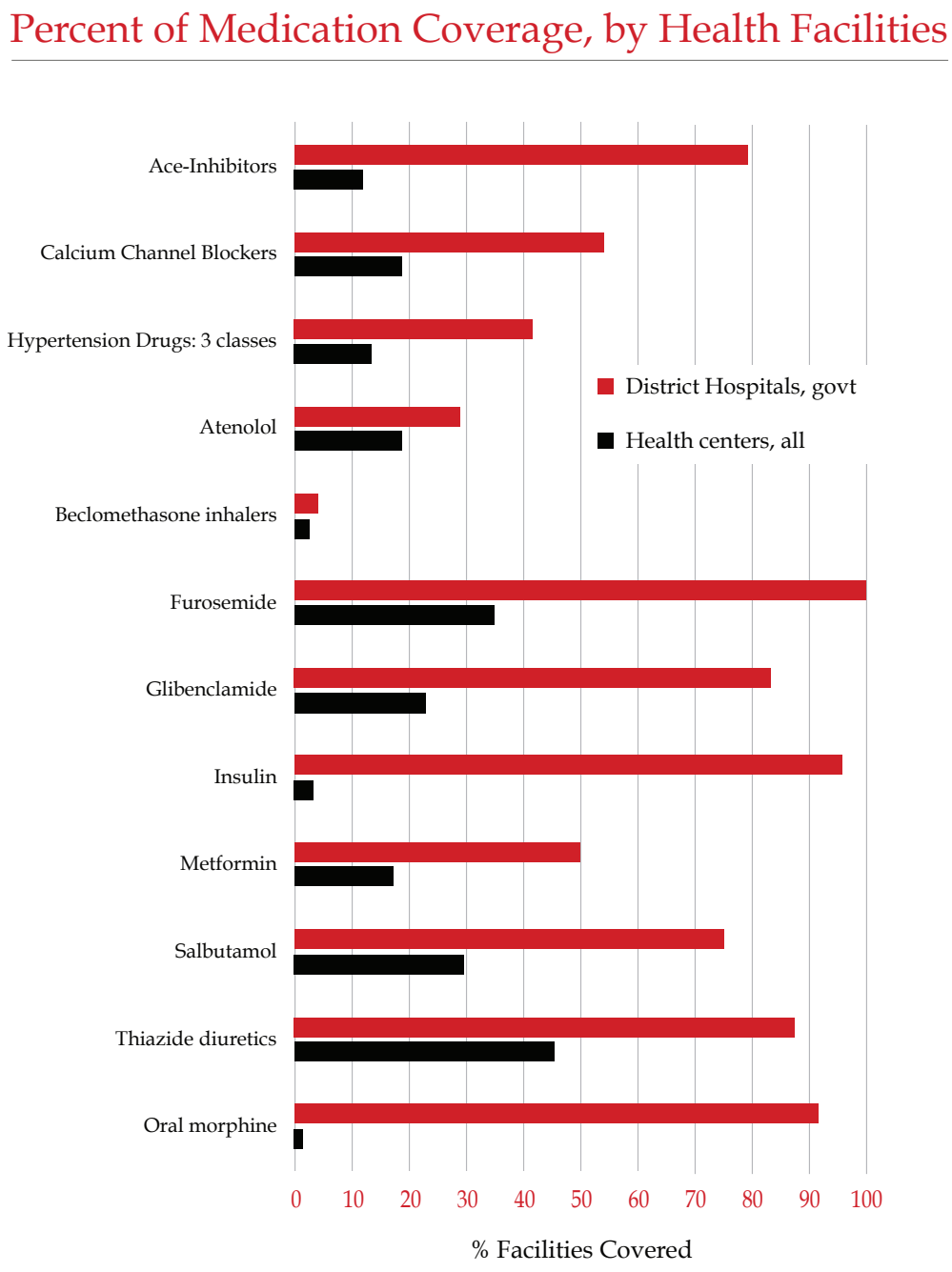

Figure 22 – Availability of medication for treating NCDIs in Malawi at levels of health system, 2013-2014 (Source: SPA, 2013-2014)

Table 2 shows an analysis on medications supplied through the public supply chain in 2016. Utilizing data from Central Medical Stores Trust (CMST) for all medications purchased in 2016, the number of patients theoretically covered – under ideal conditions, such as 100% efficient distribution — was calculated for hypertension, diabetes, asthma, and epilepsy.[54] This calculation was done by averaging the dose per patient from the prescribing data and treatment protocols. From this, an approximate calculation of the number of patients that could be covered was found. Specific assumptions were made, including 100% efficient distribution of medications purchased by CMST and no loss of medications by patients, or other scenarios that would drive up consumption. The number of expected people in Malawi living with those four conditions in 2016, as well as the proportion who would be covered by the medications available through CMST, was calculated. This approach also assumes 100% case-finding – meaning that all patients living in Malawi with each condition would be found. Despite significant assumptions in this analysis, the trend supports the SPA analysis and suggests that drug shortages are a critical limitation in NCDI care, with apparent gaps in specific vital medication coverage, such as inhalers for asthma treatment, second-line anti-hypertensive medications, and insulin for diabetes.

Condition	Medication	Patients needing*	Patient covered^	% patients supplied
Hypertension	HCTZ	1,221,075	77,443	6.3%
	Calcium channel blocker	949,725	1,941	0.2%
	Beta Blocker	203,513	4,402	2.2%
Diabetes	Sulfonylurea	183,403	11,986	6.5%
	Metformin	122,269	3,050	2.5%
	Insulin, rapid	30,567	4,604	15.1%
	Insulin, long acting	30,567	2,230	7.3%
Asthma	Salbutamol inhaler	1,007,138	458	0.1%
	Steroid inhaler	302,142	458	0.2%
Epilepsy	Carbamazepine	6,492	7,300	112.4%
	Phenobarbitone	25,967	18,885	72.7%
	Valproic acid	4,869	462	9.5%

* Calculated based on total number of patients needing this medication for this condition. This assumes 100% case identification, and the number of patients needing specific medications was taken from real prescribing practices.
^ Calculated from medications available from Central Medical Stores Trust (CMST) in 2016, using average dosage for each medication. Assumes 100% distribution efficiency and no medication loss.

Table 3 – Availability of common NCD medications provided by Central Medical Stores Trust, 2016 (Source: CMST, 2016)

3.6 HEALTH FINANCING AND EXPENDITURE

In the fiscal 2014-2015 year, Malawi had a total health expenditure (THE) of approximately 670M USD, which equates to $39 USD per capita, the lowest in the SADC region. Neighboring Zambia had a higher health expenditure at $69 USD, Zimbabwe at $94 USD, and Botswana at a far higher $389 USD.[55] According to the National Health Account, NCDs accounted for 9.1% of spending and injuries for 6.7%, cumulating in a total NCDI spending of 15.8%, or $106M USD ($6.2 USD per capita).[3] Government assistance for NCDIs was approximately 43% of the funding. According to Resource Mapping in 2015, targeted programmatic funding for NCDs was much lower than for other conditions, with NCDs receiving less than 2% of program funding despite accounting for over 30% of the disease burden in Malawi.[3,10] These figures differ because the NHA reflects actual health spending, while resource mapping is prospective and encompasses targeted funding for disease programs – e.g. NGO spending dedicated to maternal health programming would be categorized under maternal health. Figure 23 compares programmatic funding allocation, proportion of overall health spending, and the proportion of the burden of disease for health conditions in Malawi. NCDIs, while accounting for a significant proportion of the burden of disease, attract a much smaller proportion of total health expenditure and extremely little targeted programmatic funding.

Percent Allocation of Programmatic Funding and Health Spending in Malawi, 2015-2016

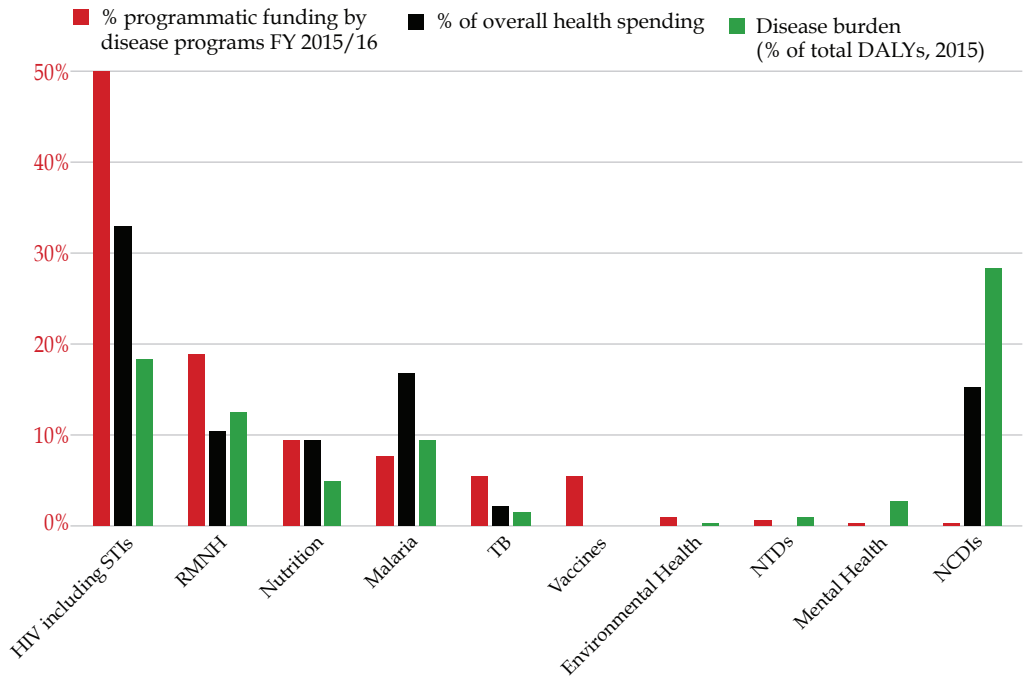

Figure 23 – Percent allocation of programmatic funding in Malawi, 2015-2016 (Source: Resource Mapping, FY 15/16; National Health Account, 2014/15; GBD, 2015)

This trend of minimal direct NCDI programmatic funding has stayed consistent and even decreased from 2012 through 2016 (Table 3).[3]

Resource Mapping	Year	Total Health Funds (Million USD)	Total Funding for Disease Programs (Million USD)*	Total Funding for NCDI Disease Programs (Million USD)#
Round1	2012-2013	558	354	4.2 (1.2%)
Round 2	2013-2014	600	388	3.96 (1.02%)
Round 3	2014-2015	641	422	1.7 (0.4%)
Round 4	2015-2016	637	370	2.0 (0.54%)

* Excludes cross-cutting
# Cancer, cardiovascular, dental, diabetes, eye/ear/skin, mental health, trauma/injuries

Table 4 – Direct Programmatic Funding for NCDIs, 2012-2016 (Source: MOH Resource Mapping Report: Rounds 1-4, 2016)

3.7 THE PATIENT EXPERIENCE

In order to highlight the voices and experience of patients with NCDIs who also face the added burden of living in poverty, the Commission produced five video profiles of Malawians living in these complex conditions. The complete videos can be found at http://ncdsynergies.org/voices-of-ncdi-poverty/. Select quotes are shown below.

Nimiya, age 40

Rheumatic Heart Disease

"At the time I was sick, I had two children in secondary school…It was difficult for me to do any work. I couldn't even fetch a pail of water and carry it on my head. I was so weak. My husband did his best. He helped me get back and forth to the hospital. He hired himself out in the fields and paid the children's school fees.

At that time, I didn't go to the local health centre because it's a mission hospital and I couldn't pay them..

One of my heart valves was damaged. So, the hospital tried to treat me. I was seven months pregnant and I lost the baby.

The hospital administrators and the government really helped me by sending me to a hospital in India. I had serious doubts. My relatives were saying "Can it really be possible for a person to have an operation on the heart?" …my decision was to just go to the hospital and see if they could help fix the problem I had…It's amazing all this led to my chance...

Now I go to the hospital every month and get an injection. The injections are for protecting the part of my heart where I had my operation..

I am so happy because at that time I didn't know if I would live this long.

Voices Box 1. Nimiya, age 40, Rheumatic Heart Disease

Sheila, age 14

Type 1 Diabetes

"***Sheila:*** *At the time I was diagnosed with diabetes I had headaches and stomach problems. Sometimes I still do… I play well with my friends, depending on how I'm feeling. Sometimes, I have to stop and go home for my medication and something to eat…*

I want to be a nurse. I want to help save sick people's lives.

Mom: *sometimes she gets a fever and sweats a lot. I know she is dizzy. So I take a little sugar and I give it to her. The medicine she takes is injected. I inject her here twice in the morning and twice in the evening…when I do that I make sure that her food is ready so that when she is done with her medication she can eat her food…*

There is definitely a difference between diabetes and something like malaria. Her problem is an ongoing condition. She's going to be on medication for a long time. With malaria, you can get sick, and then get well. While for her, she always has to take her diabetes medication even if she also has malaria. It's a must. Whether she is sick or not, she takes her diabetes medication.

This affects me too. How can I leave the house when I am the one who knows how to inject her? So, it's always in the back of my mind that I need to be home to give her medication. I never compromise with that. I might neglect other things but I take care of her."

Voices Box 2. Sheila, age 14, Type 1 Diabetes

Vito, age 36

Kaposi Sarcoma

*"**Vito:** In 2001, my leg gave me problems, it was swollen.*

***Wife:** He couldn't do anything like bathing, eating, walking.*

I would wake up very early, around 5 and go to the farm for a short time. Then I would come back to give him porridge and medicine. Then I would go back and farm a little… There was no one to farm for us or to take care of him.

Food shortage was a big problem since I could not work on the farm since I needed to care for him. Financially, I can't overstate how we struggled because we were idle.

***Vito:** The doctor then said to me: "you need to change your drugs to Taxol injections." The medicine started working in my body.*

Had it not been for this hospital being here like in other places, I might have died. I might have been long gone to the grave."

Voices Box 3. Vito, age 36, Kaposi Sarcoma

Enock, age 28

Psychosis

"Fear would just strike me. And I would take off running very fast… At that time, everyone was afraid of me. It was known all over that I had lost my mind… People would mock me shouting: "Crazy man! Crazy man!" people would beat me. Some threw rocks at me. Others tied me up, saying I should be killed… When I tried to run away, they would catch me and take me to the police station.

It's safe at the hospital because it's a place respected by the people… I never knew that a mentally ill person could get well because I had seen my friends who didn't go to the hospital and sought help from traditional healers instead. Even now, they are still disturbed… But after I ran to the hospital, I got well. I feel fine and healthy and energetic in a good way. I take my medicine at the proper time…life goes on.

People are nice to me now. They bring their clothes for me to sew sometimes. That makes me feel like I'm trusted and I can do my job properly. I feel like I could even handle having a job working for someone else… I am a happy person. I can feel free, yeah."

Voices Box 4. Enock, age 28, Psychosis

Robert, age 22

Epilepsy & Type 1 Diabetes

[Regarding epilepsy]

Mother: *In the past I used to take him to traditional doctors and eventually I saw that my money was just being wiped out in vain… I saw that when I started going to the hospital, he improved a lot… He used to be fainting all night until morning. I never had peace. But now I can sleep.*

Sometimes he even has a seizure. But his friends know him very well… They come and tell me, "Robert has collapsed," and I go and bring him home.

He used to run away from home… He would go a long way… So, I would follow him and bring him back home… Now, he doesn't' leave home as much, he has improved since they gave me additional medicine. He seems calmer now.

[Regarding diabetes]

Mother: *… it must have been 2008… The first sign was that he was urinating too much… Since I didn't know anything, I thought it was bilharzia… Sometimes we would stay in the hospital for 2 months… he was obviously very weak… and they diagnosed him with diabetes. When they started giving him diabetes treatment I noticed that he stopped urinating abnormally. So ever since, I've been taking him to the hospital. Things have definitely changed.*

I used to be able to make money in the past but now I don't have money and I can't feed him properly as I'm advised. I'm really failing at that.

Voices Box 5. Robert, age 22, Epilepsy and Type 1 Diabetes

4. DEFINING PRIORITIES

4.1 SETTING PRIORITY CONDITIONS

4.1.1 Process

The Malawi NCDI Poverty Commission completed a national NCDI priority setting exercise with GBD estimates from the Institute of Health Metrics and Evaluation (IHME).[36] Four metrics were chosen to both represent different aspects of health priorities and to evaluate NCDIs in Malawi with a focus on poverty: 1) A poverty metric focused on equity: comparing disability adjusted life years (DALY) per 100,000 population in Malawi versus high-income countries; 2) A life expectancy metric focused on diseases of the young: using years of life lost per death; 3) A severity metric: using years of life of disability per case; and 4) A burden of disease metric: using total DALYs to estimate which illnesses cause Malawians to lose the most healthy years (Figure 24). The Malawi NCDI Poverty Commission ranked the 190 NCDI conditions from the GBD Study 2015 database in order by each metric. Conditions were then assigned a quartile for each metric. Quartiles were assigned values 1 through 4, with 4 being the quartile with the highest scores within that metric. Composite scores were calculated for each condition based on the average of the 4 quartile scores for each metric. Conditions were then ranked by composite scores. Ranked composite scores were presented to the Commissioners for expert review.

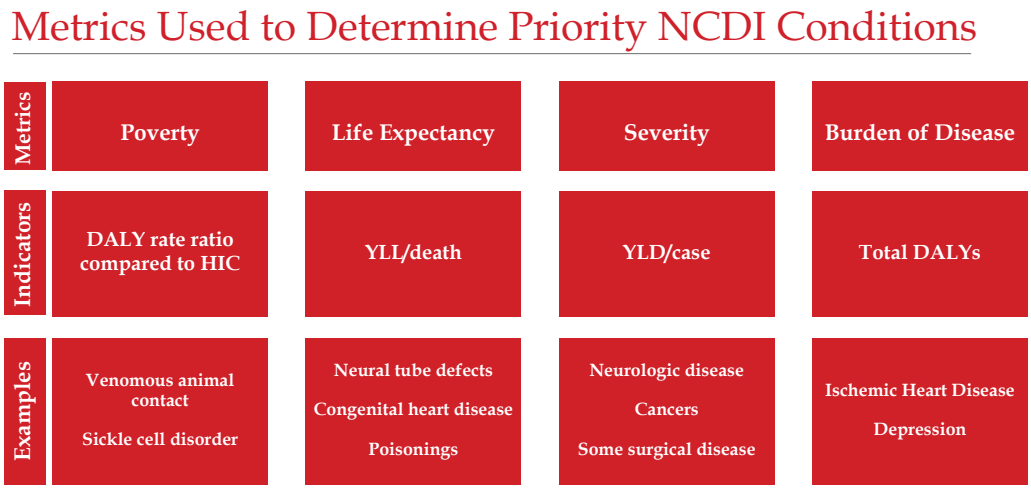

Figure 24 – Matrix of four metrics used to determine Malawi NCDI priority conditions. (Source: Malawi NCDI Poverty Commission)

The Commission adopted all conditions with a composite score > 3 (N=50) to undergo further review. This list was pared to 36 potential priority conditions after eliminating those without clear health interventions (e.g. exposure to forces of nature or non-venomous animal contact). A Commission meeting was held at which the final list of priority conditions was discussed and the

conditions selected by unanimous agreement (N=18) were approved. For the remaining conditions (N=18), the Delphi method was used. Through a confidential online survey, which included scores for each metric and basic explanations of the scores, Commissioners were then asked whether each remaining condition should be assigned to the list of priorities. The survey also elicited expert opinions on which conditions were missing from the list. A second Delphi round provided the Commissioners with the aggregate results from Round 1, including suggested additional conditions. The Commissioners held a second vote on whether to remove or keep each condition on a final list and the majority results from the second Delphi round were then accepted as final.

4.1.2 Priority-Setting Results

Through this priority-setting process, the Malawi NCDI Poverty Commission selected 38 priority conditions in total, 6 of which were not originally in the set of conditions determined by the GBD Study 2015 metrics. These conditions are a priority list of NCDIs that cause a significant burden in Malawi, especially amongst younger and poorer members of the population. Table 4 shows these conditions, in alphabetical order by disease category. While the list includes the 'big 4' commonly discussed in NCD forums, there are also several severe, chronic NCDIs on the list that are neither 4x4 conditions nor experienced in the same way in higher income countries. Conditions in red in Table 4 are conditions that were not highlighted by the GBD Study 2015, but were selected by the Commissioners. Of note, this includes Kaposi Sarcoma (KS) (Voices Box 3), which is often included with HIV data in GBD and elsewhere. However, given that needs for service delivery interventions for KS more closely mimic other malignancies, it was included here by the Commission.

Disease Category	Prioritized NCDIs in Malawi
Cancer	Cervical cancer; Oesophageal cancer; Non-Hodgkin lymphoma; Liver cancer due to hepatitis B; Bladder cancer; Breast cancer; Acute lymphoblastic leukaemia; Kaposi sarcoma
Cardiovascular	Haemorrhagic stroke; Ischemic stroke; Hypertensive heart disease; Ischemic heart disease; Rheumatic heart disease
Congenital	Neural tube defects; Sickle cell disorders; Congenital heart anomalies
Endocrine	Diabetes mellitus
Gastrointestinal	Peptic ulcer disease
Injuries	Poisonings; Fire, heat, and hot substances; Pedestrian road injuries; Motor vehicle road injuries; Gender & partner violence

Table continues on next page

Disease Category	Prioritized NCDIs in Malawi
Liver	Cirrhosis and other chronic liver diseases due to alcohol use; Hepatitis B; and due to other causes
Mental Health	Major depressive disorder; Psychotic disorders; Bipolar disorder; Anxiety disorders; Suicide
Musculoskeletal	Low back pain
Neurologic	Epilepsy
Renal	Chronic kidney disease
Respiratory	Asthma; Chronic obstructive pulmonary disease
Surgical	Appendicitis; Paralytic ileus and intestinal obstruction
** Conditions in red were additions from the Commissioners.*	

Table 5 – Final list of priority NCDI conditions in Malawi (Source: Malawi NCDI Poverty Commission)

4.2 SELECTING & COSTING INTERVENTIONS FOR NCDIS

4.2.1 Selecting priority NCDI interventions

An array of health interventions, focusing on both prevention and treatment, is needed to address the priority NCDI conditions in Malawi. Many of these interventions already exist to some extent, while others need to be fully introduced. The Commission utilized interventions identified by the Disease Control and Priorities Network (DCP).[56] Based in Seattle, Washington, USA, DCP provides systematic reviews of cost-effective interventions for low-income countries. The Third Edition (DCP3) proposes a set of health interventions as countries work toward UHC. DCP3 focuses on interventions that are cost-effective, address significant burdens of disease, and feasible to implement in low- and middle-income countries, to support and inform financing in these countries.[56]

The Commissioners reviewed the DCP3 interventions for the 33 of the 38 priority conditions for which DCP3 interventions identified as cost-effective were available. Applicability and utility of DCP3 interventions were first discussed as a group and then voted on through blinded online voting. Commissioners added to the intervention packages for each of the 38 conditions through both the in-person discussion and voting as well as the online forum. Ultimately, the Commission identified and recommended 54 health interventions for Malawi.

The recommended interventions include: mass media and IEC campaigns around issues such as sexual and reproductive health, gender-based violence, healthy diets and physical activity, and tobacco and alcohol use; prevention methods such as HPV vaccinations, hepatitis B vaccinations, and screening services for

diabetes, hypertension, and sickle cell disorders in appropriate settings; pharmacological interventions such as chemotherapy, systemic steroid use for acute asthma, nicotine replacement therapy, and diuretic, beta-blocker, ACE-inhibitor, and mineralocorticoid antagonists for chronic heart failure; hospital-based policies and interventions such as burn and wound treatment services, increased availability of blood, oxygen, activated charcoal, and basic antidotes, as well as emergency hospital care, basic rehabilitation services, basic outpatient surgical services, and referral systems for rape victims; and increased specialized services such as surgical care, pathological oncology services, and psychiatric care.

Condition(s)	Intervention
All	• Specialized surgical services • Basic outpatient surgical services • Basic rehabilitation services
Assault, partner violence, gender violence, assault by other means	• Post gender-based violence care including, counseling, provision of emergency contraception, and rape-response referral (medical and judicial) • Education campaigns for the prevention of gender-based violence
Asthma	• Management of acute exacerbations of asthma and COPD using systemic steroids, inhaled beta-agonists, and, if indicated, oral antibiotics and oxygen therapy • Low-dose inhaled corticosteroids and bronchodilators for asthma and for selected patients with COPD • Management of acute ventilatory failure secondary to acute exacerbations of asthma and COPD; in COPD use of bilevel positive airway pressure preferred • Mass media for awareness on handwashing and household air pollution health effects • Self-management for obstructive lung disease to promote early recognition and treatment of exacerbations
Asthma; Ischemic heart disease, Hypertensive heart disease, hemorrhagic stroke, ischemic stroke	Tobacco cessation counseling, and use of nicotine replacement therapy in certain circumstances
Bipolar disorder	Management of bipolar disorder using generic mood-stabilizing medications and psychosocial treatment
Breast cancer	Treat early stage breast cancer with appropriate multimodal approaches, including generic chemotherapy, with curative intent, for cases that are referred from health centers and first-level hospitals following detection using clinical examination
Cancers	Palliative care and pain control services*
Cervical cancer	• Opportunistic screening for cervical cancer using visual inspection or HPV DNA testing and treatment of precancerous lesions with cryotherapy • School-based HPV vaccination for girls • Treatment of early-stage cervical cancer
Chronic kidney disease	Treatment of hypertension in kidney disease, with use of ACEi or ARBs in albuminuric kidney disease
Cirrhosis and other chronic liver diseases due to alcohol use	Screening and brief intervention for alcohol use disorders
Cirrhosis and other chronic liver diseases due to alcohol use; Asthma; Ischemic heart disease, Hypertensive heart disease, hemorrhagic stroke, ischemic stroke	Mass media messages concerning use of tobacco and alcohol
Cirrhosis and other chronic liver diseases due to hepatitis B	Hepatitis B vaccination: EPI-6 for all children plus vaccination of high-risk populations (PWID, MSM, household contacts, persons with multiple sex partners), with addition of birth dose and vaccination of healthcare workers as resources permit
Cirrhosis and other chronic liver diseases due to other causes	Hepatitis B and C testing of individuals identified in the national testing policy (i.e., based on endemicity and risk level), with appropriate referral of positive individuals to trained providers

Condition(s)	Intervention
Diabetes mellitus	• Screening for diabetes in all high-risk adults • Prevention of long-term complications of diabetes through blood pressure, lipid, and glucose management as well as consistent foot care • Diabetic retinopathy screening via telemedicine, followed by treatment using laser photocoagulation • Screening and management of albuminuric kidney disease with ACEi or ARBs, including targeted screening among people with diabetes • Screening for diabetes in all pregnant women • Diabetes self-management education
Epilepsy	Management of epilepsy using generic anti-epileptics
Esophageal cancer, bladder cancer	Mass drug administration for lymphatic filariasis, onchocerciasis, schistosomiasis, soil-transmitted helminthiases and trachoma, and foodborne trematode infections
Fire, heat, and hot substances	• Expanded first-level hospital surgical services • Compression therapy for amputations, burns, and vascular or lymphatic disorders
Ischemic heart disease, Hypertensive heart disease, hemorrhagic stroke, ischemic stroke	• Medical management of acute heart failure • Medical management of chronic heart failure with diuretics, beta-blockers, ace-inhibitors, and mineralocorticoid antagonists • Use of aspirin in case of suspected myocardial infarction • Mass media messages concerning healthy eating or physical activity • Use of percutaneous coronary intervention for acute myocardial infarction where resources permit • Use of unfractionated heparin,aspirin, and generic thrombolytics in acute coronary events • Combination therapy for persons with multiple risk factors to prevent CVD (primary prevention) • Long term management of IHD, stroke, and PVD with aspirin, beta blockers, ACEi, and statins (as indicated), for secondary prevention • Screening and management of hypertensive disorders in pregnancy • Opportunistic screening for hypertension for all adults, with treatment decisions guided by absolute CVD risk • Use of community health workers to screen for CVRD using non-lab-based tools for overall CVD risk, improving adherence, and referral to primary health centers for continued medical management
Leukemia	Treat selected early-stage childhood cancers with curative intent in pediatric cancer units/ hospitals
Liver cancer due to hepatitis B	For individuals testing positive for hepatitis B and C, assessment of treatment eligibility by trained providers followed by initiation and monitoring of antiviral treatment when indicated
Major depressive disorder	Mass media messages concerning sexual and reproductive health; and mental health for adolescents
Major depressive disorder; Anxiety disorders	Management of depression and anxiety disorders with psycological and generic antidepressant therapy
Neural tube defects; Congenital heart anomalies	Provide iron and folic acid supplementation to pregnant women, as well as food/caloric supplementation to pregnant women in food insecure households
Paralytic ileus and intestinal obstruction; Motor vehicle road injuries; Pedestrian road injuries; Appendicitis	Basic first-level hospital surgical services
Poisonings	Management of intoxication/poisoning syndromes using widely available agents; e.g., activated charcoal, naloxone, bicarbonate, antivenin
Psychotic disorders	Management of schizophrenia using generic anti-psychotic medications and psychosocial treatment
Rheumatic heart disease	• Treatment of acute pharyngitis in children to prevent rheumatic fever • Secondary prophylaxis with penicillin for rheumatic fever or established RHD
Sickle cell disorders	In settings where sickle cell disease is a public health concern, universal newborn screening followed by standard prophylaxis against bacterial infections and malaria

Table 6 – Health Sector Interventions Recommended by the Malawi NCDI Poverty Commission

4.2.2 Costing Interventions in Phases

Through group discussion, the target level of care was assigned for each recommended intervention: community, primary (health centre), secondary (district hospital), or tertiary (central hospital), with the assumption that services available at the primary level would thus also be available at the secondary and tertiary level, and so forth. Interventions received a score for three different metrics: cost-effectiveness (0-4), financial risk protection (0-6), and equity (0-3), with higher numbers representing more optimal values in each metric.

Based on an anticipated expansion strategy toward Universal Health Coverage (UHC), the Commission recommends a phased implementation approach over the next 10-15 years, with each intervention placed into one of three phases (Figure 25). Malawi's Health Sector Strategic Plan II (2017-2022) is rooted in the aim of UHC.[4] Malawi's NCD Strategy is charged with balancing burden of disease, cost-effectiveness of interventions, and an equity agenda to ensure the impoverished and rural population in Malawi has access to care.[11] As Figure 25 shows, Interventions were preliminarily assigned to 3 phases, with Phase 1 being focused on equity and involving the most cost-effective and scalable interventions, and Phase 3 holding the more aspirational interventions.

Expansion Strategy Toward Universal Health Coverage for Priority NCDI Conditions in Malawi

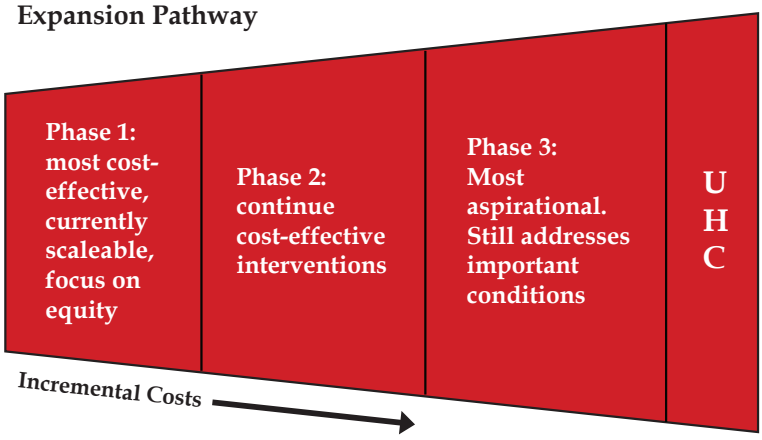

Figure 25 – Expansion strategy toward Universal Health Coverage for priority NCDI conditions in Malawi (Source: Malawi NCDI Poverty Commission)

Baseline coverage was assigned for each intervention by utilizing existing data, when available, from national surveys such as DHS, STEPS, and SPA, and utiliz-

ing the collective experience and knowledge from the expert Commissioners. A coverage target was set at 50% across all interventions for costing purposes. The total cost of each intervention was determined by multiplying the unit cost for the intervention (adjusted for Malawi by DCP3) by the population in Malawi in need of the intervention. Additionally, a 50% indirect cost was added to every intervention to cover overhead, infrastructure, and other indirect costs, such as laboratory and pathology services. Furthermore, a 17% mark-up was applied to all cost projections to also capture system costs not incurred at the facility level such as financing, supply chain, and M&E systems; this is a standard recommendation from DCP3.

Ultimately, the total per capita cost for these interventions would be $13.7 USD annually. In absolute terms, the annual total cost for implementation of these interventions in Phase 1 is an estimated $166M USD ($9.6 USD per capita), with the bulk of the costs in Phase 1, largely driven by the need for strengthening basic systems (such as surgical services and rehabilitation) as well as many of the most equitable and cost-effective interventions have large target populations. The Phase 1 recommendation represents approximately 24% of current total health expenditure.

A table detailing the selection metrics, current and target coverage, and costing analysis for all of the recommended health sector interventions is included in Appendix 1 at the end of this report.

Scaling up the full Highest Priority UHC Package from DCP3 in low-income countries, acknowledging limitations in health system capacity, was estimated to avert about 12% of projected NCDI deaths between the ages of 5 and 69 in the year 2030.[57] Assuming the possibility of averting a more conservative 10% would translate to about 5,180 deaths averted in the year 2030 in Malawi. Given the wide range of interventions prioritized by the Commission and the additional ability to save lives in children under 5 from surgical interventions, burn treatment, paediatric cancer treatment, prevention of congenital anomalies, and sickle cell disorder treatment, there is a great opportunity to save a substantial number of lives.

4.2.3 Intersectoral Interventions

Utilizing both the DCP3 recommended list of cost-effective interventions as well as expert consensus among members, the Commission made 31 intersectoral and policy interventions recommendations. These are shown in Table 7.

Key Health Risk	Malawi NCDI Priority Condition(s)	Policy*
Air pollution	Asthma, COPD	• Fiscal measures and regulations to reduce carbon emissions*# • Subsidies and regulations to support cleaner household fuels*# • Strengthening affordable public transportation systems in urban areas*# • National monitoring systems that track all sources of air pollution* • Safer cookstove design# • Improved ventilation as part of building codes and norms# • Subsidized public transportation#
Tobacco smoke	Ischemic heart disease, Hypertensive heart disease, hemorrhagic stroke, ischemic stroke	• Large excise taxes on tobacco products*# • Bans on smoking in public places and on advertising, promotion, sponsorship, with adequate enforcement*# • Warning labels and plain packing on tobacco products*#
Dietary risks	Neural tube defects	• Fortification of food products with iron and folic acid*#
	Ischemic heart disease, Hypertensive heart disease, hemorrhagic stroke, ischemic stroke, Diabetes mellitus	• Bans on trans fats and replacement with polyunsaturated fats*# • Actions to reduce salt in manufactured food products and discourage discretionary use*#
	Diabetes mellitus	• Product taxes on sugar-sweetened beverages*# • Actions to discourage consumption of unhealthy foods, including restrictions on marketing to children and sales in schools*#
Unsafe alcohol use	Cirrhosis and other chronic liver diseases due to alcohol use, Ischemic heart disease, Hypertensive heart disease, hemorrhagic stroke, ischemic stroke, Motor vehicle road injuries	• Excise taxes on alcohol products*# • Restrictions on access to retailed alcohol*# • Bans on advertising alcohol#
Injuries	Motor vehicle road injuries	• Regulations on drunk driving, enforcement of blood alcohol limits*# • Legislation and enforcement of personal transport safety measures, including seatbelts and helmets*# • Setting and enforcement of speed limits on roads*# • Increased visibility, lanes for cyclists and pedestrians separate from traffic# • Traffic-calming infrastructure (e.g., speed humps), especially at dangerous road segments#
	Poisonings, suicide	• Strict control and movement to selective bans on highly hazardous pesticides*#
	Suicide	• Decriminalization of suicide#
	Gender-based violence	• Corporal punishment ban# • Information sharing between police and hospital emergency departments# • School-based programs to address gender norms and attitudes# • Laws and policies to protect and reduce stigma for key populations with full decriminalization of LGBT population# • Increased age of marriage# • Programs to keep girls in school#
*Identified as cost-effective by DCP3 # Identified as a priority by the Commission		

Table 7 – Intersectoral and Policy Interventions Identified by the Malawi NCDI Poverty Commission

5. HEALTH SECTOR STRATEGY & ADVOCACY: NCDI SERVICES FOR THE POOR

AN EQUITY AGENDA FOR DEVELOPMENT

The approach of the Malawi NCDI Poverty Commission is rooted in a pursuit for equity. It aims to interrogate the burden of disease and the set of risk factors that specifically affect the poor in Malawi. Though 65% of the population of Malawi falls within the poorest billion people in the world, there are important variations within Malawi, most notably between urban and rural populations. The NCDI Poverty Commission underwent a process with this in mind, both for priority setting for the NCDI conditions identified, as well as for the interventions recommended, aiming to maximise value for the most vulnerable.

THE MALAWIAN CONTEXT: A DIFFERENT BURDEN OF DISEASE

The common rhetoric around NCDs globally focuses on a narrower set of conditions: what this report has referred to as the 'big 4', also known as '4x4'. If we were to ask most politicians, health workers, and policy makers what conditions they think about when asked about NCDs, almost certainly they would list cardiovascular disease (hypertension), diabetes, malignancies, and chronic respiratory disease. The work of this Commission hopes to prompt a shift in thinking and perception in order to expand the conversation to include a broader set of conditions. This has important implications for policy and planning: rather than approaching a small set of conditions, NCDI policymakers and implementers face a range of up to 200 conditions, 38 of which have been prioritised through the analysis represented in this report. This expanded definition is critical to the poor and the young in Malawi, representing a different burden of disease than perhaps expected and provides the opportunity to address such a burden in Malawi before the burden increases.

PREVENTION VERSUS TREATMENT

Just as the 'big 4' inform the common approach to NCDIs, this set of conditions is often also represented as one that can be largely prevented by focusing on lifestyle risk factors, or how individual choice can prevent disease. This strategy promotes interventions such as counseling for tobacco and alcohol cessation and promotion of healthy eating and exercise – advocated as approaches that Malawians can make in their everyday lives to prevent themselves from getting an NCD. These risks and interventions are critically important, and the work of this Commission highlights the concurrent need for a complementary agenda. The research findings reported by this Commission suggest that an approach is needed that expands the focus of risk factors. Specifically, this approach calls for a) a broader definition of risk factors leading to the NCDI burden; b) more research to identify the most important NCDI risk factors for Malawians; and

c) advocacy for structural approaches to risk factors in addition to individual lifestyle choices.

NCDIS AND UNIVERSAL HEALTH COVERAGE: INEXTRICABLY LINKED

The agenda set forth in this report is aligned with the Sustainable Development Goals (SDGs), namely SDG 1, which aims to end poverty and SDG 3, which aims to ensure healthy lives and promote well-being. Additionally, the Malawian government's Health Sector Strategic Plan II (2017-2022) has the goal of moving "towards Universal Health Coverage (UHC) of quality, equitable and affordable health care with the aim of improving health status, financial risk protection and client satisfaction."[4] Given the contribution of NCDIs to greater than one-third of the disease burden in Malawi, the large number and diversity of individual conditions making up this burden, the need for various health interventions at all levels of the health system, and the fact that historically the NCDI agenda has not been as well funded, we propose that addressing NCDIs in Malawi will be a critical piece of the move toward Universal Health Coverage (UHC).

UHC has a number of key components that are highly relevant to the NCDI agenda. One component is access to health services for the most important causes of disease and death, and the analysis within this report makes a case for a broader set of priority conditions to be included within that effort. Access to services will have several critical components for health system planning in Malawi: human resource development, infrastructure and equipment efforts, and strengthening supply chains and key systems such as data and information, as well as mapping of care pathways for patients suffering from NCDIs. Secondly, UHC aims to provide essential health services without inflicting financial hardship or catastrophic health expenditures. This report emphasises the relatively higher out-of-pocket spending for patients suffering with NCDIs than other conditions in Malawi, reflecting less risk protection for these patients. As the NCDI agenda moves forward, it will be key to prioritise financial hardship as a consideration in program design and policy, and more information is needed to measure the financial impact of NCDIs.

LESSONS FROM HIV IN MALAWI

There are important lessons from the considerable success of the HIV program in Malawi that are particularly relevant to chronic NCDs. The HIV epidemic and subsequent treatment programs have instigated a need in the primary healthcare system to take care of patients longitudinally over time. Systems to address chronic NCDs may benefit from this experience, particularly in areas such as:

- A strong central vision and strategy for prioritisation and implementation;
- A robust and uniform Monitoring & Evaluation system, which facilitates data quality within the current paper-based system;

- Human Resource planning for specific cadres trained and supported to do chronic care delivery; and
- Supply Chain planning for a strong system.

As we learn from the successes of the HIV program in Malawi and apply it to programming for chronic NCDs, it will also be important to recognise the differences: HIV is a single disease with a significant amount of vertical funding, whereas NCDs are a broad range of conditions, with varying clinical courses across the lifespan. Within the 38 NCDI conditions prioritised by this Commission, 25 are chronic, which may indicate that an integrated approach to chronic conditions is needed. Some considerations that need exploring include 1) Which chronic NCDs would be part of an integrated chronic disease programme?; 2) At which levels of the health system is this appropriate?; and 3) What specific human resource cadre is needed to take care of patients with this set of chronic conditions, and what training and support system do they require?

NONCOMMUNICABLE VS COMMUNICABLE: A BLURRED LINE?

Closer inspection of the prioritised NCDI conditions by this Commission reveals another trend. Many of these are related to infections, at least in some instances: Human Papilloma Virus and cervical cancer; Hepatitis B and C Viruses and liver disease and cancer; tuberculosis and chronic lung disease; schistosomiasis and bladder cancer; neurocysticercosis and epilepsy; Helicobacter Pylori and peptic ulcer disease; and childhood strep infection and rheumatic heart disease. In order to comprehensively address survival, longevity, and quality of life in these patients, a patient-centered approach across the lifespan is needed, with a focus both on infection prevention and treatment, as well as identifying and treating NCDIs afflicting the same patients.

THE WAY FORWARD

This report investigated the burden of NCDIs in Malawi with available data and estimates, identified priority NCDI conditions in Malawi, and makes several conclusions and recommendations in the following section. There is much still work to be done in continuing to advocate for NCDI funding, care delivery, and research. We look forward to pursuing this work to address the burden of NCDIs in Malawi, and we are very grateful to everyone who made this report and this work possible.

6. CONCLUSIONS

This Commission report summarizes the NCDI picture in Malawi, with a particular, needed focus on the poor. We explore a broad set of NCDI conditions, including both the 'big 4' (cardiovascular disease, diabetes, chronic respiratory disease, and cancer) as well as a complementary agenda including a more extensive set of severe, chronic NCDI conditions that impact the poor and the young, such as mental illness, epilepsy, congenital conditions, injuries, and conditions requiring surgery or palliative care. After described the burden of disease of this wide-ranging set of conditions and contextualized the burden in Malawi compared to high income settings, we explored how the burden of NCDI in Malawi impacts the young, and how a large proportion of the disease and disability caused by NCDI may not be explained by traditional 'lifestyle' risk factors. Utilizing household survey data, we described the burden of NCDI and health seeking behavior as it relates to poverty in Malawi. We then examined the availability of services and medications currently in Malawi. Through a rigorous priority setting process, we identified 38 priority NCDI conditions and proposed a set of 54 proven, cost-effective interventions to address these conditions. By estimating the incremental costs for these interventions, we provided a potential roadmap to scale up coverage and address this broad burden of NCDI in Malawi. We contend that this is a critical piece of Malawi's drive toward Universal Health Coverage, and we provide the following key findings and recommendations to support the health sector in Malawi.

6.1 Key Findings

- **NCDIs contribute to a significant share of the burden of disease in Malawi.** More than 30% of both the deaths and the burden of disease in 2015 was were due to NCD & Injuries: of the total DALYs in Malawi, 25% are were from NCD and 6% from injuries.

- **The burden of NCDs is very diverse.** 69% of the burden in Malawi in 2015 was from conditions beyond cardiovascular disease, diabetes, chronic respiratory disease and cancers, known as the 'big 4'. Within the 'big 4', sub-causes in settings of poverty can also be different. This expanded set of NCDI includes conditions such as mental health, neurologic disorders, liver conditions, digestive conditions, and many more.

- **The burden of disease from NCDI is different in Malawi than in high-income settings.** The 'big 4' make up a higher proportion of NCDI in high income countries, and Malawians suffer from many conditions that are less common in high income countries such as rheumatic heart disease, epilepsy, burns, and a different set of malignancies. Furthermore, Malawians die at younger ages from a given NCDI than if they were born in a high-income

country. Some of the most significant examples of this include sickle cell disease, congenital heart anomalies, neural tube defects, and major depressive disorder.

- **NCDI impact the young and the workforce.** 61% of the NCD burden and 82% of the injury burden were in Malawians under the age of 40 in 2015. This is compared with 19% of the NCD burden and 40% of the injury burden occurring in individuals under age 40 in high income countries. This high burden of disease amongst the young, comprised of a wide variety of conditions, represents a priority area for intervention for Malawi's current and future workforce and development.

- **A large proportion of the burden of NCDI is not explained by lifestyle risk factors.** According to Global Burden of Disease Study 2015, 79% of the NCD burden in Malawi was not attributable to behavioral or metabolic risk factors, such as obesity, diet, salt intake, alcohol, and tobacco. In fact, 74% of the burden of NCDs in Malawi was not attributable to 79 risk factors examined in GBD. Examples of risks that might fall in this category include infections such as Human Papilloma Virus, Hepatitis B Virus, childhood infections, environment factors of, undernutrition and poverty-influenced factors, and pregnancy.

- **There is a broader set of preventive efforts that can help address NCDIs in Malawi.** The definition of prevention needs to be expanded beyond individual lifestyle factors to include a wider set of interventions as well as structural changes to protect the poor. Of the 72 interventions identified by the Commission through the cost-effective analysis, 19 (26%) are preventative. Of the 38 conditions prioritized by the Commission, 16 have an associated preventative health intervention, and even more can be addressed by policy and intersectoral change.

- **NCDI burden and access differs across wealth quintiles.** Local research highlights that poorer members of the community (and particularly rural men) are severely disadvantaged in terms of accessing screening for diabetes and hypertension; and are most likely to go undiagnosed if they have developed these conditions. A national household survey found that self-reported chronic NCDs could differ across wealth quintile, specifically with mental illness and epilepsy more common amongst the poorest Malawians.

- **Health services for NCDI in Malawi are limited at all levels of the health system, and rural facilities are less equipped than urban.** In general, less than 10-20% of health centers are fully equipped to treat common NCD such as hypertension, heart failure, diabetes, epilepsy, and asthma.

- **Human resources and medication availability will be key factors to address for expansion of NCDI service availability.** Specialized human resources

trained NCDI are extremely limited, and drug coverage from Central Medical Stores in 2016 was sufficient to treat only 5 to 15% of the estimated national disease burden of hypertension, diabetes and asthma.

- **NCDI patients and their caretakers can experience life-altering effects of their illness, which can be mitigated by targeted health system interventions.** The Commission profiled several patients with NCDIs living in poverty, which demonstrated a wide range of experience of patients and their caregivers, many offering hope that, with appropriate intervention, return to productivity and their normal life was possible.

- **There is less targeted funding for NCDIs than other health conditions, and this is disproportionate to the burden of disease from NCDIs.** While NCDIs comprise over a third of the disease burden in Malawi, targeted funding for NCDIs is less than 2% of programmatic funding, and NCDI make up less than 20% of overall health spending.

- **Out-of-pocket spending for Malawians with NCDIs is higher than for other health conditions and they have less financial risk protection.** Household out-of-pocket spending in Malawi in 2014/2015 was 10.8% of overall spending on health care. Compared to out-of-pocket spending on infectious disease (10.3%) and reproductive health (10.9%), out-of-pocket spending on NCDs was the highest at 14.7%.

- **There is a broad set of NCDI conditions that need attention in Malawi.** The Commission identified 38 conditions critical to the health of Malawians, which includes the 'big 4' as well as many other NCDI conditions that should be prioritized. These were prioritized by considering their contribution to DALYs in Malawi, the burden they place on the young in Malawi, the disproportionate suffering from in Malawi compared to high-income countries, and their severity.

- **Fifty-four interventions for prioritized NCDI conditions for Malawi were ranked according to cost-effectiveness and feasibility to propose a phased approach to address these conditions and prevent early deaths.** There are 35 health interventions in Phase 1 recommended by the Commission, many of which are partially underway in Malawi.

- **More investment in NCDIs is needed and will save lives in Malawi.** This includes a broad set of needs including human resources, medical supplies and medications, data systems, supervision and mentorship, and infrastructure development. We concluded that for Phase 1 of 3 phases, an additional investment of $9.6 USD per capita is needed.

- **The NCDI agenda is closely tied to the pursuit of Universal Health Coverage.** Given the broad range of conditions and their chronicity, the

burden of disease in Malawi and amongst the poor, and the significant out-of-pocket spending, NCDI will be a critical milestone in the fight for UHC. Additionally, because such a large number of conditions contribute to the NCDI burden, a vertical and disease specific approach will not suffice, and an integrated approach to building robust health systems is needed – a cornerstone of UHC.

- **There are key gaps in data and research that need to be filled for NCDI sin Malawi.** Specifically, effort is needed to understand the epidemiology of this broad range of conditions, drivers of disease, effective interventions and their cost, and how to design service delivery to reach the most vulnerable for all of these conditions.

6.2 Key Recommendations

6.2.1 SERVICE PROVISION

- **NCDI services should be expanded to focus on rural health facilities, the most vulnerable Malawians, and a broader set of conditions, with equity as a key focus.** This includes expanding existing screening, diagnostic, curative, and palliative services for a broad range of NCDI conditions affecting Malawians. The Commission identified 38 priority conditions, which in addition to the 'big 4' shines light on conditions such as epilepsy, rheumatic and congenital heart disease, type 1 diabetes, cervical cancer, burns and road traffic injuries, among others. Given the broad range of conditions and population affected, NCDI interventions will be a critical part of the road to Universal Health Coverage.

- **Existing NCDI services should be strengthened.** Currently there is inconsistent access to care for common NCDI in Malawi, and services tend to be more sparsesparser in rural areas and at the primary healthcare level. Existing services for conditions such as hypertension, type 2 diabetes, and asthma require greater attention and resources and then may be able to act as a platform for care for a broader set of chronic conditions. Specific needs include trained and mentored healthcare providers and availability of essential medications and equipment.

- **NCDI programming should focus on integration and clustering of services in order to decentralize to all levels of the health system.** This approach will focus on finding efficiencies and areas to leverage within the existing health system and available resources. An integrated approach to chronic care will allow for utilization of common systems and resources and promote a patient-centered approach to conditions across the lifespan. At a minimum we recommend all Phase 1 interventions described in this report for priority NCDIs be championed and implemented by the government of Malawi.

6.2.2 PREVENTION

- The definition of prevention for NCDI should be expanded beyond the traditional 'lifestyle' or individual risk factors that are typically framed around choice, to complement this standard framing with a broader prevention agenda. Because many of the priority NCDI in Malawi and much of the NCDI burden of disease is not from these factors, interventions focused on prevention need to be expanded to encompass a wider set of risks. In Malawi, some of these are in process or already planned, such as HPV and HBV vaccination and folic acid supplementation. Other examples include measures to prevent road traffic injuries, burns, and poisonings, reduce household air pollution, and eradicate schistosomiasis.

- Prevention for NCDI needs to focus on broad scale structural change and policy in order to reach all members of the population. Because individual choices are often shaped by availability and acceptability, policy is a critical component to prevention in order to tackle the environment people live in to support prevention. This requires addressing risk factors and vested interests of industry such as alcohol, tobacco, sugar, and road injuries within policy, in addition to education.

6.2.3 RESEARCH AND INFORMATION

- Routine health facility data systems should be strengthened and routinely reviewed and optimized. Data collection systems, reports, indicators, and monitoring need to be improved and streamlined for the broadened NCDI agenda. DHIS2 needs optimization for routine monitoring and application of data to policy and interventions. The private sector health facilities should be included in this intervention.

- Household and other population-based surveys should be expanded to address the NCDI agenda to include the broad set of prioritized NCDI conditions and socioeconomic information and longitudinal approaches should be supported. (see Appendix) This includes surveys such as STEPS, DHS, and the Integrated Household Survey, as well as other health surveys, in order to capture incidence, prevalence, mortality, and economic impact of NCDI in Malawi. Inclusion of this set of NCDI and socioeconomic information should be standardized to provide routine population-based monitoring data, anddata and should be followed by trained analysis with timely dissemination of findings.

- National registries for select conditions should be strengthened and expanded for program monitoring such as cancer, injuries, and severe conditions such as stroke, rheumatic heart disease, and congenital conditions.

- Facility assessment and mapping should be expanded to inform NCDI policy

and service delivery. Routine facility assessments can inform NCDI systems by including information on staff mapping and workload, burden of disease in inpatients in district hospitals, and medications, equipment, and trainings available for the identified NCDI priority conditions.

- A specific research agenda should address NCDI of poverty in Malawi. More research is needed around NCDI of poverty in Malawi, particularly around the prioritized conditions to explore the epidemiology including etiology, incidence, duration, and prognosis; intervention trials and eliciting what works in Malawi; exploring different models of service provision; and further elucidating the economic impact and out-of-pocket spending by patients with NCDI. Research institutions can support through capacity building, embedding this agenda within the national research agenda, and helping translate findings to non-technical audiences.

6.2.4 EQUITY

- Equity should be considered across all interventions, policies, and research for NCDI in Malawi. For 21 out of 54 health interventions, the equity score from DCP3 was the highest. These interventions were prioritized in Phase 1, and equity focused interventions are needed across the lifespan, with specific focus on the young.

- NCDI initiatives should focus on reaching the rural poor in Malawi and for conditions with high out-of-pocket cost for patients. Greater access to diagnostic, curative, and palliative services is needed amongst the rural poor.

6.2.5 RESOURCE ALLOCATION

- A greater allocation of resources is needed to support integrated services for NCDI in Malawi. The government of Malawi can consider several ways to meet this need. Donors can be oriented to the burden of disease and government commitment in order to drive allocation of funds to targeted program support for NCDI. Existing resources can be leveraged to address NCDI within the health system. And new sources of funding should be explored. Ultimately, resource allocation and program funding should more closely align with the burden of disease, and data-driven decision making should be utilized to direct more resources toward addressing NCDI in an integrated manner as Malawi strives for UHC.

- Creative approaches to new funding streams should be pursued. Taxation systems that address NCDI prevention and industry interest should create revenue for health spending for NCDI. Strategic partnerships with pharma, corporate funders, and other industries should be explored, including pooling resources with neighboring countries for drug purchasing and advocating

for funds. Close collaboration and alignment of priorities is needed between the Ministry of Health and Ministry of Finance.

- Donor funds and strategies should include support for NCDI. Given the broad set of chronic conditions and successes in treating chronic infections in Malawi, synergistic efforts for integrated chronic care should be pursued, existing resources leveraged, and funds reoriented to include support for NCDI. Advocacy is needed through health policy and strategic planning

6.2.6 ADVOCACY, POLICY, & GOVERNANCE

- The NCDI agenda should be championed by all levels and branches of government. NCDI interventions should be included in strategy, work plans, budget, data, and accountability mechanisms at both national and district level within the health agenda.

- The NCDI advocacy agenda should focus on equity and Malawi's most vulnerable patients and work to ensure greater awareness, resource allocation, and access to services. NCDI issues should enter the mainstream in Malawi as a key public issue through advocacy and involvement of all sectors. This should be introduced to political agendas, public awareness, media initiatives, donor support advocacy, and health interventions.

- Inter-sectoral efforts and collaboration should address NCDI with one voice. Given the broad burden of disease that is impacted by many sectors, there is need for harmonized planning and a solid voice of advocacy for NCDI of poverty that spans across all sectors and stakeholders. This should include engagement between Ministries (Health, Finance, Local Government, Agriculture, Education, Transport and Gender), regulatory bodies, legislators, media, industry, civil society, community structures, and public-private partnerships.

- Structural change within and by government should be pursued to contribute to meaningful change for the environment of NCDI in Malawi. Regulatory bodies should be strengthened, and major structural risk factors should be addressed through regulation and policy change.

- Patient voices should be highlighted as part of the NCDI of poverty agenda. Through collaboration with community structures and patient advocacy groups, a respectful patient-centered approach to policy and health system design should be undertaken.

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APPENDICES

Appendix 1 - GBD Study 2015 risk factors

Behavioural Risks	Environmental/Occupational Risks	Metabolic Risks
Child and maternal malnutrition	Unsafe water, sanitation, and handwashing	High fasting plasma glucose
Suboptimal breastfeeding	Unsafe water source	High total cholesterol
Child growth failure	Unsafe sanitation	High systolic blood pressure
Low birth weight and short gestation	No access to handwashing facility	High body-mass index
Iron deficiency	Air pollution	Low cone mineral density
Vitamin A deficiency	Ambient particulate matter pollution	Impaired kidney function
Zinc deficiency	Household air pollution from solid fuels	
Tobacco	Ambient ozone pollution	
Smoking	Other environmental risks	
Smokeless tobacco	Residential radon	
Secondhand smoke	Lead exposure	
Alcohol and drug use	Occupational risks	
Alcohol use	Occuptional carcinogens	
Drug use	Occupational asthmagens	
Dietary risks	Occupational particulate matter, gases, and fumes	
Diet low in fruits	Occupational noise	
Diet low in vegetables	Occupational injuries	
Diet low in legumes	Occupational ergonomic factors	
Diet low in whole grains		
Diet low in nuts and seeds		
Diet low in milk		
Diet high in red meat		
Diet high in processed meat		
Diet high in sugar-sweetened beverages		
Diet low in fiber		
Diet low in calcium		
Diet low in seafood omega-3 fatty acids		
Diet low in polyunsaturated fatty acids		
Diet high in trans fatty acids		
Diet high in sodium		
Sexual abuse and violence		
Childhood sexual abuse		
Intimate partner violence		
Unsafe sex		
Low physical activity		
*Identified as cost-effective by DCP3	# Identified as a priority by the Commission	

Strategic Area (NAP)	Condition(s)	Intervention	Health System Level	Phase (1-3)	CE Rating*	FRP Rating*	Equity Rating*	Current Coverage	Coverage Target	Incremental Cost
Chronic NCDs	All	Specialized surgical services*	Central Hospital	1				0.10	0.5	$939,500
Injuries & Trauma	All	Basic outpatient surgical services*	District Hospital	1				0.40	0.5	$991,695
Cancers	All	Basic rehabilitation services*	District Hospital	1				0.10	0.5	$20,773,395
Cancers	Assault, partner violence, gender violence, assault by other means	Post gender-based violence care including, counseling, provision of emergency contraception, and rape-response referral (medical and judicial)	District Hospital	1				0.10	0.5	$246,509
Chronic NCDs	Assault, partner violence, gender violence, assault by other means	Education campaigns for the prevention of gender-based violence	Community	1				0.30	0.5	$1,129,100
Cancers	Asthma	Management of acute exacerbations of asthma and COPD using systemic steroids, inhaled beta-agonists, and, if indicated, oral antibiotics and oxygen therapy	Health Center	2	1	4	1	0.20	0.5	$16,581,133
Chronic NCDs	Asthma	Low-dose inhaled corticosteroids and bronchodilators for asthma and for selected patients with COPD	Health Center	1	1	3	1	0.06	0.5	$35,247,885
Chronic NCDs	Asthma	Management of acute ventilatory failure secondary to acute exacerbations of asthma and COPD; in COPD use of bilevel positive airway pressure preferred	District Hospital	3	0	1	1	0.01	0.5	$6,575,474
Chronic NCDs	Asthma	Mass media for awareness on handwashing and household air pollution health effects	Community	1	0	1	1	0.10	0.5	$96,169
Chronic NCDs	Asthma	Self-management for obstructive lung disease to promote early recognition and treatment of exacerbations	Community	1				0.10	0.5	$3,523,051
Chronic NCDs	Asthma; Ischemic heart disease, Hypertensive heart disease, hemorrhagic stroke, ischemic stroke	Tobacco cessation counseling, and use of nicotine replacement therapy in certain circumstances	Health Center	2	4	2	1	0.2	0.5	$3,477,694
Chronic NCDs	Bipolar disorder	Management of bipolar disorder using generic mood-stabilizing medications and psychosocial treatment	Health Center	1	2	4	2	0.1	0.5	$7,898,820
Injuries & Trauma	Breast cancer	Treat early stage breast cancer with appropriate multimodal approaches, including generic chemotherapy, with curative intent, for cases that are referred from health centers and first-level hospitals following detection using clinical examination	Central Hospital	2	4	4	1	0.0	0.5	$230,037
Injuries & Trauma	Cancers	Palliative care and pain control services*	Community	1		4	1	0.50	0.5	
Injuries & Trauma	Cervical cancer	Opportunistic screening for cervical cancer using visual inspection or HPV DNA testing and treatment of precancerous lesions with cryotherapy	Health Center	1	3	3	1	0.1	0.5	$984,374
Chronic NCDs	Cervical cancer	School-based HPV vaccination for girls	Community	1	3	3	1	0.1	0.5	$1,088,490

Strategic Area (NAP)	Condition(s)	Intervention	Health System Level	Phase (1-3)	CE Rating*	FRP Rating*	Equity Rating*	Current Coverage	Coverage Target	Incremental Cost
Chronic NCDs	Cervical cancer	Treatment of early-stage cervical cancer	District Hospital	2	0	4	1	0.10	0.5	$35,706
Chronic NCDs	Chronic kidney disease	Treatment of hypertension in kidney disease, with use of ACEi or ARBs in albuminuric kidney disease	Health Center	1	2	2	1	0.10	0.5	$2,181,354
Chronic NCDs	Cirrhosis and other chronic liver diseases due to alcohol use	Screening and brief intervention for alcohol use disorders	Health Center	2	3	2	1	0.5	0.5	$-
Chronic NCDs	Cirrhosis and other chronic liver diseases due to alcohol use; Asthma; Ischemic heart disease, Hypertensive heart disease, hemorrhagic stroke, ischemic stroke	Mass media messages concerning use of tobacco and alcohol	Community	1	4	1	1	0.2	0.5	$72,127
Chronic NCDs	Cirrhosis and other chronic liver diseases due to hepatitis B	Hepatitis B vaccination: EPI-6 for all children plus vaccination of high-risk populations (PWID, MSM, household contacts, persons with multiple sex partners), with addition of birth dose and vaccination of healthcare workers as resources permit	Community	2				0.10	0.5	$1,461,900
Mental Health	Cirrhosis and other chronic liver diseases due to other causes	Hepatitis B and C testing of individuals identified in the national testing policy (i.e., based on endemicity and risk level), with appropriate referral of positive individuals to trained providers	District Hospital	2				0.10	0.5	$1,090,970
Mental Health	Diabetes mellitus	Screening for diabetes in all high-risk adults	Health Center	2	4	2	1	0.4	0.5	$301,287
Mental Health	Diabetes mellitus	Prevention of long-term complications of diabetes through blood pressure, lipid, and glucose management as well as consistent foot care	Community	1	4	2	1	0.1	0.5	$15,640,667
Chronic NCDs	Diabetes mellitus	Diabetic retinopathy screening via telemedicine, followed by treatment using laser photocoagulation	District Hospital	3	3	2	1	0.0	0.5	$1,772,256
Cancers	Diabetes mellitus	Screening and management of albuminuric kidney disease with ACEi or ARBs, including targeted screening among people with diabetes	Health Center	2	2	2	1	0.01	0.5	$4,785,798
Cancers	Diabetes mellitus	Screening for diabetes in all pregnant women	Health Center	1	1	3	3	0.40	0.5	$938,511
Chronic NCDs	Diabetes mellitus	Diabetes self-management education	Health Center	1				0.10	0.5	$960,920
Cancers	Epilepsy	Management of epilepsy using generic anti-epileptics	Health Center	1	4	4	3	0.8	0.5	
Chronic NCDs	Esophageal cancer, bladder cancer	Mass drug administration for lymphatic filariasis, onchocerciasis, schistosomiasis, soil-transmitted helminthiases and trachoma, and foodborne trematode infections	Community	1				0.10	0.5	$5,462,273
Chronic NCDs	Fire, heat, and hot substances	Expanded first-level hospital surgical services*	District Hospital	2				0.05	0.5	$587,188
Chronic NCDs	Fire, heat, and hot substances	Compression therapy for amputations, burns, and vascular or lymphatic disorders	Health Center	1				0.00	0.5	$573,579

Strategic Area (NAP)	Condition(s)	Intervention	Health System Level	Phase (1-3)	CE Rating*	FRP Rating*	Equity Rating*	Current Coverage	Coverage Target	Incremental Cost
Chronic NCDs	Ischemic heart disease, Hypertensive heart disease, hemorrhagic stroke, ischemic stroke	Medical management of acute heart failure	District Hospital	1	4	5	3	0.1	0.5	$11,275,894
Mental Health	Ischemic heart disease, Hypertensive heart disease, hemorrhagic stroke, ischemic stroke	Medical management of chronic heart failure with diuretics, beta-blockers, ace-inhibitors, and mineralocorticoid antagonists	Health Center	1	4	4	3	0.1	0.5	$5,521,830
Chronic NCDs	Ischemic heart disease, Hypertensive heart disease, hemorrhagic stroke, ischemic stroke	Use of aspirin in case of suspected myocardial infarction	Community	1	4	2	1	0.1	0.5	$411
Chronic NCDs	Ischemic heart disease, Hypertensive heart disease, hemorrhagic stroke, ischemic stroke	Mass media messages concerning healthy eating or physical activity	Other	1	4	1	1	0.2	0.5	$72,127
Chronic NCDs	Ischemic heart disease, Hypertensive heart disease, hemorrhagic stroke, ischemic stroke	Use of percutaneous coronary intervention for acute myocardial infarction where resources permit	Central Hospital	3	3	4	1	0.0	0.5	$6,431,760
Chronic NCDs	Ischemic heart disease, Hypertensive heart disease, hemorrhagic stroke, ischemic stroke	Use of unfractionated heparin,aspirin, and generic thrombolytics in acute coronary events	Central Hospital	3	2	4	1	0.00	0.5	$11,513,551
Chronic NCDs	Ischemic heart disease, Hypertensive heart disease, hemorrhagic stroke, ischemic stroke	Combination therapy for persons with multiple risk factors to prevent CVD (primary prevention)	Health Center	1	2	2	1	0.15	0.5	$4,208,781

Strategic Area (NAP)	Condition(s)	Intervention	Health System Level	Phase (1-3)	CE Rating*	FRP Rating*	Equity Rating*	Current Coverage	Coverage Target	Incremental Cost
Chronic NCDs	Ischemic heart disease, Hypertensive heart disease, hemorrhagic stroke, ischemic stroke	Long term management of IHD, stroke, and PVD with aspirin, beta blockers, ACEi, and statins (as indicated), for secondary prevention	Health Center	2	2	2	1	0.10	0.5	$13,326,505
Chronic NCDs	Ischemic heart disease, Hypertensive heart disease, hemorrhagic stroke, ischemic stroke	Screening and management of hypertensive disorders in pregnancy	Health Center	1	1	3	3	0.70	0.5	
Chronic NCDs	Ischemic heart disease, Hypertensive heart disease, hemorrhagic stroke, ischemic stroke	Opportunistic screening for hypertension for all adults, with treatment decisions guided by absolute CVD risk	Health Center	2	1	1	1	0.20	0.5	$1,392,762
Chronic NCDs	Ischemic heart disease, Hypertensive heart disease, hemorrhagic stroke, ischemic stroke	Use of community health workers to screen for CVRD using non-lab-based tools for overall CVD risk, improving adherence, and referral to primary health centers for continued medical management	Community	2				0.03	0.5	$402,491
Chronic NCDs.....	Leukemia	Treat selected early-stage childhood cancers with curative intent in pediatric cancer units/hospitals	Central Hospital	3	2	5	2	0.0	0.5	$1,093,014
Chronic NCDs	Liver cancer due to hepatitis B	For individuals testing positive for hepatitis B and C, assessment of treatment eligibility by trained providers followed by initiation and monitoring of antiviral treatment when indicated	District Hospital	3				0.00	0.5	$16,496
Injuries & Trauma	Major depressive disorder	Mass media messages concerning sexual and reproductive health; and mental health for adolescents	Community	1	4	2	1	0.1	0.5	$12,109,115
Injuries & Trauma	Major depressive disorder; Anxiety disorders	Management of depression and anxiety disorders with psycological and generic antidepressant therapy	Health Center	1	3	4	1	0.0	0.5	$10,398,986
Injuries & Trauma	Neural tube defects; Congenital heart anomalies	Provide iron and folic acid supplementation to pregnant women, as well as food/caloric supplementation to pregnant women in food insecure households	Health Center	1	3	3	3	0.5	0.5	$-

Strategic Area (NAP)	Condition(s)	Intervention	Health System Level	Phase (1-3)	CE Rating*	FRP Rating*	Equity Rating*	Current Coverage	Coverage Target	Incremental Cost
Chronic NCDs	Paralytic ileus and intestinal obstruction; Motor vehicle road injuries; Pedestrian road injuries; Appendicitis	Basic first-level hospital surgical services*	District Hospital	1				0.30	0.5	$19,572,922
Injuries & Trauma	Poisonings	Management of intoxication/poisoning syndromes using widely available agents; e.g., activated charcoal, naloxone, bicarbonate, antivenin	District Hospital	1				0.05	0.5	$765,926
Cancers	Psychotic disorders	Management of schizophrenia using generic anti-psychotic medications and psychosocial treatment	Health Center	1	2	4	2	0.1	0.5	$1,252,054
Cancers	Rheumatic heart disease	Treatment of acute pharyngitis in children to prevent rheumatic fever	Health Center	1	4	2	1	0.8	0.5	
Chronic NCDs	Rheumatic heart disease	Secondary prophylaxis with penicillin for rheumatic fever or established RHD	Health Center	1	0	1	1	0.80	0.5	
All	Sickle cell disorders	In settings where sickle cell disease is a public health concern, universal newborn screening followed by standard prophylaxis against bacterial infections and malaria*	Health Center	1	4	2	3	0.0	0.5	$1,686,193
										$236,688,678

* CE = Cost-Effectiveness; FRP = Financial Risk Protection