



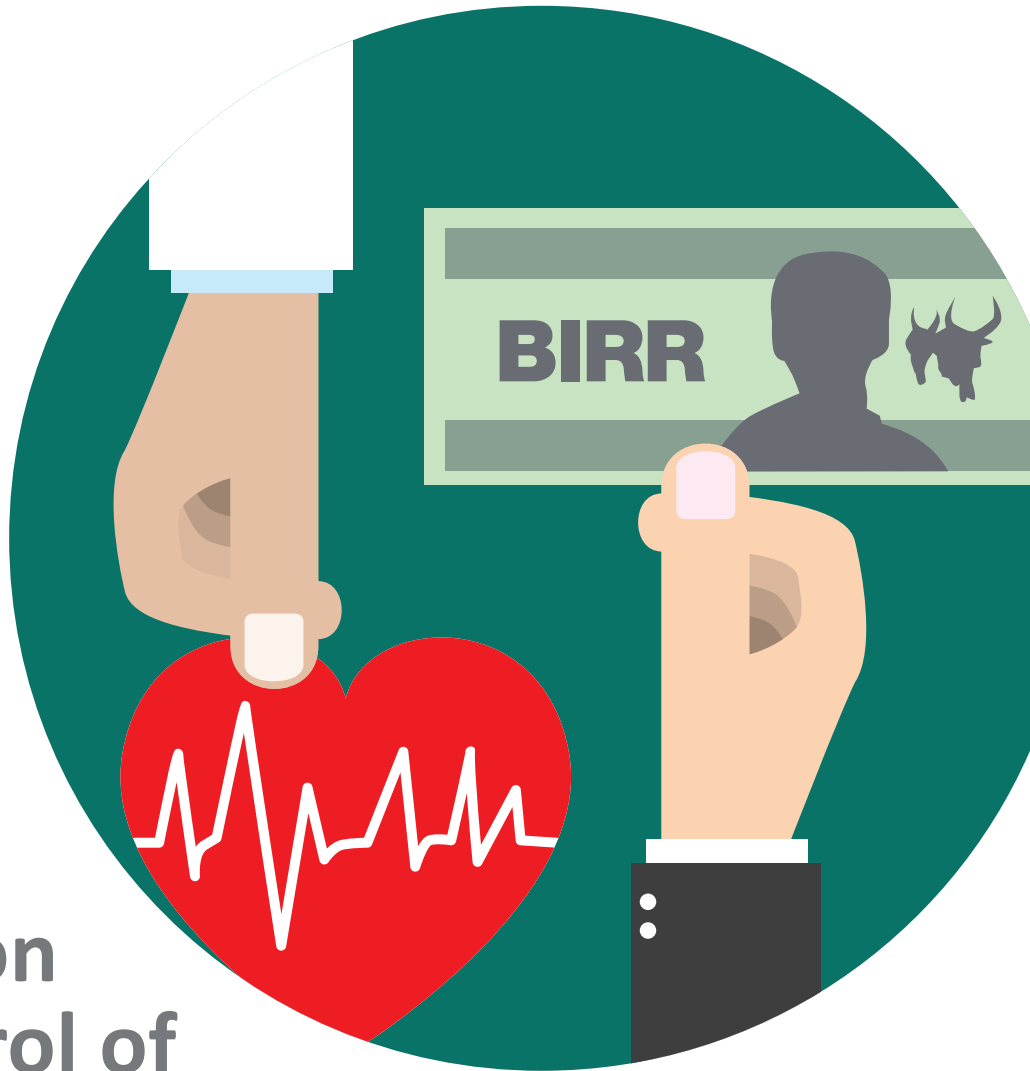
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Federal Ministry of Health



REGIONAL OFFICE FOR  
Africa



# Prevention and control of noncommunicable diseases in Ethiopia

## The case for investment, including considerations on the impact of khat

# Prevention and control of noncommunicable diseases in Ethiopia

## The case for investment

Prepared for the Ministry of Health of Ethiopia  
by  
The World Health Organization  
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## Abstract

Noncommunicable diseases (NCDs) such as cancer, cardiovascular disease, diabetes and chronic respiratory diseases, and their risk factors are an increasing public health and development challenge in Ethiopia. This report provides evidence through three analyses that NCDs reduce economic output and discusses potential options in response, outlining details of their relative returns on investment. An economic burden analysis shows that economic losses from NCDs (direct and indirect costs) make up 31.3 billion birr per year, which is equivalent to 1.84% of Ethiopia's gross domestic product in 2017. An intervention costing analysis provides an estimate of the funding required to implement a set of policy interventions for prevention, and clinical interventions. A cost–benefit analysis compares these implementation costs with the estimated health gains and identifies which policy packages would give the greatest returns on investment.

### Keywords

NONCOMMUNICABLE DISEASES  
PREVENTION AND CONTROL  
CHRONIC DISEASE  
DELIVERY OF HEALTH CARE  
HEALTH CARE FINANCING  
HEALTH SYSTEM PLANNING  
ETHIOPIA

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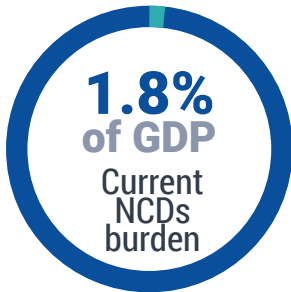
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## Acronyms and abbreviations

BMI	body mass index
CVD	cardiovascular disease
GDP	gross domestic product
MPOWER	Monitor tobacco use and prevention policies; Protect people from tobacco smoke; Offer help to quit tobacco use; Warn people about the dangers of tobacco; Enforce bans on tobacco advertising, promotion and sponsorship; and Raise taxes on tobacco (WHO package)
NCD	noncommunicable disease
ROI	return on investment
SHAKE	Surveillance; Harness industry; Adopt standards for labelling and marketing; Knowledge; Environment (WHO package)
STEPS	STEPwise approach to surveillance (WHO method)
UNDP	United Nations Development Programme

# ETHIOPIA

The case for investment in prevention and control of noncommunicable diseases (NCDs)



**242.2**  
billion Birr



Investment required for selected best buys intervention packages over a 15-year period

Billions of Birr



Tobacco control package



Alcohol control package

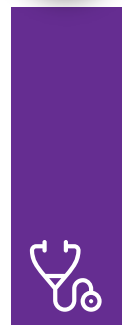


Salt reduction package



Physical activity awareness package

**221.4**



CVD and diabetes clinical interventions

**62.1**  
billion Birr



Return on investment over a 15-year period

Return on investment

Lives saved

Billions of Birr in productivity benefits



**3.1**

**220 000**

**9.3**



**1.4**

**211 000**

**8.9**



**3.3**

**455 000**

**21**



**1.8**

**209 000**

**8.8**



**0.1**

**353 000**

**14.2**

## Executive summary

In 2016, the risk of premature mortality<sup>1</sup> from noncommunicable diseases (NCDs) in Ethiopia was 18.3%. The economic costs of NCDs are significant and are due principally to their impact on the non-health sector (reduced workforce and productivity). In this study, it is estimated that NCDs cost Ethiopia at least 31.3 billion birr (US\$ 1.1 billion) per year, equivalent to 1.8% of the gross domestic product (GDP). Less than 15% of the costs is for health care.

The main behavioural risk factors for NCDs are tobacco use, harmful use of alcohol, unhealthy diet and physical inactivity. The World Health Assembly and United Nations General Assembly have endorsed a set of evidence-based, cost-effective and feasible policies<sup>2</sup> that when implemented are proven to reduce levels of NCDs.

In this study, the costs of implementing a set of 23 policy interventions to reduce the risk factors for NCDs and 8 clinical interventions to prevent and treat cardiovascular disease and diabetes were quantified and assessed. The cost was estimated to be 20.8 billion birr (US\$ 0.72 billion) over the next 15 years, and the cost of scaling up treatment for cardiovascular disease and diabetes is more than 10 times higher, at US\$ 221 billion birr (US\$ 7.7 billion).

The return on investment (ROI) of scaling up interventions that reduce NCD risk factors is significant. For example, the ROI for tobacco control is 3.05 over 15 years, and that for a salt reduction programme is 3.26. Because of the cost of treating NCDs, the ROI for clinical interventions is lower.

Together, preventive and treatment interventions, if fully implemented, would prevent more than 1 million premature deaths over 15 years, of which interventions to reduce salt consumption would account for nearly half. But deaths are only part of the story: the interventions can also prevent disease and disability such as those caused by strokes. The analysis indicates that Ethiopia will gain nearly 4 million additional years of healthy life over 15 years.

The report also outlines key concerns with regard to use of *khat* in Ethiopia. While the NCD investment case model is not currently adequate for such an analysis, the report indicates potential interventions.

Most of the NCD interventions and those for *khat* require leadership and support from sectors other than health. Implementation therefore requires a whole-of-government response.

## 1. Purpose of economic analysis of the case for investment

NCDs are estimated to account for 46% of all deaths in Ethiopia (1). The latest figures (2016) show that an Ethiopian citizen has an almost one in five risk (18.3%) of dying prematurely (before the age of 70 years) from one of the four main NCDs, with an 18.7% probability for men and 18.0% for women (2). These data indicate an opportunity to make progress on United Nations Sustainable Development Goal target 3.4, to reduce premature mortality from NCDs by one third by 2030.

The impact of NCDs on human health is clear, but it is only one part of the story. NCDs also result in high economic costs, far beyond the direct costs of health care, as NCDs reduce productivity at a macroeconomic level by preventing full participation in the labour force and the subsequent impacts on individuals, their carers and the

<sup>1</sup> Defined by WHO as death before the age of 70 years

<sup>2</sup> "Best buys" and other recommended interventions for the prevention and control of noncommunicable diseases (<https://www.who.int/ncds/management/best-buys/en/>).



state. When individuals die prematurely, the labour they would have produced in their remaining working years is lost. In addition, individuals with a disease are more likely to miss days of work or to work at reduced capacity. In low- and middle-income countries, it is estimated that NCDs will cause more than US\$ 21 trillion in lost economic output between 2011 and 2030, with nearly one third of that figure attributable to CVD alone (3). For individuals and governments, spending on treatment for health problems that could have been prevented represent significant opportunity costs,<sup>3</sup> including decreased investment in education, transport projects and other forms of human or physical capital that can have significant returns.

The high human and economic costs in Ethiopia call for a reduction in the burden of NCDs. WHO (4) recognizes that the risk of NCDs can be reduced by modifying four behavioural risk factors – tobacco use, harmful use of alcohol, unhealthy diet and physical inactivity – and metabolic risk factors such as high blood pressure and high cholesterol. Fig. 1 illustrates some of the determinants and risk factors of NCD burdens, many of which are beyond the control of the health sector alone.

WHO in its Global Action Plan for the Prevention and Control of Noncommunicable Diseases 2013–2020 (4) proposed a number of policy options and cost-effective interventions for Member States to use in reducing their NCD burden with. These “best buys” were updated by the World Health Assembly in 2017 (5,6) to include measures to reduce behavioural and metabolic risk factors for NCDs and clinical interventions to prevent and treat diseases. Recent analysis by WHO (7) suggests that every US\$ 1 invested in implementing a package of all 16 best buys in low- and lower-middle income countries will yield a return of at least US\$ 7 by 2030.

As more than 20% of deaths in Ethiopia in 2016 were caused by heart disease, stroke, myocardial infarction or other circulatory diseases, the economic analysis reported here focused on interventions to reduce the burden of CVDs.

The negative economic impacts of NCDs are too often overlooked in budgetary allocation and in weighing the pros and cons of stronger fiscal and regulatory action. WHO Member States have made quantification of the costs of NCD prevention and management and interventions and their ROIs in relation to the costs of inaction a high priority. Investment cases are designed to support countries in making an economic rationale for action to prevent and control NCDs.

In 2018, the Federal Ministry of Health in Ethiopia showed increasing interest in NCD prevention and the health system reform in Ethiopia and the value of investigating the economic case for investing in NCDs. A joint United Nations visit to Ethiopia was therefore undertaken in October 2018 to conduct such an analysis.

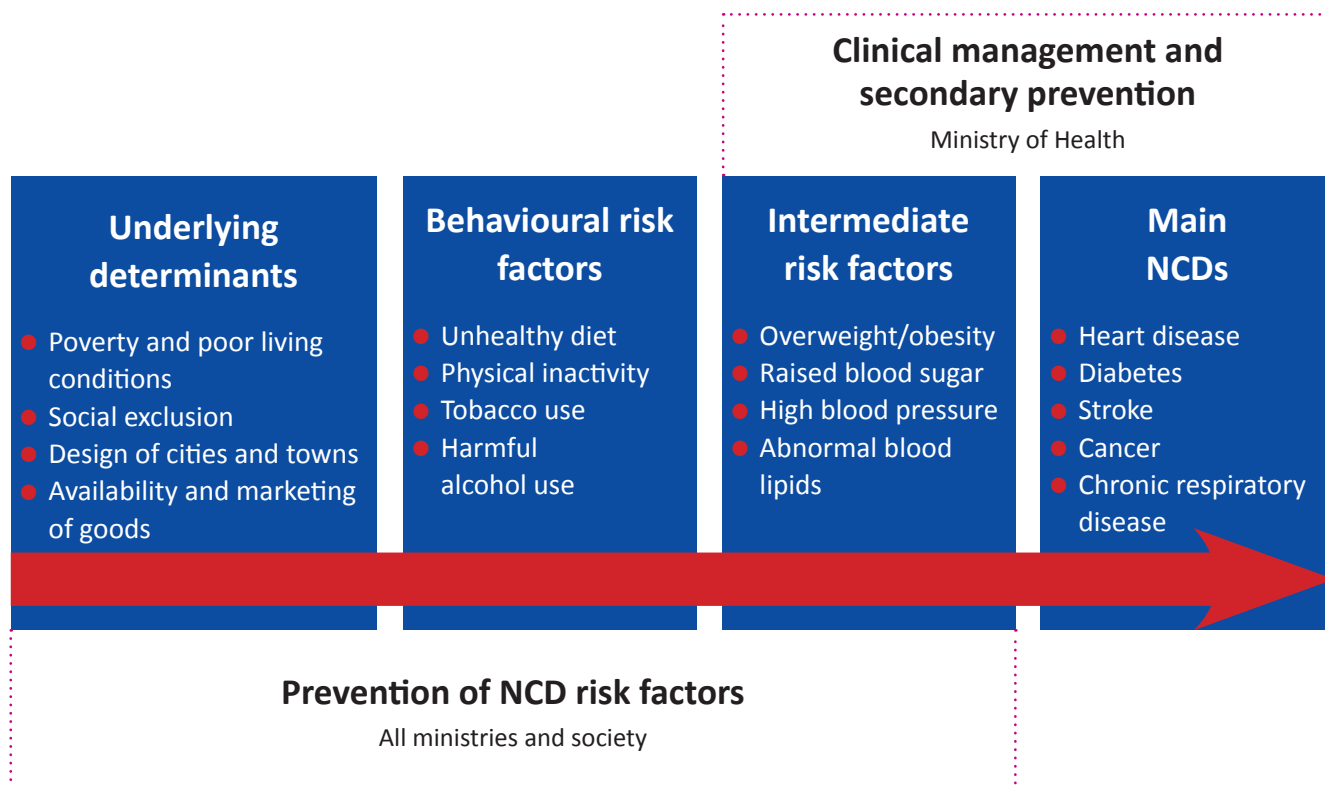
In the investment case, scaled-up action and the costs of inaction can be modelled in the medium term (5 years) and long term (15 years). One scenario is continuation of the status quo, in which no new policies are implemented and current coverage is maintained, i.e. inaction. In the other scenario, selected policies and clinical interventions are scaled up over the next 15 years. The analysis was based on the WHO OneHealth tool (8), an epidemiology-based population model prepared by United Nations agencies for strategic planning and costing of interventions and projection of the health benefits expected from their implementation. Health benefits are generated in terms of natural units (cases or deaths averted) and are also monetized through the “human capital” approach to derive benefit–cost ratios (the primary ROI metric) for each package of interventions. In the human capital approach, it is assumed that foregone economic output is equivalent to the total output that would have been generated by workers throughout their lives up to retirement age.

Section 2 summarizes the analysis of NCD behavioural risk factors in Ethiopia, including current levels and patterns of tobacco and alcohol consumption, diet and physical inactivity and the prevalence of metabolic risk factors, such as raised total cholesterol and raised blood pressure in the population. Although the current

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<sup>3</sup> A term used in economics to define cost in terms of a foregone opportunity for the benefits that could have been obtained by choosing the best alternative opportunity (Oxford Dictionary of Economics [online]).

**Fig. 1. Determinants of NCDs and responsibilities for response**



investment case model does not allow analysis of *khat* use, pollution or mental health, these key issues for Ethiopia are also discussed briefly. Section 3 outlines evidence-based policies and clinical interventions that could contribute to reducing the burden of disease and the current levels of implementation of policies and interventions in Ethiopia. Section 4 describes the methods and tools used in the analysis, and section 5 presents the results, including total costs and the expected health and economic benefits (such as healthy life-years gained, mortality averted and productivity gains) of implementing the four policy packages and clinical interventions, with a discussion of *khat* use, a key consideration for Ethiopia. Section 6 presents the conclusions and recommendations from the institutional and context analysis. Annex 1 lists the data used for calculating the NCD burden.

## 2. Situation analysis

Ethiopia has a high burden of NCDs, and the number of disability-adjusted life-years (DALYs) lost due to NCDs has increased three times during the past 25 years. The probability of dying prematurely from one of the main NCDs is similar for men (18.7%) and women (18.0%) (2). In Ethiopia, mortality from NCDs is attributed mainly to CVD and cancer. In 2015, an estimated 65 000 cases of cancer occurred in Ethiopia, two thirds of which were in women. The life expectancy at birth was 65.5 years (63.7 for men and 67.3 for women) in 2016, which is higher than the average of 61.2 years in the African Region (9).

### 2.1 Tobacco use

#### Box 1. Tobacco snapshot

**Tobacco use** is lower in Ethiopia than in many other countries, as 7.3% of men and only 0.4% of women smoke. Nevertheless, strong tobacco control measures are necessary to keep the rates low and reduce them further.

**Attributable NCDs** include many forms of cancer (most commonly lung, oral cavity, larynx, oesophagus, stomach, pancreas, kidney, bladder and breast); ischaemic heart disease, stroke and other CVD and circulatory diseases; chronic obstructive pulmonary disease and pneumoconiosis; and peptic ulcer disease, diabetes, cataract, macular degeneration and rheumatoid arthritis.

According to the WHO report on the global tobacco epidemic 2017, the prevalence of current adult tobacco smoking is 4.2%, with 3.5% of this group being daily users (10). The prevalence of smoking differs between men and women, with 7.3% of men and only 0.4% of women who smoke. Smokeless tobacco use is low in adults (0.8%) and unknown in young people. Key facts are summarized in Box 1.

Data from the 2003 Global Youth Survey (11) indicate that 9.9% of boys and 4.9% of girls aged 13–15 years use tobacco; 14.9% of young people are exposed to second-hand smoke at home and 41.2% outside their homes.

While tobacco use is currently lower in Ethiopia than in some other countries, the rates could rise in the absence of effective, comprehensive tobacco control. The tobacco industry views low rates in some African countries as a major opportunity to extend its market, particularly among young people, and is trying hard to do so. Increased tobacco consumption in Ethiopia would interfere with a range of health and development priorities.

## 2.2 Harmful use of alcohol

The total alcohol consumption per capita in Ethiopia was 2.9 L in 2016, which is below the average for the WHO African Region (12). It is estimated that Ethiopia has one of the lowest rates of alcohol consumption among alcohol consumers in the African Region (5 L for men and 0.8 L for women in 2016). In the NCD STEPS survey in Ethiopia in 2015 (13), it was estimated that 46.6% of men and 33.5% of women had drunk alcohol in the previous 30 days. Among current drinkers, 2.1% of men and 0.3% of women had drunk  $\geq 60$  g of pure alcohol on one occasion alcohol in the previous 30 days. There are no WHO data on alcohol use by young people in Ethiopia; however, a study on alcohol consumption among high-school students in eastern Ethiopia (14) showed that 22% of students drank alcohol, of whom 31.7% were female and 68.3% male. In the 30 days before the STEPS survey, current alcohol drinkers of both sexes had consumed alcohol an average of 5.5 occasions, with men reporting 6.3 occasions and women 4.3. In the STEPS survey, current drinkers in the population aged 15–69 years consumed on average of 3.5 drinks per drinking occasion, and in all age groups men consumed almost twice as much per drinking occasion as women. One in eight of the survey respondents had consumed six or more drinks on a single occasion at least once during the previous 30 days, with a significant difference between men and women.

While alcohol use is currently lower in Ethiopia than in some other countries, the rates could rise in the absence of effective, comprehensive alcohol control. The alcohol industry views lower rates in some African countries as a major opportunity to extend the markets for its products, particularly among young people, and investment in Ethiopia's drinks sector has been accelerating. Increased alcohol consumption in Ethiopia would interfere with a range of health and development priorities.

Key facts are summarized in Box 2.

## 2.3 Physical inactivity

No recent data on physical activity in Ethiopia are available, as no routine monitoring framework is in place. The most recent data indicate that, in 2016, 14% of adults were insufficiently active according to WHO standards (150 min of moderate-intensity physical activity per week, 75 min of vigorous-intensity physical activity per week, or equivalent) (15). More women (17%) than men (10%) had insufficient physical activity. The Ethiopian NCD STEPS survey (13) in

### Box 2. Alcohol snapshot

**Harmful alcohol consumption** among those who consume alcohol appears to be low in Ethiopia, especially for women. Among male drinkers, 2.1% had “binged” (drank  $> 60$  g of pure alcohol on one occasion) during the previous month. The limited data on young people indicate potentially high consumption.

**Attributable NCDs** include many forms of cancer, pancreatitis, epilepsy, diabetes, cirrhosis, ischaemic heart disease, stroke and other cardiovascular and circulatory diseases.

### Box 3. Physical inactivity snapshot

**Activity levels** are not routinely monitored. In 2016, 14% of adults did not meet the recommended level of physical activity.

**Attributable NCDs** include coronary heart disease, type 2 diabetes and breast and colon cancers (16).

2015 showed that 13.6% of the population aged 15–69 years had low physical activity, with a significant difference between sexes (8.6% of men and 19.4% of women).

Key facts are summarized in Box 3.

## 2.4 Unhealthy diet (salt)

WHO recommends that salt consumption not exceed 5 g/day, equivalent to 2 g of sodium per day. According to the Ethiopian NCD STEPS survey (13), salt consumption in 2015 was 8.3 g per person per day. Salt intake was higher in men (9.0 g/day) than women (7.4 g/day). No substantial difference in the average salt intake was found between urban (8.0 g/day) and rural (8.3 g/day) residents.

In a previous review (16), the age-standardized salt consumption by adults aged ≥ 20 years in Ethiopia in 2010 was 6 g/day.

In 2010, 32.4% of deaths from CVD among adults aged 20–69 years were attributed to sodium consumption exceeding 2 g/day (17).

Key facts are summarized in Box 4.

## 2.5 Metabolic risk factors

High levels of metabolic factors such as high blood pressure, body mass index (BMI) or blood lipids, significantly increase the risk of a cardiovascular event. According to the STEPS survey in Ethiopia (13), in 2015, the age-standardized prevalence of overweight (BMI ≥ 25 kg/m<sup>2</sup>) was 5.2%, far below the average for the WHO African Region of 31.1% (18). No significant difference was seen between the sexes, with 3.9% of men and 6.8% of women overweight. Furthermore, only 2% of women and 0.5% of men in Ethiopia are obese (BMI ≥ 30 kg/m<sup>2</sup>) (13), as compared with 5.6% of males and 15.3% of females in the WHO African Region (19).

According to the STEPS survey (13), 76.6% of people in Ethiopia had never measured their blood pressure; 20.2% had undergone blood pressure measurement but not found to have hypertension; and high blood pressure had been diagnosed > 1 year previously in 1.1% and within 12 months of the interview in 2.1%. Most (99.5%) respondents declared that their blood cholesterol had never been measured.

While high levels of any factor can increase the risk of a cardiovascular event, the risk is compounded for individuals with multiple metabolic risk factors. WHO risk prediction charts (20) can be used to assess the likelihood of a cardiovascular event and/or death within 10 years by combining six factors: gender, age, blood pressure, cholesterol, smoking status and diabetes. The percentage of respondents in the age group 40–69 years with a 10-year risk for CVD of ≥ 30% or with existing CVD was 4.7%. This proportion was higher among women (6.0%) than among men (3.7%). A 10-year CVD risk of ≥ 30% or existing CVD was found in 5.0% of respondents in the age group 40–54 years and 3.9% in the age group 55–69 years (13).

## 2.6 Khat use

*Khat* is a legal flowering plant with psychotropic leaves that is grown and chewed widely in Ethiopia and in other regions of Africa and in Arab States. WHO has classified *khat* as a possible drug of abuse but with less addictive potential than alcohol or tobacco. Some 15.8% of adults in Ethiopia chew *khat* (13), and it may be commonly used with alcohol, tobacco and other drugs. Opinions in Ethiopia on *khat* use range from strong social acceptance of a “harmless” practice to proposals to outlaw its use due to its association with mental and physical health problems, its contribution to road traffic accidents, a strain on family relationships and interference with productivity. Concern about *khat* use is growing, as the practice has graduated from predominant use among Muslims during prayer to recreational use by young and unemployed people. In consultation with the invest-

### Box 4. Salt snapshot

**Salt (and sodium) consumption** is estimated to exceed the WHO recommendation.

**Attributable NCDs** include stomach cancer. There are increased risks for ischaemic heart disease, stroke and other CVD and circulatory diseases due to hypertension.

**The proportion of deaths from CVD attributable to high sodium intake is 32.4%.**

ment case team, Ethiopian stakeholders expressed concern that any interference with the country's young workforce could impede efforts to reach middle-income country status. Growing land use for *khat* is also a challenge. At the same time, *khat* is a large contributor to Ethiopia's economy, as it generates more income per acre than all other crops. Research should be conducted on the full social, economic and environmental effects of *khat* in Ethiopia and elsewhere. Although the investment case model cannot include data on *khat*, policy decisions on *khat* use should be considered in conjunction with those recommended in the investment case. For a fuller discussion on *khat* in Ethiopia, including health, economic and ecological considerations, see section 5.6.

## 2.7 Pollution

The investment case model cannot currently include analysis of the NCD-attributable costs of pollution in Ethiopia; however, this should not obviate concrete steps to address this major environmental and health problem. Ethiopia exceeds the annual WHO guideline PM2.5 concentration,<sup>4</sup> and over 95% of the population relies on polluting fuels and technologies. According to the Ethiopian Demographic and Health Survey in 2016 (21), cooking with solid fuels (mostly wood) is a major source of exposure to smoke inside Ethiopian houses (in addition to tobacco smoke), especially when cooking is done inside the home rather than in a separate building. According to WHO, household air pollution killed over 60 000 Ethiopians in 2016, while ambient (outdoor) air pollution claimed the lives of more than 30 000 (22). A large percentage of these deaths are from NCDs (lower respiratory infections are also a major health consequence). Access to safe water and improved sanitation are concurrent challenges in Ethiopia. The United Nations Development Assistance Framework for Ethiopia 2016–2020 includes attention to environmental pollution in its emphasis on resilience and a green economy. Ethiopia's intended "nationally determined contributions" include the health co-benefits of emissions reductions and improved air quality.

## 2.8 Mental health

Mental and neurological conditions and substance use contribute to disability, suffering and premature death. They accounted for 13% of the total global burden of disease in 2000, and the figure is expected to rise to 15% by 2020. Mental disorders account for over 11% of the disease burden in Ethiopia; major depressive disorder alone is the third leading cause of DALYs lost. Only about 60 of the 311 hospitals in the country provide mental health services, despite specialist training programmes initiated by the Government. There are severe shortages of mental health workers in most facilities, and general health workers in primary care do not receive adequate training or supervision to deliver mental health care (23).

# 3. Policies and treatments to reduce the NCD burden

Ethiopia's national strategies for NCDs and mental health both expired in 2016 and are being updated, with a commitment to prepare the first multi-sectoral NCD strategy. While there is no national multi-sectoral NCD committee, there are national committees in related areas, such as tobacco control, nutrition, road safety and cancer, which could form a dedicated NCD committee. The national Sustainable Development Goal action platform (comprising ministers and United Nations agencies) should include attention to NCDs. Ethiopia ratified the WHO Framework Convention on Tobacco Control in 2014. A tobacco control directive was issued in 2015, and stronger tobacco control legislation was signed into law in 2019.

As mentioned in section 1, WHO has published various policy options and interventions for the prevention and treatment of NCDs (4,6,24). This section reviews current national NCD prevention and control initiatives, in order to identify areas of strength and areas that require further development or scaling-up to achieve full coverage.

<sup>4</sup> "PM2.5" refers to atmospheric particulate matter with a diameter of < 2.5 µm. As PM2.5 particles are small and light, they are likely to remain in the air and to penetrate the lungs and circulatory system, leading to health problems, including NCDs.

The assessment draws on the findings of the institutional and context analysis and on relevant published reports from WHO and other bodies. It focuses on packages of policy and clinical interventions (tobacco, alcohol, physical activity and nutrition policies, and management of CVD and diabetes) that are addressed in the economic analysis.

### 3.1 Tobacco

Ethiopia ratified the WHO Framework Convention on Tobacco in January 2014 and has committed itself to implementing a comprehensive tobacco control policy (25). In February 2019, the Ethiopian Parliament unanimously approved landmark tobacco control legislation in the Food and Medicine Administration Proclamation No. 112/2019, which the President later signed into law. This law is one of the strongest in Africa (26). The country has not yet increased tobacco tax rates (27) although, a proposal to amend the tobacco tax structure and rates has been submitted to the Council of Ministers.

Table 1 reflects a comparison of Ethiopia’s current tobacco control measures with the WHO MPOWER intervention package (Monitor tobacco use and prevention policies; Protect people from tobacco smoke; Offer help to quit tobacco use; Warn people about the dangers of tobacco; Enforce bans on tobacco advertising, promotion and sponsorship; and Raise taxes on tobacco), as reported in the WHO report on the global tobacco epidemic 2017 (28). It indicates that additional policies could be put in place to reduce tobacco consumption and to meet the obligations of the WHO Framework Convention on Tobacco Control, particularly regarding bans on tobacco advertising, taxation and smoke-free environments. The recent law, once implemented and enforced, should be make major advances in some of these areas. The findings of this study demonstrate the health and economic benefits that can be expected from implementation and enforcement of the law.

**Table 1. Current tobacco control measures in Ethiopia**

Policy	Current state of implementation
Monitor tobacco use and prevention policies	Ethiopia conducted a STEPS survey in 2015 (13) and a national Global Adult Tobacco survey in 2016 (29).
Protect people from tobacco smoke	Proclamation No. 1112/2019 prohibits smoking and other tobacco use in all indoor workplaces, all indoor public workplaces, on all means of public transport and in all common areas within condominium housing. The proclamation also prohibits outdoor use of tobacco within 10 m of any doorway, operable window or air intake mechanism of any public place or workplace described above. Notwithstanding this distance restriction, Proclamation No. 1112/2019 prohibits outdoor use of tobacco around health care facilities, Government institutions, facilities including schools intended for children or young people under the age of 21, higher education institutions, youth centres, amusement parks and other places as determined by the executive organ. In relation to proclamation No. 299/2013, which dictates completely smoke-free environments in all indoor workplaces, public places and public transport, stakeholders reported that enforcement is very low, and there are no defined legal or administrative measures to be taken if the law is not complied with. The Tigray region was cited as having stronger enforcement.
Offer to help to quit tobacco use	Three centres offer tobacco cessation, but there is no tobacco quit hotline in the country and no access to nicotine replacement therapy in either private or public health institutions. WHO has conducted two tobacco cessation courses for about 60 health professionals.

**Table 1. (continued)**

Policy	Current state of implementation
Warnings about the dangers of tobacco	Tobacco labelling includes a health warning covering 30% of the product pack, but few mass media campaigns are conducted. Proclamation No. 1112/2019 mandates pictorial warning labels covering 70% of the front and back of all tobacco products. This will come into effect in February 2020. A national tobacco campaign programme is conducted regularly on World No Tobacco Day in collaboration with WHO.
Enforce bans on tobacco advertising, promotion and sponsorship	All forms of tobacco advertising are banned by law, but tobacco companies and importers conduct sponsorship activities. Proclamation No. 1112/2019 bans all direct or indirect advertising, promotion and sponsorship of tobacco products.
Raise taxes on tobacco	There is a 18.8% total tax on the most frequently sold brand of cigarettes (Nyala). Cigarettes of this brand are taxed 13.9% ad-valorem (9). Increases in tobacco taxation are being advocated and discussed. A proposal to amend the tobacco tax structure and rates has been submitted to the Council of Ministers. WHO recommends parties to consider implementing specific or mixed excise systems with a minimum specific tax floor, as these systems have considerable advantages over purely ad valorem systems and that tax rates should be monitored and increased on a regular basis to ensure tobacco products do not become more affordable over time (e.g. due to inflation or growth in income).

Most of these policy interventions are also WHO “best buys” (5) (effective interventions with cost–effectiveness ratios  $\leq 100$  international dollars per DALY averted in low- and middle-income countries). This list largely corresponds to those listed in the OneHealth Tool and that were modelled as part of the ROI analysis:

- monitor tobacco use and prevention policies,
- protect people from tobacco smoke,
- offer to help quit tobacco use with mCessation,
- warning labels about danger,
- mass-media campaign about danger,
- enforce bans on tobacco advertising,
- enforce restriction of access by young people,
- raise taxes on tobacco and
- plain packaging of tobacco products.

### 3.2 Alcohol

Ethiopia together with the other WHO Member States endorsed the 2010 WHO Global strategy to reduce the harmful use of alcohol (60), which urged countries to consider strengthening national responses, as appropriate and where necessary, to public health problems caused by harmful use of alcohol, on the basis of evidence on effectiveness and cost-effectiveness of strategies and interventions to reduce alcohol-related harm. The updated Appendix 3 of WHO’s global action plan for the prevention and control of NCDs 2013–2020 (5) lists core policy options for alcohol control. These are reproduced in Table 2, with some achievements in reducing alcohol consumption in Ethiopia. The assessment is based on various sources. As for tobacco control, Ethiopia’s proclamation 1112/2019 has advanced many policy options for alcohol use, and the findings of this investment case analysis illustrate the impacts that Ethiopia can expect from such policies with strong implementation and enforcement.

**Table 2. Current state of alcohol control interventions in Ethiopia**

Policy	Policy options	Current state of implementation
Taxation	Increase excise taxes on alcoholic beverages	There is a 50% excise tax on imported beer, wine and whisky according to excise tax Proclamation No. 307/2002.
Advertising	Enact and enforce bans or comprehensive restrictions on exposure to alcohol advertising (in multiple types of media)	Proclamation 1112/2019 requires that alcohol advertisements include a warning that it is illegal to sell to anyone under the age of 21. It also makes it illegal to “directly or indirectly advertise in places of public gathering and sporting; street, condominium, and other places by unreasonably decreasing the size of the warning.” Manufacturers, importers or distributors of beverages with a volume > 10% alcohol shall not directly or indirectly sponsor public and government holidays, exhibitions, sports events, school events or other youth-centred events. Other prohibitions include advertising alcohol in connection with non-alcoholic products, services or matters and advertising alcohol with any lottery system or billboard.
Availability	Enact and enforce restrictions on the physical availability of retailed alcohol (reduced hours of sale)	Proclamation No. 1112/2019 makes it illegal to sell any alcoholic drink to anyone under the age of 21. No person may sell alcoholic drinks at health institutions, educational facilities, nursery schools, universities or colleges, Government institutions, places of worship, sports places, cinemas or other places as determined by regulation to implement the proclamation. The proclamation provides flexibility for additional restrictions on the time and manner of alcohol sales.
Drink-driving	Enact and enforce drink-driving laws and blood alcohol concentration limits at sobriety checkpoints	A drink-driving law has been enacted, but enforcement and monitoring are limited because of scarce resources for alcohol testing.
Brief interventions	Provide brief psychosocial interventions for people with hazardous and harmful alcohol use	Brief interventions have been conducted in three health institutions in Addis Ababa and one in Tigray.

The first three policy interventions listed in Table 2 are WHO “best buys”, and the fourth and fifth are WHO “effective interventions” with cost-effectiveness ratios > 100 international dollars per DALY averted in low- and middle-income countries. These correspond to those that were modelled in the ROI analysis:

- enforce restrictions on the availability of retailed alcohol,
- enforce restrictions on alcohol advertising,
- enforce drink-driving laws (sobriety checkpoints),
- raise taxes on alcoholic beverages and
- use screening and brief interventions for hazardous and harmful alcohol use.



### 3.3 Physical inactivity

The updated Appendix 3 of WHO’s global action plan for the prevention and control of NCDs 2013–2020 (5) lists several policy options for improving physical activity levels, which are reproduced in Table 3, with some of the achievements in increasing physical activity in Ethiopia.

**Table 3. Current state of physical activity interventions in Ethiopia**

Policy	Policy options	Current state of implementation
Knowledge	Public awareness and motivational communications for physical activity, including mass-media campaigns for physical activity behaviour	Ethiopia recently initiated periodic car-free days in Addis Ababa and other cities. Monthly activities promote physical activity in the community.
Health system	Provision of physical activity counselling and referral as part of routine primary health care services in a brief intervention	There is no standard brief intervention for physical activity in the health system. The Ministry of Health recently adopted the WHO global HEARTS strategy (31) for chronic care, which promotes brief intervention counselling for healthy behaviour, including physical activity.
Environment	<p>Ensuring that macro-level urban design incorporates the core elements of residential density, connected street networks that include sidewalks, easy access to a diversity of destinations and access to public transport</p> <p>Provision of convenient, safe access to high-quality public open spaces and adequate infrastructure for walking and cycling</p>	City administrations have initiated activities to promote walking and cycling by constructing sidewalks. Public condominiums, however, lack playgrounds for children and open spaces for walking and cycling.
Setting	<p>A whole-of-school programme that includes high-quality physical education and adequate facilities and programmes to ensure physical activity for all children</p> <p>Implementation of multicomponent workplace physical activity programmes</p>	<p>Physical education is not compulsory in schools, and most schools (especially private schools) do not have a playground.</p> <p>The Ministry of Health has a workplace physical activity facility, but its use is minimal. This should be strengthened and replicated in other Government and public facilities.</p>
Promotion	Promotion of physical activity through organized sport groups and clubs, programmes and events	In the car-free initiative, the Ministry of Health strongly promotes physical activity and other healthy behaviour.

The OneHealth Tool modelled the following policy changes as part of the ROI analysis:

- public awareness campaigning on physical activity and
- brief advice as part of routine care.

### 3.4 Unhealthy diets

Table 4 shows a comparison of Ethiopia’s current policies to reduce salt consumption with SHAKE (Surveillance; Harness industry; Adopt standards for labelling and marketing; Knowledge; Environment), WHO steps that countries can take to reduce salt intake (30).

**Table 4. Current state of policies to reduce salt consumption in Ethiopia**

Policy	Description <sup>a</sup>	Current state of implementation
Surveillance: measure and monitor salt use.	Measure and monitor population salt consumption patterns and the sodium content of food	The 2015 STEPS survey (13) captured salt consumption by region, which is used as a baseline. Further studies should be conducted on the salt content of local diets and the diets of various cultures and communities.
Harness industry: promote reformulation of foods and meals to contain less salt.	Set targets for the amount of salt in foods and meals, and implement strategies to promote reformulation	No salt reduction strategy is in place, but there are salt iodization initiatives. The hypertension prevention and control programme includes plans to conduct salt reduction campaigns through local media, community campaigns and health education at health services. The project also advocates development of a national salt reduction strategy, including the WHO SHAKE strategy.
Adopt standards for labelling and marketing: implement standards for effective, accurate labelling and marketing of food.	Adopt front-of-pack nutrition labelling systems (e.g. colour-coded for salt content level, “high salt” warning)	There is no front-of-pack labelling to reduce salt consumption. Salt is fortified with iodine.
Knowledge: educate and communicate to empower individuals to eat less salt.	Implement integrated education and communication strategies to raise awareness about the health risks and dietary sources of salt in order to change behaviour.	Currently, there is no community activity or engagement on salt reduction. The WHO global HEARTS strategy (31) through RESOLVE could save lives through a national salt reduction strategy and pilot sites for campaigns.
Environment: support settings to promote healthy eating.	Implement multicomponent salt-reduction strategies in community settings (e.g. schools, workplaces, hospitals)	There is no national healthy eating strategy. WHO promotes healthy eating, including salt reduction.

<sup>a</sup> From the SHAKE technical package for salt reduction (30).

Four of these interventions are assessed as WHO “best buys” (reformulation, environment, knowledge, labelling). These policy interventions correspond to those listed in the OneHealth Tool that were modelled as part of the ROI analysis:

- surveillance,
- harness industry for reformulation,
- adopt standards: front-of-pack labelling,
- adopt standards: strategies to combat misleading marketing,
- knowledge: education and communication and
- environment: salt-reduction strategies in community eating spaces.

In addition, the updated Appendix 3 to WHO’s global action plan for the prevention and control of NCDs 2013–2020 (5) lists “effective interventions” (with cost–effectiveness ratios > 100 international dollars per DALY averted in low- and middle-income countries) on *trans*-fats and on sugars. The current state of implementation is shown in Table 5.

**Table 5. Current state of policies for *trans*-fats, saturated fats and sugars in Ethiopia**

Policy	Description <sup>b</sup>	Current state of implementation
<i>trans</i> -fats	Reduce industrial <i>trans</i> -fat intake to < 1% of total energy intake by eliminating <i>trans</i> -fats through legislation to ban their use in the food chain.	There are no policies or proclamations restricting or eliminating <i>trans</i> -fats in the food chain.
Saturated fats	Reduce intake of saturated fats to < 10% of total energy intake, for example by: (i) reducing incentives for the food industry to continue or increase production of processed foods containing high levels of saturated fats; (ii) establishing standards for healthy dietary practices in pre-schools, schools, other public institutions and the workplace; and (iii) exploring regulatory and voluntary instruments (e.g. marketing regulations and nutrition labelling policies) and economic incentives or disincentives (e.g. taxation or subsidies) to promote healthy diets.	There are no policies or proclamations to reduce population intake of saturated fats.
Sugar	Reduce intake of free sugars to < 10% of total energy intake through effective taxation on sugar-sweetened beverages. A reduction to < 5% of total energy intake would provide additional health benefits.	There has been no action to reduce sugar intake in Ethiopia

<sup>b</sup> Information derived from WHO key facts for a healthy diet (32).

As the OneHealth Tool cannot yet be used to calculate the impact of interventions on fats and sugar, these were not included in the ROI analysis.

### 3.5 CVD and diabetes: clinical interventions

The updated Appendix 3 of WHO’s global action plan for the prevention and control of NCDs 2013–2020 (4) lists multiple clinical interventions for CVD and diabetes. Those most relevant to the analysis are reproduced in Table 6, with an assessment of the situation in Ethiopia.

**Table 6. Current state of clinical policies to reduce risk of CVD in Ethiopia**

Policy	Description	Current state of implementation <sup>a</sup>
CVD risk assessment and management	Screening for risk of CVD and diabetes	The Ministry of Health adopted cardiovascular risk assessment charts to be used in primary health care within the PACK (58) and WHO global HEARTS (31) strategies.  Screening and treatment for hypertension and diabetes has been introduced in a number of primary health care facilities and through the global HEARTS initiative; 50 health facilities will be added.
	Provision of drug therapy (including glycaemic control for diabetes mellitus and control of hypertension in a total risk approach) and counselling for individuals who have had a heart attack or stroke and those at high risk ( $\geq 30\%$ ) of a fatal or nonfatal CVD event in the next 10 years	
Acute myocardial infarction and stroke	Treatment of new cases of acute myocardial infarction with either acetylsalicylic acid (aspirin) or aspirin and clopidogrel or thrombolysis or primary percutaneous coronary interventions	Chronic care guideline in primary health care include management of acute myocardial infarction and stroke. Simplified protocols and algorithms for acute management adopted from WHO global HEARTS strategy guidelines.  No data on the proportion of patients with acute myocardial infarction or stroke that receive diagnosis and care within 6 h of the first symptoms.
	Treatment of acute ischaemic stroke with intravenous thrombolytic therapy	New cases of acute myocardial infarction are treated with aspirin, but drugs like clopidogrel and isosorbide dinitrate are not registered. Other thrombolytic therapy is not available in primary health care or in most public and private institutions; it is available in specialized cardiac clinics at a high price.
	Treatment of cases with established ischaemic heart disease and post-myocardial infarction	No routine data on secondary prevention. Regular follow-up is given in public hospital cardiac clinics and private health facilities. An estimated 47% of NCD patients receive service in private health institutions.
Diabetes	Glycaemic control	Glycaemic control was started as a pilot project in primary health care in addition to regular hospital care. Glycated haemoglobin test is rarely given in public hospitals, and people usually use private laboratory facilities. Glibenclamide is available in 46% of primary health care establishments and metformin in 38%. Intermediate-acting is available in 11.5% of primary care facilities at a price of US\$ 0.026/vial (33).
	Diabetic retinopathy screening and foot care to avoid complications	Foot examinations, eye examinations and urine protein analysis are offered routinely to people registered with diabetes at hospital level. In primary care, the practice is implemented as pilot projects.

<sup>a</sup> Availability and pricing of drugs obtained from the Federal Ministry of Health in September 2017

The following package of interventions was modelled in the OneHealth tool as part of the ROI analysis:

- screening for risk of CVD and diabetes,
- treatment of people with a high absolute risk of CVD or diabetes (> 30%),
- treatment of new cases of acute myocardial infarction with aspirin,
- treatment of cases of established ischaemic heart disease and post-myocardial infarction,
- treatment of people with established cerebrovascular disease and post-stroke,
- treatment of cases of rheumatic heart disease (with benzathine penicillin),
- standard glycaemic control,
- retinopathy screening and photocoagulation and
- neuropathy screening and preventive foot care.

## 4. Methods

A multiagency, multidisciplinary team comprising staff from the Federal Ministry of Health, WHO, the United Nations Interagency Task Force on the Prevention and Control of Non-communicable Diseases, UNDP, the Russian Federation and the Centre for Health Care Quality Assessment and Control of the Ministry of Health of the Russian Federation undertook initial data collection and analysis in Ethiopia from 29 to 31 October 2018 to complete a three-tier economic NCD investment case, complemented by an institutional and context analysis. The team consisted of health economists, epidemiologists and social development and public health experts. Intensive follow-up (described below) was undertaken.

This section outlines the methods and economic models used at different stages in the economic analysis:

- calculation of the economic burden of NCDs in terms of direct and indirect costs (absenteeism, reduced capacity at work and premature death);
- costing of interventions (clinical and policy interventions);
- assessment of health impact; and
- ROI analysis.

It also briefly describes the methods for the institutional and context analysis.

### 4.1 Calculating the economic burden of NCDs

WHO and UNDP prepared a model for calculating the economic burden of NCDs, which provides estimates of the current direct and indirect costs of NCDs. The data used for the population, by age and sex, for the period 2018–2032 were derived from the UNDP World population prospect (34). The details included were incidence rates by age and sex for heart attack and stroke and prevalence by age and sex for diabetes, hypertension and chronic respiratory disease; mortality rates by age and sex were applied for each condition. The model was used to calculate projections of incidence, prevalence and mortality for diabetes, CVD and chronic respiratory disease between 2018 and 2032, assuming that current rates were constant.<sup>5</sup> These projections were summarized as total incidence, prevalence and mortality for both the entire population and the working-age population, defined as people aged 15–64 years.

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<sup>5</sup> The model allows estimates of growth in prevalence, incidence and mortality due only to growth in population growth and not in disease rates.

The steps used to calculate the economic costs were as follows.

- As data only on total government health expenditure are available in Ethiopia, the share of total health expenditure on NCDs was estimated in a WHO analysis covering 13 countries (35; see Annex 1, Table A1).
- The annual value (in terms of economic output) of each full-time worker in Ethiopia was calculated from the gross domestic product (GDP) per employed person, defined as the country's GDP (1.6 trillion birr in 2017) divided by the total employed labour force. Local data on the total labour force aged  $\geq$  15 years, the unemployment rate and the labour force participation rate were used to determine the total employed labour force.
- Data were incorporated on the extent to which NCDs reduce worker productivity, obtained from the literature (36,37), which describe the reduction in labour force participation due to hypertension, stroke, acute myocardial infarction and diabetes; the reduction in full-time hours worked due to absenteeism and the reduction in productivity because of reduced capacity at work.
- The number of working people in Ethiopia with NCDs in 2015 was determined. From the labour force participation, unemployment and mortality rates, the model began with people of working age with NCDs; subtracting those who chose not to participate in the labour force or were unemployed; subtracting those who could not participate in the labour force specifically because of their NCD; and, finally, subtracting those who had died. The result was the estimated number of active workers with NCDs.
- The final steps were calculation of economic losses due to premature deaths based on the numbers of workers who had died and workers who could not participate in the labour force and calculation of the costs of absenteeism and reduced capacity at work for surviving active workers with NCDs. The model applied the relevant productivity figures found in the second step to the populations determined in the third step and multiplied this by the GDP per employed person. This calculation resulted in the total indirect costs of each NCD.

## 4.2 Calculating the costs of policy and clinical intervention

The costs of policy intervention and of clinical interventions were calculated with the WHO costing tool (38), which can be used to identify, quantify and value each resource required for the intervention, such as meetings, mass media campaigns (such as television and radio time and newspaper advertisements) and miscellaneous equipment.

Each policy is based assumptions by WHO experts about the input required to implement and enforce it. The WHO costing tool and the OneHealth Tool estimate the quantity of resources required at national, regional and district levels. The unit costs of resource items are taken from the WHO-CHOICE database (39,40).

## 4.3 Return on investment

ROI is a measure of the efficiency of health investments. It consists of a comparison of the magnitude and timing of benefits from health interventions directly with the magnitude and timing of investment costs. ROI is the ratio of the discounted (present) value of benefits to investment costs. Future benefits are discounted, as a unit of currency in the future is worth less than a unit today, owing to the time value of money. The ROI analysis, based on an Excel model developed by WHO for this analysis, provided estimates of the economic gains that would accrue from investing in the cost-effective interventions identified during the visit.

The method used is the NCD ROI model developed in 2015 for use by the UNDP/WHO Joint Programme on Governance of NCDs with the OneHealth and WHO Costing tools. More detail on use of the OneHealth tool is available in manual (8) and in Noncommunicable disease prevention and control: a guidance note for investment cases (41).

To estimate the overall impact of the interventions on increasing GDP, productivity measures were assessed. Data on the amount by which NCDs reduce worker productivity were incorporated, as noted for the model on the economic burden of NCDs. As interventions reduce the projected incidence of ischaemic heart disease and stroke, there will be an associated increase in the number of healthy life-years in the population. From the increase in healthy life-years, GDP per employed person and the reduction in rates for absenteeism and reduced capacity at work can be used to determine the increase in GDP attributable to the value of the avoided absenteeism and reduced capacity at work. The increase in labour force participation due to avoided deaths was calculated by considering the labour force participation rate in Ethiopia and the projected number of deaths avoided. Avoided mortality was monetized by multiplying by the GDP per worker, as outlined above.

The projected economic gains from implementing interventions that are considered cost-effective were therefore the value of avoided reduced capacity at work, of avoided absenteeism and of avoided mortality. The impact of an intervention, measured as the total increase in GDP, was calculated by combining the three types of gain. The ROI for Ethiopia was arrived at by comparing the impact (increase in GDP) of the interventions with the total costs of setting up and implementing the interventions. It was calculated by the “net present value approach” to future costs and economic gains, with 3% discounting. Financial costs or benefits from increased taxation were not included in the ROI.

#### **4.4 Institutional and context analysis**

The institutional and context analysis complements the economic component of the investment case. The analysis provides advocacy-centred recommendations to improve the likelihood that the numbers and policy options from the economic analysis are heard, understood and acted upon. For Ethiopia, the institutional and context analysis involved meetings between the multiagency, multidisciplinary United Nations mission team with various government sectors and other in-country stakeholders, including the United Nations Country Team, donors and development banks. Participants at these meetings discussed how NCDs affect the national development agenda, the priorities of different sectors and stakeholders and how they could support a strengthened whole-of-government response in Ethiopia, including implementing the findings of the investment case. The valuable insights gained from these discussions are incorporated throughout this report and in the conclusions. More detailed information on institutional and context analysis for investment cases can be found in *Noncommunicable disease prevention and control: a guidance note for investment cases (41)*.

## **5. Results**

The economic burden of NCDs, the component parts of the ROI analysis, including health benefits, economic benefits and total costs, and the ROI for each package of interventions are presented below.

### **5.1 Economic burden**

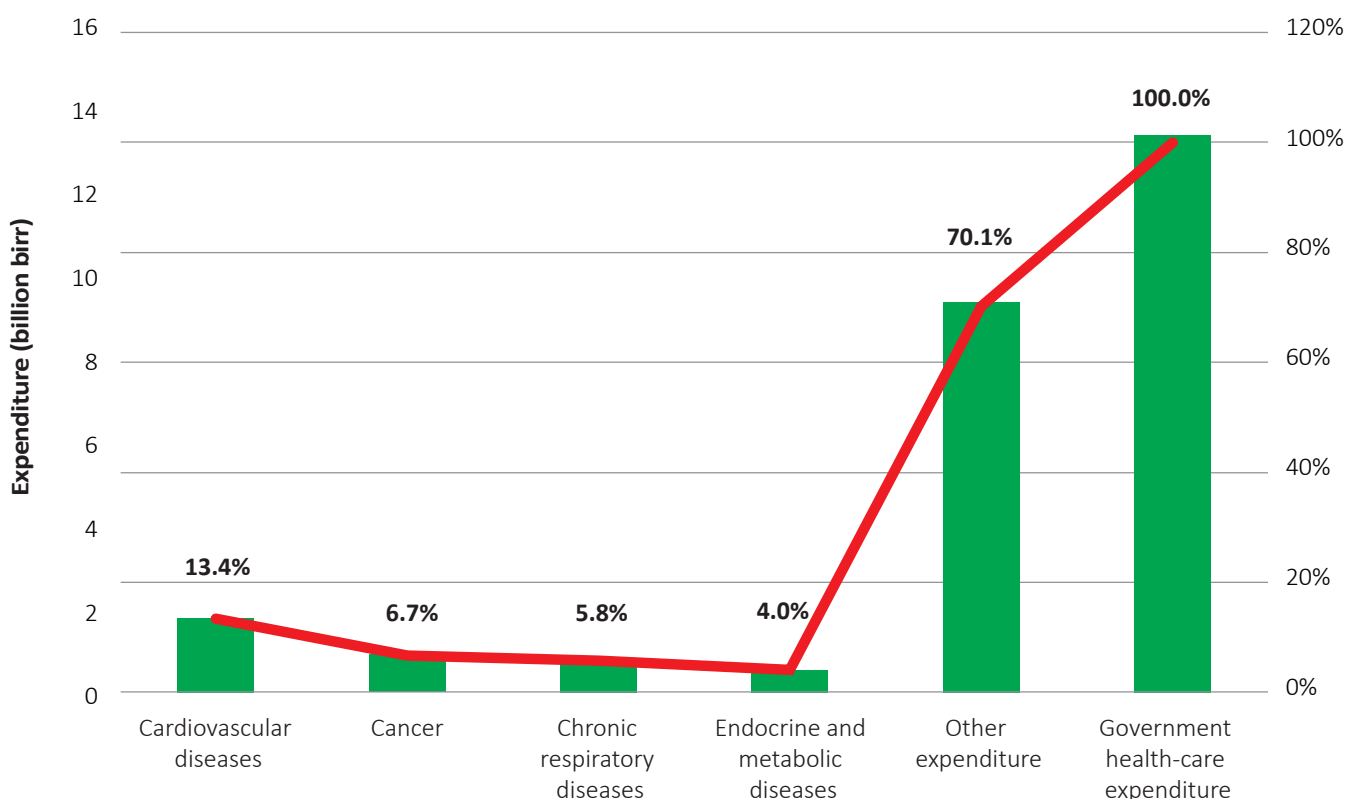
#### **5.1.1 Direct costs**

Estimates of the direct costs were based only on Government health care expenditure and not on non-health care costs, such as transport; and international numbers (see Annex 1, Table A1) were used rather than numbers specific for Ethiopia, which were not available.

Total Government expenditure on NCDs in Ethiopia in 2017 was 14.7 billion birr, as estimated from data on NCD spending in 13 other countries (35). If consistency with the data for these countries can be assumed (all have a similarly high burden of NCDs, although some are high-income countries), 30% of Government expenditure on health would be attributable to NCDs, with 13% on CVD, 7% on cancer, 6% on chronic respiratory diseases and 4% on endocrine and metabolic diseases (mainly diabetes). The actual costs were 1.97 billion birr for CVD, 0.98

billion birr for cancer, 0.58 billion birr for diabetes and 0.85 billion birr for chronic respiratory diseases. Total expenditure on the four main NCDs in 2017 (latest data) is estimated to be 4.4 billion birr (Fig. 2).

**Fig. 2. Government health care expenditure, 2017**



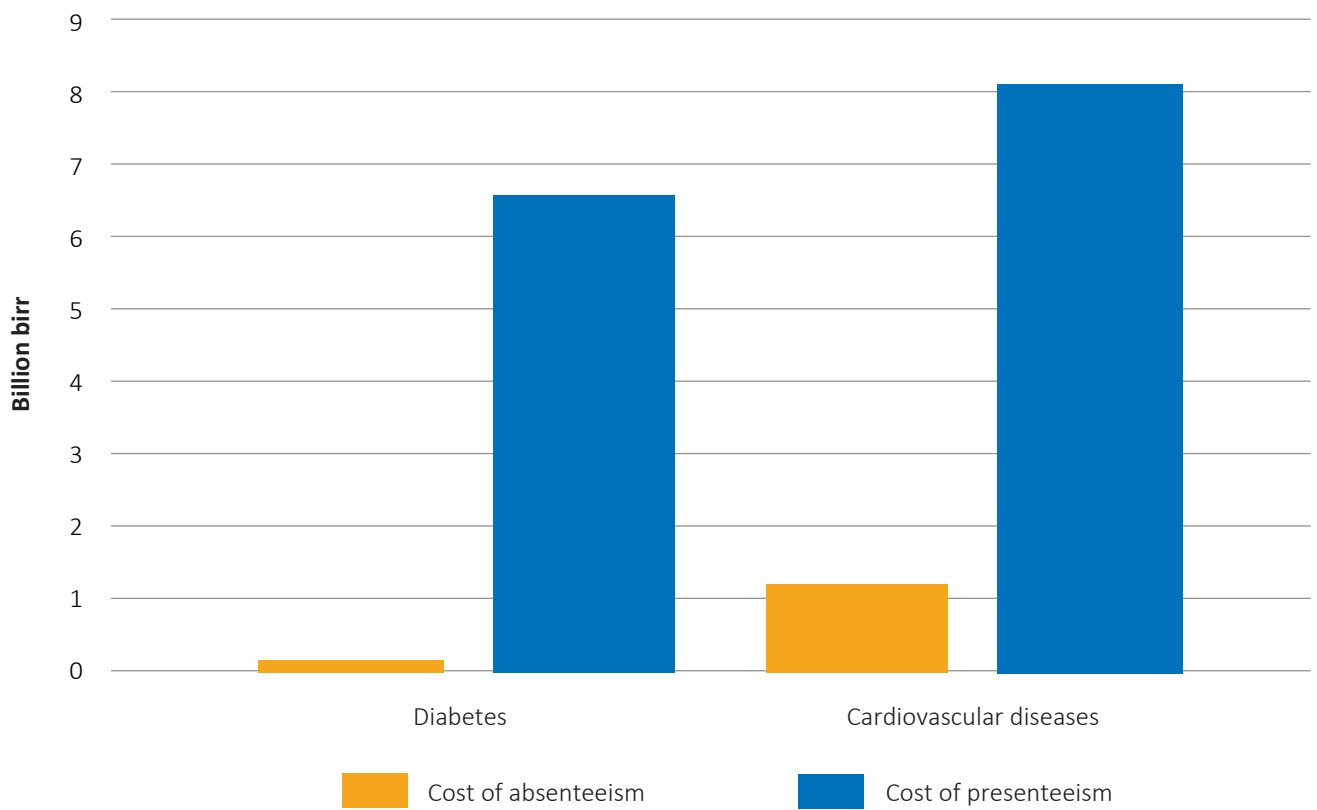
### 5.1.2 Indirect costs

The indirect economic losses due to NCDs were modelled from increased absenteeism, reduced capacity at work and losses from premature death and calculated by the human capital method. The calculation of absenteeism and reduced capacity at work was based on the proportion of the workforce who have survived NCDs (Fig. 3). These could be calculated only for CVD and diabetes, because relevant studies on chronic respiratory diseases and cancer were not found. The number of working days absent was estimated to be 34 853 due to CVD and 5899 due to diabetes, resulting in a total cost of absenteeism of 1.3 billion birr. The corresponding calculation for reduced capacity at work found 245 997 unproductive working days due to CVD and 197 860 due to diabetes, resulting in a cost of reduced capacity at work of 14.6 billion birr.

Losses due to premature death were estimated from foregone economic output, equivalent to the total output that would have been generated by workers up to retirement age. The costs of premature death were calculated by multiplying the GDP per worker by the labour force participation rate, the age-specific employment rate and the 229 922 years of life lost at working age in 2017 due to the four main NCDs. The total costs of premature death were estimated to be 10.8 billion birr (Fig. 4).

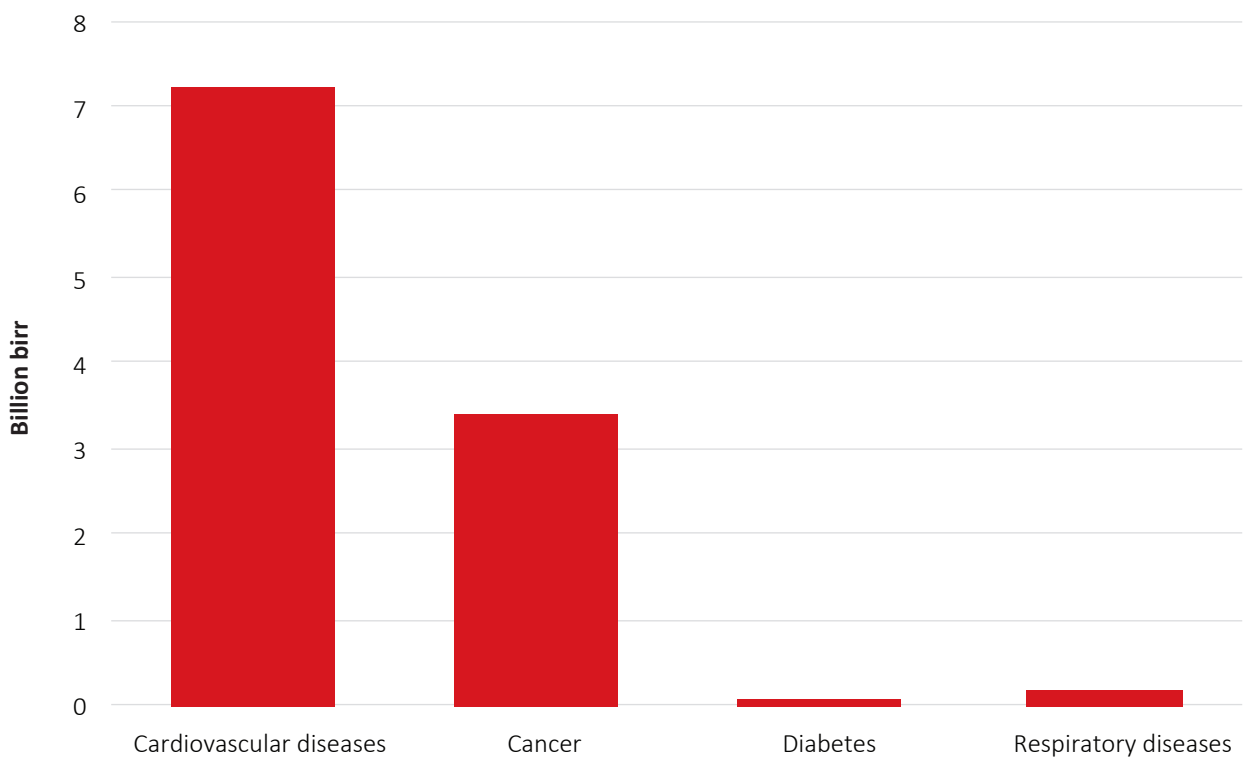


**Fig. 3. Costs of absenteeism and reduced capacity at work due to CVD and diabetes, 2017**



<sup>a</sup> "Presenteeism" is reduced productivity at work.

**Fig. 4. Costs of premature death for four NCDs, 2017**



CVD is the costliest of the four NCDs in terms of premature death, followed by cancer. Diabetes and respiratory disease are not leading causes of premature death, although they are associated with a highly reduced capacity for work.

### 5.1.3 Total economic costs

Table 7 shows the total direct and indirect costs of NCDs in Ethiopia. The indirect economic losses are much higher than the direct losses. Estimated Government expenditure on the four main NCDs is already 4.4 billion birr, and additional losses to the economy from absenteeism, reduced capacity at work (presenteeism) and premature death amount to 26.9 billion birr. The total would be even higher if the costs of absenteeism and reduced capacity at work could be estimated for cancer and chronic respiratory diseases. No data were provided on disability payments.

**Table 7. Economic burden of NCDs in Ethiopia (billion birr), 2017**

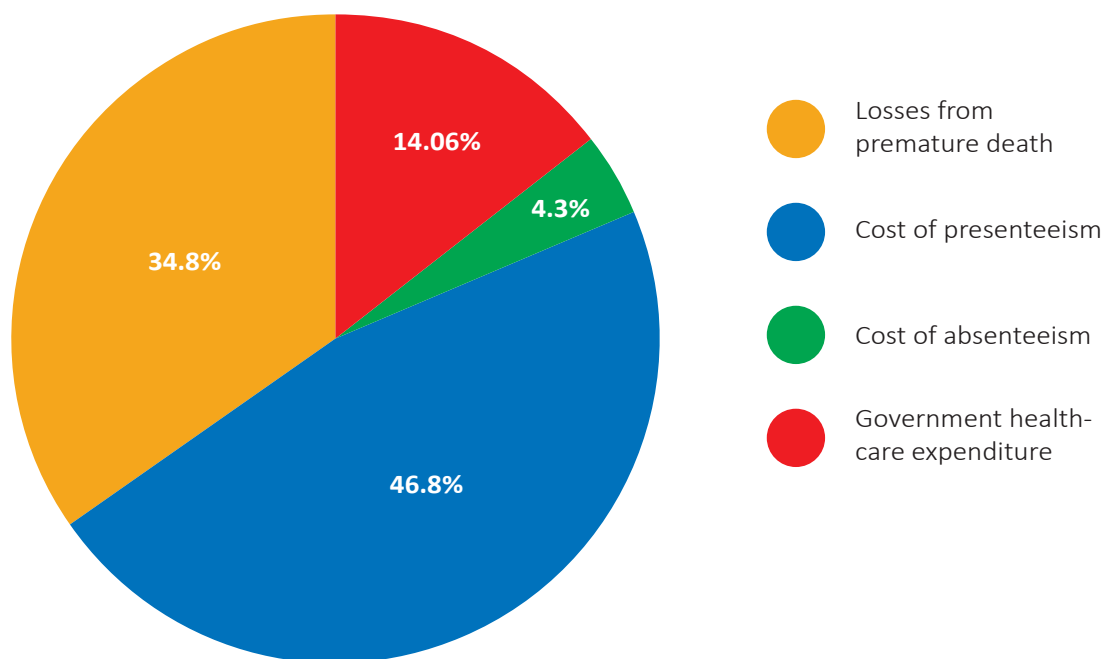
Cost	CVD	Cancer	Endocrine and metabolic diseases (mainly diabetes)	Chronic respiratory diseases	Total
<b>Direct costs</b>					
Health care					
Government expenditure	1.97	0.98	0.58	0.85	4.40
Disability payments	NA	NA	NA	NA	NA
<b>Total direct costs</b>	<b>1.97</b>	<b>0.98</b>	<b>0.58</b>	<b>0.85</b>	<b>4.40</b>
<b>Indirect costs</b>					
Absenteeism	1.15	NA	0.19	NA	1.35
Presenteeism (reduced capacity at work)	8.12	NA	6.53	NA	14.66
Premature deaths	7.27	3.39	0.06	0.17	10.89
<b>Total indirect costs</b>	<b>16.55</b>	<b>3.39</b>	<b>6.79</b>	<b>0.17</b>	<b>26.89</b>
<b>Total</b>	<b>18.52</b>	<b>4.37</b>	<b>7.38</b>	<b>1.03</b>	<b>31.29</b>

NA, not available.

The total burden of NCDs on the Ethiopian economy is thus 31.3 billion birr, equivalent to 1.84% of the GDP in 2017.

Fig. 5 shows the structure of the economic burden of NCDs in Ethiopia in 2017. Government health care expenditure represented only 14.06% of all NCD-related costs.

**Fig. 5. Structure of the economic burden of NCDs in Ethiopia, 2017**



## 5.2 Costs of intervention

The costs of intervention were estimated for the period 2018–2032. Table 8 shows the costs for each of the first 5 years of the period plus the 5- and 15-year totals. The cost of interventions for all 15 years is presented in Annex 1, Table A3.

Clinical interventions for CVD accounted for most of the estimated costs. Treating people with a high absolute risk for CVD costs 4.16 billion birr in the baseline year and increases to 9.17 billion birr in 2022. Implementing the entire CVD and diabetes clinical intervention package over the 5-year period would cost 32.95 billion birr.

The total cost of the tobacco package based on MPOWER guidelines is 0.88 billion birr for 5 years and 2.83 billion birr for 15 years, although implementation costs of the individual interventions in the package vary. The planned costs of certain policies, such as mass media campaigns and protecting people from smoking, are high; however, numerous low-cost tobacco policies exist, including package warning labels, bans on tobacco advertising and raising taxes.

**Table 8. Estimated costs of policy and clinical interventions (billion birr), 2018–2032**

Type of intervention	2018	2019	2020	2021	2022	Total for 5 years	Total for 15 years
Tobacco control package	0.19	0.18	0.17	0.18	0.17	0.88	2.83
Alcohol control package	0.34	0.37	0.34	0.34	0.34	1.73	5.75
Physical activity awareness package	0.24	0.31	0.33	0.33	0.33	1.54	6.05
Salt reduction package	0.25	0.32	0.33	0.34	0.34	1.58	6.16
All policy interventions, total	1.02	1.18	1.17	1.18	1.19	5.73	20.79
CVD and diabetes clinical intervention package	4.16	5.30	6.52	7.80	9.17	32.95	221.39
Total	5.18	6.48	7.68	8.98	10.36	38.68	242.18

### 5.3 Health benefits

All interventions significantly reduce the number of lives lost to CVD-related causes (Table 9). Salt interventions have the greatest impact (454 955 lives saved), followed by CVD and diabetes clinical interventions (352 693) and tobacco interventions (220 080).

**Table 9. Estimated health benefits over 15 years**

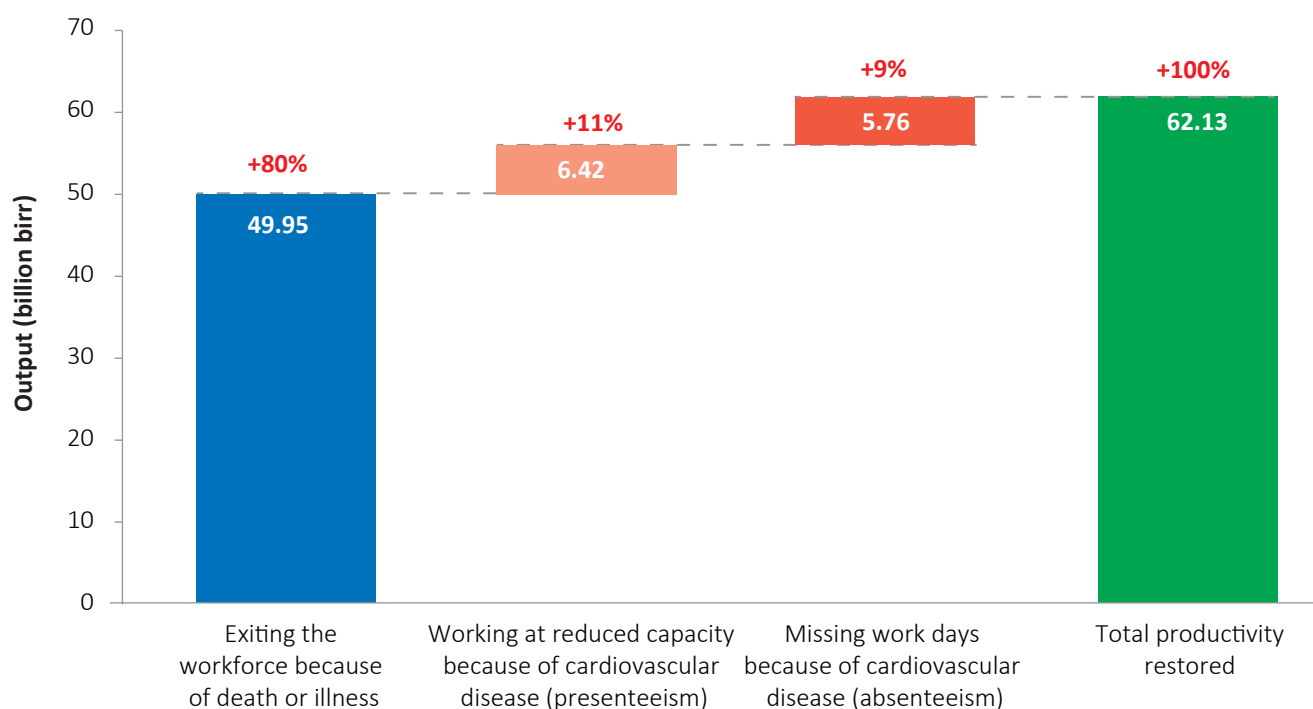
Intervention package	Stroke cases averted	Acute ischaemic heart disease cases averted	Deaths averted	Healthy life-years gained
CVD and diabetes clinical interventions	129 522	96 654	352 693	1 113 896
Tobacco interventions	142 045	109 084	220 080	968 284
Alcohol interventions	134 155	97 017	210 645	884 391
Physical activity interventions	130 466	98 471	209 030	873 171
Salt interventions	442 886	289 871	454 955	2 949 634
Total	979 074	691 097	1 447 403	6 789 376

Each set of interventions also adds healthy life-years to the population. The clinical interventions for CVD and the tobacco and salt packages prevent strokes and cardiovascular events, and thus individuals avoid disabling states (such as partial paralysis from stroke) that can increase pain and suffering, reduce mobility and impair speech and thought.

### 5.4 Economic benefits

The NCDs included in this analysis reduce the labour workforce and productivity due to premature mortality and result in fewer days off work and increase productivity while at work. Fig. 6 shows the gains in labour productivity that would result from prevention of deaths and cases of disease over 15 years (Table 9).

**Fig. 6. Recovered economic output expected from tobacco, alcohol, physical activity, salt and CVD primary prevention interventions over 15 years**



The greatest positive impact on productivity is from reduced mortality (80% of total productivity gains), followed by reduced capacity at work (11%) and absenteeism (9%). The policy packages and treatment of CVD and diabetes in primary care result in a net present value of 62.13 billion birr in labour productivity gains over 15 years.

## 5.5 Return on Investment

Comparison of the costs and benefits of each package of interventions shows that the ROI for almost all the interventions for risky behaviour at population level included in the analysis – for increased physical activity, tobacco control and salt reduction – is > 1.4 birr for each 1 birr invested over 15 years (Table 10).

**Table 10. Costs, benefits and ROI at 5 and 15 years, by intervention package (billion birr)**

Intervention package	5 years			15 years		
	Total costs	Total productivity benefits	ROI	Total costs	Total productivity benefits	ROI
Tobacco	0.88	1.01	1.05	2.83	9.34	3.05
Alcohol	1.73	0.87	0.49	5.75	8.87	1.43
Physical activity	1.54	0.86	0.55	6.05	8.79	1.77
Salt	1.58	3.21	1.99	6.16	20.96	3.26
Clinical interventions for CVD and diabetes	32.95	1.55	0.05	221.39	14.17	0.06

Interventions to reduce salt intake have the highest ROI of any intervention: for 1 birr invested in the package of salt interventions, the expected return is 1.99 birr for the first 5 years and 3.26 birr for 15 years. The tobacco control package would provide an ROI of 3.05 over 15 years.

The package of CVD clinical interventions is critical for providing Ethiopians with the necessary services, to respect their human rights and the Agenda 2030 pledge to leave no one behind. Clinical interventions avert substantial mortality and lead to large gains in healthy life years (second only to salt reduction interventions in this analysis), and their cost-effectiveness has been well studied in the Ethiopian context (59). The lower return on investment presented here is largely due to the high costs of these interventions, at more than 10 times the total cost of all policy interventions over 15 years. Nevertheless, it remains imperative that ever stronger health systems are developed in Ethiopia to ensure the WHO ‘best buys’ and other recommended interventions to manage CVD, diabetes, cancer and chronic respiratory disease are also available for the population.

Policy packages (salt reduction, tobacco and alcohol control and physical activity) are the clear best buys from an economic perspective, offering the highest ROIs over 15 years.

## 5.6 Impact of *khat* use

*Khat* is chewed, often socially, to obtain mild stimulation, as chewing releases chemicals that are structurally related to amphetamines (42). *Khat* use produces significant toxic effects including increased blood pressure, tachycardia, insomnia, anorexia, constipation, a sense of general malaise, irritability, reactive depression, migraine and impaired sexual potency in men. Toxic psychosis and paranoia due to *khat* have also been described. Other reported acute and chronic effects of *khat* include low birth weight in babies of *khat* chewing women, reduced sperm count and motility, increased risk of myocardial infarction and liver problems. In addition to the reported health problems, the regular consumption of *khat* is also associated with a variety of social and economic problems affecting the consumers and their families. *Khat* is not under international control at present,

but, two substances that are usually present in *khat*, cathine and cathinone are, since in the early 1980s all amphetamine-like substances were placed group wise under international control (22nd report, ECDD, TRS 729, 1985). Cathinone was included in Schedule I of the UN Convention on Psychotropic Substances in 1988, and cathine was included in Schedule III of this Convention. Nevertheless, the WHO Expert Committee on Drug Dependence considered that *khat* does not have high potential for abuse or dependence and that any public health threat is not significant enough to warrant international control (43).

Many countries in Asia, Europe and North America have made *khat* illegal, and some of Ethiopia's neighbours, including Eritrea and the United Republic of Tanzania, have also banned *khat* possession and consumption. *Khat* remains legal or is not a controlled substance in other countries, such as Djibouti, Somalia, South Africa and Yemen (44).

In Ethiopia, *khat* remains largely unregulated but is nonetheless a source of extensive public and political debate. While some people maintain strong social acceptance of what they consider to be a harmless, economically beneficial product, others are increasingly concerned about the potential social, economic and environmental costs of *khat* use. Concern is increased by the move from predominant use of *khat* by Muslims during prayer and in the "traditional *khat* heartlands" in the eastern and southern regions to recreational use throughout the country. Box 5 shows the results of the 2015 WHO STEPS survey on *khat* use.

#### **Box 5. *Khat* use in Ethiopia (13)**

- About 16% of respondents were current *khat* chewers.
- More than half of current chewers chew *khat* daily.
- More men currently chew *khat* (21.1%) than women (9.4%).
- Men and rural residents started chewing *khat* earlier than urban residents.
- About 24% of current *khat* chewers tried to stop the habit in the previous 12 months.
- Only 7.5% of *khat* chewers who had visited a doctor or other health worker in the previous 12 months had been advised to stop *khat* chewing.
- About 7% of current *khat* chewers drank alcohol while using *khat*.

Those who are concerned about *khat* use consider that, although WHO does not define *khat* as "a seriously addictive drug", it may still be a problem for health and development. Stakeholders in Ethiopia reported that *khat* "addiction" could result in mental and physical health problems, strained family relationships, road traffic accidents and reduced productivity (particularly among the young workforce). They were also concerned that *khat* is used with alcohol, tobacco and other drugs. It has been reported that *khat* is particularly dangerous for vulnerable people, such as those with hypertension (*khat* increases the heart rate and blood pressure) and people who are genetically predisposed to psychosis (*khat* elicits depression after initial euphoria) (42,43).

Growing concern about *khat* use in Ethiopia has led to some restrictions. For example, the Government has instituted bans on "*khat* houses" (45) and on chewing *khat* in universities and workplaces, although the degree of enforcement is unclear (43,46). In 2012, the Ethiopian Parliament imposed excise taxes on *khat* in order to reduce domestic consumption while boosting export earnings (47). Some states have also adopted regulations on *khat* (47). The aim to both reduce domestic consumption but boost export earnings demonstrates the complications of *khat* control in the country. Ethiopia is the world's leading source of *khat*, and *khat* is the country's largest crop by area of cultivation and the second largest export earner after coffee (valued at about US \$300 million) (49–51). As the majority of *khat* trade is domestic, it is also one of Ethiopia's largest sources of internal tax revenue (48). National tax revenues from *khat* were estimated to be US \$289 million in 2010 (52).

*Khat* is also a source of income for millions of Ethiopian farmers, although *khat* farming has been associated with decreased food security, biodiversity, soil health and women's empowerment (53).

The dynamics of *khat* in Ethiopia challenges policy-makers, as they must balance the economic benefits of production, trade and taxation with growing concern about potential social, economic and environmental costs. They must consider how banning or controlling *khat* use would affect public opinion, domestic conflict, illicit trade and organized crime (54). Such calculations are particularly difficult because policy-makers do not have complete information on the social, economic or environmental dimensions of *khat* use. For example, while the export earnings and tax revenue from *khat* may be known, is not yet known how use of *khat*, which leads to insomnia and sitting for hours, affects work performance.<sup>6</sup>

Ethiopia should consider both the public health and development consequences of both the supply and use of *khat* and ensure that any laws, policies and enforcement activities are not excessively punitive or harm health and development (55). The United Nations Interagency Task Force on the Prevention and Control of Noncommunicable Diseases remains ready to work with the Government, civil society and others in Ethiopia to better understand the impacts of *khat* and to identify solutions in accordance with sustainable development and human rights.

## 6. Conclusions and recommendations

NCDs pose a significant threat to Ethiopia's health and economic development. NCDs are not only major causes of premature death, disease and illness but also threaten to slow Ethiopia's rapid economic growth. Ethiopian citizens face the financial burden through out-of-pocket health spending and lost income from breadwinners who leave the labour force. This burden undermines efforts to improve nutrition and education and reduce poverty and inequalities to leave no one behind.

This report sets out the case for further investment in interventions against NCDs on the basis of the economic burden of NCDs and the cost of interventions and presents an analysis of the relative economic value and ROI on five intervention packages.

Ethiopia has made significant strides in NCD-related policies. While a number of policy and legislative frameworks for NCDs and particularly their risk factors have been formulated, there is no integrated NCD programme or action plan. The review of current NCD policies and individual services revealed gaps in implementation of the WHO-recommended, cost-effective preventive and clinical interventions for NCDs and indicated areas that should be strengthened and scaled-up to achieve 100% coverage. A national multisectoral NCD coordination mechanism is necessary to bring together and strengthen Ethiopia's cross-agency initiatives.

The analysis of the economic burden of NCDs in 2017 resulted in an estimate of a total economic loss to the economy of 31.3 billion birr per year, equivalent to 1.84% of the country's GDP in 2017. About one sixth was for direct health expenditure, and 34.8% of overall costs were for premature mortality. Premature deaths from NCDs cost the economy 10.89 billion *birr*. Lost productivity due to absenteeism (absent work days) and reduced capacity at work of people with CVD and diabetes were also quantified.

Initiatives to prevent NCDs in Ethiopia are relatively cheap and cost-effective. The economics of five policy packages were assessed: four packages to reduce the prevalence of behavioural risk factors for NCDs (tobacco use, harmful use of alcohol, physical inactivity and excessive salt consumption) and one of clinical interventions

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<sup>6</sup> The WHO Expert Committee on Drug Dependence found that "Withdrawal symptoms after prolonged use may include loss of energy, lethargy, depressive feelings and slight trembling, but these symptoms are mild and resolve rapidly. Some tolerance may also develop."

for CVD and diabetes. Policy packages to reduce the consumption of tobacco, alcohol and salt and to increase physical activity were estimated to cost 0.88 billion birr, 1.73 billion birr, 1.58 billion birr and 1.54 billion birr over 5 years, respectively. The interventions for CVD and diabetes were the most expensive options, costing 32.95 billion birr over 5 years.

Economic modelling of ROI suggested that the package to reduce salt consumption would be the most effective. By taking strong action on salt, Ethiopia can be an example for other countries in Africa and around the world. Reducing tobacco consumption, such as by increasing taxation, and increasing the physical activity of the population would also provide substantial ROIs. The economic benefits of these packages far exceed their costs, especially in the long term. The salt policy package was estimated to provide a benefit-to-cost ratio of 3.26 over 15 years. Given the significant health and economic burden of NCDs on Ethiopia, the analysis suggests that NCD prevention policies could be further implemented at population and individual levels, which would deliver substantial ROI. Implementing the intervention packages will require structured engagement from sectors other than health, such as finance, economy and trade, and benefits from investment would accrue to the whole of Government and society.

It is strongly recommended that Ethiopia take immediate steps to implement and enforce the policies modelled in the investment case, with actions to strengthen advocacy, coordination, planning and financing for development, as suggested by the institutional and context analysis. They include the following activities.

1. Use the investment case to **advocate for immediate action and awareness-raising** in non-health sectors and among parliamentarians, the Cabinet, civil society, local media, academia, the private sector and the general public. Frames for action include NCD prevention and control to support:
  - a. *rapid economic growth*, furthering Ethiopia's ambition to reach World Bank middle-income country status by 2025;
  - b. *progress in social development, including reducing poverty and inequality*, noting that the Ethiopia Non-communicable Diseases and Injuries Commission report, in collaboration with the Global Lancet Commission on Reframing Noncommunicable Diseases and Injuries for the Poorest Billion, showed that 23% of total out-of-pocket expenditure in Ethiopian households is for NCDs; and
  - c. *strengthened primary health care*, in line with the Prime Minister's agenda, as prevention reduces human and financial burdens on health systems while raising revenue (through taxation) for health system strengthening and universal health coverage.
2. **Strengthen coordination and planning** in ministries and among the Government, the United Nations and other stakeholders. The investment case offers a concrete opportunity for stakeholders to converge on an important, cross-cutting development issue. Ethiopia, led by its dedicated Minister of Health and with the Prime Minister, the President and others as champions, should pursue options to strengthen whole-of-society initiatives against NCDs, including by:
  - a. creating and empowering a new *multisectoral body on NCDs* and/or integrating NCDs into suitable platforms (e.g. on nutrition, tobacco control and/or the national Sustainable Development Goal action platform comprising ministries and United Nations agencies);
  - b. preparing a costed *national multisectoral NCD action plan*, drafted and finalized by transparent engagement with non-health stakeholders and presenting short- medium- and longer-term activities based on the investment case analysis, including clear lines of responsibility and reporting and strategies for resource-raising; and



c. *incorporating NCDs into other national and sectoral health and development plans, including Sustainable Development Goal frameworks and United Nations documents*, and any accompanying needs assessments, sector-wide modelling, indicator development and resource pursuit. Health is included in Ethiopia's Growth and Transformation Plan, but NCDs should be mentioned specifically, given their impact on economic and social development. Health service delivery for NCDs is output 6.4 of Ethiopia's United Nations Development Assistance Framework 2016-2020,<sup>7</sup> but stronger cross-agency support, especially for prevention, is necessary.

3. **Increase excise taxes on harmful products** to protect the population, avoid spending on NCDs and other health problems, avoid productivity losses and raise reliable domestic revenue to finance health, universal health coverage and development. The 2015 Addis Ababa Action Agenda on Financing for Development notes the benefits of price and tax measures on tobacco, which apply also to fiscal policies on alcohol, sugar-sweetened beverages and other harmful products. The investment case affirms the returns that Ethiopia would realize by raising excise taxes on tobacco and alcohol, in line with global guidance. WHO recommends parties to consider implementing specific or mixed excise systems with a minimum specific tax floor, as these systems have considerable advantages over purely ad valorem systems and that tax rates should be monitored and increased on a regular basis to ensure tobacco products do not become more affordable over time (e.g. due to inflation or growth in income). Ethiopia should use the investment case to advance dialogue and activities on health taxes, including those with the World Bank. Complementary efforts should be made to dispel industry-derived myths, for example in relation to job loss, illicit trade and regressivity. Innovative, nationally salient entry points for stronger health taxes should be pursued. For example, Uganda recently raised taxes on alcohol to finance its HIV response and reduce reliance on donor aid (56).
4. Use the results to **implement, enforce and extend the 2019 tobacco control law**. Ethiopia's 2019 tobacco control law was a landmark achievement, but implementation and enforcement will be essential, as will extension of the law to critical area of taxation. The tobacco control package offers the second highest ROI, 3.05 at 15 years, of all the packages modelled. The tobacco lobby in Ethiopia was described as "huge"; therefore, all government sectors must be aware of and take actions to implement Article 5.3 of the WHO Framework Convention on Tobacco Control.<sup>8</sup> The investment case is a strong opportunity to maintain momentum in tobacco control in Ethiopia, to keep rates low and reduce them further, despite industry ambitions for the opposite.
5. **Pay attention to and advance projects and partnerships on critical issues not covered in the investment case**, notably pollution (indoor and outdoor), mental health, road traffic injuries and *khat* use. The investment case presents powerful health and economic data for action on the four main NCDs and four main behavioural risk factors. Ethiopia should build on this information to ensure that other elements of its NCD burden are addressed. In line with the report of the United Nations Inter-Agency Task Force on NCDs for Ethiopia (23), action should also be planned on pollution, mental health and road traffic injuries. Car-free days in Addis Ababa and other cities are an example of the country's progress and the Health Minister's leadership. Ethiopia has taken additional steps to address pollution, for example increasing saturation of hydro-powered electricity and liquefied petroleum gas (LPG) in Addis. Building from this and expanding action on pollution to other urban and peri-urban areas, while accelerating rural electrification, is important. In global work under way to develop an investment case for air pollution, Ethiopia should be considered as a case country. The costs and benefits of *khat* use to Ethiopian society, including to youth, and effects on employment, productivity and mental health should be explored.

The NCD investment case model cannot currently be used to evaluate the **impact of khat**. Given the political salience of *khat* to Ethiopia's NCD agenda, a national assessment of the development dimensions of *khat* and

<sup>7</sup> Enhanced preventive, curative and rehabilitative capacity of health service delivery to address NCDs including injuries and violence, elderly and disabled people, the indicators being premature deaths from cancer and CVD.

<sup>8</sup> "In setting and implementing their public health policies with respect to tobacco control, Parties shall act to protect these policies from commercial and other vested interests of the tobacco industry in accordance with national law."

potential policy responses might be useful (57). Actions will probably require the collaboration of multiple stakeholders, including:

- scaling up research, data collection and data-sharing among sectors to strengthen the evidence on the impacts of *khat* use, its determinants and effective rights-based responses, including at community level;<sup>9</sup>
- banning or restricting advertising of *khat* in public media, shops and markets and banning or restricting the sale and use of *khat* in schools and workplaces;
- ensuring affordable access to culturally appropriate treatment and recovery services, including cessation counselling;
- including *khat* in local education and prevention initiatives on substance misuse and in national awareness-raising campaigns;
- improving screening, identification and care provision for people with substance use disorders, including those related to *khat* use. WHO mhGAP intervention guide can be instrumental for strengthening primary health care responses to both alcohol and stimulant use disorders. WHO-UNODC International standards for the treatment of drug use disorders provides advanced framework for strengthening system of care; and
- considering the experiences of countries that have made *khat* illegal or otherwise restricted its production and use, including evidence-based rationales for such approaches and analyses of post-intervention impact.

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National Strategic Action Plan for the Prevention and Control of NCDs in Ethiopia, 2014–2016

- Country Cooperation Strategy, 2016–2020
- United Nations Development Assistance Framework
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- Tobacco control directive, legislation and draft strategic plan
- Multi-sectoral stakeholder analysis
- National nutrition programme, 2016–2020
- Ethiopian national school health and nutrition strategy
- Food and nutrition policy
- Global adult tobacco survey

## Annex 1. Data used for calculating the burden of noncommunicable diseases

Table A1. Proportion of total health care expenditure by major noncommunicable disease

Category	Australia	Canada	Czechia	Germany	Estonia	France	Georgia	Hungary	India	Republic of Korea	Netherlands	Slovenia	United States of America
World Bank income group	High	High	High	High	High	High	Low–middle	High	Low–middle	High	High	High	High
CVD	8.6%	9.0%	9.2%	16.2%	22.0%	12.0%	0.8%	18.4%	15.6%	13.4%	11.1%	13.6%	17.0%
Cancers	4.7%	3.1%	5.5%	7.9%	9.4%	7.1%	1.9%	8.2%	4.7%	7.7%	5.5%	6.7%	7.2%
Endocrine and metabolic diseases	4.4%	2.1%	2.0%	4.0%	5.4%	3.9%	0.0%	6.1%	4.8%	4.1%	2.7%	2.4%	4.4%
Respiratory diseases	4.8%	4.5%	3.2%	5.4%	7.2%	7.3%	0.4%	5.8%	8.9%	10.8%	4.9%	6.2%	6.6%
Total for four NCDs	22.5%	18.7%	19.9%	33.5%	44.0%	30.3%	3.1%	38.5%	34.0%	36.0%	24.2%	28.9%	35.2%

Source: adapted from: Garg CC, Evans DB. What is the impact of noncommunicable diseases on national health expenditures: a synthesis of available data. Geneva: World Health Organization; 2011 (NCD discussion paper no. 3) (<http://www.who.int/healthsystems/NCDdiscussionpaper3.pdf>, accessed 25 June 2018).

**Table A2. Changes in productivity associated with noncommunicable diseases**

Disease	Parameter value	Year	Data source
<b>Labour force participation rate reduction</b>			
Hypertension	11.0%	2009	Barnay T, Debrand T. Effects of health on the labour force participation of older persons in Europe. Questions d'Économie Santé. 2006:109 ( <a href="http://www.irdes.fr/english/2006/issues-in-health-economics.html">http://www.irdes.fr/english/2006/issues-in-health-economics.html</a> , accessed 25 June 2018).
Stroke	11.0%	2009	Barnay T, Debrand T. Effects of health on the labour force participation of older persons in Europe. Questions d'Économie Santé. 2006:109 ( <a href="http://www.irdes.fr/english/2006/issues-in-health-economics.html">http://www.irdes.fr/english/2006/issues-in-health-economics.html</a> , accessed 25 June 2018).
Acute myocardial infarction	11.0%	2009	Barnay T, Debrand T. Effects of health on the labour force participation of older persons in Europe. Questions d'Économie Santé. 2006:109 ( <a href="http://www.irdes.fr/english/2006/issues-in-health-economics.html">http://www.irdes.fr/english/2006/issues-in-health-economics.html</a> , accessed 25 June 2018).
Type 2 diabetes	11.0%	2009	Barnay T, Debrand T. Effects of health on the labour force participation of older persons in Europe. Questions d'Économie Santé. 2006:109 ( <a href="http://www.irdes.fr/english/2006/issues-in-health-economics.html">http://www.irdes.fr/english/2006/issues-in-health-economics.html</a> , accessed 25 June 2018).
<b>Reduction in full-time hours due to absenteeism</b>			
Hypertension	0.5%	2011	Mitchell RJ, Bates P. Measuring health-related productivity loss. Popul Health Manag. 2011;14(2):93–8.
Stroke	5.5%	2011	Mitchell RJ, Bates P. Measuring health-related productivity loss. Popul Health Manag. 2011;14(2):93–8.
Acute myocardial infarction	1.1%	2011	Mitchell RJ, Bates P. Measuring health-related productivity loss. Popul Health Manag. 2011;14(2):93–8.
Type 2 diabetes	0.3%	2011	Mitchell RJ, Bates P. Measuring health-related productivity loss. Popul Health Manag. 2011;14(2):93–8.
<b>Reduction in productivity due to reduced capacity at work</b>			
CVD and stroke	3.7%	2011	Wang PS, Beck A, Berglund P, Leutzinger JA, Pronk N, Richling D, et al. Chronic medical conditions and work performance in the health and work performance questionnaire calibration surveys. J Occup Environ Med. 2003;45(12):1303–11.
Diabetes	11%	2011	Holden L, Scuffham PA, Hilton MF, Ware RS, Vecchio N, Whiteford HA. Which health conditions impact on productivity in working Australians? J Occup Environ Med. 2011;53(3):253–7.
Time to replace workers (percentage of a year)	20%	2012	Boushey H, Glynn SJ. There are significant business costs to replacing employees. Washington, DC: Center for American Progress; 2012 ( <a href="https://www.americanprogress.org/issues/labor/report/2012/11/16/44464/there-are-significant-business-costs-to-replacing-employees/">https://www.americanprogress.org/issues/labor/report/2012/11/16/44464/there-are-significant-business-costs-to-replacing-employees/</a> , accessed 25 June 2018).

**Table A3. Estimated costs of policy and clinical interventions (billion birr), 2018–2032**

Intervention	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	Total 15 years
Tobacco control package	0.19	0.18	0.17	0.18	0.17	0.23	0.18	0.18	0.18	0.19	0.24	0.19	0.19	0.19	0.20	2.83
Alcohol control package	0.34	0.37	0.34	0.34	0.34	0.45	0.36	0.36	0.37	0.38	0.48	0.39	0.40	0.40	0.43	5.75
Physical activity awareness package	0.24	0.31	0.33	0.33	0.33	0.49	0.43	0.43	0.43	0.44	0.50	0.44	0.45	0.45	0.45	6.05
Salt reduction package	0.25	0.32	0.33	0.34	0.34	0.50	0.43	0.44	0.44	0.44	0.51	0.45	0.45	0.46	0.46	6.16
All policy interventions, total	1.02	1.18	1.17	1.18	1.19	1.67	1.40	1.41	1.42	1.44	1.74	1.47	1.49	1.50	1.54	20.79
CVD and diabetes clinical intervention package	4.16	5.30	6.52	7.80	9.17	10.62	12.17	13.80	15.54	17.39	19.36	21.44	23.65	25.99	28.47	221.39
Total	5.18	6.48	7.68	8.98	10.36	12.29	13.56	15.21	16.96	18.83	21.09	22.91	25.14	27.49	30.01	242.18



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Development of this investment case was coordinated by a joint WHO and UNDP team. This investment case report is for advocacy purposes and provides a set of options for action to reduce the burden of the noncommunicable diseases in Ethiopia.