

# Prevention and control of noncommunicable diseases in Mongolia

## The case for investment



# The Investment Case for Noncommunicable Disease Prevention and Control in Mongolia

Return on Investment Analysis & Institutional Context Analysis

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## Executive Summary

Cardiovascular disease (CVD) is a major component of the non-communicable disease burden in Mongolia. High consumption of tobacco, alcohol, and salt, along with high levels of metabolic risk— such as high systolic blood pressure and serum total cholesterol—increase the risk of CVD events (e.g., stroke or heart attacks), and deaths due to CVD-related causes.

Many CVD deaths occur in individuals younger than age 70, highlighting the need for interventions that can accelerate progress in Mongolia toward target 3.4 of the Sustainable Development Goals, which aims to reduce premature mortality from NCDs in 2030 by one-third. Beyond the toll on health, NCDs also have economic costs that are associated with losses in productivity due to premature mortality, missed days of work due to illness (absenteeism), and/or the inability to be fully productive at work due to disease complications (presenteeism).

We undertook an economic analysis to ascertain the return on investment (ROI) from implementing interventions to reduce CVD risk factors. Interventions were drawn from the list of WHO-recommended interventions in Appendix 3 (Rev.) of the NCD Global Action Plan 2013-2020 [1]. Consultations with Mongolia's Ministry of Health during a UNIATF-led mission to Mongolia in September 2016 identified 10 policy-level interventions that target tobacco, alcohol, and salt consumption for analysis. We also analyzed clinical interventions, including three primary prevention interventions to treat those with high CVD risk, high blood pressure, and high cholesterol. These interventions are grouped into four “packages” specific to each of the three risk factors plus CVD management. The economic analysis is complemented by an institutional and context analysis that considers factors that could influence policy choices, as well as the implementation of the four intervention packages.

We used the WHO OneHealth Tool (OHT) to estimate an epidemiological baseline given existing policies in Mongolia, and the effects of introducing the selected interventions on reducing disease over a 15-year time frame. Using the OHT and the WHO CHOICE costing tool, we estimate the yearly cost of implementing and enforcing each intervention. Finally, we translate the expected health benefits—avoided incidence and deaths—into economic gains from the labor productivity gained from the expected improvements in health.

Implementing the intervention packages would result in significant health and economic benefits. The packages are projected to:

- **Save lives and reduce the incidence of disease.** Between them, the packages would save 19,454 lives over a 15-year period, with salt reduction responsible for more than half of deaths averted. Implementing just three tobacco control interventions would avoid about four percent of all tobacco related deaths over the same time frame.
- **Increase the productivity of the workforce, adding to GDP.** Taken together, the health interventions would drive over 2.4 trillion MNT (\$US 990 million)<sup>1</sup> in productivity gains over 15 years, a direct result of decreased numbers of Mongolians 1) dropping out of the workforce due to premature mortality, 2) missing days of work, and 3) working at a reduced capacity due to poor health. The average annual productivity benefits of the CVD primary prevention (49.9 billion MNT), tobacco (7.5 billion), alcohol (12.4 billion), and salt packages (81.6 billion) are equivalent to about one percent of Mongolia's 2015 GDP.
- **Provide benefits that significantly outweigh the costs, over the long run.** Comparing the costs and benefits of each package of interventions, we find that all four categories of interventions—1) tobacco control policies, 2) alcohol policies, 3) salt policies, and 4) CVD clinical interventions—have positive returns over 15 years. Salt interventions have the highest return on investment: for every Tugrik invested in the package of salt interventions, one can expect to see 16.9 Tugriks in return over a 15-year period. The alcohol package has the next highest ROI (13.6), followed by tobacco control (13.0), and the CVD clinical-intervention package (3.0), each calculated over a 15-year scale-up period.

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<sup>1</sup> Exchange rate 2,423.2 MNT to 1 USD, Mongolia Bank – Official exchange rate 4/25/2017

The long-term ROI discounts costs and benefits at 3% per year. Since benefits arise in the future and costs of new policies are immediate, the short-term ROI is lower than long-term ROI. In the short-term, investments in two out of four packages (alcohol and salt) show positive returns during the first five years. However, the benefits of investing in tobacco control and CVD clinical interventions arise predominantly after the first five years of implementation.

The results demonstrate the benefits of moving toward a health framework that focuses on the prevention of disease, as opposed to treating disease once it has already emerged. Mongolia can achieve significant health and economic gains by targeting behavioral risk factors with highly cost-effective policies, and treating high levels of metabolic risks before they lead to CVD events.

**Table I.** Costs, benefits, and the return on investment at 5- and 15-years, by intervention package (billion MNT)

Intervention package	5 years			15 years		
	Total costs	Total productivity benefits	ROI	Total costs	Total productivity benefits	ROI
Salt	18.4	26.4	1.4	77.3	1,305	16.9
Alcohol	3.7	5.8	1.6	14.6	198.9	13.6
Tobacco	2.8	1.9	0.7	9.3	120.7	13.0
CVD clinical interventions	38.0	23.8	0.6	263.6	798.6	3.0

\* Costs and benefits are discounted at a rate of three percent

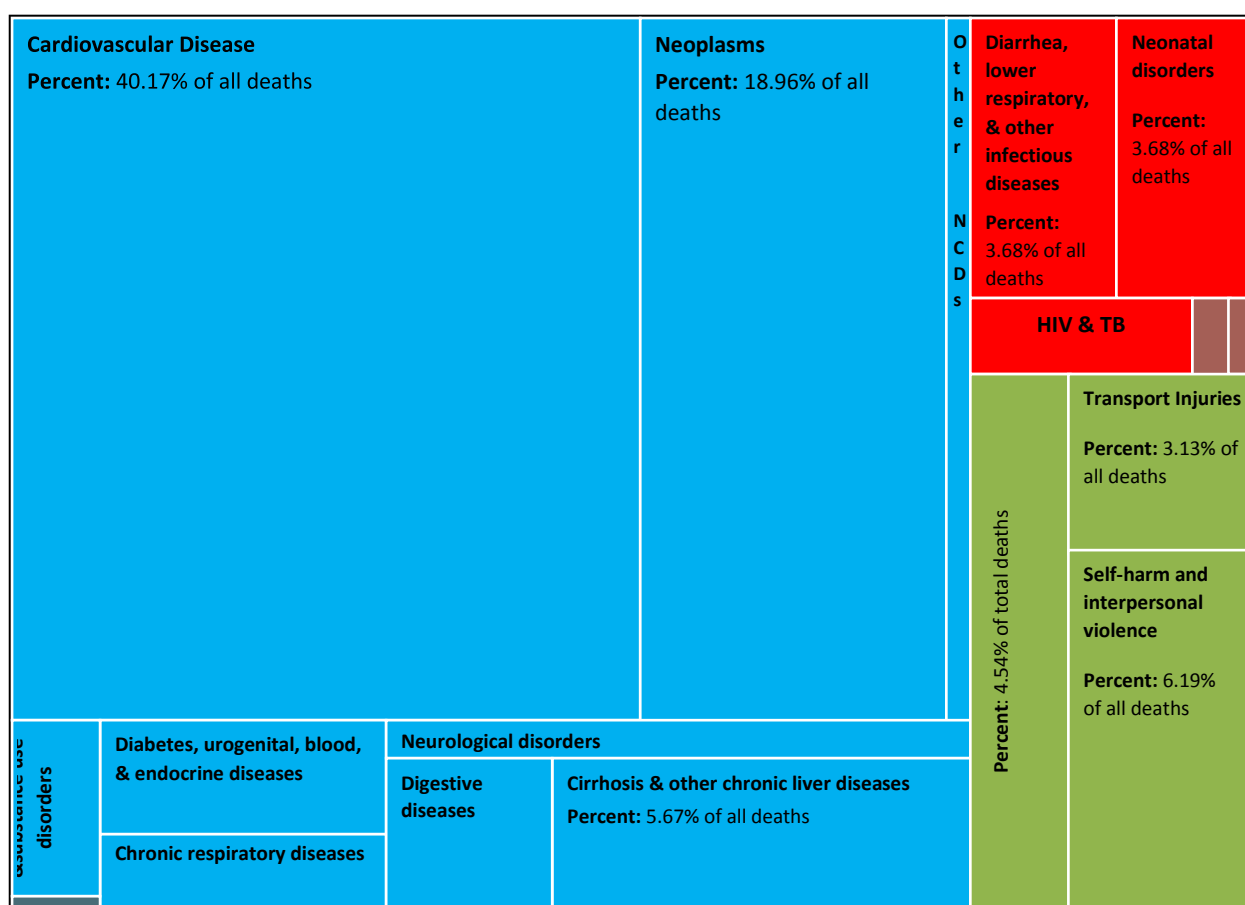
#### Interventions included in the analysis

- **CVD clinical interventions**
  - Treatment for those with a 10-year risk of a CVD event  $\geq$  30 percent
  - Treatment for those with high blood pressure, but absolute risk of a 10-year CVD event  $<$  30 percent
  - Treatment for those with high cholesterol, but absolute risk of a 10-year CVD event  $<$  30 percent
- **Tobacco interventions**
  - Restrictions on indirect advertising of tobacco products
  - Graduated tobacco tax increases
  - Mandated plain packaging for all tobacco products
- **Alcohol interventions**
  - Restrictions on the availability of retailed alcohol
  - Restrictions on direct and indirect advertising of alcohol
  - Graduated tax increases on beer, wine, and liquor
- **Salt interventions**
  - Engagement of industry in the reformulation of food products
  - Adoption of standards for front of pack labels
  - Integrated education and communication strategies to raise awareness about the health risks and dietary sources of salt
  - Implementation of multicomponent salt reduction strategies in community settings

## I. Introduction

In 2015, NCDs accounted for 64.8 percent of all deaths in Mongolia (*Figure 1*). This is 6 percentage points higher than the proportion of global deaths attributable to NCDs (71%) [2]. Many NCD deaths are considered “premature”. There is about a one in three chance that a Mongolian will die before the age of 70 from one of the four main NCDs [3]: cardiovascular disease, diabetes, chronic respiratory disease, or cancer. This highlights a significant opportunity to make progress on target 3.4 of the Sustainable Development Goals which aims to reduce premature mortality from NCDs in 2030 by one-third, as well as to contribute to other targets across the SDGs.

**Figure 1.** Percent share of 2015 deaths attributable to NCDs, communicable diseases, and injuries. Mongolia, Both sexes, All ages



Blue = NCDs, Red = Infectious disease, Green = Injuries (Underlying data: IHME, 2015 [4]).

The toll of NCDs on human health is clear, but it is only one part of the story. NCDs also incur high economic costs, given that poor health affects both labor productivity and the accumulation of capital within an economy. The latter effect is difficult to quantify – and we have not done so in this analysis – but it can impose significant economic losses in the long-run. For individuals and governments, spending on health can mean significant opportunity costs, including decreased investment in education, transportation projects, or other forms of human or physical capital that can produce long-run returns.

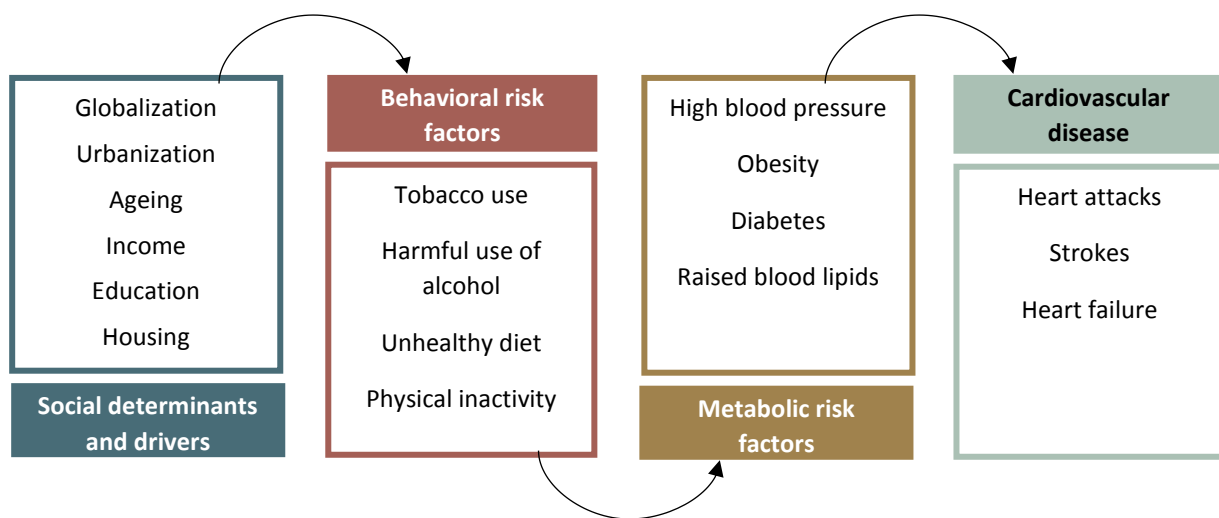
Poor health also reduces productivity by permanently or temporarily removing individuals from formal or informal labor markets. When individuals die prematurely, the labor output that they would have produced in their remaining years is lost. In addition, individuals who suffer from a disease are more likely to miss days of work (absenteeism) or to work at a reduced capacity while at work (presenteeism) as a result of health complications that they endure while suffering from given disease.

In low- and middle-income countries, it is estimated that from 2011-2030, NCDs will cause more than US \$21 trillion in lost economic output, with nearly one-third of that figure attributable to cardiovascular disease alone [5]. Direct government spending on NCDs is also a significant cost to government. In countries where disease-level spending accounts are available, 13.4 percent (median rate) of total expenditure on health is devoted to cardiovascular disease [6]. Assuming the same for Mongolia, the government expends about 57.2 billion tugriks each year on CVD<sup>2</sup>.

High human and economic costs highlight the need to reduce the burden of NCDs in Mongolia. Over 40 percent of Mongolia's 21,739 deaths in 2015 were caused by heart disease, stroke, myocardial infarction, and other cardiovascular and circulatory diseases ([2], (see *Figure I*)). Fortunately, solutions exist at both the clinical and policy levels. Interventions that reduce disease can recover some of the benefits (*e.g.* labor productivity) that are lost due to poor health. Therefore, for the economic analysis detailed in this study, we focus largely on interventions that can reduce the burden of cardiovascular disease (CVD).

*Figure II* illustrates the determinants and risk factors that drive the development of CVD. NCDs, including cardiovascular disease, are linked to behaviors that increase the risk of developing disease [10]. WHO recognizes that the risk of CVD can be reduced by modifying four behaviors (tobacco use, harmful use of alcohol, an unhealthy diet, and physical inactivity), and metabolic risk factors such as high blood pressure or cholesterol [11]. This strategy is part of a paradigm shift away from focusing on the clinical treatment of already existing illness, toward preemptive efforts that can *prevent* disease from occurring in the first place.

**Figure II.** Social determinants, and behavioral and metabolic risk factors: contributors to the development of CVD



**Image source:** Adapted from the WHO Global Brief on Hypertension [12]

As part of its Global Action Plan for the prevention and control of noncommunicable diseases, the WHO has developed a menu of policy options and cost-effective interventions to assist member states to reduce the NCD burden. Included on this menu are options to reduce behavioral and metabolic risk factors known to lead to CVD. These options include policy instruments and clinical interventions. Tobacco consumption contributes to multiple diseases. Fortunately, there are available cost-effective and feasible interventions to reduce tobacco consumption, mandated by the Framework Convention on Tobacco Control (FCTC). *Figure III* lists the first-line WHO-recommended tobacco control policies, or MPOWER package. Other policy instruments to prevent NCDs include interventions such as mass media campaigns to increase health knowledge; the

<sup>2</sup> Total government spending on CVD = (GDP \* Total health expenditure (THE) as a % of GDP \* Government Health expenditure as a % of THE \* Median % of THE spent on CVD) = (15.85 trillion MNT \* 0.47 \* 0.5732 \* 0.134) ≈ 57.2 billion MNT. [6]–[9]



implementation and enforcement of laws on the sale or advertising of potentially harmful goods (e.g., restrictions on the sale of alcohol); clear warning labels about health effects of consumption; raising taxes to reduce consumption, and; in the case of salt, working with industry to reformulate food products with high salt content. Clinical interventions include primary prevention approaches such as drug therapy for persons at high risk of cardiovascular events or for those who have hypertension. For all risk factors, a description of relevant policies and interventions can be found in *Section III*.

### *Purpose of Economic Analysis Component of NCD Investment Case*

Against this background, a joint programming mission to Mongolia was undertaken in September 2016 to conduct an economic analysis that would assist the Mongolian government to “develop and implement national NCD responses that contribute to the NCD-related targets in the Sustainable Development Goals”. The costs and benefits of intervening are important information to help the country make informed decisions about ways to reduce the NCD burden. Several NCD interventions were selected for analysis in consultation with Mongolia’s Ministry of Health, to arrive at the following question:

*What are the costs and benefits of implementing policy interventions that reduce consumption of tobacco, alcohol, and salt, and of increasing the existing coverage rates of CVD primary prevention interventions?*

In answering, we consider two scenarios and measure the difference in their effects. The first is a continuation of the status quo (no new policies are implemented and current coverage levels remain in place—i.e. the costs of inaction). The second is a scenario in which the policies and clinical interventions laid out in *Section III* are scaled up over the next 15 years. We use the WHO OneHealth Tool, an Excel-based epidemiologic model, along with the WHO *CHOICE* costing tool, both developed by UN partners, to cost interventions and to project the health benefits expected from their implementation. Health benefits are monetized using the human capital approach, and benefit-cost ratios (return on investments) are reported for each package of interventions.

In *Section II*, we begin by providing analysis of NCD behavioral risk factors in Mongolia, and outlining current levels of tobacco, alcohol, and salt consumption, as well as the existing prevalence of metabolic risk factors (i.e. high cholesterol, hypertension) within the population. *Section III* proceeds to outline evidence-based policies and clinical interventions that can contribute to reducing the cardiovascular burden of disease, and details the current state of the policies and interventions in Mongolia. *Section IV* describes the methods and tools used in our analysis. *Section V* presents results, including total costs, and the expected health and economic benefits (e.g., healthy life-years gained, mortality averted, and productivity gains) of implementing the three described policy packages, as well as of treating individuals who are already at high risk of cardiovascular disease. *Section VI* concludes.

## **II. Situation Analysis: Behavioral and metabolic risk factors in the Mongolian population**

This section describes evidence surrounding the extent to which risky behaviors—such as tobacco, alcohol, and salt consumption—are present in Mongolian lifestyles, including differences between demographic groups, and knowledge and attitudes surrounding these behaviors. The prevalence of metabolic risk factors (e.g. high blood pressure, cholesterol) is also described.

### **WHO-recommended tobacco control measures (MPOWER)**

- MONITOR** tobacco use and prevention
- PROTECT** people from tobacco smoke
- OFFER** to help people quit
- WARN** about the dangers of tobacco
- ENFORCE** bans on tobacco advertising, promotion and sponsorship
- RAISE** taxes on tobacco

*Figure III*

## Tobacco

2013 findings from the third national STEPs survey indicate that 27 percent of Mongolians smoke [13]. However, a marked gender imbalance exists. Only 5.3 percent of women smoke compared to 49.1 percent of men. Of men who smoke, nearly half (45%) are *daily* smokers who consume an average of about 10 cigarettes each day (*ibid.*). An estimated 9.2 percent of youths age 11-17 smoke cigarettes [14]. According to a representative of Mongol Tamkhi, a domestic tobacco company with a significant share of the local market, Mongolians prefer filtered, king-size cigarettes, which make up about 70 percent of the company's sales [15].

Tobacco use is relatively common and knowledge of its health consequences is widespread in Mongolia. In a nationally, representative survey of 3,854 individuals, nearly all of the individuals surveyed were aware that smoking affects their health, though education level is a factor in risk awareness. [16]. The belief that harm only occurs if an individual smokes one pack or more a day is associated with having only completed secondary education or lower. In addition, knowledge of the dangers of second hand smoke—or at least preference for smoke free environments—is also common. About 84 percent of participants objected to people smoking in their house, and 98 percent believe it is important to have a smoke-free workplace (*ibid.*).

## Alcohol

Alcohol is ubiquitous in Mongolia. The density of alcohol vendors—one shop for every 270 people—is reported to be the highest in the world [17]. Three out of four males and just over half of females are considered alcohol users, indicating that they have had a drink in the past year [13].

The rate of alcohol consumption among users is high, and rising. From 2003-2005, per capita (age 15+), Mongolians imbibed 4.1 liters of alcohol, a number that grew to 6.9 in the period of 2008-2010 [18]. Hard liquors are consumed at the highest rate (4.83 liters), followed by beer (1.86 liters) and wine (.207 liters) (*ibid.*).

Heavy alcohol use is an entrenched element of celebrations, and social interaction with friends and family [19]. Among alcohol users, 37.5 percent of men consumed greater than or equal to six drinks<sup>3</sup> in one sitting during the last month, compared to 9.7 percent of women. On average, among alcohol users who had a drink in the last month, men consumed 10.8 drinks in one sitting and women consumed 5.2 drinks [13].

Findings from a nationally representative survey of attitudes and knowledge about alcohol found significant differences in the use of alcohol among urban and rural individuals. While nearly one in three drinkers report having consumed alcohol before lunchtime, the practice is more prevalent in rural (25% of drinkers) than urban (16%) individuals [19]. One in ten of the survey participants cited the use of alcohol as a stress reduction technique, though this answer was three times as likely to be heard from an urban participant compared to a rural one.

### Tobacco Snapshot

**Tobacco use** – 49.1% of Mongolian men smoke. Half of those individuals smoke every day, on average inhaling 10 cigarettes in a 24-hour period. [12]

**Tobacco caused** 2,186 CVD deaths in 2015 [1]

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

**Percent of all IHD and stroke deaths attributable to tobacco** [16]

IHD: 23.1%

Stroke: 22.2%

### Alcohol Snapshot

**Alcohol use** – During the last month, in one sitting, 37.5% of men consumed greater than or equal to six drinks (on average consuming 10.8 drinks). [12]

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

<sup>3</sup> One standard drink = vodka 25 ml, beer 330 ml, wine 100 ml

### Unhealthy diet – The role of salt

On average, Mongolians consume about 11.1 grams of salt each day, and 83.2 percent of the population consumes more than the WHO recommendation of five grams of salt per day [20].

Few Mongolians add extra salt to their food on a regular basis when eating (5.8%) or preparing meals (8%), but the salt content of domestic foods is high [13]. A 2013 salt intake survey in the population examined 300 food products<sup>4</sup> and 200 meals<sup>5</sup> common in the Mongolian diet. Food products and meals were classified as having high salt content if they contained greater than 0.6 grams of salt per 100 grams of food. The survey finds that 81.6% of the food products and 83.6% of meals contain high salt content.

Consumption of salty tea alone makes up 46.2 percent of the total daily salt intake for Mongolians. The difference in average daily salt intake between those who consume salty tea every day and those who do not is about two grams [20]. The tea is most popular in the Western and Khangai regions, where 84.4 and 90.7 percent of the population drink it, followed by Ulaanbatar (44.8%), the Central region (23.4%), and the Eastern region 11% [21].

Mongolians are generally aware of the impact that a high salt diet can have on health. In the nationally representative 2013 salt intake survey, 66.1 percent of males and 84.5 percent of females indicate that salt can have a ‘serious affect’ on health [20]. However, knowledge of the specific health-effects is less widespread. About one in five Mongolians do not know of any specific problems caused by salt, while 44.9 percent are aware it can cause a kidney stone and 17.6 percent are aware of its link to arterial hypertension (*ibid.*). Regardless, estimates indicate that about two-fifths of Mongolians take deliberate steps to reduce salt intake, the most prevalent practices being to use spices other than salt, choosing not to add extra salt, avoiding eating out, or minimizing consumption of processed foods [13].

### Metabolic risk factors

At high levels, metabolic factors—such as blood pressure, body mass index, or blood lipid levels—significantly increase the risk of having a CVD event [22], [23]. The 2004 Interheart study of populations in 52 countries found that the odds of having a heart attack are almost twice as high for people with hypertension when compared to those without hypertension. Similarly, the odds of having a heart attack were greater than three times higher for those in the top cholesterol quintile (those with the highest levels) than those in the lowest quintile [23].

High levels of any one metabolic factor can increase the risk of a cardiovascular event, but for individuals with multiple metabolic risk factors, risk is compounded (*ibid.*). The WHO has developed risk prediction charts to assess how the combination of risk factors may affect an individual’s risk of having a CVD event, with the risk determined by six factors: gender, age, blood pressure, cholesterol, smoking status, and whether or not they have diabetes [24]. *Figure IV* shows individuals’ risk of having a CVD event in the next 10 years according to the presence or absence of each of these conditions.

In Mongolia, crude estimates from the 2013 STEPs survey show that 17.8 percent of Mongolians between ages 40-64 have a 10-year risk of a CVD event  $\geq$  30 percent [13]. Isolating the top end of that age group, 30.5 percent of men and 27.7 percent of women ages 55-64 have CVD risk  $\geq$  30 percent.

### Salt Snapshot

**Salt Consumption** - 2.2 times the WHO recommendation [20]

**High salt consumption** caused 1,786 CVD deaths in 2015 [1]

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

**Percent of all IHD and stroke deaths attributable to high sodium** [16]

IHD: 19.6%

Stroke: 8.6%

<sup>4</sup> Includes meats, flour-based products, vegetables, spices, and other products such as chips and salted peanuts.

<sup>5</sup> Examples of common meals include tea with dumplings, meat and vegetable soup, mantuun buuz, khuushuur, pilau, fried meat, tsuivan, fried meats, spaghetti, cutlet, goulash, pizza, etc.

**Figure IV.** 10-year risk of a fatal or non-fatal CVD event by gender, age, systolic blood pressure, total blood cholesterol, smoking status, and presence or absence of diabetes

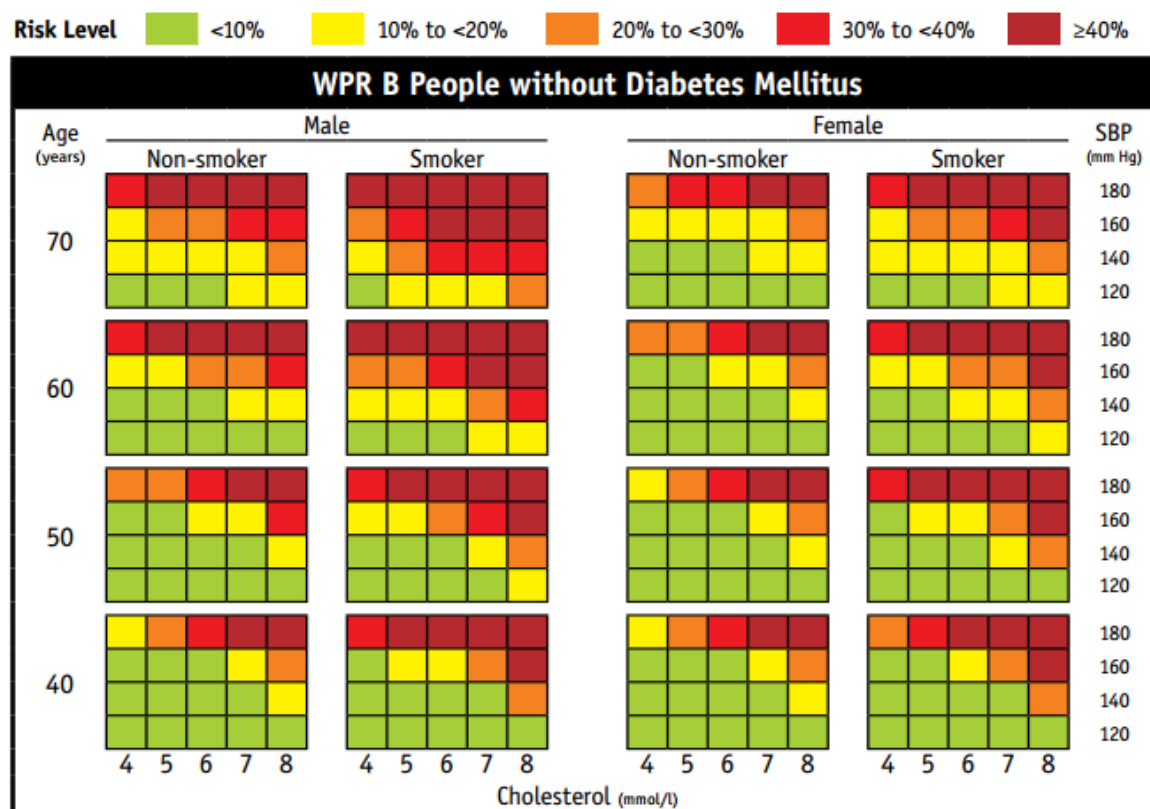


Image Source: WHO/ISH, 2007

Table II displays the crude prevalence rates reported by the 2013 STEPs survey of CVD risk factors, including hypertension (considered blood pressure levels  $\geq 140$  mmHg), high cholesterol ( $\geq 5$ mmol/L), and diabetes.

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

	Men (age)			Women (age)		
	35 to 44	45 to 54	55 to 64	35 to 44	45 to 54	55 to 64
<b>Hypertension</b>	26	46.3	59.9	22.1	42.6	54.8
<b>High Cholesterol</b>	56	59.4	58.2	69	72.7	68.8
<b>Diabetes</b>	7.3	7.4	13.6	7.0	11.6	6.3

Source: 2013 STEPs Survey [13]

### III. Surveying the Landscape: Policies and treatments to reduce the NCD burden

As of January 2017, updates to the WHO's 2013 Global Action Plan for the prevention and control of non-communicable diseases are underway [25]. The recommended interventions and policies will increase from 62 to 88 interventions. Of these 88 interventions, 15 are highlighted as most cost-effective<sup>6</sup> and most feasible for implementation (formerly referred to as "best buys").

In consultation with the Mongolian Ministry of Health, the investment case economic analysis was narrowed to assess select interventions to address cardiovascular disease, and behavioral risk factors. We look at three clinical interventions that target CVD, including 1) treatment for those with a 10-year risk of a CVD event  $\geq 30$  percent; 2) Treatment for those who have a 10-year risk of a CVD event  $< 30$  percent, but who have hypertension,

<sup>6</sup> Average Cost-Effectiveness Ratio  $\leq$  I\$100/DALY in low- and middle-income countries. DALY = Disability adjusted life-year, a measure of quality and quantity of life.

and; 3) Treatment for those who have a 10-year risk of a CVD event <30%, but who have high cholesterol. In addition we examine several tobacco, alcohol, and salt policies that are designed to lower demand for harmful substances, restrict access, and educate populations on their health effects.

Below, we summarize national-level efforts that Mongolia has made up to now toward enacting and enforcing the above-recommended policies. We then list additional policies that can move Mongolia from its current baseline toward meeting the full menu of policy options that are laid out in Appendix 3 of the updated WHO Global Action plan.

### Tobacco

A party to the WHO Framework Convention on Tobacco Control, Mongolia has a strong set of tobacco policies already in place to reduce demand for tobacco products and protect the health of its population. In 2012, the parliament of Mongolia revised its existing law on tobacco control. Among other things, the new law enlarged health warnings, banned cigarette sales in vending machines and over the internet, and banned smoking in all public places [26], [27]. *Table III* compares Mongolia’s current tobacco control policy to the MPOWER intervention package.

**Table III.** The current state of tobacco MPOWER policies in Mongolia\*

Policy name	Description	Current state in Mongolia
<b>Monitor Tobacco use/prevention policies</b>	Nationally representative surveys to track the prevalence of tobacco use	Recent, representative, and periodic data is available for both adults and youth.
<b>Protect people from tobacco smoke</b>	Legislation that bans smoking in public places (e.g., Workplaces, restaurants, cafes/pubs/bars, public transport, and health-care, educational, and government facilities), with complaint systems and recourse laws in place to ensure follow-through.	Smoking is banned in all public places (high compliance).
<b>Offer to help quit tobacco use: 1) Brief advice</b>	<b>1)</b> Brief advice consists of access to nicotine replacement therapies that are covered by national health insurance, health provider access to a national telephone quit line, and .	Nicotine replacement therapy <i>is</i> on Mongolia's essential medicines list, and the cost is partially covered by the national health insurance. Smoking cessation support is not commonly offered throughout the health system. A toll-free telephone quit line is not available.
<b>Warn about danger (warning labels &amp; mass media education campaign) &amp; plain packaging</b>	<b>1)</b> Mandated warning labels on tobacco packaging that detail health effects. <b>2)</b> Plain packaging that does not allow for the use of logos, colors, brand images, or promotion information other than the brand and product names. <b>3)</b> targeted anti-tobacco mass-media campaigns to increase knowledge about smoking and its effects	<b>1)</b> By law, 50 percent of cigarette packages are required to be covered in health warnings that describe harmful health effects of tobacco. <b>2)</b> No law exists mandating plain packaging. <b>3)</b> The government has sponsored recent national anti-tobacco campaigns.

<b>Enforce bans on tobacco advertising</b>	Banning advertising in prominent forms of media, as well as banning indirect advertising ( <i>e.g.</i> , free distribution or promotional discounts, brand product placement in TV or films, allowing brands to hold sponsored events).	Advertising is banned on TV, radio and print media, as well as some but not all forms of indirect advertising (medium compliance on existing bans).
<b>Raise taxes on tobacco</b>	Tobacco excise taxes equal to at least 70 percent of the retail price	In March 2017 the government approved a 20 percent increase in tobacco excise taxes over three years [28]. Prior to this, the tax was set at 33.26% of the retail price (2,700 MNT) of the most sold brand of cigarettes—or about 898 MNT. An increase of 20% would move the tax to about 1,077 MNT on the most sold brand, or about 40% of the retail price.
* Unless otherwise noted, information and language in this table is derived from the WHO Report on the Global Tobacco Epidemic: Country profile – Mongolia [29].		

While Mongolia’s tobacco laws are strong, additional policies can be put in place to reduce tobacco consumption, and to meet the WHO standards and recommendations represented in the ‘Intervention Description’ column in *Table II*.

**Our analysis modelled the following policy changes:**

1. Adoption of a law mandating plain packaging for all tobacco products;
2. Increasing bans on indirect advertising (*i.e.*, banning free distribution of tobacco, the appearance of tobacco products in TV and/or films, and tobacco products displays at the point of sale) and enforcing compliance, and;
3. Building on the recent tobacco excise price increase—from 33 to 40 percent of the retail price over 2018 to 2020—graduated tobacco tax increases of three percent per year are modeled through 2029, and then held for the remainder of the analysis at the WHO-recommended-excise-tax-rate: 70 percent of the retail price [30].

*Alcohol*

Alcohol policy in Mongolia is less robust than tobacco policy. As much as 90 percent of the alcohol market is controlled by domestic producers [31], and several reports suggest that industry interests, and connections between decision-makers and industry may be preventing additional regulation around alcohol consumption [32]–[34].

Still, Mongolia saw recent progress with the 2011 introduction of President Tsakhiagiin Elbegdorj’s Alcohol Free initiative [35]. In addition, while the National Programme on Prevention and Control of Alcohol ended in 2012, a working group is reportedly drafting a new national program that is supported at the presidential level [33]. Finally, in December 2015, the Alcohol Control Law received its first amendments in 12 years [36]. *Table IV* compares Mongolia’s current alcohol policy to a subset of WHO recommendations to reduce the harmful use of alcohol [37].

**Table IV.** The current state of alcohol policies in Mongolia\*

Policy name	Description	Current state in Mongolia
<b>Enforce restrictions on the availability of alcohol</b>	Regulate the number and location of alcohol outlets, and the days and hours, and modes of retail sales.	We do not find regulations limiting the number or location of alcohol outlets. The decision to prohibit sales during certain days or hours is left to regional governments (Aimags) [38].

<b>Enforce restrictions on advertising</b>	<b>Advertising ban - 1)</b> Regulating the content and the volume of marketing; direct or indirect marketing in certain or all media (including social media); sponsorship activities that promote alcoholic beverages, and; restrictions or bans on promotions in connection with activities targeting young people. <b>2)</b> Effective systems of surveillance of marketing. <b>3)</b> Effective administrative and deterrence systems for infringements on marketing restrictions.	<b>1)</b> Some forms of indirect advertising ( <i>e.g.</i> , alcohol company logos or names in films) are banned, but we do not find other explicit mention of direct marketing bans, or content or volume restrictions. Sponsorship of culture, arts, sports, or other public events is prohibited [36]. <b>2/3)</b> Per the Law on Advertisement, the State Intellectual Property Inspection Agency monitors and protects consumers from illegal advertisements [39]. We do not find evidence specifying the effectiveness of existing surveillance and deterrence.
<b>Raise taxes on alcoholic beverages</b>	Specific domestic taxation on alcohol, which may vary by alcohol content	In March 2017 the government approved a 20 percent increase in tobacco excise taxes over three years [28]. Prior to this, taxes were set at the following rates [40]: + <b>Liquor</b> above 40% alcohol by volume (ABV) – \$4.00/liter + <b>Beer</b> - \$0.20/liter + <b>Wine</b> - \$1.50/liter
* Unless otherwise noted, information and language in the ‘Intervention Description’ column is derived from the WHO’s Global strategy to reduce the harmful use of alcohol [37].		

Additional policies can be put in place to further reduce alcohol consumption, and to meet the WHO standards and recommendations represented in the ‘Intervention Description’ column in *Table IV*.

#### Our analysis modelled the following policy changes:

1. Increase restrictions on the availability of alcohol through national policies that limit the number and location of alcohol outlets, and prohibit sales during certain days or hours.
2. Regulate direct and indirect advertising of alcohol, and the volume and content of alcohol advertisements. Ensure enforcement of advertising law through the development of effective surveillance and deterrence systems.
3. Building on the recent alcohol excise tax increase, graduated alcohol tax increases are modeled for alcohol (*Table V*). After incorporating the recent 20 percent increase in excise taxes through 2020, excise taxes for beer and wine are modeled to scale up toward target goals that are reflective of the average excise tax (as a percent of retail price) of beer and wine in upper-middle-income-countries (UMIC) [37]: 25.86 percent and 30.3 percent respectively. The recent 20 percent excise-tax increase moves liquor past the UMIC average (42%), and is thus held steady from 2020-2032.

**Table V.** Excise tax as a percent of retail price, modelled scale-up by year

	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
<b>Beer</b>	3.45	3.8	4	4.14	7	10	13	16	19	22	25.8	25.8	25.8	25.8	25.8	25.8
<b>Wine</b>	21.8	23.98	25.1	26.2	30.3	30.3	30.3	30.3	30.3	30.3	30.3	30.3	30.3	30.3	30.3	30.3
<b>Liquor</b>	36.8	40.4	42.3	44.2	44.2	44.2	44.2	44.2	44.2	44.2	44.2	44.2	44.2	44.2	44.2	44.2

#### Salt

Mongolia is actively pursuing salt reduction strategies. In early 2011, pilot programs were implemented to reduce salt intake of workers in three factories in Ulaanbaatar [21]. The Ministry of Health has consulted with the food industry to reduce the salt content in bread and sausage, and conducts week-long mass-media



information campaigns to promote knowledge and awareness about salt intake during each annual World Salt Awareness Week (*ibid.*). In 2014, Mongolia built on these nascent efforts with adoption of a national salt reduction strategy that lays the groundwork for future policies. *Table VI* compares Mongolia’s current policy outlook to SHAKE, a set of WHO measures that outline steps that countries can take to reduce salt intake.

**Table VI.** The current state of policies to reduce salt consumption in Mongolia\*

Policy name	Description	Current state in Mongolia
<b>Surveillance</b>	Measure and monitor population salt consumption patterns, and the sodium content of food.	Regular surveys conducted ( <i>e.g.</i> , the 2013 STEPs survey and the 2013 Salt Intake of the Population survey)
<b>Harness industry for reformulation</b>	Set target levels for the amount of salt in foods and meals and implement strategies to promote reformulation.	Partially achieved: After meetings with the MoH, the Talkh Chikher Bread Company—maker of 50% of the nation’s bread—voluntarily reduced the salt content of its ‘Atar’ bread by 12%. Other companies followed, with an average of 1.6% less salt in 10 breads and bakeries resulting [41]. In addition, “in 2014, the sausage industry agreed to reduce the salt content in three canned products by 10%” ([42], p. 232).
<b>Adopt standards: Front of pack labels</b>	Adopt front-of-pack nutrition labelling systems ( <i>e.g.</i> , color coded for salt content level, ‘high salt’ warning).	Not achieved
<b>Knowledge: Education and communication</b>	Implement integrated education and communication strategies to raise awareness about the health risks and dietary sources of salt in order to change behavior.	Not achieved
<b>Environment: Salt reduction strategies in community-based eating spaces</b>	Implement multicomponent salt reduction strategies in community settings ( <i>e.g.</i> , schools, workplaces, hospitals).	Not achieved

\* Unless otherwise noted, information and language in the ‘Intervention Description’ column is derived from The SHAKE Technical Package for Salt Reduction, a WHO report [43].

Additional policies can be put in place to further reduce salt consumption, and to meet the WHO standards and recommendations represented in the ‘Intervention Description’ column in *Table VI*.

**Our analysis modelled the following policy changes:**

1. Continue efforts to engage industry in the reformulation of food products, especially producers of processed food (*e.g.*, pickled vegetables, canned meats, sauces).
2. Adopt standards for front of pack labels; provide education and communicate to raise awareness about the health risks of salt, and; implement multicomponent salt reduction strategies in community settings.

*CVD clinical interventions*

Designating a given metabolic measurement as “high”—high cholesterol, high blood pressure, hyperglycemic—implies a degree of concern about its distance away from an optimum, target level. Known as the ‘theoretical minimum risk exposure level’ (TMREL), this level describes the point at which there is the lowest risk of harm.



For systolic blood pressure the TMREL is generally estimated at around 115mmHg, while cholesterol is about 4 mmol/L [22].

Proper medical treatment can draw individuals' metabolic levels down toward the TMREL, decreasing their risk of having a CVD event. Early identification of—and targeted treatments for—high risk patients are necessary strategies to identify and manage CVD, offering opportunities to provide lifestyle advice and medications that can lower exposure to risk factors before severe atherosclerosis occurs [44]. We include three individual-level, CVD-primary-prevention interventions in our analysis: 1) treatment for those with a 10-year risk of a CVD event  $\geq 30$  percent; 2) Treatment for those who have a 10-year risk of a CVD event  $< 30\%$ , but who have hypertension, and; 3) Treatment for those who have a 10-year risk of a CVD event  $< 30\%$ , but who have high cholesterol.

In general, each intervention's treatment regimen consists of multi-drug therapy and a series of clinic checkup visits (see *Technical Appendix* for a full account of each intervention). For instance, most patients with hypertension receive Hydrochlorothiazide (a diuretic) alone, or in combination with Enalapril (an ACE<sup>7</sup> inhibitor) or calcium channel blockers. All hypertension patients receive at least three outpatient visits a year.

Individuals at risk of cardiovascular disease first need to be identified through opportunistic or systematic screening. In Mongolia, government-led health projects funded under the Millennium Challenge Corporation compact recently pushed opportunistic and systematic hypertension screening to cover what will be an estimated 59 percent of adults ages 40-64 years in 2017 [45]. Screening for cholesterol is lower. Twenty-two percent of all individuals age 35-64 have ever been screened for cholesterol according to the 2013 STEPs survey [13]. Finally, although there have been discussions to enact protocols that would facilitate the screening of individuals for CVD risk, currently no protocol is in place in Mongolia [46].

Treatment is recommended for found to have high CVD risk, hypertension, or high cholesterol. While in theory, all individuals with these risk factors should receive medical treatment, in practice only a proportion of those screened and diagnosed do so. According to the 2013 STEPs report, about 28 percent of those diagnosed with hypertension, and 11 percent of those diagnosed with high cholesterol, have actually received drug treatment [13]. Otgontuya (2012) reported similar findings from an earlier STEPs survey, conjecturing that accessibility and affordability of medicines, as well as knowledge and behavior, may create a gap between the number of people screened, identified as high risk, and treated in Mongolia [47].

Indeed, a recent report by the Ministry of Health provides evidence of low levels of accessibility and affordability [48]. The report cites the availability of the originator brand (OBH), most sold generic equivalent (MSG), and lowest priced generic equivalent (LPG) of 50 surveyed medicines. On average, OBH medicines were available in 3.7 percent of public sector outlets on the day of the study. MSG (20.8%) and LPG (41.7%) medicines were available at slightly higher rates. All types of medicine were available in greater quantity in the private sector, but generally at higher prices. The report also cites the number of days wages required to buy a 30 day supply of several drugs to treat hypertension and cholesterol, with individual drugs for each condition ranging from 0.4 – 2.7 days wages<sup>8</sup>, depending on the sector in which they are purchased (*ibid.*).

Within our analysis, we estimate the number of additional people that could be reached with a scale up in the coverage of screening for CVD risk, hypertension, and high cholesterol. Our analysis proceeds from the standpoint that the current infrastructure used to screen and diagnose those with hypertension, could also be used to diagnose individuals with high cholesterol or high CVD risk. *Table VII* displays the projected scale up rate of screening used in our analysis. The current baseline is set in the year 2017, when 59 percent of all individuals age 40+ are screened. By 2021, the proportion grows to 79.5 percent, reflective of the target goal for Mongolia cited in the 2015 "Health Indicator's" report [45]. The end target, in 2032, is set at 90 percent, and coverage is scaled linearly year-over-year toward that goal.

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<sup>7</sup> Angiotensin converting enzyme

<sup>8</sup> Within the study, prices are compared against the daily wage of the lowest paid unskilled government worker: 6,685.68 tugrik

**Table VII.** 15-year scale up of risk-factor screening, as a percent of all individuals age 40+

	Baseline	Year 5	Year 10	Year 15
<b>Screening</b>	<u>59</u>	<u>80.5</u>	<u>85.2</u>	<u>90</u>

Following the scale-up in Table VII, we model how many individuals who are screened move on to receive medical treatment. Table VIII, shows the proportion of all individuals with a given condition who receive treatment. For instance, in 2017, it is estimated that based on the initial level of screening, you would expect to identify 59 percent of all hypertensive individuals in the population. Among those identified, 28.1 percent receive medical treatment. Thus, in 2017, 16.6 percent ( $0.59 * 0.281$ ) of all individuals in Mongolia with high blood pressure are on medication. This number increases as more people are screened following the scale-up pattern in Table VII.

In the case of each intervention, however, treatment percentages are low. As discussed, whether due to accessibility and affordability of medicines, knowledge, behavior, and other factors, few people who are screened end up on a treatment regimen. Because the OneHealth Tool does not currently incorporate CVD quality improvement interventions<sup>9</sup> that might increase the number of people who get on treatment, we hold treatment rates at their 2017 levels throughout the 15 years, assuming no improvement. Should quality improvement interventions be enacted, there would be additional returns to screening efforts because more individuals who are screened would get on treatment.

**Our analysis modelled the following policy changes:**

**Table VIII.** Scale-up of CVD primary prevention interventions over 15 years

	Baseline	Year 5	Year 10	Year 15
<b>Hypertension</b>	<u>16.6</u>	<u>22.6</u>	<u>24.0</u>	<u>25.3</u>
<b>Cholesterol</b>	<u>6.5</u>	<u>8.9</u>	<u>9.4</u>	<u>9.9</u>
<b>CVD risk</b>	<u>4.7</u>	<u>29.4</u>	<u>31.1</u>	<u>32.9</u>

#### **IV. Methods**

To ascertain whether the benefits of implementing health interventions that target NCD risk factors outweigh the costs, we undertake an analysis to assess the expected return on implementing the policy and clinical interventions outlined in *Section III* and summarized in Table IX. We consider two scenarios over the next 15 years. The first is a continuation of the status quo (no new policies are implemented and current coverage levels remain in place). The second is a scenario in which the aforementioned policies and interventions in *Section III* are scaled up over the next 15 years.

Below, we describe the tools and methods we use for valuing costs and benefits. Throughout the report, costs and monetized benefits are reported in constant 2016 Mongolian Tugrik (MNT). All future costs are inflated at 10.3 percent per annum, a rate equivalent to average Mongolian GDP growth rate over the past five years (2011-2016), and discounted at a rate of 3%.

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<sup>9</sup> Quality improvement interventions can be enacted at the patient level (e.g. lower out-of-pocket costs, treat with combination medications to increase ease and adherence, increase knowledge), provider level (e.g. uptake of clinical guidelines, continuing education and practice observation), or health systems level (e.g. universal health insurance access, access to essential medicines, provider training) [49]

**Table IX.** Summary of interventions analyzed in the analysis

CVD clinical interventions	Tobacco interventions	Alcohol interventions	Salt interventions
Screening for CVD risk	Adopt plain packaging	Restrict availability	Harness industry
Treat CVD risk $\geq$ 30%	Ban indirect advertising	Restrict advertising	Label front of packages
Treat hypertension	Raise tobacco taxes	Raise alcohol taxes	Education & communication
Treat high cholesterol			Community-based salt reduction strategies

### Models and tools

We used the OneHealth Tool<sup>10</sup> (OHT) to model disease epidemiology, population projections, the number of people reached by interventions, health outcomes, and the total costs of implementing interventions.<sup>11</sup>

The OneHealth Tool is a freely-available software program produced by the WHO and other UN agencies. The OHT contains modules to estimate interventions' health impact (e.g. lives saved, incidence of disease averted, healthy years gained) and costs, and has been used by UN-agency actors and others to create published analyses of interventions' return on investment [50], [51].

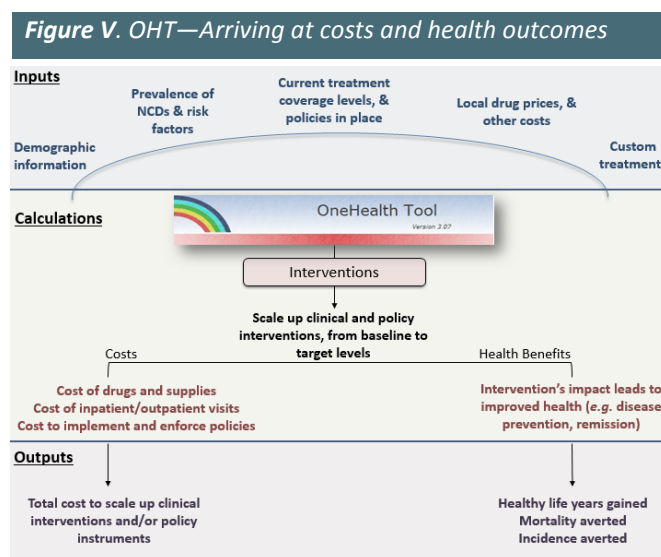
OHT is customizable, meaning users can input data that

reflects a country's health services and local costs. The tool allows users to define intervention parameters (e.g., drugs prescribed, the amount of time spent with health providers, the number of outpatient and inpatient visits); the current coverage levels of interventions; the prevalence and incidence rates of diseases and risk factors, and; the unit costs of drugs, supplies, human resources, and other tradable and non-tradable medical and non-medical goods. In addition, fertility rates, sex ratio at birth, migration patterns, life expectancy, and other demographic indicators can be customized to project demography into the future.

All Mongolian inputs were fed into OHT, and then run with the Tool's existing cost and benefit modules. Figure

V provides a conceptual illustration how the model moves from inputs to outputs. Details on the methods and assumptions used in each module are described in the sub-sections below, and the *Technical Appendix* provides fuller explanations and step-by-step description of how the model arrives at costs and benefits.

A separate Excel-based model was developed to convert OHT's health benefit outputs into estimates of the productivity gains that can result from avoiding poor population health. Health benefits were monetized using the human capital approach. GDP per capita was used to value worker productivity gained as a result of avoided premature mortality, absenteeism, and presenteeism (See *Technical Appendix*).



<sup>10</sup> Version 4.54 Beta 4

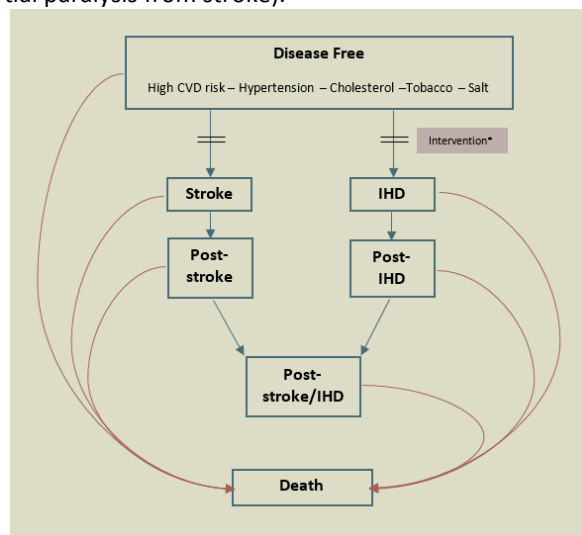
<sup>11</sup> The WHO NCD Costing Tool was used to cost policy-level policy interventions (Tobacco, alcohol, and salt-related policies).

## OHT: Arriving at Health Benefits

Individuals who have a high risk of CVD, hypertension, or high cholesterol, or who use tobacco or consume excessive amounts of salt, are at increased risk of having cardiovascular disease events. Implementing the packages of interventions in *Table VIII* will decrease these individuals' likelihood of experiencing CVD events. This both saves lives, and leads to healthier years of life lived free from disability (e.g. from partial paralysis from stroke).

The OneHealth Tool uses a probabilistic state-transition model to estimate health outcomes from interventions. Within the model, individuals transition between distinct health states. Figure VI maps individuals' pathways. All begin in a "disease-free" state, where, despite having risk factors for CVD, none of them have yet experienced a stroke or IHD event. Each has a certain likelihood of having a CVD event that drives their transition rate to more severe states—stroke or IHD. Once they have a stroke/IHD event, an individual either dies from the event, or survives the first 28 days and moves into the "post-stroke/IHD" phase. Each person remains in this post-acute state, in need of treatment to lower the risk of another event and perhaps suffering some disability even though they have survived the event. From there, they either die of related or unrelated causes of the event, or some experience a second stroke or IHD event.

Figure VI. Health state-transition model



As their name suggests, interventions "intervene", and decrease the likelihood that an individual transitions to have a CVD event. The OHT looks at a baseline scenario, and assesses how many CVD events would occur among the population and how many deaths would result. It then looks at a treatment scenario with CVD clinical interventions scaled-up and in place, and assesses how many CVD events and deaths would be averted. The *Technical Appendix* breaks down the steps that OHT takes—and the formulas it employs—to calculate these outcomes.

## Monetization of Health: productivity benefits

The economic value that an individual imparts to society is a function of the amount of time that the individual spends engaged in productive activities—whether within formal markets or informal markets. Health interventions give individuals "more productive time", by decreasing the chance that they will die prematurely, or by allowing them to work more frequently (absenteeism) or capably (presenteeism) because of reduced disease.

We use the human capital approach to monetize health outcomes from OHT. The human capital approach takes into account **two parameters**: 1) the "health-status-specific likelihood of a person's participating in the labor market," and 2) "the mean annual salary plus fringe benefits in [a given] market" [52]. Multiplying these two parameters together provides an estimate of an individual's annual expected earnings (*ibid.*).

In our analysis, NCD interventions change individuals' health-status-specific-likelihood of participating in labor markets. For example, an individual who suffers a stroke may be more likely to miss days of work. An intervention that prevents that individual from ever having the stroke event saves him/her from missing those work days, ensuring that they continue to participate fully in the labor market.

Studies have examined this difference, using surveys and other empirical methods to estimate the effect of health events on the number of work days missed by individuals suffering from a disease—or disease event—compared those who are healthy. *Table X* lists estimates that are used in our analysis (**parameter 1**).

Individuals who die prematurely are completely removed from the workforce and assumed to have a 100% reduction in working hours.

**Table X.** Estimates of the reduction in working hours due to CVD events

Reason for a reduction in full time hours	Percent reduction in working hours	Reduction in working days*
Absenteeism due to a stroke	5.5% [53]	13.2
Absenteeism due to an IHD event	1.1% [53]	2.6
Presenteeism due to a stroke/IHD event	3.7% [54]	8.9

\* Assumes a 240 day working year, author's calculations

The next step is to place a monetary value on the amount of productivity lost as a result of poor health. An individual's earnings (annual wages plus benefits) reflect their productivity in a year. In our analysis, we only value productivity benefits for individuals who are formally employed. We use GDP per employed worker, 13,115,717 MNT, (**parameter 2**) [7], [55] as a proxy for average earnings, given a dearth of available data on earnings by age, sector, gender, and health-status.

With both parameters set, we estimate the total expected gains in productivity as a result of implementing NCD interventions that improve health. The *Technical Appendix* provides a full description of calculations to monetize the health outputs that are derived from the OneHealth Tool.

#### *Healthcare expenditure and other costs*

Interventions allow for the recovery of benefits (e.g., health, labor productivity) that are lost to NCDs, but they come at a cost. We estimate the 15-year costs of clinically-based CVD primary prevention interventions, and policy interventions. For clinical interventions, we limit our costing to healthcare expenditures, including direct medical (e.g. human resources, drugs, devices) and direct non-medical costs (e.g. administrative costs, overhead, equipment.). For policy interventions, we use the assumptions embedded in the WHO NCD Costing Tool, which take into account human resources, meetings, training, mass media time, supplies and equipment, and other miscellaneous items needed to implement and enforce policies.

All interventions are costed using an ingredients-based, bottom-up approach. For the clinical interventions, the OneHealth Tool contains default regimens that are based on standard WHO protocols and expert opinion. The intervention regimens include: 1) required drugs and supplies, and 2) number/length of outpatient and inpatient visits. *Table XI* provides an example of a treatment regimen for hypertensive patients.

**Table XI.** Drugs and Outpatient visits prescribed for hypertensive patients

Drugs and supplies required per patient	% of patients receiving this aspect of the treatment	# of units	Times the medication is taken per day	Days taken per year
Hydrochlorothiazide, tablet 25mg	95	1.0	1	365
Enalapril, tablet, 20mg	40	1.0	1	365
Atenolol, tablet 10mg	25	1.5	1	365
Amlodipine, tablet, 10mg	25	0.5	1	365
Blood glucose level test	30	1.0	1	1
Cholesterol test	30	1.0	1	1
Urine analysis	30	1.0	1	1
Urine sugar analysis	100	1.0	1	1
<b>Three outpatient visits to primary care clinics</b>				

We estimate the total quantity of resources needed based on the number of people that each intervention will reach, and multiply this number by the unit price of each resource. For drug prices, we use the default values within the OHT, which are sourced from the MSH drug price indicator guide, and are the global median buyer price. We obtain the average cost of an outpatient visit at a family health center from sources in country: 14,069.2 MNT.

Similar ingredients-based assumptions underlie calculations for the policy interventions in the WHO Costing Tool. Each resource that is required for the intervention is identified, quantified, and valued. The Tool has been discussed in detail elsewhere<sup>12</sup>, but in brief the Tool operates as follows:

*Identification of resources.* For each policy, the Tool costs 1) human resources, 2) trainings, 3) external meetings, 4) mass media (e.g., television and radio time, newspaper ads), and 5) other miscellaneous equipment that are needed to enact policies and programs.

*Quantity.* Each policy contains assumptions, set by WHO experts, about the *quantity* of inputs that are required to implement and enforce the policies. The quantity of resources needed is estimated at the national, regional, and district levels. The cost of resource needs is adjusted to reflect a country's population size and the administrative composition of the evaluated country.

Human resources costs are estimated based on the percent of full-time employment (FTE) a health provider will devote to supporting a given policy, multiplied by the annual salary of his/her position. The cost of trainings and meetings is based on the frequency of meetings and workshops within a year, their average duration, the number of national and sub-national participants (plus associated support staff), and the size of the meeting venue. For mass media, TV and radio advertising, newspaper advertisements, wall posters and information leaflets were included. Estimates were based on the number and intensity of media slots, for example four, two-week series per year, each consisting of 10 one-minute TV and radio slots per week.

*Valuation.* Unit costs for resource items were taken from the WHO-CHOICE database.

Additional information, and examples of how clinical and policy interventions were costed, can be found in the *Technical Appendix*.

## V. Results

Implementing the intervention packages would result in significant health and economic benefits. Comparing the costs and benefits of each package of interventions, we find that all four categories of interventions—1) tobacco policies, 2) alcohol policies, 3) salt policies, and 4) CVD clinical interventions—have positive returns over 15 years. Salt interventions have the highest return on investment: for every Tugrik invested the package of salt interventions, one can expect to see 16.9 Tugriks in return over a 15-year period. The alcohol package has the next highest ROI (13.6), followed by tobacco (13.0), and the CVD clinical-intervention package (3.0).

This section provides a summary of the component parts of the ROIs—including health benefits, economic benefits, and total costs—and then proceeds to discuss the return on investment for each package of interventions.

### *Health benefits*

Epidemiological modelling in the OHT suggests that over a 15-year time frame an estimated 192,985 CVD events (strokes and IHD events) would occur in a do-nothing baseline scenario. Scale up of the CVD primary prevention interventions alone would avert nearly 14 percent of CVD events.

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<sup>12</sup> See the WHO report 'Scaling up action against NCDs: How much will it cost?' [56]

All interventions provide significant reductions in the number of lives lost to CVD-related causes. Salt has the greatest impact (10,403 lives saved), followed by CVD clinical interventions that target metabolic risk factors (6,042). The number of lives saved by the tobacco and alcohol interventions are smaller in magnitude. However, they represent significant reductions in the number of deaths that are caused by tobacco consumption or the hazardous use of alcohol. For instance, in Mongolia, 22.5 percent of all stroke deaths and 23.1 percent of IHD deaths are caused by tobacco use [57]. Using these figures, we estimate that 26,654 CVD deaths will occur as a result of tobacco use over the next 15 years in Mongolia. Thus, implementing or strengthening just three tobacco interventions—plain packaging, increased taxes, and bans on indirect advertising—can avert about four percent of expected tobacco-related deaths (1,092/26,654).

**Table XI.** Estimated health benefits over a 15-year time horizon, by intervention package

Intervention package	Strokes averted	IHD events averted	Mortality averted	Healthy life years gained
CVD clinical interventions	7,284	19,644	6,042	94,439
Tobacco	743	1,321	1,092	7,599
Alcohol*	--	--	1,917	61,204
Salt	10,144	10,791	10,403	87,240

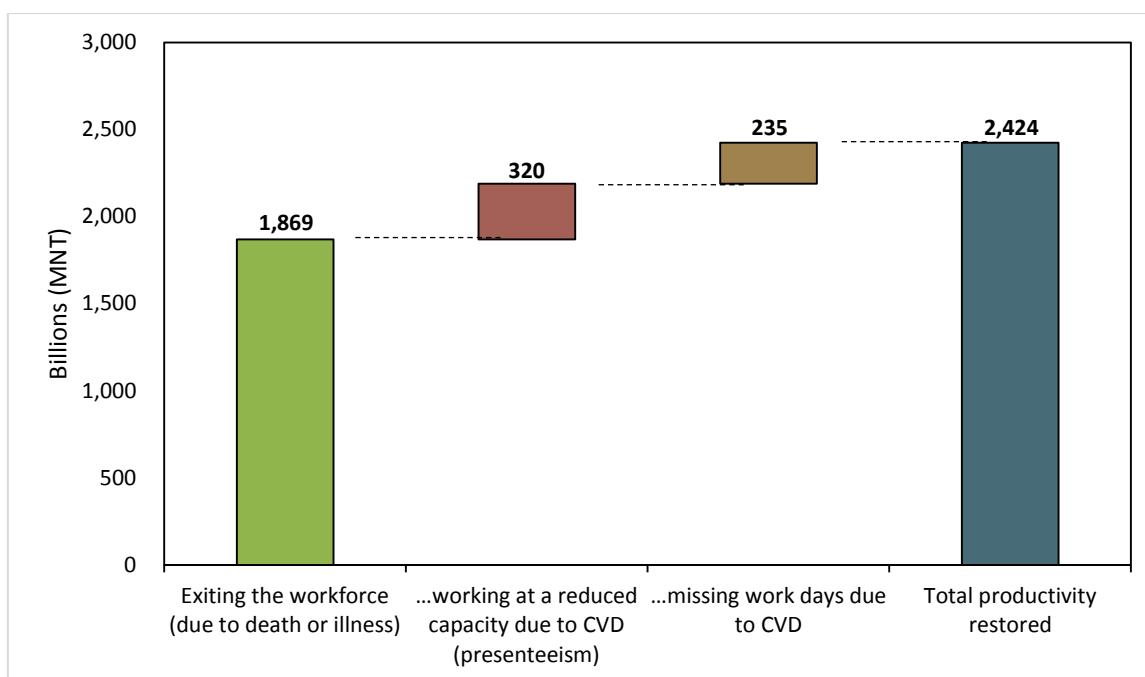
\* *Alcohol interventions' impact are estimated across multiple diseases (e.g. cancer or cirrhosis deaths averted). Health benefits of the other three packages—CVD & tobacco—only represent those interventions' impact on cardiovascular disease (e.g. averted CVD-related deaths).*

Each set of interventions also restores healthy life years to the Mongolian population. The CVD clinical interventions, and tobacco and salt packages prevent strokes and IHD events, and thus individuals avoid disabling states (e.g., partial paralysis from stroke) that can increase pain and suffering; reduce mobility, and; impair speech and thought. Our analysis of the alcohol interventions casts a wider net, going beyond just CVD to assess the impact of the package on injuries and multiple diseases. With implementation of the alcohol package, the population gains 61,204 healthy life years due to reductions in cancers, cirrhosis, epilepsy, and other diseases, as well as reductions in road injuries, falls, drownings, and interpersonal violence that are caused by alcohol use.

#### *Economic benefits*

With better health, fewer working-age individuals leave the workforce prematurely due to death. Laborers miss fewer days of work (absenteeism) and are less hindered by health complications while at work (presenteeism). *Figure VII* shows the labor productivity gains that result from the health benefits described in *Table XI*.

**Figure VII.** 15-year time-span – Recovered economic output from implementing tobacco, alcohol, salt, and CVD primary prevention interventions that save Mongolian workers from:



The largest productivity gains occur due to avoided mortality (77.1% of total productivity restored), followed by reduced presenteeism (13.2%) and absenteeism (9.7%). Taken together, implementing the policy packages results in net present value 2.4 trillion MNT (\$US 990 million) in labor productivity gains over 15 years. The average annual productivity benefits of the CVD primary prevention (49.9 billion), tobacco (7.5 billion), alcohol (12.4 billion), and salt packages (81.6 billion) are equivalent to about one percent of Mongolia's 2015 GDP.<sup>13</sup>

### Costs

Table XII shows the net present value of the cost of implementing each intervention over a 15-year time frame. CVD clinical interventions cost more than the prevention interventions. Relatively large scale-ups in screening (on average, about 242,234 additional people are screened for CVD per year) and treatment for CVD risk (on average, about 48,139 additional people are treated per year) result in high costs for these categories.

Policy intervention packages are low in cost in relative comparison to CVD clinical interventions. Two components of the salt package are also relatively costly compared to the other policy interventions. The high cost of urinary measurements as part of the Surveillance intervention, and aggressive media campaigns as part of the Knowledge intervention drive these costs.

**Table XII.** Costs by intervention, Net present value (NPV)

CVD Clinical Interventions	Cost (billions MNT)	Tobacco interventions	Cost (billions MNT)	Alcohol interventions	Cost (billions MNT)	Salt Interventions	Cost (billions MNT)
Screening	109.5	Raise Taxes	2.9	Raise Taxes	2.7	Surveillance	18.9
CVD risk	117.5	Advertising	1.8	Advertising	1.6	Harness Ind.	1.4
Hypertension	34.8	Plain Packaging	1.7	Restrict availability	7.6	Adopt standards	9.2
Cholesterol	1.8	Program cost	3.0	Program cost	2.8	Knowledge	36.0
						Environment	8.9
						Program cost	3.0

<sup>13</sup> 2015 GDP = 15.85 trillion MNT.



## The Return on Investment

Table XIII provides 5- and 15-year return on investment ratios.

Comparing the costs and benefits of each package of interventions, we find that all four categories of interventions—1) tobacco policies, 2) alcohol policies, 3) salt policies, and 4) CVD clinical interventions—have positive returns over 15 years. Salt interventions have the highest return on investment: for every Tugrik invested the package of salt interventions, one can expect to see 16.9 Tugriks in return over a 15-year period. The alcohol package has the next highest ROI (13.6), followed by tobacco (13.0), and the CVD clinical-intervention package (3.0).

The low ROI of the CVD clinical interventions (3.0) is reflective of high costs associated with medical treatment. In magnitude, however, the expected benefits from the CVD clinical interventions are eight times those of the tobacco interventions, showing that for a large investment, large benefits can be achieved. Salt is the clear “best-buy” however, offering the highest productivity benefits (1.3 trillion MNT) for a disproportionate cost (77.3 million MNT).

In the short-term, investments in two out of four packages (alcohol and salt) show positive returns during the first five years. Tobacco and CVD clinical interventions do not break even within five years. Low ROIs at five years are reflective of two things:

1. The benefit from preventing risky behaviors, or from lowering metabolic risk factors, can take time to bear fruit. For instance, reducing salt consumption may lower blood pressure in the short- to medium-term, but the results of that decrease may not be counted until many years later when an event like a stroke would have occurred (if blood pressure stayed high).
2. In our model, policy interventions are not considered to be in effect until the third year of our analysis, which means that development and implementation costs accrue in the first two years, without the policies producing any benefits.

In this sense, some policy packages must be thought of as an investment: with costs up front necessary to produce returns that eventually outweigh initial—and ongoing—costs.

**Table XIII.** Costs, benefits, and the return on investment at 5- and 15-years, by intervention package (billion MNT)

Intervention package	5 years			15 years		
	Total costs	Total productivity benefits	ROI	Total costs	Total productivity benefits	ROI
Salt	18.4	26.4	1.4	77.3	1,305	16.9
Alcohol	3.7	5.8	1.6	14.6	198.9	13.6
Tobacco	2.8	1.9	0.7	9.3	120.7	13.0
CVD clinical interventions	38.0	23.8	0.6	263.6	798.6	3.0

## Institutional and Context Analysis

Mongolia has one of the highest premature mortality rates due to NCDs among low and middle income countries. Several national policies have been adopted to address NCDs, including the Programme on Prevention and Control of Diseases Caused by Unhealthy Lifestyles (2014 – 2021); the National Strategy for Reducing Tobacco Harm (2014 – 2020); the National Strategy on Health, Diet and Physical Activity (2010 – 2021); the National Programme on Injury and Violence Prevention (2008 – 2016); and the National Programme for Reducing Salt Intake (2015 – 2024).

While there has been political commitment to addressing NCDs, implementation of policies and strategies has been hampered by weak multi-sectoral collaboration, lack of accountability mechanisms, and insufficient focus on prevention and primary care. Interference by industry in the areas of alcohol, tobacco and unhealthy foods has also influenced adoption of enabling laws and policies.

The 2015 WHO NCD Progress Monitor for Mongolia shows progress in three areas: advertising bans on tobacco products (moving from partially achieved to fully achieved); national salt/sodium policies in place (moving from not achieved to partially achieved); and restrictions on marketing to children (moving from not achieved to partially achieved). However, setbacks have been experienced in tobacco smoke free policies (moving from fully achieved to partially achieved); and alcohol pricing policies (moving from partially achieved to not achieved). Another 13 areas have seen no change, including adequate taxation of tobacco products which has remained as not achieved.

Raising tobacco and alcohol taxes and promoting healthier food choices is likely to continue to face challenges due to economic and political interests. At the same time, electoral system changes and the election of a new government in 2016 could provide greater political stability and strengthen the ability of government to pursue coherent policies and strategies with longer term returns.

Mongolia is experiencing a challenging economic environment, with a dramatic decrease in annual GDP growth due largely to falls in commodity prices. Despite this challenge and fiscal pressures, the Government has expressed commitment to maintaining health expenditure. An increase in alcohol and tobacco excise taxes could support this commitment and provide a much-needed boost to the national budget. Any industry interference will negate this option and limit sustainable financing options.

Political commitment at the highest levels and advocacy to build public awareness and incentivize action could help to mitigate industry interference, promote multisectoral NCD action, and support implementation of the interventions outlined in this investment case. Parliamentarians and selected private sector entities and NGOs could play an important role in this regard, along with teachers' associations, youth leaders, bloggers, social media, or celebrities. For example, the Mongolian Women's Parliamentary Caucus had led advocacy in parliament for tobacco and alcohol control laws.

Major employers could also support NCD prevention and control given their interest in reducing disruptions to productivity, absenteeism and presenteeism. The Chamber of Commerce, the Mongolian Employers' Association and Trade Union, and similar entities could therefore have a key role in advocacy, along with the National Center for Public Health and reputable NGOs.

The return on investment analysis is an important basis for advocacy with government sectors and other partners, particularly with the Ministry of Finance, enabling the Ministry of Health and the UN Country Team to make the case that investing in preventing and controlling NCDs provides multiple benefits that significantly outweigh the costs.

A stakeholder forum can assess the findings of the investment case to ascertain and agree policy options to pursue. WHO and the UNCT are willing to support this process.

## VI. Conclusion

We undertook an analysis to ascertain the return on investment (ROI) expected for implementing interventions that are designed to reduce CVD risk factors. We analyzed policy-level interventions that target tobacco, alcohol, and salt consumption. We also analyzed select clinical interventions, including primary prevention interventions that treat those with high CVD risk, high blood pressure, and high cholesterol.

Implementing the interventions would result in significant health and economic benefits. The intervention packages are projected to:

- **Save lives and reduce the incidence of disease.** Between them, the packages would save 19,454 lives over a 15-year period, with salt interventions responsible for the majority of deaths averted (10,403). Implementing just three tobacco interventions would avoid about four percent of all tobacco related deaths over the same time frame.
- **Increase the productivity of the workforce, adding to GDP.** Taken together, the packages represent over 2.4 trillion MNT in productivity gains over 15 years, a direct result of decreased numbers of Mongolians 1) dropping out of the workforce due to premature mortality, 2) missing days of work, and 3) working at a reduced capacity due to poor health. This gain is equivalent to 15 percent of Mongolia's 2015 GDP.
- **Provide benefits that significantly outweigh the costs, over the long run.** Comparing the costs and benefits of each package of interventions, we find that all four categories of interventions—1) tobacco policies, 2) alcohol policies, 3) salt policies, and 4) CVD clinical interventions—have positive returns over 15 years. Salt interventions have the highest return on investment: for every Tugrik invested in the package of salt interventions, one can expect to see 16.9 Tugriks in return over a 15-year period. The alcohol package has the next highest ROI (13.6), followed by tobacco (13.0), and the CVD clinical-intervention package (3.0).

The results demonstrate the benefits of moving toward a health framework that focuses on the prevention of disease, as opposed to treating disease once it has already emerged. In addition to the above outlined productivity benefits, implementing interventions that target risk factors and prevent disease altogether may assist the government to cut down on the significant health expenditure it devotes to treating people with CVD—currently estimated at about 57.2 billion tugriks annually.

Analysis of the costs of scaling up the four interventions packages suggests that realizing said benefits will require an investment of 364.8 million MNT over 15 years. Especially in the climate of austerity brought on by the recent economic stabilization package with the IMF, clearing fiscal space for new interventions, and scaling up existing ones, may be a challenge. However, it is expected that current levels of social spending will be preserved [58], and as part of the IMF stabilization package alcohol and tobacco excise taxes will be raised by 20 percent over the next three years providing one new possible revenue stream to fund interventions for NCDs [28]. In addition, the first UNIATF Joint Mission to Mongolia identified that the government intends to double the health budget after 2018 [34]. These represent potential funding sources for NCDs, and especially for cost-effective interventions like those analyzed in this report.

In addition to fiscal challenges, if history follows course, new regulations may face challenges from tobacco, alcohol, and food manufacturers. Previous attempts to raise taxes faced concerted opposition campaigns from beverage manufacturers, and food labeling has been opposed by the food industry. Enacting new regulations around advertising, labeling, and the availability of harmful substances will require political will. The Joint Missions to Mongolia identified a number of potential allies that could be used to court parliamentarians, and to spread awareness about NCDs and their detrimental impact on the economy [34]. These included private sector companies and the Chamber of Commerce, both of which have a stake in the productivity of the workforce.

NCDs, and particularly cardiovascular disease, continue to impact the health, lives, and productivity of the Mongolian population. With recent restructuring around the economic stabilization package, and new revenue streams, the policy window for change is open. Interventions that target NCD risk factors are cost-effective.

Building on noteworthy past successes, including fulfillment of the majority of the tobacco MPOWER commitments and harnessing industry to reduce salt in bread, as well as recent wins around increasing tobacco and alcohol taxes, the government of Mongolia should act to implement additional cost-effective interventions that can decrease the burden of NCDs. = = =

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The United Nations Inter-Agency Task Force on the Prevention and Control of Noncommunicable Diseases (UNIATF) was established in 2013 by the Secretary General and placed under the leadership of WHO to coordinate the activities of the UN System to support the realization of the commitments made by Heads of State and Government in the 2011 Political Declaration on NCDs. Joint activities included in the work plan of the Task Force are additive to various, more comprehensive efforts conducted by the UN agencies to prevent and control NCDs. These joint activities offer important opportunities to address cross-cutting issues and to advance capacity and learning in countries.



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