Prevention and control of noncommunicable diseases in

Kyrgyzstan

The case for investment

КЫРГЫЗ РЕСПУБЛИКАСЫНЫН ПРЕЗИДЕНТИНЕ КАРАШТУУ СТРАТЕГИЯЛЫК ДЕМИЛГЕЛЕР УЛУТТУК ИНСТИТУТУ

World Health Organization
European Region

UN INTERAGENCY TASK FORCE ON NCDs

UNDP

Prevention and control of noncommunicable diseases in

Kyrgyzstan

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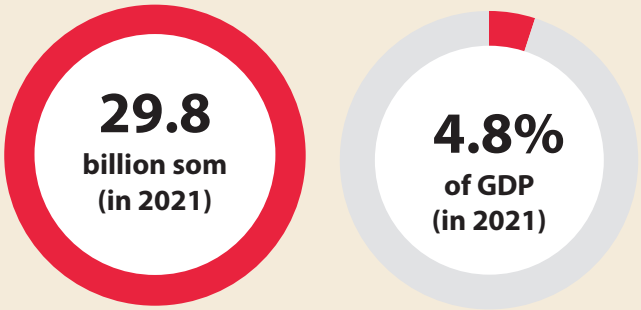
Abbreviations

CVD	cardiovascular diseases
DALY	disability-adjusted life-year
GBD	Global Burden of Disease (study)
GDP	gross domestic product
HEARTS	
LMIC	low- and middle-income country
MHIF	Mandatory Health Insurance Fund
MPOWER	
NCD	noncommunicable disease
OOP	out of pocket
PEN	WHO package of essential noncommunicable disease interventions
PHC	primary health care
SDG	Sustainable Development Goal
STEPS	STEPwise approach to NCD risk factor surveillance

Kyrgyzstan: main findings

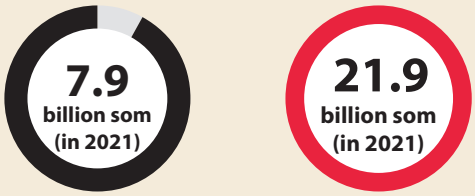
Burden of NCDs



In 2021 the total burden of the four main groups of NCDs on the Kyrgyz economy was 29.8 billion som, which is equivalent to 4.8% of the gross domestic product (GDP) that year.

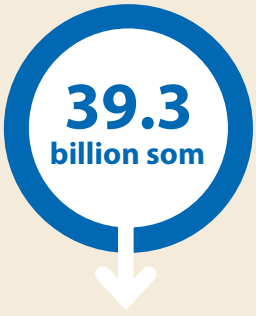
The NCDs related direct costs were 7.9 billion som in 2021. Additional indirect costs due to absenteeism, presenteeism and premature death related to NCDs were nearly three times higher – 21.9 billion som.

Direct and indirect costs



Investment required

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



355.5 million som	794.1 million som	324.5 million som	284.5 million som	37 561.7 million som
TOBACCO CONTROL PACKAGE	ALCOHOL CONTROL PACKAGE	PHYSICAL ACTIVITY AWARENESS	SALT REDUCTION INTERVENTION PACKAGE	CVD AND DIABETES CLINICAL INTERVENTIONS

Return on investment

Restore 34.4 billion som worth of productivity over 15 years. This economic gain far outweighs the costs (1.8 billion som) of implementing the policy interventions for reducing NCD risk factors (salt reduction, alcohol and tobacco control, promotion of physical activity).

Return on investment (ROI) for every 1 som invested over a 15-year period

	ROI	Productivity benefits (billion som)	Lives saved
SALT REDUCTION INTERVENTION PACKAGE	82.12	14.68	35 166
TOBACCO CONTROL PACKAGE	36.60	8.16	19 708
ALCOHOL CONTROL PACKAGE	16.25	7.04	19 231
CVD AND DIABETES CLINICAL INTERVENTIONS	0.06	2.53	7752
PHYSICAL ACTIVITY AWARENESS	11.05	2.03	5484

Executive summary

Overview

Noncommunicable diseases (NCDs), such as diabetes, heart disease, stroke, cancers and chronic respiratory diseases, are a major public health and sustainable development concern. The burden of NCDs and their risk factors is substantial and rising in Kyrgyzstan. The impacts extend beyond ill health and the suffering of people and their families. NCDs also have significant social and economic consequences, including increasing demand on already stretched health system resources and loss of economic productivity, as people who suffer from NCDs are more likely to leave the labour force (due to premature death or disability), miss days of work (absenteeism) or work at reduced capacity due to illness (presenteeism). There is also a bidirectional relationship between socioeconomic status and NCD risk factors, which can drive a self-reinforcing vicious cycle of increased vulnerability, impoverishment, increased demands on the health system and negative spillover effects to other sectors.

This report presents the findings of the case for investing in the prevention and control of NCDs in Kyrgyzstan: scaling up cost-effective NCD policies and clinical interventions. Analysis was focused on the four major groups of NCDs: cardiovascular diseases (CVD), diabetes, chronic respiratory diseases and cancers. The cost-effective interventions, also known as WHO best buys, analysed include 14 clinical interventions (such as screening for CVD/diabetes, pharmacological treatment for those with a 10-year cardiovascular risk exceeding 20%, retinopathy screening and use of photocoagulation) and 23 population-level policy interventions targeting NCD risk factors (such as tobacco taxation and warning labels, alcohol advertising bans, sodium education and communication).

The economic evidence for investing is described, including intervention costs, health gains and economic benefits. This report recommends actionable steps that the Government of Kyrgyzstan can take to strengthen a whole-of-government and whole-of-society approach to preventing and controlling NCDs, informed by the economic evidence and assessment of the political and institutional context.

Main findings

The cost of NCDs

83% of deaths

According to 2019 Global Burden of Disease (GBD) estimates, NCDs were responsible for 71% of the overall burden of disease in Kyrgyzstan (as measured by disability-adjusted life-years (DALYs). Each year NCDs claim 28 842 lives (83% of all deaths) in Kyrgyzstan. Recent nationally representative statistics on the prevalence of NCDs and their risk factors are limited. Findings from the 2013 STEPS (STEPwise approach to NCD risk factor surveillance) survey indicate a high prevalence of tobacco use (26% among adults aged 25–64 years) and raised blood pressure (30.9% among men and 26.6% among women, aged 25–44 years), as well as insufficient physical activity and high salt intake.

In 2021 NCDs cost the economy 29.8 billion som

In 2021 the total burden of the four main groups of NCDs on the Kyrgyz economy was 29.8 billion som, which is equivalent to 4.8% of the gross domestic product (GDP) that year. The direct costs (health-care expenditure) related to the four main NCDs were 7.9 billion som, measured as Government expenditure and disability payments. The direct costs of NCDs represent only 17.4% of all NCD-related costs, hence just the tip of the iceberg of the total economic burden. Additional indirect costs due to absenteeism, presenteeism and premature death related to CVD and diabetes were nearly three times higher – 21.9 billion som. CVD and cancers were the costliest of the four main NCDs in terms of premature death, accounting for 11.1 billion som and 4.8 billion som, respectively. The total economic burden estimated would be even higher if the costs of absenteeism and presenteeism could be calculated for cancer and chronic respiratory diseases (there were insufficient data to conduct these analyses). Among indirect costs, three quarters were due to premature death (16.5 billion som). Presenteeism, which was more prominent than absenteeism, resulted in a loss equivalent to 17 094 fully productive workers in a year and corresponding financial losses of 5 billion som.

These figures indicate that the economic burden associated with NCDs goes beyond health system expenditure, spilling over to lower economic productivity and the loss of the lives of breadwinners for families and the economy. A whole-of-government and multisectoral approach is needed, and other sectors would benefit from supporting NCD prevention and control efforts as they would result in a healthier and more productive workforce.

Despite this large economic burden, the treatment and service gaps remain substantial. Challenges and critical service gaps exist, contributed to by limited financing; predominance of specialist and facility-based care models; lack of nationally representative health information on NCDs; and uneven distribution of care in rural areas.

In responding to these challenges and to strengthen the national NCD response system, the Government of Kyrgyzstan has notable strengths and opportunities to leverage. There is an existing previous investment case for prevention and control of NCDs (2017), high-level leadership and multisectoral commitment towards addressing NCDs (such as the Prime Minister's High-level Committee), various supportive legislative, policy and broad stakeholder instruments (such as the Healthy Kyrgyz Citizen initiative, the national Programme and Action Plan on the Prevention and Control of NCDs 2013–2020 and the Supreme Council of Women in Parliament) and a positive track record of achieving Millennium Development Goal targets. The introduction of the Mandatory Health Insurance Fund (MHIF) has provided incentive payments since 2019 to primary health care (PHC) clinicians for the early detection and management of NCDs and mental health conditions. There is also momentum related to strengthening the mental health system (a case for investment for the prevention and control of mental health conditions is in production), efforts for which can be synergistic with those targeting NCDs.

Why invest in NCD best-buy packages

The investment case findings demonstrate that scaling up NCD interventions would, over the next 10–15 years, have the following beneficial consequences.

Save 87 341 lives

Save 87 341 lives and gain 617 278 years of healthy life by 2037. All the interventions would significantly reduce the number of lives lost as well as increase the total number of healthy life-years gained. The greatest impact would be observed for salt reduction interventions (35 166 lives saved and 268 002 healthy life-years gained, over 15 years), followed by tobacco interventions (19 708 lives saved) and alcohol interventions (19 231 lives saved). By preventing cardiovascular events such as stroke and heart attacks, interventions to reduce NCD risk factors mean that individuals can avoid disabling states (such as partial paralysis from stroke) that can increase pain and suffering and reduce ability to function and economic productivity. Furthermore, health-care expenditure will be reduced as a result of averting 37 324 strokes and 31 063 acute ischaemic heart disease events over 15 years.

Provide economic benefits

Restore 34.4 billion som worth of productivity over 15 years. This economic gain far outweighs the costs (1.8 billion som) of implementing the policy interventions for reducing NCD risk factors (salt reduction, alcohol and tobacco control, promotion of physical activity). Analysis indicates that all of the intervention packages for reducing NCD risk factors are best buys and would produce a benefit–cost ratio greater than 10.0 over 15 years. The salt reduction package has the highest cost–benefit ratio of any intervention: for each som invested, the expected return is 17 som for the first 5 years and 82 som across the 15 year expectancy. The greatest positive impact on productivity would be from reduced mortality (73.3% of total productivity gains), followed by reduced presenteeism (17.3%) and absenteeism (9.3%).

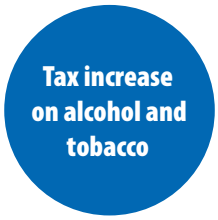
The total cost of the tobacco package based on MPOWER guidelines would be 114.1 million som for 5 years. The estimate is 182.6 million som for the alcohol control package, 80.3 million som for the salt reduction package and 108.2 million som for physical activity awareness interventions. Numerous low-cost tobacco policies exist, including package warning labels, bans on tobacco advertising and raising taxes.

The package of clinical interventions provides a return on investment of less than 1 som for every som invested at 5 years and 15 years. This is because of the high costs associated with medical treatment, given that treatment options have little potential to increase labour force participation after major stroke or heart attack. Return on investment might be optimized with earlier diagnosis and more effective primary prevention, such as management of hypertension. Lack of return on investment does not, however, mean the absence of cost–effectiveness: these interventions may still be cost-effective in other types of economic analysis. Furthermore, the package of clinical interventions is important in fulfilling the right to health.

Economic productivity gains, such as increased participation in the labour force and reduced absenteeism, are not the only considerations to be made in assessing the benefits of investing in NCDs interventions. A more holistic appraisal of benefits would be one that incorporates the social value of health, where the intrinsic value of improving health as an end in itself would be warranted. When considering the social value of health, the estimates for cost–benefit and return-on-investment ratios for the selected interventions are even more favourable.

Recommendations for consideration

The results of this investment case confirm the large economic impact of NCDs in Kyrgyzstan. In addition, they show that investment in a selected number of evidence-informed interventions can significantly prevent NCDs and improve the impact of these conditions on people, their life expectancy and national economic losses (Table ES.1). The following actionable steps can be taken to further strengthen a multisectoral, whole-of-government, whole-of-society response to NCDs and their consequences.



Raise taxes on alcohol and tobacco, and enforce the 2021 Tobacco Law. Increasing taxes on alcohol, a recommendation that is also included in the mental health conditions investment case report, would reduce affordability, decrease alcohol consumption and increase revenue. The revenue gained from alcohol and tobacco taxation should be put towards interventions to prevent and control NCDs, including better remuneration and training of the health-care workforce and stronger protection against catastrophic spending. Severe financing shortfalls have been identified as a key barrier to strengthening Kyrgyzstan's mental health system. Enforcement of the commendable 2021 Law on protecting citizens from the consequences of tobacco consumption, nicotine and exposure to second-hand tobacco smoke and aerosols requires amendments to the Code of Kyrgyzstan on Violations in order to establish appropriate sanctions.

Intensify salt reduction interventions. This intervention package has been identified to have particularly high returns on investment. Expanded educational campaigns can be implemented in partnership with civil society, media and other stakeholders. For alcohol, tobacco and salt reduction regulation initiatives, there may be a need to manage interference and foster private–public sector dialogue and partnership with industry actors (whose commercial interests/ incentives may lean towards poorer health in the long term).

Strengthen intersectoral coordination and accountability, including across noncommunicable diseases, mental health and injuries programmes. Targeted efforts to improve interministerial and intersectoral coordination can more efficiently and synergistically address shared concerns and risk factors across NCDs, injuries and mental health. Engagement of civil society (patient organizations, advocacy groups), professional societies, nongovernmental and private sector actors can be stepped up to increase support for public–private partnership projects in the health-care sector.

Enhance quality and equity

Enhance quality and equitable distribution of NCD services. Strengthen services to achieve early diagnosis and improve total cardiovascular risk management in PHC. Continue to leverage existing village health committee and generalist personnel while strengthening referral systems so that patients from rural areas requiring complex care needs can receive the care they need. Utilize salary incentives and other approaches to improve distribution of health-care professionals in rural areas of the country and facilitate health-care professional retention.

Monitor and evaluate

Increase capacity for NCD monitoring and evaluation. Strengthen key registries (cancers, stroke, heart attacks, diabetes) with respect to case identification, data completeness and representativeness at national level. Emerging digital and mobile health technologies, as well as interoperability standards, may accelerate these efforts. A practical and integrated number of indicators using data from surveys, registries, medical records and directly reported by patients can generate insights useful to monitor disease burden and the impact of health system interventions on patient lives; help to identify and share best practices and to monitor and improve performance; and benchmark against international standards.

Table 1. Summary of main results

Every year, NCDs are responsible for…	Over 15 years, adopting new interventions and intensifying existing ones would…
More than 28 000 deaths (83% of all deaths)	Save 87 341 lives and gain 617 278 years of healthy life
7.9 billion som in health-care expenditure	Reduce health-care spending as a result of averting 37 324 strokes and 31 063 acute ischemic heart disease events
21.9 billion som in economic productivity losses	Prevent 34.4 billion som in economic losses (productivity gains)
Overall economic costs equivalent to 4% of GDP (29.8 billion som)	**Generate economic benefits of 34.4 billion som, which heavily outweighs the costs (3.5 billion som)** of intensifying interventions that reduce NCD risk factors and achieves a return-on-investment ratio that exceeds 10

Photo: © WHO/Mikhail Grigorev

Introduction

1. Introduction

The global burden of NCDs is substantial and rising *(1,2)*. NCDs are a leading cause of death and poor health and well-being around the world, including in Kyrgyzstan.

NCDs accounted for an estimated 40.5 million deaths (71% of deaths worldwide) in 2016 *(1)*. Of these, an estimated 1.7 million (4% of NCD deaths) occurred in people younger than 30 years of age, 15.2 million (38%) in people aged 30–70 years and 23.6 million (58%) in people aged 70 years and older. A great majority of NCD deaths (32.2 million or 80% of NCD deaths) were due to four main groups of disease: cancers, CVD, chronic respiratory diseases and diabetes. In low- and middle-income countries (LMICs), NCDs are responsible for approximately 8.5 million premature deaths a year, with CVD responsible for 40% of these deaths and cancer 27% *(3)*. The highest fatality risks from NCDs were observed in LMICs, with central Asian and eastern European countries leading in the fatality risk from NCDs among men *(1)*.

The impacts of NCDs are far reaching and include suffering of individuals and their families and cost to the State. The global economic losses associated with untreated NCDs are predicted to be US$ 47 trillion over the period from 2010 to 2030 *(4)*. NCDs, particularly when diagnosed late, can result in high health expenditure and economic costs. When people die prematurely or are debilitated by a major stroke or amputation of a limb from diabetes, the labour output they would have produced in their remaining working years is lost. Furthermore, individuals who suffer from chronic conditions are more likely to miss days of work (absenteeism) or work at reduced capacity while at work (presenteeism). For individuals and governments, spending on health can mean significant opportunity costs, including decreased investment in education, transportation projects or other forms of human or physical capital that can produce long-term returns.

There is also a bidirectional relationship between social and economic conditions and NCDs and well-being *(5,6)*. The impacts include loss of economic productivity as people who suffer from NCDs are working age and more likely to leave the labour force (due to premature death or disability), miss days of work or work at reduced capacity. In turn, social and economic conditions and their inequities have a strong impact on the protection and promotion of NCDs and well-being, with some experiencing greater exposure to risk factors and less access to education and awareness, protective occupational environments, diagnosis and treatment interventions. When NCDs are left untreated and when social and economic conditions decline, this bidirectional relationship can turn into a negatively reinforcing vicious cycle of increased vulnerability that increases demand on already stretched health system resources, with negative spillover effects in other sectors. Investing in NCDs prevention and control, therefore, presents opportunities for health, economic and societal gains.

Evidence-backed cost-effective interventions to prevent and control NCDs exist. WHO has developed a menu of policy options and cost-effective interventions, also known as best buys, to help Member States to address NCDs. These options include measures to reduce lifestyle behaviours (such as smoking) and metabolic risk factors (such as high blood pressure) and are described in supporting implementation tools such as the Global action plan for the prevention

and control of NCDs 2013–2020 *(7)*, the WHO package of essential noncommunicable (PEN) disease interventions guidelines for PHC NCD prevention and control in low-resource settings *(8)* and the WHO HEARTS technical package for cardiovascular disease management in PHC *(9)*. Examples of such measures are reducing demand for tobacco through taxation of tobacco products; bans on advertising and creation of smoke-free policies; enabling healthy diets through salt reduction policies and restrictions to marketing to children; public education and awareness campaigns; and delivering evidence-informed PHC services to assess and reduce CVD risk factors. Yet adoption and national scale-up of these interventions have been limited, particularly in LMICs. Responding to the burden of NCDs is made challenging by various factors, including financial and resource limitations and competing demands for the limited resources.

Strengthening policy and increasing investment in addressing NCDs is beneficial for both public health and sustainable development. Investment in evidence-informed NCDs interventions could improve the overall health and quality of life of people and increase life expectancy. In addition, such investments will contribute to the achievement of a number of Sustainable Development Goals (SDGs), including Target 3.4 (by 2030 to reduce by one third premature mortality from NCDs through prevention and treatment and promote mental health and well-being), Target 4 (education), Target 5 (gender), Target 8 (employment and economic growth), Target 10 (equality), Target 11 (safe cities) and Target 17 (partnership, capacity-building and domestic resource mobilization). Addressing NCDs is critical to the SDG vision of a just, inclusive and equitable society. It is also in line with Kyrgyzstan's vision encapsulated in the National Development Strategy (2018–2040) and global commitment to leave no one behind.

However, responding to the economic and societal impact of NCDs is made challenging by various factors, including financial and resource limitations and competing demands for the limited resources. Therefore, the quantification of the costs and benefits of interventions to prevent and control NCDs, and their resulting return on investment ratios, has been a high-priority request from Member States. Investment cases are designed to help countries to make their own economic arguments for action to prevent and control NCDs and enable action across sectors *(10)*.

This report presents the case for investing in NCDs prevention and control in Kyrgyzstan and builds on the previous Kyrgyzstan NCD Investment case published in 2017 *(11)*. Investment cases are designed to help countries to make their own economic and political rationales for action to address NCDs, informed by the costs and benefits of scaled-up action, and the costs of not doing so, at baseline (2022), 10 (2032) and 15 years later (2037). The report is divided into the following sections:

- section 2 outlines the situation analysis for NCDs in Kyrgyzstan and the current and planned responses by the Government;
- section 3 outlines the methodology for the economic analyses;
- section 4 gives the results of the analysis; and
- section 5 provides the conclusions drawn from these findings and provides recommendations for consideration by the Government of Kyrgyzstan for strengthening and scaling up cost-effective policies and clinical interventions that address NCDs.

Situation analysis

2

2. Situation analysis

Reviews of the epidemiology of disease and institutional context analysis were conducted to complement the economic analysis and identify opportunities for action that can be taken in Kyrgyzstan. The purpose was to assess the political space relevant to NCD policy adoption, implementation and enforcement and uncover the most promising policy pathways for a country to take (such as areas of general consensus, political appetite, barriers to adoption).

The institutional context analysis was conducted by the investment case team from January to June 2023. Findings and recommendations were based on inputs from a desk review and interviews.

- A **desk review** was carried out to characterize the epidemiological burden of disease and national responses to date (policies and regulations, financing, resources, action plans, programmes and services, impacts) and other relevant information about the country context, socioeconomic profile and pertinent historical events. Existing legal, policy and programme documents were reviewed; a targeted literature review was conducted and descriptive analyses of public domain databases (for example, GBD Exchange) were performed.
- **Key informant interviews (online) and group discussions with diverse stakeholders** were carried out to gain understanding of the various actors, their interests, capacity to influence, and the institutional and governance arrangements. These consultations provided insights on historical legacies, social trends, opportunities and challenges that may have a bearing on success of NCD-related interventions. Group discussions were held as part of an in-country mission conducted by the United Nations Inter-Agency Task Force on NCDs in March 2023 and included representatives from the following institutions:

- Office of the President;
- Ministry of Health (including the SDG Committee Lead and the Compulsory Health Insurance Fund Lead);
- Ministry of Labour and Social Development;
- Ministry of Education and Science;
- Ministry of Finance;
- Ministry of Economy;
- Ministry of Justice;
- Social and Policy Committee of the Parliament of Kyrgyzstan;
- Ministry of Transportation and Communications;
- Alliance of Women's Legislative Initiatives of Kyrgyzstan (Women's Forum);
- NCD-related programme implementers and clinicians (in public, private and civil society/ nongovernmental organizations);
- people with lived experience; and
- the WHO Country Office in Kyrgyzstan.

2.1 Country context

Kyrgyzstan is a landlocked county in central Asia classified by the World Bank as LMIC. As of 2021 the nation is home to 6.6 million people *(12)*, nearly two fifths (37.8%) of whom are children under the age of 18 years *(12)*. Life expectancy is 71.7 years (males 67.8 and females 76 years). Kyrgyzstan boasts notable public health and development achievements to date, some of which are highlighted in Table 1. These include achieving Millennium Development Goal 4 and reducing infant and child mortality by two thirds compared with 1990 *(13)*. Furthermore, while Kyrgyzstan ranked 122nd (out of 189 countries) in the Human Development Index *(13)*, it ranked 48th in its achievement of SDGs based on 2019 reporting *(14)*. Yet Kyrgyzstan faces several constraints. These include current per capita health expenditure at US$ 64 (among the lowest in the WHO European Region) *(15)*, a critical shortage of essential health workers and high out-of-pocket (OOP) payments, which account for 45% of current health expenditure (Table 2). Kyrgyzstan's historical backdrop influences its current NCD health system response. In the 1990s the health system was weakened in Kyrgyzstan, as was the case in many nations of the former Soviet Union, following a decline in funding *(18)*. In 2010 Kyrgyzstan suffered interethnic conflicts. These resulted in the departure of mental health specialists and the displacement of 400 000 people *(19)*.

Table 2. Development statistics for Kyrgyzstan

Category	Indicator	Kyrgyzstan	Reference year
General	Population (millions)[a]	6.7	2021
General	GDP (current US$ billion)[a]	8.5	2021
General	GDP per capita (current US$[a]	1 277	2021
General	Access to electricity (%)[a]	100	2020
General	People using safely managed sanitation services (% of population)[a]	92	2020
General	Life expectancy at birth (years)[a]	72	2018
General	Current health expenditure, per capita (US$)[b]	73	2021
General	OOP spending (% of current health expenditure)[b]	40.7	2021

Sources: [a]World Bank *(16)*; [b]WHO *(17)*.

2.2 Burden of NCDs and their risk factors

This section provides context background that informs the investment case analyses. It covers the prevalence and distribution of both disease and lifestyle behaviours (such as tobacco and harmful use of alcohol, physical inactivity and unhealthy diet) and of metabolic risk factors (such as raised blood pressure, blood sugar and cholesterol).

2.2.1 Diseases

Table 2 summarizes the burden of NCDs in Kyrgyzstan. According to 2019 GBD estimates, NCDs accounted for 28 842 deaths (83% of all deaths) and 71% of the burden of disease (based on DALYs) in Kyrgyzstan. Notable findings on disease prevalence and distribution are:

- NCDs are the leading cause of mortality in Kyrgyzstan, accounting for 83% of all deaths (and 71% of DALYs) in the country each year (GBD 2019). All told, NCDs claim an estimated 28 842 lives each year (GBD 2019) and currently each citizen has a one in five chance of dying prematurely (before the age of 70 years) from NCDs *(20)*;
- the age-standardized premature mortality rate from the four major NCDs (CVD, diabetes, cancer and chronic respiratory diseases) in Kyrgyzstan in 2019 was 715 per 100 000 population;
- the age-standardized premature mortality rate from the four major NCDs for ages 30–69 years in Kyrgyzstan in 2013 (latest year available) was 833 per 100 000 population for men and 417 per 100 000 for women (average rates for the WHO European Region are 548 and 266, respectively);
- CVDs alone accounted for half (50.4%) of all NCD-related deaths;
- for those aged 0–64 years, mortality from CVDs exceed female mortality by a factor of 2.5;
- based on data from the National Statistical Committee of Kyrgyzstan, in 2021 there were 37 032 new diagnoses of CVD and 7884 of cancers *(12)*; and
- an estimated 17.4% of Kyrgyz adults aged 40–64 years have a probability of 30% or higher of having a fatal or nonfatal cardiovascular event within 10 years, with this 10-year risk increases with age.

Table 3. Burden of NCDs in Kyrgyzstan, GBD 2019 estimates

Condition	Deaths (No. (%))	Death rate (per 100 000 population)	Death rate (age-standardized per 100 000 population)	DALYs (No. (%))
All causes	34 676 (100)	530.6	809.3	1 651 025 (100)
Major four NCDs	28 842 (83.2)	331.3	715.9	1 172 333 (71)
Cardiovascular diseases	17 482 (50.4)	267.5	466.3	373 500 (22.7)
Chronic respiratory diseases	322 (0.9)	4.9	7.0	25 306 (1.5)
Diabetes	4 150 (12.0)	63.5	90.5	125 238 (7.6)
Cancers	1 513 (4.0)	23.2	41.1	44 911 (3.0)

Source: Institute for Health Metrics and Evaluation *(21)*.

2.2.2 Lifestyle risk factors

A nationally representative population survey assessing NCD risk factors and employing the WHO STEPS methodology was conducted in Kyrgyzstan in 2013 *(22)*. The survey showed a concerningly high prevalence of NCD behavioural and metabolic risk factors. Time trends based on the STEPS approach to NCD risk factor surveillance survey data could not be assessed at this time; however, it will be possible to do following completion of the 2023 STEPS survey.

Tobacco use. Among adults aged 24–64 years, 25.7% smoke (almost all being daily smokers). Smoking rates are higher among men than women: only 2.7% of women smoked while 48.2% of men smoked. Smokeless tobacco is used by 10.1%. In addition, 11.9% of women and 36.7% of men were exposed to second-hand smoke in their workplace or inside public places. Tobacco use in Kyrgyzstan involves both older and younger adults. Among the young people, the latest Global Youth Tobacco Survey (2019) found that 2.4% of those aged 13–15 years (4.2% of males; 0.9% of females) smoked cigarettes; 5.1% (7.6% of males; 2.9% of females) used smokeless tobacco; and 2.8% (3.9% of males, 1.7% of females) used electronic cigarettes *(23)*. Population-based cross-sectional surveys found that 49.7% of university students were current tobacco users in 2014 *(24)* and 21% (34% in males and 6% in females) medical students smoked cigarettes daily *(25)*. In this study of medical students, prevalence of electronic cigarettes use was low but the prevalence of tobacco hookah use was high, reaching 85% in 6-year male students *(25)*.

Table 4. Tobacco use findings from the Global Youth Tobacco Survey 2019, Kyrgyzstan

Indicator	Prevalence in young people, 13–15 years (%)
Current cigarette smoker	2.4
Current hookah smoker	1.8
Electronic cigarettes use	2.8
Exposed to second-hand smoke at home	16.8
Noticed tobacco advertisements when visiting points of sale	26.7

Source: Ministry of Health of the Kyrgyz Republic *(23)*.

Harmful use of alcohol. The 2013 STEPS survey found that 44.8% of males and 17.7% of females were alcohol users, characterized as reporting having consumed an alcoholic drink in the previous month. Among alcohol users, 22.8% of men binged (consumed six or more alcoholic drinks in one sitting) during the previous month, compared with 2.7% of women. On average, among alcohol users, men consumed 5.1 drinks in one sitting while women consumed 2.5 *(26)*.

Physical inactivity. According to the 2013 STEPS survey, around one in nine (11.4%) Kyrgyz adults aged 25–64 years were insufficiently active, engaging in less than 150 minutes per week of moderate-intensity physical activity. Rates of insufficient physical activity were higher for women than men and for those living in urban than rural areas. Around half (53.6%) of physical activity was work related; some was transport related (42.7%) while very little was recreational (3.7%).

Unhealthy diet. Sodium consumption in Kyrgyzstan is one of the highest in the world. The age-standardized salt/sodium intake in 2010 for people aged 20 years and over was 5.18 g per day, more than the WHO recommendation of 2 g per day and among the highest across 66 countries surveyed *(27)*. The 2013 STEPS survey findings showed that around a fifth (18%) of Kyrgyz adults added extra salt to their food on a regular basis. A food sampling cross-sectional study has reported sodium content ranging from 19 to 658 mg/serving in industrial foods in Kyrgyzstan. Most sodium–potassium ratios exceeded the recommended level of 1.0, and the highest ratios were found in industrial beverages, where this ratio was 16.4 *(28)*. One macronutrient analysis study found high levels of saturated fats and trans-fatty acids in some homemade traditional dishes and snacks *(29)*. One such dish is *manty*, which contained 30.2 g/serving saturated fats and 2.9 g/serving trans-fatty acids *(29)*. The 2023 STEPS survey indicated that 74% of Kyrgyz adults aged 24–64 years consumed insufficient amounts of fruits and vegetables *(22)*.

These findings present opportunities for lowering intake using various channels including legislation related to processed foods and beverages, as well as increased education and awareness of the general population.

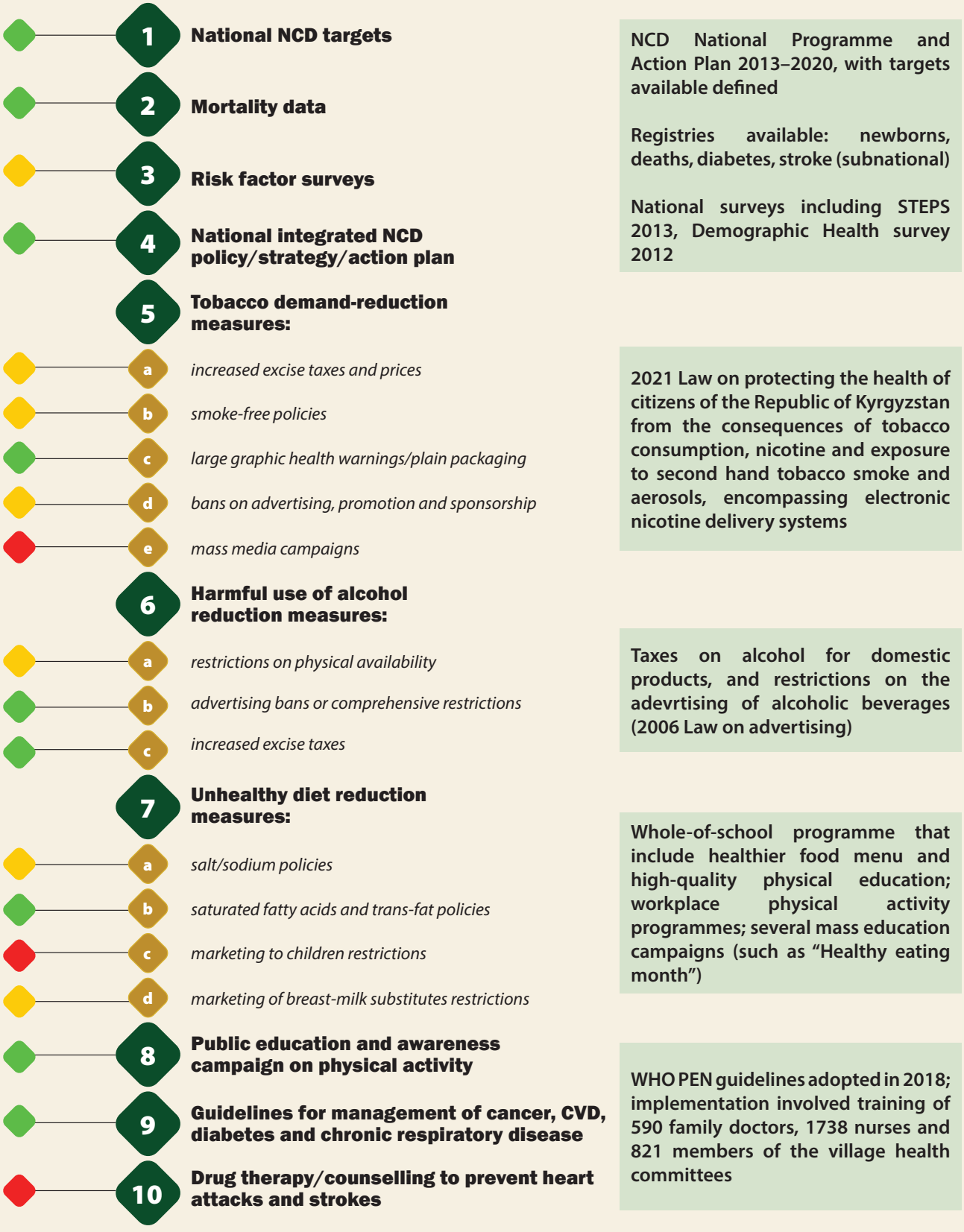
2.2.3 Metabolic risk factors

According to the 2013 STEPS NCD survey, an estimated third of adults aged 24–64 years (33.1%) in Kyrgyzstan are overweight, with body mass index over 25 kg/m^2; a quarter (23.1%) of adults are obese (body mass index over kg/m^2); 4.5% have raised blood sugar, 23.6% raised blood cholesterol and 48.7% raised blood pressure. Estimates based on the 2010 Kyrgyzstan Integrated Household Survey found low rates of adherence to antihypertensive drugs, in part reflecting the low affordability of these medicines *(30)*. A study used STEPS survey data from 44 LMICs to assess health system performance along the hypertension care cascade – prevalence of diagnosed, treated and controlled blood pressure (target blood pressure < 140/90 mmHg) *(31)*. Along with Bangladesh, Brazil and Costa Rica, Kyrgyzstan was among the countries that performed better in hypertension care cascade steps than predicted, based on GDP per capita *(31)*. Contributing factors to this include the availability of village health committees *(31)* and general availability of antihypertensive drugs enabled by the MHIF (State-guaranteed Benefit Package and Additional Drug Package) *(32)*; these assets can be leveraged to strengthen national response to reducing NCD risk factors and more generally addressing other conditions such as in mental health.

2.3 NCD-related legislation and policies

Kyrgyzstan has strong policy and legislative frameworks in place for the prevention and control of NCDs. Fig. 1 provides highlights of Kyrgyzstan's progress towards implementing evidence-informed policies and clinical interventions to curb NCDs.

Fig. 1. Kyrgyzstan's progress and example achievements in national response to NCDs



Source: adapted from WHO *(20)*.

The Den Sooluk National Health Reform Programme 2012–2018 was anticipated to result in a 1% annual reduction in deaths from CVD. The National Programme and Action Plan on the Prevention and Control of NCDs 2013–2020 provides a national strategy for implementing evidence-informed policies and clinical interventions, anchored on WHO best buys and through intersectoral action for health.

A shift in the national health strategy occurred in 2018, when the Kyrgyz Government launched three strategic documents that together articulated the policy framework and operational plan for advancing health and well-being in Kyrgyzstan and achieving sustainable development. These documents are:

- the National Development Strategy for Kyrgyzstan 2018–2040;
- the Development Programme of Kyrgyzstan 2018–2022: Unity. Trust. Creation; and
- The Programme of the Kyrgyzstan Government on Public Health Protection and Health-Care System Development for 2019–2030: Healthy Person, Prosperous Country (Health 2030).

Tobacco use. Kyrgyzstan ratified the WHO Framework Convention on Tobacco Control in 2003. A Law on protecting the health of citizens of Kyrgyzstan against the harmful effects of tobacco was adopted in 2006 and amended in 2009. In September 2021 the President of Kyrgyzstan signed the Law on protecting the health of citizens of Kyrgyzstan from the consequences of tobacco consumption, nicotine and exposure to second hand tobacco smoke and aerosols *(33)*. This pivotal Law, which came into force on 13 October 2021, provides the legislative instrument to implement the provisions of the WHO Framework Convention on Tobacco Control and, by doing so, to protect the health of its citizens. This Law (Article 5) encompasses use of electronic nicotine delivery systems. For the first time in Kyrgyzstan's history, the Law (Article 8) provides for protection of public policies from interference by the tobacco industry *(33)*. Measures to curb tobacco demand and use contained in the Law include:

- bans of smoking and the use of electronic nicotine delivery systems and hookah in all workplaces and public places, including public transport stations and taxis (with the only exemption being smoking rooms at airports);
- bans of sale of all tobacco products to children under 18 years of age and through all impersonal forms of sale, including vending machines (however, no ban on Internet sales has been adopted);
- bans on all forms of tobacco advertising, promotion and sponsorship, including at points of sale;
- pictorial health warnings covering 65% of the main surface areas of tobacco products; and
- ban on misleading information (less harmful) on consumer packaging of heating and electronic nicotine delivery systems and related accessories.

Alcohol use. Several measures have been taken to reduce the harmful use of alcohol. These include raising taxes on alcohol for domestic products; restrictions on the advertising of alcohol beverages (2006 Law on advertising); a ban on the sale of alcohol in public transport, Government offices, parks, city squares, children's areas and educational, medical, sports and cultural institutions and organizations; and the adoption of stricter legislation on blood alcohol levels (maximum 0.3 g/L)

when driving *(13)*. Of note is that about 40% of the alcohol consumed in Kyrgyzstan is imported or illegally produced *(34)* – this remains unaffected by the tax increases.

Unhealthy diet. The Ministry of Education in partnership with the Ministry of Health reformed diet policies in schools to create more healthy options. There is a programme on food security and nutrition and a food-based dietary guideline for healthy nutrition has been developed. The Customs Union technical regulation TP TC 022/2011 "Food Products in Terms of Labelling" is in force and mandates labelling of liquors, soft drinks, beverages and other food products.

Physical activity. There has been some progress with the provision of public spaces that support walking and cycling, supported by the Healthy Cities initiative and involving creation of bicycle and pedestrian paths in Bishkek and Osh. Whole-of-school programmes that include high-quality physical education have been rolled out.

Education regarding NCDs. Several mass education campaigns have been deployed to raise awareness on the NCD risk factors and how these can be minimized. Campaigns include "You Smoke? Check Your Lungs" and "Healthy Eating Month" *(35)*. These campaigns have leveraged village health committees, whose services cover 80% of Kyrgyzstan and are a major asset in reaching and engaging the public.

2.4 NCD health services: availability and access

The Kyrgyz Ministry of Health adopted the WHO PEN guidelines in 2018 and implemented the guidelines to help PHC workers to prevent, diagnose early and manage NCDs *(36)*. Implementation involved training of 590 family doctors, 1738 nurses and 821 members of the village health committees *(36)*. Delivery included patient education support groups held at PHC clinics and led by nurses. Initially funded by the Swiss Agency for Development and Cooperation, this PEN programme has now been fully integrated into the Kyrgyz PHC services package *(36)*. One quasi-experimental study, where independent samples of around 2000 adults were surveyed in 2018 (before implementation of PEN) and in 2021 (following implementation), found an increase in NCD risk factor awareness prevalence over time (from 61% in 2018 to 87% in 2021), and higher self-reported healthy behaviour in 2021 when compared with 2018 (higher physical activity and lower smoking prevalence) *(36)*.

These services are, however, unevenly distributed, and systematic assessment of compliance with guidelines and impact has yet to be conducted. Assessing quality of care is important in ensuring that the investments in services delivered result in the intended outcomes of improved survival, morbidity and economic output. Studies covering conditions amenable to health care have demonstrated that low quality of care accounts for a large proportion of deaths in LMICs *(37)*. In the case of CVD, there were approximately 2.5 million deaths worldwide while in health care that were due to low-quality care (patients receiving care that is not aligned with evidence-informed guidelines): this far outstrips the number of deaths linked to poor access/nonutilization of care for the same conditions *(37)*.

2.5 NCD resources

Chronic underfunding is often cited as a key barrier to quality health care. Currently, Kyrgyzstan's health budget is US$ 0.24 billion, representing 3.4% of total GDP. NCDs accounted for 30% of annual hospital spending in Kyrgyzstan in 2022 according to key informant interviews. Kyrgyzstan's NCD prevention and control programme has various internal and external funding sources. The largest source is the national budget account; however, there are contributions for targeted projects from municipal budgets (such as for the creation of cycling paths) and the MHIF (such as for equipment in clinics). External sources of funding include the Swiss Agency for Development and Cooperation, WHO and the World Bank–led SWAP-2 pooled funding.

The MHIF functions as a single payer system pooling public funds at national level for the procurement of a standardized package of services from health-care organizations (which are largely public) *(15,38,39)*. Current per capita health expenditure is among the lowest in the WHO European Region and OOP spending accounting for 45% of current health expenditure *(15)*. Medicines are the biggest drivers of OOP spending in inpatient, outpatient and self-treatment settings *(15)*. One study found that OOP spending increased between 2012 and 2018 by about US$ 6 and inpatient costs placed the highest cost burden on users (US$ 13.6), followed by self-treatment (US$ 10.7) and outpatient costs (US$ 9). About 378 000 to 2.084 million people (6.33%) incurred catastrophic health expenditure between 2012 and 2018. Households that were at higher risk for catastrophic spending were those located in rural areas or where a widowed or single person was acting as family head *(40)*.

The financial protections and benefits of MHIF are limited by inadequate enforcement of mandatory health insurance contributions (the payroll tax). This leads to a shortfall in funding and means that 26% of the population, comprising relatively vulnerable groups of people, is unable to benefit from lower co-payments for hospital care or from access to the subsidized outpatient medicines covered by the Fund. Introducing means-tested exemptions (specifically targeting poor people) has not yet occurred and would require a joint approach with the Ministry of Labour and Social Development *(38,39)*.

The Kyrgyz National Statistics Committee reported in 2021 that there were 14 004 doctors and 28 357 nurses and midwives in Kyrgyzstan *(12)*. There were 27 579 hospital beds in the country *(12)*. While PHC and hospital facilities are widely distributed around Kyrgyzstan, distribution of personnel was variable. The ratio of doctors to population is much higher in urban areas than in rural areas *(15)*. Salaries of health-care professionals are low; the average salary for a physician (and equivalent occupations) was 26 000 som per month or 312 000 som (US$ 3710) per year. The average salary for a nurse (equivalent occupations) was 18 000 som per month or 216 000 som (US$ 2568) per year *(15)*.

2.6 NCD health information

Kyrgyzstan has a three-tier health information system. Data are collected at the level of family medicine centres (PHC), the regional level and the national level. There are some data sources available that can be used to monitor burden of NCDs and risk factors and the impact of national responses in Kyrgyzstan. National registries that are established cover newborns, infant mortality, people with diabetes, and maternal mortality *(34)*. Subnational and smaller registries have been set up, such as for stroke *(34)* and diabetes; however, these are more targeted and their findings may not be representative of the burden of disease across the country. There is an existing cancer registry but there are indications that there is underreporting of cancers, seen more in girls than boys, and likely more underreporting of cases in rural areas given that diagnostics and treatment services for cancer are still largely confined to big cities *(41)*.

Data on NCD risk factors are available from the follow population-based surveys of adults and children:

- Kyrgyzstan STEPS (2013) *(26);*
- the Demographic and Health Survey 2012 *(42)*;
- the Global Young people Tobacco Survey in 2004, 2008, 2014 and 2019 *(43)*; and
- the fourth WHO Childhood Obesity Surveillance Initiative survey 2017/2018 *(44)*.

The Republican Medical Information Centre also collects data on NCD risk factors; however, these are data on people who visit a doctor and of health-care organizations that participate in the pilot projects. Hence, they are not population based, and the information provided may not reflect the data of people living in areas served by nonparticipating health-care organizations.

A second STEPS survey was scheduled to start in May 2023 *(45)*. This will provide updated estimates on the prevalence of NCDs and risk factors, as well as insights on trends over time through comparison with the baseline survey conducted in 2013.

3 Methodology

3. Methodology

This section outlines the methods and economic models used when calculating the economic burden of NCDs in terms of direct and indirect costs (absenteeism, presenteeism and premature death); costing interventions (clinical and policy interventions); assessing health impact; and return on investment analysis.

3.1 Calculating the economic burden of NCDs

A model was developed to calculate the economic burden of NCDs, which provides estimates of the current direct and indirect costs of NCDs in Kyrgyzstan. Calculations were based on the data provided by national authorities through the WHO Country Office. The data used for the population by age and sex for the period 2021–2036 were modelled in the OneHealth Tool *(46)*. 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 diseases, provided by a local team. Mortality rates by age and sex were applied for each condition. The model provided projections for the numbers of incident and prevalent cases and mortality due to CVD, diabetes and chronic respiratory diseases between 2021 and 2036, assuming that current rates would remain constant.[1] These projections were summarized as total incidence, prevalence and mortality for both the entire population and the working-age population, defined as people aged 15–65 years.

The following steps were followed to calculate the economic costs.

- Total Government health expenditure and the share of total health expenditure on NCDs were provided by the WHO Country Office.
- The annual value (in terms of economic output) of each full-time worker in Kyrgyzstan was calculated from the GDP per employed person, defined as the country's GDP (739.8 billion som in 2021, local data) divided by the total employed labour force. Local data on the total labour force aged 15 years and over (2 680 500, local data), the unemployment rate (5.3%, local data) and the labour force participation rate (66.8%, local data) were used to determine the total employed labour force in Kyrgyzstan.
- Data were incorporated on the extent to which NCDs reduce worker productivity. Rates were found in the academic literature *(47,48)* to describe (i) the reduction in labour force participation due to hypertension, stroke, acute myocardial infarction and diabetes; (ii) the reduction in full-time hours worked because of absenteeism; and (iii) the reduction in productivity due to presenteeism.
- The number of people with NCDs within the workforce in Kyrgyzstan in 2021 was determined from labour force participation, unemployment and mortality rates. The model began by estimating the number people of working age with NCDs and then subtracted those who chose not to participate in the labour force or were unemployed; it then subtracted those who could not participate in the labour force specifically because of their NCD and, finally, subtracted those who had died. The result was the estimated number of active workers with NCDs.

1 The model estimated growth in prevalence and mortality due to population growth only, not growth in disease rates.

- The final steps were to calculate economic losses from premature deaths from the numbers of workers who had died and would-be workers who could not participate in the labour force and the costs of absenteeism and presenteeism 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 GDP per employed person. This calculation resulted in the total indirect costs of each NCD.

Photo: © WHO/Dennis Ravays

3.2 Calculating the costs of policies and clinical interventions

The costs of policy intervention were calculated with the WHO Costing Tool *(49)*. The OneHealth Tool was used to calculate the costs of clinical interventions by identifying, quantifying and valuing each resource required for the intervention *(46)*. For each policy, the WHO Costing Tool or the OneHealth Tool costed human resources, training, external meetings, mass-media campaigns (such as television and radio time and newspaper advertisements) and miscellaneous equipment necessary to enact policies and programmes. Each policy includes assumptions, made by WHO experts, about the quantity of input required to implement and enforce it. The WHO Costing Tool or the OneHealth Tool was then used to estimate the quantity of resources required at national, regional and district levels. The unit costs for resource items were taken from the WHO CHOICE database *(50,51)*.

Return on investment and cost–benefit ratios are measures of the efficiency of health-care investment, as the magnitude and timing of the benefits of health interventions are compared directly with the magnitude and timing of investment costs. The cost–benefit ratio is the ratio of the discounted (present) value of the benefits to the investment costs. Future costs and benefits are discounted, as a unit of currency in the future is worth less than a unit today because of the time value of money. Analysis of the returns on investment, based on an Excel model developed by WHO for this analysis, provided estimates for the economic gains that accrue from investing in the set of cost-effective interventions identified by WHO; the best buys. Table 5 lists the policy-based and clinical interventions included in this calculation.

Table 5. NCD interventions costed within the OneHealth Tool

CVD and diabetes
Screening for risk of CVD/diabetes
Follow-up care for those at low risk of CVD/diabetes (absolute risk: 10–20%)
Treatment for those with very high cholesterol but low absolute risk of CVD/diabetes (< 20%)
Treatment for those with high blood pressure but low absolute risk of CVD/diabetes (< 20%)
Treatment for those with absolute risk of CVD/diabetes 20–30%
Treatment for those with high absolute risk of CVD/diabetes (>30%)
Treatment of new cases of acute myocardial infarction with aspirin
Treatment of cases with established ischaemic heart disease and post myocardial infarction
Treatment for those with established cerebrovascular disease and post stroke
Treatment of cases with rheumatic heart disease (with benzathine penicillin)
Standard glycaemic control
Intensive glycaemic control
Retinopathy screening and photocoagulation
Neuropathy screening and preventive foot care

Table 5. contd

Policy interventions: population level
Tobacco
Tobacco: monitor tobacco use/prevention policies
Tobacco: protect people from tobacco smoke
Tobacco: offer to help to quit tobacco use: cessation
Tobacco: warn about danger: warning labels
Tobacco: warn about danger: mass media campaign
Tobacco: enforce bans on tobacco advertising
Tobacco: enforce young people access restriction
Tobacco: raise taxes on tobacco
Tobacco: plain packaging of tobacco products
Offer to help quit tobacco use: brief intervention
Hazardous alcohol use
Hazardous alcohol use: enforce restrictions on availability of retailed alcohol
Hazardous alcohol use: enforce restrictions on alcohol advertising
Hazardous alcohol use: enforce drunk driving laws (sobriety checkpoints)
Hazardous alcohol use: raise taxes on alcoholic beverages
Screening and brief intervention for hazardous and harmful alcohol use
Physical inactivity
Physical inactivity: awareness campaigns to encourage increased physical activity
Physical inactivity: brief advice as part of routine care
Sodium
Sodium: surveillance
Sodium: harness industry for reformulation
Sodium: adopt standards: front-of-pack labelling
Sodium: adopt standards: strategies to combat misleading marketing
Sodium: knowledge: education and communication
Sodium: environment: salt reduction strategies in community-based eating spaces

The return-on-investment model was developed in 2015 by WHO and the United Nations Development Programme and is based on the OneHealth Tool and the WHO Costing Tool. More detail on the use of the OneHealth Tool is available in the Manual *(46)* and is discussed in a guidance note for investment cases for preventing and controlling NCDs *(10)*.

To determine the overall impact of the set of interventions on GDP, productivity measures were assessed in the following steps.

- The amount by which NCDs reduce worker productivity was incorporated, as delineated by the model on the economic burden of NCDs. As interventions reduce the projected incidence of ischaemic heart disease and stroke, there is an associated increase in the number of healthy life-years of a population. Inclusion of this increase alongside GDP per employed person, and reductions in the rates of absenteeism and presenteeism, allows determination of the increase in GDP attributable to the value of avoided absenteeism and presenteeism.
- The increase in labour force participation due to avoided deaths was calculated from taking the labour force participation rate in Kyrgyzstan and the projected number of deaths avoided. Avoided mortality was monetized by multiplying by GDP per worker, as outlined above.
- Return on investment was calculated for the interventions listed in Table 5. These were selected from the available data to ensure sufficient data for calculating the costs and health effects.
- The projected economic gains from implementing interventions that are considered cost–effective were, therefore, the value of avoided presenteeism, the value of avoided absenteeism and the value 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 return on investment for Kyrgyzstan was arrived at by comparing the impact (increase in GDP) of interventions with the total cost of setting up and implementing the interventions. It was calculated using the net present value approach to future costs and economic gains, with 3% discounting.

Photo: © World Bank

Results

4

4. Results

This section presents the assessment of the economic burden of NCDs, a summary of the component parts of the return-on-investment analysis, including health benefits, economic benefits and total costs, and discussion of the return on investment for each package of interventions.

4.1 Economic burden

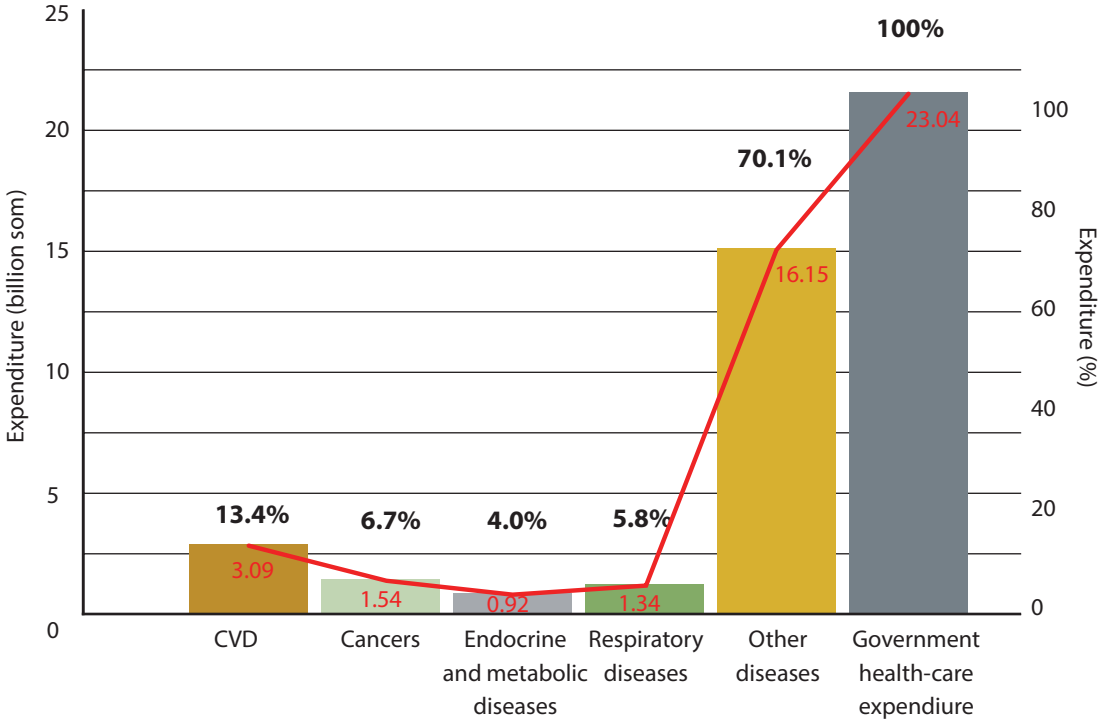
4.1.1 Direct costs

The estimate of direct costs of economic burden applies only to Government health-care expenditure. It does not include private OOP health-care expenditure, costs to third-party insurers and non-health-care costs such as transport.

According to the National Statistical Committee of Kyrgyzstan, total health expenditure for Kyrgyzstan in 2021 was 44.4 billion som. Government health expenditure was 23.0 billion som and accounted for 52.0% of total health-care expenditure.

As noted above, the share of total health expenditure for each NCD group (CVD, diabetes, cancer and chronic respiratory diseases) is known from the national health accounts. Assuming no changes to this breakdown, annual spending on the four main groups of NCDs in 2021 was 6.89 billion som: with 3.09 billion som (13.4% of total health expenditure) on CVD, 1.54 billion som (6.7%) on cancer, 1.34 billion som (5.8%) on chronic respiratory diseases, and 0.92 billion som (4.0% of total health expenditure) on endocrine and metabolic diseases (primarily diabetes) (Fig. 2).

Fig. 2. Government health-care expenditure in Kyrgyzstan (billion som) 2021

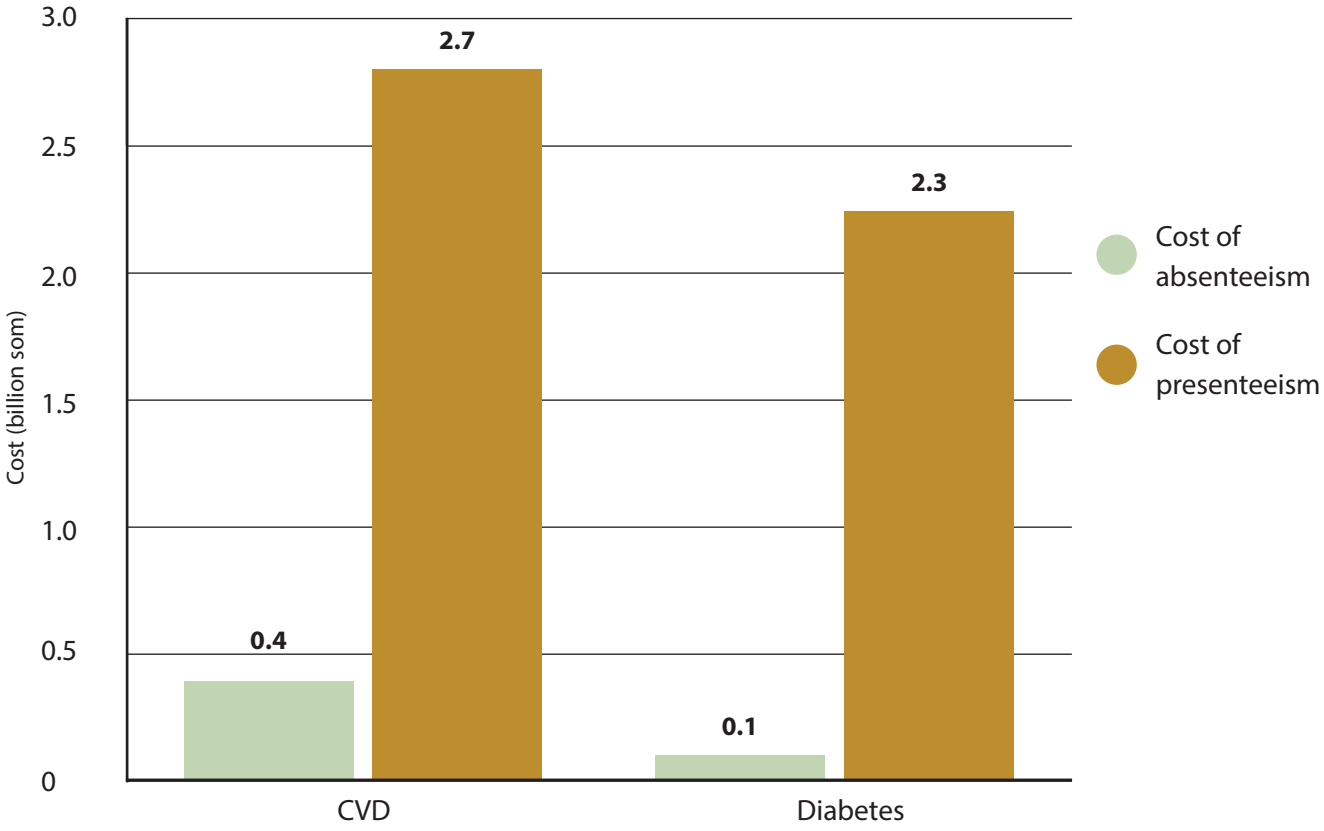


4.1.2 Indirect costs

Indirect economic losses due to NCDs in Kyrgyzstan were calculated from reduced labour force participation, increased absenteeism and presenteeism and premature death. Indirect costs (losses due to absenteeism, presenteeism and premature deaths) were calculated using the human capital method. Calculation of absenteeism and presenteeism was based on the human capital approach and the proportion of the workforce living with NCDs. Fig. 3 shows the results for 2021. These figures could only be calculated only for CVD and diabetes, because no relevant studies on chronic respiratory diseases and cancer were found in the literature search.

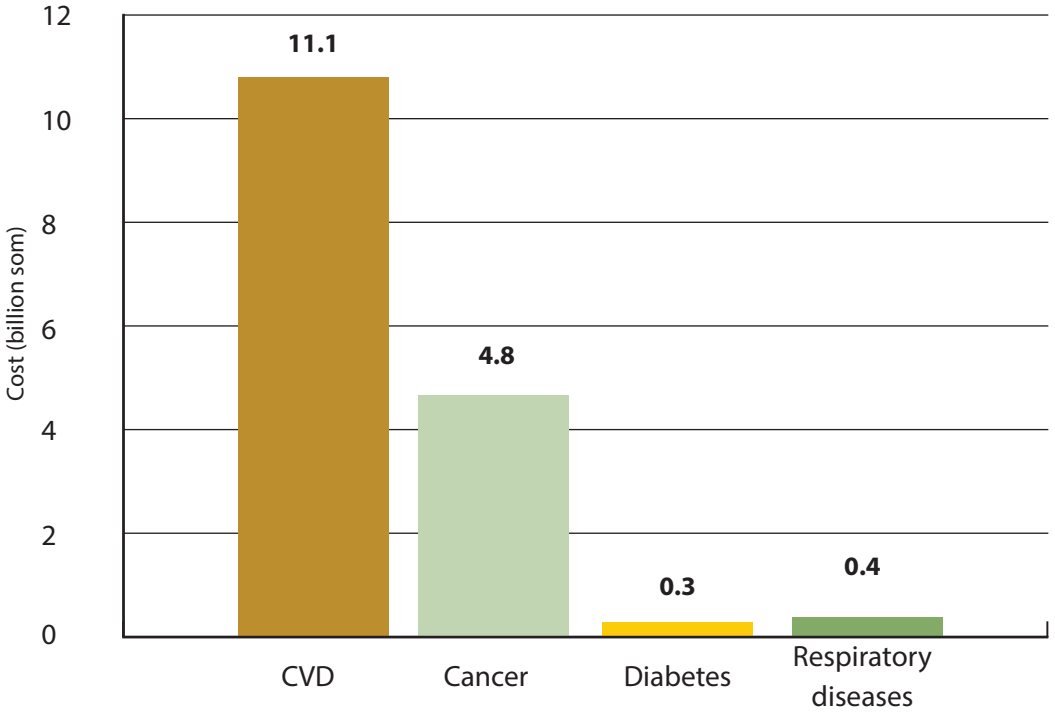
Productivity losses due to absenteeism per year were estimated to be equivalent to a productivity loss equivalent to 1357 workers from CVD and 236 workers from diabetes, which resulted in a total cost of absenteeism of 435.5 million som for Kyrgyzstan. For presenteeism, the corresponding calculation indicated that the productivity loss was the equivalent of 9177 fully productive workers from CVDs and 7917 fully productive workers from diabetes, resulting in an overall burden of presenteeism of 5.0 billion som.

Fig. 3. Costs of absenteeism and presenteeism for CVD and diabetes (billion som), 2021



Losses due to premature death were also estimated using the human capital approach. These were shown to be equivalent to the total equivalent output generated by workers during their lives until they reached retirement age. The costs of premature death were calculated by determining the proportion of years of life lost within the working population (labour force participation rate multiplied by age-specific employment rate) due to the four main NCDs in 2021 and multiplying this figure by GDP per working person. The total cost of premature death was estimated to be 16.6 billion som (Fig. 4).

Fig. 4. Costs of premature death due to four NCDs (billion som), 2021



CVD and cancer are the costliest of the four NCDs in terms of premature death, while the economic burden of mortality associated with diabetes and respiratory diseases is limited.

4.1.3 Total economic costs

Table 5 summarizes the total direct and indirect costs of NCDs in Kyrgyzstan. Indirect economic costs were three times higher than direct costs (health-care expenditure). The estimated direct costs, measured as Government expenditure and disability payments for the four main NCDs, totalled 7.9 billion som, with additional losses to the economy due to absenteeism, presenteeism and premature death amounting to a further 21.9 billion som. This total is likely to be even higher if costs of absenteeism and presenteeism could be estimated for cancer and chronic respiratory diseases.

Table 6. Economic burden of NCDs in Kyrgyzstan (million som), 2021

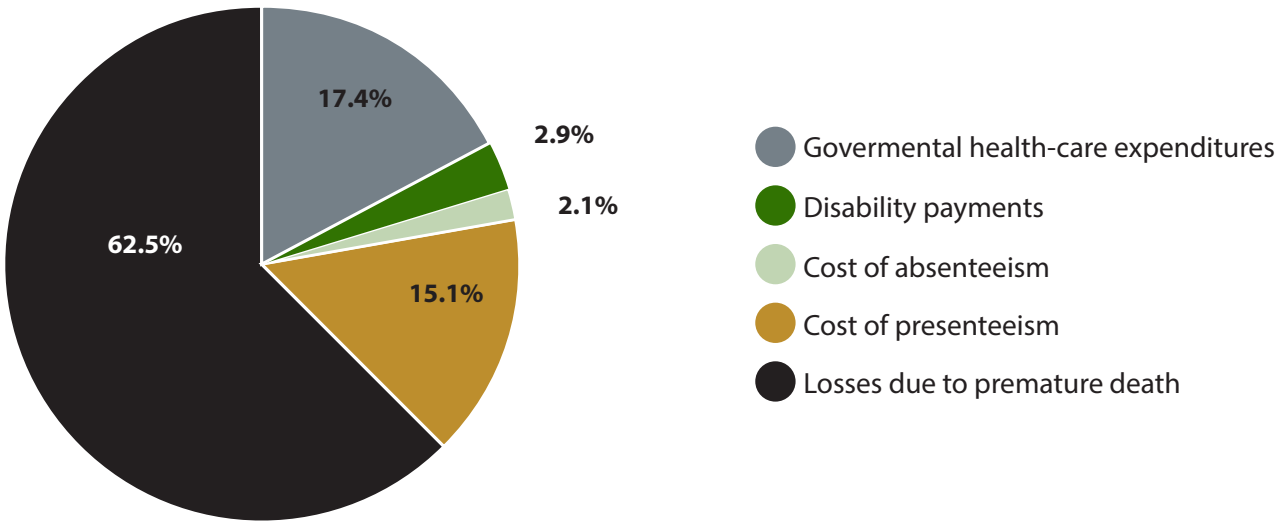
Cost	CVD	Cancer	Endocrine and metabolic diseases (mainly diabetes)	Chronic respiratory diseases	Total
Direct costs					
Government expenditure	3 087.6	1 543.8	921.7	1 336.4	6 889.5
Disability payments	519.2	191.5	209.0	62.1	981.8
Total direct costs	3 606.9	1 735.3	1 130.6	1 398.5	7 871.3
Indirect costs					
Absenteeism	366.7	NA	68.8	NA	435.5
Presenteeism	2 675.3	NA	2 307.7	NA	4 983.0
Premature deaths	11 065.6	4 789.6	306.8	352.9	16 514.9
Total indirect costs	14 107.6	4 789.6	2 683.3	352.9	21 933.4
Total cost	17 714.5	6 525.0	3 814.0	1 751.3	29 804.7

NA: not available.

The total burden of NCDs on the economy of Kyrgyzstan was, therefore, estimated at 29.8 billion som, equivalent to 4% of 2021 GDP.

Fig. 5 shows the structure of the economic burden of NCDs in Kyrgyzstan in 2021. The direct costs of NCDs (Government health-care expenditure) represented only 17.4% of all NCD-related costs so is just the tip of the iceberg in terms of the total economic burden.

Fig. 5. Structure of the economic burden of NCDs in Kyrgyzstan, 2021



4.2 Cost of interventions

The cost of interventions was estimated for the period 2023–2037. Table 6 shows the costs for each of the first 5 years of this period and the 5- and 15-year totals. Clinical interventions for CVD represent the largest estimated costs. Treating people with CVD and diabetes is estimated to increase to an annual cost of 1744.5 million som in 2027. Implementation of the entire proposed CVD and diabetes clinical intervention package would cost 6744.9 million som for the 5-year scale-up and 37 561.7 million som for the full 15-year span.

The total cost of the tobacco package (based on MPOWER guidelines) is estimated to be 114.1 million som for 5 years and 355.5 million som for 15 years, although the costs of implementing the individual interventions in the package vary. Certain policies, such as mass-media campaigns and protecting people from smoking, have large anticipated costs. Numerous low-cost tobacco policies are also viable options including package warning labels, bans on tobacco advertising and raising taxes. The alcohol control part of the package would cost an estimated 182.6 million som for 5 years, the salt reduction package 80.3 million som and physical activity awareness interventions 108.2 million som. Annex 1 lists the policy-based and clinical interventions included in the analysis.

Table 7. Estimated costs of policy and clinical interventions (million som), 2023–2037

Intervention package	2023	2024	2025	2026	2027	Total for 5 years	Total for 15 years
Tobacco control	23.8	25.4	20.3	23.5	21.1	114.1	355.5
Alcohol control	35.9	36.6	34.1	38.3	37.7	182.6	794.1
Physical activity awareness package	21.6	21.6	21.6	21.6	21.6	108.2	324.5
Salt reduction package	14.0	17.7	16.1	16.2	16.3	80.3	284.5
All policy interventions, total	95.3	101.3	92.1	99.7	96.8	485.1	1 758.6
CVD and diabetes clinical intervention package	969.4	1 151.2	1 341.1	1 538.7	1 744.5	6 744.9	37 561.7
Total	1 064.7	1 252.5	1 433.2	1 638.4	1 841.3	7 230.1	39 320.4

4.3 Health benefits and lives saved

These interventions combined would significantly reduce the number of lives lost to CVD-related causes (Table 8). Salt reduction interventions would have the greatest impact in terms of mortality (35 166 lives saved), followed by tobacco interventions (19 708) and alcohol interventions (19 231).

Table 8. Estimated health benefits over 15 years from CVD-related interventions

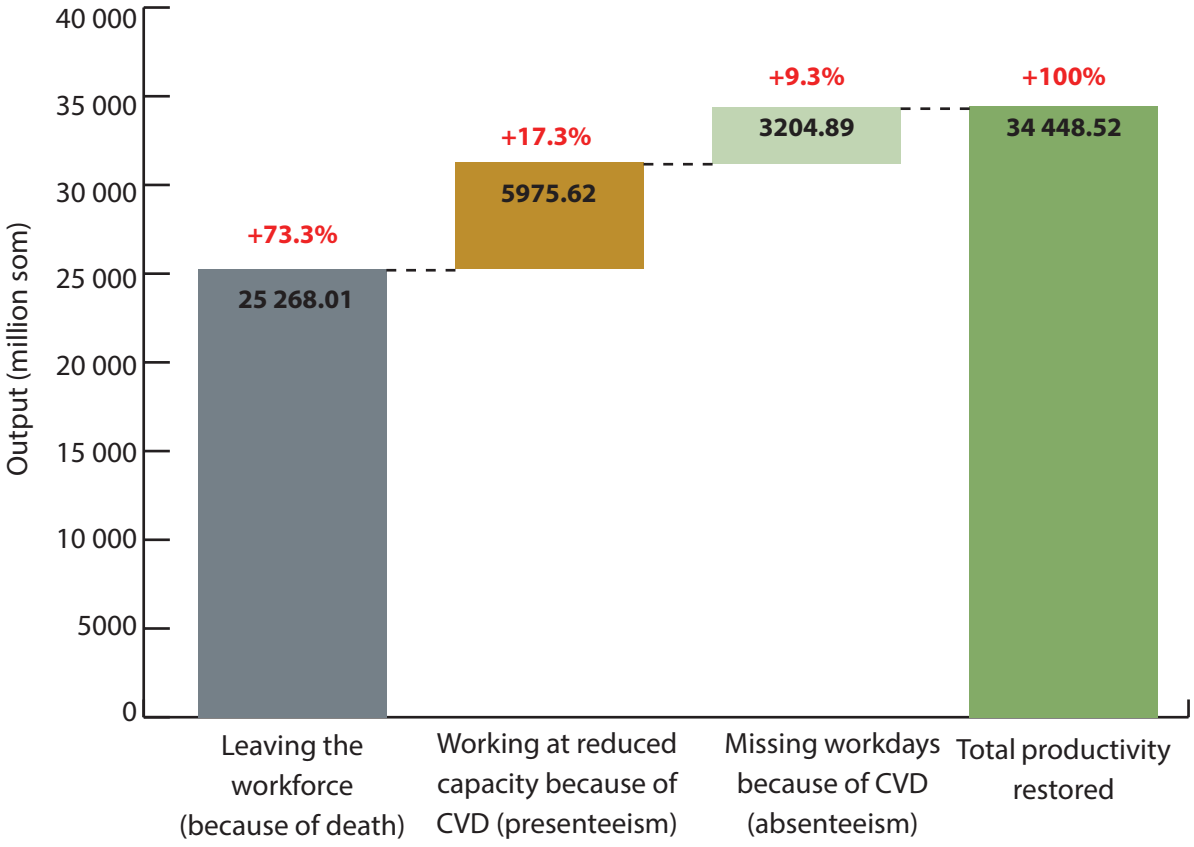
Intervention package	Strokes averted	Acute ischaemic heart disease averted	Mortality averted	Healthy life-years gained
CVD and diabetes clinical intervention package	29 782	21 323	35 166	268 002
Tobacco control	856	1 088	7 752	26 991
Alcohol control	3 576	4 527	19 708	147 061
Physical activity awareness package	2 393	3 173	19 231	134 800
Salt reduction package	717	952	5 484	40 424

Each set of interventions would also add healthy life-years. The salt, alcohol, tobacco, physical activity and clinical intervention packages prevent strokes and cardiovascular events and, therefore, individuals could avoid disabling states (such as partial paralysis from stroke) that can increase pain and suffering, reduce mobility and impair speech and thought. The largest gains in healthy life-years are, it follows, achieved by salt reduction interventions (268 002 healthy life-years gained), tobacco interventions (147 061 healthy life-years gained) and the alcohol interventions (134 800 healthy life-years gained).

4.4 Economic benefits and costs averted

The NCDs analysed in this model all reduce the labour workforce and decrease productivity through premature mortality, absenteeism and presenteeism. Fig. 6 demonstrates the labour productivity gains that would result from prevented deaths and disease cases over 15 years, based on the data listed in Table 7.

Fig. 6. Recovered economic output expected from interventions to prevent tobacco and alcohol use, inadequate physical activity, excess salt and primary prevention of CVDs over 15 years



The greatest positive impact on productivity is seen from reduced mortality (73.3% of total productivity gains), followed by reduced presenteeism (17.3%) and absenteeism (9.3%).

4.5 Return on investment

Comparison of the costs and benefits of each package of interventions shows that all of the preventive interventions at population level for risk behaviour included in the analysis – salt reduction, tobacco avoidance, increasing physical activity and CVD and diabetes clinical interventions – have benefits that exceed their cost of implementation over 15 years (Table 9).

Table 9. Costs, benefits and cost–benefit ratios at 5 and 15 years, by intervention package (million som)

Intervention package	5 years			15 years		
	Total cost	Total productivity benefits	Return on investment	Total cost	Total productivity benefits	Return on investment
Tobacco control	114.1	826.8	7.54	355.5	8 162.9	36.60
Alcohol control	182.6	815.4	4.64	794.1	7 037.1	16.25
Physical activity awareness package	108.2	236.7	2.28	324.5	2 028.3	11.05
Salt reduction package	80.3	1 295.3	16.92	284.5	14 685.2	82.12
CVD and diabetes clinical intervention package	6 744.9	305.2	0.05	37 561.7	2 535.0	0.06

The salt reduction package has the highest cost–benefit ratio of any intervention: for 1 som invested in the package the expected return is 17 som for the first 5 years and 82 som for 15 years. Tobacco interventions also had a high return on investment over 15 years, with returns of 37 som. Physical activity interventions provide the lowest return on investment, with 2 som for 5 years and 11 som for 15 years.

The package of clinical interventions, although important in fulfilling the right to health, provides a return on investment of less than 1 som per som invested for the first 5 years. This is a frequent metric in health economics due to the high cost of medical treatment. Additionally, options such as treatment, secondary prevention after acute events and others have little potential to increase labour force participation after a stroke, a myocardial infarction or diabetes. Lack of return on investment does not, however, mean the absence of cost–effectiveness: these interventions may still be cost–effective in other types of economic analysis. The policy packages for salt reduction, alcohol and tobacco control and promotion of physical activity clearly stand out as the best buys, offering the highest return on investment over 15 years.

5

Conclusions and recommendations

5. Conclusions and recommendations

The results of this investment case confirm the large economic impact of NCDs in Kyrgyzstan. In addition, they show that investment in a selected number of evidence-informed interventions can significantly improve people's life expectancy, health and well-being and decreasing national economic losses. Table 10 summarizes the main findings, and Box 1 outlines the strengths, weaknesses, opportunities and threats that have been identified.

Table 10. Summary of main findings

Every year, NCDs are responsible for…	Over 15 years, adopting new interventions and intensifying existing ones would…
More than 28 000 deaths (83% of all deaths)	Save 87 341 lives and gain 617 278 years of healthy life
7.9 billion som in health-care expenditure	Reduce health-care spending as a result of averting 37 324 strokes and 31 063 acute ischemic heart disease events
21.9 billion som in economic productivity losses	Prevent 34.4 billion som in economic losses (productivity gains)
Overall economic costs equivalent to 4.8% of GDP (29.8 billion som)	**Generate economic benefits of 34.4 billion som, which heavily outweighs the costs (1.8 billion som)** of intensifying interventions that reduce NCD risk factors and achieves a return-on-investment ratio that exceeds 10

Box 1. Strengths, weaknesses, opportunities and threats analysis findings

Strengths	Weaknesses
• Existence of strong legislations and policies supporting NCD prevention and control • High level leadership and commitment and implementation of WHO PEN guidelines • Village health committees • Track record of achieving Millennium Development Goal targets	• Inadequate financing, leading to service provision gaps and high OOP spending for families • Health workforce shortages • Unequal access and availability of high-quality care • Limited nationally representative data registries, last available STEPS data is 2013 and may not reflect current burden
Opportunities	**Threats**
• Better interministerial and intersectoral coordination, which would address shared concerns across NCD, injuries and mental health initiatives • Enforcement of existing laws and policies • 2022 restructuring of Cabinet of Ministers and the Presidential Office • Digital era and transformation, which can help to address data gaps	• High OOP costs putting patients at risk of catastrophic spending • Post COVID-19 economic shifts and uncertainties

5.1 Recommendations for consideration

The following actionable steps can be taken to further strengthen a multisectoral, whole-of-government, whole-of-society response to NCDs and their consequences:

RAISE TAXES ON ALCOHOL AND TOBACCO AND ENFORCE THE 2021 TOBACCO LAW.

Increasing taxes on alcohol, a recommendation that is also included in the mental health conditions investment case report,[2] would reduce affordability, decrease alcohol consumption and increase revenue. Taxation baseline and 15-year targets by the country team are provided in Annex 1. The revenue gained from alcohol and tobacco taxation should be put towards interventions to prevent and control NCDs, including better remuneration and training of health-care workforce and stronger protections again catastrophic spending. Severe financing shortfall has been identified as a key barrier to strengthening Kyrgyzstan's mental health system. Enforcement of the commendable 2021 Law on protecting citizens from the consequences of tobacco consumption, nicotine and exposure to second hand tobacco smoke and aerosols requires amendments to the Code of Kyrgyzstan on Violations in order to establish appropriate sanctions.

INTENSIFY SALT REDUCTION INTERVENTIONS.

This intervention package has been identified to have particularly high returns on investment. Expanded educational campaigns can be implemented in partnership with civil society, media and other stakeholders. For alcohol, tobacco and salt reduction regulation initiatives, there may be a need to manage interference and foster private–public sector dialogue and partnership with industry actors, whose commercial interests/incentives may lean towards poorer health in the long term.

STRENGTHEN INTERSECTORAL COORDINATION AND ACCOUNTABILITY, INCLUDING ACROSS NCD, MENTAL HEALTH AND INJURIES PROGRAMMES.

Targeted efforts to improve interministerial and intersectoral coordination can more efficiently and synergistically address shared concerns and risk factors across NCD, injuries and mental health programmes. Engagement of civil society actors such as patient organizations or advocacy groups alongside professional societies, nongovernmental and private sector actors can be increased in order to heighten support for public–private partnership projects in the health-care sector.

2 Ministry of Health of Kyrgyzstan, WHO Regional Office for Europe, United Nations Development Programme. Prevention and control of mental health conditions in Kyrgyzstan: the case for investment; in production.

ENHANCE QUALITY AND EQUITABLE DISTRIBUTION OF NCD SERVICES.

Strengthen services to achieve early diagnosis and improve total cardiovascular risk management in PHC. Continue to leverage existing village health committee and generalist personnel while strengthening referral systems so that patients from rural areas requiring complex care needs can receive the care they need. Utilize salary incentives and other approaches to improve distribution of health-care professionals in rural areas of Kyrgyzstan and facilitate health-care professional retention.

INCREASE CAPACITY FOR NCD MONITORING AND EVALUATION.

Strengthen key registries such as those on cancers, stroke, heart attacks and diabetes with respect to case identification, data completeness and representativeness at national level. Emerging digital and mobile health technologies, as well as interoperability standards, may accelerate these efforts. A practical and integrated number of indicators using data from surveys, registries, medical records and directly reported by patients can generate insights useful to monitor disease burden and the impact of health system interventions on patient lives; help to identify and share best practices and to monitor and improve performance; and benchmark against international standards.

References[1]

1. Bennett JE, Stevens GA, Mathers CD, Bonita R, Rehm J, Kruk ME et al. NCD countdown 2030: worldwide trends in non-communicable disease mortality and progress towards Sustainable Development Goal target 3.4. Lancet. 2018;392(10152):1072–88 (https://doi.org/10.1016/S0140-6736(18)31992-5).
2. Benziger CP, Roth GA, Moran AE. The Global Burden of Disease Study and the preventable burden of NCD. Glob Heart. 2016;11(4):393–7 (https://doi.org/10.1016/j.gheart.2016.10.024).
3. Bertram M, Banatvala N, Kulikov A, Belausteguigoitia I, Sandoval R, Hennis A et al. Using economic evidence to support policy decisions to fund interventions for non-communicable diseases. BMJ. 2019;365:1648 (https://doi.org/10.1136/bmj.l1648).
4. Tackling NCDs: best buys and other recommended interventions for the prevention and control of noncommunicable diseases, 2nd edition. Geneva: World Health Organization; 2024 (https://iris.who.int/handle/10665/376624). Licence: CC BY-NC-SA 3.0 IGO.
5. Kien VD, Van Minh H, Giang KB, Dao A, Tuan LT, Ng N. Socioeconomic inequalities in catastrophic health expenditure and impoverishment associated with non-communicable diseases in urban Hanoi, Vietnam. Int J Equity Health. 2016;15(1):169 (https://doi.org/10.1186%2Fs12939-016-0460-3).
6. Gutierrez JP, Bertozzi SM. Non-communicable diseases and inequalities increase risk of death among COVID-19 patients in Mexico. PLOS One. 2020;15(10):e0240394 (https://doi.org/10.1371/journal.pone.0240394).
7. Global action plan for the prevention and control of noncommunicable diseases 2013-2020. Geneva: World Health Organization; 2013 (https://iris.who.int/handle/10665/94384).
8. Implementation tools: package of essential noncommunicable (PEN) disease interventions for primary health care in low-resource settings. Geneva: World Health Organization; 2013 (https://iris.who.int/handle/10665/133525).
9. WHO HEARTS: technical package for cardiovascular disease management in primary health care. Geneva: World Health Organization; 2016 (https://iris.who.int/handle/10665/252661).
10. Non-communicable disease prevention and control: a guidance note for investment cases. New York: United Nations Development Programme; 2019 (https://www.undp.org/publications/non-communicable-disease-prevention-and-control-guidance-note-investment-cases).
11. Prevention and control of noncommunicable diseases in Kyrgyzstan: the case for investment. Copenhagen: WHO Regional Office for Europe; 2017 (https://iris.who.int/handle/10665/351407).
12. Statistics of the Kyrgyz Republic. Bishkek: National Statistical Committee of the Kyrgyz Republic; 2024 (http://stat.kg/en/).
13. SDG voluntary national review on the implementation of the Sustainable Development Goals in the Kyrgyz Republic 2020. New York: United Nations; 2020 (https://kyrgyzstan.un.org/en/53961-voluntary-national-review-implementation-sustainable-development-goals-kyrgyz-republic-2020).

1 All references were accessed on 22 May 2024.

14. The Global action plan in Kyrgyzstan: coming together for healthy lives and well-being. Copenhagen: WHO Regional Office for Europe; 2020 (https://www.who.int/europe/publications/m/item/the-global-action-plan-in-kyrgyzstan-coming-together-for-healthy-lives-and-well-being).
15. Kyrgyzstan health system review. Health Systems in Transition, 24(3). Copenhagen: WHO Regional Office for Europe; 2022 (https://iris.who.int/handle/10665/363175).
16. World Bank open data country profiles [online database]. Washington (DC): World Bank; 2024 (https:/data.worldbank.org/). Licence: CC-BY 4.0.
17. Global health expenditure database [online database]. Geneva: World Health Organization; 2024 (https://apps.who.int/nha/database). Licence: CC BY-NC-SA 3.0 IGO.
18. Aliev AA, Roberts T, Magzumova S, Panteleeva L, Yeshimbetova S, Krupchanka D et al. Widespread collapse, glimpses of revival: a scoping review of mental health policy and service development in central Asia. Soc Psychiatry Psychiatr Epidemiol. 2021;56(8):1329–40 (https://doi.org/10.1007/s00127-021-02064-2).
19. Molchanova E, Kirn E, Galako T. Psychiatry in the Kyrgyz Republic: in between the Soviet past and a vague future. In: Bhugra D, Tse S, Ng R, Takei N, editors. Routledge Handbook of Psychiatry in Asia. New York: Routledge; 2016:11–17 (https://www.routledge.com/Routledge-Handbook-of-Psychiatry-in-Asia/Bhugra-Tse-Ng-Takei/p/book/9780367581732).
20. Noncommunicable diseases progress monitor 2022. Geneva: World Health Organization; 2022 (https://iris.who.int/handle/10665/353048). Licence: CC BY-NC-SA 3.0 IGO.
21. Global burden of disease study 2021: results. Seattle (WA): Institute for Health Metrics and Evaluation; 2021 (https://vizhub.healthdata.org/gbd-results/).
22. Tabta AA, Makhmutkhodzhaev SA, Kydyralieva RB, Altymysheva AT, Dzhakipova RS, Zhorupbekova KS et al. [Prevalence of risk factors of non-communicable disease in Kyrgyzstan: assessment using WHO STEPS approach]. Kardiologiia. 2016;56(11):86–90 (https://doi.org/10.18565/cardio.2016.11.86-90) (in Russian).
23. Global youth tobacco survey 2019. Bishkek: Ministry of Health of the Kyrgyz Republic; 2019 (https://extranet.who.int/ncdsmicrodata/index.php/catalog/885).
24. Pengpid S, Peltzer K, Mirrakhimov EM. Prevalence of health risk behaviors and their associated factors among university students in Kyrgyzstan. Int J Adolesc Med Health. 2014;26(2):175–85 (https://doi.org/10.1515/ijamh-2013-0516).
25. Brimkulov N, Vinnikov D, Dzhilkiadarova Z, Aralbaeva A. Tobacco use among Kyrgyzstan medical students: an 11-year follow-up cross-sectional study. BMC Public Health. 2017;17(1):625 (https://doi.org/10.1186/s12889-017-4547-6).
26. National Centre of Cardiology and Internal Medicine, Kyrgyz State Medical Institute of Retraining and Professional Development, Ministry of Health. STEPS 2013. Geneva: WHO NCD Microdata Repository; 2013 (https://extranet.who.int/ncdsmicrodata/index.php/catalog/271).
27. Powles J, Fahimi S, Micha R, Khatibzadeh S, Shi P, Ezzati M et al. Global, regional and national sodium intakes in 1990 and 2010: a systematic analysis of 24 h urinary sodium excretion and dietary surveys worldwide. BMJ Open. 2013;3(12):e003733 (https://doi.org/10.1136/bmjopen-2013-003733).

28. De Morais IL, Lunet N, Albuquerque G, Gelormini M, Casal S, Damasceno A et al. The sodium and potassium content of the most commonly available street foods in Tajikistan and Kyrgyzstan in the context of the FEEDCities Project. Nutrients. 2018;10(1):98 (https://doi.org/10.3390/nu10010098).
29. Albuquerque G, Lança de Morais I, Gelormini M, Sousa S, Casal S et al. Macronutrient composition of street food in central Asia: Bishkek, Kyrgyzstan. Food Sci Nutr. 2020;8(10):5309–20 (https://doi.org/10.1002/fsn3.1753).
30. Murphy A, Jakab M, McKee M, Richardson E. Persistent low adherence to hypertension treatment in Kyrgyzstan: how can we understand the role of drug affordability? Health Policy Plan. 2016;31(10):1384–90 (https://doi.org/10.1093/heapol/czw080).
31. Geldsetzer P, Manne-Goehler J, Marcus ME, Ebert C, Zhumadilov Z, Wesseh CS et al. The state of hypertension care in 44 low-income and middle-income countries: a cross-sectional study of nationally representative individual-level data from 1.1 million adults. Lancet. 2019;394(10199):652–62 (https://doi.org/10.1016/S0140-6736(19)30955-9).
32. Medicine: prices, availability, affordability in Kyrgyz Republic. Bishkek: Medicines Transparency Alliance; 2015 (https://www.google.com/l?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwio9oCDoOOBAxWDiFwKHVvwBdsQFnoECA0QAw&url=https%3A%2F%2Fhaiweb.org%2Fwp-content%2Fuploads%2F2016%2F10%2FKyrgyzstan-Report-Pricing-Surveys-2015.pdf&usg=AOvVaw2zmX1KM3Gseb4d4QFSddOS&opi=89978449).
33. Kyrgyzstan: new, comprehensive tobacco control act adopted. Geneva: WHO Framework Convention on Tobacco Control; 2021 (https://portal-uat.who.int/fctcapps/fctcapps/fctc/implementation-database/news/kyrgyzstan-new-comprehensive-tobacco-control-act-adopted).
34. Mantingh F, Stachenko S, Popovich M, Moldokulov O, Loyola E, Kontsevaya A et al. Progress report on the implementation of Kyrgyzstan's programme and action plan on prevention and control of noncommunicable diseases, 2013–2020. Copenhagen: WHO Regional Office for Europe; 2017 (https://iris.who.int/handle/10665/375260).
35. Healthy Eating Month starts in schools of Kyrgyzstan. Bishkek: United Nations in Kyrgyz Republic; 15 March 2021 (https://kyrgyzstan.un.org/en/116317-healthy-eating-month-starts-schools-kyrgyzstan).
36. Muratalieva E, Ablezova M, Djamangulova T, Hoffarth T, Kissimova-Skarbek K, Graeser S et al. Addressing non-communicable diseases in primary healthcare in Kyrgyzstan: a study on population' knowledge and behavioral changes. Int J Public Health. 2023;68:1605381 (https://doi.org/10.3389/ijph.2023.1605381).
37. Kruk ME, Gage AD, Joseph NT, Danaei G, García-Saisó S, Salomon JA. Mortality due to low-quality health systems in the universal health coverage era: a systematic analysis of amenable deaths in 137 countries. Lancet. 2018;392(10160):2203–12 (https://doi.org/10.1016/S0140-6736(18)31668-4).
38. Jakab Z, Marmot M. Social determinants of health in Europe. Lancet. 2012;379(9811):103–5 (https://doi.org/10.1016/S0140-6736(11)61511-0).
39. Jakab M, Akkazieva B, Babicht J. Can people afford to pay for health care? New evidence on financial protection in Kyrgyzstan. Copenhagen: WHO Regional Office for Europe; 2018 (https://iris.who.int/handle/10665/329444).

40. Iamshchikova M, Mogilevskii R, Onah MN. Trends in out of pocket payments and catastrophic health expenditure in the Kyrgyz Republic post "Manas Taalimi" and "Den Sooluk" health reforms, 2012–2018. Int J Equity Health. 2021;20(1):1–17 (https://doi.org/10.1186/s12939-020-01358-2).

41. Data shapes people's views on cancer in Kyrgyzstan [website]. In: Home/News. Copenhagen: WHO Regional Office for Europe; 15 February 2023 (https://www.who.int/europe/news/item/15-02-2023-data-shapes-people-s-views-on-cancer-in-kyrgyzstan).

42. Kyrgyz Republic demographic and health survey 2012. Bishkek: National Statistical Committee of the Kyrgyz Republic, Ministry of Health of the Kyrgyz Republic, ICF International; 2013 (https://dhsprogram.com/publications/publication-fr283-dhs-final-reports.cfm).

43. Surveillance of noncommunicable diseases: Kyrgyzstan [website]. Geneva: World Health Organization; 2024 (https://www.who.int/teams/noncommunicable-diseases/surveillance/data/kyrgyzstan).

44. Childhood obesity surveillance initiative (COSI): Kyrgyzstan: fourth round of data collection (2017/2018). Copenhagen: WHO Regional Office for Europe; 2022 (https://iris.who.int/handle/10665/356346). Licence: CC BY-NC-SA 3.0 IGO.

45. Kyrgyzstan annually loses 17 billion soms due to non-communicable diseases. 24.KG News Agency. 19 April 2023 (https://24.kg/english/263666_Kyrgyzstan_annually_loses_17_billion_soms_due_to_non-communicable_diseases/).

46. OneHealth Tool. Glastonbury (CT): Avenir Health; 2017 (https://www.avenirhealth.org/software-onehealth.php).

47. Anesetti-Rothermel A, Sambamoorthi U. Physical and mental illness burden: disability days among working adults. Popul Health Manag. 2011;14:223–30 (https://doi.org/10.1089/pop.2010.0049).

48. 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;45:1303–11 (https://doi.org/10.1097/01.jom.0000100200.90573.df).

49. Scaling up action against noncommunicable diseases: how much will it cost? Geneva: World Health Organization; 2011 (https://iris.who.int/handle/10665/44706).

50. Bertram MY, Stenberg K, Brindley C, Li J, Serje J, Watts R, Edejer TT. Disease control programme support costs: an update of WHO-CHOICE methodology, price databases and quantity assumptions. Cost Eff Resour Alloc. 2017;15:21 (https://doi.org/10.1186/s12962-017-0083-6).

51. Stenberg K. Econometric estimation of WHO-CHOICE country-specific costs for inpatient and outpatient health service delivery. Cost Eff Resour Alloc. 2018;16:11 (https://doi.org/10.1186/s12962-018-0095-x).

Annex 1. NCD interventions costed within the OneHealth Tool, at baseline and 15-year time points

NCD interventions	Coverage, %	
	Baseline 2023	Target 2037
CVD and diabetes		
Screening for risk of CVD/diabetes	27	50
Follow-up care for those at low risk of CVD/diabetes (absolute risk: 10–20%)	14	30
Treatment for those with very high cholesterol but low absolute risk of CVD/diabetes (< 20%)	56	65
Treatment for those with high blood pressure but low absolute risk of CVD/diabetes (< 20%)	42	60
Treatment for those with absolute risk of CVD/diabetes 20–30%	61	75
Treatment for those with high absolute risk of CVD/diabetes (> 30%)	59	75
Treatment of new cases of acute myocardial infarction with aspirin	34	65
Treatment of cases with established ischaemic heart disease and post myocardial infarction	52	70
Treatment for those with established cerebrovascular disease and post stroke	40	70
Treatment of cases with rheumatic heart disease (with benzathine penicillin)	10	20
Standard glycaemic control	1	75
Intensive glycaemic control	12	20
Retinopathy screening and photocoagulation	24	50
Neuropathy screening and preventive foot care	20	40
Policy interventions: population level		
Tobacco		
Tobacco: monitor tobacco use/prevention policies	24	100
Tobacco: protect people from tobacco smoke	50	100
Tobacco: offer to help quit tobacco use: cessation	20	100
Tobacco: warn about danger: warning labels	100	100
Tobacco: warn about danger: mass media campaign	20	100
Tobacco: enforce bans on tobacco advertising	35	100
Tobacco: enforce young people access restriction	50	100
Tobacco: raise taxes on tobacco	14	100
Tobacco: plain packaging of tobacco products	0	100
Offer to help quit tobacco use: brief intervention	25	80
Hazardous alcohol use		
Hazardous alcohol use: enforce restrictions on availability of retailed alcohol	20	100
Hazardous alcohol use: enforce restrictions on alcohol advertising	50	100
Hazardous alcohol use: enforce drunk driving laws (sobriety checkpoints)	50	100
Hazardous alcohol use: raise taxes on alcoholic beverages	0	100
Screening and brief intervention for hazardous and harmful alcohol use	1	60

Annex 1. contd

Physical inactivity		
Physical inactivity: awareness campaigns to encourage increased physical activity	20	100
Physical inactivity: brief advice as part of routine care	30	80
Sodium		
Sodium: surveillance	0	100
Sodium: harness industry for reformulation	0	100
Sodium: adopt standards: front-of-pack labelling	0	100
Sodium: adopt standards: strategies to combat misleading marketing	0	100
Sodium: knowledge: education and communication	5	100
Sodium: environment: salt reduction strategies in community-based eating spaces	0	100