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Prevention and control of noncommunicable diseases in Kazakhstan

The case for investment



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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 Kazakhstan. 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) comprise 2.3 trillion tenge, equivalent to 4.5% of gross domestic product in 2017. An intervention costing analysis provides an estimate of the funding required to implement a set of policy interventions for prevention and clinical interventions. A cost–benefit analysis compares these implementation costs with the estimated health gains and identifies which policy packages would give the greatest returns on investment. For example, the salt policy package achieved a benefit-to-cost ratio of 118.4 over 15 years, a return of more than 118 tenge for every 1 tenge invested.

Keywords

NONCOMMUNICABLE DISEASES – PREVENTION AND CONTROL
CHRONIC DISEASE – ECONOMICS, PREVENTION AND CONTROL
DELIVERY OF HEALTH CARE
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Contents

Acknowledgements	iv
Abbreviations	v
Executive summary	vi
1. Introduction	1
Purpose of the economic analysis component of the case for investment	2
2. Situation analysis: NCDs and risk factors	3
Tobacco use	3
Harmful use of alcohol	4
Physical inactivity.....	4
Salt	5
Metabolic risk factors	5
3. Policies and treatments to reduce the burden of NCDs	6
Tobacco	6
Alcohol	9
Physical inactivity.....	10
High consumption of salt, <i>trans</i> -fats and sugar	11
Clinical interventions for cardiovascular diseases and diabetes.....	14
Summary.....	16
4. Methods	18
Calculating the economic burden of NCDs	18
Calculating the costs of policy and clinical intervention.....	19
Return on investment.....	19
Institutional and context analysis.....	20
5. Results	21
Annual economic burden	21
Costs of intervention	24
Health benefits	25
Economic benefits	26
6. Conclusion	27
References	28
Annex 1. Data used for calculating the NCD burden	33

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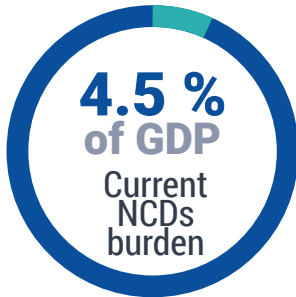
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Abbreviations

GDP	gross domestic product
MPOWER	monitor tobacco use and prevention policies; protect people from tobacco smoke; offer help to quit tobacco use; warn people about the dangers of tobacco; enforce bans on tobacco advertising, promotion and sponsorship; raise taxes on tobacco [WHO package]
NCD	noncommunicable disease
PEN	package of essential noncommunicable disease interventions
SHAKE	surveillance; harness industry; adopt standards for labelling and marketing; knowledge; environment [WHO package]
STEPS	STEPwise approach to surveillance [of WHO]

KAZAKHSTAN

The Case for Investment in Prevention and Control of Noncommunicable Diseases (NCDs)



lost per year



of this cost is due to loss of workforce and reduced productivity



of dying prematurely from one of the 4 main NCDs

89.9
trillion tenge



Investment required for selected Best Buys intervention packages over a 15-year period

Billion tenge



Tobacco Control Package



Alcohol Control Package



Salt Reduction Package



Physical Activity Awareness Package

89 715

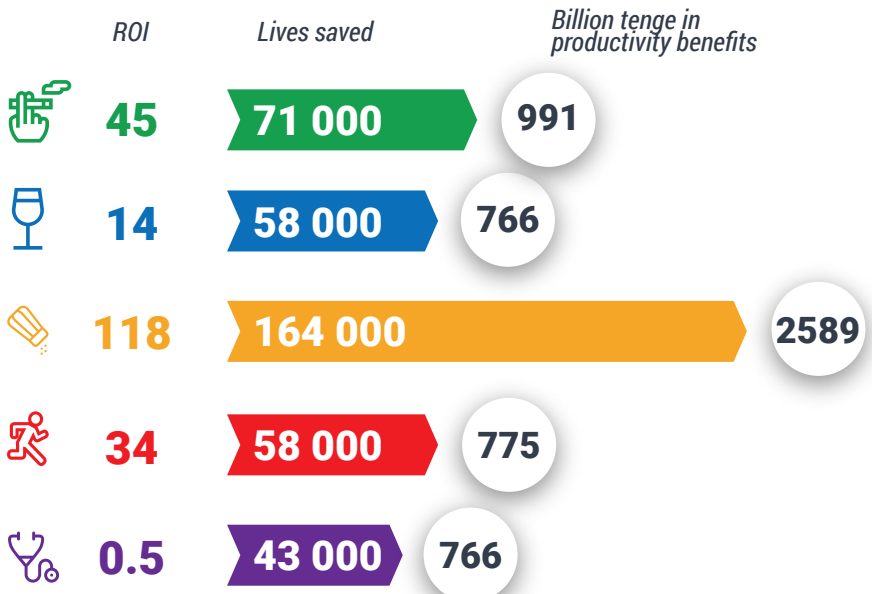


CVD and diabetes clinical interventions

5.9
trillion tenge



Total productivity benefits over a 15-year period



Executive summary

In mid-2017, given the increasing interest in preventing noncommunicable diseases (NCDs) and the health system reforms within Kazakhstan, WHO and the Ministry of Health discussed the potential value of investigating the economic case for investing in preventing and controlling NCDs. A joint United Nations visit to Kazakhstan was therefore undertaken in June 2018 to conduct such an economic analysis.

NCDs such as cancer, cardiovascular diseases, diabetes and chronic respiratory diseases and their risk factors (tobacco use, harmful use of alcohol, unhealthy diet and physical inactivity) are an increasing public health and development challenge in Kazakhstan. The probability of premature death (before the age of 70 years) from one of the four major NCDs for a person living in Kazakhstan was 27% in 2016. Cardiovascular disease is the main driver of premature mortality in the country, and excess male deaths and unhealthy behaviour contribute to the gender gap. Estimates indicate that 26% of adults have raised blood pressure and 12% have diabetes. Further, 44% of men smoke tobacco and 54% drink alcohol; among those drinking alcohol, 62% consumed at least 60 grams or more of pure alcohol on at least one occasion in the past 30 days; half the adult population is overweight or obese, one of the highest levels in the WHO European Region; and salt intake is extremely high.

Kazakhstan has several policy and legislative frameworks in place for NCDs, especially addressing risk factors, and the Densaulyk Healthcare Development State Programme 2016–2019 and the new Public Health Action Plan 2018–2021 include preventing and controlling NCDs. A review of current NCD interventions at the policy and individual service levels uncovered gaps in implementing the WHO-recommended cost-effective NCD preventive and clinical interventions. The review drew attention to areas that need to be strengthened and scaled up to achieve 100% coverage of these interventions.

The premature death, morbidity and disability associated with NCDs negatively affect socioeconomic development. As in many parts of the world, NCDs in Kazakhstan are causing a surge in health-care costs and social care and welfare support needs and contribute to reduced productivity. The government spent an estimated 0.3 trillion tenge 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 assessing their relative returns on investment. Three analyses were performed.

- An economic burden analysis showed the scale of disruption to the economy from NCDs by assessing their direct and indirect costs. Direct costs include government (public) health-care costs for treating cardiovascular diseases, diabetes, cancer and respiratory diseases. Indirect costs are based on disability payments, costs of absenteeism, costs of presenteeism and economic losses from premature deaths among people of working age.
- An intervention costing analysis estimated the funding required to implement a set of interventions for preventing NCDs: policy packages to reduce tobacco use, harmful alcohol consumption and salt consumption 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 five- and 15-year periods.

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 6.5 times higher, at 2 trillion tenge. Altogether, the current economic cost of NCDs to the Kazakhstan economy is 2.3 trillion tenge per year, equivalent to 4.5% of the country's annual gross domestic product in 2017.

Actions to prevent NCDs in Kazakhstan are highly cost-effective. Implementation requires engagement from sectors beyond health, such as finance, economy and agriculture, and the benefits from the investments would accrue across the whole of government and society. The intervention costing analysis reviewed four packages of interventions for preventing and controlling NCDs in tobacco control, harmful use of alcohol, physical inactivity and excessive salt consumption and a package of clinical interventions for cardiovascular disease and diabetes. Policy packages for 2018–2022 to reduce the consumption of tobacco, alcohol and salt and to increase physical activity were estimated to cost 5.0 billion tenge, 10.2 billion tenge, 4.5 billion tenge and 4.7 billion tenge, respectively. The cardiovascular disease and diabetes interventions were found to be the most expensive options, costing 140.7 billion tenge.

The economic modelling for the return on investment analysis suggests that the most cost-effective intervention in Kazakhstan is the package of salt-reduction interventions. The salt policy package achieved a benefit-to-cost ratio of 118.4 when considered across a 15-year period. Reducing tobacco and increasing physical activity in the population would also provide high returns on investment (45 and 34 tenge, respectively, for investing 1 tenge for 15 years). The returns on investment for alcohol interventions are lower, and cardiovascular disease and diabetes clinical interventions result in a return on investment of less than 1 tenge per 1 tenge invested over five and 15 years.

1. Introduction

Noncommunicable diseases (NCDs) account for an estimated 84% of all deaths in Kazakhstan (WHO, 2014a). The latest figures, from 2016, show that people in Kazakhstan have a 27% chance of dying prematurely – that is, before the age of 70 years¹ – from one of the four main NCDs (cardiovascular disease (cardiovascular diseases), diabetes, chronic respiratory disease and cancer), with a significantly higher probability for men (37%) than women (19%) (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 this is only one part of the story. NCDs also result in high economic costs, including direct health-care costs but reaching far beyond. NCDs reduce productivity at the macroeconomic level by interrupting full participation in the labour force and subsequently affecting individuals, their caregivers and the state. When individuals die prematurely, the labour output they would have produced in their remaining working years is lost. In addition, people who have a disease are more likely to miss days of work (absenteeism) or to work at a reduced capacity while at work (presenteeism²). In low- and middle-income countries, NCDs are estimated to cause more than US\$ 21 trillion in lost economic output between 2011 and 2030, with nearly one third attributable to cardiovascular diseases 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,³ including reduced investment in education, transport 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 Kazakhstan. 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. Recent analysis by WHO (2018a) suggests that every US\$ 1 invested in implementing a package of all 16 best buys in low- and middle-income countries will yield a return of at least US\$ 7 by 2030.

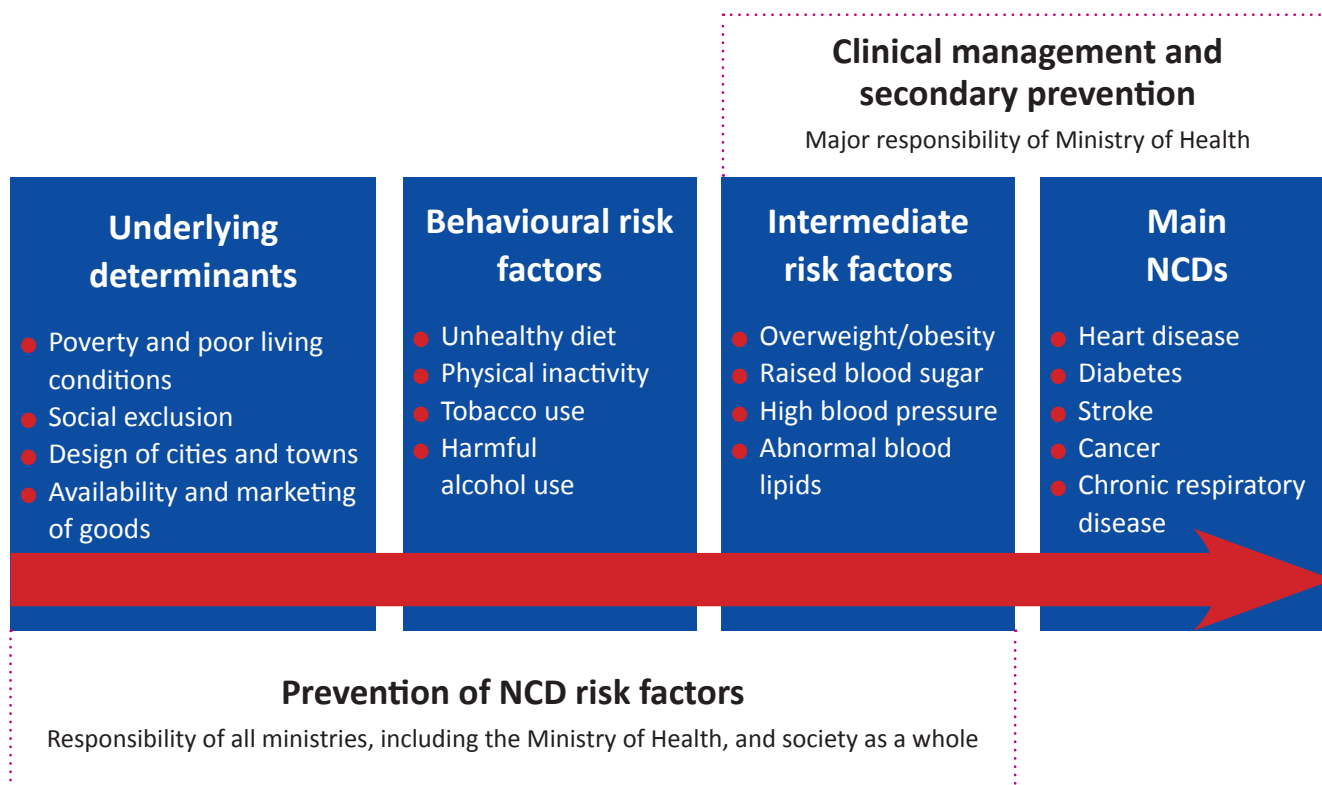
Since more than half of Kazakhstan's deaths in 2014 were caused by heart disease, stroke, myocardial infarction and other circulatory diseases (WHO, 2014a), the economic analysis detailed in this study focuses primarily on interventions that can reduce this burden of cardiovascular diseases.

¹ Definition: percentage of 30-year-old people who would die before their 70th birthday from cardiovascular disease, cancer, diabetes or chronic respiratory disease, assuming that they would experience current mortality rates at every age and would not die from any other cause of death (such as injuries or HIV infection).

² Presenteeism is defined as reduced productivity at work.

³ Opportunity cost is 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



Purpose of the economic analysis component of the case for investment

The negative economic effects of NCDs are too often overlooked in budgetary allocation processes and in weighing the advantages and disadvantages of stronger fiscal and regulatory action. Quantifying the costs of management and interventions to prevent and control NCDs, as well as their returns on investment 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 preventing NCDs and the health system reforms within Kazakhstan, 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 Kazakhstan was therefore undertaken in June 2018 to conduct such an economic analysis.

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 continuing the status quo, in which no new policies are implemented and current coverage levels remain in place – that is, 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 way of measuring return on investment) 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 analyses NCD behavioural risk factors in Kazakhstan, including current levels and patterns of tobacco, alcohol and salt consumption, and physical inactivity and 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 – especially cardiovascular diseases – and details the current implementation level of policies and interventions in Kazakhstan. 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 and the clinical interventions. Section 6 outlines the conclusions to be drawn from these.

2. Situation analysis: NCDs and risk factors

This section overviews the main NCDs and their behavioural risk factors – such as tobacco use, harmful alcohol consumption and high salt intake – in Kazakhstan and the prevalence of metabolic risk factors such as raised blood pressure, cholesterol, obesity and diabetes.

Kazakhstan has a high burden of NCDs and among the highest rates of premature mortality in the WHO European Region. The age-standardized premature mortality rate from the four major NCDs⁴ was 486 per 100 000 population in 2015, above the WHO European Region average of 380 per 100 000 population (WHO Regional Office for Europe, 2018a). In Kazakhstan, cardiovascular diseases are a major contributor to mortality from NCDs. Mortality from cardiovascular diseases is highest in the north-east and among men (WHO Regional Office for Europe, 2018b). The life expectancy at birth was 72.0 years (67.5 for men and 76.4 for women) in 2015, almost six years below the average of 77.9 years in the European Region. Life expectancy tends to be lower in the north and east of Kazakhstan (WHO Regional Office for Europe, 2018b).

Tobacco use

According to the WHO report on the global tobacco epidemic, about one fifth (22%) of adults currently use tobacco, and almost all are daily users (WHO, 2017d). The smoking prevalence differs greatly between men and women: 42% of men smoke versus only 5% of women. Smokeless tobacco use is low for adults (1.3%) and young people (0.6%).

Data from the 2014 Global Youth Survey indicate that 4% of boys and 2% of girls 13–15 years old used tobacco in the 30 days before the survey (CDC, 2014). The smoking prevalence is higher among boys, but the trend in tobacco use is increasing among girls in Kazakhstan (WHO Regional Office for Europe, 2018b). During the seven days before the survey, 18% of youths were exposed to second-hand smoke at home, 27% in enclosed public spaces and 29% in outdoor public places (CDC, 2014).

Based on the 2014 level of adult smoking in Kazakhstan, WHO projected that at least half (1.4 million) of the 2.8 million current smokers would die prematurely, possibly more in the absence of stronger policies (WHO Regional Office for Europe, 2017a).

Box 1 summarizes key facts.

Box 1. Tobacco snapshot

Tobacco use is of major concern in Kazakhstan since 42% of men and 5% of women smoke, almost all daily.

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

⁴ Age-standardized overall premature mortality rate (from 30 to under 70 years) for four major NCDs: cardiovascular diseases, cancer, diabetes and chronic respiratory diseases.

Harmful use of alcohol

Annual alcohol consumption in Kazakhstan was 7.7 litres per capita in 2016⁵, which is below the WHO European Region average (9.8 litres). Alcohol consumption has decreased since 2010,⁶ when annual alcohol consumption was 9.3 litres per capita (WHO, 2018c).

Among alcohol consumers, Kazakhstan is estimated to have some of the highest alcohol consumption in the WHO European Region. In 2016,⁷ men who consume alcohol consumed an estimated 25.0 litres per person per year versus 8.9 litres for women who consume alcohol. WHO also estimated that 62% of men currently consuming alcohol and 26% of women currently consuming alcohol binged (consumed at least 60 grams or more of pure alcohol on one occasion) in the previous 30 days (WHO, 2018c). Regarding alcohol use among young people (15–19 years old), more than 57% consumed at least 60 grams or more of pure alcohol on one occasion in the past 30 days.

The WHO STEPS survey for the Aktobe oblast found that, for people 18–69 years old, current drinkers consumed on average 3.5 drinks per drinking occasion, and, in all age groups, men consumed almost twice as much per drinking occasion than women. One in five survey respondents had consumed six or more drinks on a single occasion at least once during the past 30 days, with a significant difference between men and women.

The alcohol-attributable death rate in Kazakhstan is among the highest in the European Region. In 2016, 74% of male deaths from liver cirrhosis and 34% of male deaths from road traffic injury were attributable to alcohol (WHO, 2018c); for females, these were 45% and 31% respectively.

Box 2 summarizes key facts.

Physical inactivity

Recent data on physical activity in Kazakhstan are lacking, since no routine monitoring framework is in place. For 2010, WHO estimated that 21% of adults in Kazakhstan were insufficiently active according to WHO standards (150 minutes of moderate-intensity physical activity per week, 75 minutes of vigorous-intensity physical activity per week or the equivalent) (WHO, 2015). More recent estimates suggest that the prevalence of insufficient physical activity in 2016 was 26% (95% CI 19–34%) for males and 29% (95% CI 20–39%) for females (Guthold et al., 2018). The WHO STEPS survey for the Aktobe oblast found that 28% of people 18–69 years old had insufficient levels of physical activity, again with no apparent significant difference between the sexes.

Box 3 summarizes key facts.

Box 2. Alcohol snapshot

Alcohol consumption is high, especially for men. Among men who drink, 62% binged (consumed at least 60 grams or more of pure alcohol on one occasion) in the past month.

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

Box 3. Physical inactivity snapshot

Activity levels are not routinely monitored. In 2010, 21% of adults did not meet the recommended physical activity level, estimated to be 27% of adults by 2016.

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

⁵ Three-year average for the period 2015–2017.

⁶ Three-year average for the period 2009–2011.

⁷ Three-year average for the period 2015–2017.

Salt

WHO recommends that salt consumption levels not exceed limits of 5 g of salt per day (<2 g of sodium per day).

According to the 2017 household survey, salt consumption in Kazakhstan was 6 kg per capita per year, equivalent to 16.6 g per person per day. There has also been a 24-hour urinary sodium excretion survey in Kazakhstan, using gold-standard methods, which gave figures for mean salt intake per day in Almaty as 17.1 g and even higher for Kyzlorda, at 18.7 g. A previous review of 187 countries indicated that the age-standardized salt consumption among adults aged 20 years and older in Kazakhstan was 15 g per day (6.0 g of sodium per day) in 2010 (Powles et al., 2013), which was an increase of nearly 2.5 g (1.0 g of sodium) compared with 1990 levels.

In 2010, 32% of cardiovascular deaths among people 20–69 years old were attributed to salt consumption of more than 5 g per day (>2 g of sodium per day) (Mozaffarian et al., 2014).

Box 4 summarizes key facts.

Metabolic risk factors

High levels of metabolic factors – such as raised blood pressure, raised body mass index (BMI) or raised blood lipid levels – significantly increase the risk of a cardiovascular event. In Kazakhstan, in 2016, the age-standardized prevalence of overweight (BMI ≥ 25 kg/m²) was 54% for men and 53% for women (WHO, 2017e). Further, 19% of men and 23% of women are obese (BMI ≥ 30 kg/m²) (WHO, 2017f).

An estimated 28% of men and 25% of women older than 18 years had high blood pressure⁸ in 2015 (WHO, 2017g), and 12% of adults had diabetes⁹ in 2014 (WHO, 2017h). The latest estimates on cholesterol in Kazakhstan, from 2008, indicate that 46% of people 25 years and older had raised total cholesterol¹⁰ (WHO, 2017i).

Although 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). There are no data on the prevalence of high risk of cardiovascular diseases in Kazakhstan as a whole, but the WHO STEPS survey for the Aktobe oblast found that 18% of people 18–69 years old had 3–5 risk factors and that this was much higher for men (29%) than women (14%).

Box 4. Salt snapshot

Salt (and sodium) consumption is estimated to be around three times the WHO recommendation (WHO, 2012a) of a maximum of 5 g a day for adults.

Attributable NCDs include stomach cancer and increased risk of ischaemic heart disease, stroke and other cardiovascular and circulatory diseases caused by hypertension.

The proportion of cardiovascular deaths attributable to high salt intake is 32%.

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

⁹ 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 receiving medication for diabetes.

¹⁰ Raised total cholesterol ≥ 5.0 mmol/L or ≥ 190 mg/dL or currently receiving medication for raised cholesterol.

3. Policies and treatments to reduce the burden of NCDs

The Densaulyk Healthcare Development State Programme of the Republic of Kazakhstan for 2016–2019 addresses preventing and controlling NCDs. The roadmap for the implementation of the project “Establishment of a public health service and the development of intersectoral interaction” for 2018–2019 pays attention to NCD issues; separate and unified road maps were developed for the prevention and control of NCDs.

A multisectoral body at the national level, the National Coordination Council, discusses NCDs. Intersectoral work between the ministries responsible for health, education, sports and youth is active both formally through coordination councils and informally through technical leads. At the subnational level, the health councils at the regional (oblast) and district (rayon) levels have health key performance indicators to achieve, for which quarterly reports are submitted.

Recent public health reforms have led to a new National Centre for Public Health being formed. One function of the Centre is to promote healthy lifestyles.

As highlighted in Section 1, WHO has published a menu of policy options and interventions to prevent and treat NCDs (WHO, 2013; 2017b; 2017c). The following sections review current national efforts to prevent and control NCD against these to identify areas of strength and areas that need further development or scale-up to achieve full coverage. The assessment draws on the findings of the institutional and context analysis and relevant published reports from WHO and other bodies. It especially focuses on the packages of policy and clinical interventions (tobacco, alcohol, physical activity and nutrition policies and managing cardiovascular diseases and diabetes) that will be the focus of the economic analysis.

Tobacco

Kazakhstan ratified the WHO Framework Convention on Tobacco Control in January 2007 and has committed to implementing a comprehensive tobacco control policy (WHO, 2017j). However, the measures of the WHO MPOWER tool for tobacco control have not been fully implemented (WHO Regional Office for Europe, 2018b).

Table 1 summarizes a comparison of Kazakhstan’s current tobacco control measures and 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; and raise taxes on tobacco) as reported in the WHO report on the global tobacco epidemic (WHO, 2017k), supplemented by the institutional and context analysis. Findings indicate that additional policies could be put in place to reduce tobacco consumption and to meet WHO Framework Convention on Tobacco Control obligations, especially regarding bans on tobacco advertising, taxation and smoke-free environments.

Table 1. The current state of tobacco control measures in Kazakhstan

Policy name	Achievements (maximum of four)	Current state of implementation
Monitor tobacco use and prevention policies	4	Recent, representative and periodic data are available for adults and youth. There is no national STEPS survey; only regional (Aktobe oblast). Both the Global Adult Tobacco Survey and Global Youth Tobacco Surveys were carried out in 2014. In 2019, Kazakhstan will perform a new version of the Global Adult Tobacco Survey.

Table 1. (continued)

Policy name	Achievements (maximum of four)	Current state of implementation
Protect people from tobacco smoke	2	<p>There has been a partial smoke-free ban since 2009. Three of the eight categories^a of public places were not completely^b smoke-free by 2017, including restaurants, public transport and all other indoor public places (WHO, 2017d). A smoking ban applies in all health-care, educational (including universities) and government facilities, indoor workplaces and cafes. Smoking violations incur fines for both the smoker and the establishment, but no funds are dedicated to enforcement (WHO Regional Office for Europe, 2017a), and penalties are reportedly too low to sufficiently deter violations (~US\$ 20 for smokers and ~US\$ 300 for establishments). Smoking on school premises and grounds is banned. Using a hookah is prohibited by law in public places, but this is not commonly enforced.</p>
Offer to help to quit tobacco use	3	<p>Nicotine replacement therapy is available without prescription in pharmacies, but the public sector does not pay for this (WHO Regional Office for Europe, 2017a). Smoking-cessation support is available in some health clinics and primary care facilities, hospitals, offices of professionals and in the community. The public coverage of costs varies from fully covered in health clinics and offices of health professionals, partly covered in hospitals and not covered in the community (WHO, 2017d). There is a toll-free telephone quitline. Two challenges for cessation support are: (1) the affordability of tobacco products and (2) health-care workers who feel overburdened and, in many cases, are smokers themselves.</p> <p>Within schools, psychologists identify children at risk of starting smoking (such as if both parents smoke) and target support.</p>
Warn about the dangers of tobacco	4	<p>Large pictorial health warnings (the first in the countries of the former USSR) on tobacco packages with all appropriate characteristics have been adopted and implemented since 2016 (WHO, 2017d). Nevertheless, the size of the pictorial warnings is below global best practice (80–85% of both sides of the pack), and plain packaging has not been implemented. Health warnings are also mandated for smokeless tobacco products. The tobacco industry is promoting e-cigarettes, which are not regulated in Kazakhstan.</p>
	3	<p>A national television and radio campaign was aired between June 2014 and June 2016. The campaign was part of a comprehensive programme against tobacco use. No evaluation exists on the impact of the campaign (WHO, 2017d).</p>

Table 1. (continued)

Policy name	Achievements (maximum of four)	Current state of implementation
Enforce bans on tobacco advertising, promotion and sponsorship	3	All forms of direct advertisement on national television and radio, print and billboards are banned through a 2003 law that was amended in 2007 (WHO Regional Office for Europe, 2017a). Some forms of indirect advertisement are banned (WHO, 2017d). Tobacco and other companies are still legally allowed to publicize activities of the tobacco industry. The tobacco industry sponsors cultural activities, among other things, and is active throughout central Asia. There is a tobacco factory with 900 employees in Almaty and offices in 21 cities.
Raise taxes on tobacco	2	The total taxes for the most sold tobacco brands comprised 45.2% of the retail price in 2016, of which 34.5% was specific excise tax and 10.7% was value added or sales tax. Taxes on the most sold brands of tobacco products other than cigarettes were 73.3% (WHO, 2017d). The Ministry of Finance noted achieving raised revenue for the government each year it has raised tobacco taxes. However, although there is a plan to raise taxes slowly over five years, this is insufficient to maximize health and development gains. The minimum price of a pack of cigarettes is less than US\$ 1 (340 tenge). According to WHO recommendations, the amount of total tax per pack should comprise at least 75% of the retail price. Industry lobbying against raised taxes and other tobacco control measures appears to be active and strong. Simulation modelling for how the taxation of tobacco products affects health is planned.

^a 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).

^b “Complete” means that smoking is not permitted, with no exemptions allowed.

The table indicates that additional policies could be put in place and be more strongly enforced to reduce tobacco consumption and meet WHO Framework Convention on Tobacco Control obligations, especially regarding taxation and the affordability of cigarettes and smoke-free environments. Implementation of a combined package of tobacco control policies in accordance with the WHO Framework Convention on Tobacco Control would be expected to reduce prevalence by 42% within five years (WHO Regional Office for Europe, 2017a).

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 (DALY) averted in low- and middle-income countries. This list largely corresponds with those listed within the OneHealth Tool that can be modelled as part of the return on investment analysis:

- 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, 2010, 2017b, c; WHO Regional Office for Europe, 2012). These are reproduced in Table 2, alongside some of the achievements in reducing alcohol consumption in Kazakhstan. This assessment draws on various sources.

Table 2. The current state of alcohol control interventions in Kazakhstan

Policy	Policy options	Current state of implementation
Taxation	Increase excise taxes on alcoholic beverages	Excise taxes were increased on beer in 2011 and vodka in 2014. These led to significant increases in revenue but were not introduced systematically and steadily. Taxes follow the price index and are related to alcohol content. Taxation interventions were scored as “moderate” in one WHO report (WHO Regional Office for Europe, 2018b) and as “partly achieved” in another (WHO Regional Office for Europe, 2017b).
Advertising	Enact and enforce bans or comprehensive restrictions on exposure to alcohol advertising (across multiple types of media)	Restrictions on the content and volume of alcohol advertising, sponsorship and promotion exist (WHO Regional Office for Europe, 2018b). These regulations apply to both direct and indirect marketing but are not effectively enforced. One WHO report scored this area as “moderate” (WHO Regional Office for Europe, 2018b), and another scored it as “partly achieved” (WHO Regional Office for Europe, 2017b).

Table 2. (continued)

Policy	Policy options	Current state of implementation
Availability	Enact and enforce restrictions on the physical availability of retailed alcohol (via reduced hours of sale)	Alcohol retail is restricted in government institutions and banned in educational institutions, but improvements can be made on enforcement. Interventions in this area were considered “moderate” in one WHO report (WHO Regional Office for Europe, 2018b) and “partly achieved” in another (WHO Regional Office for Europe, 2017b). Regulation and enforcement of a minimum purchase age was scored as “extensive” and includes a loss of licence for establishments that illegally sell alcohol to people younger than 21 years (WHO Regional Office for Europe, 2018b). Further, retail alcohol sales are prohibited except for sales in restaurants, bars and cafés from 23:00 until 8:00 and from 21:00 to 12:00 if the alcohol content exceeds 30%.
Drink-driving	Enact and enforce drink-driving laws and blood alcohol concentration limits via sobriety checkpoints	A zero-tolerance policy is in place for drink-driving. The area was scored as “moderate” in a WHO report (WHO Regional Office for Europe, 2018b) because of enforcement challenges.
Brief interventions	Provide brief psychosocial intervention for people with hazardous and harmful alcohol use	Local healthy lifestyle centres can provide advice.

Within Table 2, the first three policy interventions listed are also WHO best buys; the fourth and fifth are WHO effective interventions, with cost–effectiveness analysis >100 international dollars per DALY averted in low- and middle-income countries. These largely correspond with those listed within the OneHealth Tool that can be modelled as part of the return on investment 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; 2017c). These are reproduced in Table 3, alongside some of the achievements in increasing physical activity in Kazakhstan.

Table 3. The current state of physical activity interventions in Kazakhstan

Policy	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	There are campaigns for physical activity promotion (WHO Regional Office for Europe, 2018b). Physical activity and diet are seen as priorities for intervention. The area was scored as “moderate” in one WHO report (WHO Regional Office for Europe, 2018b).
Health system	Provision of physical activity counselling and referral as part of routine primary health care services through the use of a brief intervention	Local health administrations can commission counselling on healthy lifestyles from healthy lifestyle centres.
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>	Physical activity can be supported through urban planning (WHO Regional Office for Europe, 2017c). In 2015, the mayor of Almaty, the largest city in Kazakhstan, commissioned a Danish architect to create an urban design plan to make the city more liveable. This includes more space for pedestrians and cyclists (Gehl Architects, 2015, 2018). In Astana, cycle paths have been developed and there is a city bike scheme through which bicycles can be easily hired. The key performance indicators of local government include providing sports fields to increase access to facilities. There is a move to develop outdoor fitness facilities.
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>	There are three hours of compulsory physical education per week for grades 1–11. Healthy lifestyles are taught and integrated throughout the curricula as part of functional literacy – how to apply knowledge in real life. There are networks of healthy universities, health-promoting schools and healthy cities.
Promotion	Promotion of physical activity through organized sport groups and clubs, programmes and events	Schools have voluntary extracurricular activities that include physical activity.

The OneHealth tool can model the following policy change as part of analysing the return on investment:

- public awareness campaigning on physical activity.

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

WHO (2017b) has assessed salt-reduction policies as not achieved overall. Table 4 compares Kazakhstan’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; and environment) (WHO, 2016b).

Table 4. The current state of policies to reduce salt consumption in Kazakhstan

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	<p>Nutrition data, including data on salt consumption, is not routinely collected (WHO Regional Office for Europe, 2018b). Nevertheless, there was a recent 24-hour sodium excretion survey to ascertain salt consumption in two regions, and Kazakhstan has participated in the FEEDCities initiative to analyse the composition of common foods for salt and <i>trans</i>-fat content.</p> <p>WHO has also used data from the national dietary intake survey about sources of salt in the diet to run a modelling exercise to estimate what reductions in sodium would be required to achieve the WHO target (WHO Regional Office for Europe, 2018c).</p>
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	<p>There are no specific actions in place to reduce salt. There has been a focus on fortifying foods, such as iron in flour and iodine in salt, promoted by the Gender and Family Commission. The Ministry of Investment for Development covers food processing. It can be difficult to check whether food regulations have been implemented because of moves to reduce regulatory burden on small and medium-sized enterprises. The Ministry of Agriculture acknowledges the need for less salt consumption to become the standard. According to WHO guidelines on sodium intake, salt reduction efforts are fully compatible with iodizing salt (WHO, 2012a).</p>

Table 4. (continued)

Policy	Description ^a	Current state of implementation
Adopt standards for labelling and marketing: implement standards for effective and accurate labelling and marketing of food	Adopt front-of-pack nutrition labelling systems (for example, colour-coded for salt content level, “high salt” warning)	<p>Kazakhstan still needs to ensure that (1) labelling of sodium is mandatory in the nutrient declaration on the back of packages for all packaged foods and (2) develop front-of-pack labelling systems. This will enable them to monitor the composition of foods over time; help consumers make healthy choices and incentivize the industry to remove salt. Some efforts towards food labelling (and food safety) have apparently met resistance from the business community.</p> <p>No policy to restrict the marketing of foods high in fat, sugar and salt to children exists in Kazakhstan. Kazakhstan has just completed a study on the marketing of foods to children. It found that 36% of all advertising on TV is for food products, of which 72% of the products and beverages advertised on television do not meet the nutritional criteria established in the WHO nutrient profile model.</p>
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 to change behaviour	Healthy lifestyle centres can be commissioned by local health administrations to provide health education campaigns, although salt reduction does not appear to have been a particular feature.
Environment: support settings to promote healthy eating	Implement multicomponent salt-reduction strategies in community settings such as schools, workplaces and hospitals	The Nutrition Institute developed regulations for salt intake and standard menus for hospitals. Nutrition policies in the school setting have been prepared but have not yet been implemented (WHO Regional Office for Europe. 2018b). In schools, nurses are in charge of healthy nutrition and review school menus. The boards of trustees for schools can also look at nutrition within the school, as can parents on open doors days. School-based initiatives to support healthy eating have been piloted in two regions.

^aThe 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; and labelling). These policy interventions correspond with those listed within the OneHealth Tool that can be modelled as part of the return on investment 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 WHO’s Global Action Plan for the Prevention and Control of Noncommunicable Diseases 2013–2020 (WHO, 2017c) contains two “effective interventions” (with cost–effectiveness analysis >100 international dollars per DALY averted in low- and middle-income countries) on *trans*-fat and sugar, respectively, and Table 5 shows the current state of implementation for these.

Table 5. The current state of policies for *trans*-fat and sugar in Kazakhstan

Policy	Description	Current state of implementation
<i>Trans</i> -fat	Eliminate industrial <i>trans</i> -fat by developing legislation to ban its use in the food chain	Implementation of policies restricting or eliminating <i>trans</i> -fat in the food chain had previously been scored as “limited” in a WHO report (WHO Regional Office for Europe, 2018b) describing the situation in 2016–2017. As of 1 January 2018, a new standard for the content of industrial <i>trans</i> -fatty acids in oil and fat products came into force in the Russian Federation and countries of the Eurasian Economic Union (TR CU 024/2011: Technical regulations for oil and fat products, approved by the decision of the Customs Union Commission of 09.12.2011, No. 883). The industrial <i>trans</i> -fatty acid content in hard margarines, soft and liquid margarines, milk fat substitutes and fats for special purposes must not exceed 2.0% of the total fat content in the food product. It is not clear to what extent this has been implemented in Kazakhstan yet. Some government ministries advocate increasing dairy consumption in schools, which should not be a problem if low- or medium-fat options are chosen.
Sugar	Reduce sugar consumption through effective taxation on sugar-sweetened beverages	There has been no action to reduce sugar intake in Kazakhstan through effective taxation (WHO Regional Office for Europe, 2018b). Other actions are in preliminary stages; for example, vending machines and sales of soda drinks have been banned within the school setting, but these products can be bought outside school and brought into school.

Since the OneHealth Tool is not yet able to calculate the impact of interventions on fat and sugar, these are not included in analysing return on investment.

Clinical interventions for cardiovascular diseases and diabetes

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 cardiovascular diseases and diabetes (WHO, 2017b; 2017c). Table 6 shows a selection of those most relevant to this analysis alongside an assessment of the situation in Kazakhstan.

Table 6. The current state of clinical policies to reduce the risk of cardiovascular diseases in Kazakhstan

Policy	Description	Current state of implementation
Cardiovascular risk assessment and management	Screening for risk of cardiovascular diseases and diabetes	In 2016, 11 national screening programmes were in place. The number has now been reduced but still includes screening for cardiovascular disease risk factors and diabetes. However, hypertension detection has been low and varies by region. The detection rate of screening for diabetes via blood sugar is unknown (WHO Regional Office for Europe, 2018b). More than 50% of the primary health care facilities offer cardiovascular risk stratification for managing people at high risk of heart attack and stroke, but the documentation of risk factors is not yet satisfactory, and in 2014 almost 13% of hospitalization was caused by hypertension (WHO Regional Office for Europe, 2015). The target of making drug therapy (including glycaemic control) and counselling available in more than 50% of primary health care facilities was assessed as fully achieved by 2017 (WHO Regional Office for Europe, 2017b). The drug coverage of patients is being monitored using software in a drug provision information system.
	Providing drug therapy (including glycaemic control for diabetes 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 or nonfatal cardiovascular event in the next 10 years	
Acute myocardial infarction and stroke	Treatment of new cases of acute myocardial infarction with either acetylsalicylic acid or acetylsalicylic acid and clopidogrel, or thrombolysis or primary percutaneous coronary interventions	Protocols and algorithms for acute management are available. There are no data on the proportion of people with acute myocardial infarction or stroke that receive diagnosis and care within six hours of the first symptoms, but it is estimated to be between 25–50%. Thrombolytic therapy is only available in some health centres (WHO Regional Office for Europe, 2018b). In 2015, there were 1063 stroke unit beds across Kazakhstan, of which 181 were in intensive care facilities (Akshulakov, in WHO Regional Office for Europe, 2018b). Routine data on secondary prevention do not exist. A management plan is set up for people after treatment for acute myocardial infarction. Medication can be prescribed, but the public sector does not reimburse for statins. A 2016 study found that only 32% of high-risk patients were taking prescribed acetylsalicylic acid, beta-blockers and statins (WHO Regional Office for Europe, 2018b).
	Treatment of acute ischaemic stroke with intravenous thrombolytic therapy	
	Treatment of cases with established ischaemic heart disease and post-myocardial infarction	

Table 6. (continued)

Diabetes	Glycaemic control	Chronic disease tests are offered twice a year. Medication is available free of charge through chronic disease clinics but statins, and sometimes tests, are not reimbursed by the public sector (WHO Regional Office for Europe, 2018b). The uptake of glycated haemoglobin is not routinely monitored but expected to be low. Patients receive general education on nutrition and physical activity in chronic disease clinics and “health schools”. but this area is underdeveloped in general.
	Diabetic retinopathy screening and foot care to avoid complications	Foot examinations, eye examinations and urine protein analysis are offered routinely to people registered with diabetes. The uptake and quality are unknown (WHO Regional Office for Europe, 2018b). Nurses or general practitioners carry out foot examinations.

The OneHealth Tool is able to model the following package of interventions as part of analysing the return on investment:

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

Summary

The review of current NCD interventions at the policy and individual service levels described in this section indicated gaps in implementing 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. These findings were discussed with the Ministry of Health, which estimated the current level of coverage based on the assessment above, as summarized in Table 7.

Table 7. Estimated current coverage of NCD interventions to be costed within the OneHealth Tool

TOBACCO	
Monitor tobacco use and prevention policies	100%
Protect people from tobacco smoke	80%
Offer to help quit tobacco use: mCessation	75%
Warn about danger: warning labels	100%
Warn about danger: mass-media campaign	75%
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)	100%
Raise taxes on alcoholic beverages	50%
PHYSICAL ACTIVITY	
Public awareness campaigning on physical activity	60%
SALT	
Surveillance	30%
Harness industry for reformulation	0%
Adopt standards: front-of-pack labelling	0%
Adopt standards: strategies to combat misleading marketing	0%
Knowledge: education and communication	15%
Environment: salt-reduction strategies in community-based eating spaces	25%
CLINICAL INTERVENTIONS: CARDIOVASCULAR DISEASES	
Screening for risk of cardiovascular diseases and diabetes	75%
Treatment for those with high absolute risk of cardiovascular diseases and diabetes (>30%)	50–75%
Treatment of new cases of acute myocardial infarction with aspirin	75%
Treatment of cases with established ischaemic heart disease and post-myocardial infarction	75%
Treatment for those with established cerebrovascular disease and post-stroke	75%
CLINICAL INTERVENTIONS: DIABETES	
Standard glycaemic control	75%
Retinopathy screening and photocoagulation	75%
Neuropathy screening and preventive foot care	75%

The authors estimated the coverage of policy interventions based on the assessment in Section 3, discussed with the national team during June 2018, then adjusted.

4. Methods

A multiagency, multidisciplinary team comprising staff from the Ministry of Health, WHO, the United Nations Interagency Task Force on the Prevention and Control of Non-communicable Diseases, the United Nations Development Programme, the National Research Centre for Preventive Medicine, Moscow, Russian Federation and the Center for Healthcare Quality Assessment and Control of the Ministry of Health of the Russian Federation undertook initial data collection and analysis in Kazakhstan from 22 to 28 June 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 various methods and economic models applied at various stages in the economic analysis:

- calculating the economic burden of NCDs in terms of direct costs and indirect costs (absenteeism, presenteeism and premature death);
- costing interventions (clinical and policy interventions);
- assessing health impact; and
- return on investment 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 Kazakhstan. The data used for the population by age and sex for the period 2018–2033 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 data for the neighbouring country Kyrgyzstan) 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, cardiovascular disease and chronic respiratory disease between 2018 and 2033, holding current rates constant.¹¹ These projections were summarized as total incidence, prevalence and mortality for both the entire population and the working-age population, defined as people 15–64 years old.

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

- Since only total government health expenditure data are available in Kazakhstan, 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), with median numbers from these 13 countries being used. Direct non-health care costs comprised disability payments, which were calculated using the number of people who became disabled from diseases included in the analysis and annual payments to people with disabilities (1.5 million tenge per person per year).
- The annual value (in terms of economic output) of each full-time worker in Kazakhstan was calculated. This is based on gross domestic product (GDP) per employed person, defined as the country's GDP (51.9 trillion tenge in 2017) divided by its total employed labour force. Local data on the

¹¹ The model estimates growth in prevalence, incidence and mortality from population growth only – not growth in disease rates.

total labour force aged 15 years and older (9 million), the unemployment rate (4.9%) and the labour force participation rate (70%) were used to determine the total employed labour force for Kazakhstan.

- 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 (1) the reduction in labour force participation from hypertension, stroke, acute myocardial infarction and diabetes; (2) the reduction in full-time hours worked because of absenteeism; (3) the reduction in productivity because of presenteeism; and (4) the total time taken to replace a worker (see Annex 1, Table A2).
- The exact number of people with NCDs working in Kazakhstan 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 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 intervention were calculated using the WHO Costing Tool (WHO, 2012b). Costs of clinical interventions were calculated using the OneHealth Tool. This identifies, quantifies and values 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 estimates 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 (Bertram et al., 2017; Stenberg, 2018).
- The unit costs for resource items are taken from the WHO-CHOICE database.

Return on investment

Return on investment 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. Return on investment is the ratio of the discounted (present) value of the benefits to the investment costs. Future costs and 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. Return on investment 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 7 lists the policy-based interventions included in this calculation.

The method used is the NCD return on investment 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 the 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 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. Since interventions reduce the projected incidence of ischaemic heart disease 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 Kazakhstan and the projected number of deaths avoided. Avoided mortality was monetized by multiplying by the GDP per worker as outlined above.

The return on investment was calculated for the interventions listed in Table 7. 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 return on investment for Kazakhstan 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 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 Kazakhstan, including implementing investment case findings. Specifically, from 22 to 28 June 2018, the mission team met bilaterally with representatives from: the Ministries of Health, Finance, Economy, Planning, Trade, Education, Agriculture, Internal Affairs and Labour and Social Protection; Parliamentary Committees for Social Affairs and Culture, Treasury and Revenue; the Family and Gender Committee; the National Centre for Public Health; the National Statistical Committee; two NGOs; the Chamber of Entrepreneurs; the Astana Public Health Department; Astana Medical University; and the United Nations Country Team. 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 return on investment analysis – including health benefits, economic benefits and total costs – and discusses the return on investment for each package of interventions.

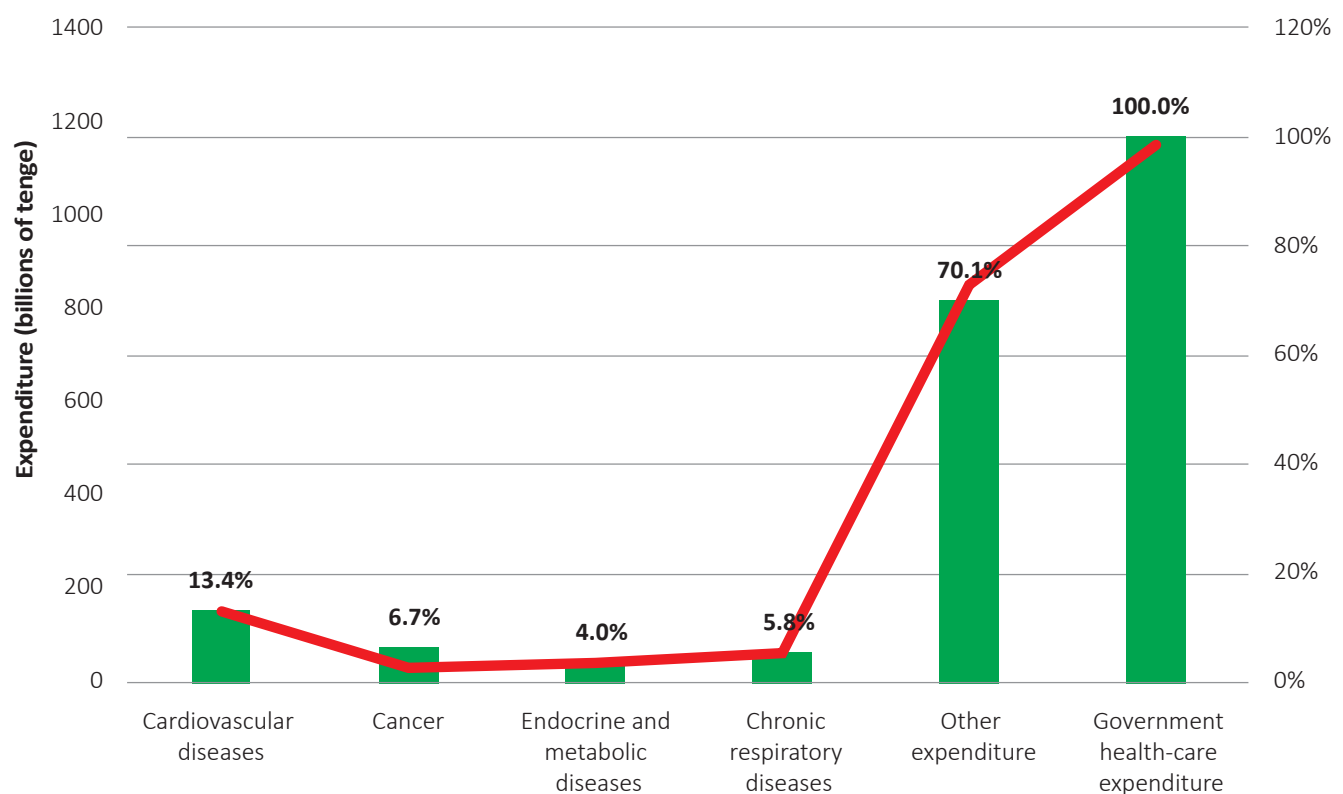
Annual economic burden

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 Kazakhstan-specific numbers, which were not available.

Total government health expenditure for Kazakhstan in 2017 was 1.1 trillion tenge. As noted above, government health-care spending on NCDs in Kazakhstan 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 cardiovascular disease; 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 0.3 trillion tenge for 2017 (Fig. 2).

Fig. 2. Government health-care expenditure in Kazakhstan, 2017, billions of tenge



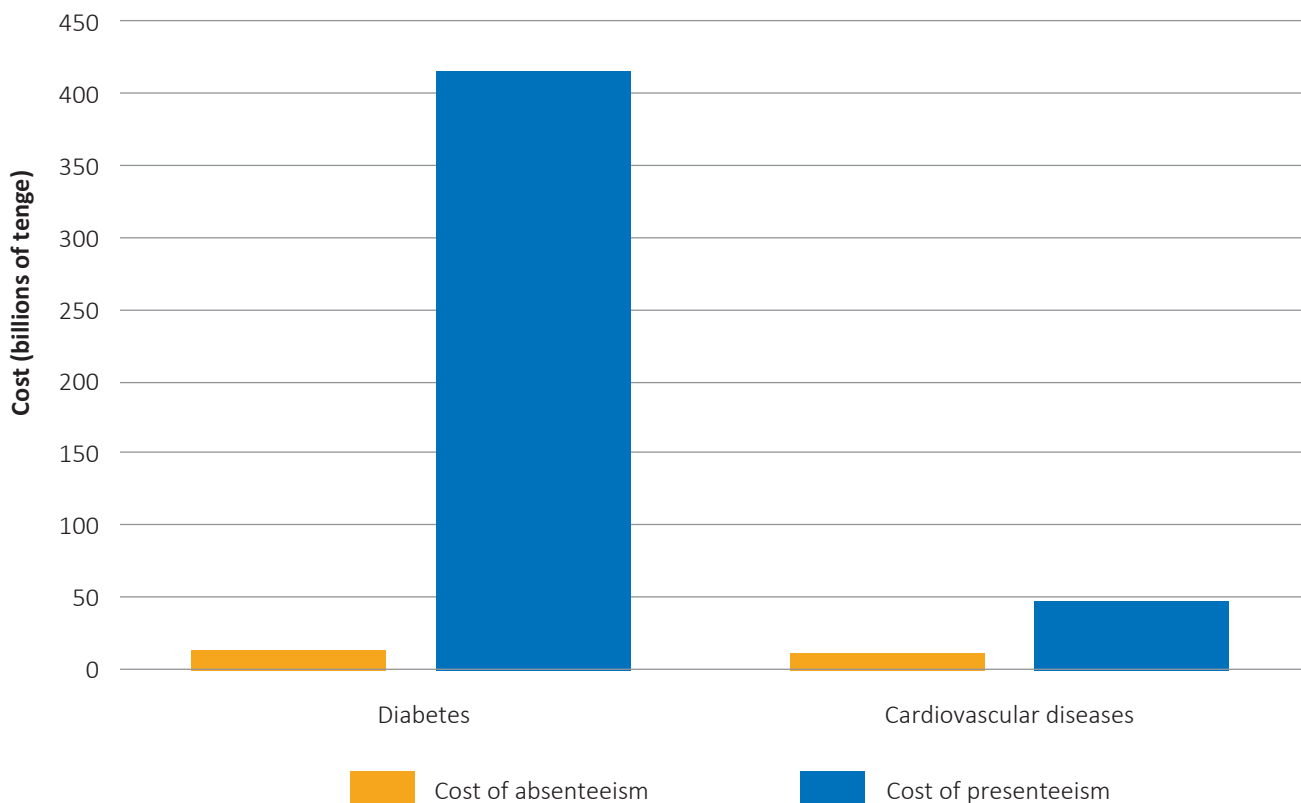
Indirect costs

For Kazakhstan, 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.

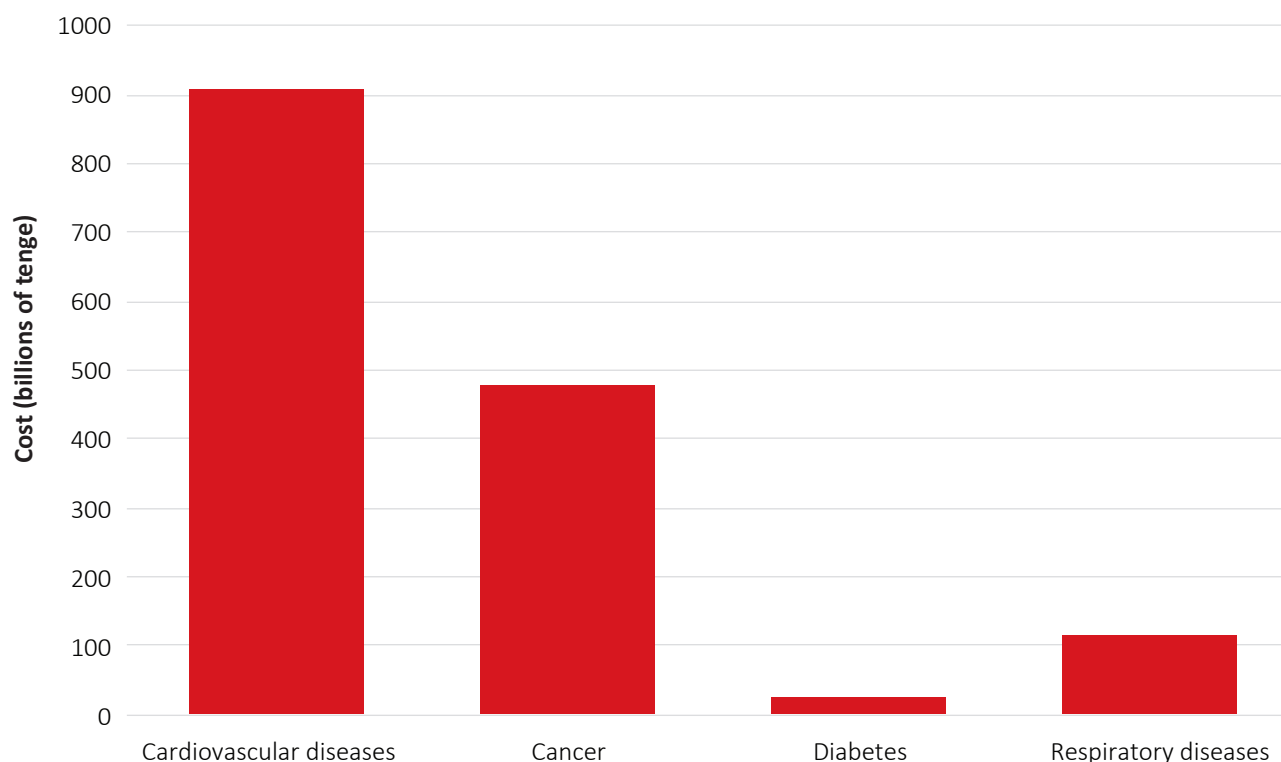
The calculation of absenteeism and presenteeism is based on the proportion of the workforce living with NCDs (Fig. 3). They could only be calculated for cardiovascular disease and diabetes, because relevant studies on chronic respiratory diseases and cancer are lacking in the literature. Productivity losses due to absenteeism per year were estimated to be equal to the full losses of productivity of 1865 workers for cardiovascular disease and 2042 workers for diabetes, which resulted in a total cost of absenteeism of 23.6 billion tenge for Kazakhstan. For presenteeism, the corresponding calculation found the number of losses of full productivity to be 7868 workers for cardiovascular disease and 68 495 workers for diabetes, resulting in a burden of presenteeism of 462.2 billion tenge.

Fig. 3. Costs of absenteeism and presenteeism for cardiovascular diseases and diabetes, 2017, billions of tenge



Losses from premature death were estimated using human capital methods, 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 determining the proportion of the years of life lost that occur within the working population (labour force participation rate times the age-specific employment rate) due to the four main NCDs in 2017, and multiplying this figure (176 093) by the GDP per working person. The total costs of premature death were estimated to be 1524.1 billion tenge (Fig. 4).

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



Cardiovascular disease 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 8 demonstrates the total direct and indirect costs of NCDs in Kazakhstan. Indirect economic losses are 6.5 times higher (2 trillion tenge) than direct losses. The estimated government expenditure on the four main NCDs is already 0.3 trillion tenge, but additional losses to the economy from absenteeism, presenteeism and premature death amount to 2 trillion tenge. This would be even larger if the costs of absenteeism and presenteeism could be estimated for cancer and chronic respiratory diseases.

Table 8. Economic burden of NCDs in Kazakhstan, 2017, billions of tenge

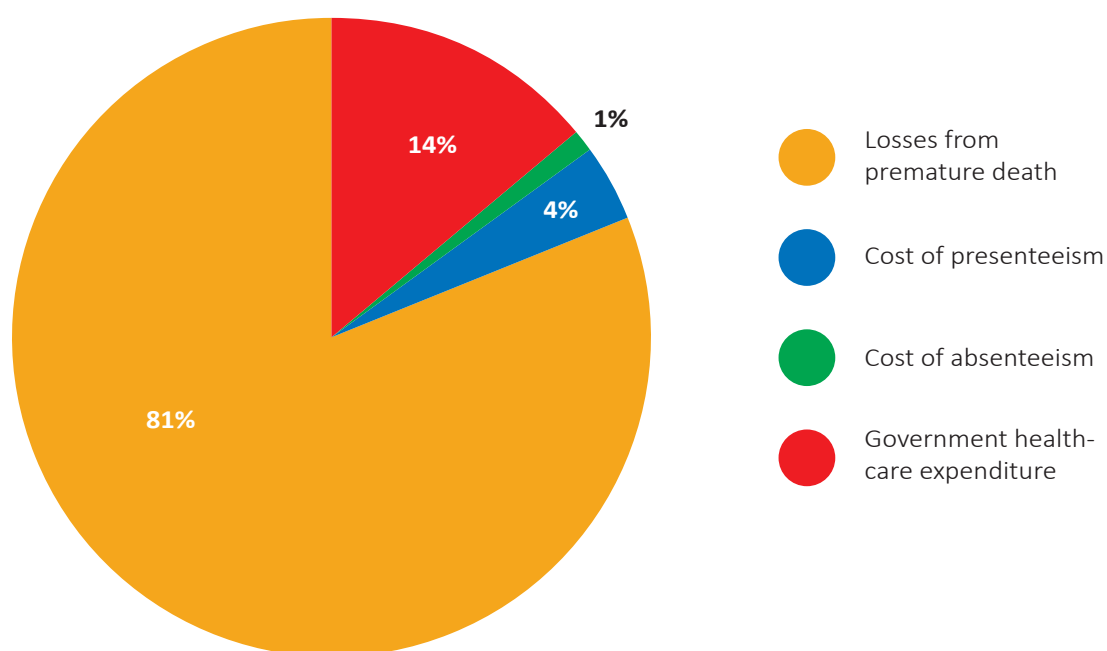
Cost	Cardiovascular diseases	Cancer	Endocrine and metabolic diseases (largely diabetes)	Chronic respiratory diseases	Total
Direct costs					
Health care					
<i>Government expenditure</i>	154.4	33.0	46.1	66.8	300.3
Non-health care					
<i>Disability payments</i>	4.1	1.4	0.6	NA	6.1
Total direct costs	158.5	34.4	46.7	66.8	306.4
Indirect costs					
Absenteeism	11.3	NA	12.4	NA	23.7

Table 8. (continued)

Cost	Cardiovascular diseases	Cancer	Endocrine and metabolic diseases (largely diabetes)	Chronic respiratory diseases	Total
Presenteeism	47.6	NA	414.6	NA	462.2
Premature deaths	908.8	476.7	23.1	115.6	1524.2
Total indirect costs	967.8	476.7	450.0	115.6	2010.1
Total burden	1126.3	511.1	496.7	182.4	2310.4

NA: not available.

The total burden on the economy of Kazakhstan is 2.3 trillion tenge, equivalent to 4.5% of GDP in 2017. Fig. 5 shows the structure of the economic burden of NCDs in Kazakhstan in 2017. Government health-care expenditure represents only 13.7% 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 Kazakhstan, 2017

Costs of intervention

The costs of intervention were estimated for the period 2018–2033. Table 9 shows the costs for each of the first five years of this period plus the five-year and 15-year total.

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

The total costs for the tobacco package based on MPOWER guidelines are 5.0 billion tenge for five years and 15.4 billion tenge for 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 9. Estimated costs of policy and clinical interventions (billions of tenge), 2018–2033

Intervention type	2018	2019	2020	2021	2022	Total for five years	Total for 15 years
Tobacco control package	0.7	1.0	1.0	1.1	1.1	5.0	15.4
Alcohol control package	1.2	2.2	2.1	2.3	2.4	10.2	69.1
Physical activity awareness package	0.6	1.0	1.0	1.0	1.1	4.7	29.2
Salt reduction package	0.6	0.9	1.0	1.0	1.0	4.5	28.2
All policy interventions, total	3.1	5.2	5.1	5.4	5.6	24.4	141.9
Cardiovascular disease and diabetes clinical intervention package	7.9	18.7	28.5	38.1	47.5	140.7	89 714.6

Health benefits

All interventions significantly reduce the number of lives lost to cardiovascular disease-related causes (Table 10). Salt interventions have the greatest impact (164 271 lives saved), followed by tobacco interventions (71 130) and physical activity interventions (58 397).

Table 10. Estimated health benefits over 15 years

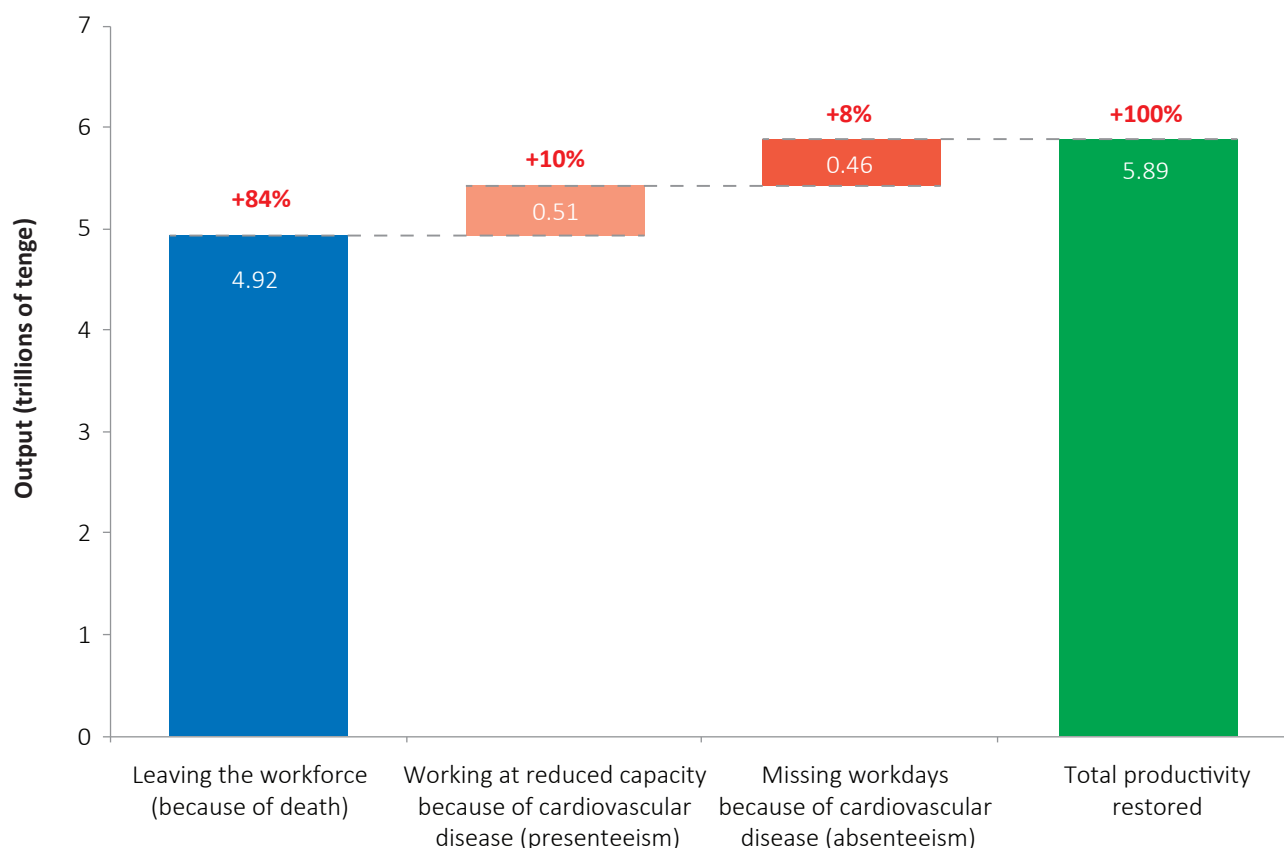
Intervention package	Strokes averted	Acute ischaemic heart disease averted	Mortality averted	Healthy life-years gained
Cardiovascular disease and diabetes clinical interventions	6 001	5 188	43 327	146 578
Tobacco interventions	16 891	20 482	71 130	258 113
Alcohol interventions	5 343	4 067	57 872	132 118
Physical activity interventions	5 505	4 863	58 397	136 601
Salt reduction interventions	125 661	122 010	164 271	1 173 866

Each set of interventions also adds healthy life-years to the population. The cardiovascular disease clinical interventions and tobacco and salt reduction 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. The same applies to the alcohol package, with a potential to avert almost 58 000 deaths. Thus, the largest gains in healthy life-years are achieved with the salt reduction intervention (1 173 866 healthy life-years gained), the tobacco interventions (258 113 healthy life-years gained) and the cardiovascular disease and diabetes clinical interventions (146 578 healthy life-years gained).

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 10.

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



The greatest positive impact on productivity is from reduced mortality (83.5% of total productivity gains), followed by reduced presenteeism (8.7%) and absenteeism (7.8%). The policy packages and cardiovascular disease and diabetes in primary care result in net present value of 5.89 trillion tenge in labour productivity gains over 15 years (equivalent to 11.3% of Kazakhstan's GDP in 2017).

Return on investment

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 return on investment greater than 1 tenge for each 1 tenge invested over 15 years (Table 11).

Table 11. Costs, benefits and return on investment at five and 15 years, by intervention package (billions of tenge)

Intervention package	Five years			15 years		
	Total costs	Total productivity benefits	Return on investment	Total costs	Total productivity benefits	Return on investment
Tobacco	5.0	73.9	15.1	15.4	991.1	45.4
Alcohol	10.2	49.3	4.9	69.1	766.3	14.2
Physical activity	4.7	50.3	10.7	29.2	774.9	33.8
Salt	4.5	228.8	53.4	28.2	2 589.1	118.4
Cardiovascular disease and diabetes clinical interventions	140.7	95.9	0.7	89 714.6	766.3	0.5

Salt interventions have the highest return on investment of any intervention: for 1 tenge invested in the package of salt interventions, the expected return is 53.4 tenge for the first five years and 118.4 tenge for 15 years. The tobacco control package also produces high return on investments for both five years and 15 years, as does the physical activity package. The alcohol control package provides a return on investment of 14.2 tenge over 15 years.

The package of clinical interventions, although being important in fulfilling the right to health, provides return on investment of less than 1 tenge per 1 tenge invested. This is frequent in health economics because of the high costs of medical treatment. Further, these treatment options (treatment, secondary prevention after acute events and other) have low potential to increase labour force participation after stroke, myocardial infarction and diabetes. But lack of return of investment does not mean absence of cost-effectiveness: these interventions can be still cost-effective from the perspective of the cost per QALY and other types of analysis.

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

6. Conclusion

NCDs pose a significant threat to Kazakhstan'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 their respective return on investment for five intervention packages to demonstrate cost-effective solutions.

Kazakhstan has several policy and legislative frameworks in place for NCDs, particularly addressing risk factors, and NCD prevention and control is included within the Densauylyk Healthcare Development State Programme 2016–2019 and the new Public Health Action Plan 2018–2021. A review of current NCD interventions at the policy and individual service levels uncovered gaps in implementing the WHO-recommended cost-effective NCD preventive and clinical interventions and drew attention to areas that need to be strengthened and scaled up to achieve 100% coverage. Also missing is a national multisectoral NCD coordination mechanism that can bring together and strengthen Kazakhstan's existing cross-agency initiatives.

Analysis of the economic burden of NCDs in 2017 estimates the total economic losses to the economy to be 2.3 trillion tenge per year, equivalent to 4.5% of the country's GDP in 2017. One small share of this is from direct

health expenditure; 81% is from premature mortality. Premature deaths from NCDs cost the economy 1.5 trillion tenge. 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 cardiovascular disease and diabetes.

Actions to prevent NCDs in Kazakhstan 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 cardiovascular disease and diabetes. Policy packages to reduce the consumption of tobacco, alcohol and salt and to increase physical activity were estimated to cost 5.0 billion tenge, 10.2 billion tenge, 4.5 billion tenge and 4.7 billion tenge over five years, respectively. The cardiovascular disease and diabetes interventions were the most expensive options, costing 140.7 billion tenge over five years.

The economic modelling for the return on investment analysis suggests that the package to reduce salt consumption largely provides the greatest return on investment. Based on this finding, scaling up effective salt reduction initiatives should be urgently given priority. 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, as has been done in many countries, notably by using the WHO modelling study, which provided significant insight on how much sodium needs to be reduced in different food categories. The regulation would apply to all foods available on the market, including in supermarkets, and thus ensure equal treatment. This would not undermine other initiatives, such as salt iodization, which should be universal and in accordance with WHO policies. 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 judgment 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 fats and sugar). Finally, the 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 increased taxation (including on *nasvai*) – and increasing physical activity in the population would also provide substantial return on investment. Regarding alcohol, the introduction of the package could avert about 58 000 deaths in a period of 15 years. 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 118.4 over 15 years, a return of more than 118 tenge for every 1 tenge invested.

Given the significant health and economic burden of NCDs to Kazakhstan, 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 return on investment. 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
Cardiovascular diseases	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%
Cancer	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 2 October 2018).

Table A2. Productivity data

Disease	Parameter value	Year	Source of data	Details of data source
Reduction in labour force participation rate				
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 2 October 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 2 October 2018).
Acute myocardial infarction	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 2 October 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 2 October 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.
Acute myocardial infarction	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				
Cardiovascular disease 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. 45:1303–11.
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. 53:253–7.
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 2 October 2018).

The WHO Regional Office for Europe

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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