



**THE CASE FOR INVESTMENT
IN PREVENTION AND CONTROL OF
NON-COMMUNICABLE DISEASES IN THE
KINGDOM OF
SAUDI ARABIA**



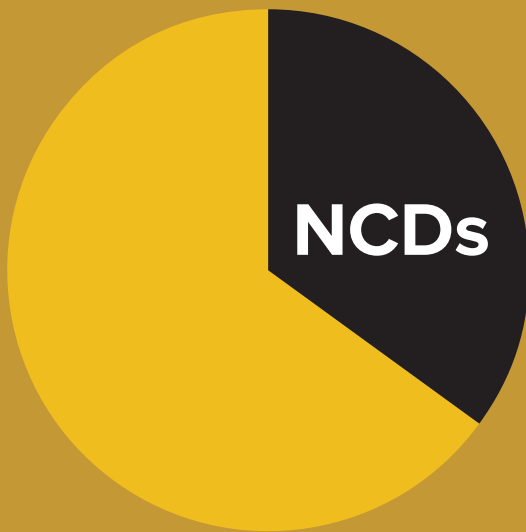
THE CASE FOR INVESTMENT IN PREVENTION AND CONTROL OF NON-COMMUNICABLE DISEASES IN THE KINGDOM OF SAUDI ARABIA

Prepared by

Ministry of Health KSA
United Nations Development Programme
World Health Organization
Secretariat of the UN Inter-Agency Task Force on NCDs

December 2021

Why invest?



AROUND 22,000 SAUDIS DIE EVERY YEAR FROM THE FOUR MAIN NON-COMMUNICABLE DISEASES (NCDs), EQUAL TO

35%

OF ALL DEATHS IN THE KSA.

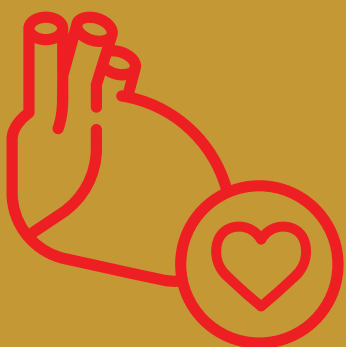


NCDs COST THE KSA SAR 91.6 BILLION (US\$ 24.4 BILLION) EVERY YEAR, EQUIVALENT TO

3.08%

OF THE KSA'S GDP IN 2019.

28%



OF THE MAIN NCDs,

**CARDIOVASCULAR
DISEASE**

CAUSES THE MOST DEATHS EVERY YEAR.



IN THE KSA, MORE THAN ONE IN FOUR PEOPLE ARE CURRENTLY AFFECTED BY ONE OF THE FOUR MAIN NCDS, AND ARE THEREFORE AT INCREASED RISK OF SEVERE COVID-19.

DIABETES AND OBESITY ARE THE MOST PREVALENT METABOLIC RISK FACTORS IN THE KSA. PEOPLE LIVING WITH DIABETES AND OBESITY ARE

**more than three
times more likely**

TO SUFFER FROM SEVERE COVID-19.¹

Investing now

IN PROVEN AND HIGHLY COST-EFFECTIVE
policy and clinical interventions

WOULD



OR (US\$ 29.7 BILLION) IN ECONOMIC LOSSES BY 2034.

¹ Responding to non-communicable diseases during and beyond the COVID-19 pandemic: State of the evidence on COVID-19 and non-communicable diseases: a rapid review. Geneva: World Health Organization and the United Nations Development Programme, 2020.

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ABBREVIATIONS

BMI	Body Mass Index
COPD	Chronic Obstructive Pulmonary Disease
COVID-19	Coronavirus Disease
CRD	Chronic Respiratory Diseases
CVD	Cardiovascular Disease
DALY	Disability-Adjusted Life-Year
FAO	Food and Agriculture Organization of United Nations
GATS	Global Adult Tobacco Survey
GBD	Global Burden of Disease
GCC	Gulf Cooperation Council
GDP	gross domestic product
GHC	Gulf Health Council
GYTS	Global Youth Tobacco Survey
ICA	Institutional Context Analysis
IMF	International Monetary Fund
KSA	Kingdom of Saudi Arabia
KSAWHS	World Health Survey Saudi Arabia 2019
MENA	Middle East and North Africa
MI	Myocardial Infarction
MOE	Ministry of Education
MOH	Ministry of Health
MPOWER	monitor tobacco use and prevention policies; protect people from tobacco smoke; offer help to quit tobacco use; warn people about the dangers of tobacco; enforce bans on tobacco advertising, promotion and sponsorship; raise taxes on tobacco [WHO package]
NCD	non-communicable disease
NRT	nicotine replacement therapy
NTP	National Transformation Plan
PM	particulate matter
PHCCs	Primary Health-Care Centres
ROI	Return on Investment
RTAs	road traffic accidents
SAR	Saudi Riyal
SFDA	Saudi Food and Drug Authority
SHIS	Saudi Health Interview Survey (2013)
SSBs	sugar-sweetened beverages
STEPS	WHO STEPwise approach to surveillance
UNDP	United Nations Development Programme
UNIATF on NCDs	United Nations Interagency Task Force on Non-communicable Diseases
WHO	World Health Organization

EXECUTIVE SUMMARY

Overview

The four main NCDs – cancer, cardiovascular diseases, diabetes and chronic respiratory diseases – cause 35 percent of deaths in the KSA, many of which are premature (before the age of 70). The premature death, morbidity and disability associated with NCDs are more than a health issue – they negatively affect socio-economic development and long-term fiscal sustainability of government and public services.

As in many parts of the world, NCDs in the KSA are causing a surge in costs expended by the Government to provide healthcare, early retirement benefits, social care and welfare support needs. Moreover, NCDs contribute to reduced economic productivity when people in the workforce die prematurely and work at lower capacity due to illness. NCDs are exacerbated by COVID-19 and vice versa. NCDs and their risk factors – behavioural, environmental and metabolic² – increase, to varying degrees, susceptibility to COVID-19 infection and the likelihood of severe and fatal outcomes. NCDs, therefore, contribute to worse outcomes from COVID-19 including overwhelmed health systems, which, in turn, threaten to disrupt access to life-saving NCD services.

Saudi Arabia's Ministry of Health made it a priority to conduct the NCD investment case presented here, which provides evidence that NCDs reduce economic output and that the KSA would benefit from investing in policy intervention packages that reduce exposure to behavioural risk factors (tobacco use, harmful use of alcohol, unhealthy diet and physical inactivity). It also examines investments in key clinical interventions for the most prevalent NCDs – cardiovascular diseases and diabetes. The findings show that addressing NCDs is a matter of urgency to ensure significant social and economic returns.

² This includes metabolic risk factors such as overweight and obesity, behavioural risk factors such as alcohol and tobacco use as well as physical inactivity, and environmental risk factors such as air pollution (Annex 1).

Main findings

1 NCDs cost the KSA economy SAR 91.6 billion (US\$ 24.4 billion), equivalent to 3.08 percent of its 2019 GDP.

These annual costs include a) SAR 66 billion (US\$ 18 billion) in healthcare expenditures and b) SAR 25.6 billion (US\$ 6.8 billion) in lost productive capacities due to premature mortality, disability and workplace losses. The productivity losses from current NCDs account for nearly 28 percent of all NCD-related costs – indicating that NCDs severely impede the KSA's development beyond health. Multisectoral engagement is required for an effective response, and other sectors benefit substantially from supporting NCD investments.

2 Cardiovascular disease had the greatest impact on the economic burden of NCDs in KSA, causing SAR 52 billion in economic losses, or 57 percent of the total burden.

Both indirect costs, including reduced workforce participation and loss in national productivity, and direct healthcare spending contributed significantly to the total CVD burden (41 percent and 59 percent, respectively).

3 The four main NCDs kill around 22,000 people in KSA per year, and the risk of dying between the age of 30–70 is 16 percent.

The four main NCDs thus account for 35 percent of all deaths in the country. Cardiovascular disease is the leading cause of NCD deaths in the KSA, accounting for 28 percent of all deaths in the country, followed by cancer, diabetes, and chronic respiratory diseases.

By acting now, the Government of the KSA can reduce the burden of NCDs. The investment case findings demonstrate that investing in four cost-effective and proven policy packages would, over the next 15 years:

1

Avert SR 112 billion (US\$ 29.7 billion) in economic output losses.

The NCD prevention measures stimulate economic growth by ensuring that fewer people drop out of the workforce due to premature mortality and miss days of work due to disability or sickness.

2

Save over 200,000 lives and reduce the incidence of disease.

Enacting the CVD and diabetes clinical intervention package would prevent the most deaths (101,000) followed by the salt reduction package (95,000). About 90 percent of the mortality averted for all interventions would be premature deaths averted (192,000 deaths averted for people <70 years of age).

3

Provide economic benefits (SAR 112 billion) that significantly outweigh the costs (SAR 21 billion) of implementation.

Each of the best buy intervention packages represents good value for money. Over 15 years, the salt reduction package has the highest return-on-investment (SAR 35.8 for every SAR invested), followed by the tobacco control (7.7:1), diet and physical activity (3:1) and clinical interventions (2.7:1) packages.

Beyond the four policy packages modelled, the investment case discusses a range of issues that affect health and sustainable development in the KSA. These include air pollution, the food system and urban design (see **recommendations #2 and #4**), road safety (**Annex 5**), bans on trans fats and health taxes on health-harming products such as sugar (see **Table 2**) and integrated responses to NCDs and COVID-19 (see recommendations and **Annex 1**). The policy and clinical interventions analysed in this investment case represent critical first actions needed to fundamentally reverse NCD trends in the KSA. The responsibility for action, as well as the benefits that come from it, fall beyond the health sector alone.

Recommendations

1 > Invest and scale-up

Invest in new and scale-up current cost-effective clinical and population-based interventions, enhancing efficiency in the health sector and public sector fiscal sustainability. Increase taxes on health-harming products (tobacco, alcohol, sugar-sweetened beverages) and shift subsidies from health-harming products (e.g. polluting fuels) to health-promoting ones.

2 > Engage and collaborate

Strengthen multisectoral, whole-of-government and whole-of-society action on NCDs and increase public awareness of NCDs and their risk factors.

3 > Monitor and account

Strengthen monitoring and evaluation and accountability across sectors.

4 > Innovate

Implement novel policy approaches and test innovative solutions to increase utilization of existing services and incentivize healthy behaviour.

5 > Build back better

Ensure that prevention and control of NCDs is a central element of the COVID-19 response and recovery.



'It's therefore not a question of whether countries can afford to implement the best buys, but whether they can afford not to. We have all the pieces to save lives we just have to put them into place. The question is, will we? It's a question we must answer with the decisions we make today, and every day.'

Tedros Adhanom Ghebreyesus,
Director-General, WHO





INTRODUCTION

This report provides an overview of the current context of NCDs in the KSA, describes the model used to estimate the NCD burden and policy benefits and offers recommendations to improve NCD prevention and control. It discusses current levels and patterns of tobacco and salt consumption, physical inactivity, dietary patterns and the existing prevalence of metabolic risk factors within the population.

INTRODUCTION

The KSA has made considerable progress in advancing the prevention and control of non-communicable diseases (NCDs) over the past several years. Still, NCDs remain the leading cause of mortality in the KSA and their prevalence continues to rise. NCDs harm not only health but also the country's sustainable development.

This investment case estimates that the four main NCDs – cancer, cardiovascular diseases, diabetes and chronic respiratory diseases – account for 35 percent of all deaths. Cardiovascular diseases alone account for 28 percent of NCD deaths in the KSA, followed by cancer (6 percent), diabetes (<1 percent) and chronic respiratory diseases (<1 percent). The investment case further estimates that all NCDs are responsible for 23,453 deaths every year in the country, and 38.2 percent of these deaths occur prematurely (between 30 and 70 years of age). [1] Based on data from the Ministry of Health in the KSA, unconditional probability of dying from NCDs between the ages of 30 and 69 years is 6.8 percent. United Nations Sustainable Development Goals target 3.4 aims to reduce such premature mortality from NCDs by one third by 2030.

The impact of NCDs on human health is clear, but this is only one part of the story. NCDs also result in high healthcare costs as well as productivity losses. When individuals die prematurely, the labour output they would have produced in their remaining working years is lost. In addition, people who have a disease are more likely to miss days of work (absenteeism) or to work at a reduced capacity while at work (presenteeism). Globally, NCDs are estimated to cost over US\$ 30 trillion from 2011 to 2030, representing 48 percent of 2010 global GDP. [2] For individuals and governments, spending to treat health problems that could otherwise have been prevented can mean significant opportunity costs, including reduced investment in education, transport projects or other forms of human or physical capital that can produce long-term returns.

The COVID-19 pandemic is exacerbated by NCDs in the KSA as elsewhere, adding to the urgency with which they must be addressed. In response to the pandemic, the Government of the KSA has created an internet resource with information on COVID-19 symptoms, prevention and recently vaccination. [3] The Government and private sector have created and expanded several apps providing information, screening, surveillance and contact tracing. [4] NCDs and their risk factors – behavioural, environmental and metabolic³ – increase both susceptibility to infection and the likelihood of severe symptoms and death from COVID-19. People living with NCDs are also at risk of adverse health outcomes due to disruption of prevention and treatment services for NCDs. The prevention and control of NCDs must therefore be a central element of the COVID-19 response and recovery. **Annex 1** briefly discusses interactions between NCDs and COVID-19 with integrated actions the KSA government can take.

3 This includes metabolic risk factors such as overweight and obesity, behavioural risk factors such as alcohol and tobacco use as well as physical inactivity, and environmental risk factors such as air pollution.

Box 1. Saudi Ministry of Health awarded WHO Tobacco Control Medal 2019

To recognise its achievements in fighting tobacco use, Saudi Arabia was awarded the WHO Tobacco Control Medal in 2019.

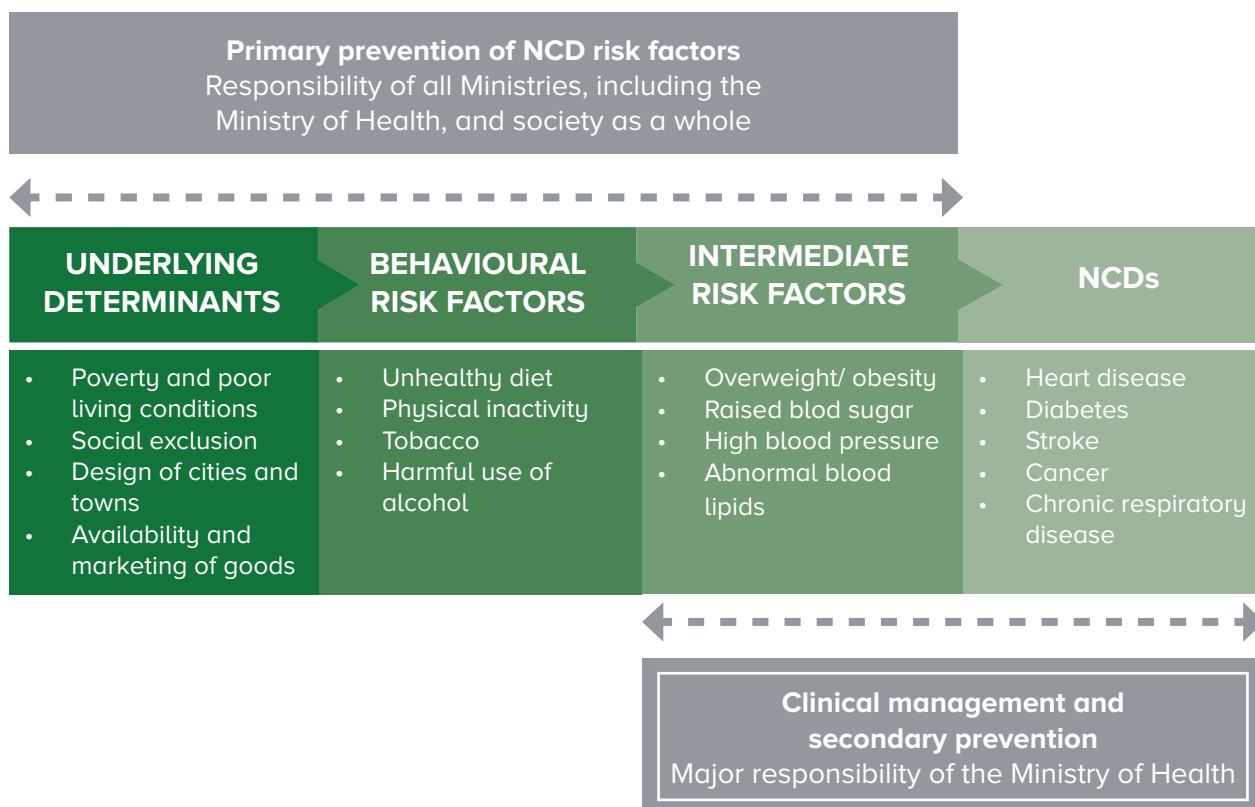
Saudi Arabia was one of the first countries to ratify the WHO Framework Convention on Tobacco Control (FCTC) in 2005 and has delivered on many of its targets. The KSA established a dedicated National Committee for Tobacco Control which implemented 100% taxation on all tobacco products, enforced plain packaging as the first country in the Middle East, banned advertisement and sponsorship and passed a law to prevent smoking in public places. The Saudi Ministry of Health (MOH) also expanded availability and accessibility of cessation support, including free medication.

Beyond this progress in tobacco legislation and control, the Saudi MOH recognised the importance of multi-sectoral action through a multitude of collaborations. This is well demonstrated by a collaboration with the Ministry of Finance aiming to reduce accessibility of tobacco products to young people. To ensure compliance with the new tobacco laws, the MOH also collaborated with the Ministry of Commerce to establish an electronic surveillance system that penalises violations.

Positive effects of these efforts can already be seen, for example through an increased rate of people that quit smoking over the past years. Together, this not only demonstrates the KSA's commitment to prevention and control of NCDs and their risk factors, but also highlights how multi-sectoral action can successfully incentivise healthier behavioural choices.

High human and economic costs of NCDs highlight the need to reduce their burden in the KSA. The risk of developing NCDs can be reduced by modifying four types of behaviour (tobacco use, harmful use of alcohol, unhealthy diet and physical inactivity) and metabolic risk factors such as high blood pressure and cholesterol. According to the World Health Organization, at least 80 percent of premature heart disease, stroke and diabetes and 40 percent of cancers can be prevented by eliminating risk factors. [5] Reducing risk for NCDs is possible through a healthy diet, regular physical activity and avoidance of tobacco products and harmful use of alcohol. Reducing people's exposure to environmental risks, such as outdoor air pollution, can also reduce deaths and disability from NCDs.

Fig. 1 Illustrates the determinants and risk factors that drive the development of NCDs, many of which are beyond the control of the health sector alone.

Fig. 1 Determinants of NCDs and responsibilities for response

WHO developed a menu of highly cost-effective policy options, referred to as ‘best buys’, and an additional set of cost-effective interventions to assist Member States to reduce the NCD burden. These interventions are laid out under the Global Action Plan for the Prevention and Control of Non-communicable Diseases 2013–2030. The best buys were updated at the 2017 World Health Assembly and included measures to reduce behavioural and metabolic risk factors known to lead to NCDs as well as clinical interventions to prevent and treat disease. [6]

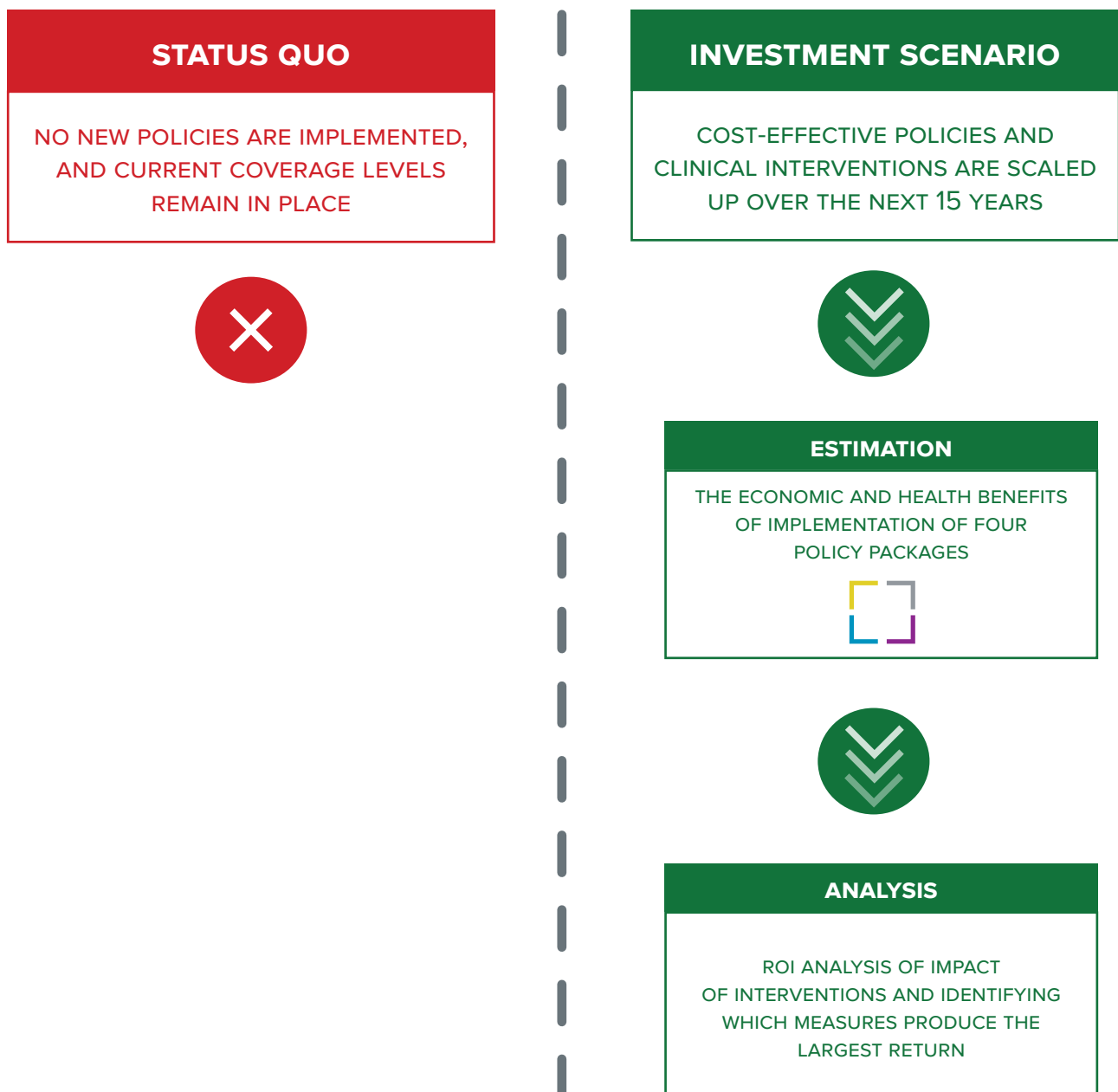
Despite the strong evidence of their cost-effectiveness, WHO best buys remain under-implemented globally. This is partly due to the hidden costs of NCDs (i.e. the economic impact) often being overlooked. Therefore, quantifying the costs of interventions to prevent and control NCDs, as well as their returns on investment, has been a high-priority request from Member States. Investment cases are designed to help countries make their own economic rationale for action to prevent and control NCDs.

The investment case models the health and economic costs of NCDs as well as the potential gains from scaled-up action, over five and 15 years. It compares two scenarios:

1. the **STATUS QUO**, in which no new policies are implemented, and current coverage levels remain in place, and
2. the **INVESTMENT SCENARIO**, where cost-effective policies and clinical interventions are scaled up over the next 15 years.

The investment case model

The investment case models the health and economic costs of NCDs as well as the potential gains from scaled-up action, over five and 15 years. It compares two scenarios:



The investment case estimates the economic and health benefits from implementing the four recommended policy packages over five and 15 years. The analysis uses the WHO OneHealth Tool, an epidemiology-based population model developed by United Nations partners. The investment case identifies which measures can produce the largest health and economic returns for the KSA. It analyses the following four packages of interventions and policies:



This report provides an overview of the current context of NCDs in the KSA, describes the model used to estimate the NCD burden and policy benefits and offers recommendations to improve NCD prevention and control. It discusses current levels and patterns of tobacco and salt consumption, physical inactivity, dietary patterns and the existing prevalence of metabolic risk factors within the population. The **Situation Analysis** outlines the health system and institutional arrangements in the KSA and details the current implementation level of evidence-based policies and clinical interventions. The **Methods** section describes the development of the model, how it estimates NCD burden and how it predicts the economic and health benefits of policy implementation. The **Results** section describes the outcomes of the model, while the conclusion section further discusses the findings and the recommendation section offers suggestions specific to the context of the KSA. The report also includes **five annexes** to provide further guidance on effective NCD prevention and control measures to support the KSA sustain improvements in population health.

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NCDS AND RISK FACTORS IN THE KSA

This section provides an overview of the most prevalent behavioural risk factors for NCDs in the KSA: tobacco use, high salt intake, poor diet and physical inactivity. It also discusses the prevalence of metabolic risk factors, including raised blood pressure, high cholesterol, obesity and diabetes; and it reviews environmental risk factors as well.

NCDS AND RISK FACTORS IN THE KSA

Despite making tremendous improvements in its healthcare system, a rising burden of NCDs, due to a rapid change in dietary and lifestyle behaviours, is challenging the KSA's healthcare and economy. The four main NCDs alone – CVD, diabetes, cancer and COPD – account for 35 percent of all deaths in the KSA. WHO estimates that all NCDs were responsible for 74 percent of all deaths in the KSA⁴ in 2016. [7] NCDs have also become the leading cause of disability in the past 25 years. [8] The rising incidence and prevalence of NCDs in the KSA can be attributed to the country's economic development along with an increased life expectancy and lifestyle changes. Indeed, behavioural risk factors such as high-calorie and high-fat content diets, reduction of physical activity and increase in tobacco consumption along with specific environmental factors particularly contribute to NCD burden in the KSA. [9]

Tobacco use

Tobacco use is common in Saudi Arabia. Most recent available national data stems from the Global Adult Tobacco Survey (GATS) in 2019, reporting that 19.8 percent of the population were current tobacco users. Overall, men were considerably more likely to use tobacco than women use tobacco. Similar trends are observed for tobacco smoking, and in tobacco smoking rates among men and women were 27.5 percent and 3.7 percent, respectively. [10] According to the GATS, during the past 30 days prior to the survey, around 16 percent of people in Saudi Arabia were exposed to secondhand smoking in the workplace; 24 percent in public transportation; 22 percent in restaurants; and 55 percent in cafes, coffee shops and tea houses. [10]



Photo credit: © [Freepik.com](https://www.freepik.com)

While cigarettes are common, other forms of tobacco consumption like water pipes (shisha) are increasingly popular, especially among women and young people. Indeed, the GATS in 2019 found that 6.7 percent of the population smoked shisha [10]. There is a false perception that shisha is less lethal and toxic than cigarette smoking, as described in a study from 2019. [13] Water pipe use is especially concerning as it is not as well-regulated as cigarette smoking in the KSA.

4 Data based on MOH Statistics yearbooks 2013, 2018 and 2019. This data was used in the economic modelling of this report.

Exposure of young people to tobacco products is high in Saudi Arabia, with 6.9 percent of 15-29 year-old males smoking daily. [10] According to the Global Youth Tobacco Survey (GYTS) in 2010, around 30 percent of youth live in a household where others smoke, and 37.5 percent are exposed to smoke outside the home. [14] Moreover, around 24.9 percent of adolescents use tobacco. Mean starting age for smoking in the KSA is at around 18 years of age [10].

The economic burden of tobacco consumption over the previous decade (2001-2010) was reported to be approximately 20.5 billion US dollars (based on 2011 prices). [16] The total cost of smoking and secondhand smoking was estimated to be equivalent to 1.04 percent of the country's gross domestic product (GDP). A higher proportion of indirect cost resulted from smoking in men and middle-aged people. [17]

Physical inactivity

WHO defines physical inactivity as less than 150 minutes of moderate-intensity or less than 75 minutes of vigorous-intensity workout per week. Globally, physical inactivity is reported as the fourth leading risk factor for mortality and accounts for 6 percent of the global mortality rate. [18]

Physical inactivity is a significant challenge in the KSA. According to a systematic review, children, youth and adults in Saudi Arabia are not meeting physical activity guidelines, with females being particularly inactive. [19] WHO estimated that in 2016 more than half of all adults in the KSA were physically inactive (64 percent of women and 44 percent of men were physically inactive). [7] This data is corroborated by the 2019 World Health Survey Saudi Arabia 2019 (KSAWHS), in which 81 percent of respondents were insufficiently physically active. [12] Lack of physical activity is also a major issue in young population groups in the KSA. 57 percent of children and 71 percent of adolescents in the country are physically inactive, leading to approximately US\$ 1 million total (direct and indirect) healthcare costs. [20]

Only about one-fifth (16.8 percent) of the Saudi population engages in a moderate and vigorous level of physical activity. [20] However, the KSA has rolled out several initiatives to improve exercise habits, particularly among the young. For example, the MOH has held educating lectures and training courses in major cities, published training manuals on physical activity, and run awareness campaigns in mass media outlets. [21] Importantly, the Ministry of Education (MOE) has introduced physical education classes for girls for the first time in 2017/18. This milestone may contribute to enhancing women's health and activity across the KSA in the future. [21]

Dietary risk factors

Dietary risk factors include but are not limited to high consumption of salt and sugar, consumption of trans fats and low consumption of fruits and vegetables. WHO recommends to reduce sugar intake to no more than 10 percent of total energy intake for both adults and children

and suggests a further reduction to 5 percent.⁵ [22] According to the KSAWHS in 2019, 94 percent of people in the KSA consume insufficient levels of fruit and vegetables in their routine diet. [12] The Saudi Health Interview Survey (SHIS) in 2013 further found that more than half of the population (61 percent men and 57 percent of women) fail to consume at least one portion of vegetables daily. [11] Only 6 percent of adults consume the recommended five servings of fruit and vegetables.



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Sugar consumption is high in Saudi Arabia, particularly among youth. [23] The KSA has introduced several policies

to regulate and combat the increased consumption of unhealthy goods. [24] In 2017, all GCC (Gulf Cooperation Council) countries, including the KSA levied an excise tax on goods harmful to human health. This also included a 50 percent tax levied on soft drinks (sugar-sweetened beverages (SSBs)) and 100 percent on energy drinks. [25]

Excess salt consumption also poses a severe health risk, contributing to high blood pressure and increased risk for heart disease and stroke. WHO recommends to consume no more than 5g of salt per day, and WHO Member States set a goal to reduce the global salt intake by 30 percent by 2025. [26] In the KSA, a cross-sectional study in 2016 found that salt consumption was almost double the WHO recommendation. [27]

Trans fats are reported to be damaging to human health and should not be consumed or produced in any manner. Every year, approximately 500,000 people die globally from cardiovascular events caused by trans fat consumption. [28] Consumption of trans fats in Saudi Arabia is likely above the limit recommended by WHO. However, the KSA has started to take action against trans fats. [15] In 2015, the KSA passed a regulation to limit trans fat consumption and in 2017 launched a strategic plan for healthy nutrition. [28] In 2018, the WHO released a plan to eliminate trans fats from food supply. Recently, the KSA has become a best-practice country for trans fat policies in line with WHO recommendations. The KSA has even established monitoring mechanisms for adherence to trans fat limits. [28]

⁵ On a 2,000-calorie daily diet, 10 percent would be 50g of sugar per day and 5 percent would be 25g of sugar per day (1 gram of sugar has 4 calories)

Metabolic risk factors

High levels of metabolic risk factors – such as raised blood pressure, raised body mass index (BMI) related to overweight and obesity and raised blood lipid levels – significantly increase the risk of having a cardiovascular event.

Obesity and overweight: Unhealthy diet and physical inactivity have resulted in an increased prevalence of both obesity (defined as body mass index (BMI) $\geq 30\text{kg/m}^2$) and overweight (BMI $\geq 25\text{kg/m}^2$) in the KSA. The KSWHS in 2019 found that 38 percent of the population were overweight and 20 percent obese. Women are more likely to be obese than men. [12] This is comparable to findings from the SHIS in 2013, which further found a third of the population to be overweight. [11]

Hypercholesterolemia: According to the SHIS (2013), 8.5 percent (9.6 percent of men and 7.3 percent of women) of people living in the KSA had high cholesterol levels and another 19.6 percent had borderline hypercholesterolemia. [11], [29] The prevalence of high and uncontrolled cholesterol levels increased with age, reaching 28.7 percent among adults aged 65 years and over. [11] More recent data from the 2019 KSAWHS found that 43 percent of respondents had increased cholesterol levels, which is a risk factor for hypercholesterolemia. [12]

Hypertension: The Global Burden of Disease (GBD) Study 2010 identified hypertension as a leading cause of death in the KSA, accounting for approximately 25 percent of all CVD-related deaths. [30] According to the SHIS survey, 15.2 percent (17.7 percent males and 12.5 percent females) of people in Saudi Arabia were hypertensive and 40.6 percent had borderline hypertension. [11] The KSAWHS in 2019 found 13 percent of the population to be hypertensive. [12] It is estimated that about 60 percent of hypertension cases remain undiagnosed, and only 45 percent of those that are diagnosed are on medication to control blood pressure. [30] In addition to challenges with diagnosis, the majority of people in the KSA were found to be unaware of national healthcare services available for hypertension care. [30]

Diabetes: Diabetes has also become a potential epidemic in the KSA, affecting approximately 3 million people. [31] The KSAWHS found that 8 percent of respondents had diabetes. [12] According to the WHO, the KSA ranks second in diabetes prevalence in the Middle Eastern Region and seventh in the world. [32] Additionally, the diabetes prevalence in the country is seeing a disturbing rising trend, with a nearly ten-fold increase in the cases in the past thirty years. [33] Recently, the International Diabetes Federation's Diabetes Atlas of 2019 reported adult diabetes prevalence in the KSA to have risen to 18.3 percent. [34]

Environmental risk factors

In 2015, environmental risk factors were responsible for 20 percent of disability-adjusted life years (DALY) in the KSA. [35] The main environmental risk factors include air pollution, chemical exposure and extreme climate conditions.

Climate conditions: Saudi Arabia has a semiarid to hyper-arid climate, characterized by very low annual rainfall, high temperatures and extremely high evapotranspiration. [36] Exposure to high temperature leads to physiological stress, can exacerbate the effect of pre-existing conditions and can increase the risk of premature death or disability. [37]

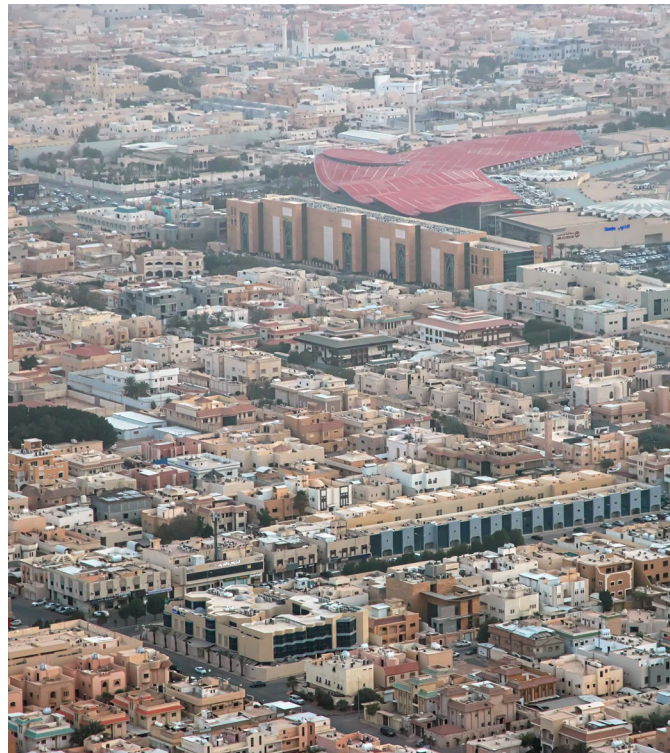


Photo credit: © [Freepik.com](https://www.freepik.com)

Air pollution: Air pollution covers a mixture of pollutants indoors and outdoors, of which the fine fraction of particulate matter (PM_{2.5}) is the prime health concern. Increased exposure to air pollution is related to an increased risk for certain NCDs, such as ischaemic heart disease, stroke, chronic obstructive pulmonary disease and cancer. PM_{2.5} exposure in particular is strongly associated with mortality and morbidity including impaired lung function in children. A cross-sectional study of the Rabigh region in Saudi Arabia found that exposure to PM_{2.5} was associated with a significant risk of respiratory disease and cardiovascular diseases among its residents. [38]

Air quality in Saudi Arabia needs to be improved to reduce related ill-health. WHO estimates indicate that the concentration of PM_{2.5} in both urban and rural areas exceeds the recommended maximum of 10 µg/m³ by a factor of eight. [7] Factors contributing to poor air quality include vehicle emissions, industrial emissions and dust storms. To reduce emissions from personal vehicles, the Riyadh Development Authority has planned to construct new metro and bus lines as a part of the country's transportation infrastructure. [39] In addition to outdoor air pollution, particulate matter and trace gases also contribute to indoor air pollution in restaurants, schools and households in Saudi Arabia. [40]

Availability and affordability of nutritious foods: Food security is currently not a major concern in Saudi Arabia. However, the country is facing growing challenges including high dependency on imported foods, insufficient food subsidies, high rate of food loss and limited natural resources for domestic production. [41]

To address these challenges, the KSA's Ministry of Environment, Water and Agriculture along with FAO (Food and Agriculture Organization of the United Nations) formulated strategic national initiatives for sustainable food security under the country's National Transformation Programme 2020. [41] The KSA was also selected as a focus country for FAO's regional initiative of "Building resilience of food security and nutrition for the Near East and North Africa". The initiative aims at strengthening the institutions, markets and production systems to cope with crises and threats. [41] The KSA has also established a multisectoral National Food Security Committee that is responsible for dealing with issues related to food safety, food loss and waste, sustainable agricultural production and trade, among other areas.⁶

In the GCC region, including the KSA, food consumption patterns have shifted towards more processed foods, sugar and animal products, and less fruit and vegetables. [42] In the past years, the KSA has taken numerous actions towards a healthier population, including implementing the National Diet and Physical Activity Strategy and several campaigns within and beyond the Vision 2030 framework. Innovative approaches to support healthy diets such as prohibiting the marketing of unhealthy foods to children, introducing food labelling and increasing food and beverage taxes align well with the KSA's drive for healthier lifestyles. Indeed, a recent study found that healthy foods are more affordable than unhealthy foods in Saudi Arabian markets, hopefully creating an incentive for healthier living. [43]

6 For more details, see: <https://sago.gov.sa/FoodSecurity/GovernanceStructure>



SITUATION ANALYSIS

This section reviews the KSA's institutional and governmental arrangements to combat NCDs and summarises national efforts to implement WHO-recommended best buy and cost-effective interventions to reduce the burden of NCDs.

SITUATION ANALYSIS – HEALTH SYSTEM AND REFORMS

In KSA, the MOH is responsible for public healthcare services. It is involved in both operation and evaluation of the health system, as well as in creating, funding and executing health promotion programmes through health education. [44] The majority of healthcare services are provided by MOH (around 60 percent). [45] The remainder of healthcare services are provided by the private sector and other governmental health sectors [45]. As the largest economy in the GCC region, the KSA has a large national budget, which has allowed the Saudi government to provide free public healthcare services to its population. [46] However, healthcare spending per capita is reportedly low in comparison to other countries with similar GDPs. Indeed, only 6.57 percent of total governmental budgets were allocated to the MOH in 2018 [47]. With over 90 percent of the MOH budget being allocated to infrastructure and development projects in hospitals, there is relatively low resource allocation towards the Primary Health Care sector. As such, development and infrastructure within this sector lags behind the well-developed secondary and tertiary health sector. [46], [48]

The health system in the KSA consists of over 2,300 primary health-care centres (PHCCs), 216 general hospitals, 58 specialist hospitals, 44 government hospitals and 152 private hospitals. [49] Additionally, the Government is further developing ‘medical cities’ to provide specialist services with investments of USD 4.3 billion. [50] The majority (58 percent) of the health sector workforce are non-Saudi citizens, however investments have been made into medical education in the KSA to enhance the domestic workforce. [51] Major challenges in the health sector include inequitable access to quality healthcare in public hospitals, rising costs of care and continual development of the primary care system. [52], [53] Both increasing the private sector and introducing a national health insurance scheme have been posited as mechanisms to achieve Universal Health Coverage and improve healthcare accessibility and quality. [51]

The constitution of the KSA signifies health as one of the fundamental rights of every citizen. As such, the Government of the KSA has offered comprehensive access to healthcare for many decades. Healthcare services through government agencies are free at the point of care for all Saudi citizens. However, to combat increasing costs and overuse, Saudi Arabia has privatized hospitals in the past 15 years and made health insurance compulsory for non-Saudi workers and Saudi nationals working in the private sector. [54] Coverage in the private sector still remains a challenge (70 percent in 2016 [55]) and concerns about equity, comprehensiveness and cooperation between private and public healthcare systems have been raised. [51] Both the Vision 2030 and National Transformation Plan of 2020 reaffirm the private sector’s role in fulfilling the demand for healthcare through healthcare provision.

The KSA has established a solid healthcare monitoring system. The Department of National Health Registries was established as part of the national centre of health information in 2013 and is the authorized body for supervision, regulation and support for the development of national related events/disease registries in the KSA. This national database classifies Health

Registries into diseases registries, medical devices registries and health services registries. Ongoing national registries include the Saudi Cancer Registry, the National Registry for Neural Tube Defects and the National Registry for Hearing Impairment. [56]

The MOH is responsible for monitoring and implementing quality improvement in the health system. [57] Mechanisms to monitor quality and performance improvement in the KSA were initially introduced by the MOH through a wide array of standardized healthcare performance improvement plans developed by the Agency for Healthcare Research and Quality. After initial criticism on a lack of key performance indicators and outcome measures relevant to a privatized system, the MOH developed and implemented initiatives based on corporate performance improvement methodologies to address these shortcomings. Current performance improvement initiatives aim to implement best clinical practice processes, embed a performance-enhancing culture of safety, effectiveness, patient centredness and timeliness as well as achieve objectives of cost efficiency, quality improvement and improved patient satisfaction. [57]

NCD GOVERNANCE

Multisectoral coordination

The KSA shows evidence of political commitment towards tackling NCDs through multisectoral collaboration and coordination. While the MOH's national NCD Committee is not multisectoral, the Public Health Authority is responsible for fostering multisectoral collaboration between sectors and has established and contributed to several intersectoral programmes, including taking a "health-in-all policies" (HiAP) approach the RASHAKA programme and Vision 2030 (**Box 2**).

On a supranational level, the KSA is a member of the Gulf Health Council which features a Committee for the Control of Non-communicable diseases. This committee convenes annually and provides a plan for targeting NCDs in the Gulf. This plan is outlined within a framework which details a number of targets and indicators to aid measurement of implementation of the plan. [59] Additionally, the Gulf Cooperation Council developed a regional strategy to address NCDs in response to the UN General Assembly Political Declaration on the Prevention and Control of NCDs. [60]

Box 2. Collaboration between MoH and stakeholders**The RASHAKA program**

This program is a collaborative initiative between the Ministry of Health and Ministry of Education designed to respond to childhood obesity in Saudi Arabia. It targets school-aged students along with their parents and school teacher to increase awareness about the importance of a healthy lifestyle. Actions include providing healthy food choices in school cafeterias, inhibiting the sales of high-energy snacks/drinks and screening children for obesity and its complications before referring for medical care.

The Healthy Schools Program

The Public Health Agency under the MOH has established this program in partnership with the Ministry of Education to improve the health of students in line with WHO-recommended best practices, standards and policies. The program takes a comprehensive approach, focusing on all aspects of student health including physical, psychological, social and religious aspects, in line with national priorities.⁷

National Nutritional Committee

Established by the Saudi Food and Drug Authority, the National Nutritional Committee is a scientific advisory committee that aims to improve health and nutrition in Saudi Arabia. It does so by providing recommendations to relevant authorities; conducting studies and research related to nutrition; evaluating nutrient contents of food; measuring the nutritional status of the population; raising awareness and promoting healthy nutrition; and coordinating between government, private and civil society organizations to promote public health. Sectors represented on the nutritional committee include the Ministries of Health, Trade and Investment, Education, Environment Water and Agriculture, as well as private sector representatives, the FDA, General Statistics Authority and the Saudi Health Council.⁸

Vision 2030

The MOH was tasked with delivering the Health Sector Transformation Strategy as part of Vision 2030 for the KSA. The plan was developed in close collaboration with the National Transformation Program and aimed to tackle major challenges in the health system including demographic changes, NCD prevention and inadequacies in the primary care sector.

Strategy and planning

In 2016, the strategic framework Saudi Vision 2030 was released detailing plans and reforms to diversify the economic base, modernize the health sector and enable the country's young and growing population to grow and develop sustainably over the coming decades. The National Transformation Plan (NTP) is one of the Vision Realization Programmes designed to achieve objectives of transforming healthcare, improving living standards and safety

⁷ For more details, see: <https://www.moh.gov.sa/en/Ministry/Projects/Healthy-Schools/Pages/default.aspx>

⁸ For more details, see: <http://old.sfda.gov.sa/ar/scienceComitee/Pages/default.aspx>

and ensuring the sustainability of vital resources. [61] NCD-relevant objectives of the Vision 2030 include easing access to and improving value and quality of healthcare services, strengthening prevention against health threats, promoting sports activities in society and substantially reducing air pollution.

More specific goals towards NCDs were set in the National Executive Plan for NCDs (2010–2020) and its updated version (2014–2025). These aim to reduce both the morbidity and mortality of NCDs by 5 percent in 10 years through strengthening prevention, monitoring and treatment of NCDs, improving health services and enhancing NCD research. Additionally, several strategic planning interventions and programmes are ongoing to control the NCD burden in the country. For example, the multisectoral National Diet and Physical Activity Strategy (2014–2025) aims to lower the rate of overweight and obesity from 66 to 40 percent, to increase the rate of vegetable and fruit consumption to 20 percent and to stabilize the prevalence of diabetes. Saudi Arabia has been a Party to the WHO FCTC since 2005 and has had a tobacco control programme since 2002. [62] A National Committee for Tobacco Control was established to support the creation of laws and initiatives to reach the goals set in WHO FCTC through collaboration from several ministries to improve tobacco control. [63], [64] Tobacco control regulations in the KSA include an anti-smoking law introduced in 2014, a 100 percent excise taxation implemented in 2017 [65] and prohibition of smoking in public areas and advertising and promotion of tobacco. [66]

Local government

Key aspects within the Vision 2030 plan include decentralization of hospitals and health services as well as the introduction of ‘competition’ between health sectors in various districts based upon health performance indicators. The KSA is divided into 13 regions, each subdivided into 118 governorates, however, Saudi governance generally remains highly centralized. The strive towards greater decentralization aims to target inefficiencies and issues within the current system such as complex organizational structures and overlapping legal authorities of various institutions. The health system itself is a largely centralized structure and the Strategic Plan for the Ministry of Health includes a commitment towards further decentralization and improving coordination between sectors of care. [45]

Health financing

Current Health Expenditure in the KSA was reported at US\$ 1,093 per capita in 2017, representing 5.2 percent of GDP per capita. [67] The majority of healthcare is financed through public funding (Government health spending), which in turn is largely dependent on oil revenue generated by the government. The remainder of funding is through private healthcare expenditures which are financed through a combination of employee insurance and out-of-pocket payments by the employer and consumer. [68]

Due to significant revenues from the oil sector, the public sector has so far been able to provide free health services for the Saudi population without the need for supplementary financial support. However, recent challenges in sustaining free publicly funded health services include escalating health costs, diminished revenues from oil, changing demographics, improved life expectancies, a growing expatriate population, a shift towards sedentary lifestyles, changing disease patterns and high expectations of healthcare users. [47] Between 2000-2017, total health spending per person increased from US\$ 824.14 to US\$ 1,200, with government spending increasing by 37 percent and out-of-pocket payments increasing by 33 percent over this period. [68]

To sustainably manage continually increasing healthcare costs, alternative financing methods have been sought through privatization and insurance schemes. It has also been projected that the Government will seek further private and foreign direct investments in the health sector with an anticipated increase from SAR 30 billion to SAR 70 billion in investments from the private sector. [50] Additionally, an extension of the current health insurance programme introduced under the Cooperative Health Insurance Act 2008 to cover more of the population remains under consideration. [69]

IMPLEMENTATION STATUS OF MEASURES MODELLED UNDER THE INVESTMENT CASE

The WHO's Global Action Plan for the Prevention and Control of Non-Communicable Diseases 2013–2020 contains effective clinical and policy interventions recommended for implementation at the national level. **Table 1, 2 and 3** outline the progress the KSA has made towards implementation of key interventions recommended by the WHO.

Table 1. Implementation status of population-based policies and interventions

TOBACCO	
Intervention	<i>Monitor tobacco use/prevention policies</i>
Current state of implementation	
MPOWER score = weak policy. Representative surveys have been conducted for both youth and adults, with the latest GATS conducted in 2019 [10]. The last GYTS was conducted in 2010, however. [14] Further, the MOH has launched a mobile app for reporting and monitoring violations of tobacco regulations. The impact of these initiatives is yet to be evaluated. [72]	
Intervention	<i>Protect people from tobacco smoke</i>
Current state of implementation	
MPOWER score = moderate policy. The KSA has had a tobacco-control programme since 2002 and a dedicated National Strategy for Tobacco Control (2019–2030). Smoking of cigarettes and e-cigarettes is banned in healthcare facilities, educational institutions, government buildings, public transport and indoor offices. Restaurants, cafes, pubs and bars are permitted to have Designated Smoking Areas, thus preventing the KSA from fully implementing a complete smoke-free law. [73]	
Intervention	<i>Offer to help quit tobacco use: mCessation</i>
Current state of implementation	
MPOWER cessation programmes score = complete policy. The KSA is a best practise country in offering to help quit tobacco use. In line with the Saudi Clinical Guidelines for Tobacco Cessation Services, the MOH runs an Anti-smoking Clinic initiative. The MOH increased the number of these Anti-smoking Clinics from 160 in 2017 and 262 in 2018 to 542 in 2019. [73] All medications for smoking cessation are available free of charge at public health facilities.	

TOBACCO

Intervention *Warn about danger: Warning labels*

Current state of implementation

MPOWER score = complete policy. The KSA is a best practise country in warning about dangers of tobacco. In 2012, as part of the GCC Standardization Organization, the KSA adopted national technical regulation regarding labelling of tobacco product packs. This regulation governed that all countries of the GCC must adopt graphic health warnings on tobacco packaging with requirements to include picture-based health warnings covering 50 percent of the package with an Arabic warning on the front and an English warning on the back. There are specific bans on misleading terms including “light”, “mild”, “low tar”, “extra light”, “low” and similar terms. In 2018, a plain packaging policy introduced by the Saudi Food and Drug Authority (SFDA) included the regulation that health warnings should cover 65 percent of the surface of packaging. [74]

Intervention *Warn about danger: Mass media campaign*

The current state of implementation

MPOWER score = complete policy. The 2021 WHO Report on the Global Tobacco Epidemic found that the KSA had achieved effective mass media campaigns to educate the public about the harms of smoking/tobacco use and secondhand smoke. [58] The KSA first implemented an antismoking campaign in 2003 and later joined other WHO member states by implementing a public awareness campaign about the dangers of tobacco use in 2017. [73]

Intervention *Enforce bans on tobacco advertising*

Current state of implementation

MPOWER score = complete policy. The KSA is a best practice country in enforcing bans on advertising, promotion and sponsorship. Advertising and promotion of tobacco is prohibited while financial or other sponsorship by the tobacco industry or promotion of e-cigarettes are not. [66]

Intervention *Enforce youth access restriction*

Current state of implementation

In 2012, legislation was introduced banning the sale of cigarettes to youth under 18 years of age. Additionally, the 2015 Anti-Smoking law prohibiting smoking in public areas mandated that if places designate areas for smoking, the person in charge must ensure that they are isolated, restricted and are not accessible to persons aged under 18 years. An mHealth mobile app was launched as part of the KSA's antismoking drive in order to monitor violations of antismoking regulations including the selling of tobacco to children under 18 years. Violations can be reported to relevant officials via this app. [72]

TOBACCO

Intervention *Raise taxes on tobacco*

Current state of implementation

MPOWER score = complete policy. In 2017, the KSA imposed an excise tax of 100 percent on tobacco products. This correlated with a 213 percent increase in demand from people seeking help to give up smoking as well as 43.1 percent decrease of tobacco imports into the KSA. [73]

Intervention *Plain packaging of tobacco products*

Current state of implementation

In 2018, the SFDA mandated plain packaging on tobacco products (including cigarette and waterpipe products) from 1 May 2019 onwards. Model “plain” packages display brand names and product names in a standard colour and font style, without using logos, colours, brand images or promotional information inside and/or outside of the packaging. [75]

PHYSICAL INACTIVITY

Intervention *Awareness campaigns to encourage increased physical activity*

Current state of implementation

The WHO NCD Progress Monitor 2020 found that the KSA had only partially achieved public education and awareness campaigns on physical activity. [58] Nonetheless, the KSA has undertaken numerous awareness campaigns to promote physical activity in order to reduce health risks. This included athletic events such as the first female marathon in 2017 as well as community events in Riyadh, Jeddah and Jubail. During these events, presentations were conducted to educate about the health and physical benefits of physical activity. Approximately 5,000 participants took part in community events and 1,500 women took part in the female marathon. [76] Further events to increase physical activity awareness include the Emshi 30 Campaign and Baytak Nadeek Campaigns, which engaged nearly four million people. [71]

Intervention *Brief advice as part of routine care*

Current state of implementation

The National Diet and Physical Activity Strategy includes a programme to train health educators in health centres and clinics about balanced diet and the significance of physical activity and assisting initiation of health regimens.

SODIUM

Intervention *Surveillance*

Current state of implementation

WHO NCD Progress Monitor 2020 found that the KSA had fully achieved salt/sodium policies. The Strategy of Regulating Healthy Food introduced by SFDA in 2018 monitors daily calorie intake through a national nutrition survey aiming to identify the nutritional status of the population. The KSA also conducted a urinary sodium excretion study, considered the gold standard in the assessment of dietary sodium intake. [77]

Intervention *Harness industry for reformulation*

Current state of implementation

The KSA's National Diet and Physical Activity Strategy includes voluntary commitment agreements urging the private sector to reduce levels of sugar, salt and fat in food products and to develop clear and readable nutrition data on food labels. Major companies which have signed up to the voluntary commitment include Nestlé Middle East, Mars Saudi Arabia Gulf Mondelez Arabia, Kellogg's Arabia and Coca Cola amongst others. [78]

Intervention *Adopt standards: front-of-pack labelling*

Current state of implementation

Authorities have made it mandatory for restaurants, food suppliers and manufacturers to display nutritional information on food labelling in order for consumers to identify ingredients and nutritional value.

Intervention *Adopt standards: strategies to combat misleading marketing*

Current state of implementation

The National Strategy for Diet and Physical Activity includes a plan to publish information about the importance of health diets during the time of programmes directed to children as well as limiting the rates of advertisements directed to children and formulating policies for limiting advertisements about beverages and fast food. [79]

SODIUM

Intervention *Knowledge: education and communication*

Current state of implementation

The MOH has held educational lectures, training courses and workshops in major cities, published training manuals on physical activity and healthy diets as well as conducted media awareness campaigns as part of the National Diet and Physical Activity Strategy.

Intervention *Environment: salt-reduction strategies in community-based eating spaces*

Current state of implementation

Calorie levels in restaurant and café menus must be displayed and excise taxes have increased on some harmful food products.

In addition, the updated **Appendix 3** to WHO's Global Action Plan for the Prevention and Control of Non-communicable Diseases 2013–2020 contains two effective interventions (with cost-effectiveness ratios >100 international dollars per DALY averted in low- and middle-income countries) on trans fat and sugar, respectively. Though these are not modelled under the investment case, **Table 2** shows the current state of implementation for trans fats and sugar-related policies.

Table 2. Current state of policies for trans-fat and sugar in the KSA

TRANS-FAT

Intervention *Eliminate industrial trans-fat by developing legislation to ban their use in the food chain*

Current state of implementation

The WHO NCD Progress Monitor 2020 found that the KSA had fully achieved saturated fatty acids and trans fat policies. [58] The KSA has introduced policies to regulate trans fat consumption, including limiting trans fat content in foods and oils, forbidding misleading presentation or labelling of products as well as the obligation of labelling trans fat content as one of the nutrition facts on foods. [80] Indeed, as a best-practice country for trans fat policies, the KSA is one of only 14 countries to qualify for WHO's certification programme for trans fat elimination. [81]

SUGAR

Intervention *Reduce sugar consumption through effective taxation on sugar-sweetened beverages*

Current state of implementation

The General Authority of Zakat and Tax (GAZT) of the KSA announced a 50 percent Excise Tax on Sugar Sweetened Beverages and a 100 percent tax on energy drinks in 2019. [82]

The WHO's Global Action Plan for the Prevention and Control of Non-communicable Diseases 2013–2020 lists multiple clinical interventions for cardiovascular diseases and diabetes. **Table 3** below lists a selection of those most relevant to this analysis and are included in the modelling.

Table 3. Implementation status of clinical interventions for chronic conditions

CARDIOVASCULAR DISEASE

Intervention *Screening for risk of cardiovascular disease and diabetes*

Current state of implementation

More than 50 percent of primary healthcare centres offer CVD risk stratification according to the WHO non-communicable diseases progress monitor 2020. [58]

Intervention *Treatment of new cases of acute myocardial infarction with aspirin*

Current state of implementation

Findings from the Saudi Acute Myocardial Infarction (MI) Registry Program suggest that compliance with medication guidance was high with 96 percent of patients receiving aspirin within 24 hours of admission after acute myocardial infarction. [83] Additionally, 10 out of 10 NCD medicines (including aspirin) were reported to be generally available in the health system according to the WHO NCD Progress Monitor period. [58]

CARDIOVASCULAR DISEASE

Intervention *Provision of drug therapy (including glycaemic control for diabetes mellitus and control of hypertension) and counselling to individuals who have had a heart attack or stroke and to people with high risk (≥ 30 percent) of a fatal or non-fatal cardiovascular event in the next 10 years*

Current state of implementation

According to the WHO NCD Progress Monitor 2020, the KSA has fully achieved provision of drug therapy, including glycaemic control, and counselling for eligible persons at high risk to prevent heart attack and strokes. [58]

Intervention *Treatment of cases with established ischaemic heart disease and post-MI*

Current state of implementation

The WHO NCD Progress Monitor 2020 reports that the KSA has evidence-based national guidelines/protocols/standards for the management of major NCDs including MI.

DIABETES

Intervention *Screening for risk of diabetes*

Current state of implementation

The National Executive Plan of Diabetes Control (2010-2020) includes the objective of secondary prevention through early detection of the disease and its complications. Patients are detected and followed up through the Diabetics' Registration Program. [84]

Intervention *Standard glycaemic control*

Current state of implementation

The objective towards secondary prevention also includes good management of blood glucose to prevent complications of diabetes mellitus. Furthermore, the MOH introduced a National Campaign for Diabetes control which included distributing more than 400,000 blood glucose meters for patients registered in health centers. [84]

DIABETES

Intervention *Retinopathy and neuropathy screening, and photocoagulation (used to treat retinopathy) and preventive foot care*

Current state of implementation

The MOH recognizes retinopathy and neuropathy (including diabetic foot) to be complications of diabetes, which they strive to prevent via the objective of secondary prevention aiming to reduce complications after a diagnosis of diabetes mellitus. [84]

STROKE

Intervention *Treatment for those with established cerebrovascular disease and post-stroke*

Current state of implementation

The MOH recommends control of hypertension, hypercholesterolaemia, diabetes, smoking and obesity/physical activity to reduce risk of a subsequent stroke. [85] Internationally accepted best practice guidelines for the management of acute stroke have been developed by the American Heart Association/American Stroke Association. Evidence suggests that compliance with these guidelines in the KSA may still lag behind that of other high-income countries. [85] The urgent need for stroke care development has been identified as a priority by the Saudi Arabian Ministry of Health's stroke committee. [86]

Intervention *Treatment of acute ischaemic stroke with intravenous thrombolytic therapy, acetylsalicylic acid and clopidogrel or thrombolysis or primary percutaneous coronary interventions*

Current state of implementation

The MOH recommends treatment of ischaemic stroke with t-PA, aspirin and antiplatelet drugs. [87]

CANCER

Intervention *Prevention of liver cancer through hepatitis B immunization*

Current state of implementation

The National Immunization Schedule published in 2013 includes Hepatitis B immunization at birth, 2 months, 4 months and 6 months. [88] There is also a well-established National Programme to Eradicate HCV, which features an integrated programme for the prevention, detection and treatment of chronic HCV patients and associated liver cancer.

Intervention *Prevention of cervical cancer through screening linked with timely treatment of pre-cancerous lesions*

Current state of implementation

The implementation of a national cervical screening and treatment programme has been recommended by the Saudi Centre for Evidence-Based Healthcare as a cost-effective management option. The MOH recommends human papillomavirus (HPV) vaccinations and 1-2 yearly cervical screening for women. [89]

CHRONIC RESPIRATORY DISEASE

Intervention *Treatment of asthma based on WHO guidelines*

Current state of implementation

The Saudi Initiative for Asthma guidelines updated in 2019 outline evidence-based diagnosis and management recommendations for asthma. [90] The KSA has also developed the Asthma Pocket Guide for Health Care Professionals to help physicians assess patient conditions, explain proper use of medications, and guide their treatment at home.⁹

Intervention *Influenza vaccination for patients with COPD*

Current state of implementation

The Saudi Thoracic Society published guidelines for influenza vaccinations with the recommendations that annual vaccination is indicated for persons at higher risk for influenza-related complications including children and adults with chronic illness (asthma, COPD, diabetes mellitus). [91]

⁹ For more details, see: <https://www.moh.gov.sa/en/Ministry/About/Health%20Policies/Asthma-Pocket-Guide-for-Health-Care-Professionals.pdf>



METHODS

This section outlines the different methods and economic models applied at different stages of the economic analysis.

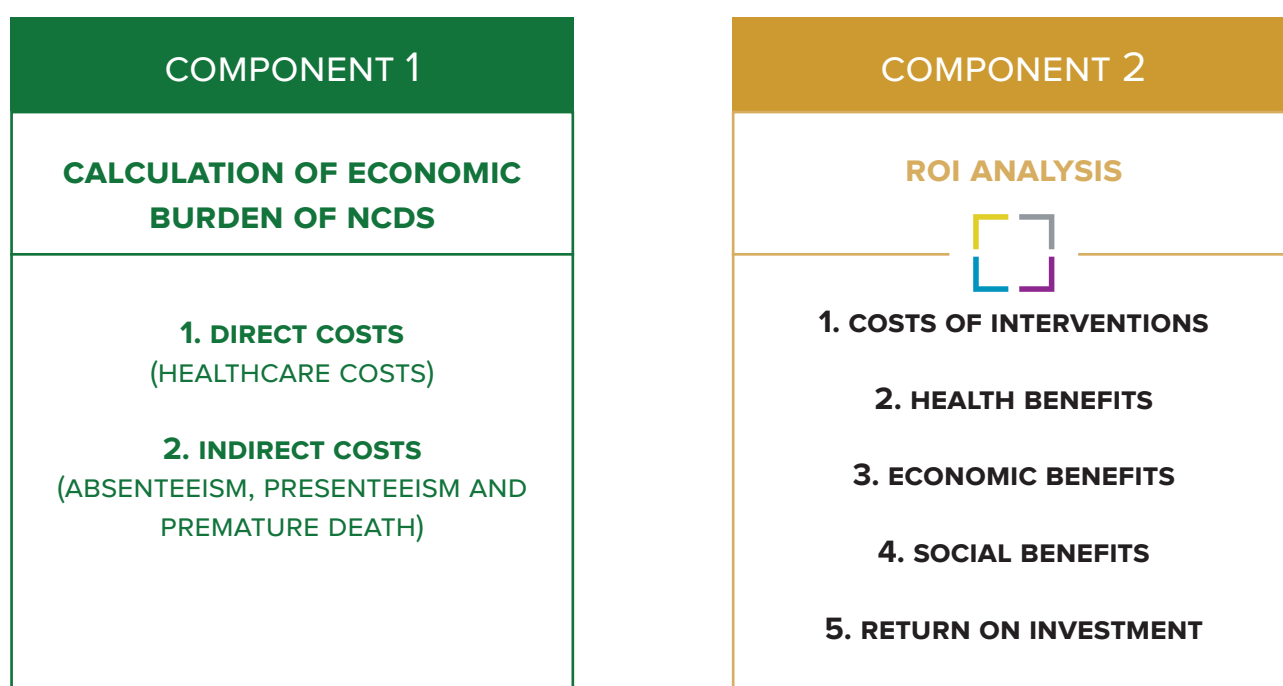
METHODS

A multiagency, multidisciplinary team comprising staff from WHO (headquarters, WHO Regional Office for the Eastern Mediterranean and WHO Saudi Arabia Office), the United Nations Inter-Agency Task Force on the Prevention and Control of Non-communicable Diseases, the United Nations Development Programme (UNDP) and Gulf Health Council of the Cooperation Council for the Arab States of the Gulf undertook initial data collection and analysis in Saudi Arabia in 2020–2021 to complete a three-tier economic NCD investment case, complemented by an institutional context analysis. The team consisted of health economists, epidemiologists and social development and public health experts. Intensive follow-up work (described below) was undertaken as part of the methods for collecting and analysing data.

The approach consisted of a desk review of materials, interviews with policymakers across sectors and institutions, and collation and analysis of data. Further data analysis took place over subsequent months. This NCD investment case is one of six to be carried out in Gulf Cooperation Council Countries during 2019-2021. The work also benefited from a peer review and a methodological review by Research Triangle Institute International, as well as a quality assurance review by David Tordrup (Triangulate Health Ltd).

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

Economic analysis



1. Component 1: Estimating the economic burden of NCDs

The starting point for the investment case is an analysis to determine the current and projected economic burden of NCDs. This requires assessing both the direct and indirect costs of NCDs using a cost of illness approach. The cost of illness component reveals the extent to which NCDs are affecting Saudi Arabia economic growth, by calculating the cost of illness as a share of gross domestic product (GDP) which was lost due to NCDs in 2019. Direct and indirect costs are calculated independently of each other and then added to calculate the total cost of NCDs to the KSA's economy. WHO and UNDP developed the NCD economic burden model, which provides estimates of the current direct and indirect costs of NCDs.

Step 1. Calculating the direct costs

Direct costs represent costs incurred within the health system to treat diseases. These are represented by government and private health spending on medical staff salaries, equipment and procedures such as diagnosis and distribution of treatment for cardiovascular diseases, cancers, diabetes mellitus and chronic respiratory diseases. The total health expenditure on each of these four NCDs was calculated by multiplying the estimated average cost per patient by the estimated number of patients using the health services. The average cost per patient for each of the four NCDs was estimated based on the local, regional and international literature and adjusted using the consumer price index. The number of patients using the health services was estimated based on prevalence and utilization rates reported in the Saudi Arabia Household Health Survey 2017, Saudi Arabia World Health Survey 2019 and local literature (**Table 4**).

Table 4. Data used for calculating the direct costs of NCDs in Saudi Arabia in 2019

NCDs	Average cost per patient in 2019		Estimated number of patients using the health services in 2019	
	Cost SAR	Data source	Number	Data source
Diabetes	12,327	(Rabha Salman, 2019)	2,189,963	Saudi Arabia Household Health Survey 2017 (Prevalence of 8% and utilization rate of 80%)
Cancer	44,479	(Oman estimation used proxy for Saudi Arabia, 2015)	68,436	Saudi Arabia Household Health Survey 2017 (Prevalence of 0.2% and utilization rate of 100%)
Chronic Respiratory diseases	8,500	(Guarascio, 2013)	603,609	M Al Ghobain, 2015 (Prevalence of 4.2% and utilization rate of 42%)
CVD				
Myocardial infarction	16,720	(Ziyad Almalki, 2019)	242,949	Saudi Arabia World Health Survey 2019 (Prevalence of 1% and utilization rate of 71%)
Stroke	44,203	(Ziyad Almalki, 2019)	85,203	Saudi Arabia World Health Survey 2019 (Prevalence of 0.3% and utilization rate of 83%)
Heart Failure	34,263	(Ziyad Almalki, 2019)	284,011	Saudi Arabia World Health Survey 2019 (Prevalence of 1% and utilization rate of 83%)
Hypertension	5,843	(Ziyad Almalki, 2019)	2,272,086	Saudi Arabia World Health Survey 2019 (Prevalence of 8% and utilization rate of 80%)

Sources: [12], [92]–[94]

Step 2. Calculating the indirect costs

In our analysis, indirect costs are those associated with reduced workforce participation and the resulting reduction in national productivity, i.e. the costs of absenteeism, reduced capacity at work, i.e. presenteeism, and the economic losses due to premature deaths caused by NCDs. These costs were computed with the human capital approach. The indirect costs were computed as detailed below.

Missed working days and working at reduced capacity

In this section, we detail the methods used to estimate the productivity losses due to absenteeism (missed working days) and presenteeism (working at reduced capacity) due to NCDs with the human capital approach. The fraction of the workforce in Saudi Arabia with NCDs was estimated by applying the prevalence rates of the diseases to population figures and relevant economic indicators, such as unemployment rates and labour force participation rates. Then, the number of unproductive days worked was determined by applying rates of productivity loss derived from the academic literature.

The lost economic output to the Saudi Arabia economy as a consequence of absenteeism and presenteeism was estimated as described below:

- ^ First, we estimated the number of people of working age (15–64 years) with NCDs based on data collected from the Saudi Arabia World Health Survey 2019, Saudi Arabia General Authority for Statistics (GASTAT),¹⁰ WHO Global Health Expenditure database, World Bank Open Data and estimates from the Institute for Health Metrics and Evaluation.
- ^ We then multiplied the size of the working-age population with NCDs by the rate of participation in the labour force and employment to determine the prevalence of NCDs in workers. Similarly, the number of deaths from NCDs was multiplied by the rate of participation in the labour force and employment to estimate the number of workers who died from NCDs. The number of deaths was subtracted from the number of workers with prevalent NCDs to estimate the number of workers who survived despite their illness.
- ^ The figures for productivity losses associated with specific diseases (**Table 5**) were multiplied by the number of surviving workers to estimate the total number of unproductive days that resulted from NCDs.
- ^ In the final step, GDP per worker was used to approximate each worker's productive output in a given year. GDP per worker was multiplied by the total number of unproductive working days.

¹⁰ https://www.stats.gov.sa/sites/default/files/gdp_report2019_en_1_0.pdf

Table 5. Rates of absenteeism and Presenteeism due to NCDs

	Absenteeism rate* Reduction in working days (%)	Presenteeism rate Working at reduced capacity	Labour force participation rate reduction
Hypertension	0.6% (Mitchell RJ, 2011)	3.7% (Wang PS, 2003)	2% (Barnay, 2006)
Stroke	6.3% (Mitchell RJ, 2011)	3.7% (Wang PS, 2003)	18% (Barnay, 2006)
Acute MI	1.3% (Mitchell RJ, 2011)	3.7% (Wang PS, 2003)	11% (Barnay, 2006)
Diabetes	0.3% (Salman, 2019)	0.5% (Bommer C, 2017)	10% (Barnay, 2006)

*Based on the number of days worked per year in Saudi Arabia (222 days)

Sources: [94]–[98]

Premature deaths

The loss of GDP due to premature death of workers was estimated using the human capital approach. This assumes that forgone economic output is equivalent to the total output that would have been generated by workers through their life until reaching retirement age. In this method, all future potential income lost by a worker who dies during his or her working lifetime is calculated from the number of working years lost between the age at death and the age at which the deceased employee would have reached the average retirement age. Productivity losses due to premature deaths were calculated as the product of the total working years lost in all age groups multiplied by the labour force participation rate, age-specific employment rate and GDP per worker.

2. Component 2: Return on Investment (ROI) analysis

Step 1. Calculating the costs of policy and clinical interventions

The return on investment is a performance measure used to evaluate the efficiency of healthcare investment. It compares the magnitude and timing of benefits from health intervention directly with the magnitude and timing of investment costs. The return on investment is the ratio of the discounted (present) value of the benefits to the investment costs. Future benefits are discounted at 3 percent since a unit of currency in the future is worth less than a unit today owing to the time value of money.

A return on investment analysis, based on a spreadsheet model developed by WHO, provided estimates of the economic gains that accrue from investing in the set of cost-effective interventions identified during the visit.

The method used is the NCD return on investment model developed in 2015 for use by the United Nations Development Programme/WHO Joint Programme on Governance of NCDs using the OneHealth Tool and WHO Costing Tool. More detail on the use of these tools is available from the OneHealth Tool Manual [99] and is discussed in a new guidance note for investment cases for preventing and controlling NCDs. [100]

Costs of policy and clinical interventions were calculated using the WHO Costing Tool for NCD prevention and control. The tool identifies, quantifies and values each resource required for the intervention as follows:

- ^ For each policy intervention, the WHO Costing Tool costs human resources, training, external meetings, mass-media campaigns (e.g. television and radio time, newspaper ads) and other miscellaneous equipment needed to enact policies and programmes.
- ^ Each policy intervention contains assumptions, set by WHO experts, about the quantity of inputs required to implement and enforce it – the Tool estimates the quantity of resources needed at the national, regional and district levels.
- ^ The costs of clinical interventions were calculated using the WHO Costing Tool, which conveniently has built-in functionality that works out expected costs of treatment interventions.
- ^ For each clinical intervention, the WHO Costing Tool estimates the cost of primary care visits, ancillary care visits, lab and diagnostic tests and drugs for the total number of NCD cases who are expected to be covered each year.
- ^ Intervention-specific data on current effective coverage are not available. Current and target coverage of clinical interventions was estimated in line with previous WHO analyses in the area of NCDs, [101] aiming to reach 80 percent coverage by 15 years.
- ^ For each clinical intervention, the WHO Costing Tool takes as input data points such as the salaries of medical staff and the quantities of drugs and supplies needed, as well as their prices.
- ^ Each clinical intervention contains assumptions, set by WHO experts, about the quantity of inputs required to provide it. The unit costs for resource items are taken from the WHO-CHOICE database and from available local data.
- ^ In the absence of local data, estimates based on global data was used for the computations.
- ^ The interventions scale-up scenario for policy interventions is Front Growth scale-up. This pattern assumes that much of the capacity to scale-up policy interventions is already in place, meaning that coverage can escalate rapidly, within 2 years. For clinical interventions we are using a linear scale-up. This pattern assumes a gradual but sustained increase in coverage.

Step 2: Estimating the impact of interventions

To determine the overall impact of the set of interventions in terms of economic losses avoided, productivity measures were assessed using the following steps:

- ^ The One Health Tool was used to assess the health benefits of implementing and scaling up policy and clinical interventions by modelling the number of disease cases averted, healthy life years gained and lives saved over the 15 years under study. Local data from the STEPS survey were fed into the tool to determine the prevalence of risk factors disaggregated by age group and gender.

- ^ Data on the amount by which NCDs reduce worker productivity were incorporated, as noted for the NCD economic burden model. Since interventions reduce the projected incidence of ischemic heart disease and stroke, there is an associated increase in the number of healthy life-years of the population.
- ^ By considering the increase in healthy life-years, GDP per employed person and the reduction in rates for absenteeism and presenteeism, avoided economic losses can be determined, attributed to the value of avoided absenteeism and presenteeism.
- ^ By considering the labour force participation rate in Saudi Arabia and the projected number of deaths avoided, the increase in labour force participation resulting from avoided deaths was calculated. An increase in economic output was therefore attributed to the value of avoided mortality.
- ^ The projected economic gains from implementing the cost-effective interventions were therefore the value of avoided presenteeism, the value of avoided absenteeism and the value of avoided mortality.
- ^ The impact of an intervention, measured as the total economic burden avoided, was calculated by combining the three types of gains.
- ^ Following Stenberg et al, [102] we estimated the social benefit of improved health by applying a value of 0.5 times GDP per capita to each healthy life-year gained from the interventions to estimate the intrinsic value of longevity. We used the net present value approach to future social value, with 3 percent discounting.

Step 3: Calculating the returns on investment

The return on investment for Saudi Arabia was reached by comparing the impact (avoided economic losses) of the interventions with the total costs of setting up and implementing the interventions. This was calculated using the net present value approach to future costs and economic gains, with 3 percent discounting.

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RESULTS

This section assesses the economic burden of NCDs before summarizing the component parts of the return on investment analysis – including health benefits, economic benefits and total costs – and discussing the return on investment for each package of interventions.

1. Economic burden assessment

a. Direct costs

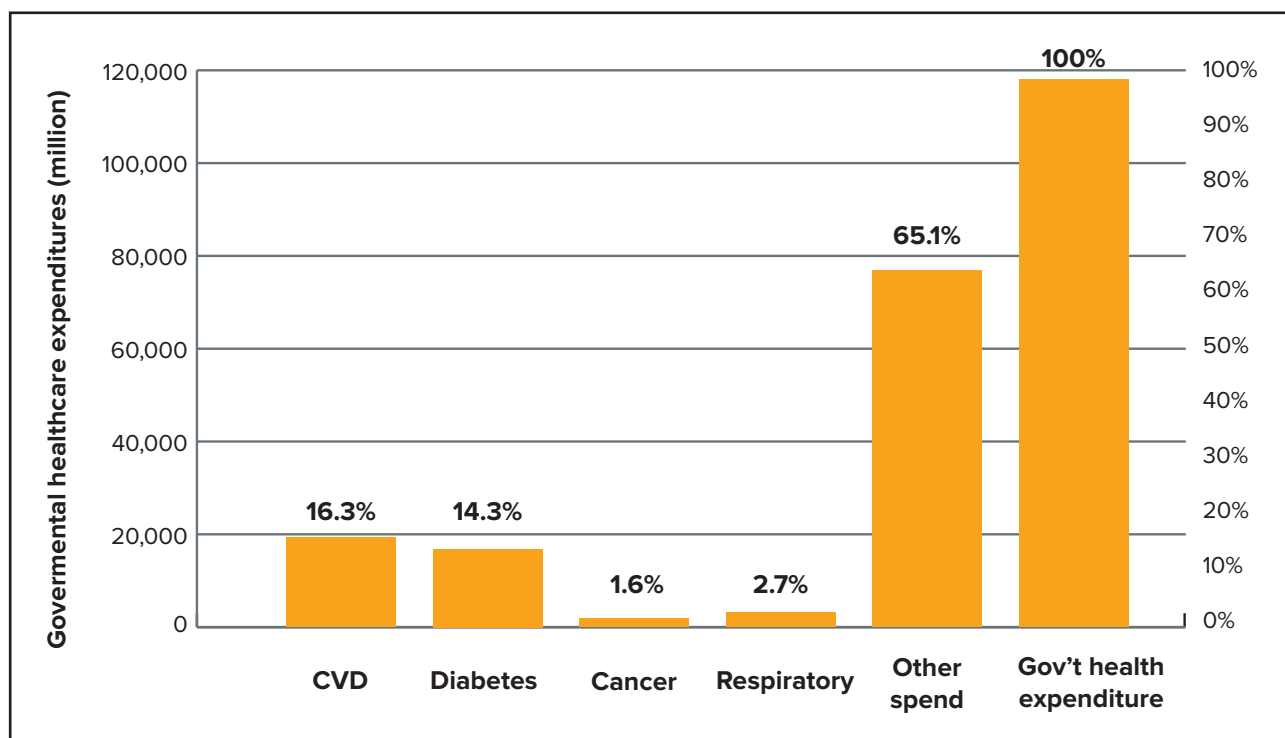
The estimate of the direct costs of the economic burden considered the total health expenditure which includes the government healthcare expenditure and the private healthcare expenditure (out-of-pocket, voluntary and other health insurance schemes) and excluded non-healthcare costs such as transport.

Total healthcare expenditures for Saudi Arabia in 2019 was SAR 189,168,303,363 (US\$ 50 billion). Government health expenditure was SAR 118,112,940,818 (US\$ 31 billion) and accounted for 62.4 percent of the total healthcare expenditures.

National Health Account data in Saudi Arabia are not available at the disease subgroup account level by NCD. Our estimates suggest that the Government spent SAR 41,211,963,271 (US\$ 11 billion) on the four major NCD groups under study, so that more than 34.9 percent of all government health expenditure is attributable to the four disease groups. This proportion is consistent with other international estimates which, based on average numbers from nine countries, found that the four major NCDs were responsible for 30 percent of healthcare expenditure. [67] **Fig. 2** shows the estimated Government Health Expenditure in 2019 on the four major NCD groups.

We estimated that private healthcare cost of the four major NCD were SAR 24,792,634,670 (US\$ 6.6 billion). The total healthcare expenditure on these four major NCD groups was SAR 66,004,597,941 (US\$ 17.6 billion). CVD accounted for the major share (16.3 percent of

Fig. 2 Saudi Arabia Government Health Expenditure in 2019 on the four major NCD groups



total health spending), at SAR 30,835,209,226 (US\$ 8.2 billion), followed by diabetes which accounted for 14.3 percent of total health spending, at SAR 26,994,736,577 (US\$ 7.2 billion). Total expenditure on chronic respiratory diseases and cancers was SAR 5,130,672,260 (US\$ 1.4 billion) (2.7 percent) and SAR 3,043,979,878 (US\$ 800 million) (1.6 percent), respectively.

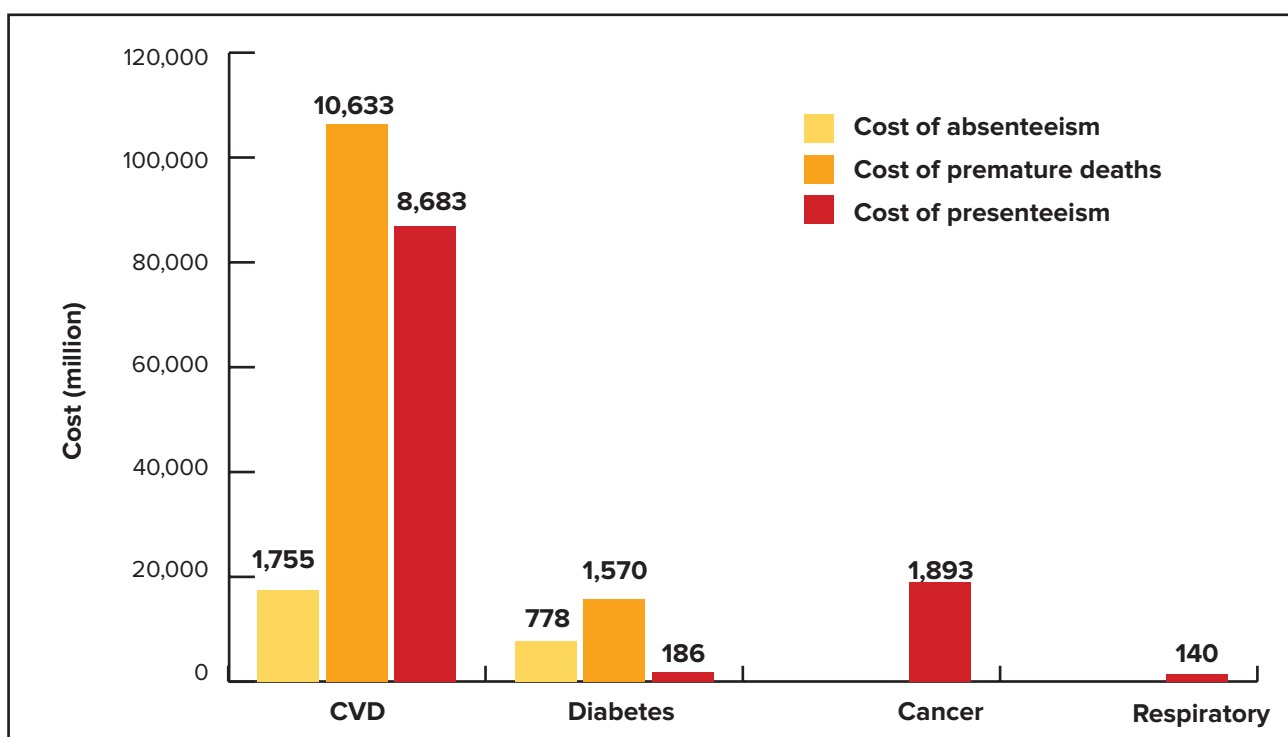
b. Indirect costs

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

The calculation of absenteeism and presenteeism is based on the surviving workforce. **Fig. 3** shows the results for 2019. They could only be calculated for cardiovascular diseases and for diabetes because data are lacking on the impact of cancer and chronic respiratory diseases for these parameters. The cost of absenteeism resulting from cardiovascular diseases was an estimated SAR 1,755,483,044 (US\$ 468 million). For presenteeism, the corresponding calculation found that the burden is SAR 10,633,121,393 (US\$ 2.8 billion). For diabetes, the cost of absenteeism was an estimated SAR 778,058,702 (US\$ 207 million). For presenteeism, the corresponding calculation found that the burden is SAR 1,570,263,926 (US\$ 419 million).

The cost of premature deaths was computed by considering the total output that would have been generated by workers during their lives before retirement. The total cost of premature deaths was estimated to be SAR 10,900,971,885 (US\$ 2.9 billion). The loss was the highest for cardiovascular diseases, at SAR 8,682,526,076 (US\$ 2.3 billion), followed by cancer, at SAR 1,893,253,388 (US\$ 505 million).

Fig. 3 Cost of absenteeism, presenteeism and premature death due to NCDs in Saudi Arabia, 2019



c. Total economic costs

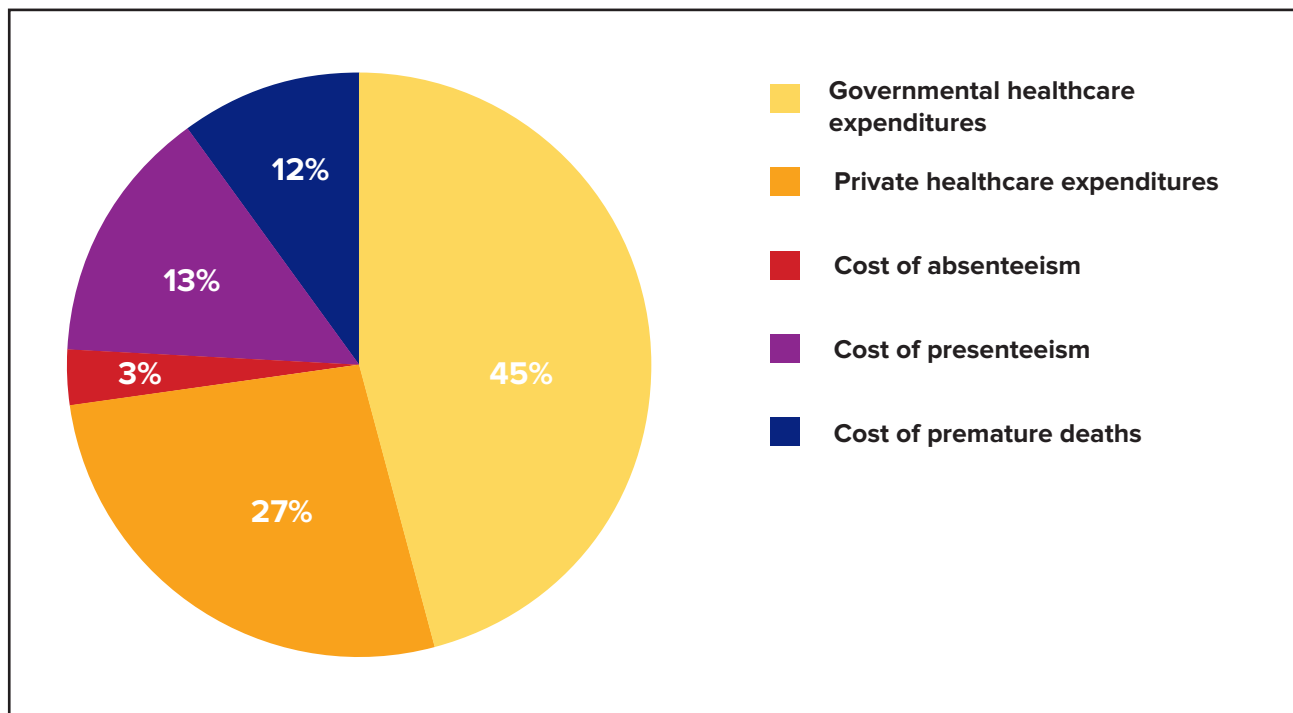
Table 6 summarizes the total direct and indirect costs of NCDs in Saudi Arabia. The total healthcare spending on the four main NCDs in 2019 was already SAR 66,004,597,941 (US\$ 17.6 billion) but additional losses to the economy (absenteeism, presenteeism, premature deaths) brought the total economic burden of NCDs to SAR 90,138,914,562 (US\$ 24 billion), of which 73.2 percent was direct costs and 26.8 percent indirect costs. This would be even larger if the costs of absenteeism and presenteeism could be estimated for cancer and chronic respiratory diseases. The estimated total burden of NCDs is equivalent to 3 percent of GDP in 2019. **Fig. 4** illustrates the structure of the economic burden of NCDs in Saudi Arabia in 2019, and **Table 7** shows the breakdown of direct expenditure on the four main NCDs.

Table 6. Economic burden of NCDs in Saudi Arabia in 2019 (in SAR)

Cost	Cardiovascular diseases	Diabetes	Cancer	Chronic respiratory diseases	Total	Per GDP
Direct cost						
Government	19,252,893,734	16,854,978,699	1,900,600,728	3,203,490,110	41,211,963,271	1.39%
Private	11,582,315,493	10,139,757,878	1,143,379,149	1,927,182,150	24,792,634,670	0.83%
Total direct cost	30,835,209,226	26,994,736,577	3,043,979,878	5,130,672,260	66,004,597,941	2.22%
Indirect cost						
Absenteeism	1,755,483,044	778,058,702	No data	No data	2,533,541,746	0.09%
Presenteeism	10,633,121,393	1,570,263,926	No data	No data	12,203,385,319	0.41%
Premature death	8,682,526,076	185,648,548	1,893,253,388	139,543,873	10,900,971,885	0.37%
Total indirect cost	21,071,130,513	2,533,971,176	1,893,253,388	139,543,873	25,637,898,950	0.86%
Total burden	51,906,339,740	29,528,707,753	4,937,233,266	5,270,216,133	91,642,496,891	3.08%

Table 7. Direct expenditure on the four main NCDs (in SAR)

Government health expenditure	62.4%	41,211,963,271
Private health expenditure	37.6%	24,792,634,670
• Out-of-pocket	14.4%	9,495,051,576
• Voluntary health insurance (VHI)	10.7%	7,055,350,824
• Other private health expenditure	12.5%	8,242,232,271

Fig. 4. Structure of the economic burden of NCDs in Saudi Arabia, 2019

2. Return on investment analysis

a. Costs of intervention

The costs of intervention were estimated for the period 2020–2034. **Table 8** shows the costs for each of the first five years of this period and the five-year and 15-year totals.

The cardiovascular disease clinical interventions produced the largest estimated costs. Treating people who have cardiovascular diseases and diabetes costs SAR 147,592,073 (US\$ 39.5 million) in the baseline year and increases to SAR 832,805,161 (US\$ 222 million) in 2024. Implementing the entire cardiovascular disease and diabetes clinical intervention package over the five-year scale-up period would cost SAR 2,450,332,547 (US\$ 365 million).

The total costs for the tobacco package based on MPOWER guidelines are SAR 324,255,596 (US\$ 86 million) for five years and SAR 902,896,669 (US\$ 240 million) for 15 years. The salt reduction package would cost an estimated SAR 647,515,334 (US\$ 173 million) in five years and the physical activity awareness interventions, SAR 455,095,720 (US\$ 121 million).

Table 8. Estimated costs of policy and clinical interventions, 2020–2034 (in SAR)

Intervention package	2020	2021	2022	2023	2024	Total for 5 years	Total for 15 years
Policy interventions							
Tobacco control	64,846,088	66,596,895	63,517,544	65,777,526	63,517,544	324,255,596	902,896,669
Diet and physical activity awareness	60,479,852	94,626,551	96,326,114	99,790,026	103,873,177	455,095,720	1,950,517,363
Salt reduction	137,929,064	128,926,567	127,396,567	126,631,567	126,631,567	647,515,334	1,925,716,002
Clinical interventions							
CVD and diabetes clinical intervention	147,592,073	316,494,145	490,216,952	663,224,216	832,805,161	2,450,332,547	22,327,267,177
Total	410,847,077	606,644,158	777,457,177	955,423,335	1,126,827,449	3,877,199,197	27,106,397,210

b. Health benefits

All interventions significantly reduce the number of lives lost to causes related to cardiovascular diseases over 15 years (**Table 9**). Cardiovascular disease and diabetes clinical interventions and salt interventions have the greatest impact in terms of mortality averted (100,772 and 94,974 lives saved, respectively), followed by tobacco interventions (10,027 lives saved) and diet and physical activity awareness (7,756 lives saved). More than 89.8 percent of these mortalities averted are premature mortality (<70 years).

Each set of interventions also adds healthy life-years to the population. The cardiovascular disease clinical interventions, tobacco and salt reduction packages prevent strokes and cardiovascular events, and thus individuals avoid disabling states (such as partial paralysis from stroke) that can increase pain and suffering, reduce mobility and impair speech and thought. Thus, the largest gains in healthy life-years are achieved with the salt reduction intervention (730,424 healthy life-years gained), the cardiovascular disease and diabetes clinical interventions (376,481 healthy life-years gained) and tobacco interventions (73,285 healthy life-years gained), and the diet and physical activity awareness interventions (66,379 healthy life-years gained).

Table 9. Estimated health benefits over a 15-year time horizon, 2020–2034

Intervention package	Strokes averted	Acute IHD averted	Mortality averted (total deaths, includes premature deaths)	Mortality averted (premature deaths)	Healthy life-years gained
Tobacco control	10,481	7,743	10,027	9,519	73,285
Salt reduction	109,258	82,969	94,974	86,050	730,424
Diet and physical activity awareness	5,536	10,646	7,756	6,424	66,379
CVD and diabetes clinical intervention	48,157	30,889	100,772	89,720	376,481
Total	173,432	132,247	213,529	191,713	1,246,569

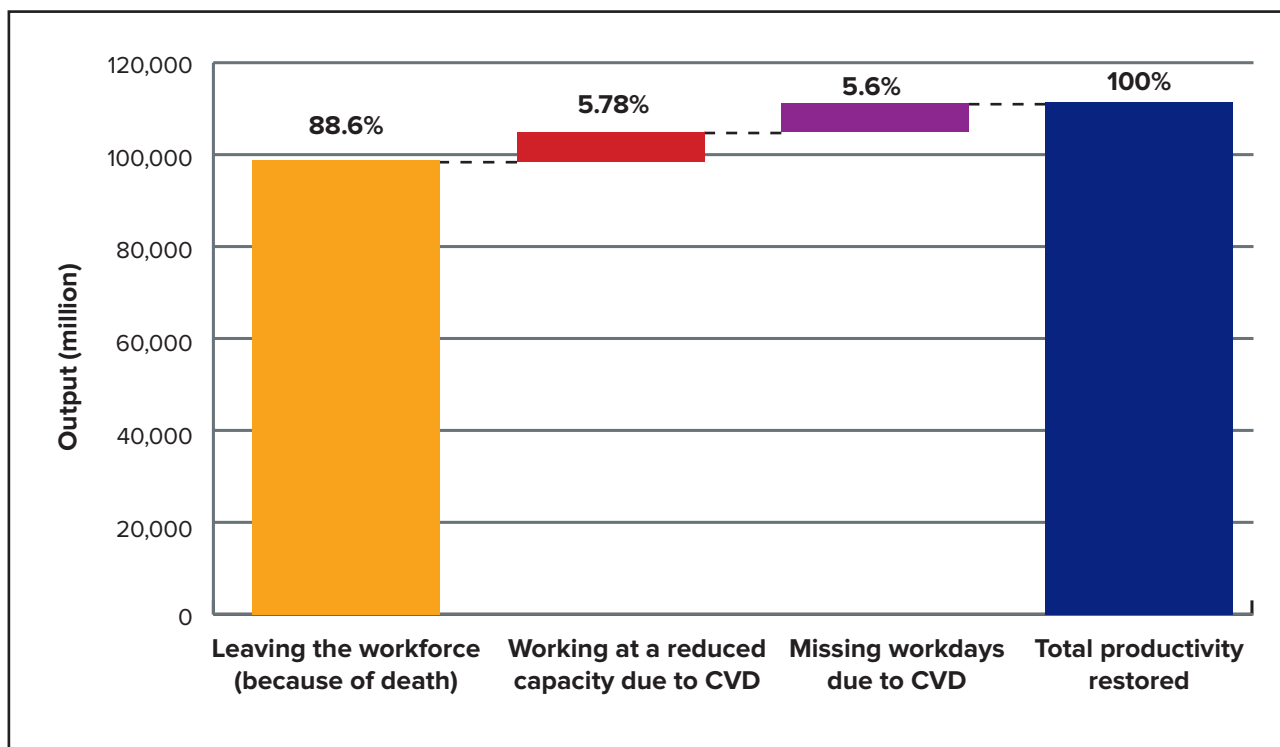
c. Economic benefits

The NCDs included in this analysis reduce the labour workforce and productivity through premature deaths, fewer days of work (absenteeism) and reduced productivity while at work (presenteeism). **Fig. 5** demonstrates the labour productivity gains that would result from the prevented deaths and disease cases over 15 years, described in **Table 9**.

The combined recovered economic output from both the clinical and the policy intervention packages in net present-value terms would be SAR 111,511,008,364 (US\$ 29.7 billion) in labour productivity gains over the 15-year period or equivalent to 3.8 percent of Saudi Arabia's 2019 GDP over 15 years.

The highest labour productivity gains are derived from reduced premature deaths (88.6 percent of recovered economic output), followed by reduced presenteeism and reduced absenteeism (5.78 percent and 5.6 percent of recovered economic output, respectively).

Fig. 5 Recovered economic output expected from tobacco, physical activity, salt and cardiovascular diseases primary prevention interventions over 15 years (in million SAR)



d. Social benefits of increased years of healthy life

Gained healthy life-years is a measure that expresses the additional number of years of life that a person lives in a healthy condition as a result of receiving treatment or avoiding a disease. It is common when estimating the benefits of improved health to put a value on being alive. We estimated that the combined social value from both the clinical and the policy intervention packages in net present-value terms would be SAR 38,694,657,604 (US\$ 10.3 billion) over the 15-year period.

The highest social benefits are derived from the monetary value of healthy life-years gained as a result of full implementation of salt reduction package.

Table 10. Social value of the investment over 5- and 15-years

	5 years		15 years	
Intervention package	SAR	US\$	SAR	US\$
Tobacco control	137,569,264	36,685,137	2,285,138,451	609,370,254
Salt reduction	1,478,589,948	394,290,653	22,842,539,384	6,091,343,836
Diet and physical activity awareness	137,956,576	36,788,420	2,077,080,667	553,888,178
CVD and diabetes clinical interventions	317,399,010	84,639,736	11,489,899,102	3,063,973,094
Total	2,071,514,797	552,403,946	38,694,657,604	10,318,575,361

e. Return on investment

Comparing the costs and benefits of each package of interventions shows that all NCD prevention interventions at the population level for risk behaviour included in the analysis – for tobacco control, salt reduction and increasing physical activity – have returns on investment greater than 1 SAR for each 1 SAR invested over 15 years (**Table 11**).

Table 11. Costs, benefits and return on investment at five and 15 years, by intervention package (in SAR, not including social value)

	5 years			15 years		
Intervention package	Total discounted costs	Total productivity benefits	ROI	Total discounted costs	Total productivity benefits	ROI
Tobacco control	306,004,913	198,807,535	0.65	744,849,283	5,728,597,316	7.69
Salt reduction	611,580,302	2,102,568,614	3.44	1,581,143,756	56,519,493,030	35.75
Diet and physical activity awareness	426,758,873	173,048,816	0.41	1,541,079,086	4,592,717,426	2.98
CVD and diabetes clinical interventions	2,263,825,144	771,904,396	0.34	16,877,030,635	44,670,200,592	2.65
Total	3,608,169,233	3,246,329,361		20,744,102,761	111,511,008,364	

The salt reduction package has the highest return on investment of any intervention: for every 1 SAR invested in the salt reduction package, the expected return is 35.75 SAR for 15 years. Tobacco control also produces a high return on investment over 15 years (7.69), as does the physical activity package (2.98).

The package of clinical interventions is estimated to provide a return on investment of 2.65 SAR per 1 SAR invested. This slightly lower ROI is frequently the case in health economics because of the high costs of medical treatment necessary under clinical interventions. Further, these treatment options (treatment, secondary prevention after acute events and other) have low potential to increase labour force participation after stroke, myocardial infarction and diabetes. Nevertheless, the clinical interventions package still provides an ROI > 1 under this analysis, while importantly also resulting in most lives saved (89,720 premature deaths averted, see **Table 9**).

Adding the values of social benefits due to increased years of healthy life to the total productivity values increases the return on investments as described in **Table 12**.

Table 12. Costs, benefits and return on investment at five and 15 years, by intervention package (including social value) in SAR

	5 years			15 years		
Intervention package	Total discounted costs	Total productivity + social benefits	ROI	Total discounted costs	Total productivity + social benefits	ROI
Tobacco control	306,004,913	336,376,799	1.10	744,849,283	8,013,735,767	10.76
Salt reduction	611,580,302	3,581,158,562	5.86	1,581,143,756	79,362,032,414	50.19
Diet and physical activity awareness	426,758,873	311,005,391	0.73	1,541,079,086	6,669,798,093	4.33
CVD and diabetes clinical interventions	2,263,825,144	1,089,303,405	0.48	16,877,030,635	56,160,099,694	3.33
Total	3,608,169,233	5,317,844,158		20,744,102,761	150,205,665,968	

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CONCLUSION & RECOMMENDATIONS

Investing in four proven and cost-effective intervention packages (best-buys) can significantly reduce the burden of cardiovascular disease as well as cancer, chronic respiratory disease, and diabetes.

CONCLUSION

The four major NCDs impede the KSA's efforts to achieve the health, social and economic targets of its Vision 2030. NCDs are not only a leading health and development challenge in the KSA, but they are also making the COVID-19 pandemic worse and vice versa. Addressing NCDs and COVID-19 together can reduce the health and economic burdens of both.

The findings from the investment case model show that:

- ^ NCDs cost the Saudi economy SAR 91.6 billion (US\$ 24.4 billion) each year, equivalent to 3.03 percent of its 2019 GDP. More than a quarter of this burden (26.8 percent) is through lost productivity due to people leaving the workforce.
- ^ Cardiovascular disease contributes the most to the economic burden of NCDs in the KSA, at 57 percent of the total burden or SAR 52 billion (US\$ 13.8 billion) in total.
- ^ Investing SAR 27 billion (US\$ 7.4 billion) over the next 15 years can save over 200,000 lives and provide economic benefits of SAR 112 billion (US\$ 30 billion) in restored productivity.
- ^ Investing in four proven and cost-effective intervention packages (best buys) can significantly reduce the burden of cardiovascular disease as well as cancer, chronic respiratory disease and diabetes. Furthermore, these best buys can increase people's life expectancy and quality of life while decreasing the burden on the national economy and accelerating economic growth. Thus, these investments contribute to the overall socio-economic development of the KSA.

NCD prevention and control is well worth the investment. For the KSA, prioritizing investment in the salt reduction and tobacco control packages would lead to the greatest returns. Importantly, even the strong returns outlined in this report understate the case for increased investment, as they consider only the economic benefits of improved health outcomes. They do not account for the significant additional revenue that would come from the recommended increases in excise tax rates on health-harming products including tobacco, alcohol and sugar-sweetened beverages, that can be significantly higher than the costs needed to implement the recommendations (see **Annex 3**).

NCDs pose a significant and increasing burden on Saudi Arabia's people and economy. This report demonstrates that investing in NCD prevention and control provides economic and social benefits that significantly outweigh the costs. Recommendations for next steps are detailed below and aim to help guide the KSA on its way to a healthier, more productive society.

Summary of main findings

The economic modelling considers baseline coverage levels for each intervention and assumes a significant but realistic scale-up of coverage levels. The main findings regarding the intervention packages are as follows:

OVER 15 YEARS, INVESTING IN ALL FOUR COST-EFFECTIVE INTERVENTION PACKAGES WOULD...



OVER 15 YEARS, THE PACKAGES TO PREVENT NCDS, SALT REDUCTION AND TOBACCO CONTROL HAVE THE HIGHEST RETURNS-ON-INVESTMENT (ROI)

	YIELD FOR EVERY SAR	TOTAL COST OF POLICY PACKAGE (MILLION SAR)	TOTAL BENEFIT (MILLION SAR)
TOBACCO CONTROL	7.69	745	5,729
SALT REDUCTION INTERVENTION	35.75	1,581	56,519
DIET & PHYSICAL ACTIVITY AWARENESS	2.98	1,541	4,593
CVD & DIABETES CLINICAL INTERVENTIONS	2.65	16,877	44,670

RECOMMENDATIONS

The analysis drew attention to specific areas that need to be strengthened and scaled up to implement the WHO-recommended cost-effective NCD preventive and clinical interventions. The following actions would help the KSA reap significant health and economic benefits from scaled-up investments to reduce NCDs:



A. Invest in new and scale- up current cost-effective clinical and population-based interventions, enhancing efficiency in the health sector and overall public sector fiscal sustainability.

Since the salt reduction and tobacco control packages largely provide the greatest return on investment, scaling up initiatives to reduce salt and tobacco consumption should be of high priority.

Despite current policies, salt consumption in the KSA remains high and is almost double the WHO recommendations. To reduce salt consumption, the KSA should follow the steps taken by other GCC countries and proceed with proposals to monitor and reduce salt content in bread by 10 percent annually until achieving a target of 30 percent. These efforts can also be extended to other products traditionally high in salt (e.g. chips, canned goods and frozen meals). The KSA should continue their commendable efforts to engage with the private sector to reduce levels of sugar, salt and fat in food products and to develop clear and readable nutrition data on food labels and encourage more major companies to make these commitments. These initiatives will allow citizens to make more informed decisions regarding nutrition and have a significant impact on their ability to adhere to national nutritional guidelines. The KSA can also adopt standards to combat misleading marketing and scale up education and communication initiatives to raise awareness of salt consumption and its associated health risks.

Currently, the KSA is a best practice country in three out of six MPOWER policies. To strengthen tobacco control, the KSA should further strengthen existing restrictions to fully align with WHO FCTC. Areas in particular need of improvement are strengthening sponsorship regulations, protecting people from tobacco smoke, monitoring and taxation. While many forms of advertising have been regulated, the KSA should prohibit tobacco sponsorship of all kinds including events, activities and contributions to corporate social responsibility programmes. The law requiring health warnings in places where tobacco products are sold should also be extended to require health warnings on all permitted forms of tobacco advertising, promotion and sponsorship. To adopt fully smoke-free legislation, the KSA should reconsider the introduction of designated smoking rooms in drinking and catering facilities, and ensure the law prohibits smoking in all indoor public places. As a Party to the WHO Framework Convention for Tobacco Control, the KSA should aim for full implementation of the Convention. In line with this, it is also important that the KSA continues its surveillance activities for both youth and adults on a regular basis, to ensure regular monitoring of the epidemic and the impact of different tobacco control policies on prevalence.

Interventions to reduce physical inactivity are crucial, considering that 58.5 percent of adults are considered to have insufficient levels of physical activity. Particular attention should be given to women who typically report higher rates of physical inactivity and obesity (67.7 percent and 39.5 percent respectively). [103] According to WHO NCD Progress Monitor 2020 the KSA has only partially achieved public education and awareness campaigns on physical activity targets. [58] To meet goals included in Vision 2030, including to increase public participation in physical activity and sports, the KSA should scale up its national and local awareness programmes, school programmes and other sports initiatives and engage civil society. It is imperative that such initiatives are developed and delivered in collaboration with other sectors, including civil society and the private sector. To facilitate coordination between various current and future initiatives, the KSA could establish a working group for physical activity under the NCD national coordination committee. Physicians must be sufficiently trained to provide brief advice as part of routine physician care which could include offering specific guidance on how to exercise healthily in the heat. Healthcare providers and institutions should be involved in devising guidelines for such advice in routine care.

Although the clinical intervention package has the lowest ROI, it is still cost-effective (1:2.65) and an important intervention in fulfilling the right to health. Indeed, this package would save the most lives, averting 100,772 lives lost (89,720 of which premature). While chronic conditions such as diabetes and cardiovascular disease cannot be reversed in most cases, early detection and effective management can extend life-expectancy and dramatically increase well-being. The KSA has several initiatives which could be scaled up to achieve greater impact. This includes the National Executive Plan of Diabetes Control (2010-2020) which can be extended and scaled up to ensure more patients are detected and followed up through the Diabetics' Registration Programme. The KSA can also consider expanding the available basic technologies in primary care facilities for diabetes including foot vascular status by Doppler and dilated fundus examination.

B. Increase taxes on health-harming products (tobacco and sugar-sweetened beverages) and shift subsidies from health-harming products (e.g. polluting fuels) to health-promoting ones.

Using fiscal measures to address NCDs, whether by increasing tax rates on health-harming products or shifting subsidies from health-harming to health-promoting products, represents a promising approach to finance scaled-up action on NCDs. Increasing taxes on health-harming products is one of the most effective measures a government can take. Doing so reduces the consumption of such products, thereby improving population health and reducing associated costs, while also increasing government revenue for national development priorities. Effective 'health taxes' require ministries of finance and health to work together and benefit from broader whole-of government support. The KSA could also inform the public on how the revenue will be spent; countries such as the Philippines announced in advance how tax revenues would be earmarked towards expanding UHC, thereby gaining overwhelming public support for the tax increases.

Tobacco: The KSA adopted the GCC-approved excise taxes in 2017, implementing a 100 percent excise tax on all tobacco products. A further 100 percent excise tax on all electronic smoking appliances, tools and liquids used in such items was adopted in March and entered into force in December 2019. [104] The KSA should ensure that taxes meet the WHO-recommended minimum of 75 percent of the retail price, to both reduce consumption and increase government revenue.

Sugar-sweetened beverages (SSBs): The KSA implemented the GCC-approved 100 percent excise tax on energy drinks and 50 percent tax on carbonated high-calorie drinks (applicable to sodas and other SSBs) in 2017. [105] This commendable initiative will help reduce consumption of sugar-sweetened beverages and the associated health and economic costs. A recent study examining the impact of the tax found a subsequent decrease in sales volume of soft drinks. [106] In 2019, the tariff was expanded to include any sweetened beverage, meaning non-carbonated sugar sweetened beverages¹¹ would also be taxed at 50 percent of the retail price. [107] The KSA could consider implementing an excise tax based on sugar content or volume rather than price alone to encourage consumers to make healthier choices. [108] Modifying the tax structure to the amount of sugar or size of the beverage can encourage consumers to choose smaller beverages with less sugar, while still generating revenue.¹²

The Gulf Cooperation Council (GCC) makes tax decisions as a regional block. The GCC is inclined towards health taxes and is considering how to design and implement a more effective tax on sugar-sweetened beverages. The KSA can present the GCC with evidence on the fiscal and health benefits of health-taxes, defending proposals for tax increases that would align those in the KSA to more impactful levels. Earmarking revenue from excise taxation for health systems strengthening and/or the SDGs broadly increases public support for such measures and has become standard practice in many countries. The Philippines, for instance, earmarks excise tax revenues from health-harming products for universal health coverage [109] and Egypt allocates tax revenue from tobacco products to health insurance schemes for students. [110]

Fossil fuels: Like many countries in the region, the KSA subsidizes fossil fuels. While the KSA seeks to diversify its energy sources towards renewable energy, reductions in fossil fuel subsidies can help finance the implementation of the recommended policies discussed in this report. Reductions can also be expected to deliver additional health benefits from reduced exposure to air pollution. The KSA should also continue to invest in renewable energy.

11 Some drinks are exempt from this tariff such as milk-based products (where at least 75 percent of the product is milk), milk, infant formula, drinks containing natural sugar, and beverages for medical purposes.

12 The UK has successfully introduced a tiered excise tax structure based on the sugar content of beverages to discourage consumers from purchasing drinks with high quantities of sugar.

2 >

Engage and collaborate by strengthening multisectoral, whole-of-government and whole-of-society action on NCDs and increasing public awareness of NCDs and their risk factors.

As the cause and effects of NCDs are not limited to health, the health sector should not be the only sector to respond to these chronic ailments. A whole-of-government and whole-of-society approach is needed for effective prevention and control of NCDs and their risk factors. The KSA should ensure there is a formalized, fully functional national multisectoral NCD coordination mechanism for NCDs with high-level participation from sectors across government. More non-health sectors need to be engaged if not already, such as Finance, National Economy and Planning, Commerce and Investment, Education, Food and Agriculture, Labour and Social Development, Communication, Youth and Sports, Gender and Family Welfare, Transport, Legislative and Executive branches, and Municipal and Rural Affairs. Additionally, clear mechanisms to ensure accountability for each ministry should be established to ensure NCD commitments are upheld.

The KSA can increase the number and intensity of media campaigns to spread awareness of NCDs and how reducing NCD risk factors can help minimize risk for development of NCDs and their related health complications. The KSA can launch new national mass media campaigns to spread awareness of the health harming effects of tobacco use, physical inactivity and unhealthy diets, while also expanding successful campaigns such as awareness campaigns launched as part of Vision 2030 to promote awareness of NCDs and promote healthy practices to prevent and eliminate associated health risks, including promoting a culture of sports. [76] Campaigns may prioritize women and the young in physical activity campaigns and programmes, as they are more likely to report high levels of physical inactivity. The KSA can look at previous successful campaigns targeting these groups including Sport England's 'This Girl Can' campaign, after which 2.8 million 14–20-year-old women said they did some, or more, activity and cited the campaign as the reason. [111]

The Government can engage civil society in monitoring the progress of NCD policies and share success stories with the public to strengthen support. It can also involve organizations and the public in the development and dispersal of media campaigns and other outlets to share NCD-related information. The KSA should also regularly update and engage the public on the status of NCD prevention and control programmes by sharing updates via government websites and social media platforms.

3 >

Strengthen monitoring and evaluation and accountability across sectors.

The latest national health survey in KSA stems from 2013. To strengthen monitoring, the KSA should continue to conduct nationwide surveys on a routine basis, such as the STEPS survey (which was last conducted in 2005) and youth and adult tobacco surveys (GYTS last conducted in 2010). The KSA should also continue sodium surveillance, including continuing to conduct regular urinary sodium excretion measurement studies with a representative sample of the population, considered the gold standard in the

assessment of dietary sodium intake.¹³ The KSA should follow the steps taken by other GCC countries and proceed with proposals to pass a decree aiming to reduce salt in bread by 10 percent annually until achieving a target of 30 percent and monitor the salt content until these goals are achieved. Taxation on health-harming goods, such as sugar-sweetened beverages, should also be monitored for changes in consumption patterns and in revenue. In general, the KSA should monitor implemented NCD policies and campaigns on a continual basis to evaluate for effectiveness. To strengthen accountability, the KSA should continue to establish key performance indicators such as those in the National Executive Plan for NCDs, and report these annually to the NCD Committee.

4



Implement novel policy approaches and test innovative solutions to increase utilization of existing services and incentivize healthy behaviour.

In addition to adopting the best buys and modelled interventions, the KSA can benefit from applying innovations in key areas:

Urban planning to promote health: Purposeful urban planning can incentivize healthier habits (e.g. through access to urban/community gardens, fresh food markets and mobility systems which encourage walking and/or cycling) and reduce behavioural risk factors. Urban planning is significant in the KSA, given that an estimated 84 percent of the population lives in urban areas. [112] The KSA has made commendable progress in this area and now has five healthy accredited cities; Aldiriyah, Jalajel, Onaiza, Riyadh Al-Khubara and Al-Jumum. Taif was also recently accredited by WHO as a Global Health City. The KSA should continue their efforts in taking steps to ensure more cities in the KSA achieve ‘Healthy City’ status from the WHO. The KSA can also look to other GCC countries for innovative uses of urban planning to promote health, including “Khalifa Town” in Bahrain and “Masdar City” or “The Sustainable City” in the United Arab Emirates. The KSA should evaluate similar existing innovations for impact and consider implementing new urban design and planning measures to promote health, including increasing physical activity, in both new and older neighbourhoods.

Improving air quality: Emissions from industries and transport have resulted in significant challenges to air quality, which is compounded by national sources of air pollution due to the climate including frequent dust storms. The KSA can continue to implement measures to encourage the use of public transport, such as those under the Transport Master Plan (approved in 2013). The KSA can also consider promoting renewable energy investments and energy efficiency incentives to improve air quality.

Behavioural nudges towards healthy choices: Under the Ministry of Education’s leadership, public schools can adopt innovative measures (see annex 4) such as pre-ordering for school meals with embedded nudges to prompt children to consume healthier food. Changing food placement and labels in school cafeterias to encourage healthy eating has also been shown to be effective. Schools can also ensure responsible food marketing towards children which encourages healthy food choices.

¹³ The previous study involved participants only from the Aljouf region of northern Saudi Arabia. Further studies should include a representative sample of the population.

This is particularly important given that the KSA has not achieved WHO recommended measures on marketing restrictions for children.

Food environment: Addressing access and availability to healthy food is key to a holistic approach to health. The KSA can adapt traditional and modern technologies to help fill the existing gap between demand and production of agricultural products. Water and land saving measures such as investing in bio salinity research and promoting conventional crops which are best suited to the climate conditions can help the KSA achieve goals of sustainable agriculture and food security. [113] Other innovative approaches to improving the food environment can also be considered, including encouraging local food markets and incentivizing consumption of health-promoting foods (see Annex 4 for more details).

5 >

Build back better to ensure that prevention and control of NCDs is a central element of the COVID-19 response and recovery (see Annex 1 for more details). [114] COVID-19 is another major reason to address NCDs urgently.

NCDs and their risk factors, to varying degrees, increase susceptibility to both COVID-19 infection and more severe outcomes. At the same time, impacts from the pandemic on health systems and prevention approaches threatens to stall progress on NCDs. People living with or at risk of NCDs face significant disruptions in access to prevention and treatment services for NCDs. The NCD-COVID-19 double pandemic is a major cost to health and well-being as well as to the economy, with each issue causing similar economic devastation.¹⁴ There are initial steps the Kingdom of Saudi Arabia can take to ensure NCDs and COVID-19 are addressed together, both in the immediate response and in longer-term efforts to rebuild. These include:

- ^ Ensure NCDs and NCD health and development experts are represented on COVID-19 taskforces [115] to support sensitization of actors and integration of NCDs into immediate and longer-term responses.¹⁵ Ensure COVID-19 experts are represented on NCD coordination mechanisms in turn.
- ^ Optimize regional and global coordination and information sharing on the nexus of NCDs and COVID-19, leveraging existing key platforms for example the GCC joint operations room for COVID-19.
- ^ Integrate NCDs into the country's National COVID-19 Strategic Preparedness and Response Plan, especially around pillar 9: maintaining essential services. Refer to WHO's Interim guidance on Maintaining essential services during an outbreak. [116]
- ^ Different sectors review the WHO and UNDP NCD sectoral briefs to analyse how their COVID-19 response and recovery can be sensitive to NCDs and to further integrate NCDs into longer-term development work including efforts for universal health coverage and the SDGs (see **Annex 1** of this document for further details).

¹⁴ 3.03 percent of GDP burden due to NCDs, and 5.4 percent GDP contraction forecasted due to COVID-19 according to the International Monetary Fund, Real GDP growth, IMF Data Mapper. Available at: <https://www.imf.org/en/Countries/SAU>

¹⁵ For example, many governments have been cognizant of the implications of social isolation on physical and mental health and have allowed people to take exercise outside for a short period during the movement restriction.



ANNEXES

ANNEX 1: NCDS AND COVID-19

Prevention and control of NCDs is of increased importance during the COVID-19 pandemic. In addition to an increased vulnerability to severe outcomes from COVID-19, patients with NCDs suffer from disruption of or limited access to NCD prevention and treatment services. [117] A recent WHO survey across 155 countries found that the majority of countries are encountering disruptions to the delivery of NCD services, correlating with the severity of the COVID-19 outbreak. [118] Saudi Arabia implemented strict containment measures in the early stages of the pandemic, but has still experienced a large number of cases and deaths. [119] The KSA has also taken on global responsibility by contributing 90 million USD to the WHO global COVID-19 response. [120]

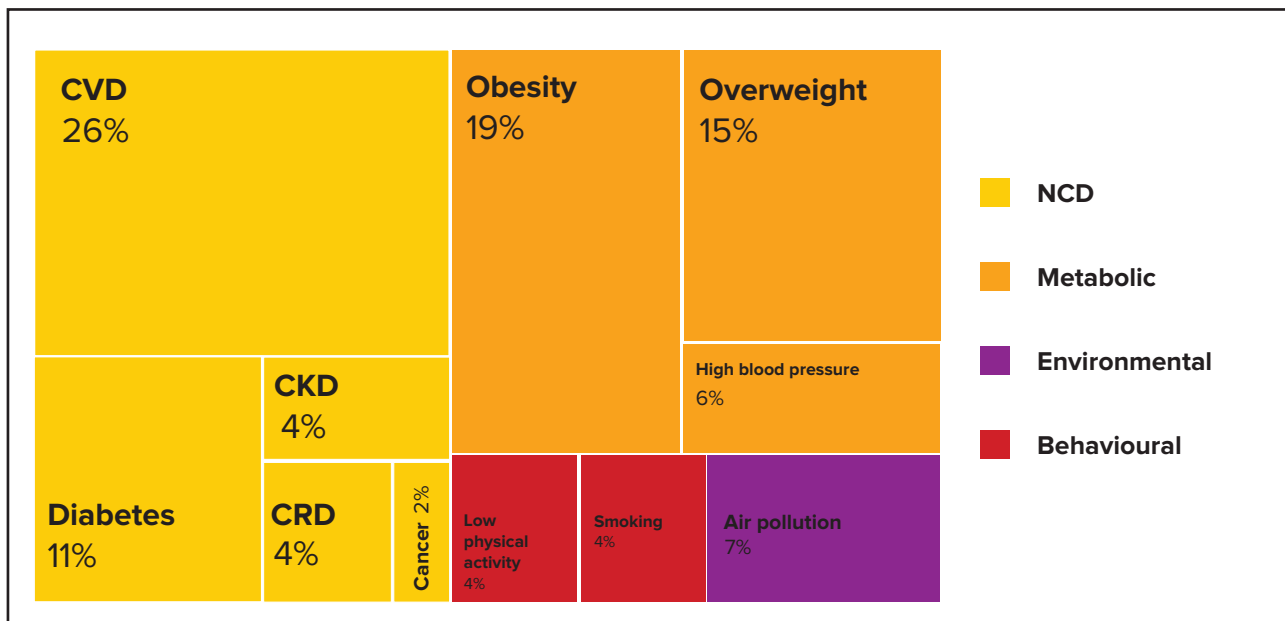
Interactions between NCDs and COVID-19

Persons with NCDs are more vulnerable to developing severe illness of or dying from COVID-19, with diabetes, cancer, chronic respiratory disease or cardiovascular diseases being key risk factors for adverse outcome. [121], [122] In addition, smoking, [123] alcohol consumption, [124] obesity, [125] and exposure to air pollution. [126] This strong interconnection between NCDs and COVID-19 highlights the necessity to integrate considerations for NCDs into the pandemic response on all levels.

The KSA scores 5.57 in the NCD/COVID-19 Vulnerability Index indicating a vulnerability to COVID-19 owing to NCDs and risk factors above the global median and the 2nd lowest in the Gulf region. The index is a weighted average of the normalized prevalence indicators for a set of NCDs and risk factors with established links to COVID-19.¹⁶

The key NCD-related factors driving vulnerability to COVID-19 in the KSA, indicated in the index breakdown (**Fig. 6**) are cardiovascular diseases, obesity and overweight. Air pollution, which is higher than the GCC average, is also a major risk factor for severe COVID-19 and contributes to making the population of Saudi Arabia particularly vulnerable.

¹⁶ For further data and details on the Index methodology, please refer to the [NCD COVID-19 Vulnerability Dashboard](#) and [Theoretical Framework](#).

Fig. 6 NCD-driven COVID-19 Vulnerability Index – breakdown of risks in the KSA

Recommendations & governance strategy

Addressing NCDs as risk factors for COVID-19 contraction and severity is crucial for reducing the pandemic's strain on the healthcare system and economy. The KSA should communicate the elevated vulnerability of affected individuals. The Government of the KSA should also devise policies to encourage a healthy lifestyle and reduce exposure to factors linked to development of NCDs, including smoking, alcohol use, physical inactivity and air pollution. An effective and sustainable COVID-19 response requires an intersectional, multi-faceted, 'whole-of-society' and 'whole-of-government' approach. The main building blocks are:

- ^ An **interdisciplinary task force** should devise policies and response strategies. This should consider and meet the needs of all groups of society, with a particular focus on those that are most vulnerable.
- ^ **Coordinate with global and regional efforts** to allow for the exchange of ideas and ensure the selection of most suitable approaches on all levels of society.
- ^ **Integrate considerations for NCDs into COVID-19 response**, including identification of essential NCD services and the need for service delivery adaptations to maintain essential services. Prioritize NCD patients for COVID-19 testing, and early care and protect supply chains for NCD medicines and technologies
- ^ **Leave no one behind.** Identify vulnerable groups at risk for COVID-19, including marginalized population groups with high rates of NCDs and including migrant workers. Incorporate their needs into the COVID-19 response plan. [127]
- ^ **Implement multi-sectoral action.** COVID-19 action is not confined to the health sector alone, but requires cooperation from a multitude of sectors to ensure that the pandemic response and recovery is sensitive to NCDs.

Other Innovative COVID-19 Policy Solutions

In addition, the KSA can incorporate more innovative approaches to help reduce risk factors for NCDs and COVID-19 infection and complications. Advanced technological approaches can be used to identify vulnerable groups at risk for severe disease. For example, finding geographical groups at higher risk of severe symptoms of COVID-19 by mapping areas of high prevalence of certain pre-existing conditions or areas of high levels of pollution. [128]

Contact tracing apps are becoming a commonly used tool to help contain the spread of COVID-19 and the KSA has joined an ongoing list of countries implementing this technology. [129]–[131] The MOH in the KSA has launched and updated six apps, which allow for contact tracing (Tabaud), obtain movement permissions during curfews (Tawakkalna), book COVID-19 test appointments (Tetamman) and which provide public health information (Sehhaty). [132] The tracing functions and alerts of the Tabaud app should emphasize vulnerable groups, such as persons with NCDs, by prioritizing these groups when contact tracing and offering useful information on the interaction between NCDs and COVID-19 on the app. The app should also provide advice and support on how to stay healthy during a mandatory 14-day quarantine.

As mentioned, government efforts to promote physical activity and mental health, to reduce alcohol use, exposure to air pollution and tobacco usage are of critical value. The MOH of the KSA has taken the initiative to provide the public with useful up-to-date, accurate information on COVID-19. Notably, the MOH is active on social media as well as on their website, where they inform about COVID-19 policy as well as about the interaction of COVID-19 and other diseases. [133], [134] These efforts should utilize scientifically backed information could be further expanded with media campaigns, apps and other forms of technology utilized to communicate about the novel coronavirus as well as suggestions on how to maintain a healthy lifestyle during times of self-isolation and quarantine. For example, the KSA can implement resources on a healthy diet [135] and exercise [136] on their Ministry of Health website or their apps in addition to the provided information on COVID-19. These initiatives help address concerns of both NCD and COVID-19 prevention.



ANNEX 2: ESTIMATED CURRENT COVERAGE OF NCD INTERVENTIONS TO BE COSTED WITHIN THE ONEHEALTH TOOL

	Current implementation levels	Modeled implementation levels in 2030
Tobacco use		
<i>Monitor tobacco use and prevention policies</i>	Level 1	Level 4
<i>Protect people from tobacco smoke</i>	Level 2	Level 4
<i>Offer to help quit tobacco use: mCessation</i>	Level 4	Level 4
<i>Warn about danger: warning labels</i>	Level 1	Level 4
<i>Warn about danger: mass-media campaign</i>	Level 4	Level 4
<i>Enforce bans on tobacco advertising</i>	Level 3	Level 4
<i>Enforce youth access restriction</i>	Level 3	Level 4
<i>Raise taxes on tobacco</i>	Level 3	Level 4
<i>Plain packaging of tobacco products</i>	Level 4	Level 4
Physical inactivity		
<i>Public awareness campaigning on physical activity</i>	Level 1	Level 4
<i>Brief advice</i>	Level 1	Level 4
High salt consumption		
<i>Surveillance</i>	Level 1	Level 4
<i>Harness industry for reformulation</i>	Level 1	Level 4
<i>Adopt standards: front-of-pack labelling</i>	Level 1	Level 4
<i>Adopt standards: strategies to combat misleading marketing</i>	Level 1	Level 4
<i>Knowledge: education and communication</i>	Level 1	Level 4
<i>Environment: salt-reduction strategies in community-based eating spaces</i>	Level 1	Level 4

Clinical interventions: cardiovascular diseases

<i>Screening for risk of cardiovascular diseases and diabetes</i>	5%	80%
<i>Treatment for those with high absolute risk of cardiovascular diseases and diabetes (>30 %)</i>	5%	80%
<i>Treatment of new cases of acute myocardial infarction with aspirin</i>	5%	80%
<i>Treatment of cases with established ischaemic heart disease and post-myocardial infarction</i>	5%	80%
<i>Treatment for those with established cerebrovascular disease and post-stroke</i>	5%	80%

Clinical interventions: diabetes

<i>Standard glycaemic control</i>	5%	80%
<i>Retinopathy screening and photocoagulation</i>	5%	80%
<i>Neuropathy screening and preventive foot care</i>	5%	80%

ANNEX 3: HEALTH TAX MODELLING

Health taxes are considered the most effective policy measure to reduce consumption of health-harming products. Additionally, they generate revenue and reduce the burden on the health system. The Addis Ababa Action Agenda on Financing for Development [137] recognizes price and tax measures on tobacco as an important revenue stream for financing for development, and the WHO Global Action Plan for SDG 3 -- to ensure healthy lives and promote well-being at all ages -- emphasizes the role of taxes on cigarettes, tobacco and sugar in improving population health while reducing healthcare expenditures and increasing government revenue.

There is a consensus among the 194 United Nations Member States to promote fiscal measures to reduce main risk factors for NCDs and promote healthy diets and lifestyles. [138] Health taxes are a fiscal measure that can help finance the health systems across lower middle-income countries whose funding levels for health are currently insufficient to sustain progress towards SDG3. [139] Summan and Laxminarayan estimated that a tax on tobacco, alcohol, SSBs that increases retail prices by 50 percent could “avert over 50 million premature deaths while raising over US\$20 trillion of additional revenues worldwide over the next 50 years.” [140], [141] Identifying and increasing sustainable domestic revenue streams is more important now than ever, with COVID-19 causing economic contraction worldwide [142] and placing an additional strain on health-systems.

While health taxes hold great potential, they remain under-implemented, including in the KSA. The sale and import of alcohol is banned, and the KSA has implemented taxes on tobacco and initiated steps to implement taxes on SSBs. Still, these health-harming products remain either very affordable or the tax structure could be improved. Increasing the excise tax on these products and altering the SSB tax structures to be specific to sugar content is an effective means to reduce consumption and prevent NCDs in the KSA.

ANNEX 4: INNOVATIVE POLICY SOLUTIONS TO ENHANCE DIETS IN THE KSA

Fruits and vegetables are important components of a healthy diet. Insufficient intake is linked to poor health and increased risk of NCDs. An estimated 3.9 million deaths worldwide were attributable to inadequate fruit and vegetable consumption in 2017. [143] WHO recommends that an adequate intake of fruit and vegetables is about 400g of fruit and vegetables. [144] Four or five servings of fruits and vegetables are typically recommended to reach the 400g recommendation. Data from the Saudi Health survey in the KSA, however, showed that 97 percent of respondents reported having an insufficient daily intake of fruits and vegetables. [145] The following table reviews a number of innovative interventions, including subtle ‘nudge solutions’, to increase fruit and vegetable consumption to help prevent NCDs.

SCHOOLS



Foster healthy dietary habits in schools



Photo credit: © The California Endowment via Flickr

Children form the core of their dietary preferences in the places where they spend most of their time – at home and school. Some schools have successfully experimented with innovative “nudge” interventions that prompt children to make (and internalize) healthier choices. [146] In one such intervention, researchers from the University of Florida created a software program that children could use to preorder their school meals. While some children simply placed their orders as usual, others were given a “tweaked” version of the software with gentle cues, such as showing a screen with a smiley face when children choose all five foods recommended by the U.S. Department of Agriculture, or designing on-screen buttons that make the healthy choices more natural. Another experiment, carried out by researchers at Cornell University, found that children were more inclined to order foods with appetizing or even quirky descriptors such as “tender grilled chicken” (instead of simply “grilled chicken”) or the more over-the-top “X-ray vision carrots.”



Integrating nutrition policies in school canteens



Photo credit: © Zsuzsanna Schreck

Changing the food offered or the shifting the menus may help promote healthier options. The KSA can encourage healthy choices in schools by shifting subsidizing towards fruits and vegetables, similar to Finland where milk subsidies exclude products high in fat or salt. Bans on salty snacks in schools and banning sugary beverages in schools and shops around schools may help deter unhealthy purchases. In California in the United States, state legislation bans the sale of SSBs on school campuses. [147]

SCHOOLS



Innovative approaches in primary schools



Photo credit: © Zsuzsanna Schreck

Parental involvement, taste testing and games are simple ways to encourage healthy eating in children. In England, children who attended schools where parents were involved in efforts to promote fruits and vegetables ate more vegetables compared to schools that did not have a high parental involvement. [148] In the United States, an evaluation of a nutrition education program that utilizes a taste testing component found that adding taste testing to the program resulted in higher student consumption rates of fruits and vegetables compared to without taste testing. [149] In Utah in the United States, a school used a game-based approach by promising rewards when the school met a fruit or vegetable consumption goal. Results showed students and teachers enjoyed the game and fruit and vegetable consumption increased when it was played. [150]



Reduce salt, sugar, and trans-fats in school meals



Photo credit: © Zsuzsanna Schreck

Countries have taken initiatives to reformulate foods to reduce trans-fat, added sugar and salt in processed foods. Tunisia has demonstrated a successful public-private partnership to achieve food reformulation. [143] Given biscuits are commonly consumed in schools in Tunisia, sweet biscuits filled with jam were reformulated to reduce fat, salt and sugar and eliminate trans-fat.

REFORMULATING FOODS AND BEVERAGES



Reduce sugar in soft drinks



In the United Kingdom, the Government set a goal for food industry to reduce sugar content in food by 20 percent by 2020 and implemented a tiered tax on sugar-sweetened beverages in 2018, encouraging reformulation of products. These policies were also accompanied by awareness campaigns. Sugar sold per capita coming from soft drinks decreased by 30 percent between 2015 and 2018. [151]

Photo credit: © World Bank via Flickr

GROCERY SHOPPING



Front-of-Pack (FOP) labelling



While limited, FOP nutrition labelling schemes, such as traffic light labelling, Nutri-score and health or endorsement logos, are in use or under development in the WHO Eastern Mediterranean Region. For example, the KSA and the United Arab Emirates have introduced traffic light labelling systems to indicate healthiness of nutrient levels by colour (red, amber or green), Morocco is developing a Nutri-score system which gives an overall rating of food on a scale from A to E, and Tunisia uses a healthy logo to indicate healthier foods. [152]

Photo credit: © Betarice Murch via Flickr

GROCERY SHOPPING

➤ **Highlight healthy foods through strategic positioning**



Photo credit: © I r via Flickr

A well-established environment nudge for increasing consumer propensity for buying healthy foods involves placing healthy foods next to the cash register (or at the desk) while keeping unhealthy foods elsewhere in the premises. This intervention has been found to increase sales of healthy products (although not necessarily to curb sales of unhealthy products). [146]

➤ **Shopping cart designs and product placement in supermarkets**



Photo credit: © Hyacinth50 via Flickr

In a pilot experiment led by a researcher at the New Mexico (US) State University College of Business, shopping carts were decorated with a yellow tape and a sign, indicating a space reserved for fruit and vegetable. The research found that this simple intervention made shoppers more inclined to buy more fruit and vegetables. Evidence suggests that customers could be further incentivized by making the cart even more appealing (e.g. by including pictures of fresh fruit). [153]

➤ **Increasing local markets**



Photo credit: © WHO

In Montreal, a seasonal outdoor fruit and vegetable market receiving funding from the Public Health Department was placed in a disadvantaged neighbourhood near a subway station. [154] Integrating alternate food sources, such as local markets, in disadvantaged areas, offers a useful strategy to promote the consumption of fruits and vegetables while addressing health inequalities. Additionally, placing these markets on travel routes may help increase awareness and access.

RESTAURANTS



Making healthy meals the rule with default menus



Photo credit: © WHO

In some cities, restaurants have tried to nudge consumers towards choosing more nutritious and less caloric meals by presenting healthy foods as the default option in their menus. This could entail, for instance, swapping the French fries for a salad as the default side dish for a protein. Here, the Government can play a coordinating role in engaging with restaurants and offering workshops on how to design healthier default menus.

MEDIA



Mass media campaigns



Photo credit: © Chelsey Badlock via Flickr

Providing nutrition information through various outlets may help promote fruit and vegetable consumption. Adolescents in Austria report television most often as a source a nutrition information. However, those who used newspaper articles, booklets and the internet as a source were more likely to consume fruit and vegetables. [155] This highlights the importance of using a variety of media when developing a public health nutrition campaign.

ANNEX 5: ROAD SAFETY AND ACCIDENTS IN THE KSA

Every year, 1.35 million people die in road traffic accidents (RTAs) and more than 50 million are seriously injured; the cost to population health, the economy and society is staggering. [156] Concurrent with NCD prevention efforts, road safety is an important component especially considering its burden on motorists, cyclists, pedestrians and wider population wellbeing in the KSA. To reduce RTAs, the KSA Government could consider provisions to protect high-risk populations; ensure accurate collection and interpretation of road accident statistics; assess their implications and accordingly incorporate policies and practices to safeguard against RTAs.

According to the WHO, the Kingdom of Saudi Arabia has the highest road accident toll in the world. The national burden of mortality and morbidity from RTAs is disproportionate among certain groups, with RTAs now being the principal cause of death in young people aged 16 to 36 in the KSA. Additionally, the great majority of road traffic injuries (83.65 percent) occurs in cities. [157] Over 65 percent of accidents were due to vehicles moving at excess speeds and/or drivers disobeying traffic signals. [158]

Although the burden of road traffic injuries is already high in the KSA, some studies highlighted that the prevalence of accidents is likely understated. The regional director of research on injuries at King Abdullah International Medical Research Center stated that “death statistics cited by the traffic department in the KSA only count people who die at vehicular collision scenes. It does not consider deaths inside hospital operating theatres or intensive care units...the recorded death toll here represents only 48 percent of the total”. [157] Accordingly, regional and international literature calls for a multi-tiered approach to prevent RTAs, using broader data collection and accurate interpretation as a cornerstone.

Recommendations to improve road traffic safety include: driver education, training and awareness programs promoting safe and responsible driving in cities and high-risk areas; adapted camera locations according to accident frequency per location; improved enforcement of speed limit and safe driving practices, and; strengthened trauma systems to improve survival after a crash. It is recommended that the KSA’s traffic safety agencies should emphasize safety in non-intersection locations (where the majority of collisions take place). [159] Further, partnership with civil society organisations, advocacy groups and academics can improve community engagement and public campaigns highlighting the consequences of speeding, abrupt lane change and distracted driving – all of which increase the size and severity of RTAs in the KSA. [160]

With a projected annual rate of 4 million road traffic collisions per annum by 2030, there is an urgent need for effective and comprehensive traffic safety policies, provisions and services in the KSA. [160]

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