COST-EFFECTIVENESS OF INTERVENTIONS TO TACKLE NON-COMMUNICABLE DISEASES (NCDs) IN FOUR REGIONS IN UKRAINE

An Investment Case

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DISCLAIMER

EXECUTIVE SUMMARY

BACKGROUND

Non-communicable diseases (NCDs), including cardiovascular disease (CVD) and diabetes, are estimated to affect two billion persons worldwide and be responsible for three-quarters of all deaths, killing 28 people prematurely every minute [1]. They cause significant morbidity and mortality in low-, middle- and high-income countries alike, and generate billions of dollars in economic losses annually from reduced productivity and higher health care costs. Every 10% increase in NCDs mortality equates to a half percentage point reduction in annual economic growth [2].

Countries around the world are increasingly focused on the delivery of clinical interventions to control and prevent NCDs, but also on addressing behavioural risk factors for NCDs, including alcohol use, tobacco use, physical inactivity and unhealthy diets, among others. However, although many NCDs are preventable or controllable, and technical packages of essential interventions are widely available, only one to two percent of global financing for health goes towards their prevention and control, and the World Health Organization (WHO) has deemed progress on these conditions to be "inadequate" [1], [2].

In Ukraine, NCDs were linked to 91% of total deaths in 2017, and the overall NCD mortality rate is roughly twice that of European Union countries [3], [4]. A wide range of actions by Government and other stakeholders are ongoing to tackle these categories of NCDs, guided by the NCD National Action Plan. In that plan, the Government of Ukraine has set an ambitious target to reduce by one-third the risk of premature mortality from CVDs, cancer, diabetes, chronic respiratory diseases and other NCDs, and to reduce the prevalence of their associated risk factor behaviours [5]. In the regions of Dnipro, Lviv, Poltava and Rivne, home to 8 million persons (18% of the country's population), the Act4Health project is implementing activities aimed at strengthening national and regional public health authorities' ability to contribute to the implementation of the NAP, strengthening the capacity of primary healthcare providers to ensure efficient and good quality services for the prevention and care of people with NCDs and strengthening the capacity of the public health system and communities to deliver clear interventions and campaigns.

To better focus their activities, Act4Health commissioned an investment case to identify the policy and clinical interventions that would be most cost-effective for the burden of disease (BOD) from CVDs and diabetes in the four above-mentioned project regions. This report details the methods for that analysis and summarises the findings and recommendations from the research.

METHODS

The analysis was carried out over the period January 2022 to May 2023, using the NCD investment case methodology in combination with the OneHealth Tool (OHT) software. In summary, the consultants assessed the current health and economic burden from NCDs in the four regions, estimated the costs of additional investments in the delivery of policy and clinical interventions to reduce the disease burden from CVDs and diabetes and compared these investments with the health and economic benefits they would bring about (e.g., estimated the return on investment of NCD prevention and control interventions) over a period of ten years (2022-2031). More specifically, the consultants developed and employed a six-step methodology:

► We first gathered the most readily available, recent data needed for the analysis (Step 1). This included a large amount of local cost, demographic, economic, epidemiological, health and policy intervention coverage and risk factor prevalence data. We used data from the four regions where possible, otherwise national-level or data from the European and/or international literature.

► Next, we constructed the so-called Baseline Scenario, a scenario with no additional investments to prevent or control NCDs, that is, without any increases in coverage of either policy or clinical interventions with respect to the year 2022. Using OHT, we obtained estimates of projected health status over this time period, including future incidence, prevalence, premature mortality, disability, and BOD measured in DALYs. OHT also estimated the operating costs that the country would incur in the provision of these interventions, including the costs of labor, drugs, and medical supplies (Step 2).

► Using as input the future DALYs lost from the selected NCDs, we estimated the reduction in economic output from the lower labor participation by working-age individuals expected to die prematurely or to live with disabilities as a consequence of CVDs and diabetes (Step 3).

► We then formulated the so-called Investment Scenario, characterised by increased coverage rates for all policy and clinical interventions. Using OHT we drew estimates of the future BOD and its reduction, relative to the BOD in the Baseline Scenario, thanks to the greater provision of NCD control interventions, and estimated the incremental investment needed relative to the Baseline Scenario (Step 4).

► We estimated the lower economic loss, or economic gains, resulting from poor health associated with these NCDs, given the increased coverage in the Investment Scenario (Step 5).

► Finally, we contrasted the Investment Scenario's incremental investment with the economic gains and computed the ROI as the ratio between the economic gains and the investment costs (Step 6).

We conducted four separate investment case analyses (one for each region), and then aggregated results using Microsoft Excel. We considered two time horizons: four years, to correspond to the project duration, and ten years.

MAIN FINDINGS

The research has documented a considerable burden from CVDs and diabetes in the four regions:

► CVDs and diabetes killed an estimated 59,000 persons in these four regions in 2022, meaning that 40% of all deaths in these regions are attributable to CVDs and diabetes. Patients dying prematurely from CVDs and diabetes lose, on average, 14.6 years of life.

► Further, 200,000 years of life were lived with disability in 2022. A total of one million disability-adjusted life years (DALYs) were attributable to CVDs and diabetes in 2022.

► This health burden is accompanied by a considerable economic burden: treatment costs for CVDs and diabetes were estimated to be USD 178.5 million in 2022, and economic losses from persons with NCDs who are unable to work, or work at less than full capacity were estimated to be USD 2.1 billion in 2022, equivalent to approximately 6% of GDP in the four studied regions (USD 36.9 billion) and 1% of Ukraine's total GDP of USD 200.1 billion in 2021.

► Without further action, an estimated 524,000 people would die from these NCDs over the next ten years, resulting in nearly ten million DALYs, USD 1.7 billion in direct economic costs and USD 18-24 billion in economic losses.

The results suggest that additional investments in scaling up policy and clinical interventions would result in a considerable reduction in the burden of disease in the four project regions in Ukraine: fewer people would get these NCDs, and those getting them would, on average, live longer and better lives. More specifically:

► Together, Act4Health project and NAP activities in NCDs prevention and control can reduce the burden of disease from CVDs and diabetes by nearly 30% by 2031.

► An additional investment of USD 583 million will be required through 2031. This represents less than 0.5% of Ukraine's current health spending of USD 11.8 to USD 15.2 billion per year. On a per capita basis, the investment is equivalent to roughly USD 7.20 per person per year, considering the 8 million persons living in the four project regions.

► This investment will generate economic returns of USD 6.9 to USD 8.2 billion over that same time period. This represents an estimated 1.5-1.7% of the GDP in the four project regions over the ten-year time period.

► In terms of return on investment, this study concludes that it is highly advisable to invest additional public resources in the prevention and control of NCDs. Although a significant investment is required to scale-up the coverage of NCD control interventions, it would result in large health and economic gains, saving lives, restoring health and increasing economic output. The additional spending would economically pay for itself and leave a sizeable additional monetary return: every USD 1 invested will generate returns of USD 11.9 to USD 14.1 by 2031.

► On a macro level, results are similar across regions, despite different starting demographic and epidemiological profiles, health and policy intervention coverage and risk factor prevalence. Investments in Dnipro generate the lowest ROI (10.6-12.5), but still represent a strong investment.

RECOMMENDATIONS

In Dnipro, Lviv, Poltava and Rivne, greater investments in NCD prevention and control over the coming ten years would unambiguously lead to improved health status and economic benefits to individual, family and society. Specific recommendations to help achieve this impact are:

1. **Prioritise activities focused on promoting physical activity and healthy eating as part of life course approach**, which offer the highest return on investment. Despite the ongoing war, it may be feasible to implement some activities immediately, such as strengthening restrictions around the marketing of unhealthy food products to children, while other activities, such as improving the built environment to promote physical activity, should feature prominently in post-war recovery plans. Making arrangements now to include these activities as part of official post-war recovery plans is crucial.

2. **Secure additional financing for priority National Action Plan (NAP) activities**. It is crucial to identify a lead organization with dedicated financing to carry out implementation of priority activities. Given the considerable burden of disease from NCDs, there is a strong argument for the Ministry of Health to dedicate additional budget to these activities. Beyond the health sector, presenting the investments as catalysts to larger economic growth, and not simply as public health measures, can help draw interest from the Ministry of Finance, bilateral donors, international organizations, private foundations and social impact investors. External funding can also be used to mobilise private sector investment, a strategy known as blending financing. In the longer term, increased revenue generated from taxes on tobacco, alcohol, and sugar-sweetened beverages can provide financing for NCD prevention and control activities.

3. **Reduce clinical intervention costs. Over 90% of the cost of scaling up NCD prevention and control efforts is for clinical interventions**. Focusing on cost-saving counselling and high-quality primary care for NCD patients (through community-based delivery channels, where possible, including home-based care and the social care system) will help avert costly hospital-based care in the future. Strategies to lower pharmaceutical costs, such as through increased competition (which should drive down prices) and more rational prescribing by providers and use by patients, can also help lower the cost of medicines.

4. **Strengthen NCD data, surveillance and monitoring and evaluation systems**. Strong data systems are needed to identify early both people at high risk and those already with a NCD and better assess which risk factor behaviours need addressing through public health measures. This routine data and ongoing surveillance can help support multi-disciplinary and multi-spectral support for priority NCD interventions. Good data systems are also needed to facilitate future NCD-related monitoring and evaluation, such as monitoring progress of newly implemented or scaled-up public health measures, as well as for future NCD-related research activities. The newly established Centre for Diseases Control (CDC) and the NCD Knowledge HUBs in each region may be well-placed to take the lead on data, surveillance and monitoring and evaluation-related issues.

5. **Learn from other countries who have made progress on NCD prevention and control**. Examples from countries such as Argentina, Barbados, Kenya, Mexico, Mongolia, Peru, Samoa, South Africa and Tunisia highlight the importance of having a spokesperson for NCD prevention and control efforts, the acceptability of salt reduction policies, strategies for strengthening clinical care for CVDs and diabetes and more.

ACRONYMS

AMI	Acute myocardial infection
AI	Artificial intelligence
BMI	Body mass index
ByA	Bitrán & Asociados
BMI	Body mass index
BOD	Burden of disease
CDC	Centre for Diseases Control [Ukraine]
CEA	Cost-effectiveness analysis
CHF	Swiss francs
CVD	Cardiovascular disease
DALY	Disability-adjusted life year
DEC	Direct economic cost
EU	European Union
GBD	Global Burden of Disease
GCEA	Generalized Cost-Effectiveness Analysis
GDP	Gross domestic product
GFA	GFA Consulting Group
HUG	Geneva University Hospitals
I$	International dollar
IEC	Indirect economic cost
LMICs	Low- and middle-income countries

ACRONYMS

MMT	Mobile Medical Team
NAP	NCD National Action Plan
NCDs	Non-communicable diseases
NGO	Non-governmental organization
NPV	Net present value
OECD	Organization for Economic Cooperation and Development
OHT	OneHealth Tool
PDALY	Productivity year DALYs
PYLD	Productivity YLDs
PYLL	Productivity YLL
ROI	Return on investment
SDC	Swiss Development Cooperation
STP	Standard treatment protocol
TOC	Theory of change
UAH	Ukrainian hryvnia
UNDP	United Nations Development Program
USSR	Union of Soviet Socialist Republics
WHFP	Women's Health and Family Planning
WHO	World Health Organization
YLD	Years Lived with Disability
YLL	Years of Life Lost

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FORWARD

Non-communicable diseases (NCDs) are impacting health systems, reducing human capital, undermining economic development, and threatening global security. Each country can play a critical role in leading strategic advocacy, awareness and accountability campaigns to raise the profile of NCDs and demand high-level political will and action to address NCDs and their risk factors to contribute achieving SDG (Sustainable Development Goal) 3 including Ukraine.

In Ukraine, NCDs are increasingly responsible for both significant morbidity and mortality as well as billions of dollars in economic losses from reduced productivity and higher health care costs.

The Ministry of Health of Ukraine has developed an NCD National Action Plan (NAP), which is a strategic vision for controlling and preventing NCDs in Ukraine, supported by various partners. One such effort, the "Reducing risk factors for NCDs" project (known as Act4Health), is being carried out by GFA Consulting Group GmbH (GFA) and the Geneva University Hospitals (HUG) in partnership with the non-governmental organization (NGO) Women's Health and Family Planning (WHFP) and One Health. With support from the Swiss Development Cooperation (SDC), the overall goal of the project is to mitigate NCD-related risk factors, morbidity and mortality over the period 2020-2024 in five target regions: Dnipropetrovs´k (Dnipro), Kherson, Lviv, Poltava and Rivne. The project seeks to provide the people of Ukraine with more equitable and sustainable access to quality and affordable primary healthcare services, with a focus on disease prevention and health promotion to adopt healthier lifestyles.

Act4Health commissioned an investment case to better understand the cost-effectiveness of increased investments in NCD prevention and control, and to guide project activities over the coming years. Findings indicate that additional investments in scaling up policy and clinical interventions would result in a considerable reduction in the burden of disease in the four project regions in Ukraine: fewer people would get these NCDs, and those getting them would, on average, live longer and better lives. More specifically:

▶ Together, the Act4Health project and NAP activities in NCDs prevention and control can reduce the burden of disease from CVDs and diabetes by nearly 30% by 2031.

▶ An additional investment of USD 583 million will be required till 2031. This represents less than 0.5% of Ukraine's current health spending of USD 11.8 to USD 15.2 billion per year. On a per capita basis, the investment is equivalent to roughly USD 7.20 per person per year, considering the 8 million persons living in the four project regions.

▶ This investment will generate economic returns of USD 6.9 to USD 8.2 billion over that same time period, representing an estimated 1.5-1.7% of the GDP in the four project regions over the ten-year time period.

▶ The additional spending would economically pay for itself and leave a sizeable additional monetary return: every USD 1 invested will generate returns of USD 11.9 to USD 14.1 by 2031.

In short, additional investments in NCD prevention and control can save thousands of lives over the coming years and generate significant economic savings. These results provide a convincing health and economic argument in support of additional investments in NCD prevention and control, which can be implemented in the context of the NAP.

I hope all stakeholders will fully utilise this document to advocate for and secure additional resources to support these activities, Prioritise physical activity and healthy eating-related policy interventions, **which offer the highest return on investment planning**, scale-up clinical prevention interventions and ensure high-quality primary-level care for NCD patients, and strengthen NCD data, surveillance and monitoring and evaluation systems to best target interventions and monitor their impact.

INTRODUCTION

1. INTRODUCTION

DR. JUMA KHUDONAZAROV,

GFA CONSULTING GROUP, CONSULTANT OF THE HEALTH DEPARTMENT

In countries around the world including Ukraine, non-communicable diseases (NCDs) are increasingly responsible for both significant morbidity and mortality as well as billions of dollars in economic losses from reduced productivity and higher health care costs. However, additional investments in NCD prevention and control can save thousands of lives over the coming years and generate significant economic savings. The Government of Ukraine has developed an NCD National Action Plan (NAP), which is a strategic vision for controlling and preventing NCDs in Ukraine, supported by various partners. One such effort, the "Reducing risk factors for NCDs" project (known as Act4Health), is being carried out by GFA Consulting Group GmbH (GFA) and the Geneva University Hospitals (HUG) in partnership with the non-governmental organization (NGO) Women's Health and Family Planning (WHFP) and OneHealth. With support from the Swiss Development Cooperation (SDC), the overall goal of the project is to mitigate NCD-related risk factors, morbidity and mortality over the period 2020-2024 in five target regions: Dnipropetrovs´k (Dnipro), Kherson, Lviv, Poltava and Rivne. The project seeks to provide the people of Ukraine with more equitable and sustainable access to quality and affordable primary healthcare services, with a focus on disease prevention and health promotion to adopt healthier lifestyles.

Over the period January 2022 to June 2023, Kelsey Vaughan and Ricardo Bitrán (the consultants) provided technical assistance to the Act4Health project on assessing the cost-effectiveness of interventions to tackle NCDs in Ukraine. This report presents the research findings from that study, which considered the current and future health and economic burden from CVD and diabetes in four regions: Dnipro, Lviv, Poltava and Rivne[1], and modelled the possible ten-year health and economic impact of actions taken by the Act4Health project and the government as part of the NCD National Action Plan (NAP) to prevent and control these conditions in these same regions. The document is organised as follows:

► **Chapter 2** presents a background about the burden from CVDs and diabetes globally and in Ukraine, as well as the risk factors for these conditions. It also outlines the ongoing actions to combat NCDs in Ukraine as part of the NAP and Act4Health project.

► **Chapter 3** summarises the investment case methodology.

► **Chapter 4** presents the summary investment case results for the four project regions.

► **Chapter 5** presents a series of theories of change for the Act4Health project, showing how project activities as well as activities carried out under the NAP lead to improvements in the burden from CVDs and diabetes in the four project regions.

► Finally, **Chapter 6** discusses the investment case results and provides recommendations for how these research results can be best utilised to address the burden from NCDs in Ukraine.

The report also includes a number of annexes with supplementary materials.

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1. Originally Kherson was also to be included, but it was later excluded due to ongoing war and inability to gather the data required for the investment case.

2

BACKGROUND

2. BACKGROUND

2.1 CARDIOVASCULAR DISEASES (CVDS) AND DIABETES: THE GLOBAL BURDEN AND RESPONSE

Non-communicable diseases (NCDs), also known as chronic diseases, are long-duration diseases that cannot be transmitted from one person to another. Examples of NCDs include cardiovascular diseases (CVDs), diabetes, cancers, chronic respiratory disease, mental health disorders and/or liver and kidney diseases [6]. Over the last three decades, NCDs have been increasingly accounting for a growing share of the world's burden of disease (BOD)2: from 1990 to 2017 premature avertable deaths from NCDs increased 49.3%, and NCDs now kill over 41 million persons annually (71% of all deaths globally), equivalent to 28 persons per minute [1], [7], [8]. The growth of NCDs is attributable to both population aging as well as behavioural risk factors such as tobacco use, alcohol consumption, an unhealthy diet, and physical inactivity [9]. Tobacco, alcohol use, dietary risks and high body-mass index are among the top ten risk factors contributing to disability-adjusted life years (DALYs) [10]. The COVID-19 pandemic also put increased attention on NCDs, as it was found that people living with NCDs were at a higher risk of severe complications and death from COVID-19 [11].

NCDs are not only associated with significant morbidity and mortality, but also with serious economic and social consequences. In Europe, NCDs are responsible for over 600 billion euros in losses annually, and the estimated total global economic losses from NCDs are expected to reach USD 47 trillion between 2011 and 20303 [12]–[14], equivalent to 75% of global GDP in 2010 and the amount of money needed to eradicate poverty among the 2.5 billion people living on less than USD 2/day for over 50 years. Every 10% increase in NCDs mortality equates to a half percentage point reduction in annual economic growth [2]. NCDs also result in high personal healthcare expenses [15].

Although the majority of NCDs can be prevented or delayed [7], the multi-sectoral nature of the risk factors – with ties to social, environmental, commercial, and genetic causes – complicates the response, since a coordinated response requires the participation of various government ministries, industries and societal groups. That said, the World Health Organization (WHO) has estimated that every USD 1 invested in implementing a recommended package of 16 policy and clinical interventions to tackle NCDs will provide a minimum return of USD 7 on average in LMICs by 2030 [16]. Despite accounting for two-thirds of the burden of disease in low- and middle-income countries (LMICs), they receive less than two percent of health funding, and the WHO has deemed progress on these conditions to be "inadequate" [1], [17], [18]. Delivery of NCD prevention, treatment and control interventions was disrupted in many countries during the global COVID-19 pandemic [19]–[22].

2.2 CVDS AND DIABETES IN UKRAINE

Ukraine is a lower middle-income country of 43.79 million persons as of 2021 [23]. Since the collapse of the Union of Soviet Socialist Republics (USSR) in 1991, Ukraine has worked to build an independent economy, modernise the health system and improve health outcomes. Gross domestic product (GDP) per capita has increased from USD 1,598 in 1989 to USD 4,836 in 2021 (current USD) [23] . Government has carried out major reforms related to the health system, guaranteeing the right to receive free medical care at public facilities in the Constitution (Article 49) and restructuring the financing and delivery of primary healthcare services in particular. Health indicators have, overall, shown improvement. Although life expectancy remains stagnant (70.5 years in 1989 versus 69.6 years in 2021), infant, under-5 and maternal mortality have all fallen significantly [23]. However, there remain challenges. The incidence and prevalence of tuberculosis and HIV are among the worst in Europe [24]. There is a shortage of public funding for health, particularly at sub-national level and in the context of decentralization reforms, part of reorganization of the primary healthcare network and many rural facilities have closed in recent years, leading to inequalities in access, and Ukrainians continue to pay out-of-pocket for care at point of service [24], [25]. Ukraine struggled in its response to the COVID-19 pandemic, with high vaccine hesitancy and misinformation, low vaccination coverage, resulting in considerable medical, economic, and social consequences. The ongoing war with Russia has exacerbated these problems and introduced new challenges: high cost of services, limited availability of medicines, lack of health personnel, long waiting times, degraded infrastructure and security issues with accessing care [3], [24]–[26].

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2. BOD is measured in terms of disability-adjusted life years (DALYs), a composite measure which reflects the years of life lost to due to premature mortality (YLLs) and the years lived with a disability (YLDs) due to prevalent cases of the disease or health condition in a population. One DALY represents the loss of the equivalent of one year of full health.

3. Economic losses include the result of reduced labor force, reduced productivity of the remaining labor force and capital losses (diversion of savings from the increase of physical capital to healthcare consumption associated with NCDs).

Ukraine is comprised of 27 regions: 24 oblasts, two cities with special status (Kyiv and Sevastopol) and one autonomous republic (Crimea). The Act4Health project is focused primarily in four regions: Dnipro, Lviv, Poltava and Rivne. Work in the original fifth region of Kherson has been seriously impacted by the ongoing war. Dnipro is the largest of these regions, with 3.1 million persons, while Poltava is the smallest with a population of 1.1 million. Together these four regions represent 8.1 million persons, or 18 percent of Ukraine's population.

2.2.1 BURDEN OF DISEASE FROM CVD AND DIABETES

NCDs are the leading cause of death in Ukraine, with NCDs linked to 91% of total deaths in 2017 [4], [27]. The overall NCD mortality rate in Ukraine is now almost twice the European Union (EU) average for women, and 2.3 times the EU average for men [4]. The highest mortality rates from CVDs are observed in Poltava and Rivne [4]. Although the prevalence of CVDs has fallen slightly in recent years, both nationally and in all project regions except Dnipro, the overall incidence of diabetes has remained stable, though increasing in children under the age of 18 [4]. In the project regions, mortality rates from diabetes are alarmingly high in Lviv, and morbidity and mortality are trending upward in Dnipro, Poltava and Rivne, with prevalence growing the fastest in Rivne [4].

2.2.2 RISK BEHAVIOURS FOR NCDS IN UKRAINE

Most illnesses and deaths due to NCDs can be avoided by preventing and controlling the main risk behaviours associated with NCDs: tobacco use, alcohol consumption and physical inactivity and unhealthy diets including high sodium consumption.4 This section briefly explains how these risk factor behaviours are related to CVDs and diabetes, and then provides evidence about the prevalence and incidence of these risk behaviours in Ukraine.

How risk behaviours contribute to CVDs and diabetes is well-documented in the scientific literature [28]–[35]. In simple terms, tobacco use, alcohol consumption and unhealthy diets all strain the body's ability to function normally. The chemicals in tobacco smoke swell and inflame the body's blood vessels, which can lead to many cardiovascular conditions including atherosclerosis (narrowing of arteries), coronary heart disease, stroke, peripheral arterial disease (reduced blood flow to extremities) and aortic aneurisms. This inflammation also causes cells to stop responding to insulin. People who smoke are at a higher risk for belly fat, which increases the risk for diabetes. Alcohol consumption increases the heart rate and blood pressure. Consumed in higher than advised quantities over the long term, this ensuing strain can lead to CVD while also increasing strain on the pancreas and impairing liver functions. Similar to tobacco, regular heavy drinking increases the body's insulin resistance. Unhealthy diets – which feature highly refined, high glycemic-load carbohydrates, unhealthy fats and high levels of sodium – have various impacts, among others insulin resistance, higher blood pressure, weight gain and elevated levels of blood glucose and insulin. Physical inactivity, or having a sedentary lifestyle, is associated with insulin resistance as well as an increased risk for metabolic syndrome (diabetes, high blood pressure and obesity). There is also a direct link between tobacco use, alcohol consumption, and physical inactivity and unhealthy diets and various cancers [28]–[35].

The 2019 WHO STEPS survey for Ukraine and data collected by Act4Health project Mobile Medical Teams (MMTs) in the Dnipro, Kherson, Lviv, Poltava, Rivne5 offers greater insight into the prevalence of risk factors for NCDs [36]:

► Although the 2019 STEPS survey found that over a third (35.4%) of the population reported currently using tobacco products, most (84.8%) on a daily basis, smoking may have declined in recent years, as it was reported by only 12% of respondents interviewed by the MMTs [36], [37] According to STEPS, usage is higher in men (51.0%) than women (19.3%). Thirty percent (30.2-30.4%) of adults reported being exposed to second-hand tobacco smoke at home or work. 37.6% of smokers were advised to quit smoking tobacco during a visit to a health care provider [36].

► Average alcohol consumption may also be on the decline, as alcohol abuse was reported by only 3% of respondents interviewed by MMTs [37]. Previously, the STEPs survey found that average alcohol consumption in Ukraine was 8.6 litres of pure alcohol per person over the age of 15 per year (2016). Over half of the population (55.6%) consumed alcohol at least monthly (66.1% of men, 44.6% of women). A fifth of persons (19.7%, 29.5% of men and 9.4% of women) reported heavy episodic drinking, meaning the consumption of six or more drinks on a single occasion [36].

► MMT data found that nearly two-thirds of respondents (61%) reported having an unhealthy diet [37]. The 2019 STEPS

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4. Although not included in this research, environmental factors and genetics are also risk factors for NC

survey found that two thirds (66.4%) of the population did not consume a minimum of five servings of fruits and vegetables per day. Ukrainians consume an average of 12.6 grams of salt per day, more than twice the maximum recommended level of 5 grams. This salt comes both from home cooked food, where 66.7% of people always or often add salt to food when cooking at home, and processed food, which is consumed "always or often" by 26.9% of persons [36]. Nearly half (47%) of MMT respondents were found to lead a sedentary lifestyle, which may represent a decline on previous findings which found that ten percent of the population did not meet the WHO recommendation of at least 150 minutes of moderate intensity physical activity, or equivalent, per week [36], [37]. Physical inactivity and unhealthy diets can cause overweight and obesity; an estimated [35]50% of the population is either overweight (BMI 24.4-32.8) or obese (BMI 32.8+) [36], [37]. By region, the percentage of population overweight or obese is 59.8% in Dnipro, 50.7% in Lviv, 51.1% in Poltava and 55.8% in Rivne [38]. Over two-thirds of men (64%) and three-quarters of women (76%) have an increased or slightly increased waist circumference [37], [35].

2.2.3   ACTIONS TO COMBAT NCDS IN UKRAINE

The Government of Ukraine has developed an NCD National Action Plan (NAP), which is a strategic vision for controlling and preventing NCDs in Ukraine [5]. Launched in 2018, by 2030 the NAP aims to:

- ► Reduce by one-third the risk of premature mortality from CVDs, cancer, diabetes, chronic respiratory diseases and other NCDs.

- ► Reduce by at least ten percent harmful use of alcohol.

- ► Reduce by ten percent physical inactivity and insufficient physical activity.

- ► Reduce by 30 percent mean population intake of salt/sodium.

- ► Reduce by 18.5 percent current tobacco use in persons aged 15+ years.

- ► Halt the rise in diabetes and obesity.

- ► Reduce by 25 percent road traffic accident death rates [4].

The NAP is supported by various partners and projects. The "Reducing risk factors for NCDs" project (known as Act4Health) is being carried out by GFA Consulting Group GmbH (GFA) and the Geneva University Hospitals (HUG) in partnership with the non-governmental organization (NGO) Women's Health and Family Planning (WHFP) and OneHealth. With support from the Swiss Development Cooperation (SDC), the overall goal of the project is to mitigate NCD-related risk factors, morbidity and mortality over the period 2020-2024 in five target regions: Dnipro, Kherson, Lviv, Poltava and Rivne. Through a number of activities in direct support of the NAP (Box), the project seeks to provide the people of Ukraine with more equitable and sustainable access to quality and affordable primary healthcare services, with a focus on disease prevention and health promotion to adopt healthier lifestyles [39], [40].

During the Act4Health project's inception period, Dr Katarzyna Kissimova-Skarbek conducted an ex-ante cost-effectiveness analysis (CEA) of project activities. Her analysis concluded that given the project budget of 4.4 million Swiss francs (CHF, approximately USD 4.0 million) and a targeted reduction in DALYs of 5%, the project would be cost-effective (see Annex J). Further analysis was needed to identify the most cost-effective policy and public health measures, as well as clinical interventions, to help the project meet – or exceed – this goal of reducing DALYs by 5%, and to quantify the health, social and economic impacts of those interventions. That analysis is the subject of the present report.

3

INVESTMENT CASE METHODS

3. INVESTMENT CASE METHODS

The goal of the assignment was to assess the cost-effectiveness of interventions to tackle NCDs in Ukraine. This included:
A comprehensive analysis of the health and economic impacts of NCDs in Ukraine.

▶ Recommendations on most cost-effective policy, public health and clinical interventions for NCD prevention for Ukraine, to help the Act4Health project to Prioritise their activities.

▶ There are various ways to measure "cost-effectiveness," taken here to broadly refer to an analysis of relative costs and outcomes (effects) of different courses of action. This type of analysis is also sometimes referred to as an economic evaluation. The consultants chose to conduct this analysis as part of an investment case. An investment case for NCDs:

▶ Examines the health and economic burden of NCDs (including direct and indirect costs) over a variable time period, such as 1, 5, 10 or 15 years.

▶ Costs interventions to combat NCDs (clinical, public health, and policy interventions), to be implemented over that same time period.

▶ Estimates the health and economic impacts of these interventions over the specified period.

▶ Produces an estimate of the benefit-to-cost ratio representing the potential return on investment (ROI) from investing in NCD prevention and control interventions. Comparing monetary investments in health service provision with monetary returns from increased economic output corresponds to a cost-benefit analysis.

NCD investment cases are fed by local data and therefore highly contextualised to the current health system, economic, and political environment of a country or group of countries. In that way, they allow countries to make a powerful health and economic argument for taking action to prevent and control NCDs. Additionally, they can be used as an advocacy tool to support additional health funding for NCDs and form the basis for additional national and intersectoral action on NCDs. In recent years, NCD investment cases have been carried out by around two dozen LMICs.[6]

Over the period January 2022 to May 2023, we developed and employed a six-step methodology for the investment case (see Figure 1), informed primarily by the WHO/UNDP Guidance Note on NCD Investment Cases [41]. We also relied on the large number of existing NCD investment cases to inform our methods [42]–[61]. In summary:

▶ We first gathered data that would be required for the investment case (Step 1).

▶ Next, we constructed the so-called Baseline Scenario, assuming that current coverage rates of policy and clinical interventions would remain unchanged over the 10 years. Using OHT, we obtained estimates of projected health status over the set horizon, including future incidence, prevalence, premature mortality, disability, and BOD measured in DALYs. OHT also estimated the operating costs that the country would incur in the provision of these interventions, including the costs of labor, drugs, and medical supplies (Step 2).

▶ Using as input the future DALYs lost from the selected NCDs, we estimated the reduction in economic output from the lower labour participation by productive age individuals expected to die prematurely or to live with disabilities as a consequence of CVDs and diabetes (Step 3).

▶ We then formulated the so-called Investment Scenario, characterised by increased coverage rates for all policy and clinical interventions. Using OHT we drew estimates of the future BOD and its reduction, relative to the BOD in the Baseline Scenario, thanks to the greater provision of NCD control interventions, and estimated the incremental investment needed relative to the Baseline Scenario (Step 4).

6. Countries include, among others, Armenia, Bahrain, Barbados, Belarus, Ethiopia, Iran, Jamaica, Jordan, Kazakhstan, Kenya, Kyrgyzstan, Mongolia, Oman, Serbia, Thailand, Turkey, Uganda, Uzbekistan, Zambia and several Pacific Islands [42]–[61].

▶ We estimated the lower economic loss, or economic gains, resulting from poor health associated with these NCDs, given the increased coverage in the Investment Scenario (Step 5).

▶ Finally, we contrasted the Investment Scenario's incremental investment with the economic gains and computed the ROI as the ratio between the economic gains and the investment costs (Step 6).

Figure 1: The six steps of the NCD investment case methodology

Assess the current burden of disease and intervention costs from NCDs

Estimate the economic losses from NCDs

BASELINE SCENARIO

Gather Data

Calculate the net benefits and **return on investment** of each policy measure and clinical intervention

INTERVENTION SCENARIO

Estimate **health gains** that can be achieved as a result of scale up of policy and clinical interventions, and estimate the **costs of implementation**

Monetize health gains produced by OHT to **assess the impact on the labor force and economic output**

Source: Authors

We used OneHealth Tool (OHT),[7] the Generalized Cost Effectiveness Analysis (GCEA) module of Spectrum and Microsoft Excel to complete the modelling and analysis. We conducted four separate investment case analyses (one for each region), and then aggregated results using Microsoft Excel. We considered two time horizons: four years, to correspond to the project duration, and ten years.

Finally, using the investment case results, we developed a high-level theory of change (TOC) for the project, and four package-specific TOCs to show how and why the investments will lead to improved health and economic outcomes.

In the remainder of this chapter, we describe in detail each step of our methodology.

7. OHT is the most widely used software package to cost out individual and sets of health interventions, including NCD-related clinical and public health interventions, and quantify their health benefits. OHT has also been used in most of the cited investment cases, and also for a global modelling exercise to estimate the return on investment for prevention and treatment services in 20 low- and middle-income countries [104].

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3.1   STEP 1: GATHER DATA

We completed a comprehensive literature review about NCDs in Ukraine, and in the four regions specifically [5], [26], [27], [36], [39], [62]–[68]. Specific data required for the investment case included clinical and policy intervention coverage rates, cost data, demographic data, economic data, epidemiological data, risk factor prevalence data and more. Where possible, we gathered region-specific data (Dnipro, Lviv, Poltava and Rivne). If region-specific data was not available, we attempted to obtain Ukraine-specific data. Some of this data was already built-in to OHT, drawn from various sources. In the absence of either region- or Ukraine-specific data, we resorted to regional (Europe) estimates and/or data from the international literature. Table 1 provides an overview of data collected, and whether it was available at region-, Ukraine- or regional/international-level.

Table 1: Data collected for investment case

Category of data	Type of data	Region-specific	Ukraine-specific	Regional estimate and/or data from literature
Clinical and policy interventions*	Clinical and policy interventions* Coverage of policy and public health interventions	X	X	
Cost data	Salary data Costs of drugs and supplies Costs of in/outpatient visits NCD program running costs (fixed) NCD program running costs (variable)		X X X	X X
Demographic data	Population Life tables Life expectancy Total fertility rate Migration**	X	X X X X	
Economic data	Inflation Labour force participation Unemployment Health expenditure Size of the labour force*** GDP per capita**	X X X X X	X	
Epidemiological data	Prevalence and incidence of CVDs and diabetes Mortality from CVDs and diabetes	X		
Risk factor prevalence data	Prevalence of risk behaviours	X	X	
Other data	Disability weights Intervention effect sizes		X	X

* This investment case included all policy measures (including public health measures) and clinical interventions that are available in OHT to address CVDs and diabetes and their risk factors: tobacco and alcohol consumption as well as physical inactivity and poor diets (including high sodium consumption). All of the included measures are part of either the Act4Health project activities and/or the NAP (though Act4Health and the NAP also include additional activities not modelled in OHT). Many of the included measures appear on WHO's Best Buy list for NCD prevention and control (see Annex A:).

** Refers to data from neighbouring European countries.

*** Region-specific value calculated by consultants using national-level estimate and each region's share of total population.

**** In some cases, region-specific data was available but not in the format required by OHT. Therefore, Ukraine-specific data in the required format was used to estimate region-specific values.

We gathered the most readily available, recent data to represent the Baseline Scenario starting year (2022). In some cases this data was from 2017-2019 because of challenges in collecting more recent data as a result of the ongoing war, recent changes in the data collection form for collection of regional data and the schedule for the release of the newest mortality data. We avoided data from 2020 and 2021 where possible as it may have been contaminated by the COVID pandemic.

We then entered the collected data in OHT and/or Microsoft Excel, as explained below.

3.2   STEP 2: ASSESS THE CURRENT BURDEN OF DISEASE AND INTERVENTION COSTS (BASELINE SCENARIO)

The **Baseline Scenario** is a scenario with no additional investments to prevent or control NCDs, that is, without any increases in coverage of either policy or clinical interventions with respect to the year 2022. The second step of our methodology was to assess the current burden of disease (BOD) and intervention costs in the Baseline Scenario.

3.2.1   BURDEN OF DISEASE

BOD is measured by OHT in DALYs [69]. The DALY is a single indicator used largely in low- and middle-income countries that accounts for both morbidity and mortality: time lived with a disability (YLDs) and time lost due to premature mortality (YLLs) (Figure 2).

Figure 2: The DALY explained

DALY = YLD + YLL

Disability Adjusted Life Years is a measure of overall disease burden, expressed as the cumulative years lost due to ill-health, disaility or early death

Years Lived with Disability

Years of Live Lost

Healthy Life   Disease or Disability   Early death   Expected life years

Source: [70]

YLDs are calculated using the following formula: YLD = I × DW × L, where I = number of incident cases in the population (generated by OHT), DW = disability weight of the specific condition, and L = average duration of the case until remission or death (years). Disability factors or weights capture the severity of an illness on a 0 to 1 scale, with 0 representing no disability and 1 representing death [71]. The greater the disability resulting from the severity of a person's condition, the greater the disability factor and the smaller the person's health status and productivity. We used OHT's built-in weights and calculated remaining life expectancy using World Bank statistics [23], [72].

The BOD in the **Baseline Scenario** corresponds to the largest shape of Figure 3, indicated by connecting the points A, B, C and D (ABCD).

Figure 3: Burden of disease in the Baseline and Investment Scenarios
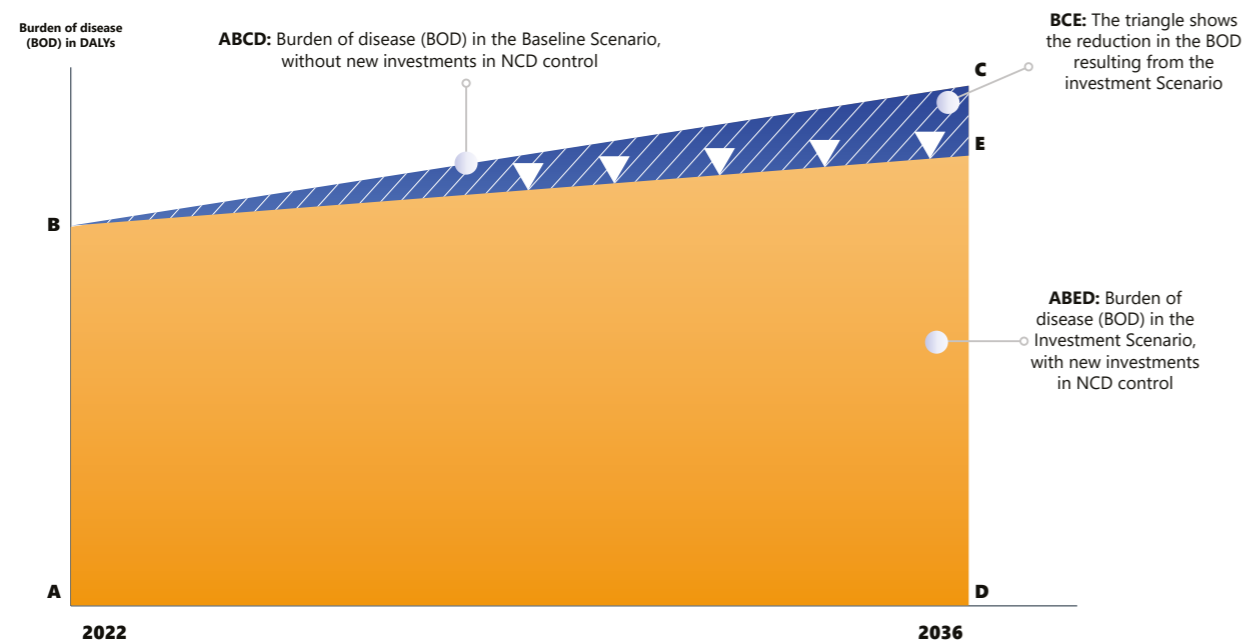
Source: Authors

OHT estimated this projected BOD by age group and gender using:

- ▶ Standardised effect sizes from the literature (see Annex B).
- ▶ Transition probabilities between health states – for example, moving from healthy to having diabetes, from diabetes to having a lower extremity amputation, from amputation to death: we used OHT's built-in values which come from the Global Burden of Disease study [73], but adjusted them as necessary to better reflect the current epidemiological profile of each region.
- ▶ Epidemiological information, by gender: OHT uses baseline epidemiological data on the prevalence of strokes and acute IHD as well as the incidence of diabetes, and mortality from these conditions. We adjusted OHT's built-in epidemiological data so that it aligned with region-specific data from the literature [23], [74]–[76].
- ▶ Risk factor prevalence, by gender: we used OHT's built-in values for Ukraine.
- ▶ Demographic data including population, fertility rate, life expectancy at birth and international migration: data is by gender where available and comes from the State Statistics Service of Ukraine [77]. We used OHT's built-in life tables. See Annex C.
- ▶ Relative risk ratios: OHT's built-in relative risk ratios are taken from the international literature and determine which interventions are likely tied to which priority diseases: a relative risk greater than one means that a particular health event, such as ischemic heart disease, is more likely to occur if there was exposure to a specific risk factor. If the relative risk is less than 1, then the event is less likely to occur if there was exposure. Therefore, we can deduce that if a risk factor elevates the risk for a condition, policy interventions targeting that risk factor will also target the associated priority disease. For example, tobacco use is associated with a higher risk of developing ischemic heart disease, stroke, cervical cancer (for women), diabetes, asthma and COPD. An intervention aiming to reduce tobacco use, such as higher taxation on tobacco products, aims to reduce the number of tobacco users. Although the relative risk associated with tobacco use remains the same, the affected population is reduced, meaning fewer persons will develop ischemic heart disease. Since ischemic heart disease is a type of CVD, prevalence of CVD will also decline.
- ▶ Disability weights: we used OHT's built-in values for Ukraine (Annex B).
- ▶ Coverage levels of policy and clinical interventions: see below.

We considered all policy measures (including public health measures) and clinical interventions that are available in OHT to address CVDs and diabetes and their risk factors: tobacco and alcohol consumption as well as physical inactivity and poor diets (including high sodium consumption). Policy interventions reduce the incidence of NCDs, and therefore the health and economic burden of these diseases, but they also reduce the BOD, and the IECs through other channels: for example, policy interventions aimed at controlling the consumption of alcohol also avoid deaths and disability from traffic accidents and from violence. Clinical interventions, on the other hand, reduce the death and disability among people suffering from these NCDs.

All of the included measures are part of either the Act4Health project activities and/or the NAP (though Act4Health and the NAP also include additional activities not modelled in OHT). Many of the included measures appear on WHO's Best Buys list for NCD prevention and control (see Annex A, Table A.16) and are part of WHO's MPOWER strategy for tobacco control [78]. Although OHT assumes facility-based delivery of clinical interventions, innovative delivery mechanisms such as telephone consultations, pre-recorded tele-phone messages and group consultations are also in use in Ukraine.

Through an extensive desk review, we assessed the current state of implementation of each policy intervention and proposed a baseline coverage level (Annex D) [27], [62]–[65], [67], [68], [79]–[86]. For tax-based policy interventions (increase taxes on tobac-co, alcohol and sugar-sweetened beverages), OHT uses current tax rates on alcohol and tobacco as baseline.

Clinical interventions are organised in terms of the priority disease they aim to address. CVD and diabetes are presented together as per the logic of OHT, since many clinical interventions address both priority diseases. For clinical interventions, Act4Health project staff consulted with three family doctors to obtain a single set of baseline coverage values for Ukraine as a whole. The consultants then adjusted the baseline values where region-specific data was available (Table 2) [63], [75], [87]–[90].

Table 2: Baseline clinical intervention coverage values

Intervention	Status of implementation in Ukraine	2022 national baseline coverage*	Region-specific coverage values, where available			
			Dnipro[1]	Lviv[2]	Poltava[3]	Rivne
Screen for risk of cardiovascular disease and diabetes	Services are available for everyone but only some people use them	20%		80%	80%	
Follow up care for those at low risk of CVD and diabetes	Services are available for everyone but only some people use them. Little attention is paid to this intervention	20%				
Treat those with very high cholesterol but low absolute risk	Services are available for everyone but only some people use them. In the state program of medical guarantees only 1 statin (simvastatin) is included	50%				
Treat those with very high blood pressure but low absolute risk (<20%)	Services are available for everyone but only some people use them. The as-sessment of risks is con-ducted very rarely	55%				

Intervention	Status of implementation in Ukraine	2022 national baseline coverage*	Region-specific coverage values, where available			
			Dnipro[1]	Lviv[2]	Poltava[3]	Rivne
Treat those with 20-30% risk of CVD	Services are available for everyone but only some people use them. The assessment of risks is conducted very rarely	50%				
Treat those with high risk of CVD	Services are available for everyone but only some people use them. The assessment of risks is conducted very rarely	70%		54.8%		
Treat new cases of acute myocardial infection (AMI) with aspirin	AMI is diagnosed very rarely, especially at the primary healthcare level	5%	27.8%	7.8%		
Treat cases with established ischemic heart disease (IHD) and post myocardial infection	Services are available for those who require them; medicines prescribed at the primary healthcare level are free. Medicines prescribed by specialists (secondary and tertiary healthcare levels) may not be free, patients must purchase them	90%				
Treat those with established cerebrovascular disease and post stroke	Services are available for those who require them; medicines prescribed at the primary healthcare level are free. Medicines prescribed by specialists (secondary and tertiary healthcare levels) may not be free, patients must purchase them	85%				
Treatment of Rheumatic Heart Disease (with benzathine penicillin	Services are available for everyone but only some people use them.	25%				
Standard glycemic control	Glycated hemoglobin is done only in private laboratories	80%	50%	45.8%	50%	50%
Intensive glycemic control	Glycated hemoglobin is done only in private laboratories	20%	30%	0%	30%	30%
Retinopathy screening and photocoagulation	Services are available for everyone but only some people use them. In most cases this intervention is done by ophthalmologists based on the referrals of family doctors	20%	80%		80%	
Neuropathy screening and preventive foot care	Services are available for everyone but only some people use them.	35%	80%		80%	

* We used the values in this column for each regional analysis, unless region-specific values are noted.

1 National coverage adjusted based on Borysova and colleagues (2020), who found that the public health system in Dnipro offers personalised diabetes program.

2 National coverage adjusted based on the fact that Lviv oblast is also characterised by the low population reference for medical care: 69% of patients who fall sick do not consider going to the doctor, and this may aggravate NCDs chronic conditions. World Bank research showed that 32-50% of type-2 diabetes cases were not detected and registered, 91.7% of registered type-2 diabetes patients are linked to care, less than 50% of those (45.8%) are under HbA1C monitoring, and of those linked to care, only 9% have their glucose controlled. For hypertension, World Bank research found that 34% of the adult population has hypertension but only 24% succeed at reaching normal BP levels when receiving treatment in Lviv specifically. The Health Index Surveys of 2017 and 2018 collected self-reported data on BP measurement at clinics, which found that 82% of adults in Lviv region reported having measured their BP within the last 12 months; of these, 21% had elevated BP, according to the survey respondents (compared with 24.3% based on patient file review). Patient file review also indicated that HTN patients were receiving medical prescriptions that are in line with evidence-based regimens. Eighty-one percent (81%) of patients in the Lviv region have results for all three ABC measurements (glucose, BP measurement, LDL cholesterol) in their medical records.National coverage adjusted based on Borysova and colleagues (2020), who found that the public health system in Dnipro offers personalised diabetes program.

3 National coverage adjusted based on World Bank research, which found that HbA1C testing is integrated in Poltava's diabetes program (unlike in Lviv) and Poltava providers had budget allocations for offering the test free of charge to patients. Seventy-three (73%) of HbA1C monitored cases didn't achieve target in 2016, 30-34% of T2DM were not detected and registered, 91.6% of registered type-2 diabetes patients are linked to care, the majority of those who are linked to care (92.4%) are under HbA1C monitoring and of those linked to care only 25% have their glucose controlled. Regarding hypertension, World Bank research found evidence of a hypertension prevention, screening and health sector strengthening program in Poltava. Between 23.7% and 45% of adult population have hypertension; 35% succeed at reaching nor-mal BP levels when receiving treatment. The Health Index Surveys of 2017 and 2018 collected self-reported data on BP measurement at clinics and found that in 2017, 80% of adults reported having measured their BP within the last 12 months; among hypertension patients whose BP is monitored as per protocol, 35% achieved target. Of these, 23% had elevated BP, according to the survey respondents (compared with 23.7% based on patient file review). Patient file review also indicated that HTN patients were receiving medical prescriptions that are in line with evidence-based regimens. Prescription of aspirin was 20 percent higher in Poltava compared to the Lviv sample (67% vs 47% of patients). Seventy-three (73%) of patients have results for all three ABC measurements (glucose, BP measurement, LDL cholesterol) in their medical records.

Note: for more information on the modelling and assumptions behind clinical interventions that address CVDs and diabetes, see Ortegón et al 2012 [91].

Source: Expert opinion of three family doctors; regional values from the literature [63], [75], [87]–[90].

3.2.2   BURDEN OF DISEASE IN WORKING AGE POPULATION (PDALY)

We use the BOD in the working age population to estimate the indirect economic losses from CVDs and diabetes (see step 3). The BOD in the working age population is estimated as the DALYs incurred by those aged 15-64 multiplied by the percent of persons of working age who are employed. We used data from the State Statistics Service on the number of employed persons per region to estimate the percent of the working-age who were employed by dividing number of employed persons per region by the regional population aged 15-64 [77], [92]. We call these DALYs lost in the working age population the Productivity DALY, or PDALY. This approach has been used elsewhere, including in Australia for estimating losses from diabetes [93], [94].

3.2.2 ESTIMATE FINANCIAL COSTS OF POLICY AND CLINICAL INTERVENTIONS IN BASELINE SCENARIO

We estimated the financial costs in the Baseline Scenario of policy and clinical interventions using GCEA and OHT. Financial costs represent the financial outlays (i.e., expenditures) required for implementation of activities. We exclude economic costs, also known as opportunity costs, which represent the value of opportunity forgone, strictly the best opportunity forgone, as a result of engaging resources in another activity. Economic costs are always excluded from investment cases because the focus is on actual expenditures required to implement the policy, public health and clinical interventions. Likewise, investment cases do not include patient costs, because the focus of the analysis is on costs of implementation by government and partners.

For policy interventions, we used GCEA's built-in assumptions about the costs of running an NCD program supporting multiple interventions (staffing, trainings meetings, mass media and supplies and equipment); this data is based on expert opinion and "averages" present in many countries. We combined these fixed program costs with the variable cost of policy interventions at baseline coverage levels over four and 10 years, drawn from the findings of other investment cases (Armenia, Belarus, Kazakhstan, Thailand, Turkey), which we calculated on a per capita basis (Table 3).

Table 3: Cost assumptions for policy interventions: baseline scenario (2022 USD)

Policy in-tervention package	Cost per capita per year in 2022 Total cost per year in 2022				Total cost per year in 2022			
	Dnipro	**Lviv**	**Poltava**	**Rivne**	**Dnipro**	**Lviv**	**Poltava**	**Rivne**
Tobacco cessation	0.257	0.257	0.257	0.235	1,246,889	982,958	545,495	460,043
Alcohol control	0.289	0.253	0.253	0.325	1,787,993	1,409,52	782,220	659,686
Physical inactivity and healthy eating	0.080	0.080	0.080	0.090	713,007	562,084	311,930	263,066
Total inter-vention cost (variable)	0.626	0.590	0.588	0.648	3,747,889	2,954,568	1,639,644	1,382,795
Program costs (fixed)					840,482	840,482	840,482	840,482

Source: Investment scenario costs calculated by authors based on investment case cost findings from Armenia, Belarus, Kazakhstan, Thailand and Turkey [42], [45], [50], [56], [57]. Baseline values were derived by authors on the basis of baseline coverage rates of policy interventions.

The cost of clinical interventions was computed by OHT based on assumptions about resource use (drugs and supplies, laboratory tests, personnel, and in/outpatient visits), provided by OHT in the form of standard treatment protocols (STPs). These are based on best practices and reflect, on average, how most countries deliver services, and assume availability of infrastructure and health workers, though we recognise this may not be the case in all regions in Ukraine presently. OHT uses bottom-up costing, or in the other words the price of inputs multiplied by the quantity of each input needed. For example, the total cost of cholesterol testing would be the price of a single cholesterol test multiplied by the number of tests required per patient per year, multiplied by the expected number of patients. The OHT software computed the total cost of clinical interventions based on our projections of intervention coverage over the four and ten year horizon, as well as our demographic and epidemiological projections. We used local salary data and drugs/supplies prices provided by Act4Health (see 0) [95]–[97]. For drugs and supplies, where Ukraine-spe-cific prices were not available, we used the average percentage difference between OHT built-in prices and the prices that were

available for Ukraine to adjust upwards (by 288%) OHT built-in prices. We included a fixed cost per outpatient visit and a cost per inpatient day for the corresponding number of days, as defined by OHT's STPs. cost per outpatient day comes from an official government resolution [98], while cost per inpatient day is from the literature [99] (see 0, Table A.29).

We assumed an annual inflation rate of 7.19% for local currency calculations, which represents the annual average for the period 2018-2020, and 3% for USD calculations [72]. We converted between Ukrainian hryvnia (UAH) and USD at a rate of 1 USD = 32.34 UAH [100]. We present four and 10 year cost estimate as the net present value (NPV), meaning the sum of all future cash flows, discounted to the present value at a rate of 3%.

3.3 STEP 3: ESTIMATE ECONOMIC BURDEN FROM NCDS (BASELINE SCENARIO)

In the Baseline Scenario, the economic burden from NCDs is comprised of two types of indirect economic costs: (1) the cost of years of life lost (YLLs) due to premature mortality and (2) the cost of years of life lived with a disability (YLDs). In summary, we value the PDALYs associated with both YLLs and YLDs using GDP per employed person. These methods are discussed in more detail below.

3.3.1 ECONOMIC BURDEN FROM YEARS OF LIFE LOST

When an individual dies from an NCD, society loses the economic output the person would have otherwise produced if he or she had not died prematurely from that condition. For example, consider the case of a 55-year-old dying of heart disease in 2025 and suppose the study adopts a horizon of 10 years, from 2022 to 2031. Had the person not died prematurely from heart disease, he or she would have lived and worked for another 10 or more years in the future. These is a lost economic output as a result of this person's early death.

To monetise the corresponding economic loss to society, we defined the economic cost of one year of premature death as the country's gross domestic product (GDP) per employed person. This approach assumes that all working age individuals in a coun-try make, on average, an annual economic contribution equal to the country's average GDP per employed person. According to the World Bank, Ukraine's total GDP in 2021 was USD 200.1 billion (current dollars) [23], [72]. We estimated the GDP per region by applying the population share of each region to the national GDP [77]. We then calculated the GDP per employed person as the ratio of regional GDP / regional labour force (Table 4). We multiplied the PDALYs corresponding to mortality by the GDP per employed person, with GDP per employed person inflated by 3% per year for years 2-10 of the analysis.

Table 4: GDP per employed person (2022 USD)

Region	GDP (millions)	Number of employed persons	GDP/employed person (2022)*
Dnipro	14,148	1,413,700	10,007
Lviv	11,322	1,075,200	10,530
Poltava	6,178	591,200	10,451
Rivne	5,217	486,000	10,734

Source: [23], [72], [77], [92]

* GDP per employed person in years 2-10 is adjusted for both inflation and population changes.

We further defined two alternative methods to determine the economic burden caused by years lost due to premature mortality. With Method 1, we assumed that when a person dies during the 10-year horizon, we would count as years of life lost (YLLs) only those that would accrue within the 10 years. With Method 2, we considered not only the YLLs during the investment period of 10 years, but also the economic costs of those years lost beyond the end of the investment period, under the assumption that some of the economic returns from some investments in NCD prevention and control made during the investment period will continue to result in benefits beyond the 10-year time period (Figure 4). Method 2 ascribes a higher economic cost to society to a premature death than Method 1.

Figure 4: Two methods to value the productivity lost due to mortality
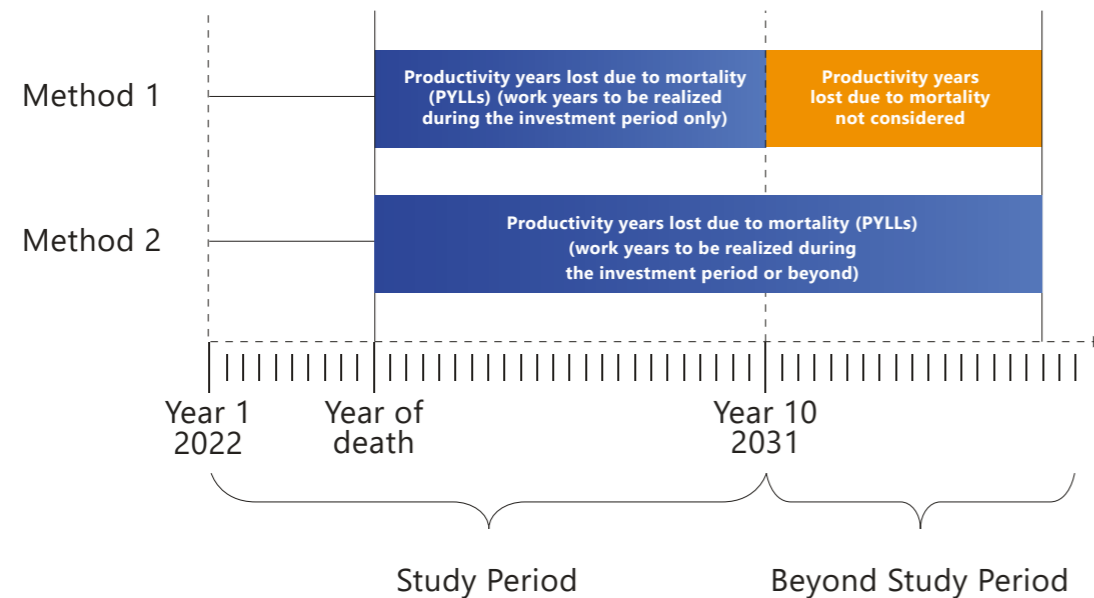
Source: Constructed by the authors.

3.3.2   ECONOMIC BURDEN FROM YEARS LIVED WITH DISABILITY

Economically active individuals afflicted with an NCD may see their productivity diminished as a consequence of their deteriorated health. A person employed in a physically strenuous job who has severe shortness of breath as a result of a heart condition will naturally be less productive than one who is diabetic with only occasional episodes of deteriorated health and even less so than one who is healthy. As such, the number of years of life lost from disability (YLDs) reflect the degree to which a person's productivity can be affected by his or her NCD:

► Missed work due to illness (absenteeism)

► Reduced productivity while at work (presenteeism)

By multiplying the YLD by the average GDP per employed person, we can obtain an estimate of the economic cost of an NCD. This is an approach that we have chosen as an alternative to the one which estimates the lost economic output based on absenteeism and presenteeism [42].

3.3.3   TOTAL ECONOMIC BURDEN

We summed the years lost from premature mortality and those lost from disability and multiplied the result by the average GDP per employed person. We called this the value of the productivity year DALY, or PDALY. A PDALY is therefore society's lost economic output resulting from the burden of disease caused by NCDs.

3.4   STEP 4: ESTIMATE HEALTH GAINS AS A RESULT OF SCALED-UP COVERAGE OF POLICY AND CLINICAL INTERVENTIONS, AND THE INCREMENTAL COST OF SCALE-UP (INVESTMENT SCENARIO)

To generate the Investment Scenario, we scaled up coverage of policy and clinical interventions from their baseline values. All policy interventions were scaled up to an intensity of "4" in year 2, meaning the law or measure is in place and well-implemented, as has been standard practice in other NCD investment cases. Tax-related policy intervention targets were set at an increase of 50% of current tax levels for alcohol and 75% of the supplier price for tobacco. Similar to the other policy interventions, this target was applied from year 2 onwards. The impact from these tax rate changes depends on price elasticities (which measure the change in consumption of a product in relation to a change in its price), which were provided by OHT from the literature.

Clinical interventions were scaled up linearly to 90% coverage in year ten, meant to represent a "best case" scenario.

Figure 5: Clinical and policy intervention coverage in Baseline and Investment Scenarios
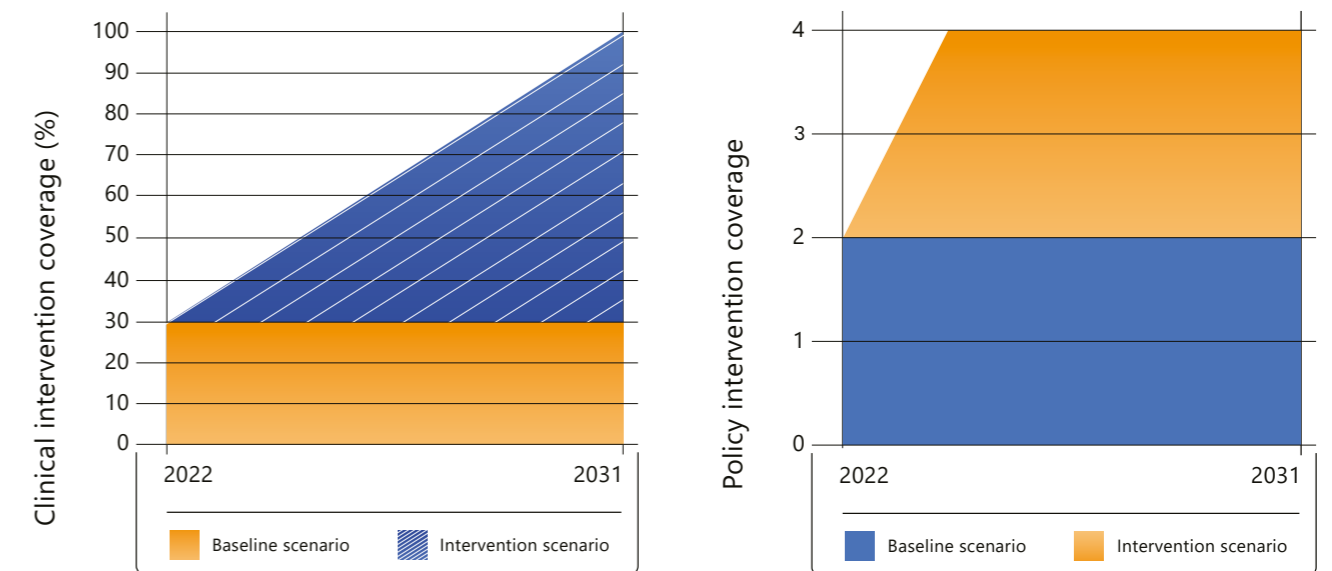
Note: Baseline values are for illustration purposes only; actual baseline values used can be found in Table 2, Table A.24, Table A.25 and Table A.26.

Source: Authors

We then estimated the health gains as a result of scaled-up coverage, and the incremental costs of scale-up.

3.4.1   ESTIMATE HEALTH GAINS

The projected BOD under the Investment Scenario represents health gains achieved as a result of scaling up policy and clinical interventions. OHT measures health gains for the entire package of clinical interventions, not per individual intervention or service included in each package. As with the Baseline Scenario, the BOD is expressed in terms of DALYs and includes the two components previously explained in section 0: Years of Life Lost (YLLs) due to premature mortality from the selected NCDs, and Years Lived with Disability (YLDs) from these NCDs.

The investment in the provision of policy and clinical interventions to combat these NCDs will bring about a reduction in their

BOD, as is shown through the smaller shape (ABED) in Figure 6. The net reduction in BOD are the health gains resulting from the interventions and are shown as the small triangle (BCE).

Figure 6: Burden of disease with the Baseline Scenario and the Investment Scenario
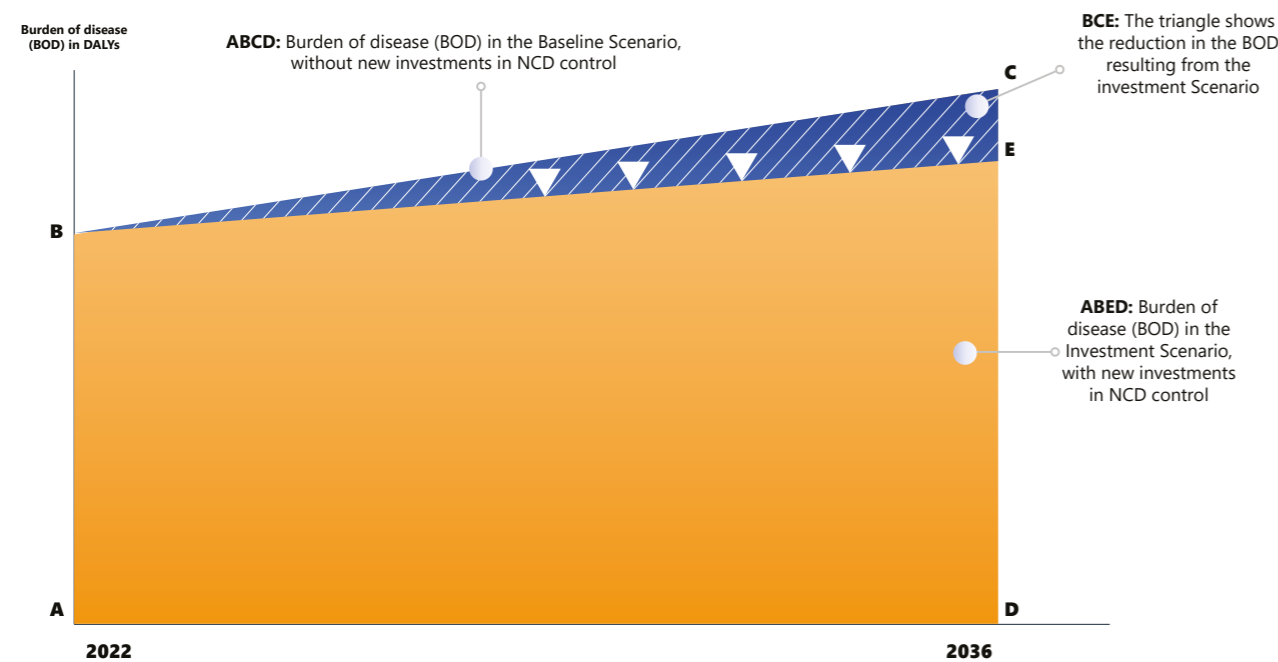
Source: Authors

3.4.2   ESTIMATE INCREMENTAL FINANCIAL COSTS OF SCALING UP POLICY AND CLINICAL INTERVENTIONS

As in the Baseline Scenario, we estimated the costs of implementing the policy and clinical interventions at higher coverage rates. Only the additional, or incremental, costs over and above the costs of the Baseline Scenario are included. For policy interventions, we assumed fixed NCD program costs remain unchanged, so there are no additional costs in the Investment Scenario, but there are additional variable costs associated with higher coverage.

Table 5: Cost assumptions for policy interventions: investment scenario (2022 USD)

Policy intervention package	Cost per capita per year in years 2-15*			
	Dnipro	Lviv	Poltava	Rivne
Tobacco cessation	0.403	0.403	0.403	0.403
Alcohol control	0.577	0.577	0.577	0.577
Physical inactivity and healthy eating	0.230	0.230	0.230	0.230
Total intervention cost (variable)	1.210	1.210	1.210	1.210

Source: Investment scenario costs calculated by authors based on investment case cost findings from Armenia, Belarus, Kazakhstan, Thailand and Turkey [42], [45], [50], [56], [57]. The cost calculations use the difference between Investment and Baseline Scenarios.

*We applied inflation to these unit costs in years 2-10. Total costs assumed both inflation and population changes.

The cost of clinical interventions in the Investment Scenario considers changes in coverage, in that more services may be delivered, but the cost of delivering a single service is the same at 30% or 90% coverage. In other words, there are no economies of scale or marginal costs taken into account. We also applied inflation to the Baseline Scenario unit costs of salaries, drugs/supplies and indirect costs. There is also an economic impact related to avoided future healthcare treatment costs. These avoided healthcare expenditures include direct costs avoided by preventing strokes and IHD events and direct costs avoided by preventing sight-threatening retinopathy and amputations due to severe neuropathy. The number of people who would have been treated for each disease or disease event is multiplied by the cost of the treatment to estimate the averted costs.

3.5   STEP 5: MONETISE HEALTH GAINS (INVESTMENT SCENARIO)

The scale-up of policy and clinical interventions increases (or restores) productive time for individuals by decreasing the chance that they will die prematurely, and restores the ability of persons with NCDs to work, work more frequently or work more capably because of improved health. The reduced BOD as a result of the scaled-up policy and clinical interventions in the Investment Scenario will bring about an economic gain in the form of greater economic output by the working-age population. We used the same methods as in the Baseline Scenario to monetise the health gains from increased investments in NCD prevention and control measures made in the Investment Scenario, multiplying the reduced BOD by GDP per employed person.

3.6   STEP 6: CALCULATE RETURN ON INVESTMENT

The ROI from NCD control equals the ratio between the economic gains and the investment costs (see Box).

HOW TO INTERPRET THE ROI?

A ROI greater than 1.0, or a favorable relationship between costs and benefits, means that the incremental costs of delivering more CD control interventions are less than the economic gains from increased productivity by a healthier population. Conversely, an ROI smaller than 1.0, or an unfavorable balance between costs and benefits, means that the increased investment in the provision of control interventions is not justified on economic grounds, because the economic gains are less than the additional investment required.

Whether the ROI is greater or smaller than 1.0, the higher investment in NCD control should unambiguously lead to improved health status and that is an unquestionable social benefit of scaling up NCD control efforts. It is expected that the investment in NCD control will be smaller than the economic gains from the increased economic output, and therefore the ROI will be greater than 1.

We calculated the ROI for groups of interventions, or "packages" that target specific diseases, and risk factors (e.g., tobacco use, alcohol use, physical activity and healthy diets). For each package we divided the monetised health gains achieved by implementing/scaling up our chosen measures and interventions by the costs of implementation and scale-up. We summed all packages to estimate the costs, benefits, and a ROI for all interventions. Note that the OHT model does not consider the overlapping effects that implementing all packages in combination may have. We discounted future costs and/or benefits at a rate of three percent.

3.7 DEVELOP THEORIES OF CHANGE (TOCS)

A TOC uses narrative and/or illustrative descriptions to explain how and why certain actions will lead to desired outcomes. In the case of this analysis, we used the investment case results to develop two types of TOCs:

1. **A HIGH-LEVEL TOC TO:**

   ▶ Outline the problem: what are the health and economic impacts from CVDs and diabetes in the four regions?

   ▶ Introduce four packages of Act4Health activities that will address the main risk factors and behaviours and/or the NCDs themselves.

   ▶ Describe the 10-year health and economic impact of these actions.

2. **FOUR SEPARATE PACKAGE-SPECIFIC TOCs**...
   (tobacco-related interventions, alcohol-related interventions, physical activity and healthy eating-related interventions and clinical interventions) to further detail the four thematic packages of Act4Health and NAP activities that will address the main risk factors and behaviours and/or the NCDs themselves. These more detailed TOCs:

   ▶ Explain the relationship between the package of interventions and the burden of disease (BOD) from CVDs and diabetes, and report the 10-year health and economic consequences (in 2022 USD) from these NCDs (modelled results from OneHealth Tool (OHT)).

   ▶ Outline the planning and preparation that are required to implement the package of interventions to combat NCDs. Planning and preparation activities are general and similar across all packages.

   ▶ Note the specific activities carried out by the Act4Health project and as part of Government's NCD NAP, and estimate their costs in 2022 USD (OHT results). Note that costs should be considered minimum estimates, since some activities in the government's NAP are not specifically included in OHT. Not all activities may be feasible to implement in the short- or medium-term given the current situation in Ukraine. The project should carefully consider the feasibility and ease of implementation of each activity, and Prioritise activities accordingly.

   ▶ Describe the outputs from these activities. Outputs describe who is affected – directly and indirectly – by the activities.

   ▶ Predict the CVD and diabetes-related health outcomes resulting from the outputs.

   ▶ Estimate the ten-year health and economic impact of the activities (OHT results).

The detailed TOCs are accompanied by suggestive monitoring and evaluation indicators, structured to mirror the logic of the TOCs. They are presented as process indicators (were the activities implemented?), output and outcome indicators (were the target audiences reached and did they change their behaviours?) and impact indicators (what were the health and economic impacts?). Project staff should consider the suggested monitoring and evaluation indicators a starting point only, and these should be further developed by persons more closely involved in the implementation of the project's activities. Data sources for each indicator should also be identified.

In addition to investment case results, we used the following resources to develop the TOCs:

   ▶ The Act4Health project documentation including the logframe (to identify relevant activities and indicators).

   ▶ The Government's NCD NAP (to identify relevant activities and indicators).

   ▶ Various examples of TOCs from the health sector [101]–[103].

4
RESULTS

4. Results

This chapter presents results organised around the two scenarios: Baseline and Investment. Thus, in section "4.1 Baseline Scenario" we present the current and future BOD attributable to CVDs and diabetes in the four project regions, assuming that the coverage of policy and clinical interventions during the 10-year horizon is constant and equal to that observed in 2022. Next, we show the magnitude of the economic burden associated with these NCDs assuming no change in coverage in the next 10 years. The economic burden comprises both direct economic costs (DECs), or the costs of the policy and clinical interventions, and indirect economic costs (IECs), or those resulting from productivity losses caused by premature mortality and disability from these NCDs.

Section 4.2 Investment Scenario follows the same structure as Section 4.1 except that it presents the incremental health and economic burden, that is, the impact that an increase in intervention coverage over the next 10 years will have on the health and economic burden compared to the Baseline Scenario.

4.1 BASELINE SCENARIO

4.1.1 DISEASE BURDEN FROM NCDS IN FOUR PROJECT REGIONS

The BOD associated with the Baseline Scenario is comprised of both mortality and morbidity. Taken together, these are the total DALYs resulting from CVDs and diabetes. Below each component is discussed separately.

MORTALITY
Given the current coverage levels of clinical and policy interventions in each of the four regions, an estimated 59,000 persons died in 2022 from the selected NCDs (see panel 1 of Table 6). By 2031, 524,000 people would die from these NCDs if the coverage of clinical and policy interventions to control these diseases remained unchanged from current values (see 10-year total in panel 1). As a consequence of this mortality, nearly 7.7 million YLLs are estimated over the next 10 years (panel 2 of Table 6). The most deaths and YLL occur in Dnipro, likely due to its larger population, lower baseline intervention coverage levels as well as a higher baseline prevalence of CVDs and diabetes.

Table 6: Baseline Scenario: Estimation of the health burden from CVDs and diabetes, annually 2022-2031, and present value of first four years and total 10 years (in thousands)

Cause/Year	4-year Total	10-year Total	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
1. Deaths												
Lviv	86	163	18	18	17	17	16	16	16	15	15	15
Dnipro	105	197	22	22	21	20	20	19	19	18	18	18
Poltava	48	89	10	10	9	9	9	9	8	8	8	8
Rivne	39	74	8	8	8	8	7	7	7	7	7	7
Total	277	524	59	57	55	54	52	51	50	49	49	49

Cause/Year	4-year Total	10-year Total	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
2. Years of Life Lost due to mortality (YLLs)												
Lviv	1,235	2,430	255	250	246	243	240	239	239	239	239	240
Dnipro	1,441	2,817	299	293	287	283	279	277	275	275	275	275
Poltava	650	1,267	135	133	130	127	125	124	123	123	123	123
Rivne	578	1,147	119	117	115	114	113	113	113	114	114	115
Total	3,903	7,661	808	793	778	767	758	753	750	750	751	753
3. Years Lived with Disability (YLDs)												
Lviv	275	542	57	56	55	54	54	54	53	53	54	54
Dnipro	436	859	90	88	87	86	85	84	84	84	85	85
Poltava	193	379	40	39	38	38	37	37	37	37	37	37
Rivne	118	235	24	24	23	23	23	23	23	23	24	24
Total	1,022	2,014	211	207	204	201	199	198	198	198	199	199
4. DALYs (YLLs + YLDs)												
Lviv	1,509	2,972	312	306	301	297	294	293	292	292	293	293
Dnipro	1,877	3,676	389	382	374	368	364	364	360	359	359	360
Poltava	843	1,645	175	172	168	165	163	161	160	160	160	160
Rivne	695	1,381	143	140	138	137	136	136	136	137	138	139
Total	4,925	9,674	1,019	999	981	968	957	952	948	948	950	952

Source: Calculated by the authors from OHT.

Patients dying prematurely from CVDs and diabetes do so, on average, 14.6 years before their average life expectancy (Figure 7). The number of years of life lost per patient as a result of premature mortality ranges from 14.2 in Poltava to 15.4 in Rivne.

Figure 7: Baseline Scenario: Average number of YLLs per patient from CVDs and diabetes, by region, 2022-2031
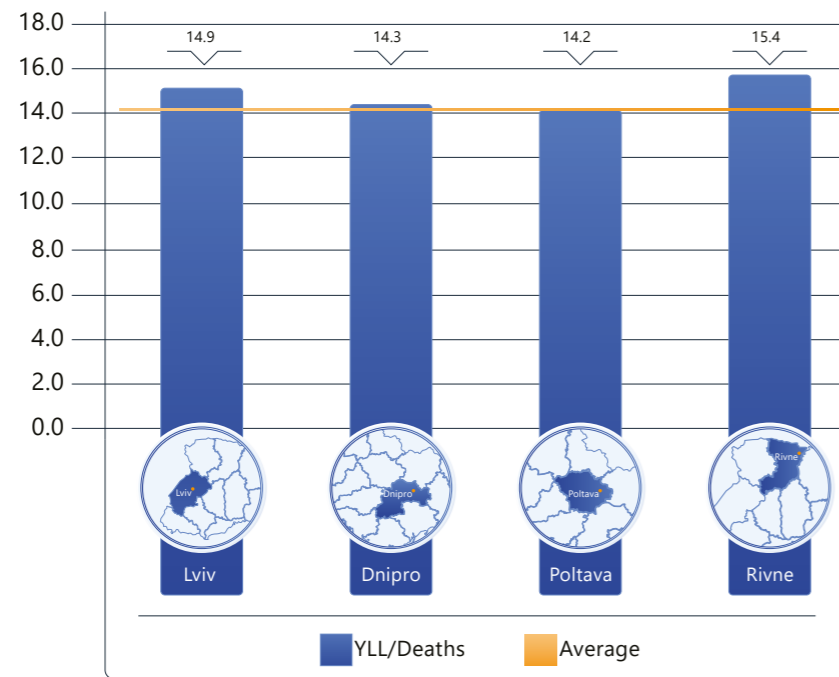
Source: Calculated by the authors from OHT.

MORBIDITY

Over 200,000 years of life were lived with disability (YLDs) in 2022 (panel 3 of Table 6). Over ten years, there will be over two million YLDs. The most YLDs occur in Dnipro, likely for the same reasons as mentioned above regarding morality and YLLs.

DALYs

The total DALYs are the sum of those two metrics (DALYs = YLLs + YLDs) and are shown in Table 6 and in Figure 8. CVDs and diabetes accounted for over 1 million DALYs in 2022 in the four project regions and will account for nearly ten million DALYs over the next ten years. Overall, 79% of the DALYs projected to be lost from the study NCDs will be years lost from premature mortality (YLLs), while only 21% will be years lost from disability (YLDs). Again, Dnipro represents the largest share of DALYs.

Figure 8: Baseline Scenario: Projected burden of disease in DALYs over the next 10 years and its structure in terms of YLLs and YLDs, 2022-2031 (thousands)
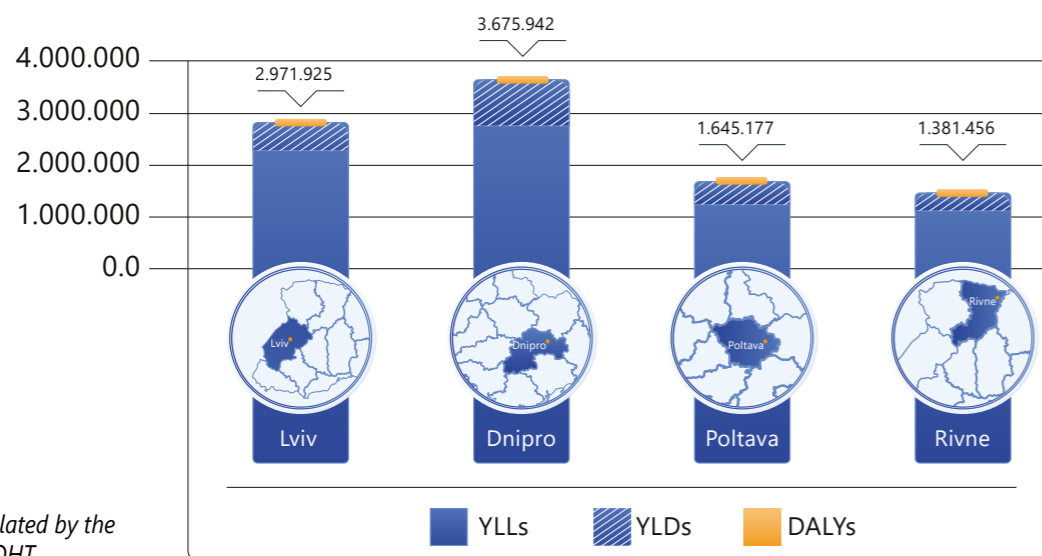
Source: Calculated by the authors from OHT.

PDALYs

CVDs and diabetes caused an estimated 207,000 PDALYs in the four regions in 2022, or 20% of the total number of DALYs. Over ten years, there are over 1.8 million PDALYs resulting from CVDs and diabetes in the four regions, with the most PDALYs occurring in Dnipro (see Annex F, Table A.30).

4.1.2 ECONOMIC BURDEN

The economic burden from CVDs and diabetes under the Baseline Scenario includes both direct and indirect costs.

4.1.3 DIRECT ECONOMIC COSTS (DECS)

The estimates of the DECs associated with the Baseline Scenario are shown in Table 7 and Table 8 in USD millions of 2022. In 2022, USD 178.5 million was estimated to have been spent on clinical interventions for CVDs and diabetes in the four regions, and costs are expected to increase over time. By the year 2031, they would amount to USD 240.7 million. Over the 10 years, clinical interventions would cost USD 1.7 billion. Policy interventions are estimated to have cost USD 8.3 million in 2022. They would increase slightly over the horizon, to reach the amount of USD 9.0 million in 2031. Over the 10 years, policy interventions would cost USD 73.7 (in real value of 2022). DECs are highest in Dnipro, again driven by its larger population, lower baseline intervention coverage levels as well as a higher baseline prevalence of CVDs and diabetes.

4.1.4 INDIRECT ECONOMIC COSTS (IECS)

Our estimates of the IECs for the Baseline Scenario are shown in Table 9. Considering only indirect costs realise during the 10 years (Method 1, top half of Table 9), IECs were estimated to be US$2.1 billion in 2022 and will total US$18.2 billion over ten years. With Method 2, the present value of IECs is larger, as expected, since the gains in productive economic years are extended beyond the 10-year projection horizon ($23.5 billion over 10 years). Again, IECs are highest in Dnipro.

Table 7: Baseline Scenario: Projected direct economic costs of clinical interventions for CVDs and diabetes, 2022-2031 (millions of USD of 2022)

Cause/Year	4-year Total	10-year Total	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Lviv	183.7	471.0	47.2	48.6	50.1	51.9	53.8	56.0	58.4	61.0	63.8	66.6
Dnipro	267.9	669.1	69.6	71.2	72.9	74.9	76.9	79.3	81.9	84.8	87.8	90.9
Poltava	148.5	370.9	38.6	39.5	40.4	41.5	42.6	43.9	45.4	47.0	48.7	50.4
Rivne	89.6	230.7	23.0	23.7	24.5	25.4	26.3	27.4	28.6	30.0	31.4	32.9
Total	689.7	1,741.8	178.5	182.9	187.9	193.7	199.7	206.7	214.3	222.7	231.6	240.7

Source: Calculated by the authors from OHT.

Table 8: Baseline Scenario: Projected direct economic costs of policy interventions for CVDs and diabetes, 2022-2031 (millions of USD of 2022)

Intervention	4-year NPV	10-year NPV	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Lviv												
Tobacco cessation	2.9	6.3	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Alcohol control	2.8	5.2	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Physical activity and healthy eating	0.9	1.6	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Fixed program costs	4.1	8.2	0.8	0.9	0.9	0.9	0.9	1.0	1.0	1.0	1.1	1.1
Total Lviv	**10.7**	**20.3**	**2.3**	**2.3**	**2.3**	**2.4**	**2.4**	**2.4**	**2.4**	**2.4**	**2.5**	**2.5**
Dnipro												
Tobacco cessation	3.6	6.6	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.7	0.7
Alcohol control	4.0	7.4	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.8	0.8	0.8
Physical activity and healthy eating	1.1	2.0	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Fixed program costs	4.1	8.2	0.8	0.9	0.9	0.9	0.9	1.0	1.0	1.0	1.1	1.1
Total Dnipro	**12.8**	**24.1**	**2.8**	**2.8**	**2.8**	**2.8**	**2.8**	**2.8**	**2.8**	**2.9**	**2.9**	**2.9**
Poltava												
Tobacco cessation	1.6	2.9	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Alcohol control	1.5	2.8	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Physical activity and healthy eating	0.5	1.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Fixed program costs	4.1	8.2	0.8	0.9	0.9	0.9	0.9	0.9	1.0	1.0	1.1	1.1
Total Poltava	**7.7**	**14.8**	**1.7**	**1.7**	**1.7**	**1.7**	**1.7**	**1.8**	**1.8**	**1.8**	**1.8**	**1.8**
Rivne												
Tobacco cessation	1.2	2.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Alcohol control	1.7	3.1	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Physical activity and healthy eating	0.5	0.9	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Fixed program costs	4.1	8.2	0.8	0.9	0.9	0.9	0.9	1.0	1.0	1.0	1.1	1.1
Total Rivne	**7.4**	**14.4**	**1.6**	**1.6**	**1.6**	**1.7**	**1.7**	**1.8**	**1.8**	**1.8**	**1.8**	**1.8**
Total all 4 regions												
Tobacco cessation	9.3	17.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.9	1.9
Alcohol control	10.1	18.5	2.2	2.2	2.2	2.2	2.2	2.2	2.1	2.1	2.1	2.1
Physical activity and healthy eating	3.0	5.5	0.7	0.7	0.7	0.7	0.7	0.6	0.6	0.6	0.6	0.6
Fixed program costs	16.3	32.6	3.4	3.5	3.6	3.7	3.8	3.9	4.0	4.1	4.3	4.4
Total all 4 regions	**38.7**	**73.7**	**8.3**	**8.4**	**8.5**	**8.5**	**8.6**	**8.7**	**8.8**	**8.8**	**8.9**	**9.0**

Source: Estimated by the authors using OHT.

Table 9: Baseline Scenario: Projected indirect economic costs from lost economic output by working age individuals afflicted from NCDs (millions of USD of 2022)

Cause/Year	4-year NPV	10-yar NPV	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Method 1: Value of PDALYs (work years to be realized during investment period only)												
Lviv	2,414	5,507	652	650	649	647	647	647	646	644	639	632
Dnipro	3,.026	6,948	813	815	815	813	813	815	817	818	816	810
Poltava	1,345	3,080	362	363	362	360	360	360	361	362	361	360
Rivne	1,174	2,679	313	323	314	314	314	314	314	313	311	308
Total	**7,959**	**18,214**	**2,141**	**2,151**	**2,139**	**2,134**	**2,134**	**2,136**	**2,138**	**2,136**	**2,128**	**2,109**

Cause/Year	4-year NPV	10-yar NPV	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Method 2: Value of PDALYs (work years to be realized during investment period or beyond)												
Lviv	2,854	7,243	734	756	780	804	833	862	894	930	967	1,004
Dnipro	3,477	8,783	9.2	9.4	957	984	1,014	1,047	1,083	1,122	1,163	1,204
Poltava	1,543	3,889	4.1	4.1	424	436	448	463	479	496	514	532
Rivne	1,383	3,559	356	358	382	396	410	426	444	461	480	500
Total	**9,258**	**23,474**	**2,393**	**2,419**	**2,543**	**2,620**	**2,705**	**2,799**	**2,900**	**3,009**	**3,124**	**3,240**

Source: Estimated by the authors using OHT.

4.2 INVESTMENT SCENARIO

In this section we present the incremental costs and consequences of the Investment Scenario with respect to the Baseline Scenario.

4.2.1 INCREMENTAL HEALTH BURDEN: MORTALITY, MORBIDITY, DALYS AND PDALYS

Scaling up clinical interventions will avert nearly 30,000 deaths and over 800,000 DALYs across the four project regions over the next 10 years (Table 10). Policy interventions are expected to have a similar impact on the BOD: although they will avert fewer deaths (27,000), they have a larger impact on total DALYs as compared to the clinical interventions (1.2 million DALYs averted across the four project regions over the next 10 years, Table 11). Overall, the BOD from CVDs and diabetes is reduced by 29% over the period 2022-2031 (Figure 9). The region expected to see the largest reduction in BOD in absolute terms is Dnipro.

Table 10: Investment Scenario: Estimated reduction in the BOD from clinical interventions, 2022-2031 (thousands)

Cause/Year	4-year Total	10-year Total	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
1. Death averted												
Lviv	2,666	9,557	0	270	584	817	995	1,150	1,277	1,390	1,492	1,582
Dnipro	3,174	10,906	0	340	707	969	1,158	1,314	1,443	1,557	1,663	1,755
Poltava	1,375	4,691	0	147	308	419	501	568	621	668	711	748
Rivne	1,181	4,215	0	119	259	362	441	505	563	612	656	698
Total	8,396	29,369	0	876	1,858	2,567	3,095	3,537	3,904	4,227	4,522	4,783
2. Years of Live Lost due to mortality (YLLs) averted												
Lviv	48,134	187,708	0	4,802	10,246	14,652	18,434	21,956	25,086	28,059	30,897	33,570
Dnipro	54,725	204,480	0	5,814	11,829	16,554	20,528	24,013	27,158	30,116	32,936	35,530
Poltava	23,569	87,599	0	2,514	5,127	7,097	8,829	10,329	11,628	12,875	14,061	15,138
Rivne	21,748	84,287	0	2,138	4,620	6,625	8,364	9,823	11,296	12,604	13,813	15,003
Total	148,177	564,068	0	15,271	31,822	44,929	56,155	66,121	75,167	83,654	91,708	99,241
3. Years Lived with Disability (YLDs) averted												
Lviv	16,133	77,914	0	1,545	3,151	4,838	6,599	8,428	10,326	12,292	14,321	16,414
Dnipro	20,459	96,847	0	1,987	4,026	6,135	8,311	10,554	12,855	15,222	17,644	20,113
Poltava	8,990	42,082	0	880	1,776	2,696	3,638	4,603	5,590	6,598	7,628	8,673
Rivne	7,130	34,251	0	686	1,398	2,138	2,908	3,711	4,539	5,399	6,281	7,191
Total	52,712	251,094	0	5,098	10,351	15,807	21,456	27,296	33,310	39,511	45,874	52,391
4. DALYs (YLLs + YLDs) averted												
Lviv	64,267	265,616	0	6,347	13,397	19,490	25,033	30,384	35,415	40,351	45,218	49,984
Dnipro	75,184	301,327	0	7,801	15,855	22,689	28,839	34,567	40,013	45,338	50,580	55,643
Poltava	32,559	129,681	0	3,395	6,903	9,793	12,467	14,932	17,218	19,473	21,689	23,811
Rivne	28,878	118,538	0	2,824	6,018	8,763	11,272	13,534	15,835	18,003	20,094	22,194
Total	200,889	815,162	0	20,369	42,173	60,736	77,611	93,417	108,477	123,165	137,582	151,632

Source: Estimated by the authors using OHT.

Table 11: Investment Scenario: Estimated reduction in the BOD from policy interventions (thousands)

Cause/Year	4-year Total	10-year Total	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
1. Death averted												
Lviv	3,504	7,815	0	881	879	874	870	867	863	861	860	860
Dnipro	5,057	11,063	0	1,270	1,273	1,266	1,248	1,232	1,215	1,198	1,185	1,176
Poltava	2,295	5,015	0	578	577	573	567	558	551	543	536	532
Rivne	1,433	3,178	0	359	360	358	358	351	349	348	348	347
Total	12,289	27,069	0	3,088	3,089	3,071	3,041	3,008	2,978	2,950	2,929	2,915
2. Years of Live Lost due to mortality (YLLs) averted												
Lviv	57,481	126,949	0	14,546	14,438	14,315	14,182	14,094	13,977	13,862	13,798	13,739
Dnipro	78,206	170,740	0	19,866	19,723	19,487	19,130	18,936	18,676	18,492	18,289	18,141
Poltava	35,232	76,802	0	8,972	8,857	8,746	8,658	8,486	8,409	8,309	8,228	8,139
Rivne	24,140	53,419	0	6,058	6,059	6,019	6,004	5,883	5,866	5,838	5,852	5,840
Total	195,059	427,910	0	49,441	49,077	48,567	47,973	47,399	46,927	46,501	48,166	45,858
3. Years Lived with Disability (YLDs) averted												
Lviv	104,901	232,272	0	28,606	26,349	26,089	25,857	25,868	25,538	25,454	25,392	25,319
Dnipro	133,414	293,368	0	33,862	33,527	33,181	32,844	32,531	32,242	31,972	31,720	31,489
Poltava	59,230	129,992	0	15,036	14,888	14,731	14,574	14,427	14,283	14,147	14,014	13,890
Rivne	46,905	105,691	0	11,750	11,733	11,716	11,706	11,708	11,725	11,751	11,787	11,821
Total	344,450	761,329	0	87,254	86,497	85,718	84,981	84,334	83,788	83,324	82,914	82,519

Cause/ Year	4-year Total	10-year Total	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
4. DALYs (YLLs + YLDs)												
Lviv	162,382	359,221	0	41,152	40,787	40,404	40,039	39,762	39,515	39,316	39,190	39,058
Dnipro	211,620	464,108	0	53,728	53,250	52,668	51,974	51,467	50,918	5,646	50,009	49,630
Poltava	94,462	206,794	0	24,008	23,745	23,478	23,232	22,913	22,692	22,456	22,243	22,028
Rivne	71,045	159,116	0	17,808	17,792	17,735	17,710	17,591	17,591	17,589	17,639	17,661
Total	**539,509**	**1,189,239**	**0**	**136,695**	**135,574**	**134,285**	**132,955**	**131,733**	**130,715**	**129,825**	**129,080**	**128,377**

Source: Estimated by the authors using OHT.

Figure 9: Ten-year change in the BOD from additional investment in NCD prevention an control interventions
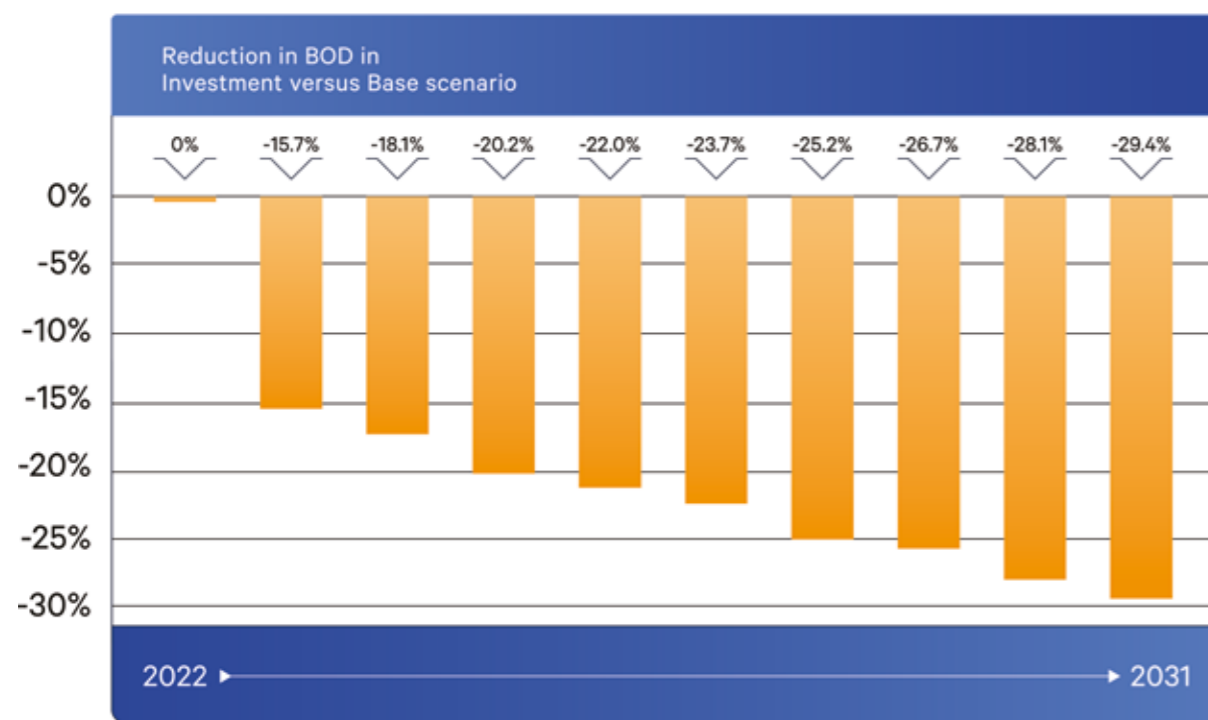
Source: Constructed by the authors using OHT results.

Nearly 700,000 PDALYs are averted over 10 years in the four project regions as a result of the scaled-up policy and clinical interventions. If we consider work years realise beyond the investment period as well, over 800,000 PDALYs are averted (see Annex, Table A.31).

4.2.2 ECONOMIC BURDEN

As in the baseline Scenario, in the Investment Scenario the economic burden from the selected NCDs comprises both direct and indirect costs. Their projected magnitude is presented next.

4.2.3 DIRECT ECONOMIC COSTS (DECS)

An additional USD 17.1 million is needed through 2026 and USD 35.2 million through 2031 to scale-up policy interventions targeting risk factors for CVDs and diabetes in the four project regions (Table 12). Half of this investment is for alcohol control interventions, a quarter for tobacco cessation and a quarter for diet and physical activity-related (25%) interventions including sodium-related interventions. Additional financial requirements to support scale-up of clinical interventions are more sizeable: an additional $116 million is needed through 2026 and $548 million through 2031 (Table 13). Over 42% of the required investment should occur in Dnipro.

Table 12: Investment Scenario: Projected incremental direct economic costs of policy interventions (millions of USD of 2022)

Interven-tion	4-year NPV	10-year NPV	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Lviv												
Tobacco cessation	1,3	2,7	0,0	0,4	0,4	0,4	0,4	0,3	0,3	0,3	0,3	0,3
Alcohol control	2,9	5,9	0,0	0,8	0,8	0,8	0,8	0,8	0,8	0,8	0,8	0,8
Diet and physical activity	0,4	0,9	0,0	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1
Sodium	0,9	1,9	0,0	0,3	0,3	0,2	0,2	0,2	0,2	0,2	0,2	0,2
Total Lviv	**5,5**	**11,3**	**0,0**	**1,5**	**1,5**	**1,5**	**1,5**	**1,5**	**1,5**	**1,5**	**1,5**	**1,4**
Dnipro												
Tobacco cessation	1,6	3,3	0,0	0,4	0,4	0,4	0,4	0,4	0,4	0,4	0,4	0,4
Alcohol control	3,2	6,5	0,0	0,9	0,9	0,9	0,9	0,9	0,9	0,8	0,8	0,8
Diet and physical activity	0,5	1,1	0,0	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1
Sodium	1,1	2,3	0,0	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3
Total Dinpro	**6,4**	**13,2**	**0,0**	**1,8**	**1,8**	**1,8**	**1,7**	**1,7**	**1,7**	**1,7**	**1,7**	**1,7**
Poltava												
Tobacco cessation	0,7	1,4	0,0	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2
Alcohol control	1,6	3,2	0,0	0,4	0,4	0,4	0,4	0,4	0,4	0,4	0,4	0,4
Diet and physical activity	0,2	0,4	0,0	0,1	0,1	0,1	0,1	0,1	0,0	0,0	0,0	0,0
Sodium	0,5	1,0	0,0	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1
Total Poltava	**2,9**	**6,0**	**0,0**	**0,8**	**0,8**	**0,8**	**0,8**	**0,8**	**0,8**	**0,8**	**0,8**	**0,8**

Intervention	4-year NPV	10-year NPV	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Rivne												
Tobacco cessation	0,7	1,4	0,0	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2
Alcohol control	1,0	2,1	0,0	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3
Diet and physical activity	0,2	0,3	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Sodium	0,4	0,9	0,0	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1
Total Rivne	**2,3**	**4,8**	**0,0**	**0,6**	**0,6**	**0,6**	**0,6**	**0,6**	**0,6**	**0,6**	**0,6**	**0,6**
Total all 4 regions												
Tobacco cessation	4,3	8,8	0,0	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2
Alcohol control	8,6	17,7	0,0	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3
Diet and physical activity	1,3	2,7	0,0	0,4	0,4	0,4	0,4	0,4	0,4	0,3	0,3	0,3
Sodium	2,9	6,0	0,0	0,8	0,8	0,8	0,8	0,8	0,8	0,8	0,8	0,8
Total all 4 regions	**17,1**	**35,2**	**0,0**	**4,8**	**4,8**	**4,7**	**4,7**	**4,6**	**4,6**	**4,6**	**4,5**	**4,5**

Source: Constructed by the authors using OHT.

Table 13: Investment Scenario: Projected incremental direct economic costs of clinical interventions (millions of USD of 2022)

Region	4-year NPV	10-year NPV	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Method 1 : Value of PDALYs (work years to be realized during investment period only)												
Lviv	37	174	0	3	8	13	18	23	29	35	41	48
Dnipro	50	235	0	5	11	17	24	31	39	47	55	64
Poltava	13	64	0	1	3	5	6	9	11	13	15	18
Rivne	15	74	0	1	3	5	7	10	12	15	18	21
Total	**116**	**548**	**0**	**10**	**25**	**40**	**56**	**72**	**90**	**109**	**130**	**151**

Source: Constructed by the authors using OHT.

4.2.4 INDIRECT ECONOMIC COSTS (IECS)

The modelled investments in NCD policy and clinical interventions are projected to result in a large drop in IECs. Over the next 10 years, policy and clinical interventions combined are projected to reduce the BOD relative to the Baseline Scenario, leading to a reduction in IECs of USD 6.9-8.2 billion (Table 14). Policy interventions result in more than double the IEC savings as compared to clinical interventions (see Annex H).

Table 14: Investment Scenario: Projected reductions in indirect economic costs in absolute amounts and relative to the baseline Scenario (USD million of 2022 and %)

NCD	4-year NPV	10-year NPV	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Method 1: Value of PDALYs (work years to be realized during investment period only)												
Baseline Scenario	7,959	18,214	2,141	2,151	2,139	2,134	2,134	2,136	2,138	2,136	2,128	2,109
Reduction in INV. Scenario	2,794	6,914	0	682	748	809	868	927	987	1,047	1,106	1,165
Reduction	**35,1%**	**38,0%**	**0,0%**	**31,7%**	**35,0%**	**37,9%**	**40,7%**	**43,4%**	**46,2%**	**49,0%**	**52,0%**	**55,2%**

NCD	4-year NPV	10-year NPV	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Method 2: Value of PDALYs (work years to be realized during investment period or beyond)												
Baseline Scenario	9,258	23,474	2,393	2,419	2,543	2,620	2,705	2,799	2,900	3,009	3,124	3,240
Reduction in INV. Scenario	3,131	8,219	0	742	829	913	999	1,090	1,186	1,288	1,397	1,511
Reduction	**33,8%**	**35,0%**	**0,0%**	**30,7%**	**32,5%**	**34,8%**	**36,9%**	**38,9%**	**40,9%**	**42,8%**	**44,7%**	**46,6%**

Source: Estimated by the authors using OHT.

4.3 RETURN ON INVESTMENT (ROI)

As has been shown, scaled-up policy and clinical interventions, at a cost of more than USD 583 million over ten years, are projected to reduce the BOD from CVDs and diabetes by 29%. These health gains have an associated economic return of USD 6.9 to USD 8.2 billion over ten years (Table 15). Thus, the investments turn out to be considerably smaller than the economic returns. In the first four years of the Investment Scenario, which corresponds to the Act4Health project duration, the return on investment (ROI) is estimated at 21.0, meaning that for every USD 1 invested in NCD prevention and control, there will be an economic return of USD 21. The ROI over 10 years equals 11.9 with Method 1 where health gains are restricted to the investment period only, and 14.1 with Method 2, where the health gains from interventions made during the next 10 years can be accounted for even if they are realise beyond that horizon.

Table 15: Net present value of investments and economic returns: return on investment (ROI) (USD million of 2022 and ratio)

Intervention/Period	4 Year	10 Year
DECs of policy interventions		
Tobacco cessation	4	9
Alcohol control	9	18
Physical activity and healthy eating	4	9
Total policy invervention costs	17	35
DECs of clinical interventions		
Clinical interventions	116	548
Total clinical interventions costs	116	548
Total DECs of policy and clinical invervention	133	583

NPV OF IECS (ECONOMIC RETURNS), USD MILLION

Cause/Period	4 Year	10 Year (a)	10 Year (b)
Clinical interventions	520	2,063	2,792
Policy interventions	2,275	4,841	5,428
Total policy invervention costs	2,794	6,914	8,219

Intervention/Period	4 -year	10-year (a)	10-year (b)
Total ROI	21.0	11.9	14.1

DECs – Direct economic costs
IECs – Indirect economic costs
CVDs – Cardiovascular diseases
ROI – Return on investment

(a) The impacts of health investments considered (both clinical and policy interventions) are those that are realized only during the 10-year horizon.
(b) The impacts of health investments considered (both clinical and policy interventions) are those that originate during the 10- year horizon even if they are realized partially beyond the 10-year horizon.

By region, the 10-year ROI ranges from 10.6 in Dnipro to 16.5 in Poltava using Method 1 (considering only impacts realise during the 10-year horizon), and 12.5 to 19.4 in the same regions using Method 2 (considering also impacts realise beyond the 10-year horizon) (see Annex, Table A.35 Return on investment results: Dnipro , Table A.36, Table A.37, Table A.38).

The policy interventions offer a better ROI than the clinical interventions: their costs are significantly less than clinical interventions, and the economic return is higher. Given baseline coverage of the different policy interventions, their incremental costs and what is known about the impact of the different packages from the global analysis, we expect the physical activity and healthy eating package to offer the highest ROI, followed by the alcohol and tobacco packages [104].

5

THEORIES OF CHANGE

5.   THEORIES OF CHANGE

The overarching theory of change (TOC) for this study (Figure 10) shows the pathways between:

► The health and economic burden from NCDs (on the left-hand side of the figure).

► The main risk factors and behaviours for NCDs.

► CVDs and diabetes.

► The policy and clinical interventions that can influence either the main risk factors and behaviours or the NCDs themselves. Clinical interventions impact both on the main risk factors and behaviours for NCDs as well as the NCDs themselves. Policy interventions have a direct impact on the main risk factors and behaviours for NCDs.

► How the policy and clinical interventions impact on the main risk factors and behaviours, the targeted NCDs and ultimately results in a health and economic impact (on the right-hand side of the figure).

The conceptual figure highlights that individual risk factors often contribute to multiple NCDs, such as the case with tobacco smoking contributing to both CVDs and cancers. Similarly, individual priority diseases have multiple contributing risk factors, such as alcohol consumption and sugar-sweetened beverages for diabetes. Likewise, policy and/or clinical interventions often impact on multiple risk factors and behaviours or priority diseases, as is the case of annual screening for metabolic risk factors being used to diagnose both diabetes and CVDs.

The overall project TOC also notes the incremental implementation costs of at least USD 583 million over ten years, and the importance of ongoing monitoring and evaluation.

Figure 10: Overall Act4Health Project Theory of Change

Problem

In 2022, cardiovascular disease **(CVD)** and diabetes are estimated to have caused over **58,000 deaths** and **200,000 years** lived with disability, totaling 1 million disability-adjusted live years (DALYs) in the four project regions of **Dnipro, Lviv, Poltava** and **Rivne**

Productivity losses from **CVDs** and diabetes currently total **US$ 2 billion/year** and will reach **US$ 18-23 billion** over ten years

Incremental implementation cost: at least $583M over 10 years

Act4Health activities

Clinical, policy and public interventions
Cost of implementation over 10 years (2022 US$M)

CVDs and diabetes clinical interventions US$ 548M

Tobacco control US$ 9M

Alcohol control US$ 18M

Promotion of physical activity & healthy eating US$ 9M

See package - specific theories of change for more details

Main risk factors and behaviors

Tobacco smoking

Alcohol consumption

Physical (in) activity and unhealthy diet including high sodium consumption

Additional activities part of government's NCD National Action Plan (NAP) to Achieve SDGs (2018)

Targeted NCDs

CVDs

Diabetes

Ten-year impact

Scaling up clinical, policy and public health interventions will avert over **40,000 strokes** and **57 cases of ischemic heart disease**. Over **56,000 deaths** would be averted.

Over a million healthy life years are gained as a result of reduced morbidity. Overall the burden of disease (BOD) from CVDs and diabetes is reduced by **29% over the period 2022 - 2031**

Economic gains total **US$ 6.9-8.2 billion**

Return on investment **is 11.9 - 14.1**

Source: Consructed by the authors.

Ongoing monitoring and evaluation

2022 | 2024   2024 | 2031

Legend

- Health burden
- Economic burden
- Planning and preparation
- CVDs and diabetes clinical intervention
- Policy intervention
- Risk factor or behavior
- Targeted NCDs (CVDs and diabetes)
- Costs and impacts modelled by OHT
- *Carried out by Act4Health Project
- **Part of National Action Plan (NAP)
- **A** Refers to indicators

- Legal
- Media
- Financial
- Community
- Healthcare (HC) delivery
- HCW training

Acronyms

BCC - Behavioral change communication
BOD - Burden of disease
CVD - Cardiovascular disease
DALYs - Disability-adjusted life years
HC - Health care
HCW - Health care worker
M - Millions (of US$)
NAP - Government of Ukraine's National Action Plan to Achieve the Sustainable Development Goals
NCD - Non-communicable disease
OHT - OneHealth Tool
SDGs - Sustainable Development Goals
TOC - Theory of change
US$ - United States dollar

The four package-specific theories of change (alcohol control, tobacco control, physical activity and healthy eating and clinical interventions) provide more specifics on the policy and clinical interventions that prevent and control CVDs and diabetes and the main risk factor behaviours (drawn from the investment case results), ultimately leading to health and economic gains. They also note the importance of a set of planning and preparation activities, which are similar across packages but necessary for the successful implementation of the noted interventions. Some of these planning and preparation activities may already have been completed or be underway in the four project regions:

- ▶ Develop NAP.
- ▶ Cost and finance NAP.
- ▶ Appoint key staff positions for NCD prevention and control, including a spokesperson.
- ▶ Form and regularly convene multi-sectoral working groups to develop and enact implementation plans for different aspects of the NAP.
- ▶ Find and work with political and social champions for NCDs.
- ▶ Arrange any necessary technical assistance.

Each package-specific TOC are accompanied by suggestive monitoring and evaluation indicators. These are structured to mirror the logic of the TOCs, and therefore are presented as process indicators (were the activities implemented?), output and outcome indicators (were the target audiences reached and did they change their behaviours?) and impact indicators (what were the health and economic impacts?). Some of these indicators come directly from the Act4Health logframe or the NAP, and should be reviewed and further expanded upon by the project. Data sources for each indicator should also be identified. The package-specific TOCs and monitoring indicators can be found in Annex K.

All TOCs should be read in the context of the following caveats, assumptions and risks:

- ▶ The analysis does not explicitly account for the impact of both COVID and the ongoing war. Most data gathered for the investment case is from both pre-conflict as well as pre-COVID years; both of these crises have had an impact on the baseline health status. There may also be changes in risk factor behaviours, for example higher use of tobacco or alcohol as a coping mechanism, or reduced physical activity due to safety concerns. We have assumed that planned Act4Health and NAP activities will be able to be implemented on an ongoing basis in the four project regions, though this may not be the case given the impact of the war on the health system and the economy. Our analysis was also unable to specifically model the potential impact of the ongoing crisis on future health and economic gains.

- ▶ OHT's smoking-related interventions are limited to tobacco, but the risks from e-cigarettes, and impact of smoking-related interventions on e-cigarette use, should also be noted.

- ▶ There are additional health outcomes and impacts which have not been considered. This analysis is limited to the CVD and diabetes-related health outcomes resulting from the policy and clinic interventions. However, clearly investments in tobacco and alcohol control interventions, promotion of healthy eating and physical activity and strengthened clinical interventions will generate health impacts beyond CVDs and diabetes; for example, the scale-up of all packages will have a positive impact on the incidence of various cancers, while tobacco control interventions may reduce the incidence of chronic respiratory disease.

- ▶ For simplicity, some implementation details are omitted from the TOCs. For example, activities may be implemented using different delivery strategies which are not reflected in the TOCs (e.g., mobile health teams and home-based care). Particular clinical practices such as the use of WHO's 5 As (Assess, Advise, Agree, Assist, Arrange) are not noted. Screening practices should follow local guidelines and international best practices which may recommend screening only high-risk populations above a certain age, pregnant women, etc. For cost savings and better health outcomes, clinical interventions should be delivered at the lowest possible level of the health system, for example in the community or at primary care centers. NCD experts and/or local and international resources such as https://www.stop-tabac.ch and https://www.stop-alcool.ch/fr/ may be able to provide additional useful implementation guidance around the included interventions.

- ▶ There may be monitoring and evaluation challenges as a result of the ongoing war. Such challenges include reliability of baseline data, worsening of some indicators despite ongoing interventions, difficulties in measuring indicators in the presence of conflict, etc.

6

DISCUSSION AND RECOMMENDATIONS

6. DISCUSSION AND RECOMMENDATIONS

6.1 SUMMARY OF FINDINGS

This investment case aimed to quantify the current health and economic impacts from CVDs and diabetes in four regions (Dnipro, Lviv, Poltava and Rivne) in Ukraine, and the possible impact of NCD prevention and control interventions to be implemented in these same regions. The research has documented a considerable burden from CVDs and diabetes in the four regions:

▶ CVDs and diabetes killed an estimated 59,000 persons in these four regions in 2022, meaning that 40% of all deaths in these regions are attributable to CVDs and diabetes [105].

▶ Patients dying prematurely from CVDs and diabetes lose, on average, 14.6 years of life.

▶ Further, 200,000 years of life were lived with disability in 2022.

▶ A total of one million DALYs were attributable to CVDs and diabetes in 2022.

▶ This health burden is accompanied by a considerable economic burden: treatment costs for CVDs and diabetes were estimated to be USD 178.5 million in 2022, and economic losses from persons with NCDs who are unable to work, or work at less than full capacity were estimated to be USD 2.1 billion in 2022, equivalent to approximately 6% of GDP in the four studied regions (USD 36.9 billion) and 1% of Ukraine's total GDP of USD 200.1 billion in 2021 [23].

▶ Without further action, an estimated 524,000 people would die from these NCDs over the next ten years, resulting in nearly ten million DALYs, USD 1.7 billion in DECs and USD 18-24 billion in economic losses.

Together, Act4Health project and NAP activities can reduce the BOD from CVDs and diabetes by 20% by the end of 2024, and by nearly 30% by 2031, exceeding the project's goal of 5% by 2024 [106]. An additional investment of USD 583 will be required through 2031, but this investment will generate economic returns of USD 6.9 to USD 8.2 billion over that same time period. This represents an estimated 1.5-1.7% of the GDP in the four project regions over the ten-year time period. The investment would economically pay for itself and leave a sizeable additional monetary return: every USD 1 invested will generate returns of USD 11.9 to USD 14.1 by 2031. During the lifetime of the Act4Health project, returns are anticipated to be even higher (USD 21 for every USD 1 invested), due to the assumed upfront impact from policy interventions. On a macro level, results are similar across regions, despite different starting demographic and epidemiological profiles, health and policy intervention coverage and risk factor prevalence. ROI ranges from 10.6 in Dnipro to 16.5 in Poltava using Method 1 (considering only impacts realise during the 10-year horizon), and 12.5 in 19.4 in the same regions using Method 2 (considering also impacts realise beyond the 10-year horizon).

A high-level TOC and package-specific TOCs included in this report provide narrative and graphical descriptions to explain how and why the policy and clinical interventions can save lives, improve the quality of lives of persons living with CVDs and diabetes and generate the above-mentioned economic returns.

6.2 COMPARING FINDINGS WITH OTHER COUNTRIES

The estimated ROI of 11.9 to 14.1 found in this study beats the global modelling estimate, an analysis which also used OHT and found a ROI of $7 for every $1 invested [16]. Findings are similar to the ROI of NCD prevention and control interventions from other middle-income countries: Armenia, Kazakhstan and Turkey used a 15-year time horizon and predicted a ROI of 1.1 (Armenia), 5.7 (Kazakhstan) and 15.3 (Turkey) [42], [50], [57]. Findings are also in line with a global benefit-cost analysis, which used different methods and included a larger range of interventions (including mental health and cancer-related interventions), and found a ROI of 4.1-23 in low- and lower-middle income countries [107].

6.3 RECOMMENDATIONS

It is hoped that well-timed, locally relevant evidence can spur governments into increasing affordable access to clinical interventions for NCDs and introducing transformative policy measures. However, government and partners such as Act4Health must be successful in also convincing the population to change their behaviours. Keeping in mind the ongoing war, the key recommendations stemming from this report are presented below. Note that recommendations apply to all regions, given the similarity in results across regions.

6.3.1 PRIORITISE ACTIVITIES FOCUSED ON PROMOTING PHYSICAL ACTIVITY AND HEALTHY EATING AS PART OF THE LIFE COURSE APPROACH, WHILE KEEPING IN MIND IMPLEMENTATION FEASIBILITY

Through this work, we sought to provide insight into the most cost-effective policy and clinical interventions to help the Act4Health project Prioritise their activities. The results support prioritising both Act4Health and NAP activities that promote physical activity and healthy eating[8], given that:

▶ Policy interventions offer a better ROI than clinical interventions: OHT predicts their costs to be significantly less than clinical interventions, and their economic return to be higher.

▶ Amongst the policy intervention package, those interventions targeting physical inactivity and unhealthy diets (including sodium consumption) likely offer the highest ROI, given baseline coverage of the different policy interventions, their incremental costs and what is known about the impact of the different packages from the global analysis. Subsequently, the alcohol control package likely offers better ROI than the tobacco control package. For maximum impact, Act4Health project activities can be aligned according to this prioritization.

When prioritising activities, the project must remember that not all activities may be feasible to implement in the short- or medium-term given the ongoing war in Ukraine. A longer time frame may be necessary for some interventions, such as engaging with the food industry on reformulation [108]. The project should carefully consider the feasibility and ease of implementation of each activity and Prioritise activities accordingly. On the other hand, the post-war recovery presents a timely opportunity to feature activities focused on improving the built environment, such as promoting physical activity in schools by providing appropriate spaces. Making arrangements now to include these activities as part of official post-war recovery plans is crucial [109].

6.3.2 SECURE FINANCING FOR PRIORITY NAP ACTIVITIES

Although the incremental costs required to implement scaled-up policy and clinical interventions are considerable, at USD 583 million over ten years, annually they represent less than 0.5% of Ukraine's current health spending of USD 11.8-15.2 billion per year, nearly half of which is paid by government[9]. On a per capita basis, the investment is equivalent to roughly USD 7.20 per person per year[10].

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8. The modelled interventions are those included in OHT. There are additional Act4Health and NAP activities that are not included in OHT, and therefore their costs and impacts could not be modelled as part of this analysis. This does not mean they should be deprioritized, but simply that the costs (and impacts) from these interventions are excluded. The cost estimates presented in this investment case should therefore be considered as minimum estimates.

9. Assumes the investment case incremental costs are spread evenly over the ten year time period (USD 58.3 million/year). USD 11.8 billion is current (2021) health expenditure per capita of USD 269.73 multiplied by the population (2021) of 43,792,855. USD 15.2 billion is current health expenditure as percentage of GDP (7.6%, 2021) multiplied by Ukraine's GDP (2021) of USD 200.1 billion. All data comes from World Bank [23], [72].

10. Assumes the investment case incremental costs are spread evenly over the ten year time period (USD 58.3 million/year) and a population of the four regions of 8,068,685 persons.

NCD prevention and control efforts should be spearheaded by a lead organization with dedicated financing to carry out implementation of priority activities. There are a number of possible sources of financing for these efforts, including:

- ▶ MOH budget. Given the considerable burden of disease from NCDs, there is a strong argument for the MOH to dedicate additional budget to these activities.
- ▶ Other ministries. Presenting the investments as catalysts to larger economic growth, and not simply as public health measures, can help draw interest from the other ministries, such as the Ministry of Finance. Another strategy is to seek financial support from other related sectors, such as education.

- ▶ External partners. Historically, the United Kingdom and United States have been the leading bilateral funders of NCD prevention and control efforts, as well as the World Bank, the most relevant international organization and the Bill and Melinda Gates Foundation, the most important private donor. Other donors that have funded NCDs include Bloomberg Foundation, GE Foundation, MasterCard Foundation, Unilever Foundation, and Atlantic Philanthropies. In recent years, social impact bonds have also been increasingly used to support NCD programs. External funding can also be used to mobilise private sector investment, a strategy known as blending financing. Framing NCDs as barriers to economic growth, poverty reduction, and health system sustainability can help attract external financing [110]–[113].

- ▶ In the longer term, increased revenue generated from taxes on tobacco, alcohol, and sugar-sweetened beverages can provide financing for NCD prevention and control activities.

6.3.3 REDUCE CLINICAL INTERVENTION COSTS

Over 90% of the cost of scaling up NCD prevention and control efforts is for clinical interventions. These costs are particularly high in Dnipro. In addition to raising additional revenue to support NCD prevention and control activities, another possibility is to reduce costs of implementing these activities. For example, the unit costs of drugs/supplies in Ukraine appear to be higher than international market prices [114]. Given the increase in medicine prescribing in Ukraine and the documented unaffordability of medicines [115], [116], efforts to improve the performance of the pharmaceutical market (making it more efficient and competitive, thereby lowering prices) and improve rational use may have a significant impact on clinical intervention costs. Utilising cost-savings measures such as community-based delivery of NCD treatment interventions (including home-based care and the social care system) may also be cost-saving as compared to facility-based delivery by skilled personnel [117]–[119]. Finally, focusing on cost-saving counselling at primary care level may also help avert costly hospital-based care in the future.

6.3.4 STRENGTHEN NCD DATA, SURVEILLANCE AND MONITORING AND EVALUATION SYSTEMS

Strong data systems are needed to identify early both people at high risk and those already with an NCD, be able to better assess which risk factor behaviours need addressing through public health measures and monitor progress of newly implemented or scaled-up public health measures.

6.3.5 DRAW ON LESSONS LEARNED FROM OTHER COUNTRIES

The Act4Health project can draw on a number of country experiences where real progress has been made on NCD prevention and control:

- ▶ Mexico and several other Latin American countries have made significant progress on promoting healthy diets [120], [121], with the government credited for taking a bold stance against the food industry, backed by a large inter-sectoral and multidisciplinary network of academia, civil society, and various international organizations. Positioning the reforms as a matter of public finance, but with an impact on public health, instead of purely as a health issue, was important, as was citing the research behind the claims and positive examples from other countries. In addition to implementing taxes on sugar-sweetened beverages to change consumers' purchasing habits, they also used advertising regulations, a good spokesperson and the media to influence public behaviour [121], [122].

- ▶ Strong collaboration and political support were cited as enablers to making progress on salt-reduction policies in Argentina, Mongolia and South Africa [123]–[125]. In Kenya, involving persons with NCDs in strategic planning in a meaningful way was found to be helpful [126]. Training and support for food industry innovation were highlighted as key facilitators in Argentina and Mongolia [123]–[125]. In Samoa, cost and availability of "healthy" food products were found to be important determinants of their uptake [108].

- ▶ Although it is sometimes thought that it may be difficult to implement salt reduction-related interventions because of their negative impact on the taste of food, in experiments in Peru and Tunisia, a 20-35% reduction in salt added to bread at bakeries was possible without affecting taste or sales [127]–[129].

- ▶ In Mongolia, the quality of clinical interventions targeting NCDs was improved by strengthening the capacity of healthcare workers to provide necessary care, widely disseminating NCD technical packages, and improving information technology systems to allow for better consistency in, and automating of, patient follow-up [130].

- ▶ Barbados revised their NCD treatment protocols to focus more on patient counselling, and introduced electronic medical registers to improve follow-up and improving patient access to medicines [131].

- ▶ Israel is using social impact bonds to prevent type 2 diabetes in 2,250 high-risk, pre-diabetic patients: over a two-year program, participants are being motivated to improve their lifestyle, receiving guidance in nutrition and exercise, constant mentorship and oversight from a case manager with the help of various technologies including wearable fitness devices and mobile applications. Only if the interventions are successful in preventing the onset of diabetes, local public health and insurance organizations will repay the investors using the resulting savings in healthcare costs [132].

6.4   LIMITATIONS

This study has several limitations. The most important is that we used mostly pre-COVID and pre-conflict data, along with parameters obtained from the international empirical literature about the impact of different interventions built-in to the OHT, to model the consequences of clinical and policy interventions on health status. These parameters may not necessarily reflect the current situation in Ukraine, where substance use has increased in some regions as a coping mechanism for the ongoing war, access to health services is limited, leading to a higher prevalence of undiagnosed, untreated or uncontrolled NCDs, inflation is on the rise[11], economic growth is slowed or in decline[12] and other circumstances. Likewise, the anticipated benefits from scaling up policy and clinical interventions may not be fully realise given the challenges introduced by the ongoing war. Many interventions require the population to change ingrained behaviours, something that may be particularly challenging in the current context where access to health services, availability of healthy food, and the possibility of increased physical activity may be limited in some regions. The modelled costs of implementing the interventions assumes the presence of infrastructure and health workers, though there may be additional costs related to rebuilding and retraining in some regions which are unaccounted for in our analysis.

There are other limitations related to our study methods. First, the cost of policy interventions may be underestimated, as our methods were based on costs from other countries in the absence of local data. Evidence from other countries showed that the implementation costs of some NCD interventions were higher than anticipated [108]. We have also assumed that fixed costs of the NCD program (such as staffing) do not change as intervention coverage levels increase, which may not be possible depending on the capacity of the program.

11. The Ukraine National Bank and Ministry of the Economy estimate local currency inflation to be 20.3-24%, whereas our estimates are based on the 2018-2020 average rate of We assumed an annual inflation rate of 7.19%. See https://bank.gov.ua/admin_uploads/article/IR_2023-Q1.pdf?v=4 page 46 and https://ces.org.ua/event-macroforecast-2023-economic-growth/ from 35:40 listen.

12. Economic growth impacts on GDP per employed person. Our analysis has assumed an annual growth in GDP per employed person of 3%/year in years 2-10, though current estimates indicate the economy is currently contracted or growing at no more than 1% this year. See https://bank.gov.ua/ua/news/all/prosto-pro-ekonomiku-na-osnovi-materialiv-inflyatsiynogo-zvitu-za-sichen-2023-roku, https://bank.gov.ua/admin_uploads/article/IR_2023-Q1.pdf?v=4 page 46, https://fakty.com.ua/ua/ukraine/ekonomika/2030306-minekonomiky-pogirshylo-prognoz-zrostannya-vvp-ukrayiny-u-czomu-rozci-do-1/ and https://dragon-capital.com/ua/media/press-releases/dragon-sapital-polipshiv-prognoz-vvp-u-2023-rotsi-na-45-vp-do- -05-rr/.

Second, we assumed that the policy interventions will continue to have a constant effect on health behaviours per dollar spent in each of the 10 years of the projection, though evidence from other countries, such as Chile, suggests that certain policy interventions (like food labeling) may have decreasing marginal returns [133].

Third, OHT assumes the costs of scaling-up clinical interventions are linear and independent of coverage levels, as they are calculated as the unit cost per service multiplied by the number of services delivered. This may defy some empirical evidence of increasing marginal costs from other health services [134]. Related to this, there is evidence that policy interventions may have a substantial initial impact but that it may wane over time, meaning additional costs would need to be invested to sustain the impact [133].

Fourth, OHT assumes clinical interventions are delivered in facility-based settings, whereas innovative delivery mechanisms such as telephone consultations, pre-recorded telephone messages, group consultations, and others are increasingly in use in Ukraine. These alternative delivery mechanisms may be cost-saving over facility-based delivery, but may also have a different level of effectiveness.

Fifth, we adopted a method to monetise health gains using productivity DALYs (PDALYs) that differs from the method used in several other investment cases. A limitation of the PDALY method may be the homogeneity assumed in income generated by the average employed worker.

Finally, OHT doesn't use a general equilibrium model that accounts for all links and phenomena that would result from policy changes. For example, there may be negative externalities outside of the health sector from some of the modelled interventions, such as higher taxes on alcohol resulting in lower employment in the alcohol industry due to less alcohol being consumed. We expect these types of knock-off effects to be minimal for the interventions we have included and the time horizon of the study.

6.5   CONCLUSIONS

In closing, this investment case has generated strong evidence which unambiguously supports scaling up NCD prevention and control efforts, as these will lead to improved health status of the population and economic gains for the country. While the present conflict introduces many challenges for NCD prevention and control in Ukraine, the Act4Health project should carefully consider the feasibility of high ROI interventions such as those related to physical inactivity and unhealthy eating, and roll them out with the utmost urgency as the present situation allows. Post-war recovery presents an ideal moment to secure financing for, and subsequently introduce, additional NCD prevention and control measures, using the overwhelmingly positive ROI documented in this report as supporting evidence.

In the final months of the Act4Health project, we advise updating the investment case with the latest available data, to assess how much progress was made towards the health and economic impacts the investment case predicted, and to advise government on re-aligning NAP activities as necessary for the coming years.

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8

ANNEXES

8. ANNEXES

ANNEX A : WHO BEST BUY INTERVENTIONS

Originally known as the Global Action Plan for the Prevention and Control of Noncommunicable Diseases 2013–2020, WHO's list of "Best Buy" interventions were updated in 2017 [135], [136]. The recommended interventions are separated into three groups: (1) the "best buy" interventions, meaning those likely to be most cost-effective, based on a cost per DALY averted of <I$100 (international dollars); (2) those likely to be cost-effective, based on a cost per DALY averted of >I$100; and (3) other recommended interventions without cost-effectiveness evidence.

Table A.16: WHO's recommended policy interventions to combat NCD risk factors

Disease or risk factor	Best buy	Likely cost-effective interventions	Other recommended interventions
CVDs and diabetes	▶ Drug therapy (including glycemic 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 persons with high risk (≥ 30%) of a fatal and non-fatal cardiovascular event in the next 10 years ▶ Drug therapy (including glycemic 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 persons with moderate to high risk (≥ 20%) of a fatal and non-fatal cardiovascular event in the next 10 years	▶ Treatment of new cases of acute myocardial infarction** with either: acetylsalicylic acid, or acetylsalicylic acid and clopidogrel, or thrombolysis, or primary percutaneous coronary interventions (PCI) ▶ Treatment new cases of acute myocardial infarction with aspirin, initially treated in a hospital setting with follow up carried out through primary health care facilities at a 95% coverage rate ▶ Treatment of new cases of acute myocardial infarction with aspirin and thrombolysis, initially treated in a hospital setting with follow up carried out through primary health care facilities at a 95% coverage rate ▶ Treatment of new cases of myocardial infarction with primary percutaneous coronary interventions (PCI), aspirin and clopidogrel, initially treated in a hospital setting with follow up carried out through primary health care facilities at a 95% coverage rate	▶ Treatment of congestive cardiac failure with angiotensin-converting-enzyme inhibitor, beta-blocker and diuretic ▶ Cardiac rehabilitation post myocardial infarction ▶ Anticoagulation for medium-and high-risk non-valvular atrial fibrillation and for mitral stenosis with atrial fibrillation ▶ Low-dose acetylsalicylic acid for ischemic stroke ▶ Care of acute stroke and rehabilitation in stroke units ▶ Lifestyle interventions for preventing type 2 diabetes ▶ Influenza vaccination for patients with diabetes ▶ Preconception care among women of reproductive age who have diabetes including patient education and intensive glucose management ▶ Screening of people with diabetes for proteinuria and treatment with angiotensin-converting enzyme inhibitor for the prevention and delay of renal disease

Disease or risk factor	Best buy	Likely cost-effective interventions	Other recommended interventions
CVDs and diabetes		▶ Treatment of acute ischemic stroke with intravenous thrombolytic therapy ▶ Primary prevention of rheumatic fever and rheumatic heart diseases by increasing appropriate treatment of streptococcal pharyngitis at the primary care level ▶ Secondary prevention of rheumatic fever and rheumatic heart disease by developing a register of patients who receive regular prophylactic penicillin ▶ Preventive foot care for people with diabetes (including educational programmes, access to appropriate footwear, multidisciplinary clinics) ▶ Diabetic retinopathy screening for all diabetes patients and laser photocoagulation for prevention of blindness ▶ Effective glycemic control for people with diabetes, along with standard home glucose monitoring for people treated with insulin to reduce diabetes complications	

Disease or risk factor	Best buy	Likely cost-effective interventions	Other recommended interventions
Tobacco	▶ Increase excise taxes and prices on tobacco products ▶ Implement plain/standardized packaging and/or large graphic health warnings on all tobacco packages ▶ Enact and enforce comprehensive bans on tobacco advertising, promotion and sponsorship ▶ Eliminate exposure to second-hand tobacco smoke in all indoor workplaces, public places, public transport ▶ Implement effective mass media campaigns that educate the public about the harms of smoking/tobacco use and secondhand smoke	▶ TProvide cost-covered, effective, and population-wide support (including brief advice, national toll-free quit line services) for tobacco cessation to all those who want to quit	▶ Implement measures to minimize illicit trade in tobacco products ▶ Ban cross-border advertising, including using modern means of communication ▶ Provide cessation for tobacco cessation to all those who want to quit
Alcohol	▶ Increase excise taxes on alcoholic beverages ▶ Enact and enforce bans or comprehensive restrictions on exposure to alcohol advertising (across multiple types of media) ▶ Enact and enforce restrictions on the physical availability of retailed alcohol (via reduced hours of sale)	▶ Enact and enforce drink-driving laws and blood alcohol concentration limits via sobrietycheckpoints ▶ Provide brief psychosocial intervention for persons with hazardous and harmful alcoholuse	▶ Carry out regular reviews of prices in relation to level of inflation and income ▶ Establish minimum prices for alcohol where applicable ▶ Enact and enforce an appropriate minimum age for purchase or consumption of alcoholic beverages and reduce density of retail outlets ▶ Restrict or ban promotions of alcoholic beverages in connection with sponsorships and activities targeting young people

Disease or risk factor	Best buy	Likely cost-effective interventions	Other recommended interventions
Alcohol			▶ Provide prevention, treatment, and care for alcohol use disorders and comorbid conditions in health and social services ▶ Provide consumer information about, and label, alcoholic beverages to indicate, the harm related to alcohol
Unhealthy diet	▶ Reduce salt intake through the reformulation of food products to contain less salt and the setting of target levels for the amount of salt in foods and meals ▶ Reduce salt intake through the establishment of a supportive environment in public institutions such as hospitals, schools, workplaces and nursing homes, to enable lower sodium options to be provided ▶ Reduce salt intake through a behavior change communication and mass media campaign ▶ Reduce salt intake through the implementation of front-of-pack labelling	▶ Eliminate industrial trans-fats through the development of legislation to ban their use in the food chain ▶ Reduce sugar consumption through effective taxation on sugar-sweetened beverages	▶ Promote and support exclusive breastfeeding for the first 6 months of life, including promotion of breastfeeding ▶ Implement subsidies to increase the intake of fruits and vegetables ▶ Replace trans-fats and saturated fats with unsaturated fats through reformulation, labelling, fiscal policies, or agricultural policies ▶ Limiting portion and package size to reduce energy intake and the risk of overweight/obesity ▶ Implement nutrition education and counselling in different settings (for example, in preschools, schools, workplaces and hospitals) to increase the intake of fruits and vegetables ▶ Implement nutrition labelling to reduce total energy intake (kcal), sugars, sodium and fats

Disease or risk factor	Best buy	Likely cost-effective interventions	Other recommended interventions
Unhealthy diet			▶ Implement mass media campaign on healthy diets, including social marketing to reduce the intake of total fat, saturated fats, sugars and salt, and promote the intake of fruits and vegetables
Physical inactivity	▶ Implement community wide public education and awareness campaign for physical activity which includes a mass media campaign combined with other community-based education, motivational and environmental programs aimed at supporting behavioral change of physical activity levels	▶ Provide physical activity counselling and referral as part of routine primary health care services through the use of a brief intervention	▶ Ensure 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 ▶ Implement whole-of-school program that includes quality physical education, availability of adequate facilities and programs to support physical activity for all children ▶ Provide convenient and safe access to quality public open space and adequate infrastructure to support walking and cycling ▶ Implement multi-component workplace physical activity programs ▶ Promotion of physical activity through organized sport groups and clubs, programs and events

Source: WHO. 'Best buys' and other recommended interventions for the prevention and control of noncommunicable diseases. 2017. https://apps.who.int/iris/bitstream/handle/10665/259232/WHO-NMH-NVI-17.9-eng.pdf

See also a more recent update: https://www.who.int/teams/noncommunicable-diseases/updating-appendix-3-of-the-who-global-ncd-action-plan-2013-2030/

ANNEX B : OHT BUILT-IN DATA: EFFECT SIZES OF POLICY AND CLINICAL INTERVENTIONS AND DISABILITY WEIGHTS

Table A.17: Sample of effect sizes of policy measures that reduce demand for tobacco and alcohol

Policy measures	Effect size*
Implement and enforce bans on smoking in all public places	4%
Implement and enforce bans on tobacco advertising, promotion, and sponsorship (tobacco)	10%
Implement plain/standardized packaging of tobacco products	0,55%
Institute mass media campaigns	3,8%
Implement and enforce restrictions on alcohol advertising, promotion, and sponsorship (alcohol)	1,2%
Implement and enforce restrictions on the physical availability of alcoholic beverages	2,1%
Increase taxes**	–

Source: Hutchinson B, Small R, Acquah K, Sandoval R, Nugent R, Davidson T, et al. (2019). The investment case as a mechanism for addressing the NCD burden: Evaluating the NCD institutional context in Jamaica, and the return on investment of select interventions. PLoS ONE 14 (10): e0223412. https://doi.org/10.1371/journal.pone.0223412

Notes: For original sources of effect sizes from the literature, see Hutchinson et al, supplemental annex 1.

* Effect size is the absolute reduction in tobacco use prevalence, or hazardous use of alcohol. The absolute reductions represent the impact from having no policy in place to having policy in place that reflects international standards and that is well enforced.

** The impact of the tobacco and alcohol tax increases should be mediated by the size of the increase in price generated by the tax increases (based on baseline and target coverages), elasticity of consumption (for Ukraine: -0.47 for cigarettes, -0.50 for alcohol), and other factors such as unrecorded use of alcohol.

Table A.18: Sample of effect sizes of clinical interventions that address CVD and diabetes

Intervention	Effect size*
Treatment for individuals with high CVD risk (≥ 20%)	1.05 mmol/L reduction in cholesterol 5.9mmHg reduction in systolic blood pressure
Treatment for individuals with high blood pressure (≥ 140 mmHg), but low absolute CVD risk (< 20%)	5.9mmHg reduction in systolic blood pressure
Treatment for individuals with high cholesterol (≥ 6.0 mmol/L), but low absolute CVD risk (< 20%)	1.05 mmol/L reduction in cholesterol
Treat new cases of acute myocardial infarction with aspirin	15% reduction in CVD mortality
Provide multidrug therapy to treat those with established ischemic heart disease and stroke	1.05 mmol/L reduction in cholesterol 5.9mmHg reduction in systolic blood pressure

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Intervention	Effect size*
Standard glycemic control	75% reduction in the incidence of retinopathy
Intensive glycemic control	65% reduction in the incidence of retinopathy
Treatment for individuals with sight-threatening retinopathy (laser photocoagulation therapy)	80% reduction in blindness due to retinopathy
Treatment for individuals with neuropathy (protective footwear)	50% reduction in lower-limb amputation due to severe neuropathy

Source: Hutchinson B, Small R, Acquah K, Sandoval R, Nugent R, Davidson T, et al. (2019). The investment case as a mechanism for addressing the NCD burden: Evaluating the NCD institutional context in Jamaica, and the return on investment of select interventions. PLoS ONE 14 (10): e0223412. https://doi.org/10.1371/journal.pone.0223412

Note: for original sources of effect sizes from the literature, see Hutchinson et al, supplemental Annex 1.

Table A.19: Disability weights

OHT health state	Disability weight
IHD Acute	0.8
Stroke Acute	0.8
IHD Post Acute	0.6
Stroke Post Acute	0.6
Stroke IHD Post Acute	0.7
Diabetes	0.031
Diabetic Retinopathy	0.338
Lower Extremity Amputation	0.164

ANNEX C: DEMOGRAPHIC DATA

Table A.20: Population data by gender and age group, Dnipro

Age group	Total	Male	Female
2022			
0-4	164,575	84,014	80,560
5-9	159,543	81,946	77,597
10-14	137,875	70,745	67,130
15-19	127,872	64,498	63,374
20-24	240,721	114,561	126,159
25-29	318,184	155,921	162,263
30-34	307,495	153,768	153,727
35-39	250,041	125,176	124,864
40-44	203,579	99,207	104,372
45-49	190,330	89,944	100,387
50-54	170,718	76,896	93,821
55-59	202,572	87,243	115,329
60-64	178,154	72,561	105,593
65-69	150,722	56,106	94,617
70-74	89,040	30,012	59,027
75-79	78,970	22,786	56,183
80+	114,374	33,987	80,387
Total	**3,084,765**	**1,419,372**	**1,665,393**

2023			
0-4	155,774	79,647	76,127
5-9	160,693	82,339	78,355
10-14	143,129	73,564	69,565
15-19	124,705	63,212	61,493
20-24	205,454	98,810	106,644
25-29	319,103	154,508	164,594
30-34	307,253	153,250	154,003
35-39	264,968	132,585	132,382
40-44	209,605	102,604	107,001

Age group	Total	Male	Female
2023			
45-49	191,267	90,457	100,810
50-54	170,070	77,011	93,059
55-59	191,692	82,439	109,253
60-64	183,739	74,969	108,769
65-69	151,685	56,118	95,566
70-74	96,040	32,154	63,887
75-79	66,654	18,791	47,863
80+	105,639	30,909	74,730
Total	3,047,468	1,403,367	1,644,101

Age group	Total	Male	Female
2024			
0-4	147,115	75,354	71,761
5-9	160,687	82,164	78,524
10-14	146,780	75,479	71,301
15-19	125,200	63,755	61,444
20-24	176,160	85,950	90,210
30-34	309,629	153,896	155,734
35-39	280,338	139,976	140,361
40-44	214,522	105,523	108,998
45-49	193,395	91,635	101,760
50-54	173,716	79,095	94,622
55-59	177,253	76,181	101,072
60-64	189,858	77,285	112,574
65-69	148,568	54,756	93,812
70-74	104,845	35,263	69,581
75-79	56,585	15,967	40,618
80+	99,204	28,106	71,097
Total	3,012,438	1,388,184	1,624,254

Age group	Total	Male	Female
2025			
0-4	138,671	71,163	67,508
5-9	158,683	80,941	77,742
10-14	151,752	78,096	73,656
15-19	128,379	65,516	62,863
20-24	149,866	74,229	75,638
25-29	295,634	140,629	155,005
30-34	311,852	154,194	157,658
35-39	290,538	144,808	145,730
40-44	220,988	109,092	111,896
45-49	195,294	92,876	102,418
50-54	179,205	82,016	97,189
55-59	166,383	71,299	95,084
60-64	189,442	76,958	112,485
65-69	148,476	54,662	93,814
70-74	111,930	37,568	74,362
75-79	57,200	16,066	41,134
80+	84,676	23,513	61,163
Total	2,978,970	1,373,626	1,605,343

Age group	Total	Male	Female
2026			
0-4	128,834	66,251	62,583
5-9	155,610	79,159	76,451
10-14	157,933	81,318	76,615
15-19	131,464	67,269	64,195
20-24	136,114	68,159	67,955
25-29	270,243	128,033	142,210
30-34	314,009	154,380	159,628
35-39	297,899	148,221	149,678
40-44	232,346	114,973	117,373

Age group	Total	Male	Female
2026			
45-49	194,729	92,848	101,881
50-54	181,896	83,552	98,344
55-59	160,432	68,919	91,512
60-64	188,617	76,374	112,243
65-69	148,362	54,628	93,734
70-74	117,265	39,215	78,050
75-79	56,980	16,133	40,848
80+	75,492	20,448	55,044
Total	**2,948,224**	**1,359,880**	**1,588,344**

Age group	Total	Male	Female
2027			
0-4	109,690	56,409	53,281
5-9	163,728	83,514	80,214
10-14	159,400	81,855	77,545
15-19	137,685	70,618	67,067
20-24	127,515	64,243	63,272
25-29	239,476	113,678	125,798
30-34	315,006	153,621	161,385
35-39	302,781	150,289	152,492
40-44	244,791	121,263	123,528
45-49	197,201	94,469	102,732
50-54	181,731	83,618	98,113
55-59	159,280	68,686	90,594
60-64	182,663	73,870	108,792
65-69	151,803	56,166	95,637
70-74	118,578	39,068	79,510
75-79	61,145	17,517	43,628
80+	66,635	17,746	48,889
Total	**2,919,108**	**1,346,632**	**1,572,476**

Age group	Total	Male	Female
2028			
0-4	106,294	54,662	51,632
5-9	155,006	79,191	75,815
10-14	160,552	82,249	78,303
15-19	142,935	73,434	69,501
20-24	124,366	62,970	61,396
25-29	204,401	98,059	106,341
30-34	315,948	152,242	163,705
35-39	302,574	149,808	152,766
40-44	259,493	128,508	130,985
45-49	203,127	97,782	105,345
50-54	182,743	84,184	98,559
55-59	158,844	68,927	89,917
60-64	173,043	69,920	103,123
65-69	156,874	58,208	98,665
70-74	119,548	39,148	80,400
75-79	66,536	18,965	47,570
80+	59,215	15,562	43,654
Total	**2,891,498**	**1,333,821**	**1,557,677**

Age group	Total	Male	Female
2029			
0-4	103,104	53,021	50,083
5-9	146,414	74,936	71,478
10-14	160,548	82,075	78,473
15-19	146,586	75,348	71,237
20-24	124,870	63,519	61,351
25-29	175,269	85,311	89,959
30-34	305,560	145,642	159,917
35-39	304,957	150,471	154,486
40-44	274,617	135,724	138,893
45-49	207,994	100,652	107,341

Age group	Total	Male	Female
2029			
50-54	184,925	85,394	99,532
55-59	162,422	70,933	91,489
60-64	160,220	64,740	95,480
65-69	162,438	60,178	102,260
70-74	117,461	38,363	79,099
75-79	73,057	20,955	52,102
80+	54,565	14,049	40,516
Total	**2,865,009**	**1,321,312**	**1,543,697**

Age group	Total	Male	Female
2030			
0-4	100,169	51,511	48,658
5-9	138,028	70,778	67,250
10-14	158,548	80,855	77,693
15-19	151,554	77,963	73,591
20-24	128,047	65,278	62,769
25-29	149,125	73,691	75,433
30-34	292,743	138,580	154,163
35-39	307,196	150,796	156,400
40-44	284,644	140,435	144,209
45-49	214,373	104,146	110,227
50-54	186,881	86,662	100,219
55-59	167,726	73,691	94,035
60-64	150,569	60,690	89,880
65-69	162,369	60,071	102,298
70-74	117,763	38,477	79,286
75-79	78,282	22,419	55,864
80+	51,177	12,983	38,195
Total	**2,839,196**	**1,309,026**	**1,530,170**

Age group	Total	Male	Female
2031			
0-4	97,524	50,150	47,374
5-9	128,243	65,896	62,347
10-14	155,480	79,077	76,403
15-19	157,730	81,181	76,549
20-24	131,130	67,029	64,101
25-29	135,456	67,679	67,777
30-34	267,587	126,160	141,427
35-39	309,375	151,014	158,361
40-44	291,900	143,778	148,122
45-49	225,505	109,852	115,654
50-54	186,474	86,740	99,734
55-59	170,436	75,219	95,217
60-64	145,548	58,910	86,637
65-69	161,947	59,761	102,186
70-74	117,952	38,606	79,347
75-79	82,205	23,462	58,743
80+	49,374	12,407	36,967
Total	**2,813,866**	**1,296,919**	**1,516,947**

Source: OHT – NCD Impact Module. Adjusted by consultants to reflect State Statistics Service data [105].

Table A.21: Population data by gender and age group, Lviv

Age group	Total	Male	Female
2022			
0-4	131,722	67,465	64,257
5-9	114,474	59,007	55,467
10-14	99,172	50,939	48,233
15-19	122,108	60,256	61,852
20-24	267,525	129,118	138,407
25-29	261,985	127,699	134,286
30-34	232,597	113,686	118,911
35-39	204,268	103,601	100,666
40-44	154,370	76,125	78,244
45-49	144,033	69,220	74,813
50-54	129,567	60,675	68,892
55-59	151,196	67,289	83,907
60-64	130,943	54,373	76,570
65-69	102,454	38,982	63,472
70-74	74,878	27,369	47,510
75-79	53,356	18,599	34,757
80+	67,096	21,471	45,625
Total	2,441,743	1,145,874	1,295,870

Age group	Total	Male	Female
2023			
0-4	126,717	64,965	61,753
5-9	117,677	60,521	57,156
10-14	101,178	52,130	49,048
15-19	111,024	55,212	55,811
20-24	230,624	111,685	118,939
25-29	282,918	137,257	145,661
30-34	230,186	112,150	118,037
35-39	213,271	107,139	106,131
40-44	163,130	81,172	81,958
45-49	143,233	68,580	74,653

Age group	Total	Male	Female
2023			
50-54	129,477	60,739	68,738
55-59	143,094	63,658	79,436
60-64	135,499	56,456	79,043
65-69	103,833	39,091	64,742
70-74	75,235	26,643	48,593
75-79	50,489	17,211	33,278
80+	59,878	19,151	40,727
Total	2,417,463	1,133,761	1,283,702

Age group	Total	Male	Female
2024			
0-4	121,999	62,609	59,389
5-9	119,974	61,589	58,386
10-14	103,034	53,137	49,897
15-19	103,608	52,081	51,527
20-24	194,609	94,639	99,971
25-29	295,961	143,026	152,935
30-34	231,396	112,582	118,814
35-39	221,394	109,895	111,499
40-44	171,492	86,068	85,425
45-49	143,427	68,551	74,876
50-54	132,551	62,253	70,299
55-59	132,332	58,866	73,465
60-64	140,102	58,364	81,738
65-69	103,451	38,667	64,784
70-74	76,191	26,572	49,619
75-79	47,606	15,884	31,722
80+	55,829	17,573	38,256
Total	2,394,956	1,122,356	1,272,600

Age group	Total	Male	Female
2025			
0-4	117,613	60,420	57,194
5-9	120,762	61,851	58,911
10-14	106,410	54,931	51,479
15-19	100,001	50,688	49,313
20-24	159,450	77,878	81,572
25-29	303,414	146,377	157,037
30-34	235,823	114,590	121,233
35-39	225,388	110,730	114,659
40-44	180,080	90,782	89,298
45-49	144,345	69,121	75,224
50-54	136,288	63,816	72,472
55-59	124,693	55,542	69,151
60-64	139,751	58,215	81,535
65-69	105,263	39,212	66,051
70-74	77,033	26,475	50,559
75-79	49,316	15,952	33,365
80+	47,883	14,885	32,998
Total	**2,373,516**	**1,111,464**	**1,262,051**

Age group	Total	Male	Female
2026			
0-4	112,278	57,736	54,542
5-9	120,745	61,670	59,074
10-14	110,949	57,334	53,615
15-19	97,581	49,838	47,743
20-24	137,812	67,622	70,190
25-29	291,336	140,272	151,064
30-34	244,994	119,023	125,972
35-39	227,819	111,056	116,763
40-44	190,577	96,047	94,530

Age group	Total	Male	Female
2026			
45-49	144,734	69,504	75,230
50-54	137,925	64,528	73,396
55-59	120,397	53,704	66,693
60-64	139,121	57,855	81,267
65-69	106,500	39,643	66,857
70-74	78,306	26,598	51,708
75-79	48,478	15,264	33,214
80+	44,155	13,512	30,644
Total	**2,353,708**	**1,101,205**	**1,252,503**

Age group	Total	Male	Female
2027			
0-4	95,864	49,298	46,566
5-9	131,002	67,038	63,964
10-14	114,371	58,941	55,430
15-19	99,034	50,846	48,187
20-24	121,759	60,009	61,750
25-29	266,144	128,127	138,017
30-34	259,426	125,849	133,577
35-39	228,935	110,993	117,943
40-44	199,675	100,116	99,559
45-49	149,099	72,146	76,953
50-54	136,817	63,826	72,991
55-59	119,824	53,517	66,307
60-64	134,739	56,027	78,711
65-69	109,672	41,038	68,634
70-74	78,456	26,096	52,360
75-79	49,204	15,123	34,081
80+	40,662	12,318	28,344
Total	**2,334,684**	**1,091,309**	**1,243,375**

Age group	Total	Male	Female
2028			
0-4	93,840	48,257	45,583
5-9	126,056	64,572	61,485
10-14	117,573	60,455	57,118
15-19	101,040	52,037	49,003
20-24	110,714	54,993	55,721
25-29	229,435	110,831	118,603
30-34	280,199	135,298	144,901
35-39	226,603	109,524	117,079
40-44	208,565	103,586	104,979
45-49	157,622	76,996	80,626
50-54	136,154	63,296	72,857
55-59	119,880	53,678	66,202
60-64	127,634	53,082	74,552
65-69	113,677	42,732	70,944
70-74	79,727	26,247	53,480
75-79	49,801	14,814	34,988
80+	37,838	11,333	26,506
Total	2,316,357	1,081,730	1,234,626

Age group	Total	Male	Female
2029			
0-4	91,775	47,194	44,580
5-9	121,390	62,246	59,144
10-14	119,871	61,523	58,348
15-19	102,896	53,044	49,852
20-24	103,328	51,882	51,446
25-29	193,615	93,923	99,692
30-34	293,140	141,000	152,139
35-39	227,845	109,987	117,858
40-44	216,598	106,298	110,300

Age group	Total	Male	Female
2029			
45-49	165,769	81,709	84,060
50-54	136,464	63,356	73,107
55-59	122,870	55,120	67,750
60-64	118,176	49,176	69,000
65-69	117,743	44,293	73,451
70-74	79,737	26,103	53,635
75-79	50,745	14,875	35,870
80+	36,516	10,634	25,881
Total	2,298,479	1,072,365	1,226,114

Age group	Total	Male	Female
2030			
0-4	89,682	46,118	43,564
5-9	117,050	60,083	56,968
10-14	120,660	61,786	58,874
15-19	106,271	54,837	51,433
20-24	99,736	50,498	49,238
25-29	158,651	77,302	81,349
30-34	300,511	144,296	156,214
35-39	232,262	111,995	120,268
40-44	220,566	107,135	113,432
45-49	174,146	86,250	87,896
50-54	137,460	63,978	73,482
55-59	126,499	56,609	69,890
60-64	111,474	46,488	64,986
65-69	117,616	44,277	73,339
70-74	81,433	26,621	54,812
75-79	51,586	14,914	36,673
80+	35,179	9,972	25,207
Total	2,280,782	1,063,158	1,217,625

Age group	Total	Male	Female
2031			
0-4	87,584	45,039	42,546
5-9	111,756	57,422	54,334
10-14	120,644	61,606	59,038
15-19	110,807	57,238	53,569
20-24	97,328	49,656	47,672
25-29	137,135	67,133	70,002
30-34	288,508	138,251	150,257
35-39	241,359	116,378	124,980
40-44	223,010	107,488	115,522
45-49	184,382	91,313	93,070
50-54	137,952	64,431	73,522
55-59	128,181	57,352	70,829
60-64	107,912	45,133	62,779
65-69	117,266	44,102	73,164
70-74	82,614	27,045	55,569
75-79	52,700	15,075	37,624
80+	34,096	9,420	24,676
Total	**2,263,234**	**1,054,082**	**1,209,152**

Source: OHT – NCD Impact Module. Adjusted by consultants to reflect State Statistics Service data [105].

Table A.22: Population data by gender and age group, Poltava

Age group	Total	Male	Female
2022			
0-4	67,991	34,882	33,109
5-9	63,685	32,943	30,742
10-14	54,736	28,082	26,654
15-19	55,180	27,635	27,544
20-24	108,965	52,773	56,192
25-29	143,523	71,122	72,402
30-34	132,111	67,246	64,866
35-39	102,078	51,071	51,008
40-44	89,266	43,580	45,687
45-49	87,440	42,046	45,393
50-54	81,240	37,859	43,381
55-59	89,694	40,259	49,435
60-64	75,868	31,978	43,891
65-69	67,296	25,892	41,405
70-74	41,794	14,682	27,112
75-79	36,840	11,348	25,492
80+	51,554	14,889	36,665
Total	**1,349,262**	**628,285**	**720,977**

Age group	Total	Male	Female
2023			
0-4	65,032	33,382	31,650
5-9	64,432	33,253	31,179
10-14	56,674	29,184	27,490
15-19	52,610	26,473	26,138
20-24	92,774	45,206	47,568
25-29	144,513	70,933	73,581
30-34	133,522	67,684	65,837
35-39	108,925	54,780	54,145
40-44	89,886	43,914	45,972
45-49	87,488	41,989	45,500

Age group	Total	Male	Female
2023			
50-54	80,651	37,670	42,981
55-59	86,402	38,727	47,675
60-64	78,359	33,182	45,177
65-69	66,784	25,526	41,258
70-74	44,652	15,551	29,101
75-79	31,502	9,495	22,007
80+	47,586	13,763	33,823
Total	**1,331,793**	**620,712**	**711,081**

Age group	Total	Male	Female
2024			
0-4	62,133	31,914	30,219
5-9	64,693	33,315	31,378
10-14	58,132	30,007	28,125
15-19	51,609	26,124	25,486
20-24	79,182	38,891	40,290
25-29	139,981	68,168	71,813
30-34	136,137	68,584	67,553
35-39	116,510	58,807	57,703
40-44	89,941	44,022	45,918
45-49	88,041	42,214	45,826
50-54	81,715	38,264	43,451
55-59	81,451	36,453	44,998
60-64	81,355	34,463	46,893
65-69	64,480	24,547	39,933
70-74	48,255	16,864	31,391
75-79	26,942	8,092	18,850
80+	44,852	12,761	32,092
Total	**1,315,410**	**613,490**	**701,919**

Age group	Total	Male	Female
2025			
0-4	59,322	30,488	28,834
5-9	64,142	32,942	31,200
10-14	60,184	31,140	29,044
15-19	51,978	26,417	25,561
20-24	66,779	33,068	33,711
25-29	134,122	65,014	69,108
30-34	138,525	69,270	69,255
35-39	122,142	61,806	60,336
40-44	91,031	44,667	46,363
45-49	88,213	42,323	45,890
50-54	83,432	39,098	44,334
55-59	77,857	34,758	43,099
60-64	81,787	34,649	47,137
65-69	63,688	24,240	39,447
70-74	50,994	17,774	33,219
75-79	27,164	8,080	19,084
80+	38,410	10,804	27,606
Total	**1,299,770**	**606,541**	**693,230**

Age group	Total	Male	Female
2026			
0-4	55,941	28,767	27,174
5-9	63,163	32,339	30,824
10-14	62,732	32,517	30,215
15-19	52,551	26,833	25,718
20-24	59,830	29,814	30,016
25-29	122,493	59,165	63,328
30-34	140,720	69,907	70,814
35-39	126,624	64,121	62,503
40-44	94,867	46,733	48,135
45-49	86,892	41,660	45,232

Age group	Total	Male	Female
2026			
50-54	84,004	39,395	44,609
55-59	75,983	33,926	42,057
60-64	82,268	34,795	47,474
65-69	63,187	24,102	39,086
70-74	52,826	18,337	34,489
75-79	26,873	8,010	18,863
80+	34,448	9,547	24,902
Total	1,285,403	599,967	685,437

Age group	Total	Male	Female
2027			
0-4	47,603	24,480	23,123
5-9	67,630	34,668	32,962
10-14	63,628	32,907	30,721
15-19	54,660	28,032	26,628
20-24	55,024	27,525	27,499
25-29	108,396	52,365	56,031
30-34	142,090	70,079	72,011
35-39	130,081	65,735	64,346
40-44	99,937	49,478	50,459
45-49	86,447	41,487	44,960
50-54	83,438	39,083	44,355
55-59	75,715	33,836	41,878
60-64	80,782	34,154	46,628
65-69	64,506	24,795	39,711
70-74	52,724	18,025	34,699
75-79	28,566	8,577	19,989
80+	30,572	8,398	22,174
Total	1,271,800	593,624	678,176

Age group	Total	Male	Female
2028			
0-4	46,201	23,759	22,442
5-9	64,702	33,186	31,516
10-14	64,375	33,217	31,158
15-19	56,597	29,132	27,465
20-24	52,467	26,370	26,096
25-29	92,295	44,862	47,433
30-34	143,081	69,897	73,184
35-39	131,483	66,173	65,310
40-44	106,675	53,103	53,572
45-49	87,089	41,838	45,251
50-54	83,540	39,068	44,472
55-59	75,243	33,726	41,516
60-64	77,914	32,914	45,000
65-69	66,762	25,817	40,945
70-74	52,415	17,805	34,610
75-79	30,780	9,177	21,603
80+	27,287	7,444	19,843
Total	1,258,907	587,488	671,418

Age group	Total	Male	Female
2029			
0-4	44,858	23,068	21,790
5-9	61,831	31,734	30,097
10-14	64,637	33,279	31,358
15-19	58,055	29,955	28,100
20-24	51,473	26,026	26,026
25-29	78,779	38,601	38,601
30-34	138,603	67,177	67,177
35-39	134,080	67,065	67,065
40-44	114,127	57,029	57,029
45-49	87,190	41,978	41,978

Age group	Total	Male	Female
2029			
50-54	84,137	39,327	44,810
55-59	76,315	34,319	41,996
60-64	73,550	31,039	42,510
65-69	69,466	26,899	42,567
70-74	50,777	17,203	33,575
75-79	33,451	10,026	23,425
80+	25,222	6,774	18,448
Total	1,246,551	581,500	665,051

Age group	Total	Male	Female
2030			
0-4	43,595	22,418	21,177
5-9	59,044	30,322	28,722
10-14	64,088	32,908	31,180
15-19	60,105	31,087	29,018
20-24	51,843	26,321	25,522
25-29	66,448	32,828	33,620
30-34	132,802	64,069	68,734
35-39	136,454	67,749	68,704
40-44	119,654	59,948	59,706
45-49	88,297	42,634	45,663
50-54	84,366	39,475	44,891
55-59	78,005	35,129	42,876
60-64	70,381	29,641	40,740
65-69	69,965	27,119	42,846
70-74	50,332	17,079	33,253
75-79	35,475	10,611	24,864
80+	23,676	6,287	17,389
Total	1,234,529	575,623	658,906

Age group	Total	Male	Female
2031			
0-4	42,426	21,817	20,609
5-9	55,684	28,613	27,072
10-14	63,110	32,305	30,805
15-19	62,651	32,463	30,189
20-24	52,417	26,737	25,680
25-29	59,539	29,603	29,936
30-34	121,280	58,300	62,980
35-39	138,640	68,387	70,253
40-44	124,061	62,208	61,853
45-49	92,069	44,647	47,422
50-54	83,163	38,899	44,264
55-59	78,634	35,462	43,171
60-64	68,846	29,036	39,810
65-69	70,508	27,304	43,204
70-74	50,078	17,063	33,015
75-79	36,832	10,974	25,857
80+	22,815	6,017	16,798
Total	1,222,752	569,834	652,918

Source: OHT – NCD Impact Module. Adjusted by consultants to reflect State Statistics Service data [105].

Table A.23: Population data by gender and age group, Rivne

Age group	Total	Male	Female
2022			
0-4	76,946	39,401	37,545
5-9	76,003	38,776	37,227
10-14	63,057	32,336	30,721
15-19	63,739	32,289	31,450
20-24	118,998	57,501	61,498
25-29	128,643	64,339	64,305
30-34	108,343	55,298	53,045
35-39	82,951	40,967	41,984
40-44	68,081	33,839	34,241
45-49	64,184	31,900	32,284
50-54	56,619	27,438	29,181
55-59	64,233	29,468	34,765
60-64	54,131	23,701	30,430
65-69	39,511	15,746	23,766
70-74	25,061	9,016	16,044
75-79	19,166	5,855	13,312
80+	28,113	7,601	20,512
Total	**1,137,780**	**545,470**	**592,309**

Age group	Total	Male	Female
2023			
0-4	70,288	36,026	34,263
5-9	77,153	39,362	37,791
10-14	65,809	33,722	32,087
15-19	60,673	30,877	29,796
20-24	103,674	50,452	53,222
25-29	135,233	66,812	68,421
30-34	110,141	56,130	54,010
35-39	88,686	44,118	44,568
40-44	69,653	34,327	35,326
45-49	64,493	31,964	32,530

Age group	Total	Male	Female
2023			
50-54	56,721	27,555	29,166
55-59	61,052	27,966	33,086
60-64	56,365	24,619	31,746
65-69	40,691	16,148	24,544
70-74	25,861	9,185	16,676
75-79	17,124	5,177	11,947
80+	24,878	6,750	18,127
Total	**1,128,495**	**541,190**	**587,305**

Age group	Total	Male	Female
2024			
0-4	63,924	32,797	31,127
5-9	77,652	39,643	38,009
10-14	68,119	34,836	33,283
15-19	59,289	30,296	28,993
20-24	89,796	44,192	45,605
25-29	137,210	67,019	70,192
30-34	113,429	57,587	55,842
35-39	94,884	47,549	47,335
40-44	70,871	34,652	36,219
45-49	65,157	32,221	32,936
50-54	58,186	28,314	29,872
55-59	56,719	25,973	30,746
60-64	58,558	25,421	33,136
65-69	41,102	16,271	24,830
70-74	27,044	9,614	17,429
75-79	15,460	4,704	10,756
80+	22,660	6,061	16,599
Total	**1,120,061**	**537,153**	**582,908**

Age group	Total	Male	Female
2025			
0-4	57,893	29,736	28,157
5-9	77,153	39,406	37,747
10-14	71,074	36,302	34,772
15-19	59,566	30,480	29,086
20-24	76,407	38,060	38,347
25-29	137,285	66,563	70,722
30-34	117,241	59,177	58,063
35-39	99,511	50,178	49,333
40-44	72,780	35,392	37,388
45-49	65,653	32,394	33,259
50-54	59,833	28,954	30,879
55-59	53,867	24,803	29,063
60-64	58,649	25,334	33,316
65-69	42,309	16,724	25,585
70-74	28,132	9,977	18,155
75-79	15,867	4,795	11,072
80+	18,989	5,022	13,967
Total	1,112,207	533,296	578,911

Age group	Total	Male	Female
2026			
0-4	51,393	26,429	24,964
5-9	76,149	38,899	37,251
10-14	74,488	38,027	36,461
15-19	60,252	30,871	29,381
20-24	68,902	34,667	34,235
25-29	129,936	62,648	67,288
30-34	121,987	61,219	60,768
35-39	103,384	52,332	51,052
40-44	76,606	37,236	39,370
45-49	65,219	32,001	33,218

Age group	Total	Male	Female
2026			
50-54	60,862	29,439	31,422
55-59	52,265	24,121	28,144
60-64	58,616	25,189	33,426
65-69	43,226	17,054	26,171
70-74	29,290	10,367	18,923
75-79	15,679	4,742	10,937
80+	16,876	4,415	12,462
Total	1,105,132	529,658	575,474

Age group	Total	Male	Female
2027			
0-4	44,107	22,683	21,424
5-9	76,588	39,189	37,399
10-14	75,935	38,733	37,202
15-19	62,970	32,278	30,692
20-24	63,559	32,160	31,399
25-29	118,386	57,062	61,325
30-34	127,370	63,404	63,966
35-39	106,628	54,009	52,619
40-44	81,124	39,599	41,525
45-49	65,702	32,031	33,671
50-54	60,871	29,382	31,489
55-59	52,215	24,151	28,064
60-64	57,005	24,444	32,561
65-69	44,890	17,727	27,162
70-74	29,929	10,463	19,467
75-79	16,243	4,921	11,321
80+	14,980	3,910	11,070
Total	1,098,504	526,146	572,357

Age group	Total	Male	Female
2028			
0-4	43,516	22,378	21,138
5-9	69,971	35,837	34,134
10-14	77,085	39,319	37,767
15-19	65,721	33,663	32,058
20-24	60,506	30,757	29,749
25-29	103,145	50,072	53,073
30-34	133,914	65,850	68,063
35-39	108,412	54,834	53,578
40-44	86,762	42,674	44,088
45-49	67,269	32,522	34,747
50-54	61,213	29,474	31,740
55-59	52,376	24,306	28,070
60-64	54,247	23,241	31,006
65-69	46,857	18,476	28,381
70-74	30,906	10,765	20,141
75-79	16,897	5,058	11,838
80+	13,470	3,521	9,949
Total	1,092,266	522,748	569,519

Age group	Total	Male	Female
2029			
0-4	42,958	22,091	20,867
5-9	63,638	32,626	31,012
10-14	77,585	39,601	37,984
15-19	68,029	34,776	33,254
20-24	59,131	30,183	28,948
25-29	89,344	43,865	45,479
30-34	135,886	66,060	69,826
35-39	111,673	56,274	55,399
40-44	92,847	46,016	46,831
45-49	68,501	32,865	35,637

Age group	Total	Male	Female
2029			
50-54	61,905	29,754	32,151
55-59	53,801	25,030	28,771
60-64	50,470	21,632	28,838
65-69	48,803	19,138	29,665
70-74	31,338	10,907	20,431
75-79	17,783	5,339	12,443
80+	12,611	3,267	9,344
Total	1,086,302	519,423	566,880

Age group	Total	Male	Female
2030			
0-4	42,448	21,828	20,619
5-9	57,630	29,579	28,052
10-14	77,087	39,364	37,723
15-19	70,982	36,240	34,742
20-24	59,411	30,368	29,043
25-29	76,029	37,785	38,245
30-34	135,963	65,611	70,352
35-39	115,451	57,845	57,607
40-44	97,383	48,573	48,811
45-49	70,402	33,604	36,799
50-54	62,438	29,956	32,483
55-59	55,413	25,651	29,762
60-64	47,991	20,713	27,278
65-69	48,983	19,124	29,859
70-74	32,381	11,272	21,109
75-79	18,595	5,578	13,017
80+	11,913	3,068	8,845
Total	1,080,501	516,157	564,344

Age group	Total	Male	Female
2031			
0-4	41,995	21,595	20,400
5-9	51,151	26,284	24,867
10-14	76,086	38,858	37,228
15-19	74,393	37,964	36,429
20-24	60,098	30,760	29,338
25-29	68,568	34,423	34,145
30-34	128,676	61,745	66,931
35-39	120,155	59,861	60,294
40-44	101,190	50,674	50,515
45-49	74,155	35,394	38,761
50-54	62,089	29,631	32,458
55-59	56,448	26,139	30,309
60-64	46,693	20,231	26,463
65-69	49,059	19,068	29,990
70-74	33,178	11,546	21,632
75-79	19,448	5,831	13,618
80+	11,443	2,938	8,506
Total	**1,074,828**	**512,942**	**561,885**

Source: *OHT – NCD Impact Module. Adjusted by consultants to reflect State Statistics Service data [105].*

ANNEX D: BASELINE COVERAGE OF POLICY INTERVENTIONS

OHT uses an "intensity score" for coverage of policy interventions, which runs on a 1 to 4 system: 1 being low or 0%, 4 being full or 100%. A score of "1" would mean there is no law in place, whereas a "4" corresponds with having a well-implemented law or measure in place.

Table A.24: Baseline policy intervention coverage values: tobacco package of policy intervention

Intervention	Current state of implementation	Coverage score (all regions unless noted)	Region-specific data and adjusted coverage score
Protect people from tobacco smoke	▶ Scored 2 on WHO's 2022 "Noncommunicable diseases progress monitor" report ("smoke-free policies") ▶ Scored 4 in GHO data ("protect people from tobacco smoke, 2018") ▶ Scored "moderate" by project: legislation in place (though some exemptions exist, for hotels, dorms, private entities) but enforcement needs improvement ▶ Comprehensive smoke free legislation exists; only indoor offices not covered ▶ Scored 15/22 on "smoke-free public places" by Tobacco Control Scale report, 2019	3	▶ Lviv only: few inspections of the hospitality industry: in 2019 the SSFSCP conducted 15 planned inspections and in 2020 – 1 unplanned, also with no facts of violation confirmed. Total there are 5685 cafes, bars and restaurants in Lviv oblast (scored maintained at 3). ▶ Dnipro only: having issued 2048 protocols for violation of tobacco smoking in public places (Article 175-1 of Code for administrative offences) in 2020 (23882 protocols in 2019) (scored maintained at 3). ▶ Rivne only: in 2019 the SSFSCP conducted 18 out of 60 planned inspections to enforce smoke-free legislation, resulting in 1 confirmed violation case (1,000 Ukrainian hryvnia (UAH) fine) (scored maintained at 3).

Intervention	Current state of implementation	Coverage score (all regions unless noted)	Region-specific data and adjusted coverage score
Enforce bans on tobacco advertising	► Scored 2 on WHO's 2022 "Noncommunicable diseases progress monitor" report ("enforce bans on advertising, promotion and sponsorship") ► Advertising bans exist but there are loopholes, scored 11/13 (exists (Tobacco Control Scale report, 2019 and project document) ► Enforcement of bans is not at highest level of achievement (WHO report on the global tobacco epidemic 2021)	2	► Lviv only: few inspections of the hospitality industry: in 2019 – 26 planned inspections, in 2020 – 4 planned and 1 unplanned, with no facts of the violation, confirmed in both years (score maintained at 2) ► Rivne only: limited inspections carried out to enforce the legislation on the ban of tobacco advertising, promotion and sponsorship: in 2019, 6 planned inspections resulted in 4,300 UAH of fines, in 2020 – 4 planned inspections resulted in 3,167 UAH of fines (scored maintained at 2).
Implement plain/standardized packaging of tobacco products	► Scored 4 on WHO's 2022 "Noncommunicable diseases progress monitor" report ("large graphic health warnings/ plain packaging")	4	
Tobacco cessation programs (brief intervention and Cessation)	► Smoking-cessation services are available in some health clinics and other primary care facilities, but costs are not covered by the national health service or national health insurance. Nicotine replacement therapy can be purchased over the counter in a pharmacy without a prescription, but is not cost-covered. No toll-free quit line is available ► Project scores "low": cessation services do not exist on the national level so far and there is not available information if primary health care doctors regularly provide brief advice on smoking cessation to their patients. ► Approx. 1/3 of smokers advised to quit smoking during visit to healthcare provider (STEPS 2019) ► Scored 3/10 on treatment (Tobacco Control Scale report, 2019) ► There is a toll-free hotline (GHO, 2018)	2	► Rivne only: Smoking-cessation services are not available in the oblast (note: they are available in other regions, but costs are not covered by the national health service or national health insurance. Nicotine replacement therapy can be purchased over the counter in a pharmacy without a prescription, but is not cost-covered. No toll-free quit line is available (score reduced to 1).

Intervention	Current state of implementation	Coverage score (all regions unless noted)	Region-specific data and adjusted coverage score
Warn about dangers: mass media campaign	► Scored 4 on WHO's 2022 "Noncommunicable diseases progress monitor" report ("mass media campaigns") ► Rated as highest achieving country for anti-tobacco mass media campaigns (WHO report on the global tobacco epidemic 2021) ► Project rates as "low" because no funds have been allocated for this purpose at national level since 2018. Only active campaigns are conducted by NGOs with support of donors	2	
Warn about dangers: warning labels	► Scored 4 on WHO's 2022 "Noncommunicable diseases progress monitor" report ("large graphic health warnings/ plain packaging") ► Scored "moderate" by project: Currently, a pack of cigarette should contain a pictorial health warning of 50% on the backside and a text warning of 50% on the front side. Even though these norms fit minimum obligations under WHO FCTC, current warnings have not been rotated since 2012 so are worn out. New EU Agreement obligations require a mini-mum of 65% of health pictorial warnings on both sides of cigarette packaging. ► Pictoral health warnings exist but scored 4/10 on labels (Tobacco Control Scale report, 2019) ► Rated as highest achieving country for health warning labels (WHO report on the global tobacco epidemic 2021)	3	

Intervention	Current state of implementation	Coverage score (all regions unless noted)	Region-specific data and adjusted coverage score
Program strategy development	▶ Scored 4 on WHO's 2022 "Noncommunicable diseases progress monitor" report ("national integrated NCD policy/ strategy/action plan")	4	▶ Dnipro only: in 2019 Dnipropetrovsk oblast council developed and adopted the targeted program "Health of the population of Dnipropetrovsk region in 2020-2024" . The purpose of the program is to improve the demographic situation, preserve and strengthen the health of the population by improving the quality and efficiency of medical care with the priority of prevention and treatment of chronic non-communicable and infectious diseases. However, the program is focused on improving the quality of medical services providers and does not include any NCDs prevention tasks (score reduced to 3). ▶ Lviv only: council developing regional NCDs prevention program for 2021 – 2027, which will also be expected to get financial support (scored maintained at 4). ▶ Poltava only: among 41 regional programs that are being implemented by the oblast administration, there were none related to NCDs (scored reduced to 2). ▶ Rivne only: oblast state administration has developed comprehensive oblast public health program for 2021 – 2024 with various activities to establish and develop a public health system, including measures to combat NCDs based on WHO NCDs best buys. It is one of the best examples in the country of such a document. However, as of July 2021 the document remained unadopt-ed. Rivne only: there is a tobacco-specific strategy, the Tobacco Control Strategy for 2021-2025 for Rivne region. There is also an informational campaign to prevent the initiation of tobacco (scored reduced to 3).

Intervention	Current state of implementation	Coverage score (all regions unless noted)	Region-specific data and adjusted coverage score
Monitor tobacco use/ prevention policies	▶ Rated as highest achieving country for monitoring the prevalence of tobacco use (WHO report on the global tobacco epidemic 2021) ▶ Scored 0/15 on budget for tobacco control (Tobacco Control Scale report, 2019)	3	
Enforce youth access restriction	▶ Project document indicates there is a high availability of tobacco products for youth: 57.1% of current cigarette smokers reported being able to buy cigarettes from a store, shop, street vendor, or kiosk. Among current cigarette smokers who tried to buy cigarettes, 46.3% were not prevented from buying them because of their age	2	▶ Dnipro only: having issued 870 protocols for violation of sales rules of tobacco products, e-cigarettes and alcohol beverages (Article156 of the same Code) in 2020 (570 for 2019) (scored maintained at 2)

Note: The policy interventions are organized in terms of the risk factors they address, as per OHT's logic.

Sources: [27], [62]–[65], [67], [68], [79], [80], [83], [85], [86]

Table A.25: Baseline policy intervention coverage values: alcohol package of policy interventions

Intervention	Current state of implementation	Coverage score (all regions unless noted)	Region-specific data and adjusted coverage score
Enforce restrictions on alcohol advertising	▶ Scored 4 on WHO's 2022 "Noncommunicable diseases progress monitor" report ("advertising bans or comprehensive restrictions") ▶ "Limited" according to project document ▶ "Partial restriction time" for advertising on national television, cable television, national radio and local radio (all types of alcohol) (banned during day but allowed 11pm to 6am); no restriction place or content (GHO, 2018 and project document) ▶ Beer advertising banned from print media, wine/spirits "partial restriction time" (GHO, 2018) ▶ Beer advertising restrictions voluntary/self-restricted in cinemas and internet, wine/spirits no restrictions (GHO, 2018) ▶ Billboard advertising banned for all alcohol types (GHO, 2018) ▶ Point-of-sale advertising limitations voluntary/self restricted for all types of alcohol (GHO, 2018)	3	▶ Dnipro only: having issued 870 protocols for violation of sales rules of tobacco products, e-cigarettes and alcohol beverages (Article156 of the same Code) in 2020 (570 for 2019) (score maintained at 3). ▶ Lviv only: SSFCP reports inspections of 616 (2019) and 369 (2020) samples of outdoor advertising, 14 and 6 indoor advertising, respectively, and one case of TV advertising, with no facts of violation confirmed (score maintained at 3). ▶ Rivne only: the SSFSCP reported 31 violations of alcohol advertisement ban (30,520 UAH of fines) in 2019, and 16 violations (13,947 UAH of fines) in 2020 (score maintained at 3).
Implement and enforce restrictions on the physical availability of retailed alcohol	▶ Scored 2 on WHO's 2022 "Noncommunicable diseases progress monitor" report ("restrictions on physical availability") ▶ "Moderate": sales of alcohol to minors are banned, alcohol consumption restriction covers government, educational, medical and other public facilities and there are restrictions for on- / off-premise sales of alcoholic beverages, however, this should be adopted by the local governments[1]. Thus, this regulation is not adopted in all regions so far.	2	▶ Lviv only: SSFCP reports restrictions on sales of alcohol at night time, from 22:00 – 10:00 in retail, were introduced in Lviv in 2010, however, in 2019 this decision has been renewed due to the changes in the legislation (scored maintained at 2). ▶ Dnipro only: all cities and towns of the oblast banned the night sale of alcoholic beverages (10 pm – 10 am) (score increased to 3).

Intervention	Current state of implementation	Coverage score (all regions unless noted)	Region-specific data and adjusted coverage score
	▶ Illicit trade undermines the legal restrictions.		▶ Rivne only: restriction on sales of alcohol at night time, from 22:00 – 08:00 in retail has been enforced since 2015 by the Rivne city council decision No. 5677. Another city council decision (No. 907 from 2011) enforced alcohol sales restriction measures on state and several other holidays. Juvenal police reported regular informational and prophylactical measures undertaken to prevent alcohol abuse in public settings. Also, regular raids were conducted in places popular among the youth (3212 raids in 2020). Enforcement police officers reported that 3459 protocols were issued to minors for alcohol consumption in 2020. This work also is supported by an informational campaign to prevent the initiation of tobacco and alcohol (score increased to 3).
Enforce drink driving laws (breath-testing sobriety check-points)	▶ Legal blood alcohol concentration limits: reduced from 0.05 to 0.02% in 2021 (GHO, 2018 and project document) ▶ In practice no random breath testing or sobriety checkpoints, though legally allowed (GHO, 2018 and project document) ▶ Penalties for drink driving: detention short/long term, license suspended/revoked, fines; no penalty points, ignition interlocks, mandatory treatment education, vehicle impoundment, community public service (GHO, 2016)	1	▶ Rivne only: National Police Department in Rivne oblast reported some increasing data on alcohol driving: 1954 cases in 2017, 2107 in 2018, 2294 in 2019 and 2686 in 2020. Drink driving caused 94 incidences in 2017, 74 in 2018, 96 in 2019 and 115 in 2020. It is noteworthy that regardless of strict quarantine measures that decreased business activity in 2020, the number of road traffic incidences caused by alcohol increased (score maintained at 1)

Intervention	Current state of implementation	Coverage score (all regions unless noted)	Region-specific data and adjusted coverage score
Screening and brief intervention for hazardous and harmful alcohol use	▶ "Limited"; there are protocols for primary care level but not updated since 2009, though local governments and health care facilities may establish some forms services (psychosocial interventions, hotlines, consultancies; availability varies oblast to oblast). ▶ Detox clinics are available.	1	▶ Lviv only: no information on available interventions for alcohol addiction treatment (score maintained at 1). ▶ Rivne only: alcohol addiction treatment is available in the Oblast (scored increased to 2).
Monitoring	▶ In 2019 the Government also adopted the Decree on the procedure of monitoring the drug and alcohol situation in Ukraine. This regulatory action should have improved the surveillance capacity of the responsible institutions and improve data quality. However, this is not clear so far if the new procedure were implemented and rolled out.	1	
Advocacy support/ partnerships	▶ No information available.		

Intervention	Current state of implementation	Coverage score (all regions unless noted)	Region-specific data and adjusted coverage score
Program strategy development	▶ Scored 4 on WHO's 2022 "Noncommunicable diseases progress monitor" report ("national integrated NCD policy/ strategy/action plan")	3	▶ Dnipro only: in 2019 Dnipropetrovsk oblast council developed and adopted the targeted programme "Health of the population of Dnipropetrovsk region in 2020-2024". The purpose of the program is to improve the demographic situation, preserve and strengthen the health of the population by improving the quality and efficiency of medical care with the priority of prevention and treatment of chronic non-communicable and infectious diseases. However, the programme is focused on improving the quality of medical services providers and does not include any NCDs prevention tasks (scored maintained at 3). ▶ Poltava only: among 41 regional programmes that are being implemented by the oblast administration, there were none related to NCDs (score reduced to 2). ▶ Rivne only: oblast state administration has developed comprehensive oblast public health programme for 2021 – 2024 with various activities to establish and develop a public health system, including measures to combat NCDs based on WHO NCDs best buys. It is one of the best examples in the country of such a document. However, as of July 2021 the document remained unadopted (score maintained at 3).

Note: The policy interventions are organized in terms of the risk factors they address, as per OHT's logic.
Sources: [27], [62]–[65], [67], [68], [80]–[82]

Table A.26: Baseline policy intervention coverage values: physical inactivity and unhealthy eating package of policy interventions

Intervention	Current state of implementation	Coverage score (all regions unless noted)	Region-specific data and adjusted coverage score
Promote public awareness about physical activity	▶ Scored 4 on WHO's 2022 "Noncommunicable diseases progress monitor" report ("public education and awareness campaign on physical activity") ▶ There is a physical activity public awareness program being implemented according to GHO (2019) ▶ Project rates "limited": No national information and mass media campaign implemented targeted at improving population physical activities. No public funds allocated to a mass media campaign aimed at NCD risk factors prevention. However, community-based media campaigns may be organized by public health institutions.	2	▶ Poltava only: Poltava oblast public health center presented on its website the public health communication strategy for 2020-2023, which was signed by the head of the Poltava health care department in February 2020. The document fully embraced a comprehensive approach to health promotion and communicating NCD risk factors. The Strategy prioritized NCDs and 3 other health areas. They plan to promote healthy diets and physical activity, but it is unclear how far they have progressed with funding and implementation of these activities (scored increased to 3). ▶ Rivne only: Rivne only: All-Ukrainian center for physical health "Sport for all" informed that they regularly conduct events in Rivne oblast to promote physical activities. In 2018 there were 765 events with over 24,000 participants, in 2019 192 events and 32,000 participants, and in 2020 123 events with 48,000 participants (score increased to 3).
Reduce salt intake	▶ Scored 2 on WHO's 2022 "Noncommunicable diseases progress monitor" report ("salt/sodium policies") ▶ Scored "limited" by project: There is no legislation or norms that restrict or regulate the amount of salt in food and meals for the general population. There is no communication campaign is in place to promote less salt intake by the population	1	

Intervention	Current state of implementation	Coverage score (all regions unless noted)	Region-specific data and adjusted coverage score
Environment: salt reduction strategies in community-based eating spaces	▶ Scored "limited" by project: government has recently adopted new regulations for organizing meals in school and social education institutions. This act will decrease using salt and serving processed food in these settings.	2	
Replace trans fat with polyunsaturated fat	▶ Scored 4 on WHO's 2022 "Noncommunicable diseases progress monitor" report ("saturated fatty acids and trans-fats policies") ▶ Scored "limited (moderated)" by project: At the beginning of 2021 MOH developed and placed for the public debates the draft law on restricting of use of trans fatty acids in food products. In May 2021 this draft law was registered in the Parliament.	2	
Replace saturated fat with unsaturated fat	▶ Scored 4 on WHO's 2022 "Noncommunicable diseases progress monitor" report ("saturated fatty acids and trans-fats policies") ▶ Scored "limited (moderated)" by project: draft law on restricting of use of trans fatty acids in food products registered in Parliament in 2021.	2	
Restrict marketing of food and beverages to children	▶ Scored 1 on WHO's 2022 "Noncommunicable diseases progress monitor" report ("marketing to children restrictions")	1	
Promote healthy eating & physical activity in schools	▶ Scored 4 on WHO's 2022 "Noncommunicable diseases progress monitor" report ("public education and awareness campaign on physical activity")	3	

Intervention	Current state of implementation	Coverage score (all regions unless noted)	Region-specific data and adjusted coverage score
	▶ Project rates "moderate": School curriculum includes regular classes on physical activities and in their majority have adequate facilities and programs to support physical activity for the children, though in practice these are limited and physical activity classes are often cancelled		
Promote healthy eating & physical activity in worksites	▶ Scored 4 on WHO's 2022 "Noncommunicable diseases progress monitor" report ("public education and awareness campaign on physical activity")	4	
Offer counselling concerning diet and physical activity (extensive counselling)	▶ Project rates "limited": primary healthcare practitioners are obliged to promote health and provide counselling on risk factors but extent to which this happens is unknown. ▶ Recent trainings on NCDs risk factors counseling were conducted for specialists from 5 regions as part of WHO project, who increased their awareness and skills in counselling and motivation interviews, incl. issues of physical activity. The situation in other regions is unknown. No routine trainings are offered (project document)	1	
Brief advice on physical activity/inactivity as part of routine care	▶ Project rates "limited": primary healthcare practitioners are obliged to promote health and provide counselling on risk factors but extent to which this happens is unknown. ▶ Recent trainings on NCDs risk factors counseling were conducted for specialists from 5 regions as part of WHO project, who increased their awareness and skills in counselling and motivation interviews, incl. issues of physical activity. The situation in other regions is unknown. No routine trainings are offered (project document	1	

Intervention	Current state of implementation	Coverage score (all regions unless noted)	Region-specific data and adjusted coverage score
Harness industry for reformulation re: sodium	▶ Scored 2 on WHO's 2022 "Non-communicable diseases progress monitor" report ("salt/sodium policies")	1	
Adopt standards: front of label packaging	▶ There are no special regulations on the front-of-pack labelling for salt	1	
Adopt standards: strategies to combat misleading marketing	▶ NCD national action plan contains measures around marketing but these are reportedly not yet enforced	1	
Knowledge: education and communication	▶ Government does not allocate any financial resources for the strategic communications on NCD risk factors, so no information campaigns aimed at the reduction of salt intake are in place. Fragmented media messages and articles do not substantially change this risky behavior (project document)	1	
Program strategy development	▶ Scored 4 on WHO's 2022 "Non-communicable diseas-es progress monitor" report ("national integrated NCD policy/strategy/action plan")	3	▶ Dnipro only: in 2019 Dnipropetrovsk oblast council developed and adopted the targeted programme "Health of the population of Dnipropetrovsk region in 2020-2024" to "improve the demographic situation, preserve and strengthen the health of the population by improving the quality and efficiency of medical care with the priority of prevention and treatment of chronic non-communicable and infectious diseases. However, the programme is focused on improving the quality of medical services providers and does not include any NCDs prevention tasks" (score maintained at 3). ▶ Poltava only: among 41 regional programmes that are being implemented by the oblast administration, there were none related to NCDs (scored reduced to 2). ▶ Rivne only: oblast state administration has developed comprehensive oblast public health programme for 2021 – 2024 with various activities to establish and develop a public health system, including measures to combat NCDs based on WHO NCDs best buys. It is one of the best examples in the country of such a document. However, as of July 2021 the document remained unadopted (score maintained at 3).

ANNEX E : DRUGS/SUPPLIES COSTS, SALARIES AND COST PER OUTPATIENT VISIT AND INPATIENT DAY

Table A.27: Unit costs of drugs/supplies

Drug or supply	Drug or supply	Unit cost (UAH)
70 isopropyl alcohol, 10 ml	Supply	77.26252
Acetic acid, 5% dilute, 5 ml	Supply	29.78805
Acetyl salysilic acid (aspirin), tablet, 75 mg	Drug	0.88482
Acetylsalycilic acid, 500 mg tab	Drug	0.43756
Alendronate, 10 mg tab	Drug	5.64107
Alkaline phosphatase reagents	Supply	372.3489
Amitriptyline 25 mg tablets	Drug	0.67008
Amitriptyline(25 mg tab)	Drug	0.67008
Amlodipine, tablet, 10 mg	Drug	0.88224
Amoxicillin, 500 mg tab	Drug	2.91351
Anti-streptolysin O titer	Supply	0
Antireflective lens	Supply	0
Applicator sticks	Supply	0.52973
Aspirating needle	Supply	2,085.15
Aspirating syringe	Supply	2,087.01
Atenolol, tablets, 50 mg	Drug	0.69499
Autoclavable bags at 134°C, 410 x 620 mm, 100 pieces per pack	Supply	5,119.80
Azithromycin, 500 mg	Drug	29.78805
Balloon catheter	Supply	18,524.35
Beclometasone 100mg	Drug	3.94
Benzathine benzylpenicillin, powder for injection, 1.2 m IU	Drug	16.2903
Bioprosthetic valve	Supply	98,020.81
Biopsy needle	Supply	2,086.08
Blood collecting tube, 5 ml	Supply	5.00009
Blood glucose level test	Supply	130
Blood test: Test for fasting lipid profile	Supply	384.9999
Breast cancer screening drugs/supplies to service a client	Drug	0
Buffer solution	Supply	18.61749
BUN test	Supply	242.6784
Butylscopolamine, one ampoule	Drug	25.13368

Drug or supply	Drug or supply	Unit cost (UAH)
C-reactive protein	Supply	0
Cannula, IV, 22G, sterile, disposable	Drug	13.96312
Cannulae	Supply	150.8011
CareHPV Test Kit	Supply	876.8813
Cauterizer	Supply	660.919
CEA test	Supply	1,110.53
Cefazolin, 1g	Drug	40.02754
Cefrriaxone, powder for infection, 250 ml vial	Drug	22.3408
Cervical cytology brush/scraper	Supply	70.54163
Cholesterol test	Supply	120.0002
Cidex 2-4% glutaraldehyde (cl), 100ml	Supply	26.06
Cisplatin (50 mg tab)	Drug	623.68
Colorectal cancer treatment: stage 1	Supply	9,494.89
Colorectal cancer treatment: stage 2	Supply	45,798.90
Colorectal cancer treatment: stage 3	Supply	145,868
Colorectal cancer treatment: stage 4	Supply	43,657.89
Complete blood count	Supply	234.5798
Compressed gas, 25 kg cylinder	Supply	6,516.10
Condom, male	Supply	2.79256
Cotton swab	Supply	9.30875
Cotton wool	Supply	0.27942
Cryotherapy unit with cryotips, use for one patient	Supply	5.58512
Cyclophosphamide, 1 g	Drug	942.9733
Cyclophosphamide, 500 mg	Drug	1,058.40
Data collection forms	Supply	18.61749
Definitive radiotherapy (50Gy in 25 fractions)	Supply	7,028.08
Developer chemicals	Supply	40.02754
Dexamethasone (4mg tablets)	Drug	5.58512
Dexamethasone, 4 mg, 1 ampoule	Drug	13.96312
Diagnosis of colorectal cancer	Supply	2,401.65
Diazepam, 5 mg	Drug	0.80042
Diazotized reagent	Supply	38.16573
Docusate (100mg tablet)	Drug	14.89386
Doxorubicin, 10 mg vial	Drug	237.3724

Drug or supply	Drug or supply	Unit cost (UAH)
Doxorubicin, 50 mg vial	Drug	558.5231
EIA rapid strep test	Supply	363.0401
Electrocardiogram	Supply	0
Electrodes, electrocardiographic	Supply	8.378
Electrolytes test	Supply	416.0997
Electrosurgical pen	Supply	314.6346
Electrosurgical unit (monopolar pen, pad)	Supply	314.6346
Enalapril, tablet, 20 mg	Drug	1.04167
Erythrocyte sedimentation rate	Supply	0
Filgastrim	Drug	12.25686
FIT test set	Supply	254.128
Fixing chemicals	Supply	40.02754
Fluorescein drops	Supply	58.00
FOBT test set	Supply	530.5969
Forceps, punch biopsy	Supply	3,672.29
Forceps, sponge holder	Supply	1,177.55
Formalin, 1 liter	Drug	67.95378
Gas cylinder adapter	Supply	930.872
Gauze pad, 10 x 10 cm, sterile	Supply	4.65437
Gauze pad, 10X4 cm	Supply	13.96312
Gel, electrode	Supply	25.13368
Glibenclamide, 5 mg tab	Drug	0.35994
Gloves, exam, latex, disposable, pair	Supply	6.69988
GoLytely (PEG 3350 + electrolytes), 4 L	Supply	13.03205
H and E staining	Supply	46.54373
Haloperidol (oral liquid, 2mg)	Drug	2.90
HbA1c test	Supply	240
HER2 amplification (immunoanalyzer)	Supply	7,037.39
Home glucose monitoring	Supply	19.54824
Hormone receptor testing (immunoanalyzer)	Drug	2,317.87
Hydrochlorothiazide, tablet, 25 mg	Drug	1.67651
Ibuprofen, 400 mg tab	Drug	1.02388
IEC materials	Supply	93.08713
Insoles	Supply	399.9999

Drug or supply	Drug or supply	Unit cost (UAH)
Insulin	Drug	81.91657
Intravenous administration set	Supply	192.8001
Ipratropium Bromide 20 mcg inhaler	Drug	2.04777
IV contrast	Drug	23.27186
IV giving/infusion set, with needle	Supply	26.06442
IV line	Supply	88.43276
Ketamine, 10 ml vial, 50 mg/ml	Drug	108.9121
KY jelly packet	Supply	17.50047
Laser Photocoagulation	Supply	1,530,282
Lidocaine HCl (in dextrose 7.5%), ampoule 2 ml	Drug	30.7188
Loperamide 2 mg	Drug	0.93075
Lugol's solution, 1 ml	Supply	77.44848
Mammography film	Supply	59.58
Mammography film chemistry	Supply	5.95767
Mechanical valve	Supply	70,280.83
Metformin, 850 mg tab	Drug	1.09697
Metoclopramide (10mg tablet)	Drug	0.58632
Microscope slides with frosted end, pack of 50	Supply	8.28486
Midazolam, 1 mg	Drug	27.2002
Monofilament, 10 g	Drug	77.99988
Monsel's solution, 1 ml	Supply	12.1013
Morphine injection (5mL)	Drug	282.985
Morphine oral liquid (10mg/mL)	Drug	13.96312
Morphine slow release tablet (10mg)	Drug	75.40071
Needle, spinal, 22g (disposable)	Drug	83.77839
Nitrofurantoin, 100mg tab	Drug	3.72363
Omega 3 fish oil capsule, 1000 mg	Drug	3.57
Ondansetron (4mg tablets)	Drug	49.43848
Other perioperative costs	Supply	27,926.16
Oxygen, 1000 liters, primarily with oxygen cylinders	Supply	3,600.00
Paclitaxel	Drug	956.0053
Paper, Recording ECG	Supply	2.79256
Paracetamol, tablet, 500 mg	Drug	0.67946
Penicillin G Benzathine, 1440 mg	Drug	35.44238

Drug or supply	Drug or supply	Unit cost (UAH)
Perthodine (cl)	Supply	2.79256
Phosphate enema	Supply	147.0778
Pipette tips	Supply	45.00014
Pipette, repeater	Supply	3.72363
Pipettes, fixed, 50 uL	Supply	3.72363
Portable slit lamp	Supply	70,500.00
Prednisolone, tablet, 20 mg	Drug	24.46
Prednisolone, tablet, 5 mg	Drug	4.12755
Protective shoes	Supply	1,480.00
Repeater tips	Supply	3.72363
Ring or band	Supply	0
Salbutamol inhaler, 100 mcg	Drug	0.92169
Saline solution	Drug	22.08014
Scalpel blade, disposable	Supply	6.51619
Senna, 7.5 mg tab	Drug	1.04264
Serum creatinine	Supply	200.1374
Simvastatin, 15 mg	Drug	4.51208
Skin preparatory solution, 500 ml vial	Supply	0.93075
Soap or hand sanitizer, 1L	Supply	1,023.96
Soft tissue marker/fiduciary clip	Supply	0
Specimen container	Supply	4.50011
Sponges	Supply	3.72363
Stable chlorine desinfectant, pack of 100 tablets	Supply	2,513.35
Sterile indicator tape, autoclave	Supply	198.2756
Sulfadiazine, 500 mg tab	Drug	4.99879
Sutures	Supply	61.43759
Syringe, 10 cc with needle	Supply	38.95709
Syringe, 5 cc with needle	Supply	51.84037
Syringe, needle + swab	Supply	4.65437
Syringes, single use, 20 ml	Supply	724.2184
Tamoxifen, 20 mg tablet	Drug	12.1013

Drug or supply	Drug or supply	Unit cost (UAH)
Test strips, urine analysis	Supply	2.79256
Tetracaine drops	Supply	94.67988
Theophylline 200mg SR	Drug	2.69942
Total bilirubin	Supply	33.69763
Trastuzamab, 1 mg	Drug	397.4822
Ultrasound gel	Supply	19.26914
Ultrasound probe cover	Supply	663.7116
Urine analysis	Supply	159.9999
Urine sugar analysis	Supply	120.0002
Urine test: Test for urine albumin excretion and albumin to creatinine ratio	Supply	230.00
Vaginal estrogen	Supply	1,861.74
Wire localization needle	Supply	7,162.13
Wound drainage kit	Supply	2,471.46
X-ray	Supply	0
X-ray film	Supply	59.57578
X-ray film chemistry	Supply	5.58512

Note: *Not all drugs/supplies are used for the included CVDs and diabetes-related interventions.*

Sources: *The price of a selection of drugs and supplies was informed by various internet sources [96], [97]Where Ukraine-specific prices were not available, we used the average % difference between OHT built-in prices and the prices that were available for Ukraine to adjust upwards (by 288%) OHT built-in prices.*

Table A.28: Annual salaries of human resources

Health service provider	Annual salary (UAH)	Annual increase (%)
Assistant nurses and midwives	162,000.00	3%
Clinical officers/surgical technicians	162,000.00	3%
Community health workers	51,432.13	3%
Emergency medical technicians	162,000.00	3%
Generalists/primary care doctors	240,000.00	3%
Laboratory technicians/assistants	162,000.00	3%
Midwives	162,000.00	3%
Nurses	162,000.00	3%
Nursing aides	162,000.00	3%
Ob\Gyns	240,000.00	3%
Other specialist doctors	240,000.00	3%
Pediatricians	240,000.00	3%
Pharmaceutical technicians/assistants	162,000,00	3%
Radiographers/X-ray technicians	162,000,00	3%
Health management and support personnel		
Clerical support workers	67,065.05	3%
Elementary occupations	67,065.05	3%
Health management personnel not elsewhere classified	67,065.05	3%
Health service managers	67,065.05	3%
Medical secretaries	67,065.05	3%
Non-health professionals not elsewhere classified	67,065.05	3%
Non-health technicians and associate professionals not elsewhere classified	67,065.05	3%
Plant and machine operators and assemblers	67,065.05	3%

Note: Not all human resources are used to deliver the included CVDs and diabetes-related interventions. For salary calculations, we assumed 14 holidays falling on normal working days in 2022 [137].

Sources: Clinical personnel salaries are per official decree [95]. We used OHT built-in salary data for health management and support personnel.

Table A.29: Cost per outpatient visit and inpatient day

Type of visit	Description	Cost (UAH)
Outpatient visit (2022)	1 visit to family doctor	786.65
Inpatient day (2022)	1 day of stay in the private hospital	2,245

Sources: Cost per outpatient day comes from official resolution [98]. Cost per inpatient day is from the literature [99].

ANNEX F : PDALYS IN BASELINE SCENARIO

Table A.30: Baseline Scenario: PDALYs (in thousands), 2022-2031

Cause/Year	4-year Total	10-year Total	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
1. Productivity Years Lost due to mortality (PYLLs) (work years to be realized during the investment period or beyond												
Lviv	247	502	50	49	49	49	50	50	50	51	51	52
Dnipro	289	580	58	58	58	58	58	58	58	58	59	58
Poltava	123	247	25	25	25	25	24	25	25	25	25	25
Rivne	122	249	24	24	24	25	25	25	25	25	26	26
Total	**781**	**1,579**	**156**	**156**	**156**	**156**	**156**	**157**	**158**	**159**	**161**	**163**
2. Productivity Years Lost due to mortality (PYLLs) (work years to be realized during the investment period or beyond												
Lviv	189	332	42	40	38	36	34	32	30	29	27	25
Dnipro	222	389	49	47	44	42	40	38	36	33	31	29
Poltava	95	167	21	20	19	18	17	16	15	14	13	12
Rivne	92	163	20	19	18	18	17	16	15	14	13	12
Total	**598**	**1,050**	**132**	**126**	**119**	**113**	**107**	**102**	**96**	**91**	**85**	**79**
3. Productivity Years Lived with Disability (PYLDs)												
Lviv	102	207	20	20	20	21	21	21	21	21	21	21
Dnipro	162	326	32	32	32	32	33	33	33	33	33	33
Poltava	68	137	14	14	14	14	14	14	14	14	14	14
Rivne	46	93	9	9	9	9	9	9	9	9	10	10
Total	**378**	**763**	**75**	**75**	**76**	**76**	**76**	**77**	**77**	**77**	**77**	**77**
4. PDALs (PYLLs + PYLDs) (PYLLS) to be realized during the investment period or beyond												
Lviv	349	708	70	70	70	70	70	71	71	72	72	73
Dnipro	451	907	90	90	90	90	90	90	91	91	92	92
Poltava	191	384	38	38	38	38	38	38	38	39	39	39
Rivne	168	342	33	33	34	34	34	34	35	35	35	36
Total	**1,159**	**2,342**	**231**	**232**	**232**	**232**	**232**	**233**	**235**	**237**	**238**	**240**

Cause/Year	4-year Total	10-year Total	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
5. PDALs (PYLLs + PYLDs) (PYLLS to be realized during the investment period only												
Lviv	291	539	62	60	58	56	55	53	51	50	48	46
Dnipro	384	715	81	79	77	74	72	70	68	66	64	62
Poltava	163	304	35	34	33	32	31	30	29	28	27	26
Rivne	138	256	29	28	28	27	26	25	25	24	23	22
Total	**975**	**1,813**	**207**	**201**	**195**	**189**	**183**	**178**	**173**	**168**	**162**	**156**

Sources: *Constructed by the authors using DALY results from OHT.*

ANNEX G : PDALYS AVERTED: INVESTMENT SCENARIO

Table A.31: Investment Scenario: PDALYs averted

Year	4-year Total	10-year Total	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
1. Productivity Years Lost due to mortality (PYLLs) (work years to be realized during the investment period only												
Lviv	18,262	46,468	0	3.643	4,401	4,927	5,292	5,564	5,705	5,743	5,684	5,511
Dnipro	23,277	56,442	0	4,922	5,688	6,180	6,487	6,681	6,752	6,736	6,618	6,378
Polta-va	9,826	23,650	0	2,095	2,410	2,590	2,732	2,793	2,818	2,804	2,755	2,653
Rivne	8,074	20,603	0	1.567	1,940	2,190	2,377	2,464	2,541	2,556	2,524	2,445
Total	**59,439**	**147,163**	**0**	**12,227**	**14,438**	**15,886**	**16,887**	**17,502**	**17,815**	**17,838**	**17,582**	**16,987**
2. Productivity Years Lost due to mortality (PYLLs) (work years to be realized during the investment period or beyond)												
Lviv	28,710	88,825	0	5,374	6,668	7.811	8.857	9.952	10.973	12.000	13.069	14.122
Dnipro	36,251	105,068	0	7,162	8,575	9.740	10.774	11.810	12.759	13.769	14.751	15.727
Polta-va	15,216	43,762	0	3,040	3,598	4.052	4.526	4.912	5.308	5.710	6.122	6.495
Rivne	12,736	39,395	0	2,318	2,944	3.481	3.993	4.387	4.886	5.338	5,796	6,251
Total	**92,913**	**277,050**	**0**	**17,894**	**21,785**	**25,084**	**28,149**	**31,062**	**33,926**	**36,817**	**39,738**	**42,595**
3. Productivity Years Lived with Disability (PYLDs)												
Lviv	65,571	163,833	0	15,471	16,068	16,688	17,345	18,056	18,820	19,631	20,459	21,296
Dnipro	87,491	214,290	0	20,820	21,522	22,218	22,930	23,695	24,497	25,341	26,196	27,075
Polta-va	37,085	90,636	0	8,826	9,126	9,419	9,715	10,031	10,360	10,704	11,051	11,405
Rivne	28,886	72,848	0	6,746	7,058	7,377	7,706	8,055	8,413	8,786	9,162	9,546
Total	**219,034**	**541,613**	**0**	**51,863**	**53,773**	**55,701**	**57,697**	**59,837**	**62,091**	**64,463**	**66,867**	**69,322**
4. PDALs (PYLLs + PYLDs) (PYLLS to be realized during the investment period or beyond)												
Lviv	94,281	252,658	0	20,844	22,736	24,499	26,203	28,008	29,793	31,631	33,527	35,417
Dnipro	123,742	319,364	0	27,983	30,097	31,958	33,704	35,506	37,256	39,110	40,974	42,802
Polta-va	52,301	134,398	0	11,866	12,723	13,471	14,241	14,943	15,668	16,414	17,173	17,900
Rivne	41,622	112,243	0	9,064	10,002	10,858	11,698	12,442	13,300	14,124	14,958	15,797
Total	**311,946**	**818,663**	**0**	**69,757**	**75,558**	**80,785**	**85,846**	**90,899**	**96,017**	**101.279**	**106.632**	**111.916**

Year	4-year Total	10-year Total	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
5. PDALs (PYLLs + PYLDs) (PYLLS to be realized during the investment period only												
Lviv	83,833	210,301	0	19,113	20,468	21,615	22,637	23,620	24,524	25,374	26,143	26,807
Dnipro	110,768	270,738	0	25,742	27,210	28,398	29,417	30,377	31,249	32,077	32,814	33,454
Poltava	46,912	114,286	0	10,921	11,535	12,008	12,447	12,824	13,178	13,508	13,806	14,058
Rivne	36,960	93,452	0	8,312	8,998	9,566	10,083	10,518	10,954	11,342	11,686	11,991
Total	**278,472**	**688,776**	**0**	**64,089**	**68,212**	**71,587**	**74,584**	**77,339**	**79,906**	**82,301**	**84,449**	**86,309**

Sources: Constructed by the authors from OHT.

ANNEX H : VALUE OF PDALYs AVERTED: INVESTMENT SCENARIO

Table A.32: Investment Scenario: Value of PDALYs resulting from policy interventions, by region (USD millions)

Year	4-year NPV	10-year NPV	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Method 1 : Value of PDALYs (work years to be realized during investment period only)												
Lviv	692	1,485	0	189	191	193	194	196	198	201	204	206
Dnipro	883	1,866	0	243	244	245	246	247	248	249	250	252
Poltava	392	829	0	108	109	109	109	110	110	111	111	112
Rivne	308	670	0	83	85	86	87	89	90	92	93	95
Total	**2,275**	**4,851**	**0**	**623**	**629**	**633**	**637**	**641**	**646**	**652**	**659**	**665**

Year	4-4ear NPV	10-4ear NPV	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Method 2 : Value of PDALYs (work years to be realized during investment period or beyond)												
Lviv	758	1.662	0	204	208	212	216	220	224	229	234	239
Dnipro	966	2.089	0	262	267	270	273	276	280	284	288	293
Poltava	429	928	0	116	118	120	121	123	125	126	128	130
Rivne	338	749	0	90	93	95	97	99	102	104	107	110
Total	**2,491**	**5,428**	**0**	**673**	**686**	**697**	**707**	**718**	**730**	**743**	**758**	**772**

Source: Constructed by the authors from OHT.

Table A.33: Investment Scenario: Value of PDALYs resulting from clinical interventions, by region

Year	4-year NPV	10-year NPV	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Method 1 : Value of PDALYs (work years to be realized during investment period only)												
Lviv	165	665	0	18	38	56	74	92	110	128	145	162
Dnipro	194	764	0	22	44	65	86	106	126	146	166	185
Poltava	84	330	0	10	19	28	37	46	54	63	71	80
Rivne	77	304	0	8	18	26	34	42	50	58	66	73
Total	**520**	**2,063**	**0**	**59**	**119**	**176**	**231**	**286**	**340**	**395**	**448**	**500**

Year	4-year NPV	10-year NPV	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Method 2 : Value of PDALYs (work years to be realized during investment period or beyond)												
Lviv	206	921	0	22	46	70	95	122	150	181	213	247
Dnipro	236	1,014	0	26	53	80	107	135	165	197	231	266
Poltava	102	436	0	11	23	34	46	58	71	85	99	114
Rivne	96	420	0	10	21	32	44	56	69	82	96	111
Total	**640**	**2,792**	**0**	**69**	**143**	**216**	**292**	**372**	**456**	**545**	**640**	**739**

Source: Constructed by the authors from OHT.

Table A.34 : Investment Scenario: Value of PDALYs resulting from policy and clinical interventions combined, by region

Year	4-year NPV	10-year NPV	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Method 1 : Value of PDALYs (work years to be realized during investment period only)												
Lviv	857	2,150	0	207	229	249	368	288	308	329	349	368
Dnipro	1,076	2,630	0	265	289	311	331	352	373	395	416	437
Poltava	476	1,160	0	118	128	137	146	155	164	174	183	192
Rivne	385	974	0	92	102	112	122	131	140	150	159	168
Total	2,794	6,914	0	682	748	809	868	927	987	1,047	1,106	1,165

Year	4-year NPV	10-year NPV	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Method 2 : Value of PDALYs (work years to be realized during investment period or beyond)												
Lviv	964	2,583	0	226	254	282	311	342	375	410	447	487
Dnipro	1,202	3,103	0	288	320	349	380	412	445	481	519	559
Poltava	531	1,364	0	128	141	145	168	181	196	211	227	244
Rivne	434	1.170	0	100	114	127	141	155	170	186	203	221
Total	3,131	8,219	0	742	829	913	999	1,090	1,186	1,288	1,397	1,511

Source: Constructed by the authors from OHT.

ANNEX I : RETURN ON INVESTMENT RESULTS BY REGION

Table A.35 : Return on investment results: Dnipro

NET PRESENT VALUE OF INVESTMENTS, USD MILLION

Intervention	Period	4-year	10-year
Prevention Intervention			
Tobacco cessation		2	3
Alcohol control		3	6
Diet and physical activity		1	1
Sodium		1	2
Total invervention costs		7	13

Clinical interventions for CVDs and diabetes			
Total clinical intervention costs		50	235
Total intervention costs		57	248

NET PRESENT VALUE OF ECONOMIC RETURNS, USD MILLION

Type of intervention	Period	4-year	10-year (a)	10-year (b)
Clinical interventions	194	764	1.014
Policy interventions	833	1,866	2,089
Total economic returns	1,076	2,630	3,103

a: The impact of health investments considered (both clinical and policy interventions) are those that are realized only during the 10-year horizon

b: The impacts of health investments considered (both clinical and policy interventions) are those that originate during the 10-year horizon even if they are realized partially beyond the 10-year horizon

Return on Investment			
Intervention	Period	4-year	10-year (a)	10-year (B)
Total	19,0	10,6	12,5

Table A.36 : Return on investment results: Lviv

NET PRESENT VALUE OF INVESTMENTS, USD MILLION

Intervention	Period	4-year	10-year
Prevention Intervention			
Tobacco cessation		1	3
Alcohol control		3	6
Diet and physical activity		0	1
Sodium		1	2
Total invervention costs		**5**	**11**

Clinical interventions for CVDs and diabetes		
Total clinical intervention costs	37	174
Total intervention costs	**42**	**185**

NET PRESENT VALUE OF ECONOMIC RETURNS, USD MILLION

Type of intervention	Period	4-year	10-year (a)	10-year (b)
Clinical interventions	165	665	921
Policy interventions	692	1,485	1,662
Total economic returns	**857**	**2,150**	**2,583**

a: The impact of health investments considered (both clinical and policy interventions) are those that are realized only during the 10-year horizon

b: The impacts of health investments considered (both clinical and policy interventions) are those that originate during the 10-year horizon even if they are realized partially beyond the 10-year horizon

Return on Investment			
Intervention	Period	4-year	10-year (a)	10-year (B)
Total	**20,2**	**11,6**	**13,9**

Table A.37 : Return on investment results: Poltava

NET PRESENT VALUE OF INVESTMENTS, USD MILLION

Intervention	Period	4-year	10-year
Prevention Intervention			
Tobacco cessation		1	1
Alcohol control		2	3
Diet and physical activity		0	0
Sodium		0	1
Total invervention costs		**3**	**6**

Clinical interventions for CVDs and diabetes		
Total clinical intervention costs	13	64
Total intervention costs	**16**	**70**

NET PRESENT VALUE OF ECONOMIC RETURNS, USD MILLION

Type of intervention	Period	4-year	10-year (a)	10-year (b)
Clinical interventions	84	330	436
Policy interventions	392	829	928
Total economic returns	**476**	**1,160**	**1,364**

a: The impact of health investments considered (both clinical and policy interventions) are those that are realized only during the 10-year horizon

b: The impacts of health investments considered (both clinical and policy interventions) are those that originate during the 10-year horizon even if they are realized partially beyond the 10-year horizon

Return on Investment			
Intervention	Period	4-year	10-year (a)	10-year (B)
Total	**29,9**	**16,5**	**19,4**

Table A.38 : Return on investment results: Rivne

NET PRESENT VALUE OF INVESTMENTS, USD MILLION

Intervention	Period	4-year	10-year
Prevention Intervention		
Tobacco cessation	1	1
Alcohol control	1	2
Diet and physical activity	0	0
Sodium	0	1
Total invervention costs	**2**	**5**

Clinical interventions for CVDs and diabetes		
Total clinical intervention costs	15	74
Total intervention costs	**18**	**79**

NET PRESENT VALUE OF ECONOMIC RETURNS, USD MILLION

Type of intervention	Period	4-year	10-year (a)	10-year (b)
Clinical interventions	77	304	420
Policy interventions	308	670	749
Total economic returns	**385**	**974**	**1.170**

a: The impact of health investments considered (both clinical and policy interventions) are those that are realized only during the 10-year horizon

b: The impacts of health investments considered (both clinical and policy interventions) are those that originate during the 10-year horizon even if they are realized partially beyond the 10-year horizon

Return on Investment			
Intervention	Period	4-year	10-year (a)	10-year (B)
Total	**21,7**	**12,3**	**14,8**

ANNEX J : COMPARISON: EX-ANTE CEA AND INVESTMENT CASE RESULTS

There are significant methodological differences between the ex-ante CEA and the present investment case, which makes comparing results difficult. These range from the regions and activities included, which intervention costs were included and how they were estimated and methods for determining and valuing the number of DALYs averted.

Table A.39 : Comparison: ex-ante CEA and investment case results

Scenario	Element	Ex-ante CEA*	NCD investment case
Baseline	BOD (DALYs)	All Ukraine: 2.9-7.2 million Four project regions (18% of national population): 528,705-1.3 million**	4.9 million (1 million in 2022)
Investment	Activities included and geographical scope	Act4Health-implemented activities in five regions	Act4Health implemented and NCD NAP activities in four regions
	Intervention costs	Project budget: CHF 4.41 million (approx. USD 4.0 million)	Modelled OHT results: USD 17 million policy interventions (4 years) USD 116 million clinical interventions (4 years)
	DALYs averted	Target: 69,558-96,750 (5% reduction)**	539,509 (4 years) PDALYs = 278,472-311,946 (4 years)
	Monetary valuation of DALYs averted	GDP/capita of Ukraine 2018: CHF 3,173 (approx. USD 2,900)	Only PDALYs, GDP/employed person USD 10,431 (adjusted for inflation and population in years 2-4)
	Economic benefits	DALYs averted x GDP/capita: 220.7-307.0 million CHF	PDALYs averted x GDP/employed person: Clinical interventions: USD 520 million Policy interventions: USD 2.3 billion Total: $2,592 million
	ROI	50.1-69.6	21.0

Note: All results are for four years unless noted.
CHF = Swiss franc. USD = US dollar
* Originally estimated results in five project regions; results are for five regions except where noted.
** Unclear if this refers to single year or four-year total.

Sources: Authors, based on [106] and investment case results.

Figure A.11: Alcohol-Control-Specific-Theory-of-Change

Problem	Planning and preparation	Activities carried out by Act4Health project (*)	and as part of Government´s NCD NAP (**)	Outputs	Health outcomes	Impact (10 years)

Alcohol use is a direct cause of both CVDs and diabetes

Without further intervention, **500,000** persons will die from CVDs and diabetes over 10 years and **2 million years of life will be lost to disability**

CVDs and diabetes would cause **US$ 18-23 billion in economic losses** over 10 years

Planning and preparation

- Develop national action plan (NAP)
- Cost and finance NAP
- Appoint key staff positions for NCD prevention and control
- Form and regularly convene multi-sectoral working groups to develop and enact implementation plans for different aspects of NAP
- Find and work with political and social champions for NCDs
- Arrange any necessary technical assistance

Implementation cost: at least **US$18M** over 10 years

Policy interventions

- Better enforce drink driving laws (soberity checks) (**) — N
- Strengthen liability for drunk drivers (**) — O
- Better enforce restrictions on alcohol advertising and availability to retail alcohol (**) — B
- Introduce fisacl measures (e.g. taxes) to discourage purchase of alcohol (**) — C
- Develop and roll-out behavioral change communication in community and schools about excessive alcohol consumption (*/**) — D
- Educate drivers about risks of driving under influence of alcohol (*/**) — P

Clinical interventions

- Develop and utilize better educational materials for training current and future HCW (*/**) — G
- Develop and rollout counselling guidelines on NCD prevention for use by HCW (**) — H

Outputs

- Alcohol products are more expensive and less attractive to consumers.
- Fewer existing alcohol users drink in public spaces.
- There are fewer road traffic accidents as a result of drink driving.
- Existing alcohol users receive support to quit drinking
- People are exposed to less alcohol-related advertising and more messages promoting healthy living including not drinking or drinking less.
- Current and future healthcare workers are better trained in identifying risk factors for NCDs and counselling on reducing alcohol consimption.

Health outcomes

- People consume less alcohol or quit drinking altogether.

Reduced prevalence of alcohol use — T

Reduced incidence of CVD and diabetes — J

Reduced prevelance of CVDs and diabetes — K

Reduced severity of CVDs and diabetes — L

Impact

Over 10 years alcohol-related interventions contribute to **averting over 40,000 strokes and 57,000 cases of ischemic heart disease, over 56,000 deaths and over a million healthy life years are gained** as a result of reduced morbidity.

Overall, the BOD from CVDs and diabetes is reduced by 29% over the period 2022-2031 — M

Alcohol-related interventions contribute to economic gains of **US$ 6.9 - 8.2 billion**

Ongoing monitoring and evaluation

Legend

- Health burden
- Economic burden
- Planning and preparation
- CVDs and diabetes clinical intervention
- Policy intervention
- Risk factor or behavior
- Targeted NCDs (CVDs and diabetes)
- Costs and impacts modelled by OHT

*Carried out by Act4Health Project
**Part of National Action Plan (NAP)

- A — Refers to indicators

- Legal
- Media
- Financial
- Community
- Healthcare (HC) delivery
- HCW training

Acronyms

BCC	- Behavioral change communication
BOD	- Burden of disease
CVD	- Cardiovascular disease
DALYs	- Disability-adjusted life years
HC	- Health care
HCW	- Health care worker
M	- Millions (of US$)
NAP	- Government of Ukraine's National Action Plan to Achieve the Sustainable Development Goals
NCD	- Non-communicable disease
OHT	- OneHealth Tool
SDGs	- Sustainable Development Goals
TOC	- Theory of change
US$	- United States dollar

Figure A.12: Tobacco-Control-Specific-Theory-of-Change

Problem	Planning and preparation	Activities carried out by Act4Health project (*)	and as part of Government´s NCD NAP (**)	Outputs	Health outcomes	Impact (10 years)

Tobacco use is a direct cause of both CVDs and diabetes

Without further intervention, **500,000** persons will die from CVDs and diabetes over 10 years and **2 million years of life will be lost to disability**

CVDs and diabetes would cause **US$18-23 billion in economic losses** over 10 years

Planning and preparation
- Develop national action plan (NAP)
- Cost and finance NAP
- Appoint key staff positions for NCD prevention and control
- Form and regularly convene multi-sec toral working groups to develop and enact implementation plans for different aspects of NAP
- Find and work with political and social champions for NCDs
- Arrange any neces sary technical assistance

Implementation cost: at least **US$9M** over 10 years

Policy Interventions

⚖️ Develop and introduce stronger warning labes on tobacco products (**)   **A**

⚖️ Better enforce public smoking laws, advertising bans and restrictions on sales (**)   **B**

⚖️ Introduce fiscal measures (e.g. taxes) to discourage purchase of tobacco (**)   **C**

⚖️ Develop and roll-out behavioral change communication in community and schools about tobacco use (*/**)   **D**

⚖️ Develop and launch tobacco cessation hotline, website and mobile application (*/**)   **E**

👥 Introduce healthy workplace approach for NCD prevention at companies (*/**)   **F**

Clinical Interventions

🎓 Develop and utilize better educational materials for training current and future HCW (*/**)   **G**

👨‍⚕️ Develop and rollout counselling guidelines on NCD prevention for use by HCW (**)   **H**

Outputs
- Tobacco products are more expensive and less attractive to consumers.
- Fewer existing smokers smoke in public spaces.
- Existing smokers receive support to quit smoking.
- People are exposed to less tobacco-related advertising and more messages promoting healthy living including not smoking
- Employees work in healthy workplaces.
- Current and future healthcare workers are better trained in identifying risk factors for NCDs and counselling on tobacco cessation.

Health outcomes
- Fewer people including children start to smoke
- Existing smokers smoke less.
- More people quit smoking.
- Smokers and non-smokers live healthier lives.

Reduced prevalence of tobacco use   **T**

Reduced incidence of CVD and diabetes   **J**

Reduced prevalence of CVDs and diabetes   **K**

Reduced severity of CVDs and diabetes   **L**

Impact (10 years)

Over 10 years tobacco-related interventions contribute to **averting over 40,000 strokes and 57,000 cases of ischemic heart disease, over 56,000 deaths and over a million healthy life years are gained** as a result of reduced morbidity.

Overall, the BOD from CVDs and diabetes is reduced by 29% over the period 2022-2031   **M**

Tobacco-related interventions contribute to economic gains of **US$6.9 - 8.2 billion**

Ongoing monitoring and evaluation

Legend

- 🔵 Health burden
- 🟢 Economic burden
- 🩷 Planning and preparation
- 🟣 CVDs and diabetes clinical intervention
- 🟡 Policy intervention

- 🔘 Risk factor or behavior
- 🔴 Targeted NCDs (CVDs and diabetes)
- ⬚ Costs and impacts modelled by OHT

*Carried out by Act4Health Project
**Part of National Action Plan (NAP)

A Refers to indicators

- ⚖️ Legal
- 🖥️ Media
- 💰 Financial
- 👥 Community
- 👨‍⚕️ Healthcare (HC) delivery
- 🎓 HCW training

Acronyms

BCC - Behavioral change communication
BOD - Burden of disease
CVD - Cardiovascular disease
DALYs - Disability-adjusted life years
HC - Health care
HCW - Health care worker
M - Millions (of US$)
NAP - Government of Ukraine's National Action Plan to Achieve the Sustainable Development Goals
NCD - Non-communicable disease
OHT - OneHealth Tool
SDGs - Sustainable Development Goals
TOC - Theory of change
US$ - United States dollar

Figure A.13: Physical Activity and Healthy Eating-Specific Theory of Change

Problem	Planning and preparation	Activities carried out by Act4Health project (*)	and as part of Government´s NCD NAP (**)	Outputs	Health outcomes	Impact (10 years)

Problem

Physical inactivity and unhealthy eating (including high sodium consumption) are direct causes of both CVDs and diabetes

Without further intervention, **500,000** persons will die from CVDs and diabetes over 10 years and **2 million years of life will be lost to disability**

CVDs and diabetes would cause **US$ 18-23 billion in economic losses** over 10 years

Planning and preparation

- Develop national action plan (NAP)
- Cost and finance NAP
- Appoint key staff positions for NCD prevention and control
- Form and regularly convene multi-sec toral working groups to develop and enact implementation aspects of NAP
- Find and work with political and social champions for NCDs
- Arrange any neces sary technical assistance

Implementation cost: at least **US$ 9M** over 10 years

Activities carried out by Act4Health project (*)

Policy interventions

- Draft law regulating the content of trans fats in food products (**) — Q
- Strengthen laws on salt, sugar and saturated fats food labelling (**) — R
- Strengthen legal limits on food product advertising for unhealthy food products (**) — B
- Work with food producers to reduce sugar, sodium and saturated fat content (**) — S
- Develop and submit draft law on taxation of unhealthy food products (**) — C
- Develop and roll-out behavioral change communication in community and schools (*/**) — D
- Include physical activity facilities in urban planning proposals (**) — T
- Provide free acces to population to public recreational facilities (**) — U
- Support programs to ensure healthy nutritional offerians in educational institutions (**) — V
- Implement measure to reduce nutrient and vitamin deficiencies in the population (**) — W
- Implement safe and healthy school environment strategy in schools (*/**) — X
- Implement healthy lifestyle / NCD prevention programs at education institutions (*/**) — Y
- Introduce healthy workplace approach for NCD prevention at companies (*) — F
- Develop and introduce in schools standards for physical activity for children (**) — Z

and as part of Government´s NCD NAP (**)

Clinical interventions

Develop and utilize better educational materials for training current and future HCW (*/**) — G

Develop and rollout counselling guidelines on NCD prevention for use by HCW (**) — H

Outputs

- Increased regulation limits unhealthy options in the marketplace and allows consumers to make healthier options
- Unhealthy products such as sugar-sweetened beverages and high sodium content foods are more expensive and less attractive to consumers.
- Healthier food options are availabe in schools and workplaces.
- People have more opportunities to engare in physical activity
- Current and future healthcare workers are better trained in identifying risk factors for NCDs and counselling on healthy behaviors.

Health outcomes

- People are more physically active and consume less salt, sugar and saturated fat.
- People achieve and maintain a healthy body mass index.

Reduced prevalence of physical inactivity and unhealthy eating

Reduced incidence of CVD and diabetes — J

Reduced prevalence of CVDs and diabetes — K

Reduced severity of CVDs and diabetes — L

Impact (10 years)

Over 10 years physical activity and healthy eating-related interventions contribute to **averting over 40,000 strokes and 57,000 cases of ischemic heart disease, over 56,000 deaths and over a million healthy life years are gained** as a result of reduced morbidity.

Overall, the BOD from CVDs and diabetes is reduced by 29% over the period 2022-2031 — M

Tobacco-related interventions contribute to economic gains of **US$6.9 - 8.2 billion**

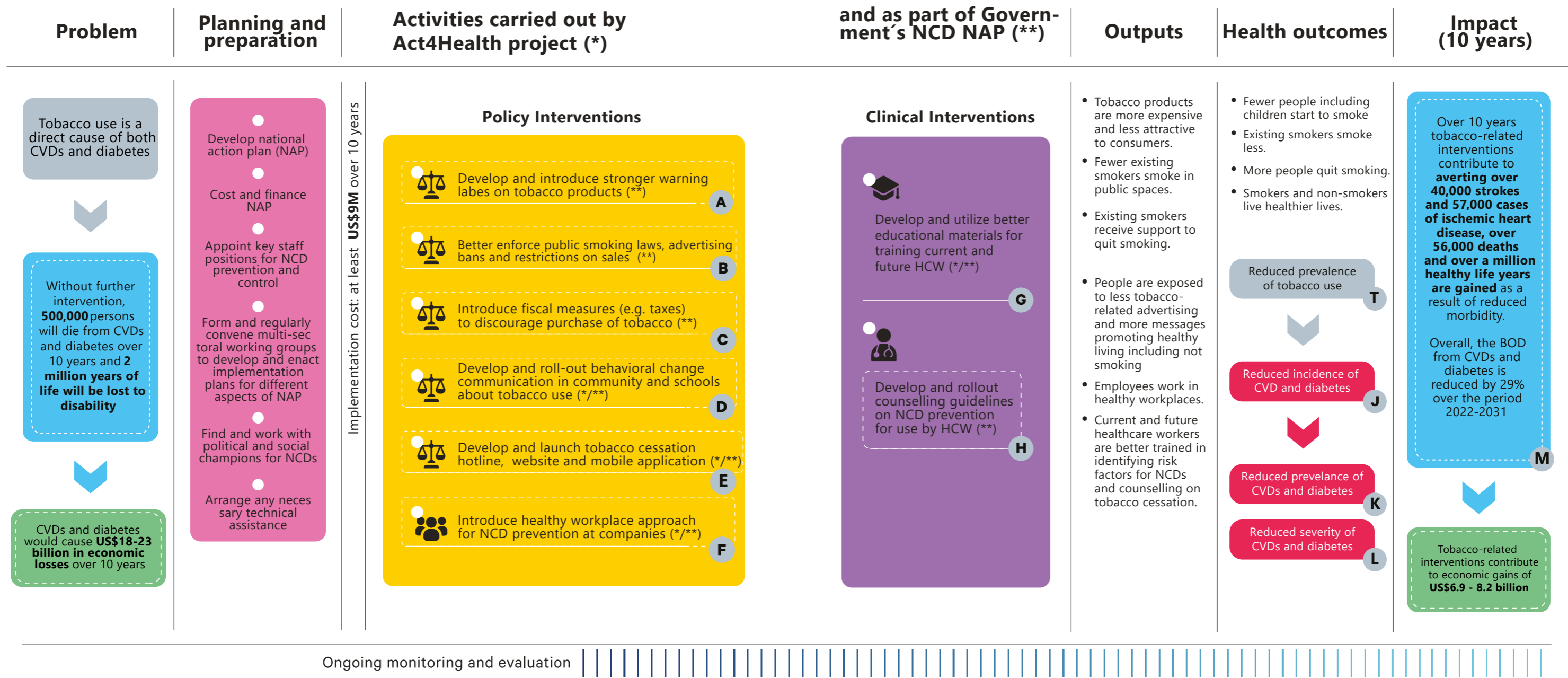Ongoing monitoring and evaluation

Legend

- Health burden
- Economic burden
- Planning and preparation
- CVDs and diabetes clinical intervention
- Policy intervention
- Risk factor or behavior
- Targeted NCDs (CVDs and diabetes)
- Costs and impacts modelled by OHT
- *Carried out by Act4Health Project
- **Part of National Action Plan (NAP)
- A Refers to indicators
- ⚖️ Legal
- 🖥️ Media
- 💰 Financial
- 👥 Community
- 🧑‍⚕️ Healthcare (HC) delivery
- 🎓 HCW training

Acronyms

BCC	- Behavioral change communication
BOD	- Burden of disease
CVD	- Cardiovascular disease
DALYs	- Disability-adjusted life years
HC	- Health care
HCW	- Health care worker
M	- Millions (of US$)
NAP	- Government of Ukraine's National Action Plan to Achieve the Sustainable Development Goals
NCD	- Non-communicable disease
OHT	- OneHealth Tool
SDGs	- Sustainable Development Goals
TOC	- Theory of change
US$	- United States dollar

Figure A.14: Theory of Change for Clinical Interventions

Problem	Planning and preparation	Activities carried out by Act4Health project (*) and as part of Government's NCD NAP (**)	Outputs	Health outcomes	Impact (10 years)

Clinical interventions

Problem

Many persosns with or at high risk of CVDs and diabetes do not receive adequate clinical care resulting in higher incidence or greater severity of these conditions

Without further intervention, **500,000** persons will die from CVDs and diabetes over 10 years and **2 million years life will be lost to disability**

CVDs and diabetes would cause **US$18-23 billion in economic losses** over 10 years

Planning and preparation

Develop national action plan (NAP)

Cost and finance NAP

Appoint key staff positions for NCD prevention and control

Form and regularly convene multi-sectoral working groups to develop and enact implementation aspects of NAP

Find and work with political and social champions for NCDs

Arrange any necessary technical assistance

Activities carried out by Act4Health project (*) and as part of Government's NCD NAP (**)

Implementation cost: at least **US$548M** over 10 years

1. Improve equity in financing and access to care across rural and urban areas (**)
2. Screen population for risk of CVDs /diabetes
3. Treat high cholesterol and blood pressure (**)
4. Treat new cases of acute myocardial infarction and established cases of CVD, post-stroke and ischaemic heart disease (**)
5. Provide standard and intensive glycemic control (**)
6. Screen and treat diabetes patients for retinopathy and neuroapthy (**)
7. Develop and utilize better education materials for training current and future HCW (*/**)
8. Develop and rollout counselling guidelines on NCD prevention for use by HCW (*/**)
G. Develop and utilize better educational materials for training current and future HCW (*/**)
H. Develop and rollout counselling guidelines on NCD prevention for use by HCW (**)

Outputs

- Patients know their risk for CVDs and diabetes and take actions to change their behaviors
- Patients with CVDs and diabetes receive higher quality care for their conditions.
- Healthcare workers have better access to patient histories, improving quality of care
- Current and future healthcare workers are better trained preventionn and managment of NCDs

Health outcomes

Reduced incidence of CVD and diabetes **J**

Reduced prevelance of CVDs and diabetes **K**

Reduced severity of CVDs and diabetes **L**

Impact (10 years)

Over 10 years clinical interventions contribute to **averting over 40,000 strokes and 57,000 cases of ischemic heart disease, over 56,000 deaths and over a million healthy life years are gained** as a result of reduced morbidity.

Overall, the BOD from CVDs and diabetes is reduced by 29% over the period 2022-2031 **M**

Tobacco-related interventions contribute to economic gains of **US$6.9 - 8.2 billion**

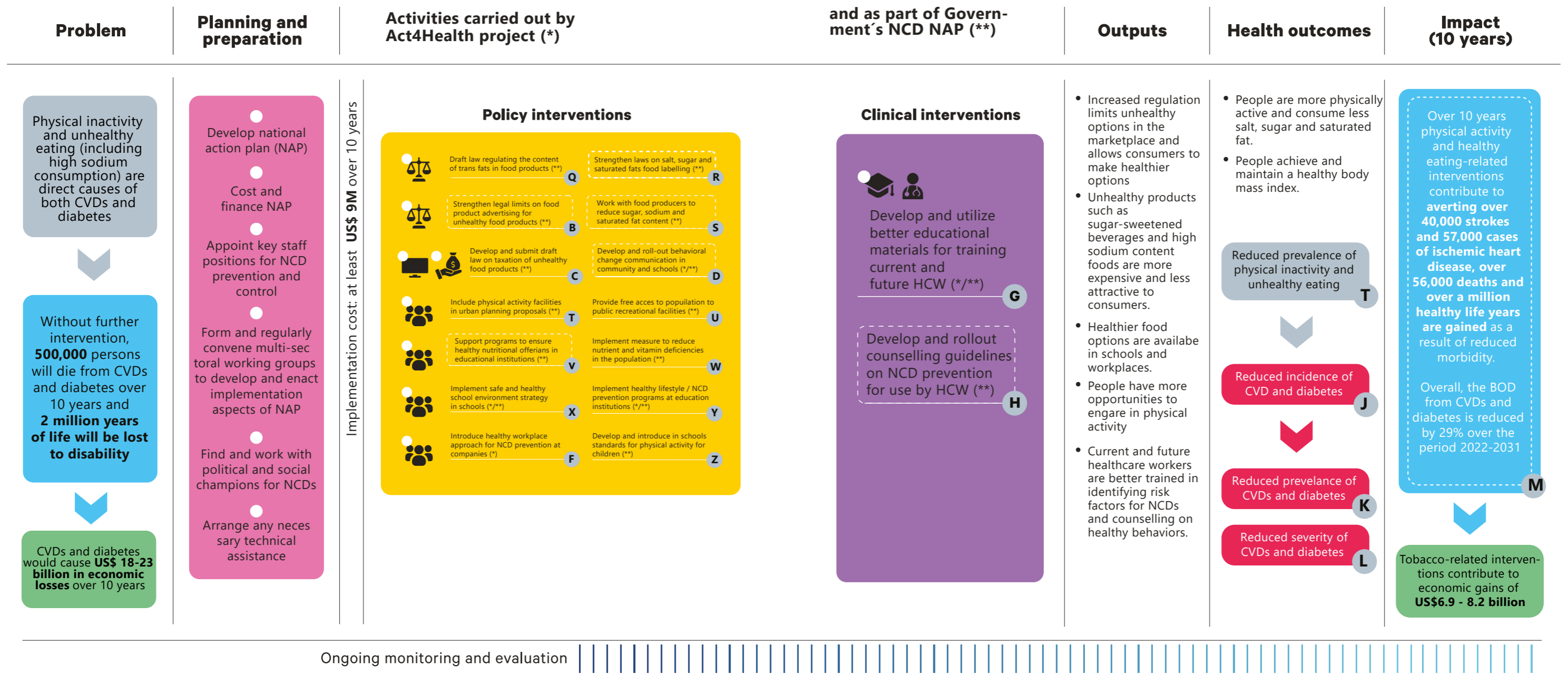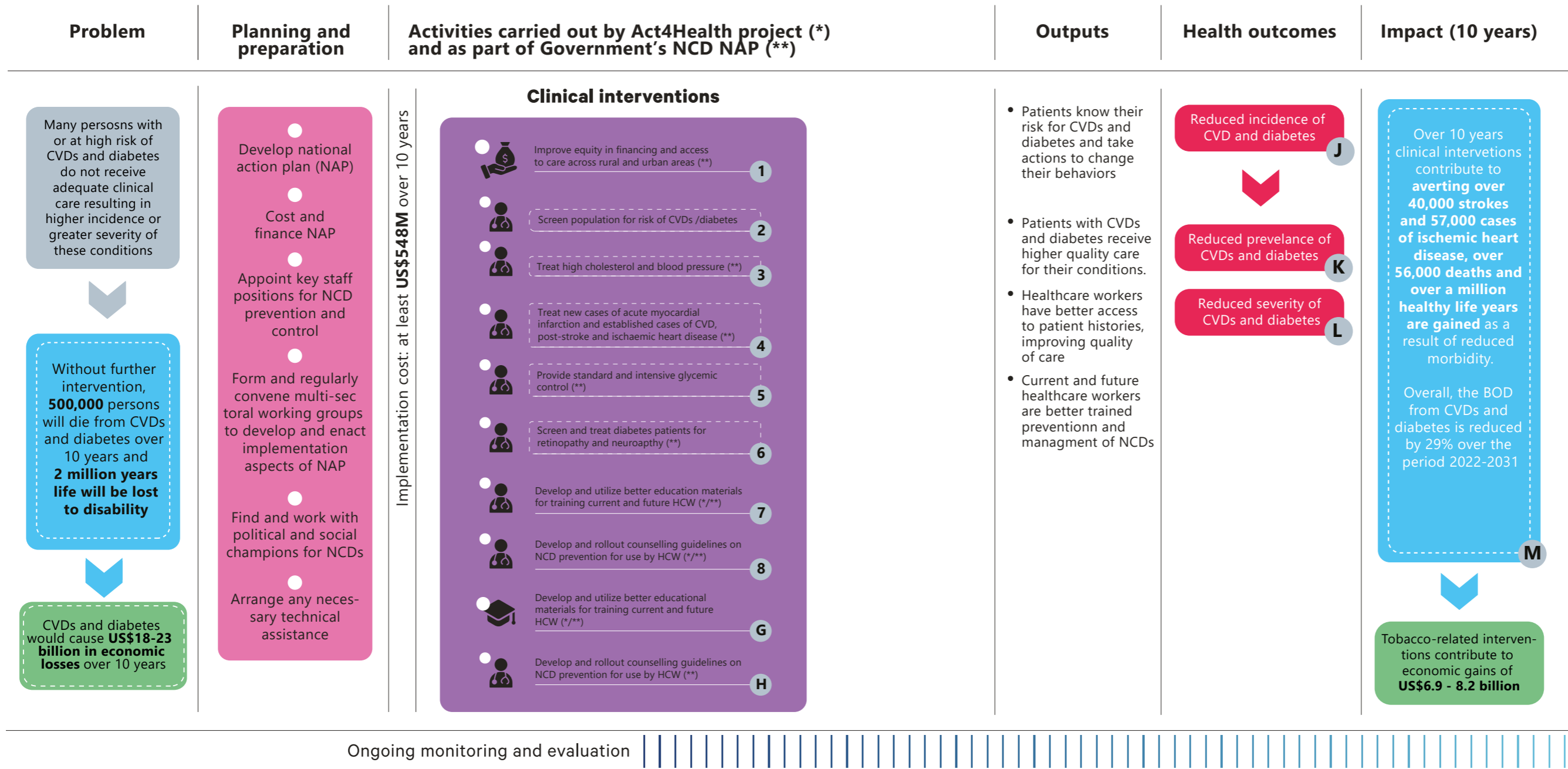Ongoing monitoring and evaluation

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Legend

- Health burden
- Economic burden
- Planning and preparation
- CVDs and diabetes clinical intervention
- Policy intervention

- Risk factor or behavior
- Targeted NCDs (CVDs and diabetes)
- Costs and impacts modelled by OHT

*Carried out by Act4Health Project
**Part of National Action Plan (NAP)

A Refers to indicators

- Legal
- Media
- Financial
- Community
- Healthcare (HC) delivery
- HCW training

Acronyms

BCC	- Behavioral change communication
BOD	- Burden of disease
CVD	- Cardiovascular disease
DALYs	- Disability-adjusted life years
HC	- Health care
HCW	- Health care worker
M	- Millions (of US$)
NAP	- Government of Ukraine's National Action Plan to Achieve the Sustainable Development Goals
NCD	- Non-communicable disease
OHT	- OneHealth Tool
SDGs	- Sustainable Development Goals
TOC	- Theory of change
US$	- United States dollar

Table A.40: Suggestive Process Indicators for Policy and Clinical Interventions

Code	TOC/ Package of interventions	Intervention/ action	Process indicator (A-H)	Data sources for process (project to complete)
A	Tobacco	Develope and introduce stronger warning labels on tobacco products	Warning labels introduced	
B	Tobacco, alcohol	Better enforce public smoking laws, advertising bans on tobacco/ alcohol and restrictions on sales of tobacco/ alcohol and stregthen legal limits on food product advertising for unhealthy products	Number of enforcement actions taken Number of citations for breaking law/ban/ restriction	
C	Tobacco, alcohol, physical inactivity and unhealthy eating	Introduce fiscal measure (e.g. taxes) to discourage consumption of unhealthy products	Passage of (increased) tobacco tax Drafting and submission of law on taxation of unhealthy food products	
D	Tobacco, alcohol, physical inactivity and unhealthy eating	Develop and roll-out behavioral change communication (BCC) in community and schools about risk factors	BCC materials developed and introduced for at least three different audiences X% school children 10-18 y.o. covered by BCC and health promotion interventions in target regions # men and women reached by gender-specific BCC interventions (including children, people in business sector) # stakeholders implemented community-based advocacy and BCC interventions (total, by type of stakeholders and community)	
E	Tobacco	Develop and launch tobacco cessation hotline, website and mobile application	Tobacco cessation hotline /website/mobile app developed/updated / launched Number of callers/ visitors / active users	
F	Tobacco, physical inactivity and unhealthy eating	Introduce healthy workplace approach for NCD prevention at companies	Guidance for companies on healthy workplace approach developed X companies signed up to introduce healthy workplace approach X companies implement healthy workplace approach X employees benefit from healthy workplace approach	
G	Tobacco, alcohol, physical inactivity and unhealthy eating, clinical interventions	Develop and utilize better educational materials for training current and future healthcare workers (HCW), including motivational interviewing	Training package with 15 e-modules developed or improved Educational materials utilized at X% of training institutes Educational materials incorporated in X% of continuing medical education offerings X staff strengthened their knowledge and skills due to trainings X% improvement in HCW skills across all domains X facilities participate in capacity building program and implement models of care to meet the needs of people at risk of and with NCDs	
H	Tobacco, alcohol, physical inactivity and unhealthy eating, clinical interventions	Develop and rollout counselling guidelines on NCD prevention for use by HCW	National guidelines/protocols developed, approved and distributed X facilities implement protocols X% adherence to national guidelines by HCW	
N	Alcohol	Better enforce drunk driving laws (sobreity checks	Number of sobriety checks conducted	
O	Alcohol	Strengthen liability for drunk drivers		
P	Alcohol	Educate drivers about risks of driving under infulence of alcohol	Number of education campaigns launched Number of drivers reached with educational messages	

Code	TOC/ Package of interventions	Intervention/ action	Process indicator (A-H)	Data sources for process (project to complete)
Q	Physical inactivity and unhealthy eating	Draft law regulating the content of trans fats in food products	Drafting of law regulating the content of trans fats in food products	
R	Physical inactivity and unhealthy eating	Strengthen laws on salt, sugar and saturated fats food labelling	Strengthening of laws on food labelling	
S	Physical inactivity and unhealthy eating	Work with food producers to regulate sugar, sodium and saturated fat content in food products	Number of food producers who reduce sugar, sodium and saturated fats content in food products Number of food products with regulated sugar, sodium and/or saturated fat content In products reducing sugar content: X% reduction in sugar content In products reducing sodium content: X% reduction in sodium In products reducing saturated fats content: X% reduction in saturated fats	
T	Physical inactivity and unhealthy eating	Include physical activity facilities in urban planning proposals	% new urban planning proposals that include physical activity facilities	
U	Physical inactivity and unhealthy eating	Provide free acess to population to public recreational facilities	% public recreational facilities with no usage charges X% increase in use of recreational facilities	
V	Physical inactivity and unhealthy eating	Support programs to ensure healthy nutritional offerings in educational institutions	Number of educational institutions offering healthier nutrition options	
W	Physical inactivity and unhealthy eating	Implement measures to reduce nutrient and vitamin deficiencies in the population	Number of measures to reduce nutrient and vitamins deficiencies introduced	
X	Physical inactivity and unhealthy eating	Implementing safe and healthy school environment strategy	Number of schools implementing safe and healthy school environment strategy	
Y	Physical inactivity and unhealthy eating	Implement healthy lifestyle / NCD prevention programs at education institutions	Number of educational institutions implementing healthy lifestyle / NCD prevention programs	
Z	Physical inactivity and unhealthy eating	Develop and introduce in schools standards for physical activity for children	Number of schools introducing standards for physical activity for children Number of schools complying with standards for physical activity for children	
1	Clinical intervention	Improve equity in financing and access to care across rural and urban areas	Expediture per capita by region and by urban/ rural area Coverage by region and by urban/rural area	
2	Clinical intervention	Screen population for risk of CVDs/ diabetes	X% high risk adult population aged 40+ screened for risk of CDVs/diabetes	
3	Clinical intervention	Treat high colesterol and blood pressure	X% patients with high cholesterol who have cholesterol levels controlled X% patients with high blood pressure who have blood pressure controlled	
4	Clinical intervention	Treat new cases of acute myocardial infraction and established cases of CVD, post stroke and ischaemic heart disease	X% population in need receiving treatment at PHC level X% population in need receiving treatment at secondary/tertiart level	

Code	TOC/ Package of interventions	Intervention/ action	Process indicator (A-H)	Data sources for process (project to complete)
5	Clinical intervention	Provide standard and intensive glycemic control	• X% diabetics receiving regluar glycemic managment at PHC level • X% diabetics with HbA1c within desired range	
6	Clinical intervention	Screen and treat diabetes patients for retinopathy and neuropathy	• X% diabetes patients screened for retinopathy • X% diabetes patients screened for neuropaty • % diabetes patients referred for additional care for retinopathy • % diabetes patients referred for additional care for neuropathy	
7	Clinical intervention	Develop and utilize better educational materials for training current and future HCW	• Improved educational materials developed • % current healthcare workers trained with improved educational materials • % future healthcare workers trained with improved educational materials	
8	Clinical intervention	Develop and rollout electronic medical records for improved care of NCD patients	• Electronic medical records developed • Electronic medical records piloted in X facilities	

Sources: Constructed by the authors.

Table A.41: Suggestive Output and Outcome Indicators for Policy and Clinical Interventions

Code	Theory of change	Output and outcome indicators	Data sources for process (project to complete)
J	Tobacco, alcohol, physical inactivity and unhealthy eating, clinical interventions	Reduce incidence of CVD and diabetes	
K	Tobacco, alcohol, physical inactivity and unhealthy eating, clinical interventions	Reduce prevalence of CVD and diabetes	
L	Tobacco, alcohol, physical inactivity and unhealthy eating, clinical interventions	Reduce severity of CVD and diabetes	

Sources: Constructed by the authors.

Table A.42 : Suggestive Impact Indicators for Policy and Clinical Interventions

Code	Theory of change	Impact indicators (M) and data sources	Data sources for process (project to complete)
M	Tobacco, alcohol, physical inactivity and unhealthy eating, clinical interventions	• Number of strokes averted • Number of cases of ischemic heart diseae averted • Number of averted deaths • Healthy life years gained • Reduction in burden of disease	

Sources: Constructed by the authors.

ANNEX L : DATA, MODELLING AND ANALYSIS FILES (OHT, MICROSOFT EXCEL)

See supplementary files

NOTES

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