# Codebook for R Tool on COVID-19 QALYS

* Tool by Prof Andrew Briggs developed in Excel information: <https://www.lshtm.ac.uk/research/centres-projects-groups/chil#covid-19>
* Based on v5.0 of Excel tool
* R code originally written by Nichola Naylor June 2020 – inputs and codebook adapted for v5.0 of the excel tool November 2020
* Update 2.1 was to add information from the publication:
  + Briggs, A.H., Goldstein, D.A., Kirwin, E., Meacock, R., Pandya, A., Vanness, D.J. and Wisløff, T., 2020. Estimating (quality‐adjusted) life‐year losses associated with deaths: With application to COVID‐19. *Health Economics.*
  + Available: [Estimating (quality‐adjusted) life‐year losses associated with deaths: With application to COVID‐19 (wiley.com)](https://onlinelibrary.wiley.com/doi/epdf/10.1002/hec.4208) [last accessed 05/02/2021]

## Inputs

* Excel file (inputs.xslx) with the following information:
  + Life table – probability of dying between ages and
    - Note copied this for age=100 to age=120
  + = Population quality of life norms for different ages
  + Age distribution of deaths from covid19
* User defined inputs through the app interface:
  + Discount rate (r) [where 0.035 represents a discount rate of 3.5%]
  + Standardized mortality ratio (smr) - summarizes how a given comorbidity can increase the risk of dying. For example, an smr=1 shows no adjustment for comorbidities. [[1]](#footnote-1) This must be between 1 and 5.
  + qcm – comorbidity impacts on QALYs [this is in terms of % percentage of population norm QoL associated with SMR]
  + **Note that this version of the tool does not flag when numbers are out of range so please make sure that qcm and discount rates entered are between 0 and 1 for the outputs to be reasonable.**
  + Choice of country, current options are (see data dictionary for sources):
    - Canada
    - Israel
    - Norway
    - UK
    - USA
  + To add your country data, see the corresponding section in this codebook.

## Outputs

* Mean life expectancy loss associated with COVID-19 per 100,000 population
* Mean quality-adjusted life expectancy loss associated with COVID-19 per 100,000 population
* Mean discounted quality-adjusted life years lost associated with COVID-19 per 100,000 population

## Functions

* = probability of dying between time x and x+1
* = the underlying instantaneous death rate
* = number surviving to age per 100,000, where
* is estimated for females and males separately, and then averaged to get a “person” estimate using:
  + proportion female =
* = the person years lived between
* = the total number of person-years lived above age , is the upper bound of life-expectancy reported in the life table (e.g. 100 years old for the UK).
* = the life expectancy at age
* = quality-adjusted person years between x and , where is the average population quality of life at age x, and adjusts quality of life based on pre-existing comorbidities that occur for the remainder of that person’s life (NOT the same as COVID-19 related comorbidities).
* = the total number of quality-adjusted-person-years lived above age
* = Quality-adjusted life expectancy at
* + For example, if a person died at age 2 , for u=2,3…. :
  + + + ….+
* = = discounted quality-adjusted life years associated with a premature death at age
* Weighted loss(LE) = , where = proportion of covid19 deaths of age (for the purposes of this tool this is the mean age of the specified groupings).
* Weighted discounted QALY loss =

## To update data for countries currently included:

* The input excel (“input.slxs”) that is used has the following layout: (variable names and first values shown)
  + male\_LT: the probability of dying between and for males based on country lifetables

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Age | UK | US | Canada | Norway | Israel |
| 0 | 0.0042 | 0.006302 | 0.00477 | 0.002 | 0.003336 |

* + female\_LT: the probability of dying between and for females based on country lifetables

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Age | UK | US | Canada | Norway | Israel |
| 0 | 0.003548 | 0.005226 | 0.00427 | 0.002 | 0.002937 |

* + qol\_norm: quality adjusted life year norms based on the age (low and high correspond to the age bands)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Age band | Low | high | UK | US | Canada | Norway | Israel |
| 0-17 | 0 | 17 | 1 | 1 | 1 | 0.89 | 0.985461 |

* + age\_covid: age distribution of deaths from COVID-19 (the rows must sum to 1)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Age band | low | high | UK | US | Canada | Norway | Israel |
| 0-9 | 0 | 9 | 0.00004 | 0.000222 | 0 | 0 | 0 |

* Data can be updated to match this formatting.
* Previously, for the excel model, downloaded/”copy and pasted” tables from the statistics websites were converted into these. This functionality is present in the excel file “LookupTables\_converter\_v1.1.xlsx”. If data are downloaded or copied into similar tables in the e.g. “UK ONS 16-18” tab, this may then automatically update the tab “LookUpTables”, which can then be copied and pasted (selecting values only) into “inputs.xlsx”, however coding may have to be changed (such as definitions of columns/rows to sum over). Start by looking at the formulae used within the LookUpTables tab. We have updated from excel tool V4.0 to V5.0 and only updated key tables so there may be a slight mismatch of unused data and used data – please see Excel tool for full workings of the Tables [saved as “Copy of COVID-19 QALYs v5.0.xlsx”]. Note the model does not directly use the lookuptables\_coverter file.
* Once the new data in “inputs.xlsx” have been saved, the app can be rerun.

## To add data for new countries:

* Add in the data dictionary references for data on all inputs needed.
* For every single tab in “inputs.xslx” add a new column with the country name e.g.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Age band | low | high | UK | US | Canada | Norway | Israel | **France** |
| 0-9 | 0 | 9 | 0.00004 | 0.000222 | 0 | 0 | 0 | 0 |

* Within the “app.R” RScript update the following code within the ‘ui’ section:

## nationality

radioButtons(inputId="country", label="Country",

choices=c("UK", "US","Canada","Norway","Israel" **,"France"** ), selected = "UK"),

* Rerun app accordingly.
* **Please note the current version does not contain error messages, therefore please ensure data are correct before entering new data (e.g. age distribution summation equaling 1).**

1. Using life table methods to calculate QALY losses from deaths: with application to COVID-19, Andrew Briggs, LSHTM, May 13, 2020 [↑](#footnote-ref-1)