The Burden of Non-Communicable Diseases and Its Implications for Sustainable Development Goals Across Regions in Ethiopia.

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Abstract

Background: Non- Non-communicable diseases (NCDs) are major global public health concerns that cause nearly three-quarters of the burden of mortality worldwide. Cardiovascular diseases, cancer, chronic respiratory diseases, and diabetes alone account for over eight out of ten NCD deaths. To alleviate this huge burden, the Sustainable Development Goals (SDG) aimed to reduce premature mortality from non-communicable diseases by one-third. However, the magnitude of NCDs at national and subnation levels is poorly documented in resource-constrained settings such as Ethiopia, making it difficult to track progress. We analyzed the burden of non-communicable diseases across regions to show the disparity, progress, and implications towards achieving SDG targets in Ethiopia.

Methods: This analysis is a component of the GBD 2019 study, which is a collaborative effort between the Ethiopian Public Health Institute and the Institute for Health Metrics and Evaluation for Ethiopia. The primary sources of data utilized for estimating the GBD included census data, demographic surveillance, cancer registration, household surveys, health service utilization, disease reporting, and verbal autopsy. Our assessment, conducted in accordance with the GBD protocol, focuses on reporting the incidence, mortality, disability-adjusted life years (DALYs) along with a 95% Uncertainty Interval (UI), and the progress of non-communicable diseases in Ethiopia..

Results: In 2019, 202 million new cases of NCDs (95% Uncertainty Interval (UI), 189 million-215 million), 219,000(197,000-241,000) deaths, 13 million (11-15) DALY of NCDs were exhibited in Ethiopia. In the same period, Incident rate, death rates, DALY rates of NCDs were 190,000 (180,000-200,000), 550 (500-600), and 12,200 (10,400-14,200) per 100,000 population, respectively. Overall, NCD prevalence accounted for 63.2% of total cases in Addis Ababa, 59.8% in Harari, and 55% in Somali regional states. Overall, NCD deaths accounted for 55% of total deaths in Addis Ababa, 51% in Tigray, 45% in Harari, 43% in Amhara, and 42% in Dire Dawa, while it was 29% to 33% of total deaths in Somali, Benishngul Gumuz and Afar regional states. From 2010-2019, the percentage change in death count was 21% (8-35%), incidence cases 25% (24-26%), and DALYs count was 17% (6-29%). In 2019, skin and subcutaneous diseases, neurological disorders, mental disorders, digestive diseases, musculoskeletal disorders, and neoplasms were the five leading causes of incidence rates in Ethiopia. In contrast, cardiovascular diseases, neoplasms, digestive diseases, chronic respiratory diseases, and diabetes mellitus were Ethiopia's leading causes of death rates. In 2019, modifiable risk factors accounted for 52% (48-56%) of all NCD-caused mortality.

Conclusion: This study showed a high burden and relatively stable trend of NCD-caused mortality and disability in Ethiopia. The epidemiological transition was not uniform across the regions. Current NCD strategies fail to address high-incidence NCDs that overburden the health care system while designed to address killer NCD types and their risk factors. Strategies and interventions could target modifiable risk factors such as high systolic blood pressure, dietary risks, air pollution, and high fasting plasma glucose, which contribute almost half of NCD mortality and disability. This study suggests the need to develop proclamations and strategies on risk factors, such as reducing sodium, fat, and sugar use to prevent and control non-communicable diseases in Ethiopia. This result may also call for tailored and innovative public health interventions across highly NCD-prevalent regions to progress on reducing NCD deaths by one-third at the end of 2030. . [*Ethiop. J. Health Dev.* 2023;37 (SI-2)]

Keywords: Sustainable Development Goals, Non-communicable diseases, Global Burden of Diseases, Ethiopia

Introduction

Non-communicable diseases are major global public health concerns and challenges in the 21st century, contributing to a significant burden of morbidity, mortality, disability, and quality of life worldwide (1). However, low and middle-income countries, particularly in Sub-Saharan Africa, have faced a triple disease burden, including communicable diseases, non-communicable diseases, and debilitated injuries (2, 3). Non-communicable diseases are chronic diseases that tend to be long duration, non-transmittable from person to person, and caused by physiological, behavioral, genetic, and environmental factors (4). Non-communicable diseases such as cardiovascular, chronic respiratory disease, cancer, and diabetes mellitus are a leading global burden of deaths-kills, 41 million people each year, equivalent to 71% of all deaths and responsible for more than 54% global DALYs (4-6). More than 15 million premature deaths (between 30-69 years) and 1.7 million below 30 years from NCD, and more than 80% of all premature NCD-related deaths were due to the common NCD (1, 5, 6). More than 77-

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80% NCD-related mortality have occurred in Low and Middle Income Countries (LMICs), particularly sub-Saharan Africa (1, 5, 6).

NCD has a grave economic impact on both direct and indirect medical costs. Based on the economic estimate, between 2011-2030, about $47 trillion has been lost due to NCD, and more than $30 trillion was attributable to cardiovascular diseases, cancers, chronic pulmonary diseases, and diabetes (6). Despite African countries having a high burden from communicable, maternal, and child health conditions, countries in sub-Saharan Africa have undergone rapid epidemiological, socioeconomic, and demographic changes, which will change the profile of disease burden to NCD from dominant communicable disease (7). Understanding its burden and impact, global due attention has been given to alleviate its burden through the 2011 Political declaration of the UN in preventing and controlling NCDs (8). WHO Global Action Plan for Prevention, and Control of NCDs 2013-2020 (8-10) and Sustainable Development Goals targets to reduce 33% of premature mortality from NCDs by 2030 (11). Ethiopia has also adopted and agreed to the WHO Global NCD Action Plan and SDGs decision., Ethiopia developed and implemented a National Strategic Plan for the Prevention and Control of Major Non-Communicable Diseases to achieve the SDGs' goals in 2020 (12).

National national-level studies haveshown the general burden of non-communicable diseases and specific non-communicable diseases such as cardiovascular diseases and common risk factors (13-15). However, there is a lack of comprehensive and comparable subnational level studies on NCDs and attributing risk factors, and studies demonstrating the burden of non-communicable diseases and epidemiological transitions that explore national and subnational progress of NCDs towards SDG. Therefore, we provided the burden of NCDs at national and subnational levels to show the epidemiologic transitions and their implications on the progress towards SDGs on Non-Communicable Diseases in Ethiopia. In this analysis, we aim to provide an epidemiological estimation of incidence, prevalence, mortality, disability-adjusted life-years (DALYs), and trends of non-communicable disease in Ethiopia.

Methods

Overview

This study is conducted by the Ethiopia Public Health Institute (EPHI) and Institute of Health Metrics and Evaluation (IHME) collaborative initiative using GBD 2019 methodology for Ethiopia with nine regional states and two chartered cities. The Sidama and South West Ethiopia regions were reported under the Southern Nations Nationalities and Peoples (SNNP) regional state. Global Burden of Disease (GBD 2019) study is a comprehensive and comparable study that provides an up-to-date and model-based on causes of death and non-fatal outcomes for 369 diseases and conditions and 87 risk factors. The National Data Management and Analytics Center (NDMC) of EPHI and IHME used all available Ethiopia health data to estimate non-communicable disease incidence, prevalence, causes of death, years of life lost (YLL), years lived with disability (YLDs), disability-adjusted life years (DALYs) and risk factor attributable burden of non-communicable diseases by age, sex and years (16). The YLLs from NCDs are years of life lost due to premature mortality and are calculated by subtracting the age at death from the longest possible life expectancy for a person at that age. Years lived with disability from NCDs is measured by taking the condition's prevalence multiplied by the disability weight for that condition. Disability-adjusted life-years (DALYs) is the sum of YLLs and YLDs (16). Disability weight represents the severity of health loss associated with a generic health state. It ranges from 0 (“perfect health”) to 1 (“death”).

The non-communicable diseases in the GBD study were classified into twelve categories, including cardiovascular diseases, neoplasms, chronic respiratory diseases, digestive diseases, neurological disorders, mental disorders, substance use disorders, diabetes and chronic kidney diseases, skin and subcutaneous tissue disorders, sense organ diseases, musculoskeletal disorders, and other non-communicable diseases. The latter category encompasses congenital anomalies, genitourinary and male infertility, blood disorders, and oral disorders. Each category is further subdivided into specific non-communicable disease types.

Data Sources

A comprehensive description of GBD study aims, methodology, data sources, and analytic tools has been reported previously (16). The process of GBD estimation for Ethiopia was based on multiple relevant data sources for each non-communicable disease. The main data sources were censuses, demographic surveillance, disease and cancer registry, household surveys, air pollution monitoring, health services use, satellite imaging, disease notification, verbal autopsy, and others. EPHI and IHME collaboratively searched each data source from electronic data bases, governmental and international organization websites, demographic health surveys, and systemic reviews of published and unpublished studies. The identified data sources were screened, quality of the data was assessed, extracted, standardized, and mapped according to GBD guidelines (16). This analysis complies with the Guidelines for Accurate and Transparent Health Estimates Reporting (GATHER) (16).

Modeling Techniques

For most non-communicable diseases, processed data are modelled using GBD-standardized tools and techniques. There are three main standardized tools: Cause of Death Ensemble model (CODEm) to estimate causes of death, spatiotemporal Gaussian process regression (ST-GPR), and DisMod-MR(16) to estimate non-fatal outcomes and attribute risk factors. We produced 95% uncertainty intervals (UI) for the estimates by taking 1000 draws of the distribution of every modeling and computation process. The final mean estimate was calculated by taking the mean value of the 1000 draws. The UI was calculated by taking the

2.5th and 97.5th percentiles of the distribution across all 1000 draws(16).

Results

In Ethiopia, there were 202 million new cases of NCDs (95% Uncertainty Interval (UI), 189-215) in 2019, making an incidence rate of 187,436 (175,653-199,806) per 100,000 (Table 1). During this period, skin and subcutaneous diseases, neurological disorders, mental disorders, digestive diseases, musculoskeletal disorders, and neoplasms were the five leading causes of incidence rates in Ethiopia (Table 2). Overall, NCD prevalence accounted for 63.2% of total cases in Addis Ababa, 59.8% in Harari, and 55% in Somali regional states (Figure 1). From 2010 to 2019, the incidence cases of NCDs increased by 25% (24-26%), death counts by 21% (8-35%), and DALYs by 17% (6-29%) (Table 3).

Table 1: **Incidence cases, death, and DALY counts and rates of NCDs in Ethiopia, 2019**

	Incidence cases			**ASIR**			**Death counts**			**ASDR**			**DALYs counts**			**ASDALYsR**		
Name	Value	95%UI		Value	95%UI		Value	95%UI		Value	95%UI		Value	95%UI		Value	95%UI	
Ethiopia	202000000	189000000	215000000	190000	181000	200000	219000	197000	241000	550	500	600	13100000	11200000	15200000	19700	17200	22400
Oromia	78700000	73400000	84100000	194000	185000	204000	74700	65900	84400	520	460	580	4590000	3910000	5370000	18800	16300	21500
Amhara	43100000	40400000	45800000	189000	179000	198000	57300	49500	65600	530	460	600	3090000	2600000	3580000	19100	16400	21700
Southern Nations, Nationalities, and Peoples	41900000	39000000	44800000	187000	177000	197000	40900	35800	46600	600	530	680	2740000	2290000	3190000	21200	18300	24100
Somali	12500000	11700000	13400000	186000	177000	195000	16600	14300	19100	600	520	680	850000	710000	1010000	20800	17900	24300
Tigray	11400000	10700000	12100000	187000	178000	197000	12200	10100	14500	580	480	690	810000	680000	950000	19900	17000	23100
Addis Ababa	6500000	6180000	6800000	190000	181000	199000	9900	8500	11600	620	540	690	530000	440000	630000	20600	17700	23700
Afar	3180000	2960000	3400000	187000	178000	196000	3300	2800	3900	690	600	780	220000	180000	250000	23500	20400	26600
Benishangul-Gumuz	2000000	1860000	2150000	187000	178000	197000	2100	1700	2500	630	530	740	145000	121000	173000	22600	19200	26100
Gambella	950000	890000	1010000	189000	180000	199000	1000	800	1200	530	460	610	62000	52000	73000	18900	16100	21900
Dire Dawa	930000	880000	990000	188000	179000	198000	800	700	900	610	540	690	56000	46000	67000	20400	17600	23300
Harari	480000	460000	510000	188000	179000	198000	600	500	700	580	500	660	34000	28000	40000	20100	17200	23100

In the same period, Ethiopia's estimated number of NCD deaths was 219,284 (197,461-241,133), making a death rate of 204 (184-224) per 100,000. In contrast to the incidence, cardiovascular diseases 225 (193-257), neoplasms 88 (72-105), digestive diseases 81 (68-97), chronic respiratory diseases 38 (33-44), and diabetes mellitus 36 (31- 41) per 100,000 were found to be the five leading causes of death rates in Ethiopia (Table 2).

Table 2. **All age incidence and death rates of non-communicable diseases in Ethiopia, 2019**

Non-communicable diseases	Incidence Rate (95% UI)			Death Rate (95% UI)			DALY Rate (95% UI)		
	Value	UB	LB	Value	UB	LB	Value	UB	LB
Cardiovascular diseases	277.45	310.40	247.93	71.54	82.00	61.88	1870.7	2134.9	1620.6
Chronic respiratory diseases	779.09	1008.17	600.12	12.76	14.70	10.89	542.3	639.0	462.5
Diabetes and kidney diseases	151.99	161.04	142.94	21.20	24.20	18.56	726.7	819.9	638.9
Digestive diseases	3768.17	4243.49	3339.05	32.70	39.63	26.65	1207.2	1492.0	985.2
Mental disorders	4803.27	5445.44	4208.97	0.00	0.00	0.00	1393.0	1844.7	1018.6
Musculoskeletal disorders	2202.34	2447.68	1972.32	0.36	0.62	0.20	756.9	1013.7	538.9
Neoplasms	1430.87	1731.46	1181.57	36.81	43.32	30.39	1323.1	1564.6	1074.6
Neurological disorders	6838.08	7817.34	5967.38	8.87	19.15	4.20	653.5	1036.5	372.2
Other non-communicable diseases	80015.55	90007.57	70011.08	18.05	26.32	12.27	2275.5	3045.7	1682.5
Sense organ diseases	0.00	0.00	0.00	0.00	0.00	0.00	534.9	740.5	370.6
Skin and subcutaneous diseases	86062.48	93376.59	79390.03	0.71	0.88	0.57	638.4	996.3	412.2
Substance use disorders	1107.20	1338.32	913.44	0.80	0.97	0.67	266.7	358.2	187.5

Figure 1. **Prevalence Fraction (PF) for epidemiological transition across regions in Ethiopia in 2019**

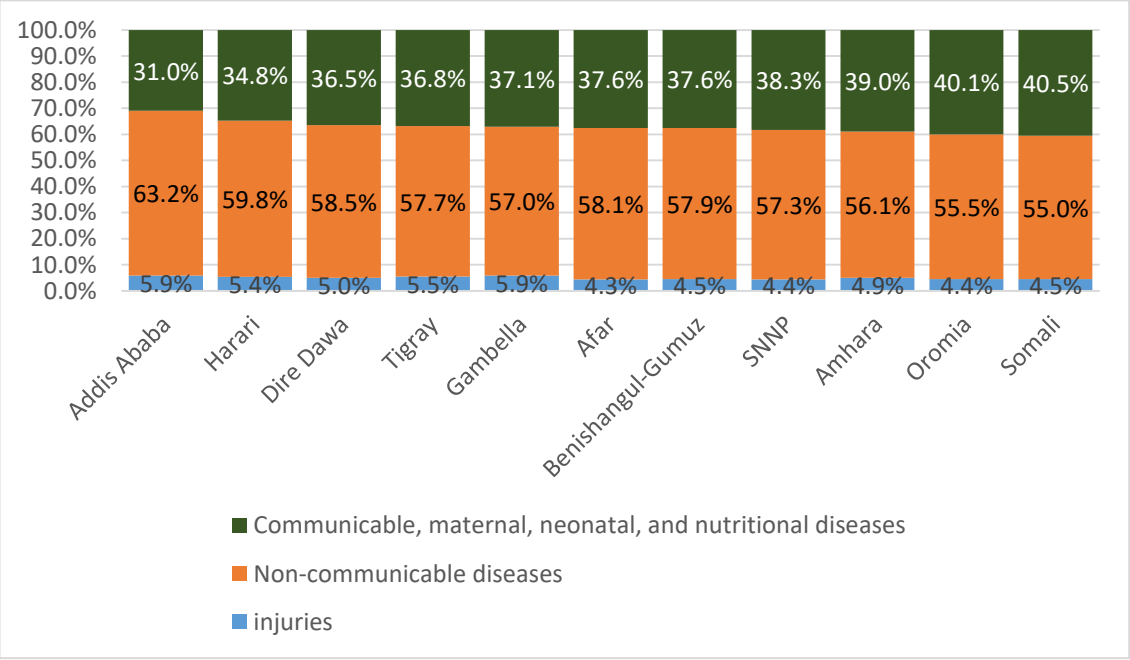

Table 3: **National percentage change of death counts, age-standardized death rates, DALYs counts, and age-standardized DALYs rate of NCDs in Ethiopia, 2010-2019**

	Change of incidence			Change of ASIR			Change of death			Change of ASDR			Change of DALYs			Change of ASDALYsR		
	value	95%UI		value	95% UI		value	95% UI		value	95% UI		value	95% UI		value	95%UI	
Ethiopia	25%	24%	26%	0%	-1%	1%	21%	8%	35%	-5%	-14%	4%	17%	6%	29%	-6%	-13%	1%
Oromia	27%	25%	30%	0%	-1%	2%	21%	5%	40%	-4%	-16%	9%	18%	6%	31%	-6%	-14%	3%
Amhara	19%	17%	21%	0%	-2%	2%	17%	0%	39%	-8%	-22%	7%	13%	-1%	27%	-8%	-17%	3%
SNNP	28%	26%	31%	0%	-2%	2%	20%	0%	43%	-5%	-18%	11%	18%	2%	35%	-6%	-16%	5%
Somali	26%	23%	28%	0%	-2%	2%	28%	7%	53%	1%	-14%	18%	24%	9%	42%	-2%	-15%	12%
Tigray	24%	22%	26%	0%	-2%	2%	27%	3%	56%	-3%	-21%	18%	19%	4%	35%	-4%	-15%	8%
Addis Ababa	16%	14%	19%	1%	-1%	3%	31%	10%	58%	-11%	-21%	2%	23%	9%	41%	-8%	-17%	3%
Afar	9%	6%	10%	0%	-2%	1%	4%	-14%	27%	-3%	-18%	14%	4%	-9%	19%	-5%	-16%	8%
Benishangul-Gumuz	36%	33%	38%	0%	-2%	2%	16%	-7%	45%	-15%	-30%	4%	19%	2%	40%	-13%	-25%	1%
Gambella	37%	35%	40%	0%	-1%	2%	31%	8%	61%	-5%	-20%	14%	22%	7%	40%	-7%	-17%	6%
Dire Dawa	27%	24%	29%	0%	-1%	2%	34%	7%	69%	-6%	-21%	13%	31%	13%	51%	-9%	-21%	4%
Harari	23%	21%	26%	0%	-2%	2%	25%	0%	52%	-4%	-20%	14%	17%	-1%	34%	-7%	-20%	6%

In 2019, the estimated number of DALYs from NCDs in Ethiopia was 13 million (15- 11), making a DALY rate of 12188.9 (14137.2- 10374.6) per 100,000 (Table 1). In 2019, the five leading DALYs rates in Ethiopia were cardiovascular diseases 1870.7 (1620.6-2134.9), neoplasms 1323.1 (1074.6-1564.6), mental disorders 1393.0 (1018.6-1844.7), digestive diseases 1207.2 (985.2-1492.0), and musculoskeletal disorder 756.9 (538.9-1013.7) per 100,000 (Table 2).

Regional level estimates showed that The highest NCD death rate was recorded in Addis Ababa 281.6 (331.6-242.5), Tigray 266.4 (306.7-229.6), Amhara 246.4 (282.0-213.0) and Harari 224.8 (259.8-190.8) per 100,000 (Table 1). Overall, NCD deaths accounted for 55% of total deaths in Addis Ababa, 51% in Tigray, 45% in Harari, 43% in Amhara, and 42% in Dire Dawa, while it was 29% to 33% of total deaths in Somali, Benishngul Gumuz and Afar regional states (Figure 2).

Figure 2. **Death Fractions (DF) from epidemiological transitions across regions in Ethiopia, 2019**

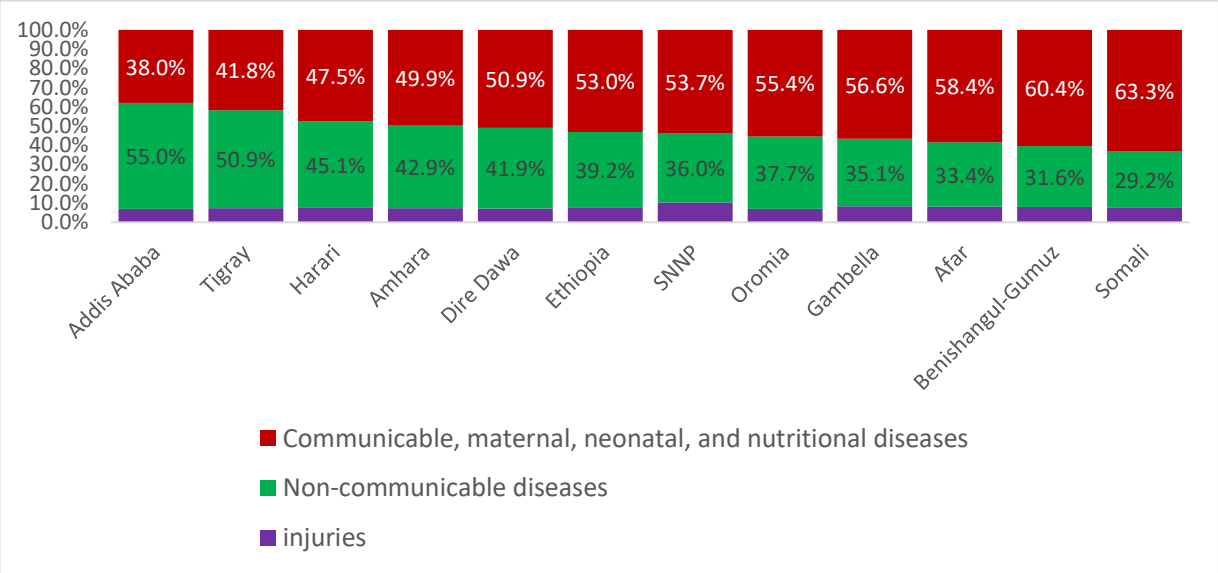

Table 4. **Percent of all modifiable risk factor-attributed deaths and DALYs of NCDs in Ethiopia, 2019**

Cause of DALYs	**Percent**	**UB**	**LB**
Cardiovascular diseases	73%	76%	70%
Chronic respiratory diseases	41%	47%	35%
Diabetics and kidney diseases	100%	100%	99%
Digestive diseases	24%	35%	16%
Mental disorders	10%	14%	5%
Musculoskeletal disorders	21%	25%	18%
Neoplasms	20%	26%	17%
Neurological disorders	4%	7%	2%
Non-communicable diseases	30%	32%	27%
Other non-communicable diseases	0%	1%	0%
Sense organ diseases	23%	27%	19%
Substance use disorders	100%	100%	100%
Causes of Death	Percent	UB	LB
Cardiovascular diseases	79%	82%	76%
Chronic respiratory diseases	60%	68%	51%
Diabetics and kidney diseases	100%	100%	99%
Digestive diseases	28%	40%	19%
Musculoskeletal disorders	1%	2%	0%
Neoplasms	25%	30%	21%
Neurological disorders	10%	17%	5%
Non-communicable diseases	52%	56%	48%
Other non-communicable diseases	0%	1%	0%
Substance use disorders	100%	100%	100%

Regarding risk factors, significant portions of NCD mortality in Ethiopia were attributed to modifiable risk factors. Modifiable risk factors a accounted for 52% (48-56%) of all NCD-caused mortality. Specifically, modifiable risk factors were accountable for 79% of cardiovascular disease mortality, 99.7% of diabetes and chronic kidney diseases, 60.4% of chronic respiratory disease mortality, 25% of cancer mortality, 28% of digestive disease mortality, 100% of substance use disorder mortality rates in Ethiopia in 2019 (Table 4). High systolic blood pressure 22 % (19-25%)), dietary risks 17% (12-23%), air pollution 17% (14-20%), and high fasting plasma glucose 13% (11-15%) were the four leading risk factors associated with NCD mortality rates (Figure 6).

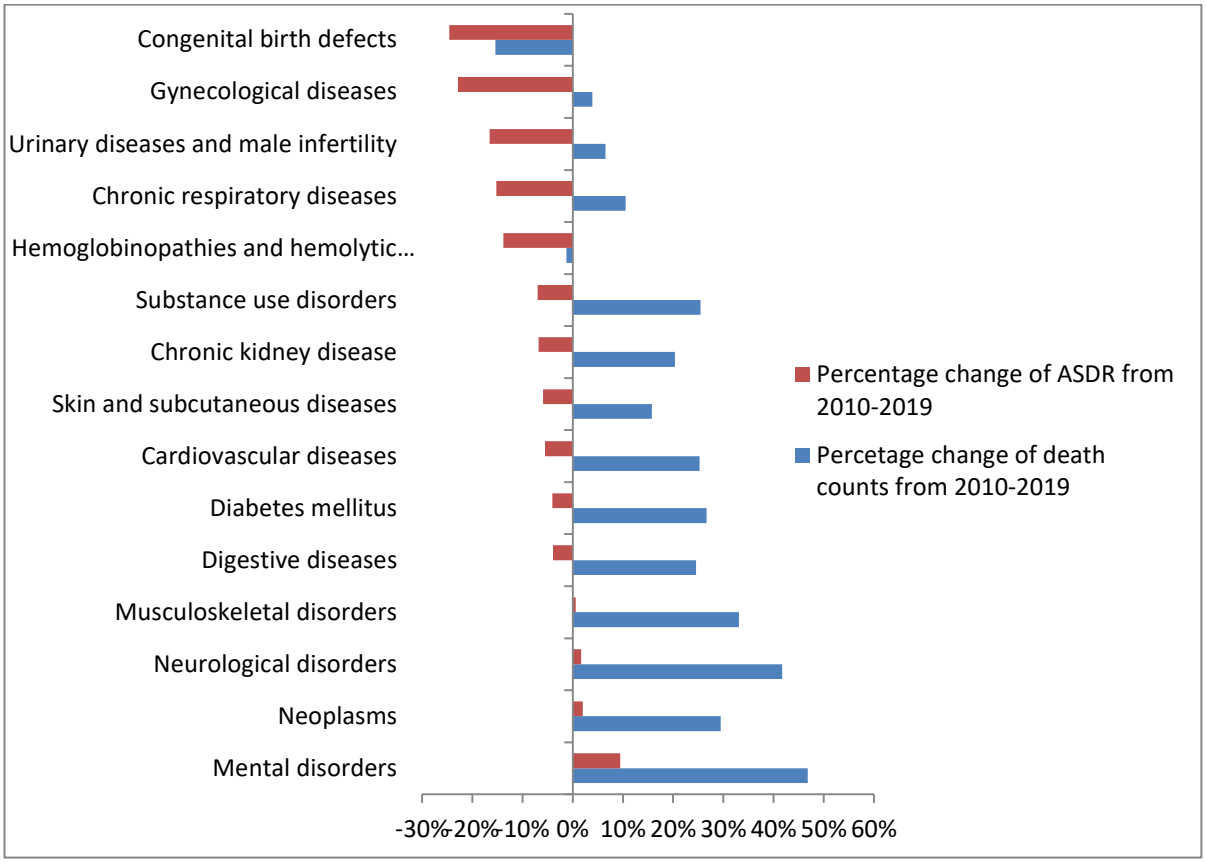

Figure 3: **Percentage of deaths and ASDR of NCDs in Ethiopia between 2010-2019.**

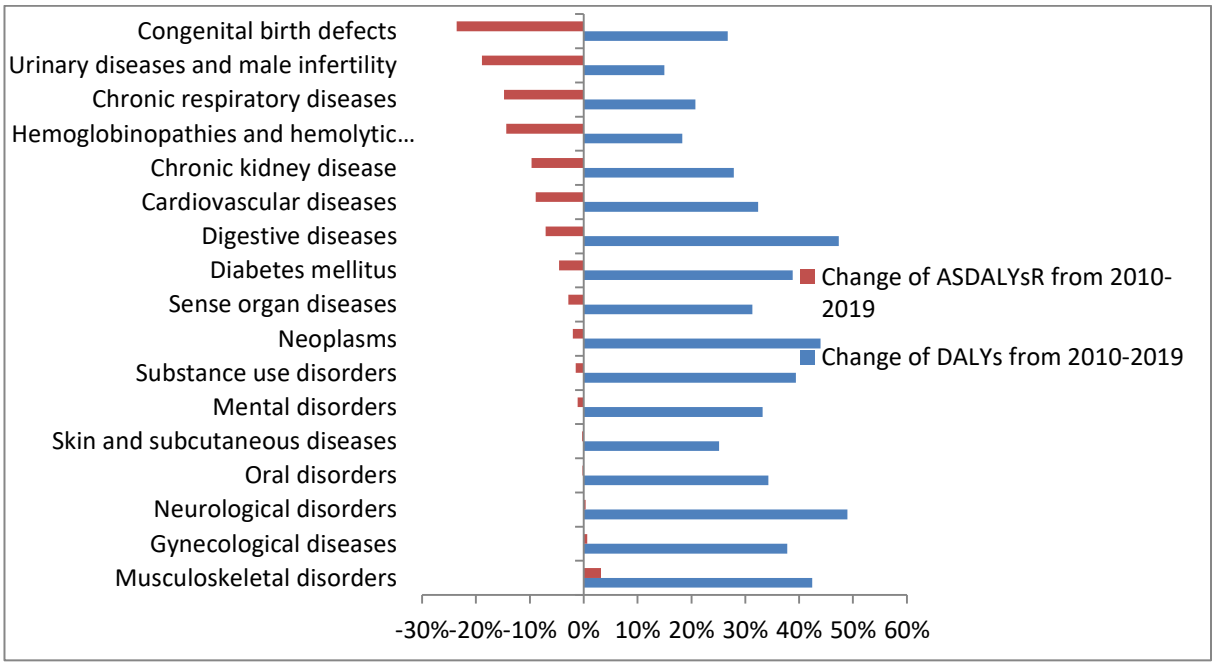

Figure 4: **Percentage of DALYs and Age-standardized DALYs rate of NCDs in Ethiopia between 2010-2019.**

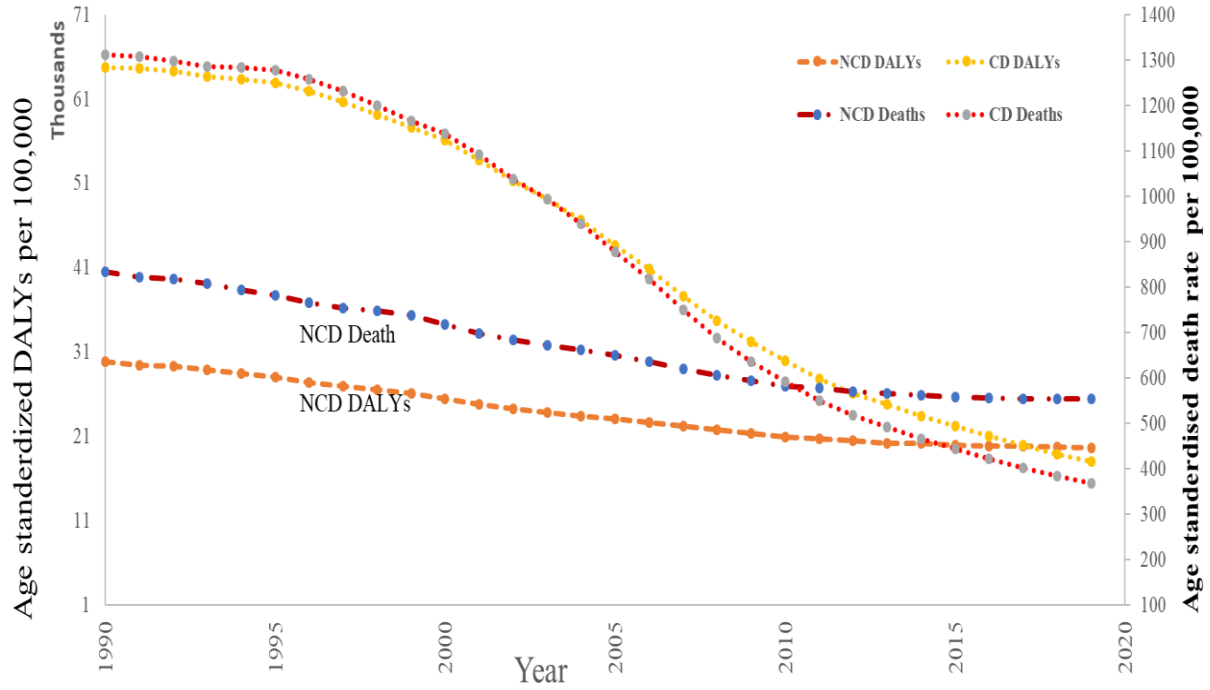

Figure 5: **Trends of age-standardized death and DALYs rate of NCDs and Communicable Diseases, maternal, neonatal, and nutritional diseases in Ethiopia between 1990-2019.**

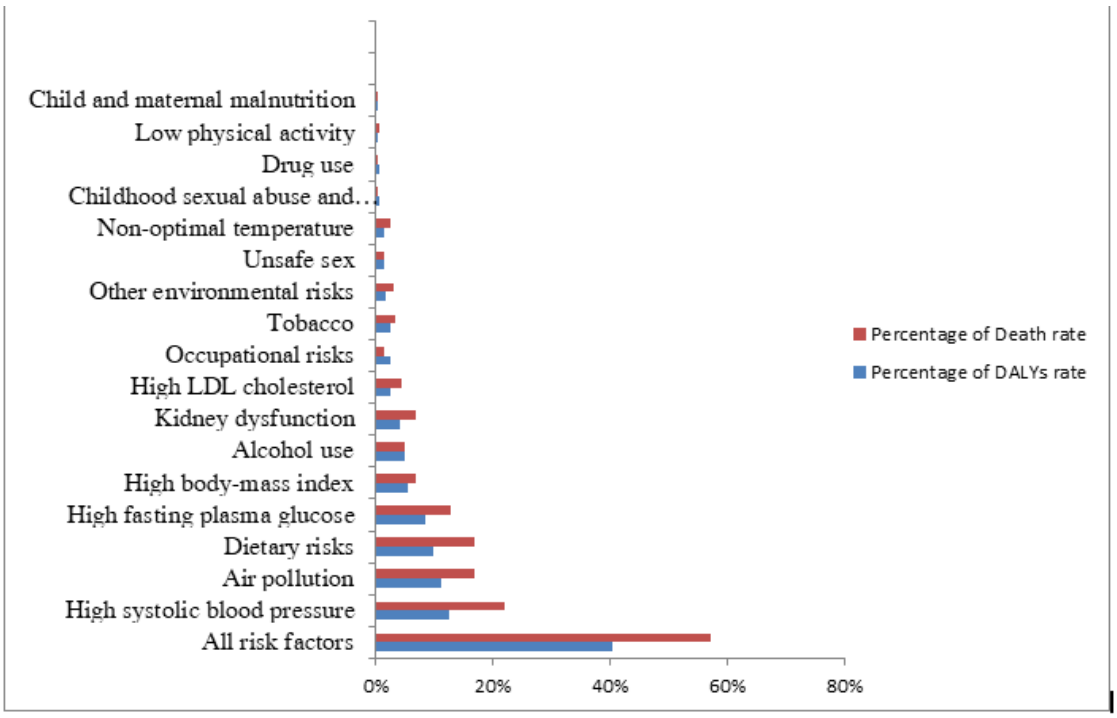

Figure 6. **Attributable risk factors of NCDs in Ethiopia, 2019**

Discussion

Observation from this study revealed that trends in death and DALY rates from non-communicable diseases were fairly stable, which has significant implications for SDG indicators. An absolute number of incidence cases, deaths, and DALYs of NCD have increased across the regions. Our findings are consistent with previously reported trend of NCDs in sub-Saharan and East African regions (7, 15, 17). Compressive national evidence has suggested a significant improvement in health across regions and cities for the last three decades, for which progress with NCDs and their risk factors were inadequate compared with infectious diseases, under-5 mortality, and others (18).

This study has shown a high incidence of non-communicable diseases such as skin and subcutaneous diseases, neurological disorders, mental disorders, digestive diseases, and musculoskeletal disorders that could be a high burden to the health care service, which has already been overwhelmed by infectious diseases and maternal and child health issues. These trends were observed in most low- and middle-income countries where low attention was given to these NCDs(19). For example, digestive disease is the third leading cause of

mortality and disability in African countries(19, 20). These diseases are neglected within current NCD national strategies focusing on killer NCD diseases such as cardiovascular diseases, cancer, chronic respiratory diseases, and diabetes and their risk factors. The non-uniform epidemiologic transition status across the regions could be due to differences in socio-economy, demography, and lifestyles (18).

Since 2010, Ethiopia has experienced an epidemiological shift, with increased the burden of non-communicable diseases, a decrease in communicable, maternal, neonatal, and nutritional conditions, and relatively stable injuries. It is coupled with demographic transitions where Ethiopia's life expectancy (LE) at birth has increased by 21·93 years from 1990 to 2019 (3, 18). Some regions showed higher NCDs prevalence that needs more attention and address in the health care intervention and treatment strategies. This transition has shown its implications at country and regional levels that need policy revision to address leading non-communicable diseases and progress on SDG indicators. Ethiopia a and regional states, could benefit from the enhanced implementation of the Global NCD Action Plan aligned with the 2030 Agenda for Sustainable Development Goals (11) and the WHO 13th General Program of Work 2019-2023 adopted World Health Assembly in 2018(21). Effective implementation of the WHO 'Best Buys" intervention will save 10 million lives by 2025 and 17 million by stroke and heart attack by 2030(4). Ethiopia's recent NCD national strategic plan on major non-communicable diseases with adequate resources could help to implement the Best Buys intervention to progress on SDGs targets (12). Some of the highly prevalent NCDs need special health care. Digestive diseases, , Ethiopia's third leading cause of mortality and DALYs, are mainly amenable to surgical health care. Lack of adequate surgical, anesthesiology, and obstetrics care are the main reason for rising digestive diseases against global trend. According to the Lancet Commission of Global Health Report, more than 5 billion people do not have access to affordable and safe surgical and anesthesia care when needed-access is worst in low-income and lower-middle-income countries, where nine of ten people cannot access basic surgical, and 143 million additional surgical procedures are needed in LMICs each year to save lives and prevent disability (22).

Although most NCDs showed decreasing death rates and DALY rates from 2010-2019, there are some notable exceptions. Death and disability due to mental disorders and musculoskeletal disorders have been raised over the past decade. Low attention, treatment gap, and poor regulation have contributed to significant disability and productive loss of mental health disorders. This supports findings of YLDs of mental health and substance use, which are predicted to be 45 million in 2050 in the sub-Sahara (23). Unipolar depressive disorders are projected to be the second burden of NCDs in 2030 (24). Thisfinding urges nations, regional and global communities to collaborate, integrate, and draft evidence-based interventions and capacity building and incorporate them into healthcare policy framework (25).

More than half of NCD-related mortality and disability in Ethiopia have been attributed to modifiable risk factors such as high systolic blood pressure, dietary risks, air pollution, and high fasting plasma glucose. Evidence suggests that the contributions of modifiable risk factors in Ethiopia are nearly identical to those found globally, except for tobacco, which ranks third globally (26). Elevated systolic blood pressure (SBP), a global public health concern, is estimated to occur in over 4 billion adults (27). HBP is an important risk factor for morbidity, mortality, and disability of ischemic heart disease, stroke, peripheral arterial disease, chronic kidney disease, and others (28, 29). Due to its grave impact, it is one of the global NCD targets adopted by the World Health Assembly in 2013 to lower the prevalence of raised blood pressure by 25% by 2025(10). United Nations Sustainable Development Goal (SDG) indicator 3.4.1, which focuses on reducing premature mortality from cardiovascular disease (CVD) by 33% by 2030, will not be achieved without substantial investment in interventions to reduce the health burden attributable to elevated SBP(11). Evidence obtained from epidemiological studies suggests that population-level policies such as lowering the sodium content of packaged and prepared food, increasing the availability, accessibility, and affordability of vegetables and fruits; and reducing indoor and outdoor air pollution, built-environment interventions to promote physical activity, reductions in emissions and increased investment in public transport systems have a great impact on reduction of high systolic blood pressure (SBP) and its health effect (27). All this suggests the need to develop proclamation and strategies on reducing sodium, fat and sugar use to prevent and control non-communicable diseases in Ethiopia.

In contrast to global trends, dietary risks are a second important attributable risk factor of NCDs in Ethiopia. Approximately 8 million deaths and 188 million DALYs were attributable to dietary risks globally(30). High sodium and low intake of whole grains and fruits were leading dietary risks for deaths and DALYs worldwide (30).

Air pollution, specifically household air pollution from solid fuels in Ethiopia, has significantly impacted morbidity, disability, and economic loss worldwide(26, 31, 32). It was the fourth leading risk factor following high blood pressure, smoking, and dietary risks worldwide. Premature mortality, economic loss, and disability were highest in low and low-middle-income countries due to air pollution, whereas the lowest was in USA, Europe, and high-income Pacific countries (26, 33). Air pollution was responsible for more than 6.7 million deaths globally (26, 33) and approximately one million in Africa (34). It has reduced global average life expectancy by 1.8 years but has had the greatest impact in countries with low- and low-middle socio-demographic index (SDI) values, where life expectancy has been reduced by 2.7 and 2.5 years,

respectively(33). Epidemiological global studies revealed that air pollution is a major risk for major public health importance, such as cardiovascular, cancer, and respiratory diseases(26, 33). High fasting plasma glucose is an important risk contributing to a significant burden of global and regional morbidity, morbidity, and disability. Globally, high fasting plasma glucose accounted for approximately 6.50 million and 172.07 million deaths and DALYs, respectively. High fasting plasma glucose was attributed to most deaths due to cardiovascular, kidney disease, and diabetes (35).

Tobacco smoking is another major behavioral risk factor with a significant global health impact (36). In 2019, approximately 77% of deaths caused by tobacco use occurred in low- and middle-income countries(37). Although tobacco plays a minor role in the burden of non-communicable disease in Ethiopia, the country adopted and implemented the WHO Framework Convention on Tobacco Control (WHO FCTC), which is based on ‘’6 MPOWER’’ measures such as Monitor tobacco use and prevention policies, Protect people from tobacco use, Offer help to quit tobacco use, Warn about the dangers of tobacco, Enforce bans on tobacco advertising, promotion and sponsorship, and Raise taxes on tobacco(38). NCD Countdown 2030 also recommended adopting and implementing tobacco excise taxes, smoking regulations, and information, education, and communication as “health in all” policies to prevent costly health impacts(39).

The progress toward preventing and controlling NCDs in Ethiopia could be challenged to meet the target of SDG. In addition to socio-cultural factors, health service financing would contribute to delay in achieving SDGs. The government's healthcare budget has been increasing, reaching 4-6% in 2021/22 (40), but it remains below the Abuja Declaration's 15% spending target (41). According to the National Health Survey, the government covers only 32% of total health expenditure, while donors cover 34%, and out-of-pocket spending accounts for 31% (40). Due to this constraint, NCDs received approximately 11% of total healthcare spending, with 68% coming from out-of-pocket expenditure (OOP), 30% from the government, and less than 1% from donors (15). Another challenge impeding SDG progress is the COVID-19 pandemic. The COVID-19 pandemic has been a significant global problem, especially in low- and middle-income nations. According to a WHO assessment, the COVID-19 epidemic caused significant service disruptions for NCD in more than 75% of nations (42). Additionally, the recent conflict and war in the northern part of the country has primarily impacted healthcare services in the Amhara, Afar, and Tigray regions. During the current conflict, more than 45-50 percent of healthcare facilities in Amhara and Afar were destroyed. The war damaged and looted over 40 hospitals, 472 health centers, 1850 health posts, four blood banks, and one oxygen bank, and displaced over 10,000 health workers in Amhara regional state, which serves over 30 million people. Two hospitals, 17 health centers, and 42 health posts in Afar regional state were attacked, and their infrastructure, medical equipment and supplies were destroyed, looted, and wrecked(40, 43). Around 28 hospitals and 153 health centers were damaged in Tigray (40). As a result, NCDs care services would be severely harmed.

Policy implications

Ethiopia has been in epidemiological transition. Ethiopia has adopted a WHO "Best Buys" intervention to achieve the SDGs' goals and is currently implementing a National Strategic Plan for the Prevention and Control of Major Non-communicable Diseases in 2020 (12). Despite all the efforts, this analysis revealed that progress in reducing mortality and disability due to non-communicable diseases is minimal, which will impact the progress towards achieving SDG targets. This would be a good wake-up call to develop proclamations and strengthen and revise NCD prevention, control, management, and rehabilitation strategies and policies considering regional NCD disparities. Modifiable risk factors have contributed more than half of Ethiopia’s mortality and morbidity associated with NCDs . As a result, evidence-based preventive, promotional, and control policies and strategies would prevent a sizable portion of the country's NCD burden.

Conclusion

Ethiopia is currently facing a triple burden. For the last three decades, Ethiopia has experienced an epidemiological shift, with an increase in the burden of NCDs, a decrease in infectious diseases, and relatively stable injuries with improved life expectancy (LE). This study found almost stable mortality and disability of NCD trend in Ethiopia. Most importantly, more than half of NCD-related mortality and disability in Ethiopia have been attributed to modifiable risk factors such as high systolic blood pressure, dietary risks, air pollution, and high fasting plasma glucose. Ethiopia and regional states could benefit through developing proclamations on risk factors and adopting, integrating ,and implementing the Global NCD Action Plan,2030 Agenda for Sustainable Development Goals strategy, and WHO 13th General Program of Work 2019-2023 resilience and mitigate the burden of NCDs.

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