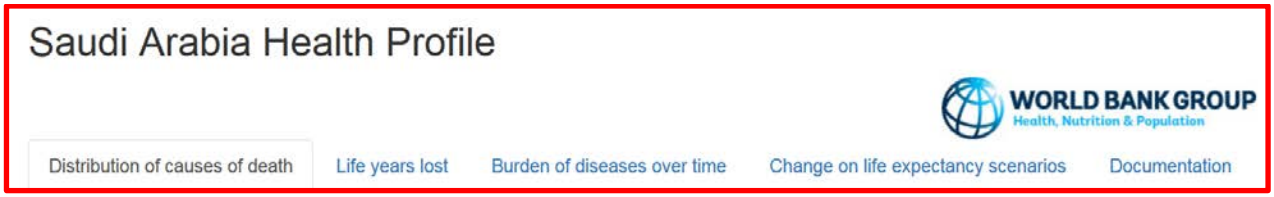
Saudi Arabia Health Profile

Users' Manual

Vladimir Canudas-Romo and José Manuel Aburto

The aim of this document is to give a brief presentation of the interactive link-application: https://population-health.shinyapps.io/saudi-arabia-health-profile/

The app includes an upper horizontal menu with five options: the first four correspond to visualizations of Saudi Arabia's mortality profile, while the last option includes documents explaining the use and content of the application.



Explanations of the data used and each of the elements of the four visualization tools in the menu follow. For further information on the data and methods used see the "Source and Methods" tab found in the "Documentation" menu.

Sources of data

Two sources of data were needed to assess the health profile of Saudi Arabia from 1999 to 2015 with further projections to the year 2030: cause specific mortality, and life table data.

Cause of death information was obtained from the Institute of Health Metrics and Evaluation (IHME) (https://vizhub.healthdata.org/cod/) from 1999 to 2012. Cause of

death information was collected from this source for ages 0, 1-4, and then in five-year age groups until the open age-group 95 and more.

Ten main causes of death in Saudi Arabia were selected: 1) Tuberculosis and HIV/AIDS, 2) Diarrhea, lower respiratory, and other common infectious diseases, 3) Neoplasms, 4) Cardiovascular diseases, 5) Diabetes, 6) Urogenital, blood, and endocrine diseases, 7) Transport injuries, 8) Unintentional injuries, 9) Self-harm and interpersonal violence, and 10) the group of other causes of death including those not accounted by the previous nine causes.

Life table data by sex and grouped in five calendar years were obtained from the UN demographic yearbook. All the life table functions (e.g. age-specific death rates and life expectancy) were retrieved from this data source, including the projections for 2025-2030.

The UN life tables had the further advantage that they could be combined with the IHME cause of death information. Life tables were selected for the following periods: 2000-2005, 2005-2010 and 2010-2015, as well as the UN projections for 2025-2030. Causes of death were also organized in these five calendar years. We were able to match life table and cause of death data for most of the years, an exception was the last period 2010-2015 which only included data on causes of death for 2010-2012. In the interactive application app whenever we refer to the period 2010-2015 we assume that the causes of death data from 2010-2012 represent the distribution over age of the entire period 2010-2015.

Visualization Tools

Four different visualization tools are presented. The first one is the proportion of deaths by causes of death for each age category and in each year, for females and males. The remaining three tools help us answer three questions:

1) If all the Saudi Arabian population is not surviving to age 85 then how many life years are lost to the different causes of death? The “Life years lost” tool shows the accumulation of mortality over age.
2) The, then how have the different ages and causes of death contributed to the increase in Saudi Arabian life expectancy? The “Burden of diseases over time” tool quantifies the recent past of changes.
3) “If” there were sudden declines in Saudi Arabian cause specific mortality, what would be the possible scenarios of future life expectancy? “Change of life expectancy scenarios” presents this perspective.

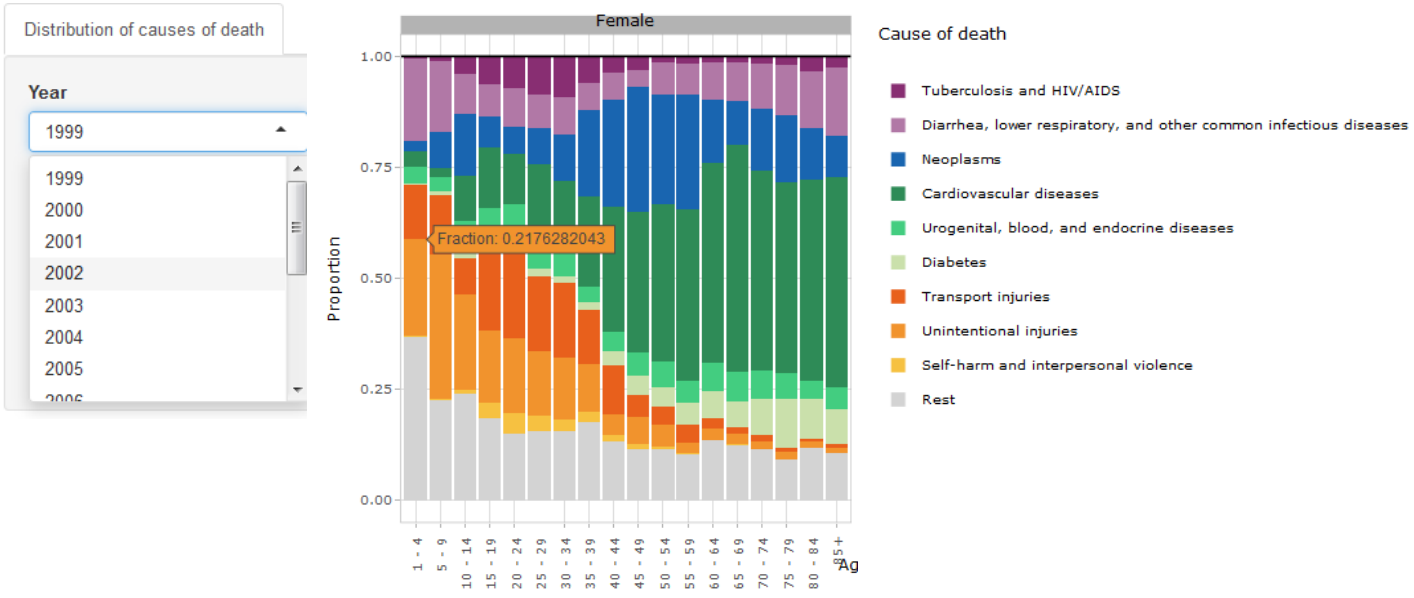
These three methodologies are briefly explained below and more details on them can be found on the “Sources and Methods” document.

Distribution of causes of death

The proportion of the 10 causes of death by age used, is found as the first menu option in the interactive application on “Distribution of causes of death”. This tool gives a glance of the distribution of mortality in the Saudi Arabian female and male populations.

Figure 1 below corresponds to the distribution of causes of death for Saudi Arabian females in 1999. In Figure 1 (and app), a left dropdown menu allows the user to select among the different years with available data from 1999 to 2012. The different causes of death are depicted with colours, the horizontal axis corresponds to ages and the user can move the cursor into the figure and obtain the specific percentage distribution of each cause of death at each age, in Figure 1 at ages 1-4 accidents (unintentional injuries) correspond to 22% of all deaths at that age.

Figure 1. Distribution of deaths by age for Saudi Arabian females in 1999.

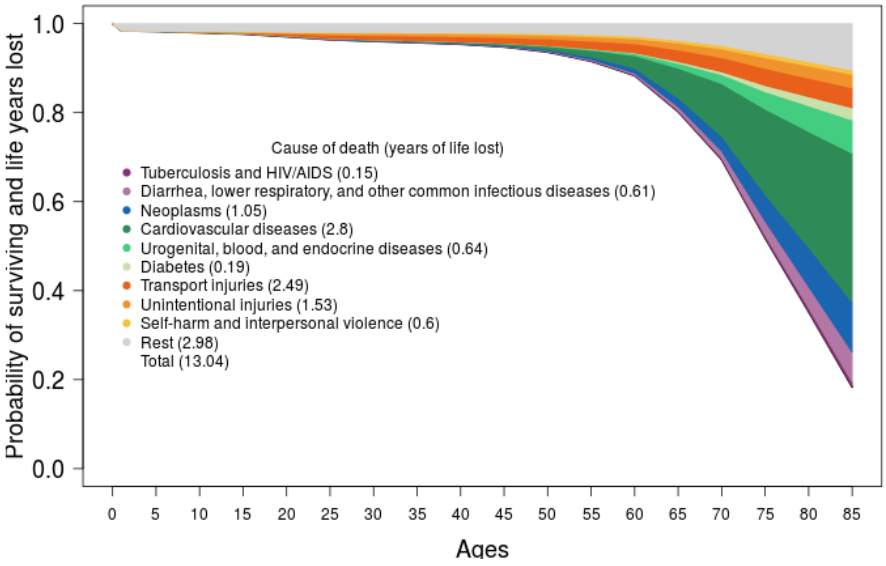


Life years lost

To further understand the burden of mortality, it is imperative to translate the distribution of deaths into a summary measure like life expectancy, namely its complement: life years lost. The latter measure describes the number of years lost due to death and it is used for analysing differences in mortality between subpopulations or for changes over time. It is calculated as the number of years between death and a set upper limit. For the Saudi Arabian population 85 years was selected as this upper bound. For example, in 2005-2010 male life expectancy between birth and age 85 was 72 years, then life years lost are 13 years (our upper limit 85 – life expectancy 72). A further advantage of using this tool is the possibility of calculating *years lost* due to different causes of death.

In the Saudi Arabia Health Profile app it is possible to see the life years lost profile for males in 2005-10 in Figure 2. The horizontal axis includes ages and in the vertical axis the proportion of survivors for the 2010-2015 life table and the life years lost. At age zero, 100% of survivors are found and by age 85 this has reduce to 18%. Above this curve of survivors are the life years lost due to the different causes of death. It is possible to see the excessive burden of cardiovascular mortality (2.8 years) at old ages in dark green. Transport injuries are hardly visible in this Figure, however, its occurrence is predominantly at young ages and thus accumulates a great amount of lost years for the population (2.5 years). For males the burden is such that if one added accidents (unintentional injuries with 1.5 life years lost) the total burden of these external causes is greater than the number of life years lost due to cardiovascular mortality.

Figure 2. Life years lost for Saudi Arabian males in 2010-2015.



Two further submenus are found in this visualization tool, corresponding to “Total contributions by cause of death to the change in LYL” Table and Figure. These correspond to the change over time in the number of life years lost. For example, Table 1

below shows the male life years lost changes between periods 2005-2010 and 2010-2015. Here it is possible to see how the different causes of death have reduced or increased in their number of life years lost. The app offers the option of re-arranging the Table by clicking in the upper right “Contribution” label. For example, in Table 1 a great reduction in cardiovascular life years lost was observed in this period with above half a year of gains (-0.57 years). Similar changes for females can be seen by scrolling down to the bottom of the page. The submenu on “Total contributions by cause of death to the change in LYL (Figure) shows the same results as the Table but in a Figure.

Table 1. Life years lost change from 2005-2010 and 2010-2015 for Saudi Arabian males.

Males. Changes between period 2005-2010 to period 2010-2015 .

Cause	Contribution ▲
Cardiovascular diseases	-0.566
Transport injuries	-0.411
Unintentional injuries	-0.092
Tuberculosis and HIV/AIDS	-0.085
Diabetes	-0.058
Diarrhea, lower respiratory, and other common infectious diseases	-0.016
Neoplasms	0.05
Urogenital, blood, and endocrine diseases	0.079
Rest	0.111
Self-harm and interpersonal violence	0.337

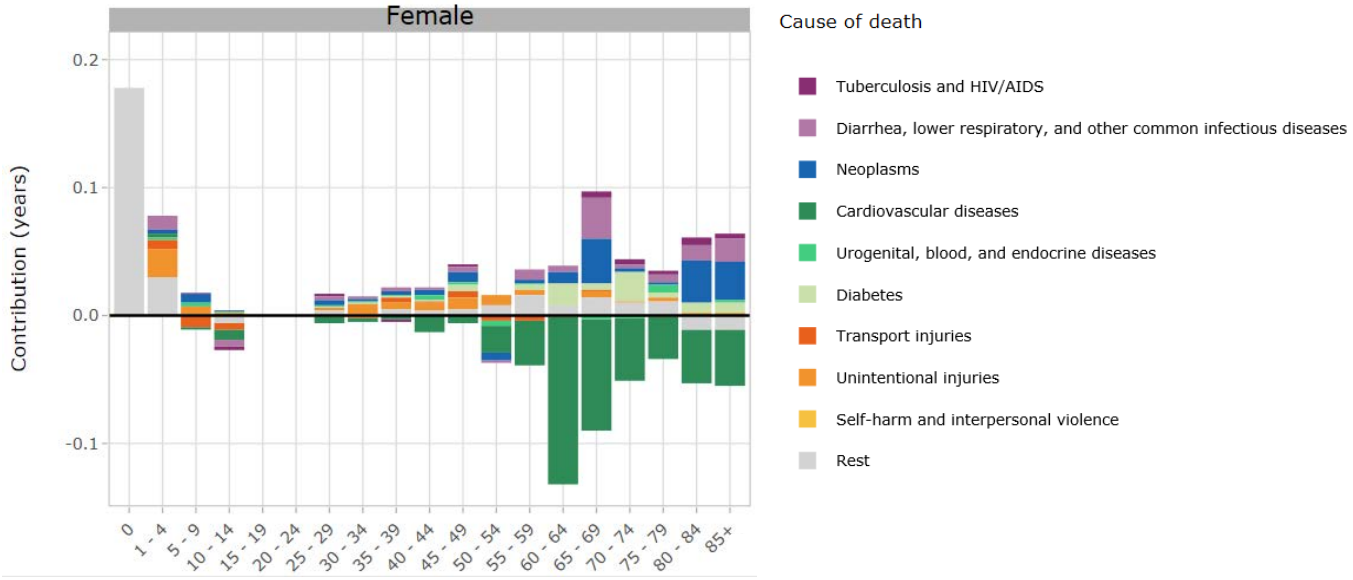
Burden of diseases over time

A further step in shedding light into the changes in life expectancy is to calculate the age- and cause-decomposition of the difference in life expectancies. These are standard methods in demography used to quantify how the different causes of death have contributed to the observed changes in life expectancy.

The results of the age- and cause-decomposition of the change in life expectancy are presented for two group of years in the interactive app left dropdown menu: life expectancy changing from 2000-2005 to 2005-2010, and the second option is from 2005-2010 to 2010-2015.

Figure 3 shows the output from the app for the comparison from 2000-2005 to 2005-2010. The Table at the bottom of this snapshot shows that females had a life expectancy in 2000-2005 of 74.44 and by 2005-2010 this had increased by 0.22 years to 74.66. The Figure on top of the Table shows the separation of these 0.22 years into ages and causes of death that contributed to the increase in life expectancy, as well as those that opposed the increase. For females Neoplasms, Diabetes and other endocrine diseases are among the main providers of the increase in life expectancy, however, cardiovascular mortality increased in this period offsetting the life expectancy progress. Details on the specific contribution of each cause of death can be found on the submenu Table “Total contributions by cause of death (Table)” and in the visualization submenu “Total contributions by cause of death (Figure)”. The Table has the same features as for the “life years lost” so that the user can arrange the contribution to the changes in life expectancy and scroll down to obtain the female Table.

Figure 3. Age- and cause decomposition of the change in life expectancy for Saudi Arabian females in 2005-2010.



Period	Sex	Life expectancy	Difference
2000-2005	Female	74.44	
2005-2010		74.66	0.22

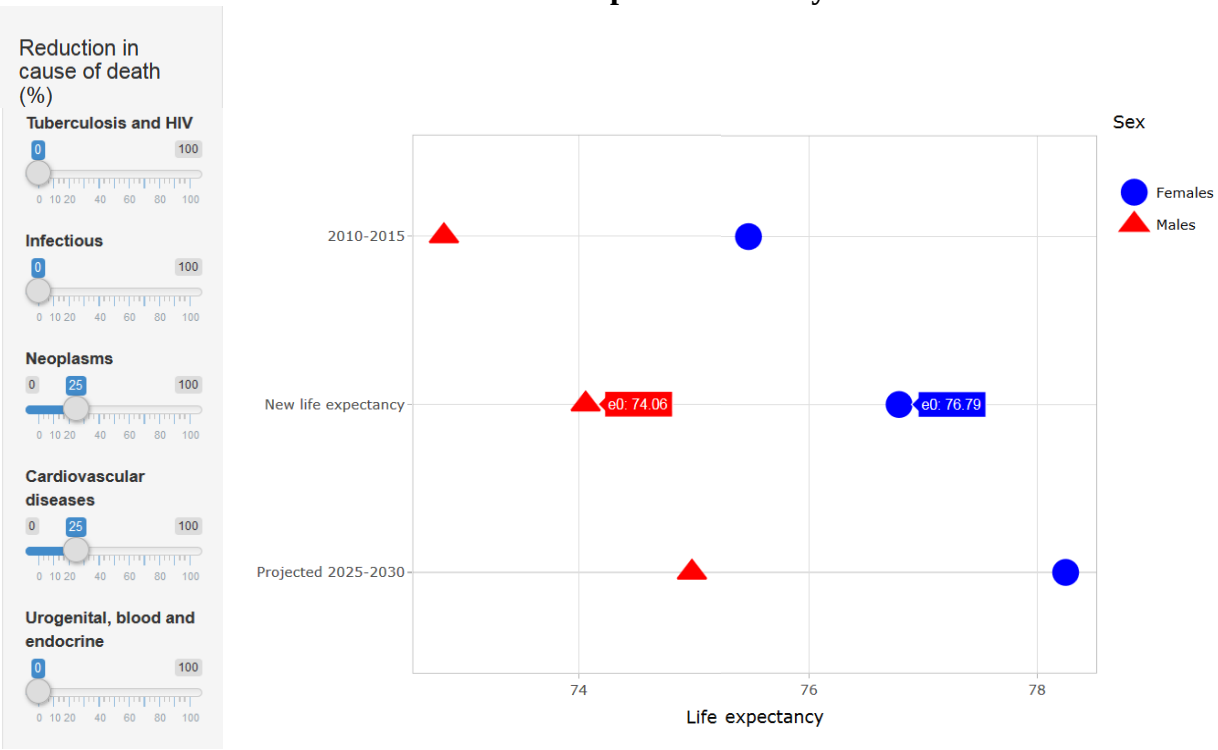
Change of life expectancy scenarios

How much would Saudi Arabian life expectancy increase if transport injury was reduced by 50%? This visualization interactive tool allows answering this and other questions related to scenarios where life expectancy increases depend on proposed reductions of mortality by cause of death.

Figure 4 shows a snapshot of the interactive app tool of *Change of life expectancy scenarios*. The left menu allows the user to select the desired reduction in cause of death mortality, e.g. in Figure 4 cardiovascular and neoplasm mortality both are selected to decline 25%. The Figure on the right presents six life expectancies corresponding to Saudi Arabia in: 2010-15 (75.5 and 72.8 years for females males respectively); in 2025-30 (females 78.3 and males 75 years), and the two “new life expectancies”. The latter life expectancies are 76.8 for females and 74.1 for males which should be achieved if there

was a 25% reduction in neoplams and cardiovascular mortality respect to the levels of mortality in 2010-15. The user has the option to scroll down and select as many reductions in different causes of death and by the percentage of decline desired.

Figure 4. Scenario of Saudi Arabian life expectancy when a 25% decline in cardiovascular and neoplasm mortality is achieved.



Further information on the data and methods of the visualization tools presented in this document can be consulted in the "Source and Methods" tab found in the "Documentation" menu.