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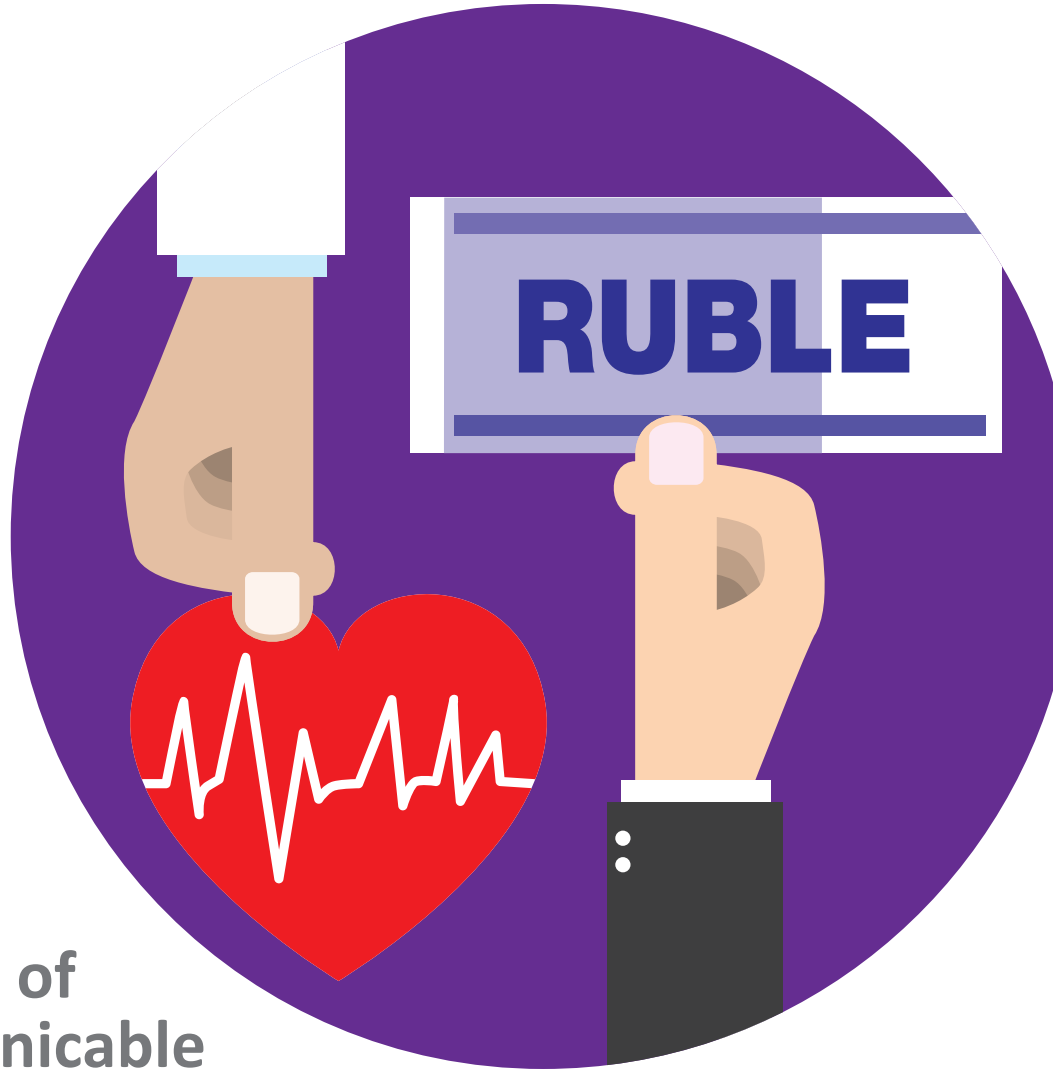

Prevention and control of noncommunicable diseases in Belarus

The case for investment

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The case for investment

Prepared for the Ministry of Health of the Republic of Belarus
by
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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 Belarus. This report provides evidence that NCDs reduce economic output and discusses potential options in response. An economic burden analysis shows that economic losses from NCDs (direct and indirect costs) are 46.7 trillion old Belarusian rubles per year, which is equivalent to 5.4% of the country's gross domestic product in 2015. An intervention costing analysis provides an estimation of the funding required to implement a set of policy interventions for tobacco and alcohol control and salt reduction, and cardiovascular disease and diabetes clinical interventions. The economic analysis demonstrated significant returns on investment for all policy interventions.

Keywords
CHRONIC DISEASE – ECONOMICS
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Abbreviations

AMI	acute myocardial infarction
BMI	body mass index
BYN[1]	new Belarusian ruble
BYR[1]	old Belarusian ruble
CVD	cardiovascular disease
DALY	disability-adjusted life-year
FCTC	Framework Convention on Tobacco Control [of WHO]
GDP	gross domestic product
IHD	ischaemic heart disease
ISO	International Organization for Standardization
LMIC	low/middle-income country
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
ROI	return on investment
STEPS	STEPwise approach to surveillance [of WHO]

[1] The currency abbreviations BYN and BYR are by the International Organization for Standardization (ISO).

Executive summary

Noncommunicable diseases (NCDs) such as cancer, cardiovascular disease, 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 Belarus. NCDs are responsible for 89% of all deaths in the country. The probability of premature death (death before the age of 70 years) for a person living in Belarus from one of these major four NCDs was one in four in 2015 (latest figures).

Cardiovascular disease causes 63% of all deaths in the country. Although almost half of the adult population (45%) has hypertension, around half (53%) of these are not taking anti-hypertensive medication. Further, 48% of men smoke tobacco, one in four of the population is obese, Belarus is estimated to have one of the highest alcohol intakes in the world and salt consumption is relatively high. A review of tobacco control policies in Belarus indicated that additional policies could be put in place to reduce tobacco consumption, and to meet the WHO Framework Convention on Tobacco Control recommendations, particularly regarding taxation and smoke-free environments.

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 Belarus are causing a surge in health care costs and social care and welfare support needs, as well as putting an increasing burden on work absenteeism, with resulting reduced productivity and employee turnover. The government was estimated to have spent 3.3 trillion old Belarusian rubles[2] (BYR) or 330 million denominated new Belarusian rubles (BYN) on treatment for the four main NCDs in 2015.

This report provides evidence that NCDs reduce economic output and discusses potential options in response. Three analyses were performed.

- An economic burden analysis showed the scale of disruption of NCDs to the economy through assessment of the direct and indirect costs of NCDs. Direct costs include government (public) health care costs for treating cardiovascular disease, diabetes, cancer and respiratory disease. Indirect costs are based on costs of absenteeism, costs of presentism and economic losses due to premature death of 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.

The economic burden analysis found that the government expenditure on health care for NCDs is just the tip of the iceberg. The hidden additional costs from lost productivity are 13 times higher, at 43.3 trillion BYR or 4.33 billion BYN in 2015. Altogether, the current economic cost of NCDs to the Belarus economy is 46.7 trillion BYR (4.67 billion BYN) per year, which is equivalent to 5.4% of the country's annual gross domestic product. With indirect economic productivity losses accounting for 95% of the economic burden of NCDs, a strong case can be made for prioritizing NCD prevention as a national economic priority.

Actions to prevent NCDs are relatively cheap and cost-effective. Their implementation requires engagement from sectors beyond health, such as finance, economy, agriculture, and benefits from the investments would accrue across the whole-of-government and society. For Belarus, the full cost of implementing a package of

[2] On 1 July 2016 the new Belarusian ruble (BYN) replaced the old Belarusian ruble (BYR) at a ratio of 1:10 000. The currency abbreviations BYN and BYR are by the International Organization for Standardization (ISO).

tobacco control “best buys” is estimated at 103.6 million BYN for 15 years; the full cost of the alcohol package is 200.5 million BYN for the same period; and the diet and physical activity packages are 72.8 million and 39.7 million BYN, respectively.

All interventions provide significant reductions in the number of lives lost to cardiovascular disease-related causes, the greatest resulting from the package of salt interventions. Salt interventions also have the highest return on investment (ROI), with a return of 94 BYN for every BYN invested in the package over 15 years. High ROIs are also expected from the tobacco and alcohol control packages; lower ROIs from the physical activity and clinical interventions.

1. Introduction

In 2015 noncommunicable diseases (NCDs) accounted for 89% of all deaths in Belarus – this is higher than the proportion of deaths attributable to NCDs at the global level (71%). The latest figures from 2015 show that a Belarusian citizen has about a one in four chance (28.6%) 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 or cancer), with a probability more than twice as high for men (38%) as for women (15%) (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 in 2030 by one third.

The impact of NCDs on human health is clear, but it is only one part of the story. NCDs also result in high economic costs, reaching far beyond direct health care costs. NCDs reduce productivity at a macro-economic level through interruption of full participation in the labour force and the subsequent impacts on individuals, their carers and the state. When individuals die prematurely, the labour output they would have produced in their remaining working years is lost. In addition, individuals who suffer from a disease are more likely to miss days of work (absenteeism) or to work at a reduced capacity while at work (presenteeism[1]). In low- and middle-income countries, it is estimated that between 2011 and 2030 NCDs will cause more than US$ 21 trillion in lost economic output, with nearly one third of that figure attributable to CVD alone (Bloom et al., 2011). For individuals and governments, spending on NCD treatment and the consequences of NCDs can mean significant opportunity cost,[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 Belarus. WHO recognizes that the risk of NCDs can be reduced by modifying four behaviours (tobacco use, harmful use of alcohol, an unhealthy diet and physical inactivity) and metabolic risk factors such as high blood pressure and cholesterol (WHO, 2013). Fig. 1 illustrates some of the determinants and risk factors that drive the development of NCDs, many of which are beyond the control of the health sector alone.

WHO developed a menu of policy options and cost-effective interventions to assist Member States to reduce the NCD burden within its global action plan for the prevention and control of NCDs 2013–2020 (WHO, 2013). These were recently updated at the World Health Assembly (WHO, 2017b) and include measures to reduce behavioural and metabolic risk factors for NCDs, as well as clinical interventions to prevent and treat disease. As almost two thirds (63%) of Belarus's deaths in 2015 were caused by heart disease, stroke, myocardial infarction and other circulatory diseases, the economic analysis detailed in this study focuses primarily on interventions that can reduce this burden of CVD.

Purpose of the economic analysis component of the case for investment

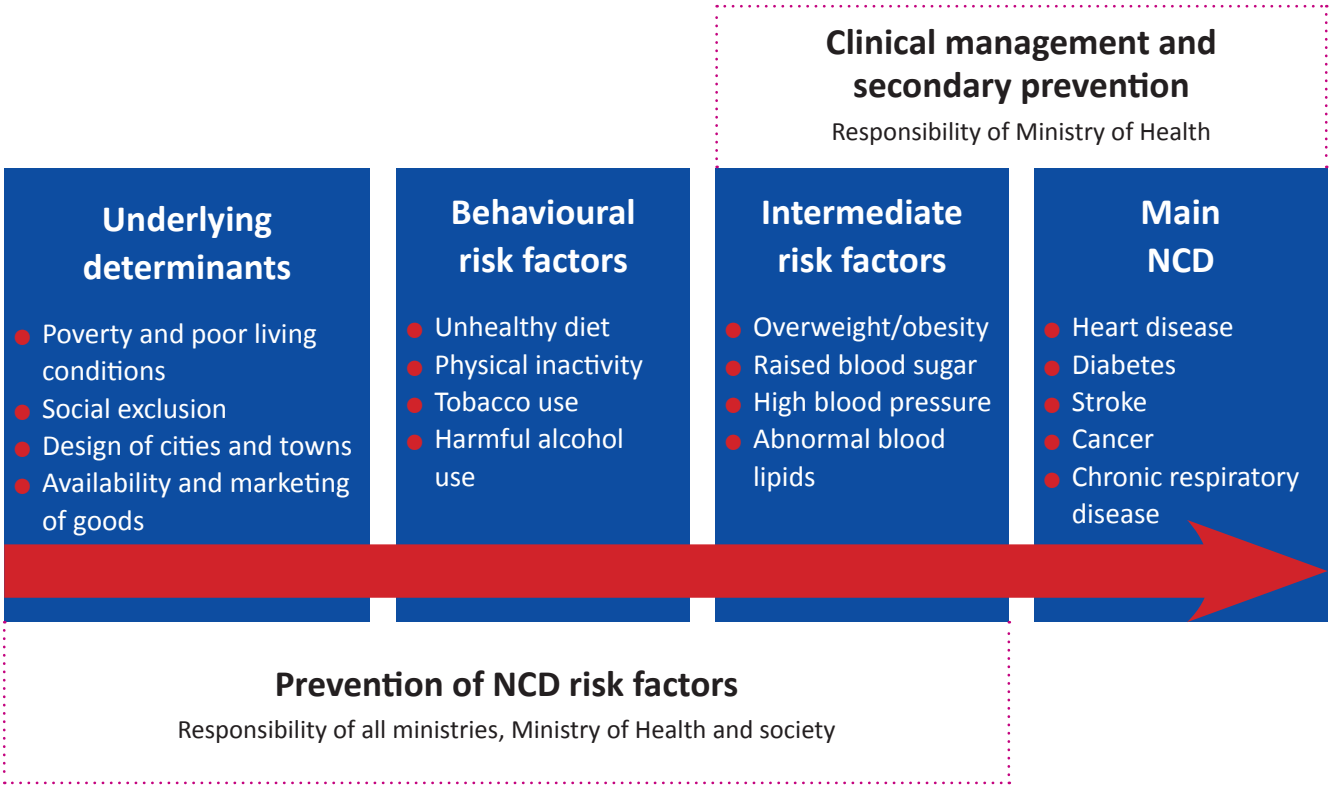
The economic aspects of NCDs are too often overlooked in budgetary allocation processes. Quantifying the costs of NCD management and interventions to prevent and control NCDs, as well as their returns in relation to the costs of inaction, has been a high-priority request from Member States. Investment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

A joint team from the United Nations Interagency Task Force on the Prevention and Control of NCDs visited Belarus for the first time on 14–18 July 2014 (WHO Regional Office for Europe, 2014). The Belarus NCD investment case was requested by the Minister of Health to help advocate a scaled-up national response to these diseases and their shared risk factors. A multidisciplinary team, led by the WHO Regional Office for Europe and United Nations Development Programme, visited Belarus in September 2016 to collect routine data, carry out interviews and perform initial analysis. Further analysis and peer review of methodology took

[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



place subsequently, with consultation on the preliminary findings taking place during 2017. At the request of the Ministry of Health and the WHO Country Office, the decision was taken to expand the limited number of policy packages modelled to include policy interventions for all four risk factors as well as a package of clinical interventions for CVD and diabetes, all of which were based on the WHO "best buys".

The investment case was accompanied by an epidemiological review and elements of an institutional and context analysis – an assessment of the institutions and actors relevant to the prevention and control of NCDs. Together with other reports on the NCD situation, the analysis helped identify national priorities, policy strengths and areas for further development related to the NCD agenda.

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 costing of policy and clinical interventions was performed using WHO Costing Tool (WHO, 2012).

Section 2 provides an analysis of selected NCD behavioural risk factors in Belarus, including current levels of tobacco, alcohol and salt consumption. Section 3 outlines evidence-based tobacco control policies (costed later in the report) and details the current implementation level of these interventions in Belarus. Section 4 describes the methods and tools used in the analysis. Section 5 presents the results, including total costs of NCDs to Belarus and the expected costs of NCD packages of interventions. Section 6 outlines the conclusions to be drawn from these.

2. Situation analysis: NCD health burden

This section gives an overview of the NCD health burden and describes the extent to which risky behaviours – such as tobacco use, harmful alcohol consumption and high salt intake – are present in Belarus, as well as the prevalence of metabolic risk factors such as raised blood pressure, cholesterol, obesity and diabetes.

Belarus has one of the highest NCD burdens in the WHO European Region, and almost two thirds (63%) of deaths can be attributed to CVD. According to the National Statistical Committee of the Republic of Belarus the premature mortality rate from CVDs is about six times higher in men than in women (245.3 and 43.6 per 100 000, respectively). There is a significant gender difference in key indicators for NCDs. The probability of dying before 70 years is more than twice as high for men as for women, and the age-standardized mortality rate for NCDs was twice as high in men (991.8 per 100 000) as in women (479.5 per 100 000) in 2015 (WHO, 2017c). Average life expectancy at birth for males is 68 years and for females is 79 years (WHO Regional Office for Europe, 2017a). There is a geographical gradient in NCD outcomes: the rural population of Belarus has lower life expectancy and higher premature mortality rates than those living in urban areas. In some rural areas male life expectancy is as low as 61.3 years. To a significant degree, the differences in male–female mortality are attributable to the male population's greater exposure to behavioural NCD risk factors, especially tobacco use and harmful use of alcohol.

Tobacco use

Findings from the 2016–2017 national WHO STEPwise approach to surveillance (STEPS) survey indicate that 29.6% of Belarusian adults (18–69 years) currently smoke (WHO Regional Office for Europe, 2017b), and almost all are daily smokers. A marked gender gap exists: only 12.6% of women smoke compared to 48.4% of men. An alarming trend, however, shows a more than threefold increase in smoking among women from 3.6% in 1995 to 12.6% in 2017 (WHO Regional Office for Europe, 2016a). Smokeless tobacco is rarely used (<1%) by adults or youths.

Box 1. Tobacco snapshot

Tobacco use is of major concern as 48.4% of Belarusian men smoke, almost all every day. One in eight women smoke (a threefold increase from 3.6% in 1995), and rates of smoking in girls (13–15 years) exceed rates in boys.

Attributable NCDs include multiple forms of cancer (most commonly lung, oral cavity, larynx, oesophagus, stomach, pancreas, kidney, bladder and breast); 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.

An estimated 9.4% of youths (8.9% of boys; 9.9% of girls) aged 13–15 years smoke cigarettes (CDC, 2015). The mean age at which people start smoking has dropped: among those aged 18–29 years the mean age of taking up smoking was 16.4 years (men: 16.1; women: 17.3); among those aged 60–69 years it was 19.3 years (men: 17.9; women: 27.1) (WHO Regional Office for Europe, 2017c). The age limit of 18 years to buy tobacco products is not sufficiently enforced in Belarus (Gavrichenkova, 2017), resulting in 40% of adolescents aged 14–17 years to buy cigarettes in shops without being asked for their identity card.[3]

In the 30 days prior to the survey, 18.8% of women, 18.9% of men and 25.1% of youths were exposed to second-hand smoke at home; 8.5% of women, 22.5% of men and 30.3% of youths were exposed to second-hand smoke in their workplace or inside public places.
An estimated 15 500 people die each year in Belarus from tobacco use (15 000 men and 500 women). This represents about 14% of all deaths (28% for men, 1% for women). Moreover, tobacco use is estimated to cause about 40% of all male deaths in middle age (35–69 years) (WHO FCTC Secretariat, 2015).

Key facts are summarized in Box 1.

[3] UNICEF, unpublished report entitled Исследование по употреблению психоактивных веществ подростками и молодежью в Республике Беларусь [Study on the use of psychoactive substances by adolescents and youth in the Republic of Belarus], 2016.

Harmful alcohol use

Alcohol consumption in Belarus is among the highest in the world, although there are some signs of improvement: the most recent data suggest that total alcohol consumption dropped to 16.4 litres per capita in 2016 from a previous peak of 17.5 litres in 2008–2010 (WHO, 2014; 2017d).

The 2016–2017 STEPS survey findings show that in 2017 around two thirds (64.9%) of males and two fifths (41.8%) of females are considered current alcohol users, indicating that they have had a drink in the past month (WHO Regional Office for Europe, 2017b). Among alcohol users, a third (34.9%) of men binged (consumed six or more drinks in one sitting) during the month before the survey, compared to 6.9% of women.

A survey conducted by the Ministry of Health and the United Nations Children's Fund on substance use by adolescents and youths in Belarus in 2016 revealed that 25% of 14–17-year-olds who had consumed alcohol in the previous 12 months had bought it in shops.[4]

WHO estimates that around 20 000 deaths in 2014 in Belarus were attributable to alcohol, including about 11 415 deaths from CVD, 5996 deaths from injuries, 1128 deaths from liver cirrhosis and 1019 deaths from alcohol-attributed cancers (Shield et al., 2016). According to the National Statistical Committee of the Republic of Belarus, 1153 men and 308 women also died because of acute alcohol poisoning in 2016 (NSC, 2017).

Key facts are summarized in Box 2.

Box 2. Alcohol snapshot

Alcohol use is of concern. Among male drinkers, 34.9% binged (consumed six or more drinks in one sitting) in the past month.

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

Physical inactivity

According to the 2016–2017 STEPS survey, around one in seven (13.2%) Belarusian adults aged 18–69 years is insufficiently active, engaging in less than 150 minutes per week of moderate-intensity physical activity (WHO Regional Office for Europe, 2017b). Around a third (35.4%) of physical activity is work-related; half (54.4%) is transport-related and a tenth (10.2%) is recreational. Around four fifths (80.5%) of adults, particularly women (91.1%), do not engage in vigorous activity.

Key facts are summarized in Box 3.

Box 3. Physical inactivity snapshot

Activity levels indicate that one in seven adults is insufficiently active. Half of physical activity is transport-related and a third is work-related.

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

Unhealthy diet (salt)

Salt or sodium consumption in Belarus is relatively high. According to a review of 187 countries, the age-standardized sodium intake in 2010 for people aged 20 years and over was estimated to be 4.35 g per day (Powles et al., 2013). Using spot urine samples among adults aged 18–69 years during 2016–2017, the STEPS survey estimated mean salt intake for men at 12.4 g per day – significantly higher than for women (9.0 g per day) (WHO Regional Office for Europe, 2017b). In each case, the intake was more than twice the WHO recommendations of less than 2 g of sodium or 5 g of salt per person per day.

Box 4. Salt snapshot

Salt (and sodium) consumption is estimated to be more than twice the WHO recommendation. Four fifths of adults add salt when cooking and a third add salt to food before eating it.

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

The proportion of cardiovascular deaths attributable to high sodium is 21.4%.

[4] UNICEF, unpublished report entitled Исследование по употреблению психоактивных веществ подростками и молодежью в Республике Беларусь [Study on the use of psychoactive substances by adolescents and youth in the Republic of Belarus], 2016.

The 2016–2017 STEPS survey findings show that around a third of Belarusian adults always or often add extra salt to their food when eating (31.7%) and four fifths do so when preparing meals (80.8%) (WHO Regional Office for Europe, 2017b).

Over a fifth (21.4%) of cardiovascular deaths among 20–69-year-olds in 2010 were attributed to sodium consumption of more than 2 g per day (Mozaffarian et al., 2014).

Metabolic risk factors

High levels of metabolic factors – such as blood pressure, body mass index (BMI) or blood lipid levels – significantly increase the risk of a cardiovascular event. Within Belarus, three fifths (60.6%) of adults are overweight (BMI ≥25 kg/m^2) and a quarter (25.4%) are obese (BMI ≥30 kg/m^2).

Table 1 displays the prevalence of raised blood pressure,[5] raised total cholesterol[6] and diabetes[7] within the Belarusian population reported by the 2016–2017 STEPS survey (WHO Regional Office for Europe, 2017b).

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

Factor	Men			Women		
	30–44 years	45–59 years	60–69 years	30–44 years	45–59 years	60–69 years
Raised blood pressure	35.1%	64.4%	81.8%	24.4%	63.4%	84.8%
Raised total cholesterol	32.9%	44.9%	48.5%	30.7%	57.0%	66.5%
Diabetes	1.1%	5.7%	7.4%	2.1%	4.3%	10.6%

Source: WHO Regional Office for Europe (2017b).

While elevated levels of any one factor can increase the risk of a cardiovascular event, the risk is compounded for individuals with multiple metabolic risk factors. WHO risk prediction charts assess the likelihood of an individual having a cardiovascular event and/or dying within 10 years by combining six factors: gender, age, blood pressure, cholesterol, smoking status and whether or not they have diabetes (WHO, 2016a). The prevalence of high cardiovascular risk among the Belarusian population can be estimated from the 2016–2017 STEPS survey according to the presence of risk factors or history of CVD or diabetes (WHO Regional Office for Europe, 2017b). This suggests that 13.5% of Belarusian adults aged 40–69 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 gender

Factor	Men		Women	
	40–54 years	55–69 years	40–54 years	55–69 years
10-year cardiovascular risk ≥30%, or with existing CVD	8.8%	24.7%	4.9%	19.3%

Source: WHO Regional Office for Europe (2017b).

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

[6] Raised total cholesterol ≥5.0 mmol/L or >=190 mg/dl or currently on medication for raised cholesterol.

[7] 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.

3. Policies and treatments to reduce the NCD burden

An initial review of the NCD response found that the Government of Belarus recognizes NCD prevention and control as one of the national priorities in the comprehensive state programme People's Health and Demographic Safety of the Republic of Belarus 2016–2020, adopted in 2016. In principle, this integrates a multisectoral response to NCDs through whole-of-government and (to a lesser extent) whole-of-society approaches; however, there is no clear indication of responsibilities for the key actors, which leads to uneven support for the most cost-effective measures to address the high burden of NCDs with population-level interventions.

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

Tobacco

Belarus ratified the WHO Framework Convention on Tobacco Control (FCTC) in 2005 and has committed to implementing a comprehensive tobacco control policy (WHO, 2017f). A new law on tobacco control was drafted in 2013, which aimed to provide a more comprehensive approach and detailed regulations. At the time of the 2016 visit, however, there had been no progress on adoption of the draft law. Instead, the Ministry of Health had begun to update Presidential Decree 28 on State Regulations for Production, Circulation and Usage of Tobacco and Tobacco Products to introduce required changes. Proposed changes to the Decree would include a ban on smoking in public places, including bars and restaurants, with the exception of separately vented areas for smoking (WHO Regional Office for Europe, 2016a).

The current national programme includes a component on interventions addressing tobacco control although it is not comprehensive: it does not include a comprehensive ban on smoking in all indoor public places and roadmap on increasing tobacco excise taxes including non-filter cigarettes; and it does not introduce regulatory measures that would work as a firewall between the management of the state tobacco monopoly and the process of elaboration, promotion and implementation of tobacco control measures. While no additional funds are available, there is an indication in the state programme that the funds for this component are within the allocated budget.

Table 3 summarizes a comparison of Belarus'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, 2017g), supplemented by the institutional and context analysis. This indicates that additional policies could be put in place to reduce tobacco consumption and to meet WHO FCTC obligations, particularly regarding taxation, as well as smoke-free environments.

Table 3. The current state of tobacco control measures in Belarus

Policy name	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, for example from the 2016–2017 STEPS survey.

Table 3 contd

Policy name	Achievements (maximum of 4)	Current state of implementation
Protect people from tobacco smoke	1	The WHO report assessed that the eight categories[a] of public places were not completely[b] smoke-free (WHO, 2017g). Special places for smoking (according to Ministry of Health standards) are allowed in all indoor public places; the remaining indoor places that are still not smoke-free are cafe/restaurants, hotels and long-distance trains. Other places mentioned (hospitals, educational facilities) are formally smoke-free but this is not enforced. Smoking violations incur fines for the patron but not the establishment (WHO Regional Office for Europe, 2017c).
Offer to help to quit tobacco use	3	Nicotine replacement therapy is available without prescription in pharmacies but no reimbursement system for it exists. Tobacco cessation services are available in some health clinics and the Ministry of Health has adopted guidelines on tobacco cessation counselling for primary health care workers. A toll-free telephone quit line does not exist. Training of national specialists involved in under- and postgraduate education of health care staff in tobacco cessation support took place in 2016 (WHO Regional Office for Europe, 2016b). Introduction of brief interventions among primary care providers on smoking cessation was implemented within the European Union-funded BELMED project.
Warn about the dangers of tobacco	4	Large health warnings on tobacco packages with all appropriate characteristics were introduced in November 2017. No data were reported on anti-tobacco mass-media campaigns.
Enforce bans on tobacco advertising, promotion and sponsorship	3	WHO reports a ban on national television, radio and print media, as well as on some but not all other forms of direct and/or indirect advertising. The 2007 law on advertising introduced bans on a number of activities related to tobacco advertising and promotion. It prohibits placement of tobacco advertising, free distribution and gift packages, games and others. A point-of-sale ban on advertising was introduced on 1 July 2015, completing the country's ban on all tobacco marketing opportunities (WHO Regional Office for Europe, 2015; 2016a; 2016b).
Raise taxes on tobacco	2	WHO reports that total taxes comprised 48.5% of the retail price for most sold brands in 2016 and that cigarettes have become less affordable since 2008. At the time of the 2016 visit, the institutional and context analysis found that tax on tobacco products stood at 42.5% of the retail price, of which 25.8% comprised specific excise tax and 16.7% was value added tax. According to WHO recommendations, the amount of total tax per pack should comprise at least 75% of the retail price.

[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 to reduce tobacco consumption and meet WHO FCTC recommendations, particularly regarding taxation and affordability of cigarettes, as well as warnings and smoke-free environments. Implementation of a combined package of tobacco control policies in line with the FCTC would be expected to reduce prevalence by 42% within five years (WHO Regional Office for Europe, 2017c).

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

- monitor tobacco use/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 NCDs 2013–2020, list a core set of policy options for alcohol control (WHO, 2010; 2017b; WHO Regional Office for Europe, 2012). These are reproduced in Table 4, alongside some of the achievements to reduce alcohol consumption in Belarus. This assessment draws on various sources.

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

Policy	Policy options	Current state of implementation
Taxation	Increase excise taxes on alcoholic beverages	There have been positive developments, such as two increases in tax on alcohol in 2014, but there is still scope for stronger action – taxation was scored as "limited" in one WHO report (WHO Regional Office for Europe, 2016a) and as "fully achieved" by 2017 in another (WHO, 2017e). The excise tax applied to beer, wine and spirits is linked to the consumer price index but is not related to alcohol content. There are no special taxes on products attractive to young people, like alcopops.

Table 4 contd

Policy	Policy options	Current state of implementation
Advertising	Enact and enforce bans or comprehensive restrictions on exposure to alcohol advertising (across multiple types of media)	Regulations on alcohol advertising, sponsorship and sales promotion are in place but enforcement is not satisfactory. There is a national regulation on alcohol sponsorship and sales promotion, but alcohol companies often use indirect marketing to promote their products. This area was scored as "limited" in one WHO report (WHO Regional Office for Europe, 2016a), and as only "partially achieved" in another (WHO, 2017e).
Availability	Enact and enforce restrictions on the physical availability of retailed alcohol (via reduced hours of sale)	There are effectively no restrictions (hours, days) on sales and in many cases locations for alcohol. Alcohol is available at petrol stations and legally traded in late-hour shops. Regulations are in place regarding availability for government and educational facilities and for special events such as graduations; enforcement could be improved. Sale to children aged under 18 years is banned but not well enforced. This area was scored as "limited" in one WHO report (WHO Regional Office for Europe, 2016a) and as only "partially achieved" in another (WHO, 2017e).
Drink–driving	Enact and enforce drink–driving laws and blood alcohol concentration limits via sobriety checkpoints	The maximum permissible level of blood alcohol concentration allowed while driving has been lowered to 0.03%. A zero tolerance policy for novice or professional drivers is not in place. This area was scored as "moderate" in a WHO report (WHO Regional Office for Europe, 2016a).
Brief interventions	Provide brief psychosocial intervention for persons with hazardous and harmful alcohol use	Training of trainers of health care staff in screening and brief interventions for alcohol use took place in 2016 (WHO Regional Office for Europe, 2016b). Introduction of brief interventions among primary care providers on harmful use of alcohol is implemented within the European Union-funded BELMED project.

Within Table 4, 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 LMICs. These 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 NCDs 2013–2020 lists several policy options for improving physical activity levels (WHO, 2017a). These are reproduced in Table 5, alongside some of the achievements to increase physical activity in Belarus mentioned during the United Nations team visit and within various WHO reports.

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

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	A specifically designated TV channel, Belarus-5, aims to raise public awareness about healthy diet and physical activity. This intervention was assessed as "moderate" in one WHO report (WHO Regional Office for Europe, 2016a) and as "fully achieved" in another (WHO, 2017e).
Health system	Provision of physical activity counselling and referral as part of routine primary health care services through the use of a brief intervention	A policy document on nutrition and physical activity counselling in primary care is available, and is partially implemented. As part of the European Union-funded BELMED project and as part of the country's goal to strengthen primary health care, doctors and nurses have been trained to deliver lifestyle counselling and motivational interviewing (WHO Regional Office for Europe, 2017d).
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	There are sidewalks and easy access to public transport in main cities. While walking is supported, cycle paths were not observed in Minsk.
	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. Physical exercise within school is compulsory and a national minimum has been set. Physical education is also included in the teacher training curriculum.
	Implementation of multicomponent workplace physical activity programmes	
Promotion	Promotion of physical activity through organized sport groups and clubs, programmes and events	Sports facilities exist across the country.

The OneHealth Tool can model the following policy change as part of the ROI analysis:

- public awareness campaigning on physical activity.

Unhealthy diet

Salt-reduction policies have been assessed overall as partially implemented (WHO, 2017e). Table 6 compares Belarus's current state against SHAKE, a set of WHO measures that outline steps countries can take to reduce salt intake (surveillance; harness industry; adopt standards for labelling and marketing; knowledge; environment) (WHO, 2016b).

Table 6. The current state of policies to reduce salt consumption in Belarus

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 2016–2017 STEPS survey (WHO Regional Office for Europe, 2017b) asked about salt consumption patterns and included urine spot tests for estimating salt consumption (see details in Section 2). The sodium content of food is not monitored, however.
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	No specific actions are in place.
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)	Plans on labelling are in place.
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	Plans are under construction.
Environment: support settings to promote healthy eating	Implement multicomponent salt-reduction strategies in community settings (e.g. schools, workplaces, hospitals)	No specific actions are in place.

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

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 WHO's global action plan for the prevention and control of NCDs 2013–2020 (WHO, 2017b) contains two "effective interventions" (with cost–effectiveness analysis >100 international dollars per DALY averted in LMICs) on trans fats and sugars; the current state of implementation for these is as shown in Table 7.

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	A national regulation requires that products containing trans fats and saturated fats must be labelled to show this content as a percentage of total fat. Special attention is given to food products for children. There is a regulation to reduce the trans fat content of oil and fat products by 2018 but little progress has been demonstrated so far. A WHO report assessed the intervention as "limited" (WHO Regional Office for Europe, 2016a).
Sugar	Reduce sugar consumption through effective taxation on sugar-sweetened beverages	Limited action has been taken so far, although there are designated low-sugar areas within large supermarkets (WHO Regional Office for Europe, 2016a).

As the OneHealth Tool is not yet able to calculate the impact of interventions on fats and sugar, these are not included in the ROI analysis.

CVD and diabetes clinical interventions

The updated Appendix 3 of WHO's global action plan for the prevention and control of NCDs 2013–2020 lists multiple clinical interventions for CVD and diabetes (WHO, 2017b). A selection of those most relevant to this analysis is reproduced in Table 8, alongside an assessment of the situation in Belarus. The state of diabetic policies was not specifically investigated but is referred to partly within the section on cardiovascular risk assessment and management.

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

Policy	Description	Current state of implementation
Cardiovascular risk assessment and management	Screening for risk of CVD/ diabetes	Annual health checks have existed for some time. Detection of hypertension and cardiovascular risk stratification is done at the primary health care level through the *dispanserizatsiya* [regular health check-up] system; however, identification and follow-up of risk groups needs to be strengthened. The screening detection rate of hypertension is low compared with population prevalence. The 2016–2017 STEPS survey (WHO Regional Office for Europe, 2017b) found that only 47.5% of men and 64.6% of women with diagnosed hypertension were taking medication prescribed by a doctor. Availability of cardiovascular risk assessment and management was assessed as "fully achieved" in 50% or more of primary health care facilities in a WHO survey (WHO Regional Office for Europe, 2017e).
	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 or nonfatal cardiovascular event in the next 10 years	

Table 8 contd

Policy	Description	Current state of implementation
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	Acute care of heart attacks and strokes is relatively strong, following international practice and achieving international standards in places (WHO Regional Office for Europe, 2017f).
	Treatment of acute ischaemic stroke with intravenous thrombolytic therapy	
	Treatment of cases with established IHD and post myocardial infarction	Secondary prevention of AMI and stroke exists in principle and patients receive free medication for six months following an acute event (WHO Regional Office for Europe, 2017f). After this, adherence may be patchier because of the costs of medication. The 2016–2017 STEPS survey indicated that the proportion of those taking aspirin or statins to prevent or treat heart disease was relatively low (11.7% and 3.1% respectively) (WHO Regional Office for Europe, 2017b).
Diabetes	Glycaemic control	In principle, insulin and diabetic medication are available and are fully reimbursed, but access to other medicines such as statins may be challenging because of the cost if the patient is not in a vulnerable group for which reimbursement is possible. There is a long history of therapeutic patient education with nurses following up patients through "health schools" but it is not standardized; nor are the outcomes monitored.
	Diabetic retinopathy screening and foot care to avoid complications	As part of the follow-up of diabetic patients, foot care and eye checks are included. A diabetes register monitors complications. Amputation rates are rising.

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

- screening for risk of CVD/diabetes
- treatment for those with high absolute risk of CVD/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 penicillin)
- standard glycaemic control
- intensive glycaemic control
- retinopathy screening and photocoagulation
- neuropathy screening and preventive foot care.

Summary

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 and drew attention to areas that need strengthening and scale-up to achieve 100% coverage. The estimation of current levels of coverage based on the assessment above is summarized in Table 9.

Table 9. Estimation of current level of coverage of NCD interventions to be evaluated within the OneHealth Tool

Tobacco	
Monitor tobacco use/prevention policies	75%
Protect people from tobacco smoke	25%
Offer to help quit tobacco use: mCessation	75%
Warn about danger: warning labels	100%
Warn about danger: mass-media campaign	25%
Enforce bans on tobacco advertising	75%
Enforce youth access restriction	60%
Raise taxes on tobacco	50%
Plain packaging of tobacco products	0%
Harmful alcohol use	
Enforce restrictions on availability of retailed alcohol	50%
Enforce restrictions on alcohol advertising	50%
Enforce drink–driving laws (sobriety checkpoints)	75%
Raise taxes on alcoholic beverages	50%
Physical activity	
Public awareness campaigning on physical activity	75%
Salt	
Surveillance	75%
Harness industry for reformulation	50%
Adopt standards: front-of-pack labelling	25%
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/diabetes	75%
Treatment for those with high absolute risk of CVD/diabetes (>30%)	75%
Treatment of new cases of AMI with aspirin	100%
Treatment of cases with established IHD and post myocardial infarction	75%
Treatment for those with established cerebrovascular disease and post stroke	75%

Table 9 contd

Clinical interventions: diabetes	
Standard glycaemic control	75%
Retinopathy screening and photocoagulation	75%
Neuropathy screening and preventive foot care	50%

4. Methods

A joint team comprising staff from the Government of Belarus, WHO and the United Nations Development Programme undertook initial data collection and analysis as well as an institutional and context analysis in Belarus during 26–30 September 2016 in order to complete a two-tier NCD investment case. The team consisted of economists, epidemiologists and social development and public health experts. The approach consisted of a desk review of materials, interviews with policy-makers across sectors and institutions, and collation and analysis of data. Initial results were presented to the Ministry of Health at the end of the assessment visit. Further data analysis took place over subsequent months. This NCD investment case was one of six carried out globally during 2016; the work also benefited from a peer review and a methodological review that took place in January 2017. The final report was completed in August 2017 and shared with the Ministry of Health for consultation. The scope was then expanded to include a broader range of policy packages.

This section outlines the different methods and economic models applied at different stages of the economic analysis. These are presented in the following order:

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

Calculation of economic burden of NCDs

The NCD economic burden model applied, developed by WHO and the United Nations Development Programme, provides estimates of the current direct and indirect costs of NCDs in Belarus. For the model, data on population by age and sex for the period 2015–2030 were collected from the Republican Scientific and Practical Centre for Medical Technologies, Informatization, Administration and Management of Health. These incorporate incidence rates by age and sex for heart attack and stroke, and prevalence rates by age and sex for diabetes, hypertension and chronic respiratory disease. Case mortality rates, disaggregated by age and sex, were applied for each condition. The model calculates projections for incidence, prevalence and mortality for diabetes, CVD and chronic respiratory disease between 2015 and 2030, holding current rates constant.[8]

At the macro-economic level, the NCD burden includes direct and indirect costs. Direct costs included in this analysis are represented by government (public) health care costs allocated for treatment of CVD, diabetes, cancer and respiratory diseases. Belarusian statistics on health care spending are built on the disease groups principle, so the Ministry of Health provided the data stratified by disease group. Direct non-health care costs include disability payments. Indirect costs included in the analysis consist of reduced workforce participation and subsequent reduction of country-level productivity – i.e. costs of absenteeism, costs of presenteeism and economic losses due to premature death at working age – caused by NCDs. These projections were summarized

[8] It is important to note that the model estimates growth in prevalence, incidence and mortality due to population growth only – not growth in disease rates.

as total incidence, prevalence and mortality for both the entire population and the working-age population, defined as those aged 15–64 years.

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

- The annual value (in terms of economic output) of each full-time worker in Belarus was calculated. This is based on gross domestic product (GDP) per employed person, defined as the country's GDP divided by its total employed labour force. To arrive at the total employed labour force for Belarus, national data on the total labour force aged 15 years and over, the unemployment rate and the labour force participation rate were used.
- Data were incorporated on the extent to which NCDs reduce worker productivity. From the academic literature (Anesetti-Rothermel & Sambamoorthi, 2011; Wang et al., 2003; Annex 1), rates were found to describe (a) the reduction in labour force participation due to hypertension, stroke, AMI and diabetes; (b) the reduction in full-time hours worked due to absenteeism; (c) the reduction in productivity due to presenteeism; and (d) the total time to replace a worker.
- The exact number of people with NCDs working in Belarus in 2015 was determined. Using labour force participation, unemployment and mortality rates, the model began with Belarusians of working age with NCDs; subtracting those who chose not to participate in the labour force or were unemployed; subtracting those who could not participate in the labour force specifically because of their NCD; and finally, subtracting those who died from NCDs. The result was an estimate of active workers with NCDs.
- The final steps were to calculate the cost of replacing both active workers who died and would-be workers who could not participate in the labour force, and to calculate the costs of absenteeism and presenteeism for surviving active workers with NCDs. The model applied the relevant productivity figures found in the second step to the populations determined in the third step and multiplied this by GDP per employed person. This calculation resulted in the total indirect costs of each NCD. These indirect costs do not include costs associated with time and money spent by family members caring for NCD chronic patients.

Calculation of policy and interventions costs

- Costs of policy interventions were calculated using the WHO Costing Tool (Chisholm, 2011; WHO, 2012). This identifies, quantifies and values each resource required for the intervention as follows:
  - for each policy, the Tool costs human resources, training, external meetings, mass-media campaigns (e.g. television and radio time, newspaper ads) and other miscellaneous equipment needed to enact policies and programmes;
  - each policy contains assumptions, set by WHO experts, about the quantity of inputs required to implement and enforce it – the Tool estimates the quantity of resources needed at the national, regional and district levels;
  - unit costs for resource items are taken from the WHO-CHOICE database (WHO, 2017h).
- The costs of clinical interventions were calculated using the OneHealth Tool, which conveniently has built-in functionality that works out expected costs of treatment interventions. For each intervention, the OneHealth Tool takes as input data points such as the salaries of medical staff and the quantities of drugs and supplies needed, as well as their prices.

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 time value of money.

An ROI analysis, based on an Excel model developed by WHO for this analysis, provided estimates for economic gains that accrue from investing in the set of cost-effective interventions identified during the visit. The policy-based interventions included in this calculation are listed in Table 9 above.

The methodology 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 tool is available from the OneHealth Tool Manual (Avenir Health, 2017) and it is discussed in detail in the technical appendix to the forthcoming RTI International report, The investment case for noncommunicable disease prevention and control (RTI International, in press).

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

- Data on the amount by which NCDs reduce worker productivity were incorporated, as noted for the NCD economic burden model. As interventions reduce the projected incidence of IHD and stroke, there is an associated increase in the number of healthy life-years of the population. By considering the increase in healthy life-years, GDP per employed person and the reduction in rates for absenteeism and presenteeism, an increase in GDP can be determined, attributed to the value of avoided absenteeism and presenteeism.
- By considering the labour force participation rate in Belarus and the projected number of Belarusian deaths avoided, the increase in labour force participation due to avoided deaths was calculated. An increase in economic output was therefore attributed to the value of avoided mortality.
- The final economic gain came from the reduced time spent having to seek new workers for replacement. The academic literature estimates the time taken to replace workers to be around 10 weeks, on average. The worker replacement rate, applied to both the total deaths avoided and the increase in healthy life-years due to avoided IHD and stroke, gives the increase in GDP resulting from not having to replace staff so frequently.

ROI rates were calculated for the interventions listed above in Table 9. These were selected on the basis of data availability to ensure sufficient data for calculations of costs and health impacts.

The projected economic gains from implementing the cost-effective interventions were therefore the value of avoided presenteeism, the value of avoided absenteeism and the value of avoided mortality. The impact of an intervention, measured as the total increase in GDP, was calculated by combining the three types of gain.

The ROI for Belarus 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.

5. Results

This section provides an assessment of the economic burden of NCDs before summarizing the components of the ROIs – including health benefits, economic benefits and total costs – and discussing the return on investment for each package of interventions.

Economic burden

Direct costs

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

Total government health expenditure for Belarus in 2015 was 35 trillion old Belarusian rubles (BYR) (3.5 billion new Belarusian rubles (BYN)).[9] National Health Account data in Belarus are available at the disease subgroup account level by NCD. During 2012–2015, around 4% of government health expenditure was allocated to CVD, around 5% to cancer, around 0.5% to endocrine and metabolic diseases (including diabetes mellitus) and around 1% to chronic respiratory diseases. Thus, on average, these four main diseases were responsible for around 10% of government health care expenditure during the period (Table 10; Fig. 2). This proportion is quite different from other international estimates which, based on average numbers from nine countries, found that the four major NCDs were responsible for 30% of health care expenditure (Garg & Evans, 2011).

Such a substantial difference in the share of health care spending might be explained by several factors. First, the other international analysis is based mainly on data from high-income countries, and there may be differences between such countries and Belarus in terms of resource allocation within the health care system. The only Commonwealth of Independent States country included in the Garg and Evans analysis was Georgia, and results from this country were quite different from those from the developed countries studied (and not dissimilar to Belarus), in that the costs of the four main NCDs were just 3% of total health expenditure (not only government expenditure). For example, cancer is the biggest health care spending group in Belarus, and in Georgia cancer costs similarly exceeded those for CVD (Garg & Evans, 2011). Another explanation could be that the principles of splitting expenditure between disease groups or ways of spending may be different, and some costs (for example, capital spending) included within the international analysis as part of the disease group were not considered directly as disease spending in Belarus. The disease group data were provided directly by the Ministry of Health to the WHO team and are not published on the official website, so full details of their composition were not available for this analysis. It should be noted that in Belarus there is no mechanism of reimbursement (except in very few cases) for lifelong supportive treatment for hypertension control and hypercholesterolemia, so the overall level of expenditure on CVD is low, whereas cancer drugs are fully reimbursed. This factor may also contribute to the differences seen.

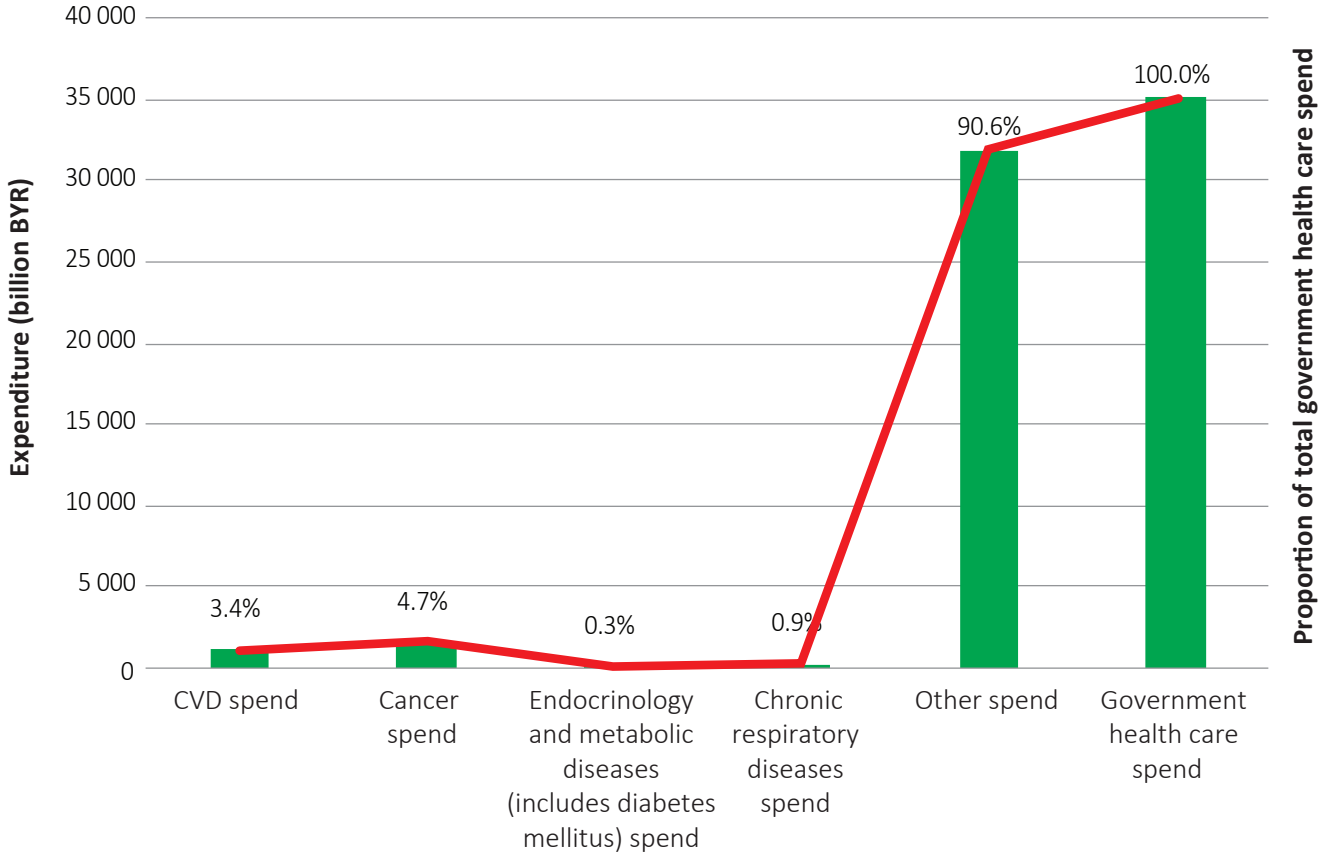
In 2015 government health care expenditure – that is, direct costs – for the four main NCDs was 3.3 trillion BYR (330 million BYN), and on average during 2012–2015 it was 2.6 trillion BYR (260 million BYN) (Table 10).

Table 10. Government health spending, total and proportion of total per NCD group, 2012 to 2015

Category	2012		2013		2014		2015		Average 2012–2015	
	Cost (billion BYR)	Proportion of total (%)	Cost (billion BYR)	Proportion of total (%)	Cost (billion BYR)	Proportion of total (%)	Cost (billion BYR)	Proportion of total (%)	Cost (billion BYR)	Proportion of total (%)
All health conditions	20 839	100	24 767	100	28 275	100	35 342	100	27 306	100
CVD	824	4.0	885	3.6	1 021	3.6	1 197	3.4	982	3.6
Cancer	887	4.3	972	3.9	1 486	5.3	1 670	4.7	1 254	4.6
Endocrinology and metabolic diseases (includes diabetes mellitus)	145	0.7	99	0.4	197	0.7	122	0.3	141	0.5
Chronic respiratory diseases	246	1.2	255	1.0	262	0.9	322	0.9	271	1.0
All four main NCDs	2 101	10.1	2 212	8.9	2 966	10.5	3 311	9.4	2 647	9.7

[9] On 1 July 2016 the new Belarusian ruble (BYN) replaced the old Belarusian ruble (BYR) at a ratio of 1:10 000. The currency abbreviations BYN and BYR are by the International Organization for Standardization (ISO).

Fig. 2. Government health care expenditure, 2015



Indirect costs

The calculations of absenteeism and presenteeism, which could only be made for CVD and diabetes as data were found in the literature only for these two groups, are based on the surviving workforce in 2015 (Fig. 3). The number of absent work days was estimated at 4305 for CVD and 613 for diabetes, which resulted in a total cost of absenteeism of 899 billion BYR to Belarus. For presenteeism, the corresponding calculation found the number of unproductive working days at 24 855 for CVD and 20 559 for diabetes. This caused the burden of presenteeism to reach 8.8 trillion BYR.

Indirect costs from premature death in Belarus were estimated using the human capital method. This assumes that forgone economic output is equivalent to the total output that would have been generated by workers through the course of their life until reaching retirement age. The cost of premature death was calculated by multiplying GDP per worker by the labour force participation rate, by the age-specific employment rate and by the 173 852 years of life lost in 2015 from the four main NCDs. Total cost of premature death was estimated at 33 trillion BYR (Fig. 4).

Indirect economic costs of NCDs accumulate due to premature deaths, reduced labour force participation, increased absenteeism and increased presenteeism. For 2015, this is estimated to be 43.3 trillion BYR (Table 11); mostly it was associated with premature death at working age.

CVD is the costliest NCD in terms of both premature mortality and productivity losses due to presenteeism.

Total economic costs

Table 11 summarizes the total direct and indirect costs of NCDs in Belarus. The government's health care spending on the four main NCDs in 2015 was already 3.3 trillion BYR but additional losses to the economy (absenteeism, presenteeism, premature deaths) brought the total economic burden of NCDs to 46.7 trillion BYR, of which 5% was direct costs and 95% indirect costs.

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

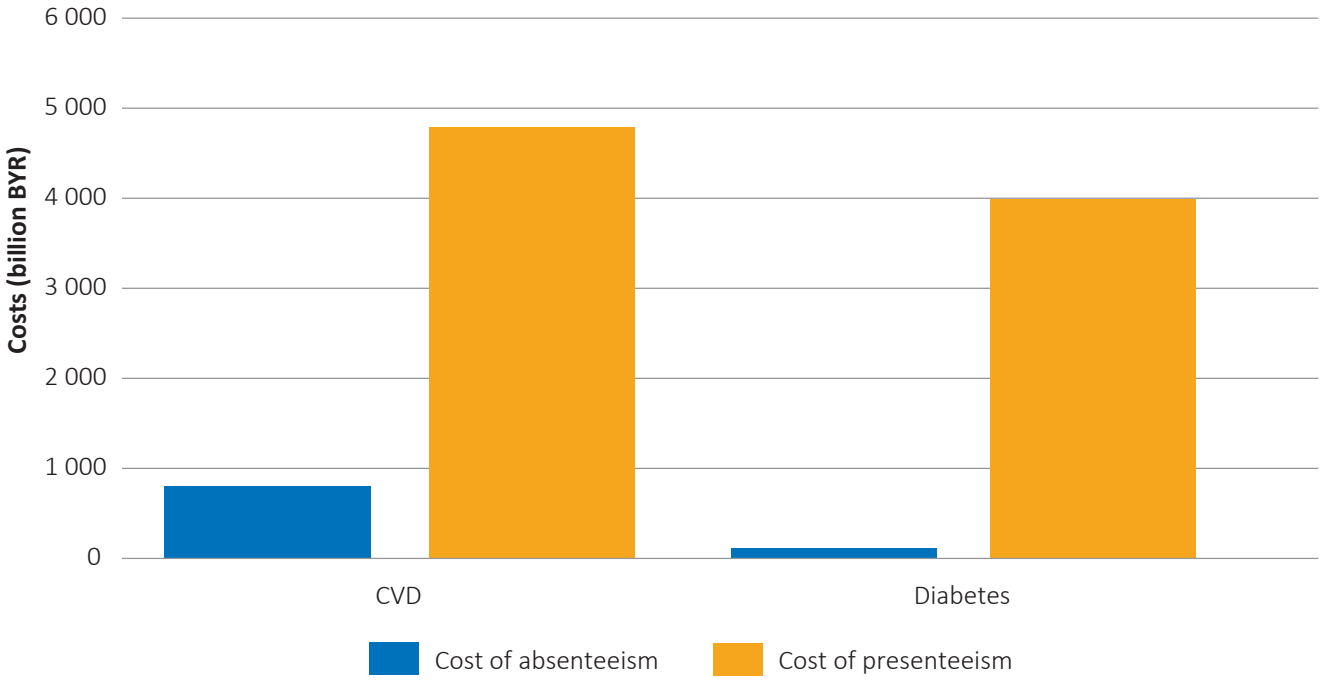


Fig. 4. Costs of premature death from NCDs – human capital method, 2015

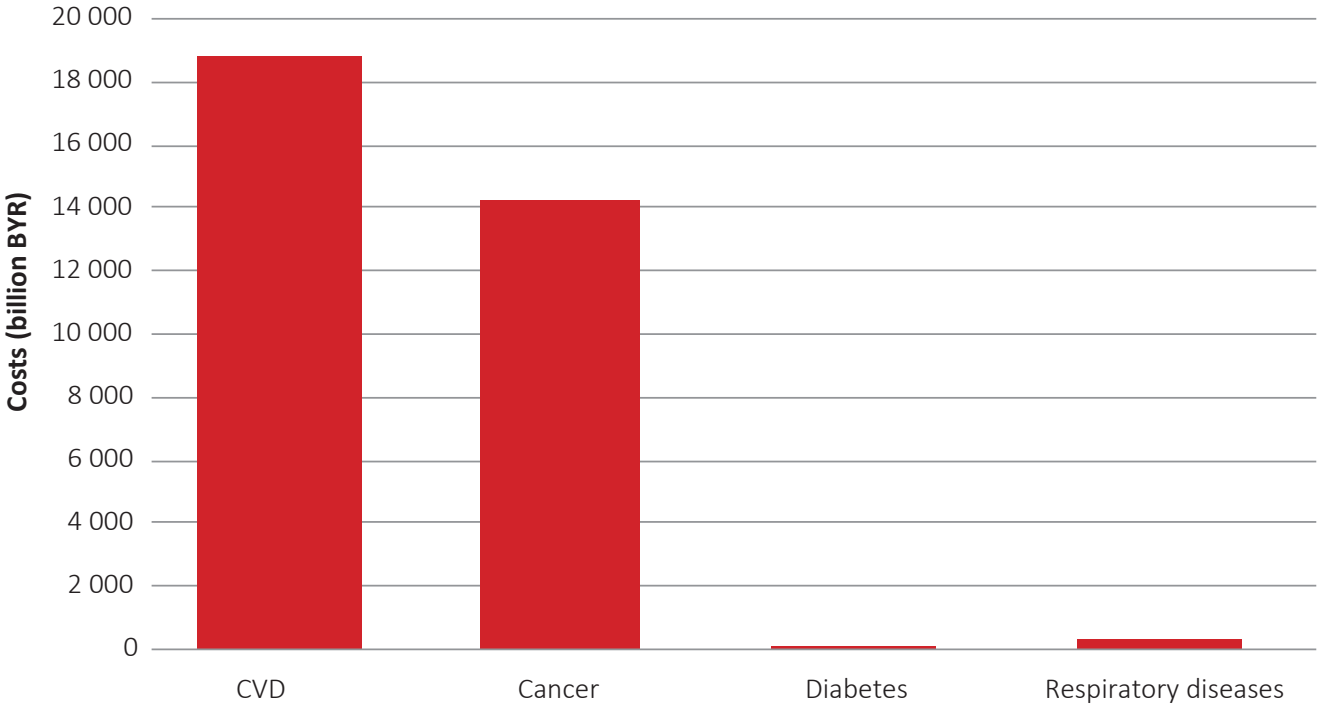


Table 11. Economic burden of NCDs in Belarus, 2015, billion BYR

Cost	CVD	Cancer	Endocrinology and metabolic diseases (includes diabetes mellitus)	Chronic respiratory diseases	Total for four main NCDs
Direct costs					
Health care: government expenditure	1 197	1 670	122	322	3 311
Non-health care: disability payments	46	32	2	1	81
Total direct costs	1 243	1 701	123	323	3 391
Indirect costs					
Absenteeism	781	No data	119	No data	899
Presenteeism	4 814	No data	3 977	No data	8 791
Premature deaths	18 870	14 334	81	341	33 630
Total indirect costs	24 464	14 337	4 177	341	43 320
Total burden	25 707	16 039	4 300	665	46 711

Economic losses due to indirect costs are thus 13 times larger than those due to direct costs. This ratio is higher than the ratios of indirect to direct costs of NCDs found for Kyrgyzstan (4:1) and Viet Nam (3:1) from other reports in this series (Kontsevaya et al., 2017; UNIATF, in press). Both those countries used international estimates (Garg & Evans, 2011) rather than actual national data as in the case of Belarus; potential limitations of using international estimates are discussed above.

Fig. 5 shows the structure of the economic NCD burden in Belarus in 2015. Government health care expenditure is just the tip of the iceberg for the NCD economic burden: the major proportion is indirect costs due to premature death (73% of total) and presenteeism (19% of total).

The total drag on the economy of Belarus from NCDs (46.7 trillion BYR) was equivalent to 5.4% of GDP in 2015 (Fig. 5).[10]

Intervention cost assessment

This section and the following sections on the various assessments relate to future costs and gains, and figures are therefore presented in BYN only.

Incremental intervention costs were estimated for the period 2018–2032. Table 12 shows costs for each of the first five years of this period, plus the five-year and 15-year totals for packages of interventions included in the analysis.

The full CVD and diabetes clinical intervention package produced a larger cost estimate than each of the individual policy intervention packages. Treating patients at high absolute risk of CVD and with clinical forms of CVD costs 20.2 million BYN in the baseline year and increases to 25.0 million in 2022. Implementing the entire CVD and diabetes clinical intervention package over the five-year scale-up period would cost 112.9 million BYN; over 15 years it would cost 850.1 million BYN.

[10] 2015 GDP was 869.7 trillion BYR.

The total costs for the tobacco, alcohol, physical activity and salt packages combined are slightly higher than those for CVD and diabetes clinical interventions over five years and slightly lower over 15 years. The most costly policy intervention area is alcohol: its total cost over the first five years would be 59.9 million BYN.

Fig. 5. Structure of the economic NCD burden in Belarus, 2015

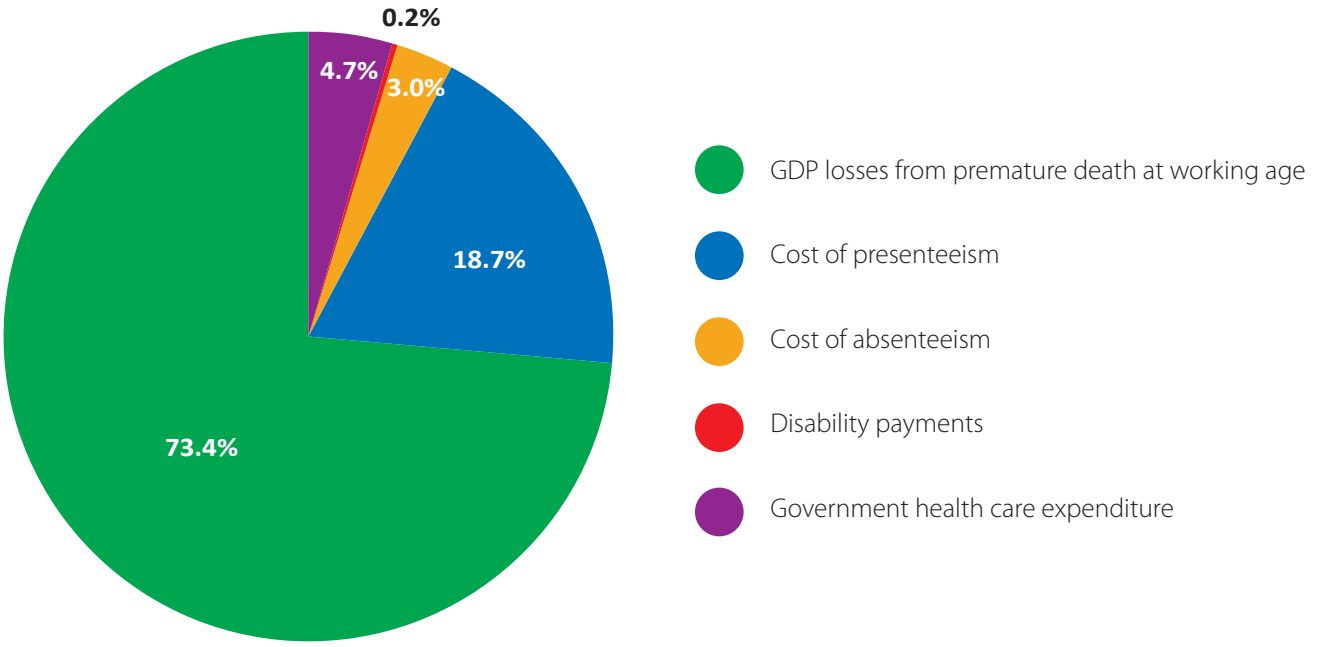


Table 12. Cost overview of packages of policy and clinical interventions (million BYN), 2018–2022

Intervention package	2018	2019	2020	2021	2022	Total for five years	Total for 15 years
Tobacco control package	3.5	6.7	6.7	6.9	6.8	30.6	103.6
Alcohol control package	8.3	12.9	12.7	13.0	13.0	59.9	200.5
Physical activity awareness package	0.1	3.4	2.8	2.8	2.8	11.9	39.7
Salt-reduction package	2.3	5.2	4.9	4.9	4.8	22.1	72.8
All policy interventions, total	*14.1*	*28.2*	*27.1*	*27.6*	*27.5*	*124.5*	*416.6*
CVD and diabetes clinical intervention package	20.2	21.3	22.6	23.8	25.0	112.9	433.5
All interventions (policy + clinical), total	**34.3**	**49.5**	**49.7**	**51.4**	**52.5**	**237.4**	**850.1**

Health benefit assessment

All interventions provide significant reductions in the number of lives lost to CVD-related causes. Salt interventions have the greatest impact (124 702 lives saved), followed by tobacco interventions (62 301) and alcohol interventions (50 680). The number of lives saved by the CVD and diabetes clinical package is 31 571. The physical activity awareness package has the smallest impact (Table 13).

Table 13. Estimated health benefits over a 15-year time horizon

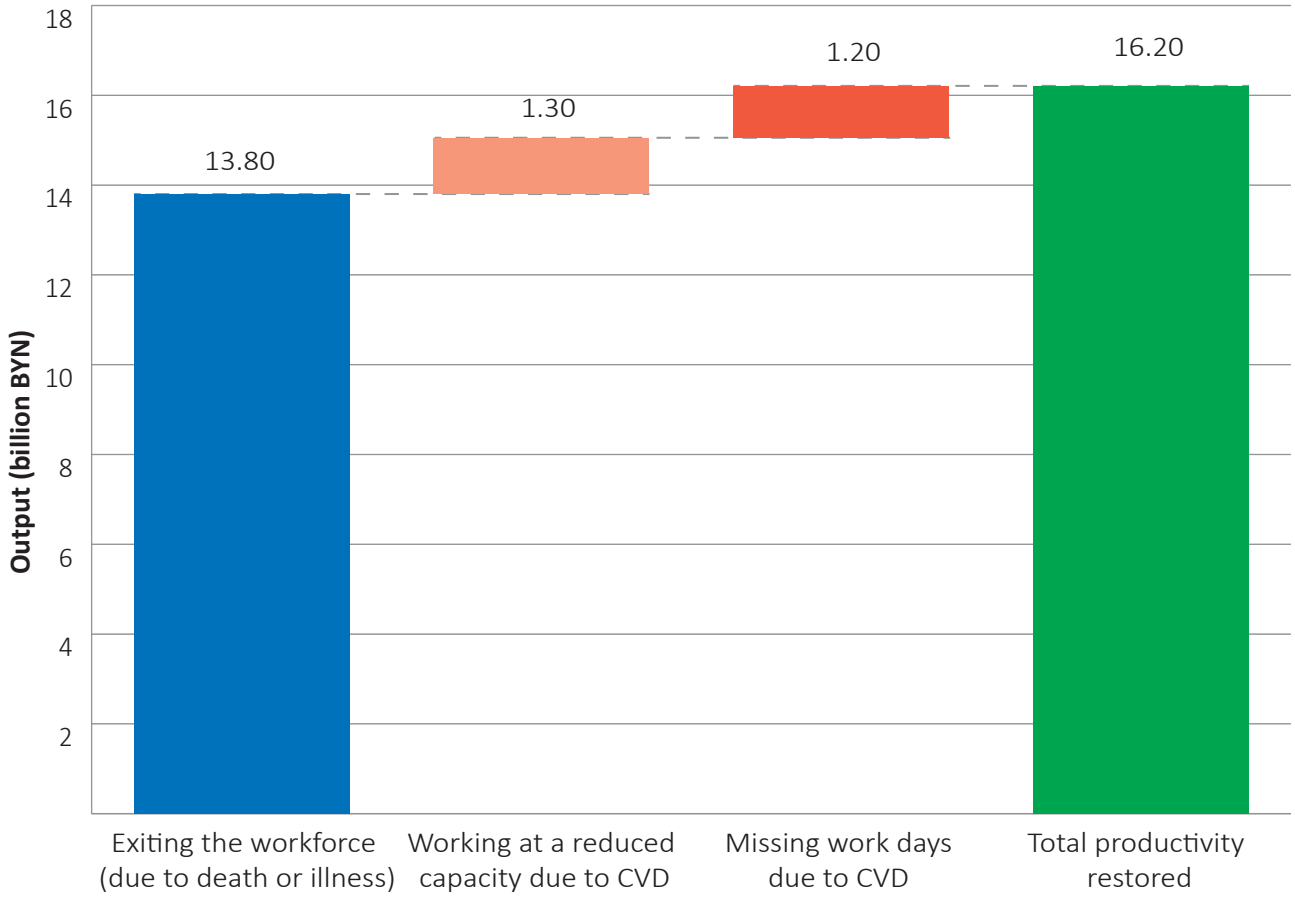
Intervention package	Strokes averted	Acute IHD averted	Mortality averted	Healthy life-years gained
CVD and diabetes clinical interventions	11 645	3 565	31 571	125 656
Tobacco interventions	24 082	22 454	62 301	266 467
Alcohol interventions	11 645	3 565	50 680	130 366
Physical activity awareness interventions	1 960	7 144	3 340	36 794
Salt interventions	123 110	81 793	124 702	921 724

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

Economic benefit assessment

NCDs included in this analysis are associated with a reduction in labour workforce and productivity due to premature mortality, fewer days of work (absenteeism) and reduced productivity while at work (presenteeism). Fig. 6 demonstrates the labour productivity gains that result from the prevented deaths and disease cases over a 15-year period, as described in Table 13.

Fig. 6. Recovered economic output from the policy and clinical intervention packages, 15-year time frame



The biggest positive impact on productivity is from decreased mortality (84.7% of total productivity gains), followed by reduced presenteeism (8%) and absenteeism (7.3%). Clinical interventions for CVD and diabetes in primary care and the policy intervention packages result in net present value 16.2 billion BYN in labour productivity gains over 15 years (equivalent to 17.1% of Belarus's 2015 GDP).

ROI assessment

Comparing the costs and benefits of each package of interventions shows that all the NCD prevention policy interventions included in the analysis – for tobacco and alcohol control, salt reduction and increasing physical activity – have positive ROIs in both the shorter term (five years) and the longer term (15 years) (Table 14).

Table 14. Costs, benefits and ROI at five and 15 years, by intervention package (billion BYN)

Intervention package	5 years			15 years		
	Total costs	Total productivity benefits	ROI	Total costs	Total productivity benefits	ROI
Tobacco control	30.6	262.8	8.4	103.6	3 584.8	31.1
Alcohol control	59.9	194.1	3.2	200.5	2 773.2	12
Physical activity awareness	11.9	22.6	1.9	39.7	229.4	5.2
Salt-reduction	22.1	648.5	28.8	72.8	7 818.1	94
CVD and diabetes clinical interventions	112.9	128.0	1.2	433.5	1 801.1	0.6

Salt interventions have the highest ROI of any intervention: for every BYN invested in the package of salt interventions, the expected return is 28.8 BYR over the first five years and 94 BYR over 15 years. The tobacco package is also characterized by high ROIs in both the five-year and 15-year periods, as is the alcohol package. The physical activity awareness package also delivers an economically appealing, albeit lower, ROI over the 15-year period and the return is still 5.2 BYN on each BYN invested.

The package of clinical interventions provides a relatively small ROI for the five-year period (1.2) and no ROI in the 15-year assessment period. This is frequently found in health economics owing to the high costs associated with medical treatment. Furthermore, these treatment options (secondary prevention after acute events) have low potential to increase labour force participation after stroke, myocardial infarction and diabetes.

Policy packages (salt reduction and tobacco and alcohol control) are the clear "best buys", offering the highest ROIs over a 15-year period.

6. Conclusion

NCDs pose a significant threat to Belarus's health and economic development. This report assesses the economic burden of NCDs for the country and costed policy interventions to help address the problem. The methodology uses national, routinely available data for the analysis.

As in many parts of the world, NCDs in Belarus are causing a surge in health care costs and social care and welfare support, as well as an increasing burden of work absenteeism, with reduced productivity and employee

turnover. The government is estimated to have spent 3.3 trillion BYR on treatment for the four main NCDs in 2015.

The economic burden analysis finds, however, that government expenditure on health care for NCDs is just the tip of the iceberg. The hidden additional costs from lost productivity are 13 times higher, at 43.3 trillion BYR. Almost three quarters (73%) of these indirect costs are due to premature mortality of working-age population (aged less than 65 years).

Altogether, the economic cost of NCDs to the Belarus economy was 46.7 trillion BYR in 2015, which is equivalent to 5.4% of the country's annual GDP. With indirect economic productivity losses accounting for 95% of the economic burden of NCDs, a strong case can be made for prioritizing NCD prevention as a national economic priority.

A review of NCD prevention policies in Belarus identified progress as well as gaps in implementation against the WHO list of "best buys" or most cost-effective interventions. For example, Belarus's tobacco control legislation has been only partially aligned with the WHO FCTC, and there are opportunities to strengthen tobacco control further, particularly in relation to smoke-free environments, enforcing youth access restrictions and pricing policy. Salt-reduction policies were perhaps the least well developed.

Actions to prevent NCDs are relatively cheap and cost-effective. For Belarus, the full cost of implementing a package of tobacco control "best buys" is estimated at 103.6 million BYN for 15 years; the full cost of the alcohol package is 200.5 million BYN for the same period; and the diet and physical activity packages are 72.8 and 39.7 million BYN, respectively.

All interventions provide significant reductions in the number of lives lost to CVD-related causes. Salt interventions have the greatest impact, followed by tobacco and alcohol interventions.

Salt interventions have the highest ROI: for every BYN invested in the package of salt interventions, the expected return is 94 BYN in 15 years. Significant ROIs are expected from the tobacco and alcohol control packages; lower but still positive ROIs from physical activity interventions. The clinical CVD and diabetes package has a small ROI in the short term and no ROI in the 15-year period. Nevertheless, these have been highlighted by WHO as cost-effective and effective interventions and remain worthwhile to implement.

Recognizing the significant health and economic burden of NCDs to Belarus, this report suggests that there is potential for further implementation of NCD prevention policies at the population and individual levels, and that to do so would give a worthwhile ROI. While implementation of the intervention packages will require engagement from sectors beyond health – such as finance, economy and agriculture – the benefits from the investments would accrue across the whole of government and of society.

7. References

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Annex 1. Productivity data used for calculations of NCD burden

Disease	Parameter value	Year	Source of data	Details of data source
Labour force participation rate reduction				
Hypertension	11.0%	2009	Institute for Research and Information in Health Economics	Barnay T, Debrand T (2006). Effects of health on the labour force participation of older persons in Europe. Questions d'économie de la Santé. 109 (http://www.irdes.fr/english/2006/issues-in-health-economics.html, accessed 8 September 2017).
Stroke	11.0%	2009	Institute for Research and Information in Health Economics	Barnay T, Debrand T (2006). Effects of health on the labour force participation of older persons in Europe. Questions d'économie de la Santé. 109 (http://www.irdes.fr/english/2006/issues-in-health-economics.html, accessed 8 September 2017).
AMI	11.0%	2009	Institute for Research and Information in Health Economics	Barnay T, Debrand T (2006). Effects of health on the labour force participation of older persons in Europe. Questions d'économie de la Santé. 109 (http://www.irdes.fr/english/2006/issues-in-health-economics.html, accessed 8 September 2017).
Type 2 diabetes	11.0%	2009	Institute for Research and Information in Health Economics	Barnay T, Debrand T (2006). Effects of health on the labour force participation of older persons in Europe. Questions d'économie de la Santé. 109 (http://www.irdes.fr/english/2006/issues-in-health-economics.html, accessed 8 September 2017).
Reduction in full-time hours due to absenteeism				
Hypertension	0.5%	2011	Population Health Management	Mitchell RJ, Bates P (2011). Measuring health-related productivity loss. Popul Health Manag. 14(2): 93–8.
Stroke	5.5%	2011	Population Health Management	Mitchell RJ, Bates P (2011). Measuring health-related productivity loss. Popul Health Manag. 14(2): 93–8.
AMI	1.1%	2011	Population Health Management	Mitchell RJ, Bates P (2011). Measuring health-related productivity loss. Popul Health Manag. 14(2): 93–8.
Type 2 diabetes	0.3%	2011	Population Health Management	Mitchell RJ, Bates P (2011). Measuring health-related productivity loss. Popul Health Manag. 14(2): 93–8.

Disease	Parameter value	Year	Source of data	Details of data source
Reduction in productivity due to presenteeism				
CVD/stroke	3.7%	2011	Wang PS, Beck A, Berglund P, Leutzinger JA, Pronk N, Richling D et al. (2003). Chronic medical conditions and work performance in the health and work performance questionnaire calibration surveys. J Occup Environ Med. 45(12):1303–11.	
Diabetes	11%	2011	Holden L, Scuffham PA, Hilton MF, Ware RS, Vecchio N, Whiteford HA (2011). Which health conditions impact on productivity in working Australians? 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	Center for American Progress	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 8 September 2017).

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