



# Prevention and control of noncommunicable diseases in Kyrgyzstan

## The case for investment





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Prepared for the Ministry of Health of Kyrgyzstan  
by  
WHO Regional Office for Europe  
United Nations Development Programme

# Abstract

Noncommunicable diseases (NCDs) such as cancer, cardiovascular diseases, diabetes and chronic respiratory diseases and their risk factors are an increasing public health and development challenge in Kyrgyzstan. This report provides evidence through three analyses that NCDs reduce economic output and discusses potential options in response, outlining details of their relative returns on investment. An economic burden analysis shows that economic losses from NCDs are equivalent to 3.9% of gross domestic product. An intervention costing analysis provides an estimate of the funding required to implement a set of policy interventions for prevention and clinical interventions. A cost–benefit analysis compares these implementation costs with the estimated health gains and identifies which policy packages would give the greatest returns on investment.

## Keywords

CHRONIC DISEASE – ECONOMICS

CHRONIC DISEASE – PREVENTION AND CONTROL

COST–BENEFIT ANALYSIS

KYRGYZSTAN

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## Acknowledgements

The authors would like to express their sincere gratitude to the Ministry of Health of Kyrgyzstan, the national team who supported the data collection and analysis, and those stakeholders who took the time to be interviewed and share their views during the visit.

Economic analysis was carried out by Anna Kontsevaya, WHO Consultant and member of the WHO Collaborating Centre on Development and Implementation of Noncommunicable Disease Prevention Policy and Programmes, Moscow, Russian Federation. This report was written by her and Jill Farrington, WHO Regional Office for Europe, with contributions from Alexey Kulikov, United Nations Interagency Task Force on the Prevention and Control of Noncommunicable Diseases; Oxana Rotar, WHO Consultant and member of Federal Almazov North-West Medical Research Centre, St Petersburg, Russian Federation; and Douglas Webb, United Nations Development Programme.

Comments received from peer reviewer Dan Chisholm, WHO Regional Office for Europe, and Roy Small, consultant, are much appreciated. The paper also benefited from the advice of Melanie Bertram, WHO headquarters, and Dudley Tarlton, United Nations Development Programme, as well as insights from the approach taken for the noncommunicable disease investment cases for Viet Nam and Mongolia.

The contributions of Oskonbek Moldokulov of the WHO Country Office in Kyrgyzstan and Roza Djakypova on behalf of the Ministry of Health to organizing the WHO visit and providing national materials to inform this report are also gratefully acknowledged.

Thanks are also extended to Lydia Wanstall for language editing, Victoria Frantseva for translation of the Russian language version and Lars Møller for layout and typesetting the report.

The assessment was conducted under the overall guidance of Dr Jarno Habicht, WHO Representative and Head of the WHO Country Office in Kyrgyzstan, Dr Gauden Galea, Director of the Division of Noncommunicable Diseases and Promoting Health through the Life-course in the WHO Regional Office for Europe, and Dr Nick Banatvala of the United Nations Interagency Task Force on the Prevention and Control of Noncommunicable Diseases.

Preparation of this report was coordinated by the WHO Regional Office for Europe and WHO Country Office in Kyrgyzstan through the biennial collaborative agreement covering 2016/2017 between the Ministry of Health of Kyrgyzstan and WHO. This publication was made possible by funding from the Government of the Russian Federation.

## Abbreviations

AMI	acute myocardial infarction
CHOICE	Choosing Interventions that are Cost-Effective [WHO methodology]
CIS	Commonwealth of Independent States
CVD	cardiovascular disease
FCTC	Framework Convention on Tobacco Control [of WHO]
GDP	gross domestic product
IHD	ischaemic heart disease
MPOWER	monitor tobacco use and prevention policies; protect people from tobacco smoke; offer help to quit tobacco use; warn people about the dangers of tobacco; enforce bans on tobacco advertising, promotion and sponsorship; raise taxes on tobacco [WHO package]
NCD	noncommunicable disease
PEN	package of essential noncommunicable disease interventions
ROI	return on investment
SHAKE	surveillance; harness industry; adopt standards for labelling and marketing; knowledge; environment [WHO package]
STEPS	WHO STEPwise approach to surveillance [survey]
UNDP	United Nations Development Programme
UNIATF	United Nations Interagency Task Force on the Prevention and Control of Noncommunicable Diseases

## Executive summary

A key recommendation of the United Nations Interagency Task Force on the Prevention and Control of Noncommunicable Diseases visit to Kyrgyzstan in March 2016 was to investigate the economic case for investing in noncommunicable diseases (NCDs). A joint United Nations follow-up visit to Kyrgyzstan was therefore undertaken in August 2016, with a further follow-up in October 2016. This report outlines the results of that economic analysis.

NCDs such as cancer, cardiovascular disease (CVD), diabetes and chronic respiratory disease and their risk factors (tobacco use, harmful use of alcohol, unhealthy diet and physical inactivity) are an increasing public health and development challenge in Kyrgyzstan. NCDs are responsible for 80% of all deaths in the country. The probability of premature death (death before the age of 70 years) from one of the four major NCDs for a person living in Kyrgyzstan was one in four in 2015.

CVD causes 50% of all deaths in the country. Although almost half of the adult population (43%) has hypertension, the majority (79%) of these are not taking anti-hypertensive medication. Further, 45% of men smoke tobacco, one in five of the population is obese and Kyrgyzstan is estimated to have one of the highest salt intakes in the world. Strong policy and legislative frameworks for NCDs are in place with the Den Sooluk National Health Reform Programme, the National Programme on NCDs 2013–2020 and the National Public Health Programme 2020. Nevertheless, there are gaps in implementation of the WHO-recommended cost-effective NCD preventive and clinical interventions.

The premature death, morbidity and disability associated with NCDs have a negative impact on socioeconomic development. As in many parts of the world, NCDs in Kyrgyzstan are causing a surge in health care costs and social care and welfare support needs, as well as putting an increasing burden on school and work absenteeism, with resulting reduced productivity and employee turnover. The government was estimated to have spent 3.7 billion som on treatment for the four main NCDs in 2015.

This report provides evidence that NCDs reduce economic output and discusses potential options in response, including assessment of their relative returns on investment. Three analyses – each of which drew on the United Nations Interagency Working Group on Costing’s strategic planning OneHealth Tool – were performed.

- An economic burden analysis showed the scale of disruption of NCDs to the economy through assessment of their direct and indirect costs. Direct costs include government (public) health care costs for treating CVD, diabetes, cancer and respiratory disease. Indirect costs are based on disability payments, costs of absenteeism, costs of presenteeism and economic losses due to premature death among people of working age.
- An intervention costing analysis provided an estimate of the funding required to implement a set of NCD interventions. Costs of policy interventions were assessed on the basis of the planned spending on policy actions in the National NCD Action Plan and other sources (such as data from the Ministry of Health and Ministry of Labour, Migration and Youth); costs for clinical interventions for CVD and diabetes were estimated using the WHO OneHealth Tool on the basis of prices of medications and supplies, as well as medical staff salaries.
- A return on investment analysis compared the estimated implementation costs during the costing analysis with the estimated health gains and economic returns of a set of interventions.

The economic burden analysis found that government expenditure on health care for NCDs is just the tip of the iceberg. The hidden additional costs from lost productivity are almost four times higher, at 14.6 billion som. Altogether, the current economic cost of NCDs to the Kyrgyzstan economy is 17.1 billion som per year, which is equivalent to 3.9% of the country’s annual gross domestic product.



Actions to prevent NCDs in Kyrgyzstan are relatively cheap and cost-effective. Furthermore, as they need to go beyond the health sector to involve other sectors such as finance, the economy and agriculture, the investments are shared across the whole of government. The intervention costing analysis reviewed four packages of interventions for the prevention and control of NCDs in the areas of tobacco control, physical inactivity and unhealthy diet, as well as a package of clinical interventions for CVD and diabetes. Assessment of alcohol-control strategies was omitted at the time for epidemiological and data reasons. Policy packages to reduce the consumption of tobacco and salt and increase physical activity were estimated to cost 0.14 billion som, 0.04 billion som and 0.12 billion som respectively. The analysis also included a breakdown of costs of the individual interventions within the packages. The CVD and diabetes interventions were found to be the most expensive options, costing 175 billion som.

The economic modelling for the return on investment analysis suggests that the most cost-effective intervention in Kyrgyzstan is the package of salt-reduction interventions. Reducing tobacco consumption – for example, through increased taxation – and increasing physical activity in the population would also be very cost-effective. The economic benefits of these packages far exceed their costs, especially in the long term. The salt policy package achieved a benefit-to-cost ratio of 12 when considered across a 15-year time period.

The analysis concluded that raising tobacco and alcohol taxation would provide an important additional revenue stream for the government. A further step would be allocation of appropriate funds to public health programmes for NCD prevention and control activities in Kyrgyzstan. If the equivalent of 10% of tobacco revenues were allocated to implementing the National Programme on NCDs 2013–2020, for example, its budget would increase threefold from the current level of investment (from 100 million to 300 million som per year). Adding the equivalent of 10% of the revenue raised from an increase in alcohol taxation would see a fourfold increase in the budget available for the Programme (from 100 million to 400 million som per year).

The increasing and relatively young population of Kyrgyzstan (currently 6 million and projected to rise to 7–9 million by 2050), as well as the increasing prevalence of NCD risk factors, suggests that unless action is taken rapidly, the costs of NCDs will grow even further, putting a huge drag on the country's economy. Investment in prevention now would have implications for the future workforce.



# 1. Introduction

In 2015, noncommunicable diseases (NCDs) accounted for 80% of all deaths in Kyrgyzstan – this is higher than the proportion of deaths attributable to NCDs at the global level (71%). The latest figures from 2015 show that a Kyrgyz citizen has about a one in four chance (24%) of dying prematurely – that is, before the age of 70 years – from one of the four main NCDs (cardiovascular disease (CVD), diabetes, chronic respiratory disease and cancer), with a higher probability for men (32%) than women (17%) (WHO Regional Office for Europe, in press). This highlights a significant opportunity to make progress on United Nations Sustainable Development Goal target 3.4, which aims to reduce premature mortality from NCDs in 2030 by one third.

The impact of NCDs on human health is clear, but it is only one part of the story. NCDs also result in high economic costs, reaching far beyond direct health care costs. NCDs reduce productivity at a macro-economic level through interruption of full participation in the labour force and the subsequent impacts on individuals, their carers and the state. When individuals die prematurely, the labour output they would have produced in their remaining working years is lost. In addition, individuals who suffer from a disease are more likely to miss days of work (absenteeism) or to work at a reduced capacity while at work (presenteeism<sup>1</sup>). In low- and middle-income countries, it is estimated that between 2011 and 2030 NCDs will cause more than US\$ 21 trillion in lost economic output, with nearly one third of that figure attributable to CVD alone (Bloom et al., 2011). 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.

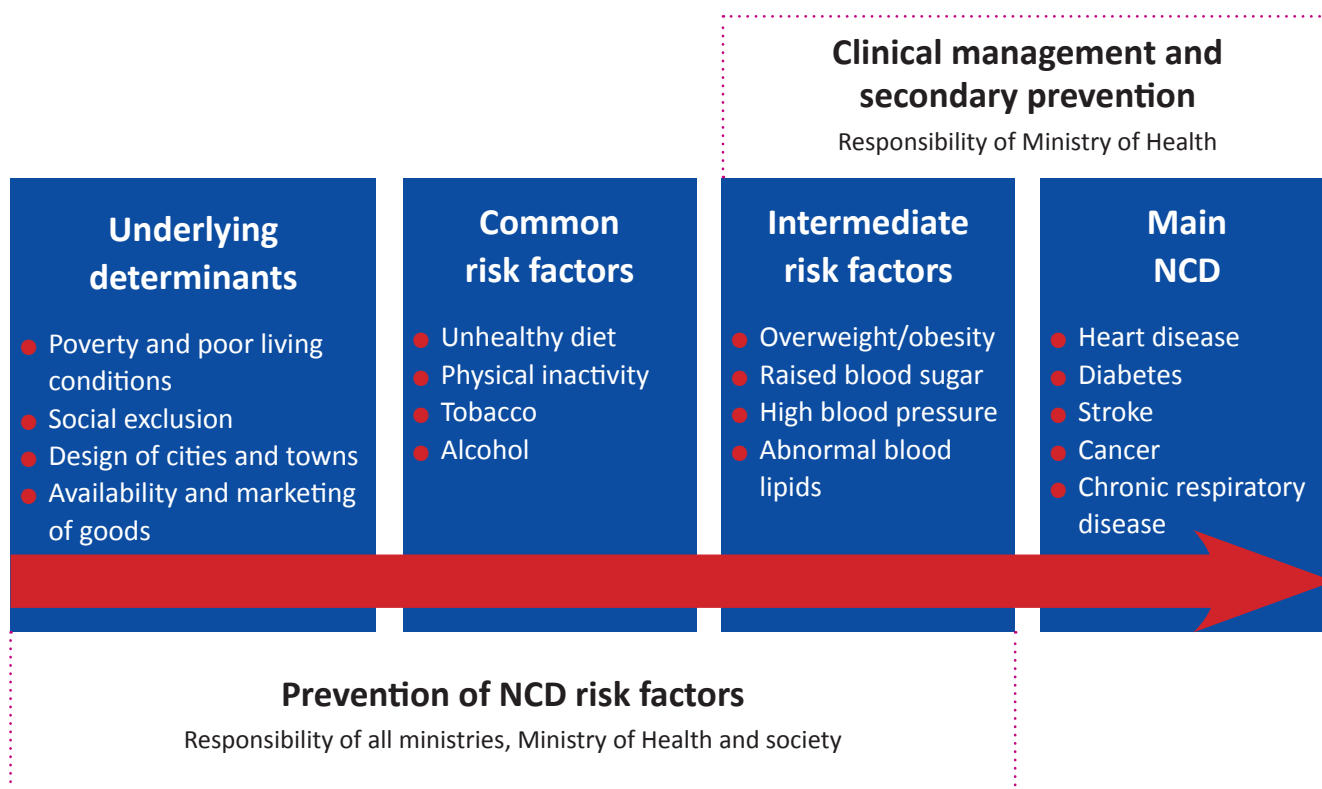
High human and economic costs highlight the need to reduce the burden of NCDs in Kyrgyzstan. WHO recognizes that the risk of NCDs can be reduced by modifying four behaviours (tobacco use, harmful use of alcohol, an unhealthy diet and physical inactivity) and metabolic risk factors such as high blood pressure or cholesterol (WHO, 2013). Fig. 1 illustrates the determinants and risk factors that drive the development of NCDs, many of which are beyond the control of the health sector alone.

WHO developed a menu of policy options and cost-effective interventions to assist Member States to reduce the NCD burden within its global action plan for the prevention and control of NCDs 2013–2020 (WHO, 2013). These were recently updated at the World Health Assembly (WHO, 2017a) and include measures to reduce behavioural and metabolic risk factors known to lead to NCDs, as well as clinical interventions to prevent and treat disease. As half of Kyrgyzstan's deaths in 2015 were caused by heart disease, stroke, myocardial infarction and other circulatory diseases, the economic analysis detailed in this study focuses primarily on interventions that can reduce this burden of CVD.

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<sup>1</sup> Presenteeism is defined as reduced productivity at work.

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



## Purpose of the economic analysis component of the case for investment

The economic aspects of NCDs are too often overlooked in budgetary allocation processes. Quantifying the costs of NCD management and interventions to prevent and control NCDs, as well as their returns in relation to the costs of inaction, has been a high-priority request from Member States. Investment cases are designed to help countries make their own economic rationales for action to prevent and control NCDs.

A key recommendation of the United Nations Interagency Task Force on the Prevention and Control of Noncommunicable Diseases (UNIATF) visit to Kyrgyzstan in March 2016 was to investigate the economic case for investing in NCDs (UNIATF, 2017). A joint United Nations follow-up visit to Kyrgyzstan was therefore undertaken in August 2016, with a further follow-up in October 2016, to conduct an economic analysis and help the country make informed decisions about ways to reduce the NCD burden.

To support the overarching economic analysis, the team carried out an epidemiological review (used in Section 2) and institutional context analysis (used in Sections 3 and 6) – an assessment of the institutions and actors involved in the prevention and control of NCDs. Together with other reports on the NCD situation, these helped identify policy strengths and areas for further development.

The investment case allows scaled-up action – and the costs of not doing so – to be modelled in medium-term (5 years) and long-term (15 years) time frames. One scenario is a continuation of the status quo, in which no new policies are implemented and current coverage levels remain in place – i.e. the costs of inaction. The other scenario is one in which selected policies and clinical interventions are scaled up over the next 15 years. The analysis used the WHO OneHealth Tool, an epidemiology-based population model developed by United Nations partners to enable strategic planning and costing of interventions and projection of the health benefits expected from their implementation. Health benefits are generated in terms of natural units (cases or deaths averted) but also monetized using the human capital approach to enable benefit–cost ratios (the primary return on investment metric) to be evaluated and reported for each package of interventions.

Section 2 provides an analysis of NCD behavioural risk factors in Kyrgyzstan, including current levels of tobacco, alcohol and salt consumption, as well as the existing prevalence of metabolic risk factors such as raised total cholesterol and raised blood pressure within the population. Section 3 outlines evidence-based policies and clinical interventions that can contribute to reducing the burden of disease – CVD in particular – and details the current implementation level of policies and interventions in Kyrgyzstan. Section 4 describes the methods and tools used in the analysis. Section 5 presents the results, including total costs, and the expected health and economic benefits (such as healthy life-years gained, mortality averted and productivity gains) of implementing the three policy packages described, as well as the clinical interventions. Section 6 outlines the conclusions to be drawn from these.

## 2. Situation analysis: NCDs and risk factors

This section sets out background information used in preparation of the investment case analysis. It addresses NCD as a whole and the extent to which risky behaviours – such as tobacco and alcohol consumption, physical inactivity and salt consumption – are present in Kyrgyz lifestyles, as well as the prevalence of metabolic risk factors such as raised blood pressure, cholesterol and diabetes. The selection of behavioural and metabolic risk factors has been narrowed to focus on those most relevant for the economic analysis.

Key epidemiological facts for Kyrgyzstan include the following.

- The age-standardized premature mortality rate from the four major NCDs (cancer, CVD, diabetes and chronic respiratory disease) for those aged 30–69 years in Kyrgyzstan in 2013 (latest year available) was 833 per 100 000 population for males and 417 per 100 000 for females (average rates for the WHO European Region are 548 and 266, respectively).
- As noted above, NCDs are the leading cause of mortality in the country, and CVD alone causes around half of all deaths.
- While cardiovascular mortality has been decreasing continuously over recent years, a gap remains between Kyrgyzstan and other countries in the Region.
- In the 0–64-year age group, male mortality from CVD exceeds female mortality by a factor of 2.5.
- Stroke mortality in Kyrgyzstan is much higher than in the countries of the Commonwealth of Independent States (CIS),<sup>2</sup> whereas mortality from ischaemic heart disease (IHD) is slightly lower than for CIS countries.
- As of 2013, Kyrgyz life expectancy was 67.0 years for men and 74.9 years for women.

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<sup>2</sup> Countries in the CIS are Armenia, Azerbaijan, Belarus, Kazakhstan, Kyrgyzstan, Republic of Moldova, Russian Federation, Tajikistan, Turkmenistan, Ukraine and Uzbekistan.

## Tobacco

Findings from the 2013 third national WHO STEPwise approach to surveillance (STEPS) survey indicate that 26% of Kyrgyz adults aged 25–64 years smoke (WHO Regional Office for Europe, 2016a), and almost all are daily smokers. A marked gender balance exists: only 2.7% of women smoke compared to 48.2% of men. Smokeless tobacco is used by 10.1% of men and 0.1% of women.

An estimated 2.4% of youths (4% of boys; 0.9% of girls) aged 13–15 years smoke cigarettes and 5.1% of youths (7.6% of boys; 2.9% of girls) use smokeless tobacco (CDC, 2014).

In the 30 days prior to the survey 28.2% of women, 18% of men and 13.5% of youths were exposed to second-hand smoke at home; 11.9% of women, 36.7% of men and 28.2% of youths were exposed to second-hand smoke in their workplace or inside public places.

Key facts are summarized in Box 1.

## Alcohol

The 2013 STEPS survey findings show that around two fifths (44.8%) of males and almost a fifth (17.7%) of females are considered current alcohol users, indicating that they have had a drink in the past month (WHO Regional Office for Europe, 2016a). Nevertheless, the rate of alcohol consumption appears to have been reducing. In 2003–2005, Kyrgyz adults (aged 15 years and over) drank 5.1 litres of alcohol per capita; this dropped to 4.3 litres by 2008–2010, less than half the WHO European average (10.9 litres) (WHO, 2014). Men are estimated to consume over three times (6.9 litres) as much alcohol per capita as women (2.0 litres).

Among alcohol users, 22.8% of men binged (consumed six or more drinks in one sitting) during the month before the survey compared to 2.7% of women (WHO Regional Office for Europe, 2016a). On average, among alcohol users who had a drink in the last month, men consumed 5.1 drinks in one sitting and women consumed 2.5 drinks.

Key facts are summarized in Box 2.

## Physical inactivity

According to the 2013 STEPS survey, around one in nine (11.4%) Kyrgyz adults aged 25–64 years is insufficiently active, engaging in less than 150 minutes per week of moderate-intensity physical activity. Rates of inactivity are higher for women than men and for those living in urban than rural areas. Around half (53.6%) of physical activity is work-related; some is transport-related (42.7%) but virtually none is recreational (3.7%). Almost three quarters (70.6%) of adults do not engage in vigorous activity, particularly women.

The survey also found that a third of adults (33.1%) in Kyrgyzstan are overweight and a quarter (23.1%) are obese.

Key facts are summarized in Box 3.

### Box 1. Tobacco snapshot

**Tobacco use** is of major concern as 48.2% of Kyrgyz men smoke, almost all every day.

**Attributable NCDs** include: multiple forms of cancer; IHD, stroke and other CVD and circulatory diseases; chronic obstructive pulmonary disease and pneumoconiosis; and peptic ulcer disease, diabetes, cataract, macular degeneration, and rheumatoid arthritis.

### Box 2. Alcohol snapshot

**Alcohol use** is of concern since, on average, men drink three times as much as women and one in five male drinkers binged (consumed six or more drinks in one sitting) in the past month.

**Attributable NCDs** include multiple forms of cancer, pancreatitis, epilepsy, diabetes, cirrhosis and IHD, stroke and other cardiovascular and circulatory diseases

### Box 3. Physical inactivity snapshot

**Activity levels** are of concern as one in nine adults is insufficiently active.

**Attributable NCDs** include coronary heart disease, type 2 diabetes and breast and colon cancers (Lee et al., 2012).

## Unhealthy diet (salt)

Sodium consumption in Kyrgyzstan is one of the highest in the world: it ranked fourth highest in a review of 187 countries (Powles et al., 2013). The age-standardized intake in 2010 for people aged 20 years and over was 5.38 g of sodium per day – more than the WHO recommendation of 2 g per day.

The 2013 STEPS survey findings show that around a fifth of Kyrgyz adults add extra salt to their food on a regular basis when eating (18%) and two thirds do so when preparing meals (63.8%) (WHO Regional Office for Europe, 2016a).

A 2016 WHO study that observed commonly available products in Kyrgyzstan found that the amounts of trans-fatty acid and salt in common foods sold in Bishkek are extremely elevated (WHO Regional Office for Europe, 2016b). Some portions of common foods would provide the maximum daily amount of salt recommended by WHO; for example, the amount of salt found in a 300 g bread portion was 4.7 g.

Over a quarter (28.5%) of cardiovascular deaths among 20–69-year-olds in 2010 were attributed to sodium consumption of more than 2 g per day – a greater proportion for stroke than coronary heart disease (Mozaffarian et al., 2014).

Key facts are summarized in Box 4.

### Box 4. Salt snapshot

**Salt consumption** is one of the highest in the world, estimated to be more than 2.5 times higher than the WHO recommendation. Two thirds of adults add salt when cooking and a fifth add salt to food before eating it.

**Attributable NCDs** include stomach cancer and increased risk of IHD, stroke and other cardiovascular and circulatory diseases due to hypertension.

**The proportion of cardiovascular deaths attributable to high sodium is 28.5%.**

## Metabolic risk factors

High levels of metabolic factors – such as blood pressure, body mass index or blood lipid levels – significantly increase the risk of having a cardiovascular event. Table 1 displays the prevalence of raised blood pressure,<sup>3</sup> raised total cholesterol<sup>4</sup> and diabetes<sup>5</sup> within the Kyrgyz population reported by the 2013 STEPS survey (WHO Regional Office for Europe, 2016a).

**Table 1. Crude prevalence of metabolic risk factors, by age and gender**

Factor	Men		Women	
	25–44 years	45–64 years	25–44 years	45–64 years
Raised blood pressure	30.9%	63.9%	26.6%	68.7%
Raised total cholesterol	11.8%	27.7%	22.5%	41.2%
Diabetes	2.4%	10.1%	2.2%	9.4%

Source: WHO Regional Office for Europe (2016a).

While elevated levels of any one factor can increase the risk of a cardiovascular event, the risk is compounded for individuals with multiple metabolic risk factors. WHO risk prediction charts assess the likelihood of an individual having a cardiovascular event and/or dying within 10 years by combining six factors: gender, age, blood pressure, cholesterol, smoking status and whether or not they have diabetes (WHO, 2016a). The prevalence of high cardiovascular risk among the Kyrgyz population can be estimated from the 2013 STEPS survey according to the presence of risk factors or history of CVD or diabetes (WHO Regional Office for Europe,

<sup>3</sup> Systolic blood pressure  $\geq 140$  mmHg and/or diastolic blood pressure  $\geq 90$  mmHg or currently on medication for raised blood pressure.

<sup>4</sup> Raised total cholesterol  $\geq 5.0$  mmol/L or  $\geq 190$  mg/dl or currently on medication for raised cholesterol.

<sup>5</sup> Raised blood glucose (defined as either plasma venous value of  $\geq 7.0$  mmol/L (126 mg/dl) or capillary whole blood value of  $\geq 6.1$  mmol/L (110 mg/dl)) or currently on medication for diabetes.

2016a). This suggests that 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; this rises with age (Table 2).

**Table 2. Crude prevalence of high cardiovascular risk, by age and gender**

Factor	Men		Women	
	40–54 years	55–64 years	40–54 years	55–64 years
10-year cardiovascular risk $\geq$ 30%, or with existing CVD	12.2%	26.7%	13.2%	29.4%

Source: WHO Regional Office for Europe (2016a).

### 3. Policies and treatments to reduce the NCD burden

As highlighted in Section 1, WHO has published a menu of policy options and interventions to prevent and treat NCDs (WHO Regional Office for Europe, 2016a; WHO 2017a). The economic analysis for this investment case was narrowed to assess selected interventions for NCD prevention (tobacco, physical activity and salt policies) and management of cardiovascular risk and disease. Assessment of alcohol-control strategies was omitted because alcohol consumption is relatively low in Kyrgyzstan compared with the average across the WHO European Region and because of a lack of data at the time of the study. The National NCD Action Plan also contained few alcohol interventions with very low costs.

Kyrgyzstan has strong policy and legislative frameworks in place for preventing and treating NCDs with the Den Sooluk National Health Reform Programme 2012–2018, the National Programme on NCDs 2013–2020 and the National Public Health Programme 2020; these aim to increase intersectoral action for health. The expected health gain from Den Sooluk is a 1% annual reduction in CVD.

The following sections summarize national efforts for specific areas against the full menu of policy options recommended by WHO, drawing on the findings of the institutional context analysis as well as relevant published reports from WHO and other bodies.

#### Tobacco

Kyrgyzstan ratified the WHO Framework Convention on Tobacco Control (FCTC) in 2006 and has committed to implementing a comprehensive tobacco control policy (WHO, 2017b). At the time of the assessment a revision of tobacco law process was under way, due to be considered by parliament as soon as it is resubmitted.

Table 3 summarizes a comparison of Kyrgyzstan’s current tobacco control measures against the MPOWER intervention package (monitor tobacco use and prevention policies; protect people from tobacco smoke; offer help to quit tobacco use; warn people about the dangers of tobacco; enforce bans on tobacco advertising, promotion and sponsorship; raise taxes on tobacco) as reported in the WHO report on the global tobacco epidemic (WHO, 2017c), supplemented by the institutional context analysis. This indicates that additional policies could be put in place to reduce tobacco consumption and meet WHO FCTC recommendations, particularly regarding taxation and affordability of cigarettes, as well as smoke-free environments.



**Table 3. The current state of MPOWER tobacco control measures in Kyrgyzstan**

Policy	Achievements (maximum of 4)	Current state of implementation
Monitor tobacco use and prevention policies	3	Recent and representative data are available for both adults and youths.
Protect people from tobacco smoke	2	Of eight categories of public place <sup>6</sup> WHO reports that 3–5 are completely smoke-free. The overall problem has been with tobacco control legislation enforcement. Smoking is banned in hospitals, for example, along with legal provision for separate smoking areas in cafes/restaurants, but these are widely ignored and the institutional context analysis was informed that only 15% of cafes and restaurants adhere to the law.
Offer help to quit tobacco use	3	Nicotine replacement therapy and/or some cessation services are available (the costs of at least one of which are covered by national/federal health insurance or the national health service).
Warn about the dangers of tobacco	4	Large health warnings are present on tobacco packages, with all appropriate characteristics. No data were reported on anti-tobacco mass-media campaigns.
Enforce bans on tobacco advertising, promotion and sponsorship	3	A ban is in place on national television, radio and print media, as well as on some but not all other forms of direct and/or indirect advertising.
Raise taxes on tobacco	2	A tenfold increase in excise tax on tobacco was planned for 2015–17, and it rose by 30% in 2015 alone. MPOWER reports that 26–50% of the retail price is tax, with no trend change in affordability of cigarettes since 2008.

Source: WHO (2017b).

The institutional context analysis found a recent change in tobacco production. The Reemtsma (a subsidiary of Imperial Tobacco) factory in Bishkek closed in 2014, having a below-threshold production rate. All tobacco is now imported from Kazakhstan, the Russian Federation and Turkey. Any small local private production is exported to Tajikistan and Ukraine. Nasvai is the local chewing tobacco, which is completely unregulated.

The return on investment (ROI) analysis modelled the following policy changes:

- monitoring of tobacco use and prevention
- measures to protect people from tobacco smoke
- offering support to people willing to quit smoking
- presence of warning labels on packages
- warning people of the dangers of tobacco and tobacco smoke (via mass-media campaigns)
- enforcing youth restrictions
- increasing tobacco excise taxes
- plain packaging of tobacco products.

<sup>6</sup> Legislation was assessed to determine whether smoke-free laws provided for a complete indoor smoke-free environment at all times, in all the facilities of each of the following eight categories of place: health care facilities; educational facilities other than universities; universities; government facilities; indoor offices and workplaces not considered in any other category; restaurants or facilities that serve mostly food; cafés, pubs and bars or facilities that serve mostly beverages; and public transport (WHO, 2017d).

## Physical inactivity

The updated Appendix 3 of WHO's global action plan for the prevention and control of NCDs 2013–2020 lists several policy options for improving physical activity levels (WHO, 2017a). These are reproduced in Table 4, alongside some of the achievements to increase physical activity in Kyrgyzstan noted within a recent WHO review (WHO Regional Office for Europe, 2017a) and the institutional context analysis.

**Table 4. The current state of physical activity interventions in Kyrgyzstan**

Policy	Menu of policy options	Current state of implementation
Knowledge	Implementation of public awareness and motivational communications for physical activity, including mass-media campaigns for physical activity behavioural change – an intervention found to be cost-effective according to an analysis using WHO Choosing Interventions that are Cost-Effective (CHOICE) methodology	Village health committees, which raise awareness, are a major asset in terms of coverage (80% of the country) and depth of public engagement.
Health system	Provision of physical activity counselling and referral as part of routine primary health care services through the use of a brief intervention	As part of pilot projects to implement a package of essential NCD interventions (PEN) in primary health care, doctors and nurses have been trained to deliver lifestyle counselling and brief interventions.
Environment	<p>Ensuring that macro-level urban design incorporates the core elements of residential density, connected street networks that include sidewalks, easy access to a diversity of destinations and access to public transport</p> <p>Provision of convenient and safe access to high-quality public open space and adequate infrastructure to support walking and cycling</p>	Bicycle and pedestrian paths have been built to promote cycling and walking in Bishkek and Osh. To achieve more intensive use, local authorities need to have stronger means to prohibit car parking on these lanes, and city streets should be restructured to provide enough space for both cycling and car parking.
Setting	<p>Implementation of a whole-of-school programme that includes high-quality physical education, availability of adequate facilities and programmes to support physical activity for all children</p> <p>Implementation of multicomponent workplace physical activity programmes</p>	Collaboration between the Ministry of Health and Ministry of Education has resulted in an order requiring the first 15 minutes of each school day to be dedicated to physical exercise.
Promotion	Promotion of physical activity through organized sport groups and clubs, programmes and events	Collaboration between the Ministry of Health and Ministry of Education has resulted in Health Walk Day, which has received good media coverage.

Source: WHO (2017a).

The ROI analysis modelled the following policy change:

- public awareness campaigning on physical activity.

## Unhealthy diet (salt)

No specific policy measures are in place to reduce salt intake in Kyrgyzstan (WHO Regional Office for Europe, 2017a). Most initiatives on salt have focused on iodine deficiency and salt iodization, without real effort to balance salt reduction with concurrent iodine supplementation. Food production and security has been the mandate of the Ministry of Agriculture and Food since June 2016. The institutional context analysis found a lack of awareness of the global and national targets for a 30% reduction in salt consumption outside the Ministry of Health. Table 5 compares Kyrgyzstan's current state against SHAKE, a set of WHO measures that outline steps countries can take to reduce salt intake (surveillance; harness industry; adopt standards for labelling and marketing; knowledge; environment) (WHO, 2016b).

**Table 5. The current state of policies to reduce salt consumption in Kyrgyzstan**

Policy	Description <sup>a</sup>	Current state of implementation
Surveillance: measure and monitor salt use	Measure and monitor population salt consumption patterns and the sodium content of food.	The 2013 STEPS survey (WHO Regional Office for Europe, 2016a) asked about salt consumption patterns and a 2016 WHO study (WHO, 2016a) measured salt in common foods (see details in Section 2).
Harness industry: promote reformulation of foods and meals to contain less salt	Set target levels for the amount of salt in foods and meals and implement strategies to promote reformulation.	Not achieved
Adopt standards for labelling and marketing: implement standards for effective and accurate labelling and marketing of food	Adopt front-of-pack nutrition labelling systems (e.g. colour-coded for salt content level, "high salt" warning).	Not achieved
Knowledge: educate and communicate to empower individuals to eat less salt	Implement integrated education and communication strategies to raise awareness about the health risks and dietary sources of salt in order to change behaviour.	Not achieved
Environment: support settings to promote healthy eating	Implement multicomponent salt-reduction strategies in community settings (e.g. schools, workplaces, hospitals).	Not achieved

<sup>a</sup> Information in the Description column is derived from the SHAKE technical package for salt reduction (WHO, 2016b).

The ROI analysis modelled the following policy changes:

- surveillance
- provision of education and communication to raise awareness about the health risks of salt
- implementation of multicomponent salt-reduction strategies in community settings.

## CVD clinical interventions

The updated Appendix 3 of WHO's global action plan for the prevention and control of NCDs 2013–2020 lists multiple clinical interventions for CVD and diabetes (WHO, 2017a). A selection of those most relevant to this analysis is reproduced in Table 6, alongside an assessment of the situation in Kyrgyzstan, drawing on recent reports published by WHO and others. The state of diabetic policies was not specifically investigated but is referred to partly within the section on cardiovascular risk assessment and management.

**Table 6. The current state of policies to reduce cardiovascular risk in Kyrgyzstan**

Policy	Description	Current state of implementation
Cardiovascular risk assessment and management	Provision of drug therapy (including glycaemic control for diabetes mellitus and control of hypertension using a total risk approach) and counselling to individuals who have had a heart attack or stroke and to people with high risk ( $\geq 30\%$ ) of a fatal and nonfatal cardiovascular event in the next 10 years	The health system has preventive interventions available at primary health care level funded by the Ministry of Health, health insurance fund and other partners. Availability of cardiovascular risk assessment and management was self-assessed as not achieved in 50% or more primary health care facilities in a WHO survey (WHO Regional Office for Europe, 2017b). PEN protocols are being implemented within pilot projects in Kyrgyzstan, and doctors and nurses within primary health care are being trained in cardiovascular risk stratification and management. The evaluation of PEN implementation was unable to demonstrate its effectiveness after one year (WHO Regional Office for Europe, 2017c) and this is being further explored through qualitative study. The 2013 STEPS survey (WHO Regional Office for Europe, 2016a) found that only 39.8% of adults previously diagnosed with hypertension were taking medication. It also found that 79.1% of those identified as having raised blood pressure through the survey were not on medication. Studies have highlighted financial barriers as reasons patients may not take medication, particularly those required long-term such as for hypertension (Abdraimova et al., 2014; 2015).
	Provision of drug therapy (including glycaemic control for diabetes mellitus and control of hypertension using a total risk approach) and counselling to individuals who have had a heart attack or stroke and to people with moderate to high risk ( $\geq 20\%$ ) of a fatal and nonfatal cardiovascular event in the next 10 years	
Acute myocardial infarction (AMI)	Treatment of new cases of AMI with either acetylsalicylic acid or acetylsalicylic acid and clopidogrel, or thrombolysis or primary percutaneous coronary interventions	Drug availability for secondary prevention of AMI and stroke is limited. High out-of-pocket payments for outpatient medicines are the main cause of catastrophic and impoverishing expenditure (WHO Regional Office for Europe, 2016c; 2016d). While the majority of post-AMI patients appear to receive long-term therapy with aspirin and beta blockers (albeit with considerable regional variation), very few receive statins or effective interventions to promote tobacco cessation.

An assessment of the health effects and costs of interventions to control CVD in Kyrgyzstan was undertaken in 2009 (Akkazieva et al., 2009). The study carried out a cost–effectiveness analysis for three events: AMI, stroke and congestive heart failure at the primary and hospital levels. It used the WHO CHOICE methodology. It evaluated 37 different interventions and found the top seven most cost-effective in the Kyrgyz context to be:

- educating people about the benefits of quitting smoking and reducing blood cholesterol level and daily salt intake through mass-media campaigns;
- providing appropriate hypertension-lowering drug treatment to individuals whose systolic blood pressure is over 160;
- providing aspirin during the acute phase of AMI;
- providing beta blockers, aspirin and angiotensin-converting enzyme inhibitors during the post-acute phase of AMI;
- providing aspirin during the post-acute phase of ischaemic stroke;
- providing diuretics for congestive heart failure;
- providing cardiac rehabilitation for all three conditions.

The current ROI analysis modelled the following policy changes:

- treatment for those with high absolute cardiovascular risk ( $\geq 30\%$ )
- treatment of new cases of AMI with aspirin
- treatment of cases with established IHD and post AMI
- treatment for those with established cerebrovascular disease and post stroke
- standard glycaemic control
- intensive glycaemic control.

## 4. Methods

A joint team comprising staff from the Government of Kyrgyzstan, WHO and the United Nations Development Programme (UNDP) undertook initial data collection and analysis and institutional context analysis in Kyrgyzstan during 22–26 August 2016 in order to complete a three-tier NCD investment case. The team consisted of economists, epidemiologists and social development and public health experts. Further data collection and analysis took place during August to December 2016, with a second visit in October 2016. In summary, the policy interventions assessed were as follows (Table 7).

**Table 7. Summary list of interventions analysed**

Tobacco interventions	Physical activity interventions	Salt interventions	CVD and diabetes clinical interventions
<ul style="list-style-type: none"> <li>● Monitoring of tobacco use and prevention</li> <li>● Measures to protect people from tobacco smoke</li> <li>● Support for people willing to quit smoking</li> <li>● Warning labels on packages</li> <li>● Warning people of the dangers of tobacco (mass media)</li> <li>● Increasing tobacco excise taxes</li> <li>● Enforcing youth restrictions</li> </ul>	<ul style="list-style-type: none"> <li>● Public awareness campaign on physical activity</li> </ul>	<ul style="list-style-type: none"> <li>● Surveillance</li> <li>● Improving literacy on health effects of salt consumption</li> <li>● Implementing salt-reduction measures in community eating places</li> </ul>	<ul style="list-style-type: none"> <li>● Treatment for those with high absolute cardiovascular risk (<math>\geq 30\%</math>)</li> <li>● Treatment of new cases of AMI with aspirin</li> <li>● Treatment of cases with established IHD and post AMI</li> <li>● Treatment for those with established cerebrovascular disease and post stroke</li> <li>● Standard glycaemic control</li> <li>● Intensive glycaemic control</li> </ul>

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

- calculation of economic burden of NCDs in terms of direct costs and indirect costs (absenteeism, presenteeism and premature death);
- costing of interventions (clinical and policy interventions);
- assessment of health impacts; and
- ROI analysis.

### Calculation of economic burden of NCDs

The NCD economic burden model applied was developed by WHO and UNDP and provides estimates of the current direct and indirect costs of NCDs in Kyrgyzstan. The data used on population by age and sex for the period 2015–2030 were collected from the National Statistical Committee. Details incorporated were incidence rates by age and sex for heart attack and stroke; and prevalence rates by age and sex for diabetes, hypertension and chronic respiratory disease. Mortality rates by age and sex were applied for each condition. The model calculated projections for incidence, prevalence and mortality for diabetes, CVD and chronic respiratory disease between

2015 and 2030, holding current rates constant.<sup>7</sup> These projections were summarized as total incidence, prevalence and mortality for both the entire population and the working-age population, defined as those aged 15–64 years.

The following steps were carried out to calculate the economic costs.

- As only total government health expenditure data are available in Kyrgyzstan, the share of total health expenditure on NCDs was calculated on the basis of a WHO analysis covering 13 countries (Garg & Evans, 2011; see Annex 1, Table A1).
- The annual value (in terms of economic output) of each full-time worker in Kyrgyzstan was calculated. This is based on gross domestic product (GDP) per employed person, defined as the country's GDP divided by its total employed labour force. To arrive at the total employed labour force for Kyrgyzstan, World Bank data on the total labour force aged 15 years and over, the unemployment rate and the labour force participation rate were used.
- Data were incorporated on the extent to which NCDs reduce worker productivity. From the academic literature (Anesetti-Rothermel & Sambamoorthi, 2011; Wang et al., 2003), rates were found to describe (a) the reduction in labour force participation due to hypertension, stroke, AMI and diabetes; (b) the reduction in full-time hours worked due to absenteeism; (c) the reduction in productivity due to presenteeism; and (d) the total time taken to replace a worker (see Annex 1, Table A2).
- The exact number of people with NCDs working in Kyrgyzstan in 2015 was determined. Using the labour force participation, unemployment and mortality rates, the model began with Kyrgyz people of working age with NCDs; subtracting those who chose not to participate in the labour force or were unemployed; subtracting those who could not participate in the labour force specifically because of their NCD; and finally, subtracting those who died. The result was an estimate of active workers with NCDs.
- The final steps were to calculate the cost of replacing both active workers who died and would-be workers who could not participate in the labour force, and to calculate 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.

## ROI

An ROI analysis, based on an excel model developed by WHO for this analysis, provided estimates for the social and economic gains that accrue from investing in the set of cost-effective interventions identified during the visit. The policy-based interventions included in this calculation are listed in Table 7 above.

The methodology used is the NCD ROI model developed in 2015 for use by the UNDP/WHO Joint Programme on Governance of NCDs using the OneHealth Tool, which conveniently has built-in functionality that works out expected costs of treatment interventions. For each intervention, the OneHealth Tool takes as input data points such as the salaries of medical staff and the quantities of drugs and supplies needed, as well as their prices. More detail on use of the tool is available from the OneHealth Tool Manual (Avenir Health, 2017) and it is discussed in detail in the technical appendix to the forthcoming RTI International report, *The investment case for noncommunicable disease prevention and control* (RTI International, in press).

To work out the overall impact of the set of interventions, in terms of the increase in GDP, productivity measures were assessed using the following steps.

- Data on the amount by which NCDs reduce worker productivity were incorporated, as noted for the NCD economic burden model. As interventions reduce the projected incidence of IHD and stroke, there

<sup>7</sup> It is important to note that the model estimates growth in prevalence, incidence and mortality due to population growth only – not growth in disease rates.

is an associated increase in the number of healthy life-years of the population. By considering the increase in healthy life-years, GDP per employed person and the reduction in rates for absenteeism and presenteeism, an increase in GDP can be determined, attributed to the value of avoided absenteeism and presenteeism.

- By considering the labour force participation rate in Kyrgyzstan and the projected number of Kyrgyz deaths avoided, the increase in labour force participation due to avoided deaths was calculated. An increase in economic output was therefore attributed to the value of avoided mortality.
- The final economic gain came from the reduced time spent having to seek new workers for replacement. The academic literature estimates the time taken to replace workers to be around 10 weeks, on average. The worker replacement rate, applied to both the total deaths avoided and the increase in healthy life-years due to avoided IHD and stroke, gives the increase in GDP resulting from not having to replace staff so frequently.

ROI rates were calculated for the interventions listed above in Table 7. These were selected on the basis of data availability for calculations to ensure sufficient data for calculations of costs and health impacts. The OneHealth Tool is able to calculate the costs of CVD and diabetes clinical interventions. For policy interventions, real country spending and/or planned spending were used, including planned country spending for policy interventions listed in the National NCD Action Plan and other sources. The detailed list of activities and data sources used to cost policy interventions is given in Annex 2.

The projected economic gains from implementing the cost-effective interventions 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 ROI for Kyrgyzstan was arrived at by comparing the impact (increase in GDP) of the interventions with the total costs of setting up and implementing the interventions.



## 5. Results

This section provides an assessment of the economic burden of NCDs before summarizing the component parts of the ROI analysis – including health benefits, economic benefits and total costs – and discussing the ROI for each package of interventions.

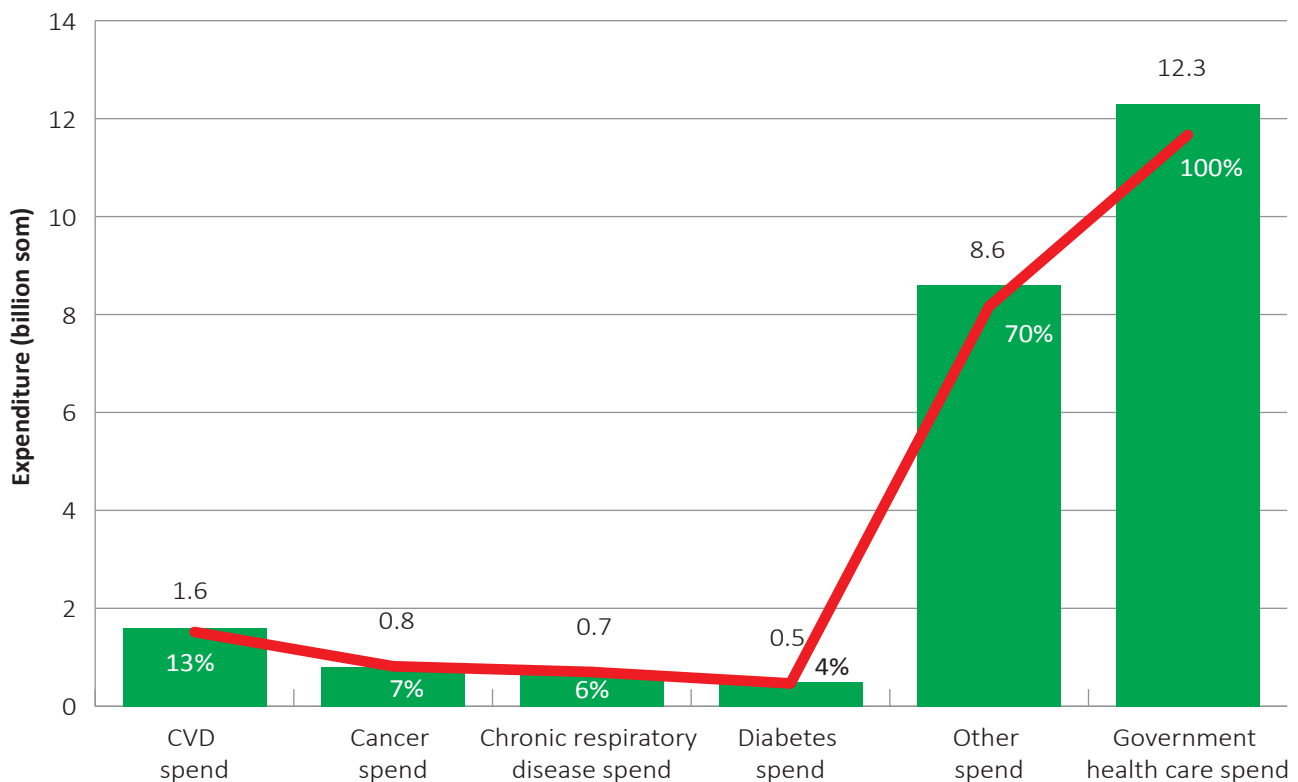
### Economic burden assessment

#### Direct costs

The estimate of direct costs of the economic burden considered only government health care expenditure, not non-health care costs such as transportation.

Total government health expenditure for Kyrgyzstan in 2015 was 12.3 billion som. As noted above, government health care spending on NCDs in Kyrgyzstan was estimated based on National Health Account data on NCD spending in 13 other countries (Garg & Evans, 2011). Assuming consistency with these countries (all have a similarly high NCD disease burden, although some are high-income countries), 30% of government expenditure on health would be attributable to NCDs (13.4% on CVD; 7% on cancer; 6% on chronic respiratory disease; 4% on diabetes). Using international rather than country-specific numbers is a limitation of this study, considering the wide variability of the share of health care expenditure per disease group (see Annex 1, Table A1). Total health care expenditure on the four main NCDs is estimated to be 3.7 billion som for 2015 (Fig. 2).

**Fig. 2. Government health care expenditure, 2015**



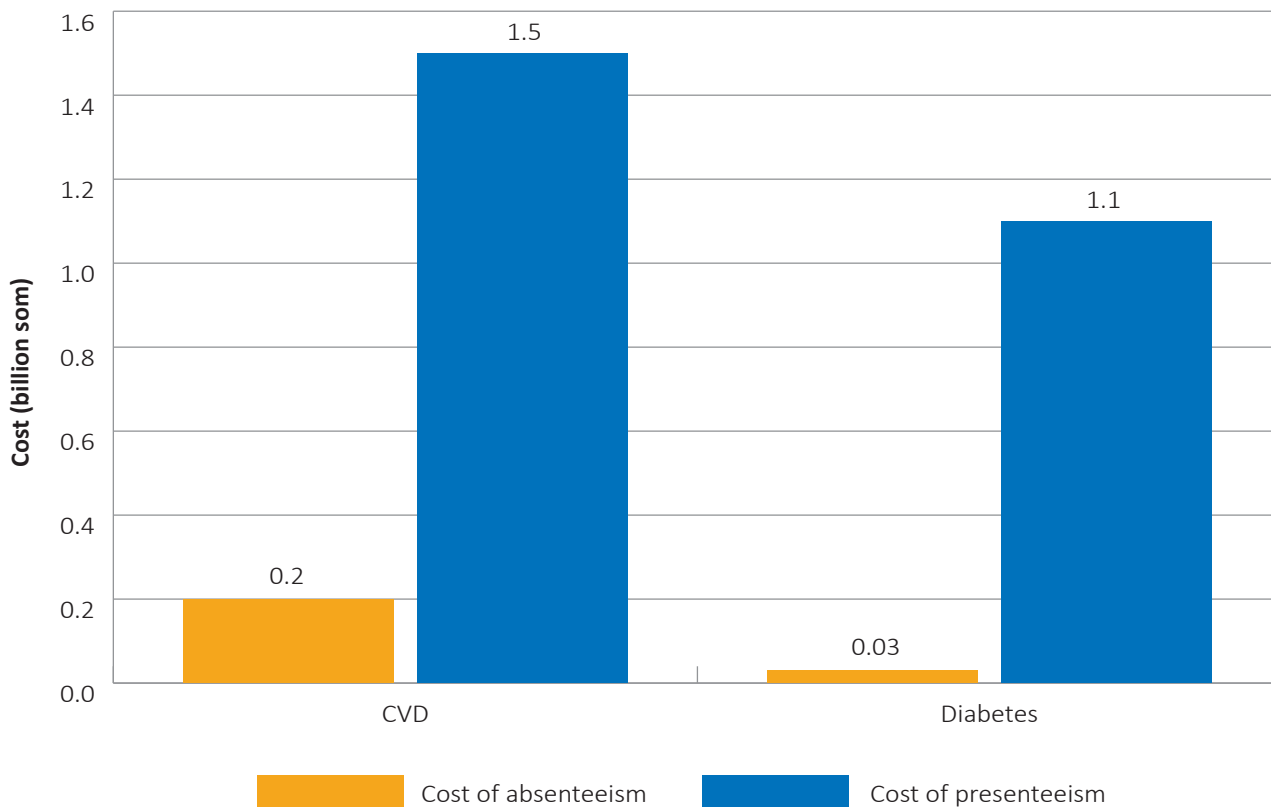
#### Indirect costs

For Kyrgyzstan, indirect economic losses due to NCDs were modelled from reduced labour force participation, increased absenteeism and presenteeism and losses due to premature death.

The calculation of absenteeism and presenteeism is based on the surviving workforce. Results are shown in Fig. 3 and details of underlying numbers are given in Annex 1, Table A2. They could only be calculated for CVD and diabetes. The number of absent work days was estimated at 1196 for CVD and 173 for diabetes, which resulted

in a total cost of absenteeism of 0.3 billion som to Kyrgyzstan. For presenteeism, the corresponding calculation found the number of unproductive working days at 8073 for CVD and 5799 for diabetes. This caused the burden of presenteeism to reach 2.6 billion som.

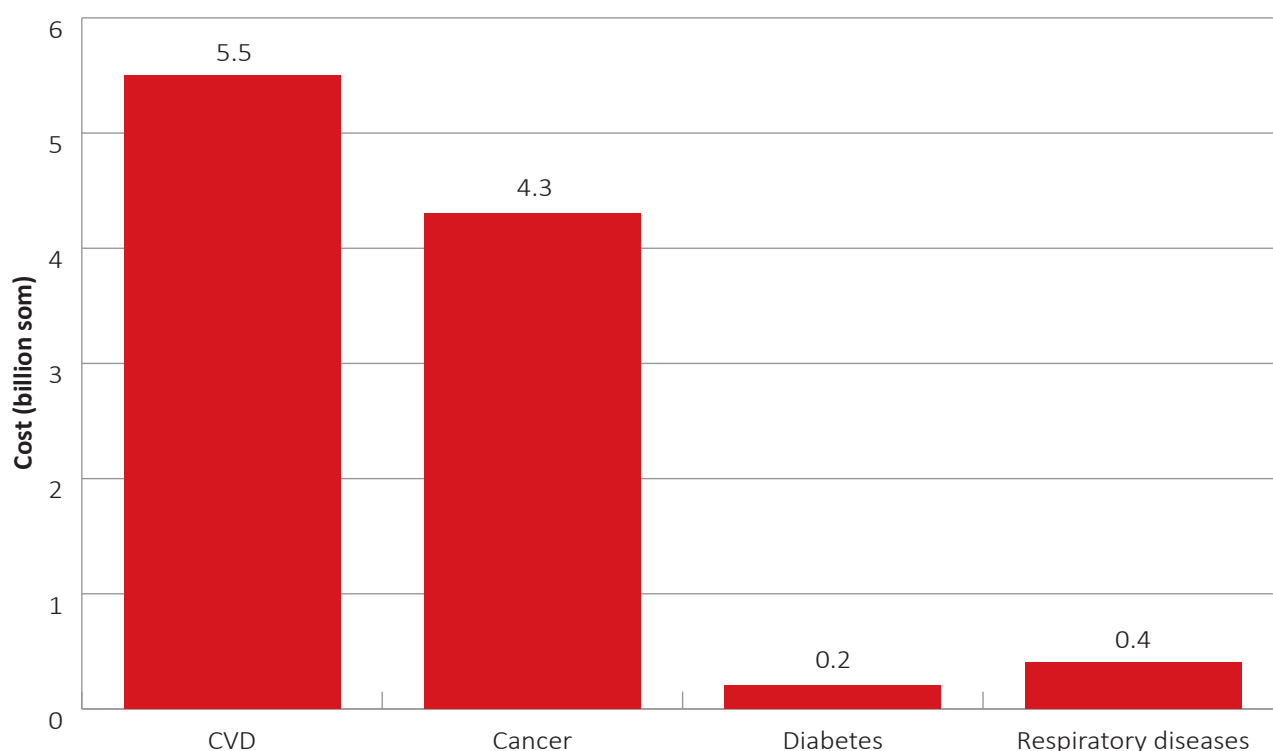
**Fig. 3. Costs of absenteeism and presenteeism for CVD and diabetes, 2015**



Levels of premature death in Kyrgyzstan were estimated using the human capital method. This assumes that forgone economic output is equivalent to the total output that would have been generated by workers through the course of their life until reaching retirement age. The cost of premature death was calculated by multiplying GDP per worker by the labour force participation rate, by the age-specific employment rate and by the 216 929 years of life lost in 2015 from the four main NCDs. Total cost of premature death was estimated at 10.4 billion som (Fig. 4).

CVD is the costliest of the four NCDs in terms of economic losses resulting from mortality. Diabetes does not appear to be a leading cause of premature death, despite the productivity losses in presenteeism; nevertheless, many people with diabetes may die of a cardiovascular event.

**Fig. 4. Costs of premature death, 2015**



#### Total economic costs

Table 8 summarizes the total direct and indirect costs of NCDs in Kyrgyzstan. Economic losses due to indirect costs are almost four times larger than those due to direct costs. The government's estimated spending on the four main NCDs is already 3.7 billion som, but additional losses to the economy (absenteeism, presenteeism, premature death) amount to 13.3 billion som. This would be even larger had it been possible to estimate the costs of absenteeism and presenteeism for cancer and respiratory diseases.

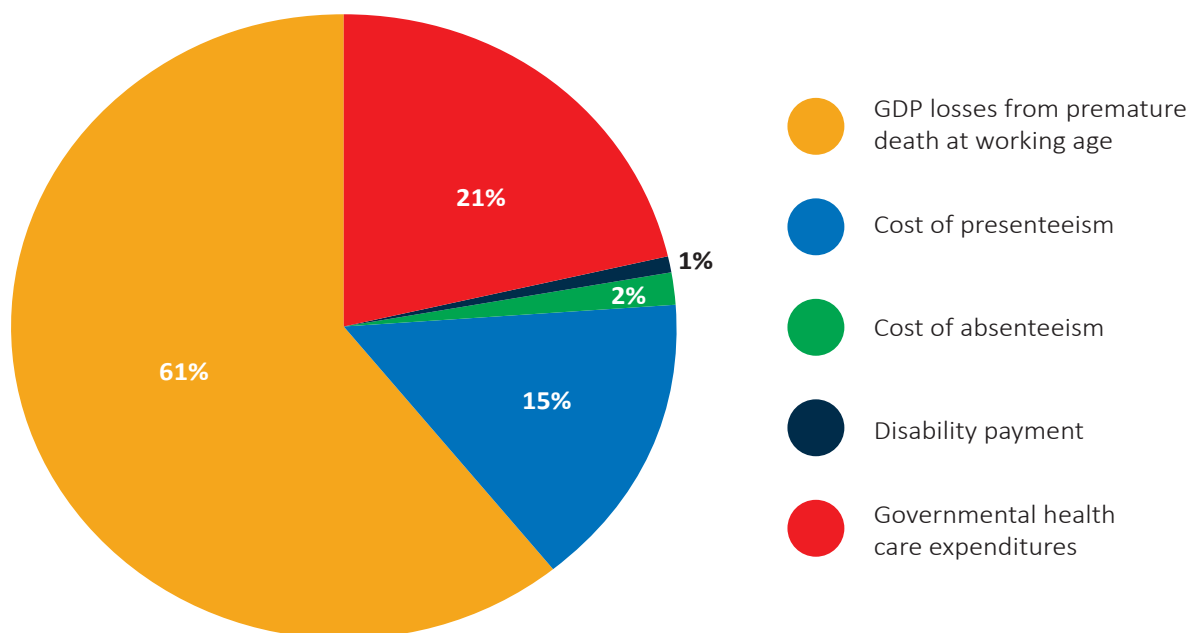
**Table 8. Economic burden of NCDs in Kyrgyzstan (billion som), 2015**

Cost	CVD	Chronic respiratory diseases	Cancer	Diabetes	Total for all NCDs
<b>Direct costs</b>					
Health care					
<i>Government expenditure</i>	1.64	0.71	0.82	0.49	3.67
Non-health care					
<i>Disability payments</i>	0.08	0.01	0.04	0.03	0.16
<b>Total direct costs</b>	<b>1.72</b>	<b>0.72</b>	<b>0.86</b>	<b>0.52</b>	<b>3.83</b>
<b>Indirect costs</b>					
Absenteeism	0.23	N/A	N/A	0.03	0.26
Presenteeism	1.53	N/A	N/A	1.10	2.63
Premature deaths	5.50	0.44	4.26	0.16	10.40
<b>Total indirect costs</b>	<b>7.26</b>	<b>0.44</b>	<b>4.26</b>	<b>1.29</b>	<b>13.29</b>
<b>Total burden</b>	<b>8.99</b>	<b>1.16</b>	<b>5.12</b>	<b>1.81</b>	<b>17.12</b>

The total drag on the economy of Kyrgyzstan is 17.1 billion som, which is equivalent to 3.9% of GDP annually.

Fig. 5 shows the structure of NCD burden in Kyrgyzstan in 2015. Government health care expenditure represents only 21% of all NCD-related costs, but these are just the tip of the iceberg for the NCD economic burden.

**Fig. 5. Structure of the NCD burden in Kyrgyzstan, 2015**



### Intervention cost assessment

Incremental intervention costs were estimated for the period 2016–2030. Table 9 shows costs for each of the first five years of this period, plus the five-year total (both undiscounted and discounted at 3% annually<sup>8</sup>).

The CVD clinical interventions produced the largest cost estimates. Treating those at high absolute risk of CVD costs 26.4 billion som in the baseline year and increases to 51.1 billion som in 2020. Implementing the entire CVD clinical intervention package over the five-year scale-up period would cost 175 billion som.

The tobacco, physical activity and salt packages were costed using the planned expenditures on these policy actions in National NCD Action Plan and other sources. The total costs for the tobacco package based on MPOWER guidelines is 0.14 billion som, although the individual interventions that make up the package vary in implementation costs. Certain policies, such as mass-media campaigns or protecting people from smoking, have large planned costs. Nevertheless, a range of low-cost tobacco policies exists, including package warning labels, bans on tobacco advertising and raising taxes.

<sup>8</sup> 3% is the usual discount rate applied to economic models.

**Table 9. Cost overview of policy and clinical interventions (million som), 2016–2020**

Intervention type	2016	2017	2018	2019	2020	Five-year total	Five-year total (net present value) <sup>a</sup>
<b>CVD clinical package</b>							
Treatment for those with high absolute cardiovascular risk ( $\geq 30\%$ )	2 133.7	3 066.3	4 064.7	5 131.6	6 289.1	20 685.3	18 666.0
Treatment of new cases of AMI with aspirin	35.3	50.6	67.8	84.0	102.0	338.5	305.6
Treatment of cases with established IHD and post AMI	201.8	290.0	384.3	485.0	592.8	1 953.9	1 763.2
Treatment for those with established cerebrovascular disease and post stroke	444.3	636.6	840.2	1 055.3	1 282.7	4 259.1	3 844.4
Standard glycaemic control	16 462.8	18 197.9	19 982.7	21 819.6	23 712.1	100 175.0	91 264.2
Intensive glycaemic control	7 171.7	10 056.4	13 001.3	16 014.3	19 103.1	65 346.8	59 047.0
<b>Total cost of CVD clinical package</b>	<b>26 499.6</b>	<b>32 297.8</b>	<b>38 340.0</b>	<b>44 589.8</b>	<b>51 081.8</b>	<b>192 758.6</b>	<b>174 890.4</b>
<b>Tobacco policy package</b>							
Monitor tobacco use/prevention policies	5.6	5.6	5.7	5.6	5.7	28.1	25.7
Protect people from tobacco smoke	9.3	9.3	9.3	0.5	0.5	28.9	27.2
Offer to help quit tobacco use: mCessation	1.9	1.9	1.9	1.9	1.9	9.5	8.7
Warn about danger: warning labels	2.4	2.5	2.7	2.8	2.9	13.3	12.2
Warn about danger: mass-media campaigns	5.4	6.0	6.6	7.2	7.9	33.1	30.1
Enforce youth restriction	1.6	1.8	1.9	2.1	2.3	9.8	8.9
Raise taxes on tobacco	3.0	3.2	3.3	3.5	3.7	16.6	15.2
Plain packaging for tobacco products	2.4	2.5	2.7	2.8	2.9	13.3	12.2
<b>Total cost of tobacco package</b>	<b>31.6</b>	<b>32.8</b>	<b>34.1</b>	<b>26.4</b>	<b>27.8</b>	<b>152.6</b>	<b>140.2</b>
<b>Physical activity package</b>							
Awareness campaigns to encourage increased physical activity	24.0	25.3	26.5	27.8	29.2	132.9	121.4
<b>Total cost of physical activity package</b>	<b>24.0</b>	<b>25.3</b>	<b>26.5</b>	<b>27.8</b>	<b>29.2</b>	<b>132.9</b>	<b>121.4</b>
<b>Salt policy package</b>							
Sodium: surveillance	0.5	0.5	1.2	0.5	0.5	3.2	3.0
Knowledge: education and communication	5.4	5.9	6.6	7.2	8.0	33.1	30.1
Environment: salt-reduction strategies in community-based eating spaces	1.0	1.0	1.0	1.0	1.0	5.1	4.6
<b>Total cost of salt package</b>	<b>6.9</b>	<b>7.4</b>	<b>8.8</b>	<b>8.7</b>	<b>9.5</b>	<b>41.4</b>	<b>37.7</b>

<sup>a</sup> Net present value discounted at 3%.

## Health benefit assessment

All interventions provide significant reductions in the number of lives lost to CVD-related causes. CVD clinical interventions have the greatest impact (9307 lives saved), followed by tobacco interventions that target metabolic risk factors (1537). The number of lives saved by the salt and physical activity interventions are similar in magnitude to the tobacco ones (Table 10).

**Table 10. Estimated health benefits over a 15-year time horizon**

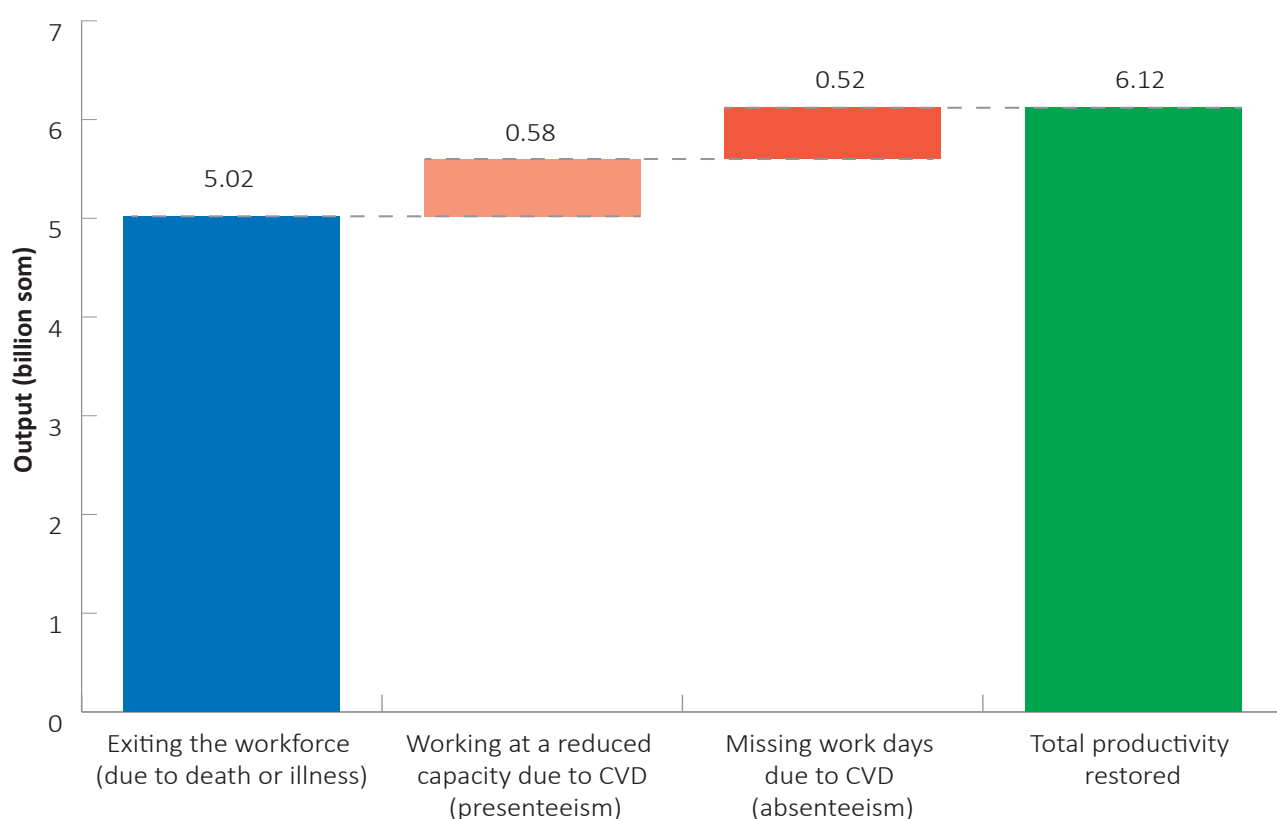
Intervention package	Strokes averted	Cardiovascular events averted	Mortality averted	Healthy life-years gained
CVD clinical interventions	3 780	7 676	9 307	46 612
Tobacco interventions	2 155	1 987	1 537	11 013
Physical activity interventions	2 363	2 042	1 192	11 745
Salt interventions	2 155	1 699	1 161	15 493

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

## Economic benefit assessment

NCDs included in this analysis are associated with a reduction in labour workforce and productivity due to premature mortality, fewer days of work (absenteeism) and reduced productivity while at work (presenteeism). Fig. 6 demonstrates the labour productivity gains that result from the prevented deaths and disease cases over a 15-year period, described in Table 10.

**Fig. 6. Recovered economic output from tobacco, physical activity, salt and CVD primary prevention interventions, 15-year time frame**



The biggest positive impact on productivity is from decreased mortality (82% of total productivity gains), followed by reduced presenteeism (9.5%) and absenteeism (8.5%). Policy packages and CVD and diabetes in primary care result in net present value 6.12 billion som in labour productivity gains over 15 years (equivalent to 1.4% of Kyrgyzstan’s 2015 GDP).<sup>9</sup>

## ROI assessment

Comparing the costs and benefits of each package of interventions shows that all the NCD prevention interventions included in the analysis – for tobacco control, salt reduction and increasing physical activity – have positive returns on investment for the period of 15 years (Table 11).

**Table 11. Costs, benefits and ROI at 5 and 15 years, by intervention package (billion som)**

Intervention package	5 years			15 years		
	Total costs	Total productivity benefits	ROI	Total costs	Total productivity benefits	ROI
Salt	0.04	0.04	0.4	0.1	0.7	12.3
Tobacco	0.14	0.08	0.2	0.5	0.7	3.8
Physical activity	0.12	0.04	0.1	0.4	0.6	3.6
CVD clinical interventions	174.9	0.6	0.001	871	4.1	0.01

Salt interventions have the highest ROI: for every som invested in the package of salt interventions, the expected return is 12 som over a 15-year period. The tobacco package has the next highest ROI (4), followed by the physical activity intervention (3.6).

The package of clinical interventions effectively provides no ROI, for either the five-year or 15-year assessment periods. This is frequently found in health economics owing to the high costs associated with medical treatment. Furthermore, these treatment options (secondary prevention after acute events) have low potential to increase labour force participation after stroke, myocardial infarction and diabetes.

Salt is the clear “best buy”, however, offering the highest ROI over a 15-year period.

Over the shorter term, all analysed packages result in relatively lower ROIs, which can be explained by two factors.

- Policy interventions aimed to change lifestyle need time for the effect to develop. For instance, reducing salt consumption may lower blood pressure in the short- to medium-term, but stroke rates will decrease later.
- In the model, policy interventions are not considered to be in effect until the third year of the analysis, which means that development and implementation costs accrue in the first two years, without the policies producing any benefits.

<sup>9</sup> 2015 GDP was 437 billion som.

## 6. Conclusion

NCDs pose a significant threat to Kyrgyzstan's health and economic development. This report sets out the case for further investment in action against NCDs. It assesses the economic burden of NCDs for the country, costs specific interventions and presents a cost–benefit analysis for four intervention packages to demonstrate cost-effective solutions.

Analysis of the economic burden of NCDs in 2015 estimates total economic losses to the economy to be 17.1 billion som per year, which is equivalent to 3.9% of the country's annual GDP. One fifth of this is from direct health expenditure; over half is due to premature mortality, at 61% of overall costs. A premature death from NCD costs the economy 10.4 billion som. In addition to premature death, the analysis quantified lost productivity through absenteeism (absent work days) and presenteeism (reduced efficiency of workers in the workplace) of people with CVD and diabetes.

Four policy packages were economically evaluated for solutions – three to reduce the prevalence of NCD risk factors and one for clinical interventions. Policy packages to reduce the consumption of tobacco and salt and increase physical activity were estimated to cost 0.14 billion som, 0.04 billion som and 0.12 billion som, respectively. The CVD and diabetes interventions were found to be the most expensive options, costing 175 billion som. The most cost-effective interventions in Kyrgyzstan are those for salt. The economic benefits of these packages far exceed their costs in the long term. The salt policy package achieved an ROI of 12.3 at 15 years.

A number of reviews of NCD policies in Kyrgyzstan identified gaps in implementation against the WHO list of “best buys” or most cost-effective interventions. For example, Kyrgyzstan's tobacco control legislation has been only partially aligned with the WHO FCTC, and there are many opportunities to strengthen tobacco control further. Existing laws remain poorly enforced, and although prices for tobacco products have increased significantly (faster than inflation), this rate has not been sufficiently high to reduce the level of tobacco use prevalence. As a result, progress has been limited or moderate in implementing most effective tobacco control interventions at the population level.

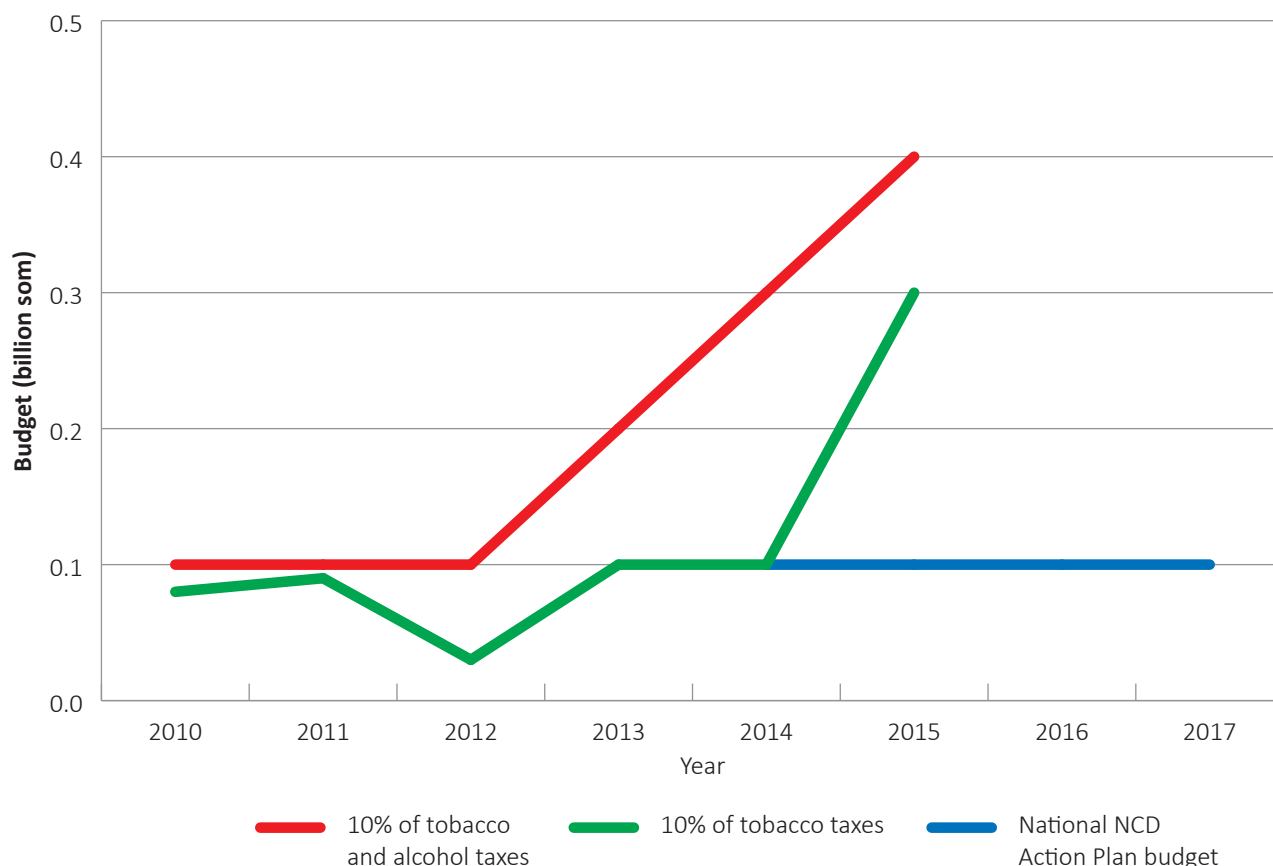
To ensure better price measures and reduced affordability of tobacco products in Kyrgyzstan, the excise tobacco tax (for both filtered and unfiltered cigarettes) should be increased by at least 30% annually in the coming three years. This measure will reduce tobacco use and increase tax revenue: international experience shows that higher tobacco taxes lead to increased government revenue, as the increase in tax normally outweighs the decline in consumption of tobacco products. Tobacco taxes are generally considered to be economically efficient as they apply to a product with inelastic demand. Low- and middle-income population groups are more responsive to tax and price changes.

Although Kyrgyzstan has a relatively low GDP compared with other post-Soviet countries, its general government expenditure on health as a percentage of total government expenditure is relatively high, compared with equivalent countries. Tobacco and alcohol taxes are explored in this report as additional sources of revenue for the government: their potential is promising and it has been found that earmarking these taxes to fill gaps in social spending often increases their acceptability to the public (WHO, 2016c). A further step would be to allocate appropriate funds to public health programmes for NCD prevention and control activities – namely, the NCD strategy as well as respective programmes addressing tobacco, alcohol (currently in draft) and nutrition and food safety. For example, if in 2015 the equivalent of 10% of tobacco revenues had been directed to implementation of the National NCD Action Plan, its overall budget would have increased three times. If this amount from tobacco revenues were combined with the equivalent of 10% from alcohol revenues, the budget for the implementation of national activities to prevent NCDs would have increased fourfold from 100 million to 400 million som (see Fig. 7).



Scenarios should be generated for raising taxes from the current level to levels consistent with full implementation of the WHO FCTC and the WHO global strategy to reduce the harmful use of alcohol (WHO, 2010). Fiscal policies to improve diet – particularly taxation and subsidies – are also important population-based policy interventions to reduce the consumption of calorie-dense foods addressing obesity and diabetes, and may serve as an additional source of revenue for the implementation of the National NCD Action Plan (WHO, 2016d).

**Fig. 7. National NCD Action Plan budget, if 10% of tobacco and alcohol revenues are allocated to its implementation**



Better financing of the National NCD Action Plan would increase state investment in the NCD prevention measures and balance government expenditure on health from costly treatment to cost-effective prevention. Implementation of the Plan would result in reduced premature NCD mortality and morbidity, leading to reduced direct and indirect costs of handling the NCD epidemic for the country. In particular, it is expected that the NCD burden in the national health care system would decrease or stop growing due to lower prevalence of CVD, diabetes, cancer and respiratory diseases.

A healthier population would allow savings on disability payments and would result in reduced absenteeism and presenteeism, lower workforce replacement costs and economic gains from the reduced premature death of people of working age.

From the analysis, the following cost-effective interventions are expected to provide the greatest impact on NCD-related health and economic outcomes:<sup>10</sup>

<sup>10</sup> All interventions mentioned are part of Annex 3 of WHO’s global action plan for the prevention and control of noncommunicable diseases 2013–2020 (WHO, 2017a) and provide good potential for both short-term and long-term outcomes.

- reduction of tobacco smoking via strengthened implementation of the WHO FCTC, to which Kyrgyzstan is a Party – in particular, tobacco tax and price increases, smoke-free public places, bans on advertising, pictorial health warnings and smoking cessation services;
- a specific annual increase in excise tax on tobacco by at least 30%, assessed in compliance with price affordability of tobacco products (the higher the tax increase, the greater the expected reduction of tobacco use and more revenue generated), applicable for both filtered and unfiltered cigarettes;
- despite the lack of data in relation to the harmful use of alcohol to inform the investment case, a reduction in the harmful use of alcohol via price measures and regulations on the affordability, marketing and sale of alcohol;
- interventions on salt reduction, which are highly cost-effective in the long term (with an ROI ratio of 12).

The increasing population of Kyrgyzstan (currently 6 million and projected to rise to 7–9 million by 2050) and the increasing prevalence of NCD risk factors suggest that unless action is taken rapidly, the costs of NCDs will grow even further, putting a huge drag on the country's economy. Given the relative youth of the population (a third aged under 15 years), an investment in prevention now would have implications for the future workforce. Actions to prevent NCDs in Kyrgyzstan are relatively cheap and cost-effective. Furthermore, as actions need to go beyond the health sector to involve other sectors such as finance, economy and agriculture, the investments are borne across the whole of government. This is a unique moment to learn from other regions and countries to make the right decisions.

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# Annex 1. Data used for calculations of NCD burden

Table A1. Share of major NCDs in total health care expenditure

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

Source: Garg CC, Evans DB (2011). What is the impact of noncommunicable diseases on national health expenditures: a synthesis of available data. Geneva: World Health Organization (NCD discussion paper no. 3; <http://www.who.int/healthsystems/NCDdiscussionpaper3.pdf>, accessed 23 August 2017).

Table A2. Productivity data

Disease	Parameter value	Year	Source of data	Details of data source
<b>Labour force participation rate reduction</b>				
Hypertension	11.0%	2009	Institute for Research and Information in Health Economics	Barnay T, Debrand T (2006). Effects of health on the labour force participation of older persons in Europe. Questions d'économie de la Santé. 109 ( <a href="http://www.irdes.fr/english/2006/issues-in-health-economics.html">http://www.irdes.fr/english/2006/issues-in-health-economics.html</a> ), accessed 8 September 2017).
Stroke	11.0%	2009	Institute for Research and Information in Health Economics	Barnay T, Debrand T (2006). Effects of health on the labour force participation of older persons in Europe. Questions d'économie de la Santé. 109 ( <a href="http://www.irdes.fr/english/2006/issues-in-health-economics.html">http://www.irdes.fr/english/2006/issues-in-health-economics.html</a> ), accessed 8 September 2017).
AMI	11.0%	2009	Institute for Research and Information in Health Economics	Barnay T, Debrand T (2006). Effects of health on the labour force participation of older persons in Europe. Questions d'économie de la Santé. 109 ( <a href="http://www.irdes.fr/english/2006/issues-in-health-economics.html">http://www.irdes.fr/english/2006/issues-in-health-economics.html</a> ), accessed 8 September 2017).
Type 2 diabetes	11.0%	2009	Institute for Research and Information in Health Economics	Barnay T, Debrand T (2006). Effects of health on the labour force participation of older persons in Europe. Questions d'économie de la Santé. 109 ( <a href="http://www.irdes.fr/english/2006/issues-in-health-economics.html">http://www.irdes.fr/english/2006/issues-in-health-economics.html</a> ), accessed 8 September 2017).
<b>Reduction in full-time hours due to absenteeism</b>				
Hypertension	0.5%	2011	Population Health Management	Mitchell RJ, Bates P (2011). Measuring health-related productivity loss. <i>Popul Health Manag.</i> 14(2): 93–8.
Stroke	5.5%	2011	Population Health Management	Mitchell RJ, Bates P (2011). Measuring health-related productivity loss. <i>Popul Health Manag.</i> 14(2): 93–8.
AMI	1.1%	2011	Population Health Management	Mitchell RJ, Bates P (2011). Measuring health-related productivity loss. <i>Popul Health Manag.</i> 14(2): 93–8.
Type 2 diabetes	0.3%	2011	Population Health Management	Mitchell RJ, Bates P (2011). Measuring health-related productivity loss. <i>Popul Health Manag.</i> 14(2): 93–8.
<b>Reduction in productivity due to presenteeism</b>				
CVD/stroke	3.7%	2011		Wang PS, Beck A, Berglund P, Leutzinger JA, Pronk N, Richling D et al. (2003). Chronic medical conditions and work performance in the health and work performance questionnaire calibration surveys. <i>J Occup Environ Med.</i> 45(12):1303–11.
Diabetes	11%	2011	Holden L, Scuffham PA, Hilton MF, Ware RS, Vecchio N, Whiteford HA (2011). Which health conditions impact on productivity in working Australians? <i>J Occup Environ Med.</i> 53(3):253–7. doi:10.1097/JOM.0b013e31820d1007.	
Time it takes to replace workers (percentage of a year)	20%	2012	Center for American Progress	Boushey H, Glynn SJ (2012). There are significant business costs to replacing employees. Washington, DC: Center for American Progress ( <a href="https://www.americanprogress.org/issues/labor/report/2012/11/16/44464/there-are-significant-business-costs-to-replacing-employees/">https://www.americanprogress.org/issues/labor/report/2012/11/16/44464/there-are-significant-business-costs-to-replacing-employees/</a> , accessed 8 September 2017).

## Annex 2. Sources of data for policy interventions – population level

Specific intervention	Source	Type of activity
<b>Tobacco</b>		
Monitor tobacco use/prevention policies	National NCD Action Plan	10% of budget for nonspecified activities
	National NCD Action Plan	Coordination and control of implementation of measures for tobacco control
Protect people from tobacco smoke	National NCD Action Plan	20% of epidemiology monitoring of risk factors on WHO methodology
	National NCD Action Plan	Development and implementation of pilot projects in Bishkek: “Healthy hospitals, centres of family medicine”, “Healthy universities, high schools, schools smoke-free”
	National NCD Action Plan	10% of budget for nonspecified activities
Offer to help quit tobacco use: mCessation	National NCD Action Plan	Providing information materials for smoking cessation for public health workers
	National NCD Action Plan	Develop mechanisms to strengthen the motivation of health workers themselves quitting
Warn about danger: warning labels	American Cancer Society Kyrgyzstan-specific estimates	Estimate
Warn about danger: mass-media campaigns	Akkazieva B, Chisholm D, Akunov N, Jakab M (2009). The health effects and costs of the interventions to control cardiovascular diseases in Kyrgyzstan: policy research paper no. 60. Bishkek: Health Policy Analysis Center	Estimate
Enforce youth access restriction	National NCD Action Plan	Enforcement of the ban sale of tobacco products to people aged under 18 years
Raise taxes on tobacco	American Cancer Society Kyrgyzstan-specific estimates	Estimate
Plain packaging of tobacco products	American Cancer Society Kyrgyzstan-specific estimates	Estimate

Specific intervention	Source	Type of activity
<b>Physical inactivity</b>		
Awareness campaigns to encourage increased physical activity	Budget of the Youth and Sport Agency	Mass-media campaigns, population involvement in physical activity, physical activity events
<b>Sodium</b>		
Surveillance	National NCD Action Plan	10% of epidemiology monitoring of risk factors on WHO methodology
Knowledge: education and communication	National NCD Action Plan	Information campaigns, round tables with employers about the dangers of excessive consumption of salt
Environment: salt-reduction strategies in community-based eating spaces	National NCD Action Plan	Raising awareness of experts and the public on matters of health and “bad” foods
	National NCD Action Plan	Submission of proposals for the revision of the diet in schools and preschools

<sup>a</sup> The activities include:

- television and radio programmes on risk factors of NCDs
- seminars with representatives of local government to implement the principles of a healthy lifestyle, including increasing the availability of sports
- development of mechanisms of interaction of the Ministry of Health’s press centre and the press centres of relevant ministries and agencies
- conducting social surveys on samples of the population on risk factors
- holding training seminars for journalists, health promotion cabinet open days, press tours and a photo exhibition on the prevention of risk factors for NCDs
- holding seminars for teachers at schools and universities
- campaigning on NCDs, including strengthening the capacity of rural health committees
- setting up a forum on healthy lifestyles.



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