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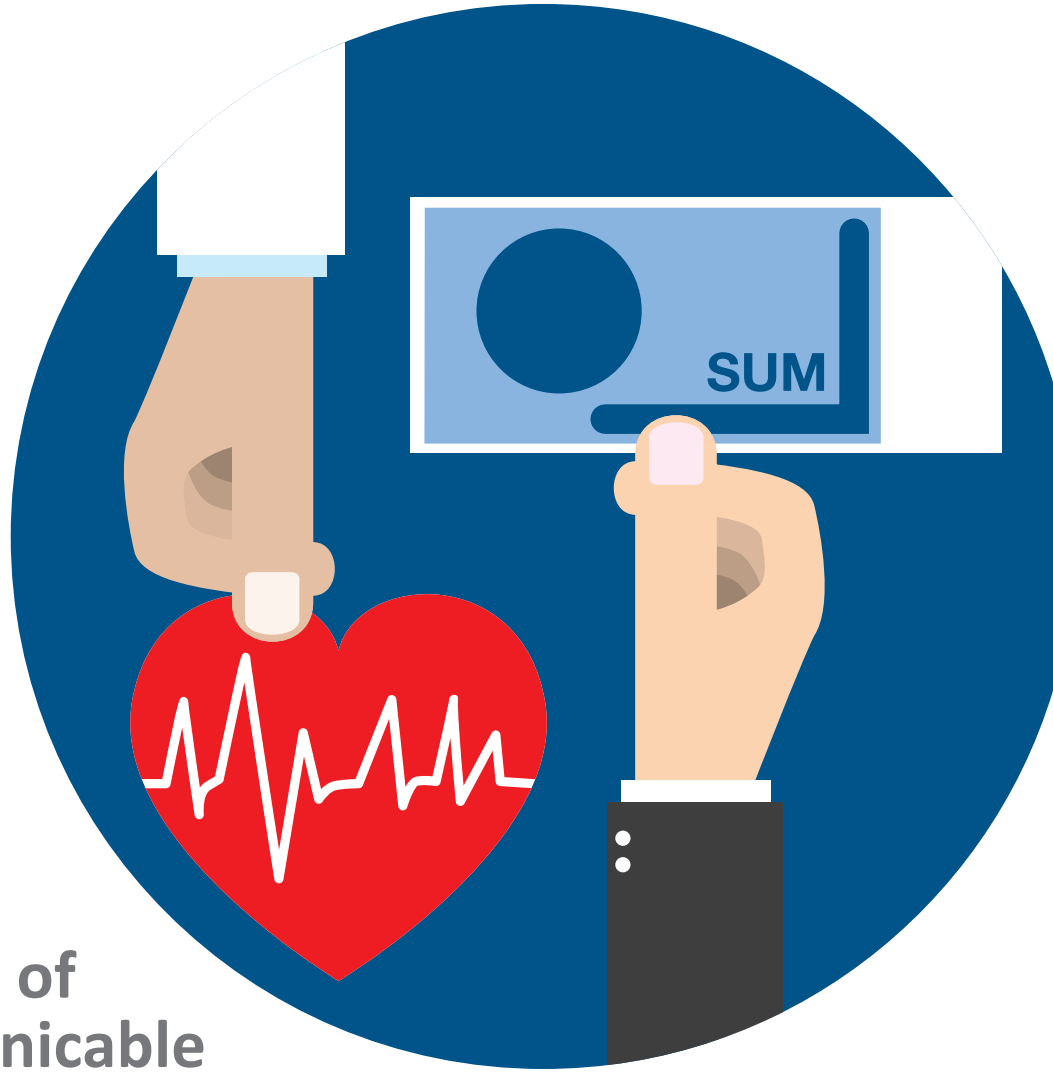

Prevention and control of noncommunicable diseases in Uzbekistan

The case for investment

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Prepared for the Ministry of Health of Uzbekistan
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Abstract

Noncommunicable diseases (NCDs) such as cancer, cardiovascular disease, diabetes and chronic respiratory diseases and their risk factors are an increasing public health and development challenge in Uzbekistan. This report provides evidence through three analyses that NCDs reduce economic output and discusses potential options in response, outlining details of their relative returns on investment. An economic burden analysis shows that economic losses from NCDs (direct and indirect costs) make up 9.3 trillion sum, which is equivalent to 4.7% of gross domestic product in 2016. An intervention costing analysis provides an estimate of the funding required to implement a set of policy interventions for prevention and clinical interventions. A cost–benefit analysis compares these implementation costs with the estimated health gains and identifies which policy packages would give the greatest returns on investment.

Keywords
NONCOMMUNICABLE DISEASES – PREVENTION AND CONTROL
CHRONIC DISEASE – ECONOMICS, PREVENTION AND CONTROL
DELIVERY OF HEALTH CARE
HEALTHCARE FINANCING
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Abbreviations

AMI	acute myocardial infarction
CVD	cardiovascular disease
FCTC	WHO Framework Convention on Tobacco Control
GDP	gross domestic product
IHD	ischaemic heart disease
LMICs	low- and middle-income countries
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	STEPwise approach to surveillance [of WHO]

Executive summary

In mid-2017, given the increasing interest in noncommunicable disease (NCD) prevention and the health system reforms within Uzbekistan, WHO and the Ministry of Health discussed the potential value of investigating the economic case for investing in NCDs. A joint United Nations visit to Uzbekistan was therefore undertaken in November 2017 to conduct such an 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 Uzbekistan, and are responsible for 79% of all deaths in the country. The probability of premature death (before the age of 70 years) from one of the four major NCDs for a person living in Uzbekistan was more than 1 in 4 in 2015. CVD is the main driver of premature mortality in the country, and excess male deaths and unhealthy lifestyle behaviour contribute to the gender gap. A third of the adult population (31%) has hypertension, and a fifth is at high risk of having a heart attack or stroke. Further, over a quarter of men smoke tobacco; half the adult population is overweight or obese.

While the country has a number of policy and legislative frameworks for NCDs, particularly addressing risk factors, an integrated NCD programme or action plan is lacking, as is a national multisectoral coordinating body for NCDs. A review of current NCD interventions at the policy and individual service levels uncovered gaps in implementation of the WHO-recommended cost-effective NCD preventive and clinical interventions. The review drew attention to areas that need strengthening and scale-up to achieve 100% coverage.

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 Uzbekistan are causing a surge in health care costs and social care and welfare support needs, as well as contributing to reduced productivity. The government was estimated to have spent 2.1 trillion sum on treatment for the four main NCDs in 2016.

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 were performed.

An economic burden analysis showed the scale of disruption to the economy from NCDs through assessment of their direct and indirect costs. Direct costs include government (public) health care costs for treating CVD, diabetes, cancer and respiratory disease, and disability payments. Indirect costs are based on costs of absenteeism, costs of presenteeism and economic losses due to premature deaths among people of working age.

An intervention costing analysis provided an estimation of the funding required to implement a set of interventions for NCD prevention; policy packages to reduce tobacco use, harmful alcohol consumption and unhealthy diet and to improve physical activity; and a package of clinical interventions for cardiovascular diseases and diabetes.

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 over a five and fifteen-year period.

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 3.5 times higher, at 7.3 trillion sum. Altogether, the current economic cost of NCDs to the Uzbekistan economy is 9.3 trillion sum per year, which is equivalent to 4.7% of the country's annual gross domestic product.

Actions to prevent NCDs in Uzbekistan are relatively cheap and cost-effective. Their implementation requires engagement from sectors beyond health, such as finance, economy and agriculture, and benefits from the

investments would accrue across the whole of government and society. The intervention costing analysis reviewed four packages of interventions for the prevention and control of NCDs in the areas of tobacco control, harmful use of alcohol, physical inactivity and unhealthy diet, as well as a package of clinical interventions for CVD and diabetes. Policy packages for 2018–2022 to reduce the consumption of tobacco, alcohol, salt and to increase physical activity were estimated to cost 6.5 billion sum, 11.7 billion sum, 6.2 billion sum and 7.6 billion sum, respectively. The CVD and diabetes interventions were found to be the most expensive options, costing 140.7 billion sum.

The economic modelling for the return on investment analysis suggests that the most cost-effective intervention in Uzbekistan is the package of salt-reduction interventions. The salt policy package achieved a benefit-to-cost ratio of 64.8 when considered across a 15-year period. Reducing tobacco and increasing physical activity in the population would also provide high ROI. ROIs for alcohol interventions are lower, and CVD and diabetes clinical interventions result in an ROI of less than 1 sum per 1 sum invested over five and 15 years.

1. Introduction

In 2015 noncommunicable diseases (NCDs) accounted for 79% of all deaths in Uzbekistan – this is higher than the proportion of deaths attributable to NCDs at the global level (71%). The latest figures from 2015 show that an Uzbek citizen has a higher than one in four chance (26.9%) 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 significantly higher probability for men (32.9%) than women (21.4%) (WHO, 2017a). 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 by one third by 2030.

The impact of NCDs on human health is clear, but it is only one part of the story. NCDs also result in high economic costs, including but reaching far beyond direct health-care costs. NCDs reduce productivity at a macroeconomic 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[1]). In low- and middle-income countries (LMICs), 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 to treat health problems that could otherwise have been prevented can mean significant opportunity costs,[2] 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 Uzbekistan. WHO recognizes that the risk of NCDs can be reduced by modifying four types of behaviour (tobacco use, harmful use of alcohol, an unhealthy diet and physical inactivity) and metabolic risk factors such as high blood pressure and 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 Noncommunicable Diseases 2013–2020 (WHO, 2013). These “best buys” were updated at the 2017 World Health Assembly (WHO, 2017b; 2017c) 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 more than half of Uzbekistan’s deaths in 2014 were caused by heart disease, stroke, myocardial infarction and other circulatory diseases (WHO, 2014a), the economic analysis detailed in this study focuses primarily on interventions that can reduce this burden of CVD.

Purpose of the economic analysis component of the case for investment

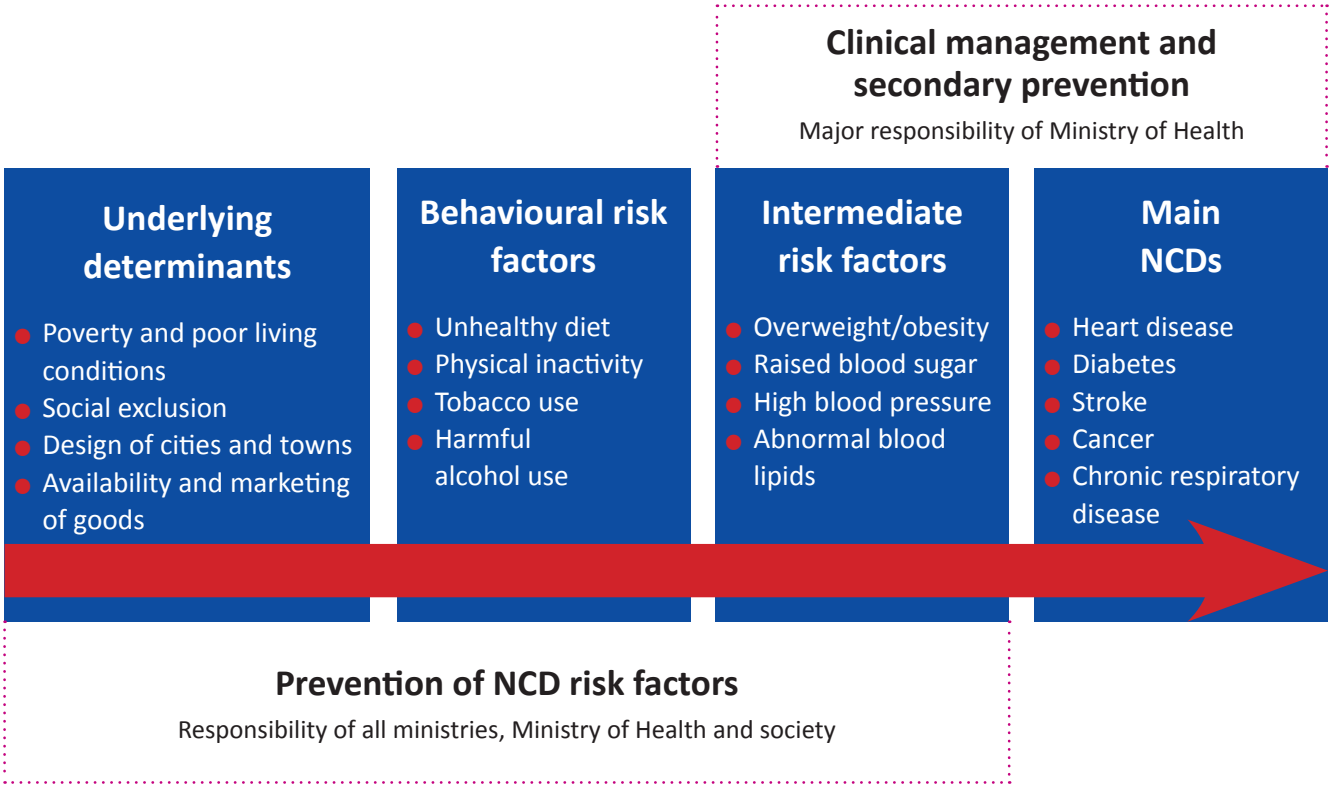
The negative economic impacts from NCDs are too often overlooked in budgetary allocation processes and in weighing the pros and cons of stronger fiscal and regulatory action. Quantifying the costs of NCD management and interventions to prevent and control NCDs, as well as their returns on investment (ROIs) 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.

In mid-2017, given the increasing interest in NCD prevention and the health system reforms within Uzbekistan, WHO and the Ministry of Health discussed the potential value of investigating the economic case for investing in NCDs. A joint United Nations visit to Uzbekistan was therefore undertaken in November 2017 to conduct such an economic analysis.

[1] “Presenteeism” is defined as reduced productivity at work.

[2] “Opportunity cost” is a term used in economics, defined as the cost of something in terms of an opportunity forgone: “opportunity cost is given by the benefits that could have been obtained by choosing the best alternative opportunity” (Oxford Dictionary of Economics [online]).

Fig. 1. Determinants of NCDs and responsibilities for response



The investment case allows scaled-up action – and the costs of inaction – to be modelled in medium-term (five 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 ROI metric) to be evaluated and reported for each package of interventions. The human capital approach 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.

Section 2 provides an analysis of NCD behavioural risk factors in Uzbekistan, including current levels/patterns of tobacco and alcohol consumption, diet and physical inactivity, 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 Uzbekistan. 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 four 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 the background information used in preparation of the investment case analysis. It addresses NCDs as a whole and the extent to which behavioural risk factors are present in Uzbek 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.

Tobacco

Findings from the 2014 national WHO STEPwise approach to surveillance (STEPS) survey indicate that 14.4% of Uzbek adults aged 18–64 years smoke, and almost a tenth (9%) of adults are daily smokers (WHO, 2014b). A marked gender imbalance exists for tobacco consumption among adults: only 1.4% of women smoke compared to 26.8% of men. Smokeless tobacco is currently used by 23.2% of men and 0.2% of women.

In the seven days prior to a survey of young people (CDC, 2014), 12.6% of youths were exposed to second-hand smoke at home and 21.0% of youths were exposed to second-hand smoke in their workplace or inside enclosed public places.

Key facts are summarized in Box 1.

Box 1. Tobacco snapshot

Tobacco use is of major concern, since a quarter of Uzbek men smoke.

Attributable NCDs include multiple forms of cancer; ischaemic heart disease (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.

Alcohol

The 2014 STEPS survey findings show that around a third (30.7%) of males (but only 5.7% of females) are considered current alcohol users, indicating that they have had a drink in the past month (WHO, 2014b). Further, the rate of alcohol consumption appears to have decreased. In 2010[3], Uzbek adults (aged 15 years and over) drank on average 3.2 litres of alcohol per capita; this decreased to 2.7 litres on average by 2016[4], although this was still less than one third of the average consumption for the WHO European Region (9.8 litres) (WHO, 2018a). Men are estimated to consume over six times (4.8 litres) as much alcohol per capita as women (0.7 litres).

Episodic drinking is high. Among alcohol users, 39% of adults binged (consumed 60 g or more of pure alcohol on at least one occasion in the past 30 days), almost three times higher for men (47%) than women (17%) (WHO, 2018b).

Key facts are summarized in Box 2.

Box 2. Alcohol snapshot

Alcohol use is of concern since, on average, men drink six times as much as women and one in nine 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.

Physical inactivity

According to the 2014 STEPS survey, around one in six (16.4%) Uzbek adults aged 18–64 years is insufficiently active, engaging in less than the 150 minutes per week of moderate-intensity physical activity as recommended by WHO (WHO, 2014b). Rates of inactivity are significantly higher for women than men. Around half (51.5%) of

[3] Three-year average for the period 2009–2011.

[4] Three-year average for the period 2015–2017.

physical activity is work-related, a third is transport-related (36.0%) and an eighth is recreational (12.4%); for all modes, women spend significantly less time than men per day engaged in the type of physical activity. Almost three quarters (60.9%) of adults do not engage in vigorous activity, particularly women.

Key facts are summarized in Box 3.

Box 3. Physical inactivity snapshot

Activity levels are significantly higher for men than women, with around half of physical activity work-related and a third transport-related each day. One in six adults is insufficiently active.

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

Salt

Unhealthy diet includes, for example, consumption of *trans*-fats and excess consumption of sodium or salt and sugar. This section focuses on salt, given the policy interventions that can be modelled and the data available.

The age-standardized intake in 2010 for people aged 20 years and over was estimated then to be equivalent to 14.1 g of salt per day (5.63 g of sodium per day) – more than 2.5 times above the WHO-recommended limits of 5 g of salt per day (<2 g of sodium per day) (WHO, 2012). A 24-hour urinary sodium excretion survey in 2014, using gold standard methods, found that, for adults aged 18–64 years, the median salt intake was around 14.9 g per day.[5]

The 2014 STEPS survey shows that 15.6% of Uzbek adults add extra salt to their food on a regular basis when eating and 36.1% do so when preparing meals, with no significant difference between the sexes (WHO, 2014b).

Over a quarter (28.2%) of cardiovascular deaths among 20–69-year-olds in 2010 were attributed to salt consumption of more than 5 g per day (>2 g of sodium per day) (Mozaffarian et al., 2014).

Key facts are summarized in Box 4.

Box 4. Salt snapshot

Salt consumption in Uzbekistan is estimated to be more than 2–3 times higher than the WHO recommendation.

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 salt is 28.2%.

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. Within Uzbekistan, half (50.1%) of adults are overweight or obese (29.8% overweight[6] and 20.2% obese[7]).

Table 1 displays the prevalence of raised blood pressure,[8] raised total cholesterol[9] and diabetes[10] within the Uzbek population reported by the 2014 STEPS survey.

[5] WHO and Ministry of Health of Uzbekistan, unpublished findings of a cross-sectional survey to estimate sodium and potassium intake by 24-hour urinary sodium and potassium excretion, 2014.

[6] Body mass index 25.0–29.9 kg/m^2.

[7] Body mass index ≥30.0 kg/m^2.

[8] Systolic blood pressure ≥140 mmHg and/or diastolic blood pressure ≥90 mmHg or currently on medication for raised blood pressure.

[9] Raised total cholesterol ≥5.0 mmol/L or ≥190 mg/dL or currently on medication for raised cholesterol.

[10] Raised blood glucose (defined as either plasma venous value of ≥7.0 mmol/L (126 mg/dL) or capillary whole blood value of ≥6.1 mmol/L (110 mg/dL)) or currently on medication for diabetes.

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

Factor	Men		Women	
	30–44 years	45–64 years	30–44 years	45–54 years
Raised blood pressure	36.0%	61.4%	22.9%	57.1%
Raised total cholesterol	43.2%	49.7%	52.5%	64.6%
Diabetes	8.6%	15.5%	7.8%	18.6%

Source: WHO (2014b).

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: sex, age, blood pressure, cholesterol, smoking status and whether or not they have diabetes (WHO, 2016a). The prevalence of high cardiovascular risk among the Uzbek population can be estimated from the 2014 STEPS survey according to the presence of risk factors or history of CVD or diabetes (WHO, 2014b). This suggests that 20.2% of Uzbek 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 but there is no significant difference between the sexes (Table 2).

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

Factor	Men		Women	
	40–54 years	55–64 years	40–54 years	55–64 years
10-year cardiovascular risk ≥30%, or with existing CVD	14.1%	22.8%	21.7%	28.4%

Source: WHO (2014b).

3. Policies and treatments to reduce the NCD burden

The NCD policy framework in Uzbekistan includes the following laws and regulations (WHO, 2017d):

- a law of 2015 setting out the imposition of penalties for use of tobacco products on workers and in public places, and increased penalties for use of alcohol in public places and tobacco products in public transport;
- Resolution of the Cabinet of Ministers No. 251 of 29 August 2015 on approval of the concept and a set of measures in the field of healthy nutrition of the population of the Republic of Uzbekistan, including labelling measures for sugar, trans-fats and salt, developing recipes for school foods, developing the norms on trans-fat and salt content in selected mass-consumption ready-to-eat products, and measures to prevent iron and vitamin deficiencies among women and children;
- Resolution of the Cabinet of Ministers No. 199 of 10 June 2016 on restriction of sales and retail promotion of alcohol and tobacco products to persons under 20 years of age;
- Presidential resolution No. 2597 of 16 September 2016 on improvement of measures to limit retail sale of alcohol products;
- Order of the Ministry of Health No. 70 of 30 November 2016 and Order of the Ministry of Justice No. 2840 on regulations on the procedure for production and placement warning signs not permitting consumption

of alcohol and tobacco products and informing about a special place and (or) premises for the use of tobacco products;

- Order of the Chief Hygiene Doctor (SanPiN) No. 0283-10 of 14 March 2016 on hygienic requirements for food safety products: restrictions on the content of salt, trans-fatty acids and sugar in products of general availability for mass consumption;
- Presidential resolution No. 2857 of 29 March 2017 on measures to improve the organization of primary health care institutions, piloting WHO protocols for primary health care and best practices at the national level from 2018;
- Presidential Resolution issued 5 June 2017 on measures for the further development of physical activity and mass sport with state programme and funding for 2017–2021 with allocation of 995.2 billion sum for building, reconstructing and equipping 167 sport facilities and swimming pools, covering all regions; and
- Presidential Decree 5368 of 5 March 2018 on measures for fundamental improvement of the system of governance for the physical culture and sport area.

While a number of policy and legislative frameworks for NCDs – particularly for risk factors – are already in place, an integrated national NCD programme or action plan has been lacking, as has a national multisectoral coordinating body for NCDs. Nevertheless, during 2018, in support of the development of a long-term concept for health sector reform, the President created a Presidential Office Steering Committee Meeting on Health Reform and 10 working groups, all interministerial and intersectoral. An intersectoral programme on healthy lifestyles and NCD prevention and control is also being developed.

As highlighted in Section 1, WHO has published a menu of policy options and interventions to prevent and treat NCDs (WHO, 2017b). The following sections review current national NCD prevention and control efforts against these in order to identify areas of strength and areas that may need further development or scale-up to achieve full coverage.

Tobacco

Uzbekistan ratified the WHO Framework Convention on Tobacco Control (FCTC) in 2012 (WHO, 2017e). A tobacco law is in place but is not comprehensive. At the time of the assessment a revision of the tobacco law was under way.

Table 3 summarizes a comparison of Uzbekistan'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, 2017f), supplemented by the institutional and context analysis and a 2017 WHO review of tobacco and alcohol control (unpublished).

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

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,[11] WHO reports that only one (public transport) is covered by a smoke-free law, and even that only scores a compliance level of 2 out of 10 (scores below 5 are low compliance). The overall problem has been with tobacco control legislation enforcement (stakeholders noted the importance of engaging the Ministry of Internal Affairs on NCDs). A new law banning the use of e-cigarettes and water pipes in public places was adopted in 2018. An age restriction for purchase of tobacco products is in place, although this is apparently not strongly enforced.
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	1–2	There has not been a national anti-tobacco mass campaign during the last few years. Health warnings are present on tobacco packages (40% of package covered, front and back combined), with some appropriate characteristics (WHO, 2018b).
Enforce bans on tobacco advertising, promotion and sponsorship	3	A ban on advertising via TV, radio and print media is in place but does not cover all forms of direct or indirect advertising.
Raise taxes on tobacco	2	MPOWER reports that 35.9% of the retail price of the most popular brand is tax; however, the specific excise tax is only 19.2% (as against the 70% global recommendation). There has been resistance to raising taxes for cigarettes further: the reason cited is that it may force the population to turn to *nasvai* (tobacco snuff).

Source: WHO (2017g).

Table 3 indicates that additional policies could be put in place to reduce tobacco consumption and meet WHO FCTC obligations, particularly regarding regulation and taxation of cigarettes and *nasvai* as well as warnings and smoke-free environments.

Most of these policy interventions are also WHO "best buys" (WHO, 2017b); that is, effective interventions with cost–effectiveness analysis ≤100 international dollars per disability-adjusted life-year averted in LMICs. This list largely corresponds with those listed within the OneHealth Tool that can be modelled as part of the ROI analysis:

[11] 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, 2017g).

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

Alcohol

The global strategy and European action plan to reduce the harmful use of alcohol, as well as the updated Appendix 3 of WHO's Global Action Plan for the Prevention and Control of Noncommunicable Diseases 2013–2020, list core policy options for alcohol control (WHO, 2017b). These are reproduced in Table 4, alongside some of the achievements to reduce alcohol consumption in Uzbekistan. Overall, alcohol policy and regulatory documents can be considered fairly strong in Uzbekistan.

Table 4. The current state of alcohol control interventions in Uzbekistan

Policy	Menu of policy options	Current state of implementation
Taxation	Increase excise taxes on alcoholic beverages	Sale of alcohol without excise labels is prohibited. Excise taxes are increased annually based on price dynamics, sales volumes, inflation and other factors. Nevertheless, the average retail price of various alcoholic beverages is at the lower end of the range for countries in the WHO European Region.
Advertising	Enact and enforce bans or comprehensive restrictions on exposure to alcohol advertising (across multiple types of media)	The policy instruments referred to at the start of Section 3 include restrictions on alcohol advertising. Advertising is banned, including sponsorship of events and use of trademarks on clothing. Promotion of alcohol consumption is banned but product placement within movies and advertising at points of sale may occur.
Availability	Enact and enforce restrictions on the physical availability of retailed alcohol (via reduced hours of sale)	The hours for alcohol sales are restricted. Alcohol can only be sold in licensed premises. The location of retail sales is also restricted – for example, not within 500 metres of an educational, sports or religious institution. There are also rules governing the maximum amount of alcohol that can be supplied to a customer, as well as the option to refuse supply to one already intoxicated. Sales to people younger than 20 years are banned. Stakeholders noted a recent positive shift in the enforcement of this age restriction, with salespeople increasingly checking the age of consumers.

Table 4. (continued)

Policy	Menu of policy options	Current state of implementation
Drink–driving	Enact and enforce drink–driving laws and blood alcohol concentration limits via sobriety checkpoints	Legal and regulatory instruments do not provide a maximum permissible blood alcohol concentration (BAC) when driving. Nevertheless, drink-driving is a criminal offence regardless of BAC. The sanctions for drink-driving are tough and the fines are high. The minimum wage is 173 000 sum, and drink-driving is punished with a fine of 3 million sum and may lead to imprisonment. However, not all police cars are equipped with breathalysers, so suspected drivers are sent to be medically tested for intoxication. In 2017, 135 000 drivers underwent medical examination for intoxication, but only 75 000 cases were proved.
Brief interventions	Provide brief psychosocial intervention for persons with hazardous and harmful alcohol use	A new WHO toolkit on alcohol screening and brief intervention was used for training narcologists (medical specialists who study and treat substance misuse) and trainers for primary health care settings in April 2017. Brief interventions on alcohol and motivational interviewing are also part of the integrated NCD prevention training package for primary health care doctors and nurses as part of the WHO package of essential noncommunicable disease interventions (PEN) project within two regions in Uzbekistan. Otherwise, brief interventions are not part of routine care in primary health care.

This assessment would seem to accord with the WHO NCD progress report of 2017 (WHO Regional Office for Europe, 2017), which assesses the overall implementation of alcohol control measures as “partly achieved”. Fairly strong regulatory measures are in place but are not strictly enforced.

The first three interventions listed in Table 4 are also WHO “best buys”. The fourth and fifth are WHO “effective interventions” with cost–effectiveness analysis >100 international dollars per disability-adjusted life-year averted in LMICs. These policy interventions largely correspond with those listed within the OneHealth Tool that can be modelled as part of the ROI analysis:

- enforce restrictions on availability of retailed alcohol
- enforce restrictions on alcohol advertising
- enforce drink–driving laws (sobriety checkpoints)
- raise taxes on alcoholic beverages.

Physical inactivity

The updated Appendix 3 of WHO’s Global Action Plan for the Prevention and Control of Noncommunicable Diseases 2013–2020 lists several policy options for improving physical activity levels (WHO, 2017b). These are reproduced in Table 5, alongside some of the achievements to increase physical activity in Uzbekistan mentioned during the United Nations team visit.

Table 5. The current state of physical activity interventions in Uzbekistan

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 behaviour	Some limited public awareness campaigns have been carried out at the local level, largely focused at youths, using printed and some video materials.
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 PEN in primary health care, doctors and nurses have been trained to deliver lifestyle counselling and brief interventions.
Environment	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	Tashkent contains public open/green space. Pedestrian paths exist but cycling paths and bicycle riding were not observed. In Fergana, on a previous WHO visit, bicycle use and bicycle stands were observed in rural areas of the healthy lifestyles pilot project.
	Provision of convenient and safe access to high-quality public open space and adequate infrastructure to support walking and cycling	
Setting	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	Physical education facilities within schools have been strengthened nationally. A presidential foundation of child sports development funded the reconstruction and building of new sports facilities for children and equipping them properly. The legislation specifies Uzstandard to monitor and control the quality of all new and reconstructed facilities. Physical exercise within school is not compulsory and a national minimum has not been set. There is a new Ministry of Preschool Education that can support a healthy life trajectory.
	Implementation of multicomponent workplace physical activity programmes	
Promotion	Promotion of physical activity through organized sport groups and clubs, programmes and events	There is a new Ministry of Sport. Under the previous President, free after-school sports clubs were established. Sports facilities have been built or upgraded around the country in recent years. From 2003 to 2009, 1117 children sports facilities were reconstructed, built and equipped, 82% in rural areas. After that, each year plan included from 10 to 50 facilities. In 2012–2017, 11.23 trillion sum was allocated from the state budget for this purpose.

The ROI analysis can model the following policy change:

- public awareness campaigning on physical activity.

High consumption of salt, *trans*-fats and sugar

As the OneHealth Tool is not yet able to calculate the impact of interventions on fats and sugar, this section focuses on salt only.

No specific policy measures are in place to reduce salt intake in Uzbekistan. Fortification of flour with iron and iodized salt has been promoted in response to the high prevalence of micronutrient deficiency. Table 6 compares Uzbekistan's current progress 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 6. The current state of policies to reduce salt consumption in Uzbekistan

Policy	Description[a]	Current state of implementation
Surveillance: measure and monitor salt use	Measure and monitor population salt consumption patterns and the sodium content of food	The 2014 STEPS survey (WHO, 2014b) asked about salt consumption patterns and a 24-hour urinary excretion study to estimate salt consumption was carried out (see details in Section 2). The sodium content of food is not yet monitored, although this is planned in 2019.
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	A regulation from 2016 restricts the salt content of products of general availability for mass consumption, but no enforcement measures, laboratory capacity and even labelling are problems.
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)	Labelling of nutritional contents including salt is recommended by the Chief Hygiene Doctor but is not obligatory. Therefore, a mandatory nutrient declaration requiring salt is not in place nor is a system for easy-to-understand front-of-pack labelling. There are also no restrictions on marketing foods to children, and no study has been conducted to date to explore the extent and nature of this.

Table 6. (continued)

Policy	Description[a]	Current state of implementation
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	There is a healthy lifestyle pilot project and community strategies to support healthy lifestyles (including healthy nutrition) in pilot regions (Fergana and Qashkadarya). As part of the pilot project, WHO conducted a series of round-tables and meetings with media, the association of bread producers and the trade-industrial chamber. The national team also trained youth union volunteers on healthy diet and physical activity "healthy lessons" in both regions and later conducted peer-to-peer short lessons and activities in summer camps and at the community level. Community campaigns in the pilot regions included basic recommendations on fruit and vegetable consumption, salt reduction, trans-fat, sugar and physical activity, disseminated through brochures, local supermarkets and mass-media TV shows. Patronage nurses (outreach primary health care nurses) also promote healthy eating and food preparation for the family during home visits.
Environment: support settings to promote healthy eating	Implement multicomponent salt-reduction strategies in community settings (e.g. schools, workplaces, hospitals)	In schools, healthy lessons are being designed.

[a]Information in the Description column is derived from the SHAKE technical package for salt reduction (WHO, 2016b).

Four of these interventions are assessed as WHO "best buys" (reformulation; environment; knowledge; labelling). These policy interventions correspond with those listed within the OneHealth Tool that can be modelled as part of the ROI analysis:

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

In addition, the updated Appendix 3 to the Global Action Plan for the Prevention and Control of Noncommunicable Diseases 2013–2020 contains two "effective interventions" (with cost–effectiveness analysis ≥US$ 100 per disability-adjusted life-year averted in LMICs), and the current state of implementation for these is as shown in Table 7.

The OneHealth Tool is currently unable to model the impact of unhealthy diet policy interventions beyond salt-reduction policies, such as those for reducing consumption of fats and sugars, so these are not included as part of the ROI analysis.

Table 7. The current state of policies for *trans*-fats and sugars

Policy	Description	Current state of implementation
Trans-fats	Eliminate industrial *trans*-fats through the development of legislation to ban their use in the food chain	There has been no legislation to ban *trans*-fats yet but the Food Security regulation since 2016 restricts the *trans*-fat content of products for mass consumption (although which products is not defined). For goods with fat content above 20%, the maximum content of *trans*-fat should be not more than 4 g per 100 g of the product. For products with fat content less than 2%, it should not exceed 10 mg per 100 g of the food product. Since this document is not supported by any further monitoring and control system, however, it is not working.
Sugar	Reduce sugar consumption through effective taxation on sugar-sweetened beverages	The same legislation as above also restricts sugar content of mass-produced food, and sugar is to be included in the labelling of products.

CVD and diabetes clinical interventions

The updated Appendix 3 of WHO's Global Action Plan for the Prevention and Control of Noncommunicable Diseases 2013–2020 lists multiple clinical interventions for CVD and diabetes (WHO, 2017b). A selection of those most relevant to this analysis is reproduced in Table 8, alongside an assessment of the situation in Uzbekistan. The state of policies on diabetes was not specifically investigated but is referred to partly within the section on cardiovascular risk assessment and management.

Table 8. The current state of policies to reduce cardiovascular risk in Uzbekistan

Policy	Description	Current state of implementation
Cardiovascular risk assessment and management	Screening for risk of CVD and diabetes	Annual health checks have existed for some time. The 2014 STEPS survey (WHO, 2014b) found that 58.7% of those deemed to be at high risk[12] of a fatal or nonfatal CVD event had received treatment and counselling. Nevertheless, availability of cardiovascular risk assessment and management was self-assessed as "not achieved" in 50% or more of primary health care facilities in a WHO report (WHO Regional Office for Europe, 2017). The 2014 STEPS survey also found that only 15.4% of those who were found to be hypertensive[13] were on medication and controlled. WHO PEN protocols are being implemented within pilot projects in eight clinics in two regions of Uzbekistan, and doctors and nurses within primary health care have been trained in cardiovascular risk stratification and management. Evaluation at 12 months indicated high coverage of target population with improvement of treatment.
	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 (≥30%) of a fatal and nonfatal cardiovascular event in the next 10 years	
	Treatment of cases with established IHD and post–myocardial infarction	
Acute myocardial infarction (AMI) and stroke	Treatment of new cases of AMI with either acetylsalicylic acid or acetylsalicylic acid and clopidogrel, or thrombolysis or primary percutaneous coronary interventions	There is a current focus on health system reform, including improvement of infrastructure and emergency health services. High payments of the population for medicines is a problem
	Treatment of acute ischaemic stroke with intravenous thrombolytic therapy	

[12] Proportion of the population aged 40–64 years with a 10-year CVD risk ≥30%, or with existing CVD. A 10-year CVD risk of ≥30% is defined according to age, sex, blood pressure, smoking status (current smokers OR those who quit smoking less than one year before the assessment), total cholesterol and diabetes (previously diagnosed OR a capillary whole blood value ≥6.1 mmol/L).

[13] Systolic blood pressure ≥140 mmHg and/or diastolic blood pressure ≥90 mmHg or currently on medication for raised blood pressure.

Table 8. (continued)

Policy	Description	Current state of implementation
Diabetes	Glycaemic control	One result of the WHO PEN pilot implementation is that patients with diabetes now appear to receive better care (access to diagnostic tests and treatment) and achieve better control. People aged over 40 years with diabetes seem to have improved access to statins as part of the WHO PEN pilot. In principle, insulin treatment is available fully reimbursed, but access to medicines otherwise may be challenging because of cost if the patient is not in a vulnerable group for whom reimbursement is possible. Patronage nurses are responsible for follow-up of patients with diabetes and hypertension and the relevant therapeutic education schools for patients with diabetes and hypertension, but this is not standardized or monitored; they are taking a greater role in PEN pilots. Across the country, however, patients seeking care go directly to district or regional endocrinologists to get prescriptions and tests such as glycosylated haemoglobin, which cannot be obtained at primary health care level. Quality of glycaemic control is not a performance indicator for providers, and patients may have difficulty getting glucometers and test strips if living in a rural area.
	Diabetic retinopathy screening and foot care to avoid complications	Patronage nurses all over the country have been trained in foot care. In principle, ophthalmoscopes are in place in primary health care facilities, but in practice they may not be working or doctors may not be confident in their use.

The OneHealth Tool is able to model the following package of interventions as part of the ROI analysis:

- screening for risk of CVD and diabetes
- treatment for those with high absolute risk of CVD and diabetes (>30%)
- treatment of new cases of AMI with aspirin
- treatment of cases with established IHD and post–myocardial infarction
- treatment for those with established cerebrovascular disease and post-stroke
- treatment of cases with rheumatic heart disease (with benzathine benzylpenicillin)
- standard glycaemic control
- intensive glycaemic control
- retinopathy screening and photocoagulation
- neuropathy screening and preventive foot care.

Summary

A review of current NCD interventions at policy and individual service level uncovered gaps in implementation of the WHO-recommended cost-effective NCD preventive and clinical interventions and drew attention to areas that need strengthening and scale-up to achieve 100% coverage. The estimation of current level of coverage based on the assessment above is summarized in Table 9.

Table 9. Estimated current coverage of NCD interventions to be costed within the OneHealth Tool

TOBACCO	
Monitor tobacco use and prevention policies	50%
Protect people from tobacco smoke	50%
Offer to help quit tobacco use: mCessation	50%
Warn about danger: warning labels	50%
Warn about danger: mass-media campaign	25%
Enforce bans on tobacco advertising	75%
Enforce youth access restriction	75%
Raise taxes on tobacco	50%
Plain packaging of tobacco products	0%
HAZARDOUS ALCOHOL USE	
Enforce restrictions on availability of retailed alcohol	75%
Enforce restrictions on alcohol advertising	75%
Enforce drink-driving laws (sobriety checkpoints)	50%
Raise taxes on alcoholic beverages	50%
PHYSICAL ACTIVITY	
Public awareness campaigning on physical activity	50%
SALT	
Surveillance	75%
Harness industry for reformulation	50%
Adopt standards: front-of-pack labelling	50%
Adopt standards: strategies to combat misleading marketing	25%
Knowledge: education and communication	25%
Environment: salt-reduction strategies in community-based eating spaces	25%
CLINICAL INTERVENTIONS: CVD	
Screening for risk of CVD and diabetes	75%
Treatment for those with high absolute risk of CVD and diabetes (>30%)	50%
Treatment of new cases of AMI with aspirin	75%
Treatment of cases with established IHD and post–myocardial infarction	75%
Treatment for those with established cerebrovascular disease and post-stroke	50%

Table 9. (continued)

CLINICAL INTERVENTIONS: DIABETES	
Standard glycaemic control	75%
Retinopathy screening and photocoagulation	50%
Neuropathy screening and preventive foot care	75%

Note: Coverage of policy interventions was estimated by the authors based on the assessment in Section 3. This was shared with the national team for comment in November 2017.

4. Methods

A multiagency, multidisciplinary team comprising staff from the Ministry of Health, WHO, United Nations Interagency Task Force on the Prevention and Control of Non-communicable Diseases, United Nations Development Programme and the National Research Centre for Preventive Medicine, Moscow, Russian Federation undertook initial data collection and analysis in Uzbekistan from 27 November to 1 December 2017 to complete a three-tier economic NCD investment case, complemented by an institutional and context analysis. The team consisted of health economists, epidemiologists and social development and public health experts. Intensive follow-up work (described below) was undertaken as part of the methods for collecting and analysing data.

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

- calculation of the 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 impact; and
- ROI analysis.

It also briefly describes the institutional and context analysis methods.

Calculating the economic burden of NCDs

WHO and the United Nations Development Programme developed the model for calculating the economic burden of NCDs, which provides estimates of the current direct and indirect costs of NCDs in Uzbekistan. The data used for the population by age and sex for the period 2018–2032 were modelled based on the population trends during 2008–2018. The details incorporated were incidence rates by age and sex for heart attack and stroke (no country-specific data were available on the disease incidence by age group, so we applied the age distribution from the registries of the neighbouring country Kyrgyzstan to hospital discharge data on ICD code groups) and prevalence by age and sex for diabetes, hypertension and chronic respiratory disease. The 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 2018 and 2032, holding current rates constant.[14] These projections were summarized as total incidence, prevalence and mortality for both the entire population and the working-age population, defined as those 15–64 years old.

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

[14] The model estimates growth in prevalence, incidence and mortality due to population growth only – not growth in disease rates.

- Since only total government health expenditure data are available in Uzbekistan, the share of total health expenditure on NCDs was calculated based on a WHO analysis covering 13 countries (Garg & Evans, 2011; see Annex 1, Table A1), median numbers from 13 countries were used. Direct non–health care costs consisted of disability payments, which were calculated using the number of people who became disabled from certain diseases and annual payments to people with disabilities.
- The annual value (in terms of economic output) of each full-time worker in Uzbekistan was calculated. This is based on gross domestic product (GDP) per employed person, defined as the country's GDP (199.3 trillion sum in 2016) divided by its total employed labour force. Local data on the total labour force aged 15 years and older, the unemployment rate and the labour force participation rate were used to determine the total employed labour force for Uzbekistan.
- 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 from hypertension, stroke, AMI and diabetes; (b) the reduction in full-time hours worked because of absenteeism; (c) the reduction in productivity because of 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 Uzbekistan in 2015 was determined. Using the labour force participation, unemployment and mortality rates, the model began with people of working age with NCDs; subtracting those who chose not to participate in the labour force or were unemployed; subtracting those who could not participate in the labour force specifically because of their NCD; and, finally, subtracting those who had died. The result estimated the number of active workers with NCDs.
- The final steps were to calculate the economic losses due to premature deaths based on the numbers of workers who had 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 the GDP per employed person. This calculation resulted in the total indirect costs of each NCD.

Calculating the costs of policy and clinical intervention

The costs of policy interventions were calculated using the WHO Costing Tool (Chisholm, 2011; WHO, 2012). The costs of clinical interventions were calculated using the OneHealth Tool. These identify, quantify and value each resource required for the intervention as follows:

- For each policy, the WHO costing tool or OneHealth Tool costs human resources, training, external meetings, mass-media campaigns (such as television and radio time and newspaper advertisements) and other miscellaneous equipment needed to enact policies and programmes.
- Each policy contains assumptions, set by WHO experts, about the quantity of input required to implement and enforce it – the WHO costing tool or OneHealth Tool estimate the quantity of resources needed at the national, regional and district levels; the unit costs for resource items are taken from the WHO-CHOICE database (WHO, 2017h).
- The unit costs for resource items are taken from the WHO-CHOICE database (WHO, 2017h).

ROI

ROI is a performance measure used to evaluate the efficiency of health-care investment. It compares the magnitude and timing of benefits from health intervention directly with the magnitude and timing of investment costs. ROI is the ratio of the discounted (present) value of the benefits to the investment costs. Future benefits are discounted, since a unit of currency in the future is worth less than a unit today owing to the time value of money. ROI analysis, 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 during the visit. Table 9 lists the policy-based interventions included in this calculation.

The method used is the NCD ROI model developed in 2015 for use by the United Nations Development Programme/WHO Joint Programme on Governance of NCDs using the OneHealth Tool and WHO Costing Tool. More detail on use of the OneHealth Tool is available from the OneHealth Tool manual (Avenir Health, 2017) and is discussed in detail in a new guidance note for investment cases for preventing and controlling NCDs (WHO & UNDP, 2018).

To work out the overall impact of the set of interventions on increasing 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 model on the economic burden of NCDs. As interventions reduce the projected incidence of IHD and stroke, there is an associated increase in the number of healthy life-years of the population. Considering the increase in healthy life-years, GDP per employed person and the reduction in rates for absenteeism and presenteeism can determine the increase in GDP attributed to the value of the avoided absenteeism and presenteeism.

The increase in labour force participation caused by avoided deaths was calculated by considering the labour force participation rate in Uzbekistan and the projected number of deaths avoided. Avoided mortality was monetized by multiplying by the GDP per worker as outlined above.

ROI was calculated for the interventions listed in Table 9. These were selected based on the available data to ensure sufficient data for calculating costs and health effects.

The projected economic gains from implementing 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 ROI for Uzbekistan was arrived at by comparing the impact (increase in GDP) of the interventions with the total costs of setting up and implementing the interventions. It was calculated using the net present value approach to future costs and economic gains, with 3% discounting.

Institutional and context analysis

The institutional and context analysis component of the investment case involved the multiagency, multidisciplinary United Nations mission team meeting with various government sectors and other in-country stakeholders, including the United Nations Resident Coordinator and United Nations Country Team, donors and development banks. Discussed at these meetings was how NCDs impact the national development agenda, the priorities of different sectors and stakeholders and how these actors could support a strengthened whole-of-government NCD response in Uzbekistan, including implementing investment case findings. Specifically, from 27 November to 1 December 2017, the mission team met bilaterally with representatives from: the Ministries of Health, Finance, Economy and Labour; the United Nations Country Team, including the United Nations Resident Coordinator; the European Union, Japan International Cooperation Agency, Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), KfW Development Bank and Asian Development Bank. The Ministry of Health and mission team also hosted a multistakeholder roundtable discussion attended by several of those already noted in addition to the Scientific Institute of Public Health and Organization of Care, Ministry of Education, World Bank, State Statistics Committee and Makhalla Foundation. The valuable insights gained from these discussions are incorporated throughout this report.

5. Results

This section assesses the economic burden of NCDs, summarizes the component parts of the ROI analysis – including health benefits, economic benefits and total costs – and discusses the ROI for each package of interventions.

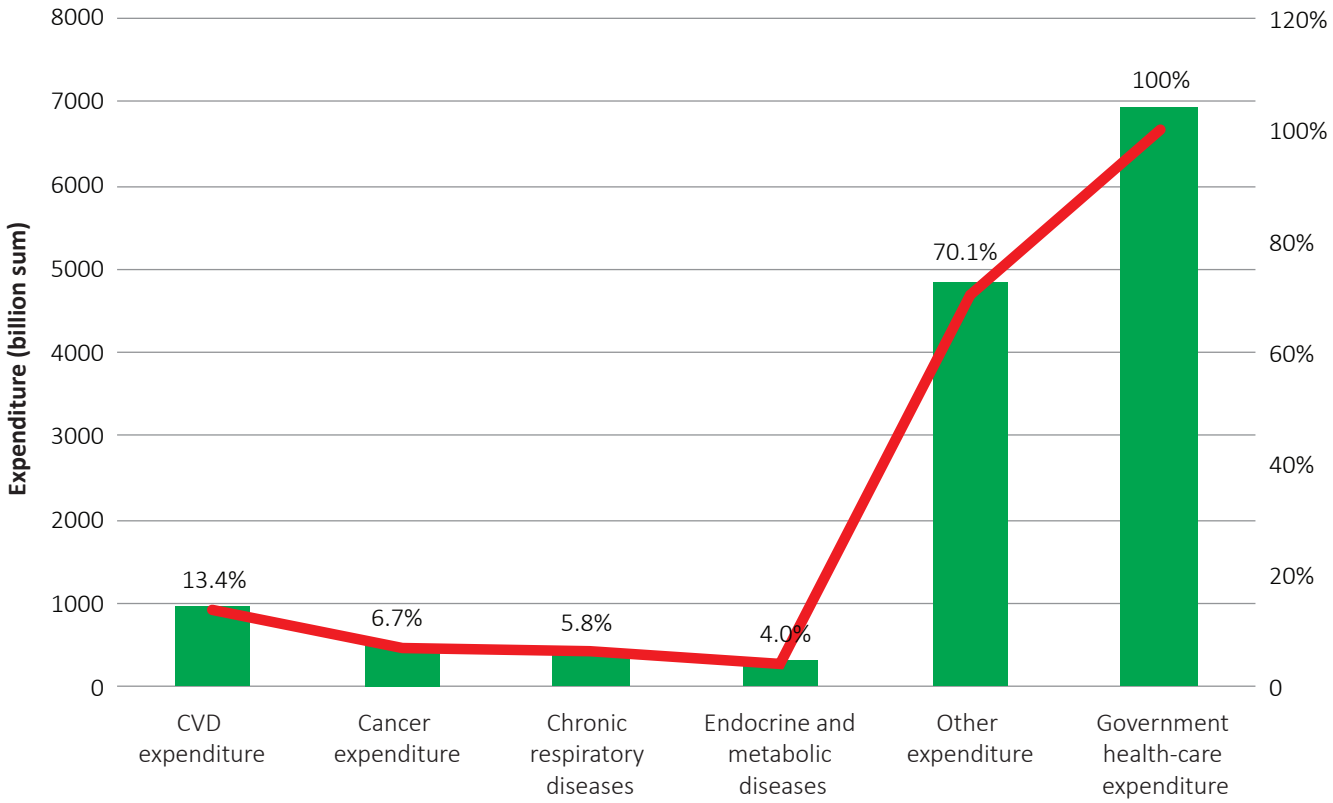
Economic burden

Direct costs

The estimate of the direct costs of the economic burden considered only government health-care expenditure, not non–health care costs such as transport. International numbers (see Annex 1, Table A1) had to be used rather than Uzbekistan-specific numbers, which were not available.

Total government health expenditure for Uzbekistan in 2016 was 6.9 trillion sum. As noted above, government health-care spending on NCDs in Uzbekistan 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 burden of NCDs, although some are high-income countries), 30% of government expenditure on health would be attributable to NCDs (13% on CVD; 7% on cancer; 6% on chronic respiratory diseases; and 4% on endocrine and metabolic diseases (largely diabetes)). Total health-care expenditure on the four main NCDs is estimated to be 2.1 trillion sum for 2016 (Fig. 2).

Fig. 2. Government health-care expenditure, 2016, billion sum



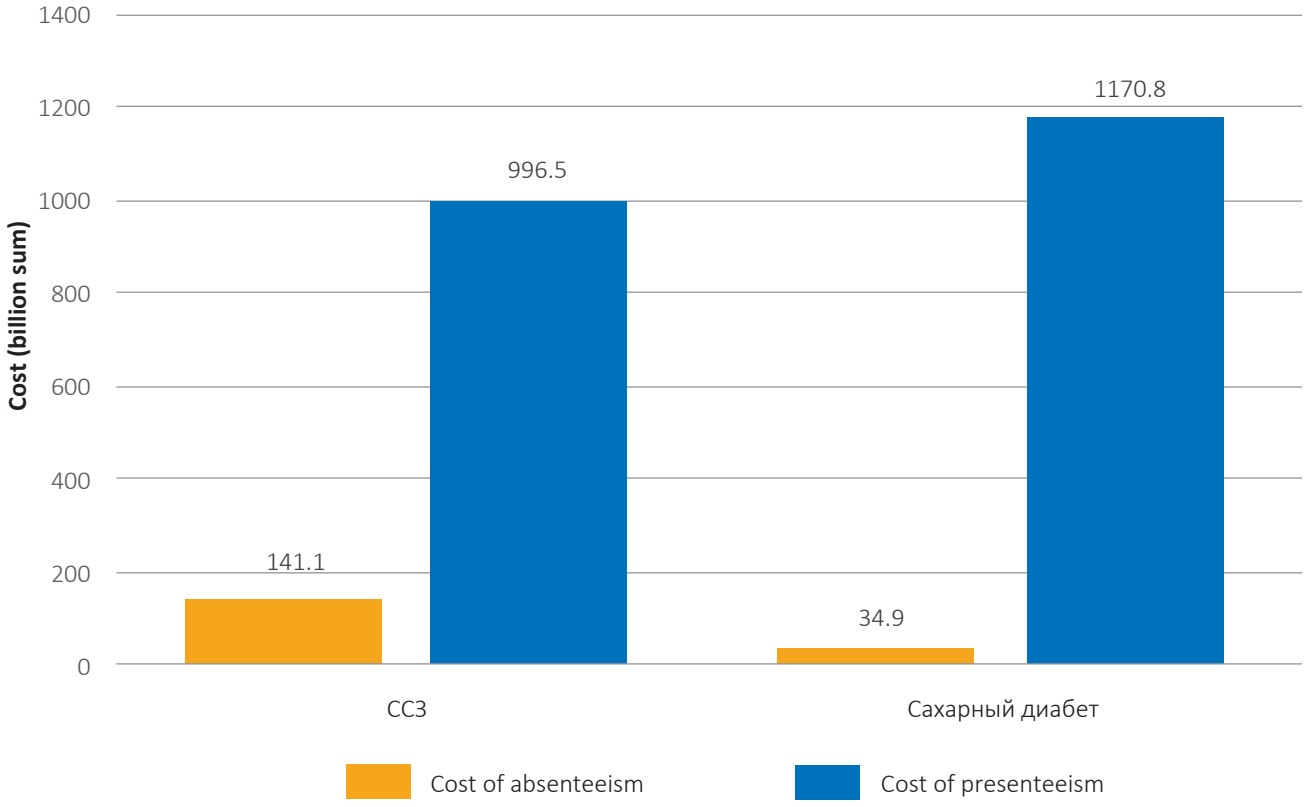
Indirect costs

For Uzbekistan, indirect economic losses caused by NCDs were modelled from reduced labour force participation, increased absenteeism and presenteeism and losses from premature death.

Indirect costs (losses from absenteeism, presenteeism and premature deaths) were calculated using the human capital method.

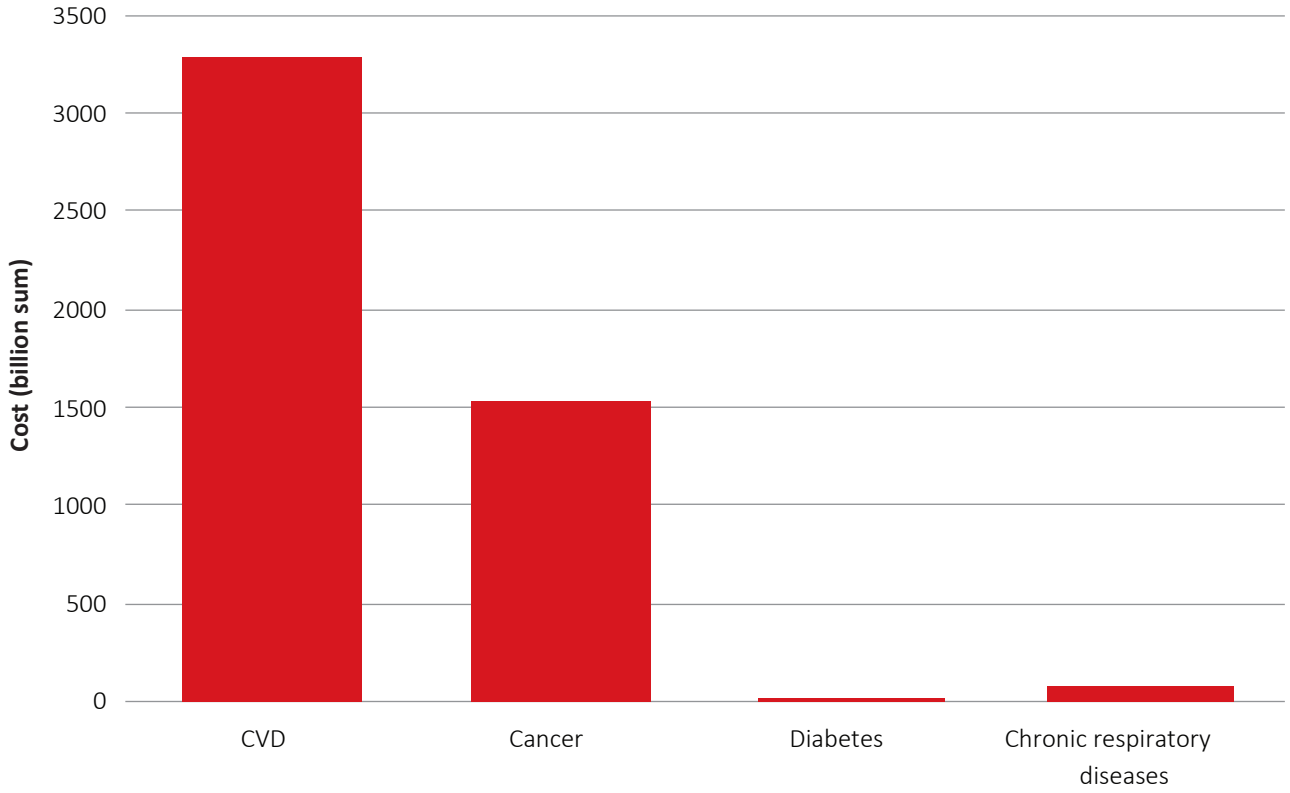
The calculation of absenteeism and presenteeism is based on the proportion of the workforce with NCDs that survive them (Fig. 3). They could only be calculated for CVD and diabetes, because relevant studies on chronic respiratory diseases and cancer are lacking in the literature. Productivity losses due to absenteeism per year were estimated to be equal to the full losses of productivity of 9413 workers for CVD and 2329 for diabetes, which resulted in a total cost of absenteeism of 176 billion sum for Uzbekistan. For presenteeism, the corresponding calculation found losses of full productivity of 66 483 workers for CVD and 78 116 for diabetes, resulting in a burden of presenteeism of 2167.3 billion sum.

Fig. 3. Costs of absenteeism and presenteeism for CVD and diabetes, 2016, billion sum



Losses from premature death were estimated using forgone economic output, equivalent to the total output that would have been generated by workers during their lives until reaching retirement age. The costs of premature death were calculated by multiplying the GDP per worker by the labour force participation rate, by the age-specific employment rate and by the 247 674 years of life lost at working ages in 2016 from the four main NCDs. The total costs of premature death were estimated to be 4940.8 billion sum (Fig. 4).

Fig. 4. Costs of premature death for four NCDs, 2016, billion sum



CVD is the costliest of the four NCDs in terms of premature death. Diabetes does not appear to be a leading cause of premature death, despite the productivity losses in presenteeism.

Total economic costs

Table 10 summarizes the total direct and indirect costs of NCDs in Uzbekistan. Indirect economic losses are 3.5 times higher (7.3 trillion sum) than direct losses. The estimated government expenditure on the four main NCDs is already 2.1 trillion sum, but additional losses to the economy from absenteeism, presenteeism and premature death amount to 7.3 trillion sum. This would be even larger if the costs of absenteeism and presenteeism could be estimated for cancer and chronic respiratory diseases.

Table 10. Economic burden of NCDs in Uzbekistan (billion sum), 2016

Cost	CVD	Cancer	Endocrine and metabolic diseases (largely diabetes)	Chronic respiratory diseases	Total
Direct costs					
Health care					
Government expenditure	924.6	462.3	276.0	400.2	2 063.1
Non–health care					
Disability payments	14.8	13.5	4.7	NA	33.0
Total direct costs	939.4	475.8	280.7	400.2	2 096.1

Table 10. (continued)

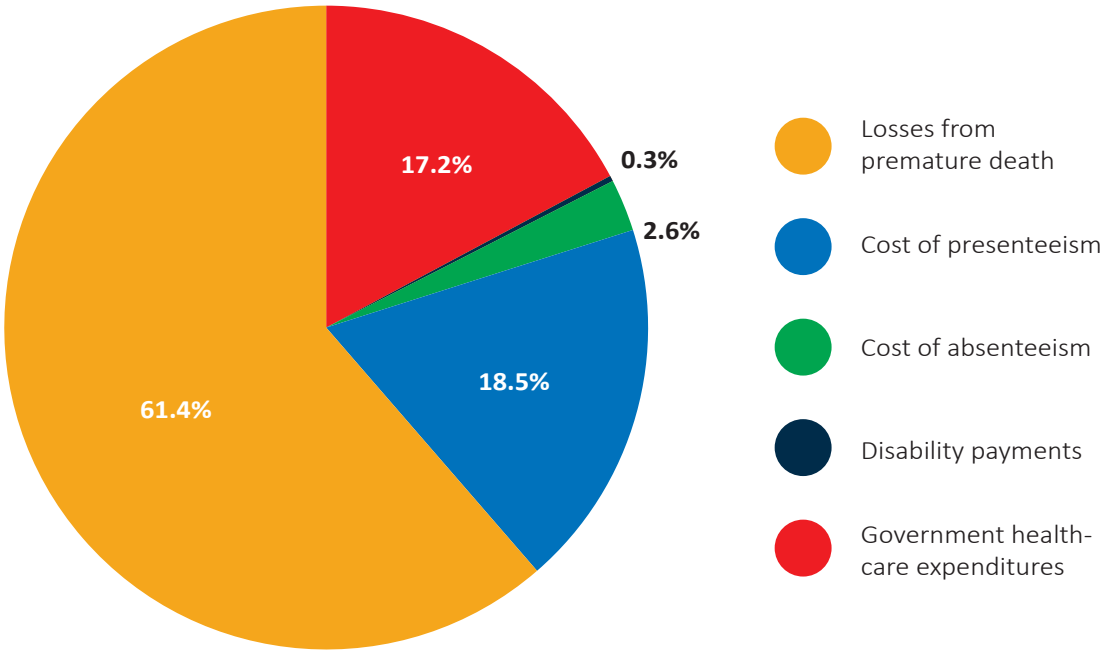
Cost	CVD	Cancer	Endocrine and metabolic diseases (largely diabetes)	Chronic respiratory diseases	Total
Indirect costs					
Absenteeism	141.1	NA	34.9	NA	176.0
Presenteeism	996.5	NA	1 170.8	NA	2 167.3
Premature deaths	3 299.3	1 536.8	26.3	78.4	4 940.8
Total indirect costs	4 436.9	1 536.8	1 232.0	78.4	7 284.1
Total burden	5 376.3	2 012.6	1 512.7	478.6	9 347.2

NA: not available.

The total burden on the economy of Uzbekistan is 9.3 trillion sum, equivalent to 4.7% of GDP in 2016.

Fig. 5 shows the structure of the economic burden of NCDs in Uzbekistan in 2016. Government health-care expenditure represents only 17.2% of all NCD-related costs, but these are just the tip of the iceberg for this economic burden.

Fig. 5. Structure of the economic burden of NCDs in Uzbekistan, 2016



Costs of intervention

The costs of intervention were estimated for the period 2018–2032. Table 11 shows the costs for each of the first five years of this period plus the five-year and 15-year total.

The CVD clinical interventions produced the largest estimated costs. Treating the people with CVD and diabetes costs 7.9 billion sum in the baseline year and increases to 47.5 billion sum in 2022. Implementing the entire CVD and diabetes clinical intervention package over the five-year scale-up period would cost 140.7 billion sum.

The total costs for the tobacco package based on MPOWER guidelines are 6.6 billion sum for five years and 29.5 billion sum in 15 years, although the individual interventions in the package vary in implementation costs. Certain policies, such as mass-media campaigns or protecting people from smoking, have large planned costs. Nevertheless, numerous low-cost tobacco policies exist, including package warning labels, bans on tobacco advertising and raising taxes.

Table 11. Estimated costs of policy and clinical interventions (billion sum), 2018–2032

Intervention type	2018	2019	2020	2021	2022	Total for five years	Total for 15 years
Tobacco control package	1.7	1.6	1.5	1.7	1.6	6.5	29.6
Alcohol control package	2.6	2.8	3.0	3.3	3.6	11.7	89.0
Physical activity awareness package	1.4	1 .6	1.6	1.6	1.6	6.2	32.2
Salt reduction package	2.3	1.8	1.8	1.8	1.8	7.6	16.7
All policy interventions, total	8.0	7.8	7.9	8.4	8.6	32.0	167.5
CVD and diabetes clinical intervention package	7.9	18.7	28.5	38.1	47.5	140.7	1 221.8

Health benefits

All interventions significantly reduce the number of lives lost to CVD-related causes (Table 12). Salt interventions have the greatest impact (60 745 lives saved), followed by CVD and diabetes clinical interventions (18 392) and tobacco interventions (18 174).

Table 12. Estimated health benefits over 15 years

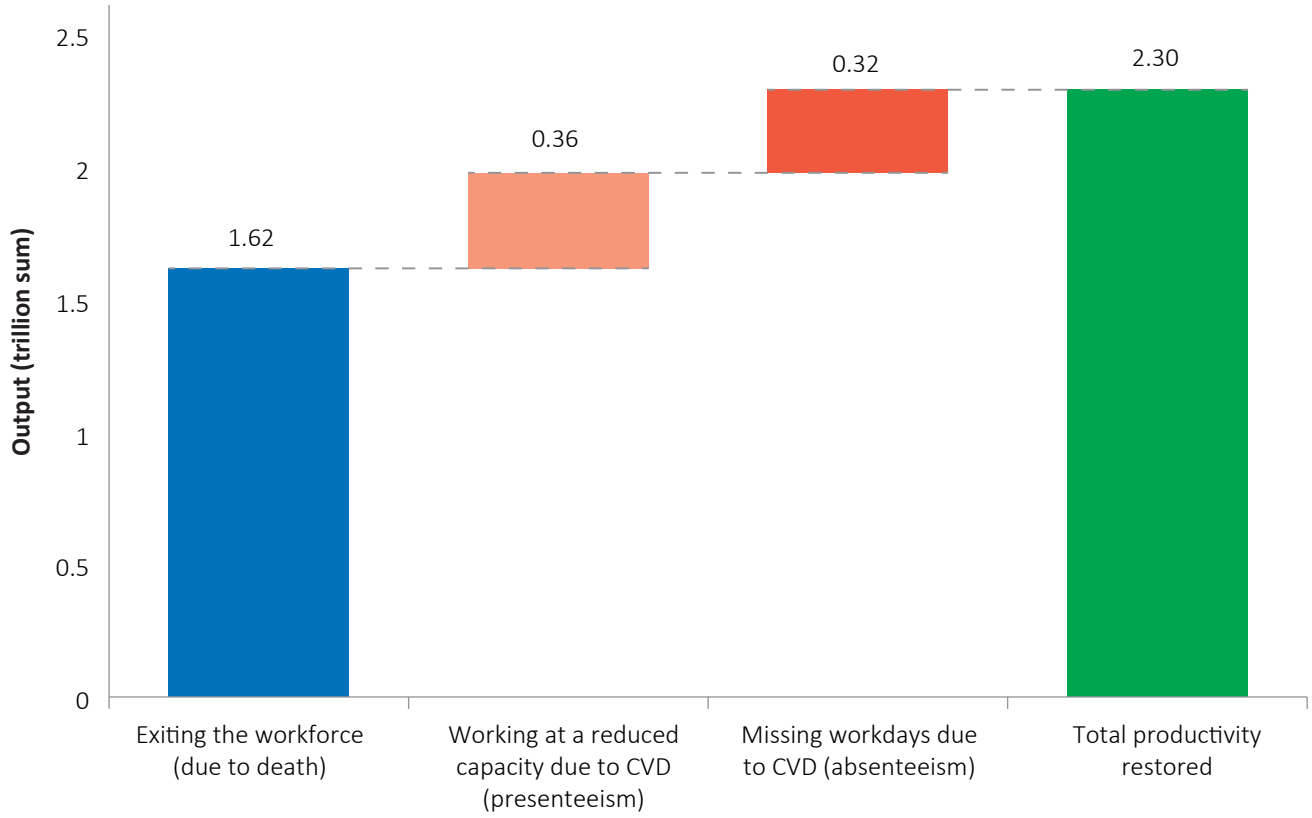
Intervention package	Strokes averted	Acute IHD	Mortality averted	Healthy life-years gained
CVD and diabetes clinical interventions	29 407	21 004	18 392	102 747
Tobacco interventions	35 626	20 324	18 174	181 649
Alcohol interventions	28 721	9 006	7 328	97 861
Physical activity interventions	31 248	20 220	14 301	155 554
Salt interventions	88 821	74 902	60 745	478 595

Each set of interventions also adds 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 benefits

The NCDs included in this analysis reduce the labour workforce and productivity from premature mortality, fewer days of work (absenteeism) and reduced productivity while at work (presenteeism). Fig. 6 demonstrates the labour productivity gains that would result from the prevented deaths and disease cases over 15 years, described in Table 12.

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



The greatest positive impact on productivity is from reduced mortality (70.4% of total productivity gains), followed by reduced presenteeism (15.6%) and absenteeism (14.0%). The policy packages and CVD and diabetes in primary care result in net present value of 2.3 trillion sum in labour productivity gains over 15 years (equivalent to 1.2% of Uzbekistan's GDP in 2016).

ROI

Comparing the costs and benefits of each package of interventions shows that all the NCD prevention interventions at the population level for risk behaviour included in the analysis – for tobacco and alcohol control, salt reduction and increasing physical activity – have ROI greater than 1 sum for each 1 sum invested over 15 years (Table 13).

Table 13. Costs, benefits and ROI at five and 15 years, by intervention package (billion sum)

Intervention package	Five years			15 years		
	Total costs	Total productivity benefits	ROI	Total costs	Total productivity benefits	ROI
Tobacco	6.0	45.7	7.3	29.6	394.7	13.0
Alcohol	11.7	4.0	0.4	89.0	175.7	1.9
Physical activity	6.2	27.3	3.9	32.2	319.1	9.6
Salt	6.7	57.5	8.3	16.7	1 232.8	64.8
CVD clinical interventions	140.7	41.2	0.3	1 221.8	175.7	0.3

Salt interventions have the highest ROI of any intervention: for 1 sum invested in the package of salt interventions, the expected return is 8.3 sum for the first five years and 64.8 sum for 15 years. The tobacco control package also produces high ROIs for both five years and 15 years, as does the physical activity package. The alcohol control package provides an ROI of 1.9 over 15 years.

The package of clinical interventions, although being important in fulfilling the right to health, provide ROI of less than 1 sum per 1 sum invested. This is frequent in health economics because of the high costs of medical treatment. Further, these treatment options (secondary prevention after acute events) have low potential to increase labour force participation after stroke, myocardial infarction and diabetes.

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

6. Conclusion

NCDs pose a significant threat to Uzbekistan'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 five intervention packages to demonstrate cost-effective solutions.

While there are a number of policy and legislative frameworks for NCDs, particularly risk factors, an integrated NCD programme or action plan has been missing. An intersectoral programme on healthy lifestyles and NCD prevention and control is also being developed. A review of current NCD interventions at policy and individual service level uncovered are gaps in implementation of the WHO-recommended cost-effective NCD preventive and clinical interventions and drew attention to areas that need strengthening and scale-up to achieve 100% coverage. Although evidence indicates that salt consumption is high, for example, there are no effective policies and measures to reduce it nor is there any policy on the marketing of foods and non-alcoholic beverages to children. Additional policies could be put in place to reduce tobacco consumption and meet WHO FCTC obligations, particularly regarding regulation and taxation of cigarettes and *nasvai* as well as warnings and smoke-free environments. A sustained national multisectoral NCD coordination mechanism that can bring together and strengthen Uzbekistan's existing cross-agency initiatives is needed.

Analysis of the economic burden of NCDs in 2015 estimates total economic losses to the economy to be 9.3 trillion sum per year, equivalent to 4.7% of the country's GDP in 2016. One fifth of this is from direct health expenditure; over half is due to premature mortality, at 61.4% of overall costs. Premature deaths from NCDs cost the economy 4.9 trillion sum. 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. Economic burden included public health-care costs but not private costs. But the purpose of the analysis was not full cost analysis but public or government perspective from the perspective of government expenditure and the possible return on investment on the next steps of the analysis.

Actions to prevent NCDs in Uzbekistan are relatively cheap and cost-effective. Implementing them requires engagement from sectors beyond health, such as finance, economy and trade, and benefits from the investments would accrue across the whole of government and society. Five policy packages were economically assessed for solutions – four packages to reduce the prevalence of behavioural risk factors for NCDs – tobacco use, harmful use of alcohol, physical inactivity and excessive salt consumption – and one for clinical interventions related to CVD and diabetes. Policy packages to reduce the consumption of tobacco, alcohol and salt and to increase physical activity were estimated to cost 6.5 billion sum, 11.7 billion sum, 7.6 billion sum and 6.2 billion sum over five years, respectively. The CVD and diabetes interventions were the most expensive options, costing 140.7 billion sum.

The economic modelling for the ROI analysis suggests that the package to reduce salt consumption provides the greatest ROI. Based on this finding, scaling up of effective salt-reduction initiatives should be urgently given priority. This would not undermine other initiatives, such as salt iodization, which should be universal and in accordance with WHO policies. The government could adopt salt-reduction targets for industrially produced foods (such as bread, meat products, savoury snacks and drinks) by setting maximum limits through regulation. In addition, the government could make a concerted effort to ensure mandatory labelling of sodium and introduce a front-of-pack labelling system that makes evaluative judgement about the sodium content (such as high, medium or low). The government could introduce mandatory restrictions on the marketing of foods high in salt (in addition to fat and sugar). Finally, literacy of the population about the importance of salt reduction could be improved via sophisticated communication campaigns and using advice by primary health care personnel. Reducing tobacco consumption – for example, through meeting FCTC obligations such as regulation, increased taxation of tobacco products and enforcing smoke free environments – and increasing physical activity in the population would also provide substantial ROI. 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 64.8 over 15 years.

Given the significant health and economic burden of NCDs to Uzbekistan, this report suggests that there is potential for further implementing NCD prevention policies at the population and individual levels and that doing this would deliver substantial ROI. Implementing the intervention packages will require structured engagement from sectors beyond health, such as finance, economy and trade, which would also reap significant benefits from addressing NCDs.

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Annex 1. Data used for calculating the 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	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
Proportion of health expenditure by disease group	CVD	8.6%	9.0%	9.2%	16.2%	22.0%	12.0%	0.8%	18.4%	15.6%	13.4%	11.1%	13.,6%	17.0%
	Cancers	4.7%	3.1%	5.5%	7.9%	9.4%	7.1%	1.9%	8.2%	4.7%	7.7%	5.5%	6.7%	7.2%
	Endocrine and metabolic diseases	4.4%	2.1%	2.0%	4.0%	5.4%	3.9%	0.0%	6.1%	4.8%	4.1%	2.7%	2.4%	4.4%
	Respiratory diseases	4.8%	4.5%	3.2%	5.4%	7.2%	7.3%	0.4%	5.8%	8.9%	10.8%	4.9%	6.2%	6.6%
Total for four NCDs		22.5%	18.7%	19.9%	33.5%	44.0%	30.3%	3.1%	38.5%	34.0%	36.0%	24.2%	28.9%	35.2%

Source: adapted from: Garg CC, Evans DB (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 24 September 2018).

Table A2. Productivity data

Disease	Parameter value	Year	Source of data	Details of data source
Labour force participation rate reduction				
Hypertension	11.0%	2009	Barnay & Debrand	Barnay T, Debrand T (2006). Effects of health on the labour force participation of older persons in Europe. Questions d'Économie Santé. 109 (http://www.irdes.fr/english/2006/issues-in-health-economics.html, accessed 24 September 2018).
Stroke	11.0%	2009	Barnay & Debrand	Barnay T, Debrand T (2006). Effects of health on the labour force participation of older persons in Europe. Questions d'Économie Santé. 109 (http://www.irdes.fr/english/2006/issues-in-health-economics.html, accessed 24 September 2018).
AMI	11.0%	2009	Barnay & Debrand	Barnay T, Debrand T (2006). Effects of health on the labour force participation of older persons in Europe. Questions d'Économie Santé. 109 (http://www.irdes.fr/english/2006/issues-in-health-economics.html, accessed 24 September 2018).
Type 2 diabetes	11.0%	2009	Barnay & Debrand	Barnay T, Debrand T (2006). Effects of health on the labour force participation of older persons in Europe. Questions d'Économie Santé. 109 (http://www.irdes.fr/english/2006/issues-in-health-economics.html, accessed 24 September 2018).
Reduction in full-time hours due to absenteeism				
Hypertension	0.5%	2011	Mitchell & Bates	Mitchell RJ, Bates P (2011). Measuring health-related productivity loss. Popul Health Manag. 14(2): 93–8.
Stroke	5.5%	2011	Mitchell & Bates	Mitchell RJ, Bates P (2011). Measuring health-related productivity loss. Popul Health Manag. 14(2): 93–8.
AMI	1.1%	2011	Mitchell & Bates	Mitchell RJ, Bates P (2011). Measuring health-related productivity loss. Popul Health Manag. 14(2): 93–8.
Type 2 diabetes	0.3%	2011	Mitchell & Bates	Mitchell RJ, Bates P (2011). Measuring health-related productivity loss. Popul Health Manag. 14(2): 93–8.
Reduction in productivity due to presenteeism				
CVD and stroke	3.7%	2011	Wang et al.	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. J Occup Environ Med. 45(12):1303–11.
Diabetes	11%	2011	Holden et al.	Holden L, Scuffham PA, Hilton MF, Ware RS, Vecchio N, Whiteford HA (2011). Which health conditions impact on productivity in working Australians? J Occup Environ Med.53(3):253–7. doi:10.1097/JOM.0b013e31820d1007.
Time it takes to replace workers (percentage of a year)	20%	2012	Boushey & Glynn	Boushey H, Glynn SJ (2012). There are significant business costs to replacing employees. Washington (DC): Center for American Progress (https://www.americanprogress.org/issues/labor/report/2012/11/16/44464/there-are-significant-business-costs-to-replacing-employees/, accessed 24 September 2018).

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The World Health Organization (WHO) is a specialized agency of the United Nations created in 1948 with the primary responsibility for international health matters and public health. The WHO Regional Office for Europe is one of six regional offices throughout the world, each with its own programme geared to the particular health conditions of the countries it serves.

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