

Appendix D1. EConDA Tool Development

EConDA Tool

WORK PACKAGE 6: DEVELOPMENT OF A DOWNLOADABLE TOOL

This report arises from the project EConDA which has received funding from the European Union
in the framework of the Health Programme

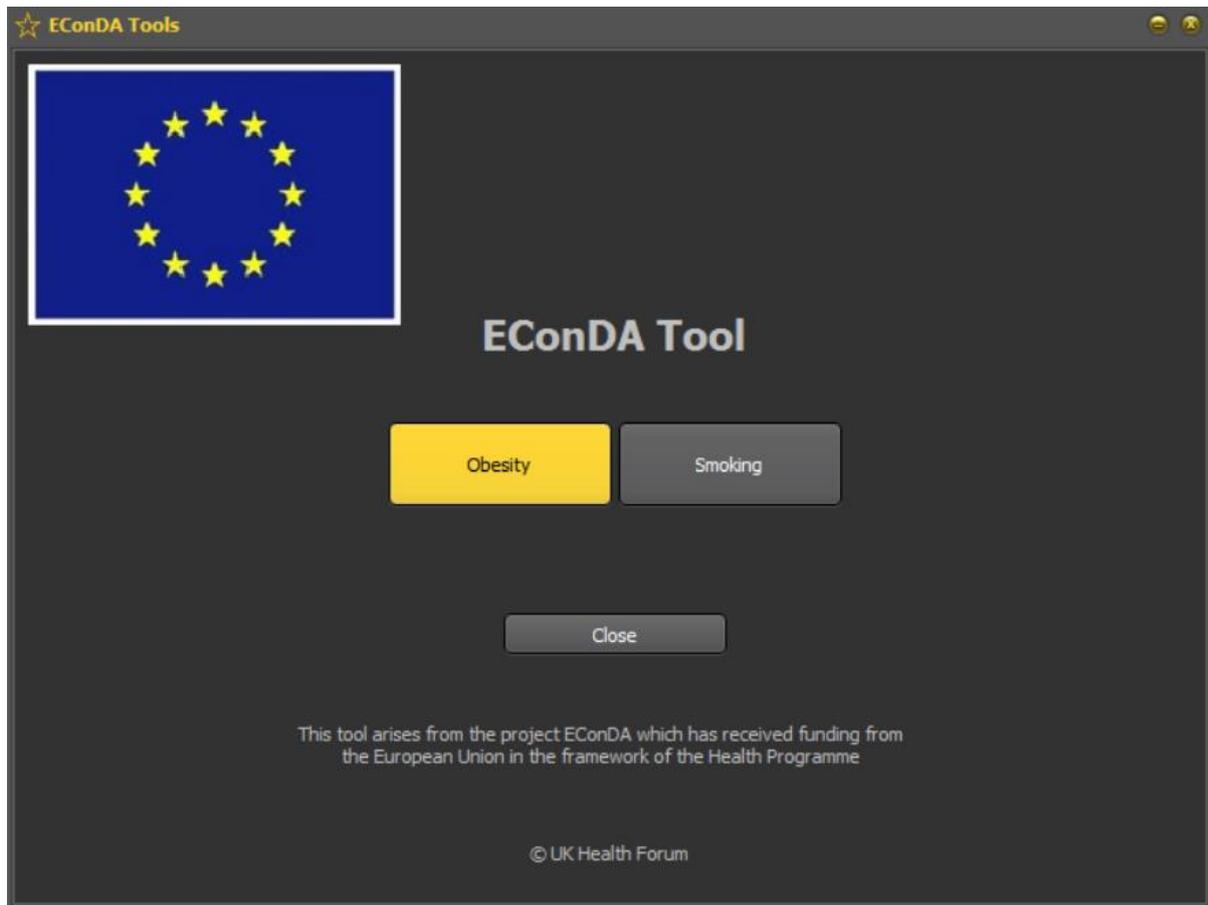
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Background and objectives

As part of work package 6 of the EConDA project a downloadable tool was developed to enable researchers and policy makers to test the impact of their own interventions upon chronic disease. The tool is effectively a 'cut-down' version of the microsimulation model that was developed in work packages 5 and 6. It provides similar, but less accurate estimates to the microsimulation without the computing power necessary to run the microsimulation. The tool is therefore complementary to the microsimulation model.

A tool was developed to test the impact of either obesity or smoking interventions on the future burden of chronic diseases. The tool provides projections of the future attributable burden of disease based on changes in respective risk factors and the future health and cost impact of planned interventions. As a consequence, it enables users to make more informed decisions about the commissioning of tailored services and interventions.



Tool development

Methods

The tool processing is different from that of the microsimulation in two main ways.

1. The tool processing is 'deterministic'¹

By 'deterministic' we mean that the tool processes cohorts of weighted individuals (e.g. a group of overweight 20-39 year old males) rather than a whole population of a variety of individuals. A cohort is a group of individuals whereby the user specifies, for each individual, their initial risk factor status (e.g. obese, smoker) and medical history. Individuals are processed one at a time from the simulation start year until they either die or reach the simulation stop year. In each simulated year they can contract, recover or die from a specified or non-specified disease. The tool is coded in C++ and includes a graphical user interface (GUI) that can be downloaded and used by the lay person.

2. Risk factor trajectories

In the microsimulation individuals have a risk factor status that is determined by the risk factor trajectory entered into the model. For example, an individual may have a BMI point of 24 or 32. However, in the tool they will be classified as either overweight or obese. In this sense the tool is less granular than the microsimulation. Importantly though, the risk factor trajectory follows the same pattern such that obesity by age and sex is generally increasing over time and smoking prevalence is generally decreasing over time (as set by the input data).

Data input

The same data collected for the disease module of the microsimulation was entered into the tool (see Table 1 and WP 5 and 6 report, section: Methods/Data collection). Importantly, the same risk factor trajectories are included, making the tool dynamic such that it takes account of changing trends in risk factors over time.

¹ See appendix B4 for an in-depth description of the microsimulation method and appendix B7 for more detail on the differences between the microsimulation and tool method

Table 1. **Data inputs in the tool**

<p>Risk factor data</p> <ol style="list-style-type: none">1. Historical and current prevalence of body mass index (BMI) groups (healthy weight, overweight and obese) by age and sex.2. Historical and current prevalence of smoker status (never smoker, ex-smoker and smoker) by age and sex. <p>Disease data</p> <ol style="list-style-type: none">3. Most recent incidence, mortality and survival of the diseases of interest by age and sex4. Relative risk of acquiring the diseases of interest by category of smoking and/or BMI, stratified by age and sex, where available <p>Demographic data</p> <ol style="list-style-type: none">5. Population data by age and sex6. Birth distribution by age and fertility rate of the population <p>DATA FOR WORK PACKAGE 6</p> <p>Health economic data</p> <ol style="list-style-type: none">7. Estimated utility weights of the diseases of interest without medical intervention8. Estimated direct cost associated with the diseases of interest9. Estimated indirect cost associated with the diseases of interest <p>Intervention data</p> <ol style="list-style-type: none">10. Impact of the intervention on risk factor or disease11. Cost of the intervention, if applicable
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Tool set-up

The tool allows the user to partially specify the setup for each run:

At the start of each run, the model loads the input data and data files and creates the necessary data structures. All the supporting data files provided with the tool consist of either supporting data in the form of named, tab-delimited text files (the same as those used as the inputs for the microsimulation) or user-selected options made at run-time such as start year, stop year, the country of interest, the intervention, the cohort, the intervention cost, the cost and health discounting rates. A full user guide was written to accompany the tool and this can be found in appendix D2.

Piloting the tool

To determine the user-friendliness and utility of the tool the tool was piloted in a two stage process.

Stage 1: Amongst the EConDA collaborators

A survey was developed to gather feedback from collaborators on the ease of use, the functionality and utility of the tool as well as any suggestions the users may have had. The survey was pre-piloted internally among EConDA collaborators and UK Health Forum colleagues. Changes requested to the tool included:

- i) Adjust person age
- ii) Larger intervention cost range
- iii) Use of the tool on small screen laptops

An online survey was also developed to generate further feedback following submission and dissemination of this tool to the wider community <https://www.surveymonkey.com/r/EConDATool>. A copy of the survey is also available in the appendix D4.

We aim to continue working collaboratively with policy makers to modify the software into fully worked up and field tested tools including modified and updated data when it becomes available.

Stage 2: Amongst users in 5 EConDA countries

A workshop took place in five EConDA countries (Bulgaria, Lithuania, Netherlands, Poland and Portugal) to further pilot the tool alongside dissemination of the project deliverables.

The survey was used to gather further feedback on the tool's usability.

Feedback from country workshops

User comments

Following live testing of the tool at the country workshops a range of themes were extracted from survey responses (a total of 49 survey responses were collected):

- i) Input
 - a. Allow user to change incidence, prevalence, relative risks
 - b. Setup multiple interventions
 - c. Allow user to specify the % drop for selected intervention (Sugar Sweet and Beverage Tax (SSB) and Multi Component Lifestyle Intervention (MCLI))
 - d. Allow user to select discounting rate for the countries
 - e. Only allow options relative to cohort/single to be selected depending on if a cohort or a single person is set
 - f. Add a “reset to default” option
- ii) Output
 - a. Ability to remove lines by clicking on them on the graph
 - b. All outputs in graphics
 - c. Use the same colour in graphs for baseline data and intervention data
 - d. Sort results by age
 - e. Add a death line to show life expectancy
 - f. Show population graph versus time
 - g. Longer time for explanatory tooltips appear on screen
 - h. Button to open Output folder
- iii) Model design
 - a. Need to see disease editor to change data
 - b. Future microsimulation tool
- iv) User guide
 - a. List references for data/assumptions
 - b. Make tense consistent
 - c. Add an FAQ
 - d. Troubleshooting section
 - e. Provide more explanation on the each of the options on the tool
- v) Survey improvements
 - a. Questions 4, 7 and 8 should be moved to the end
 - b. Scale for “How easy was the user guide to use?” should be reversed
 - c. Ask for similar tools used
- vi) General improvements
 - a. Allow user to change themes/font size
 - b. Create a version for Mac OS

- c. Put assumptions and references somewhere in the program
- d. Stop risk factor selection screen from popping up at the end of a run
- e. Stop program UI from freezing while a run is in progress
- f. Clarify that Edit > Clear output deletes all files within Output folder

The full set of responses can be found in the EConDA Feedback spreadsheet within appendix D5.

The most common requests were the ability to change the theme/font size (14% of responses), the ability to change disease data such as incidence/prevalence (12% of responses), the creation of a Mac OS version (10% of responses) and the request for us to disclose the algorithms used and data sources (10% of responses).

User satisfaction

We asked some users to rate certain parts of the program and the responses from users were generally positive. These were the results.

How did you find setting up a run in terms of ease?

Mean: 6.84 / 10 Mode: 7 / 10

How clear did you find the output editors?

Mean: 6.81 / 10 Mode: 8 / 10

How easy was the user guide to use?

Mean: 5.79 / 10 Mode: 3 / 10

How likely is it that you would recommend the EConDA tool to a friend or colleague?

Mean: 6.97 / 10 Mode: 10 / 10

Overall, are you satisfied with your experience of using the tool, dissatisfied with it or neither satisfied or dissatisfied with it?

Mean: 6.76 / 10 Mode: 7 / 10

Issues during testing

There were some issues with the installer for the EConDA Tool because it was being picked up by some anti-virus software. However, since this is a bespoke piece of software, this will unfortunately be an ongoing problem with common security software. Instruction to click through the security alert will hopefully ensure this is not a barrier to use.

Another issue that appeared during testing was related to locale settings. In certain countries across Europe, commas are used to delimit the fractional part of a real number. The tool was written without taking this into consideration and when it was run on computers with certain localisation settings, the decimal point was automatically converted to a comma and this caused issues with processing the inputs. We were able to force the delimit character to always be a full stop regardless of the locale and fix this issue.

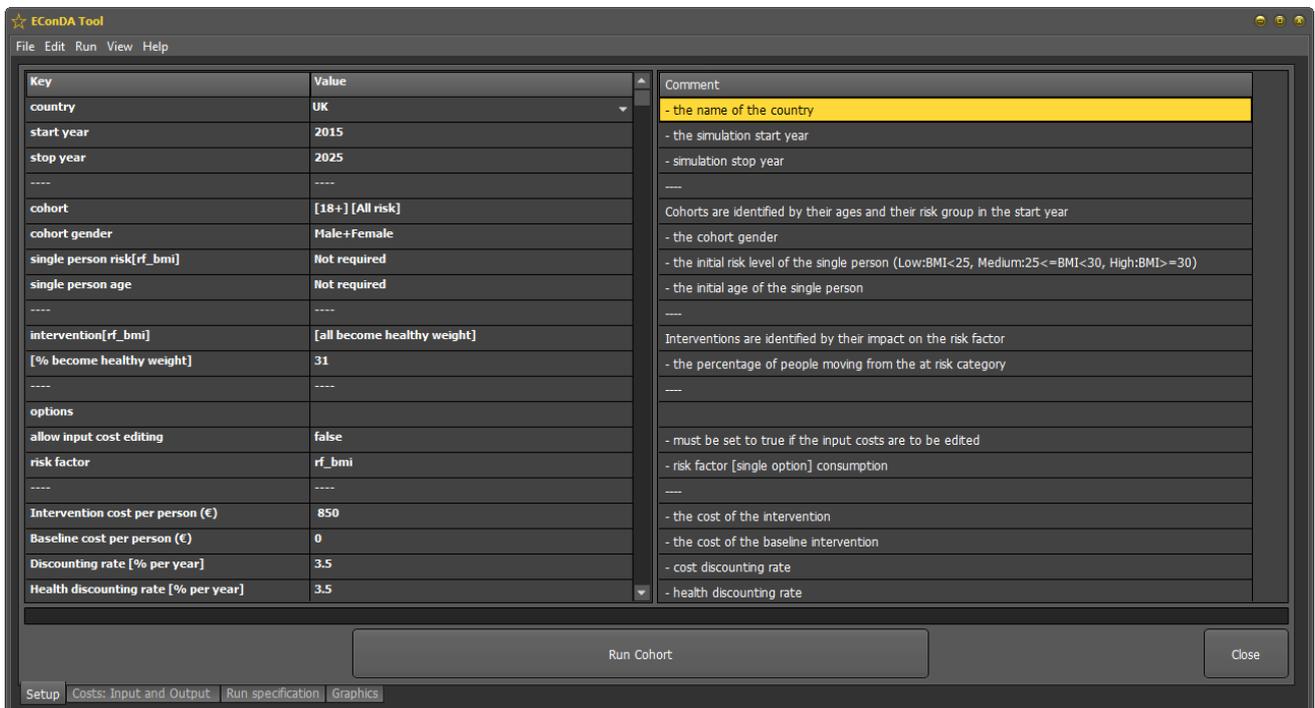
Improvements made following workshop feedback

It was not possible or feasible within the time and cost constraints to implement all of the changes suggested, however the suggestions implemented were:

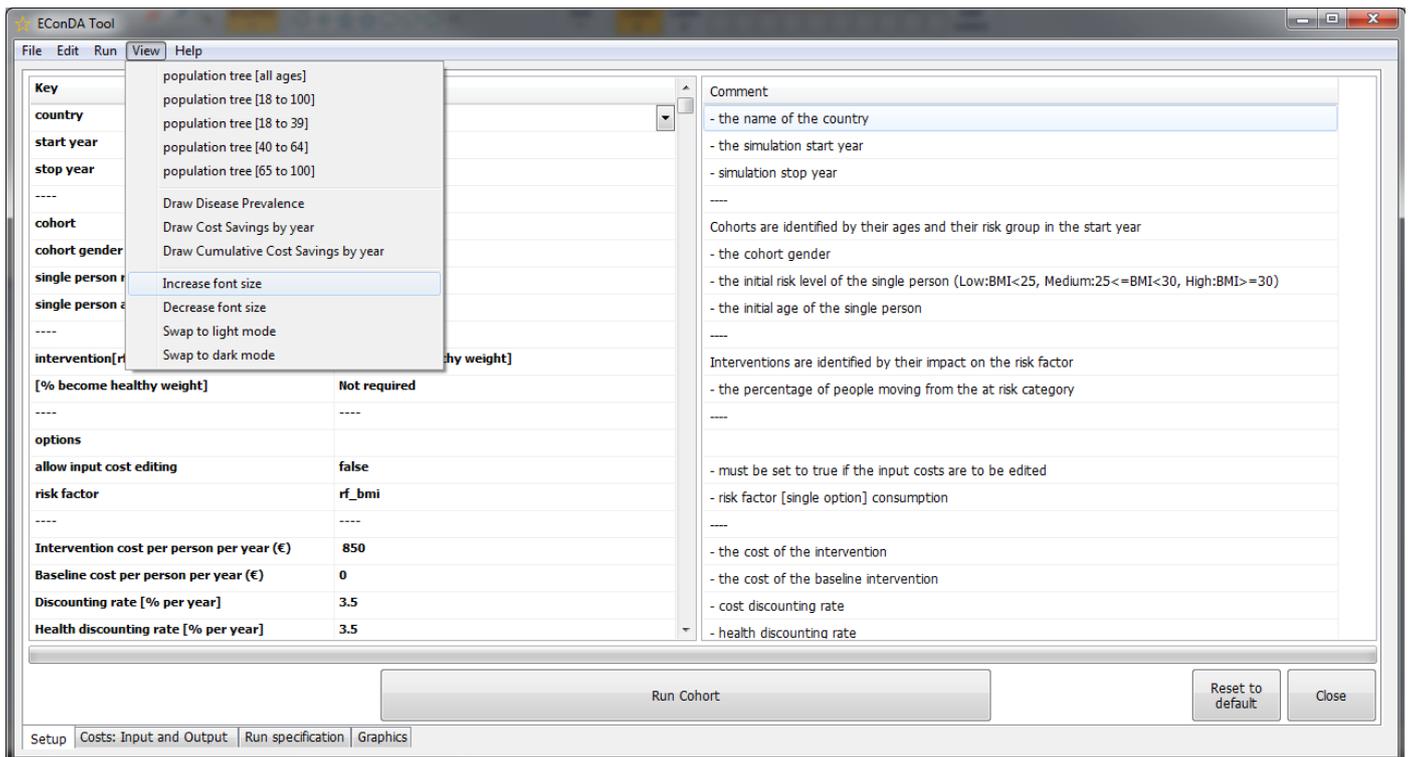
- Only allow options relative to cohort/single to be selected depending on if a cohort or a single person is set
- Add a “reset to default” option
- Ability to remove lines by clicking on them on the graph
- Use the same colour in graphs for baseline data and intervention data
- Button to open Output folder
- Allow user to change themes/font size
- Build a Mac OS version
- Stop risk factor selection screen from popping up at the end of a run

Theme and font change

Here is a screenshot of how the Setup tab in the EConDA tool looked as of the time of the workshops. Some policy makers mentioned that the white/yellow on black was difficult to read.



Below is how the EConDA tool looks now. We added the ability to swap between the dark theme as shown in the previous screenshot and a light theme which is shown below. We also added menu items to allow the user to increase or decrease the size of the font used across the tool between font sizes of 9 to 12. This should allow users who have difficulty with reading the text the option to customize how they see the tool.



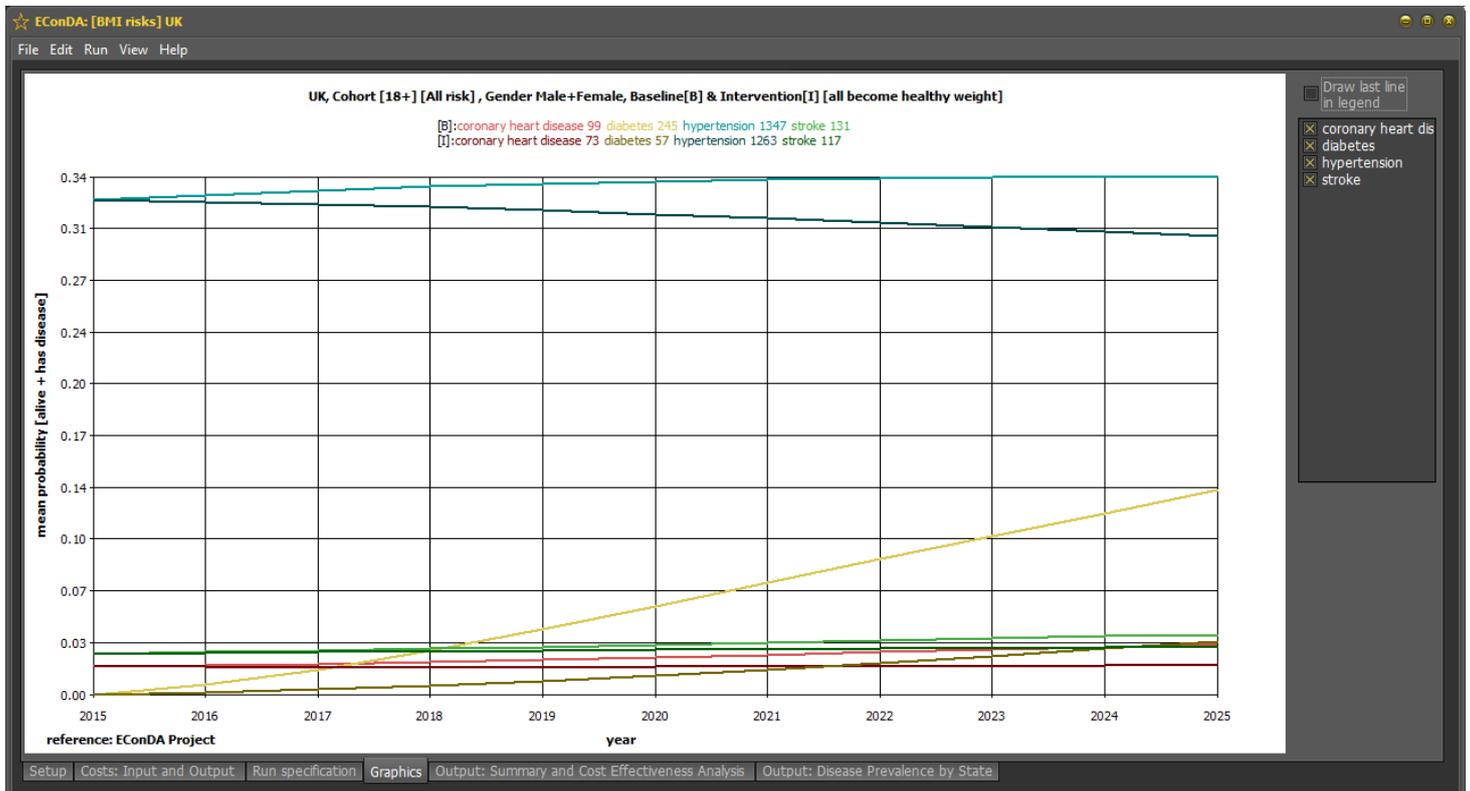
Improved options

The options for setting up a run now show “Not required” for any sections that the user does not have to change for relevant options. For example, the “[% become healthy weight]” option shows “Not required” when the selected intervention is any intervention that isn’t the % become healthy weight scenario.

There is also a “Reset to default” button at the bottom right for when the user wants to get rid of any changes they made to the options. Under File is also the option to open the Output folder directly (previously there was just a Start menu shortcut) and a Quit button.

Improved graph interface

Users also said that they would like to select which lines were shown in the graph. This functionality was already in place via a right click menu but we have implemented the same selection via a list of boxes on the right side as shown in the screenshot below. We also adjusted the colours for the lines to better differentiate between each disease.



Fixing programme and code errors

There were also a number of smaller fixes implemented after the workshops. This included:

- stopping the Risk Factor selection window from showing after completing a run
- removing duplicate diseases in right click menu on graphs
- reducing the chances of the program appearing frozen while running

Additional/future improvements

There were a number of other suggestions from the workshops that were not brought into the current tool for a number of reasons, but may be possible with further iterations of the tool in the future.

1. Many users wanted to input their own disease data, however, due to the large amount of data input required this would introduce the possibility of errors through incorrectly entered incidence and prevalence data. Such a layer of complexity may overwhelm users. More technically, it was not possible for us to include the necessary calibration function in the tool within the time constraints of the project. However, the UK Health Forum will provide further iterations of the tool as new data become available. The UKHF also welcome new data from collaborators so that models can be updated and new estimates generated.
2. Multiple interventions in a single run was also suggested but we were unable to implement this due to how the tool is structured since it requires a baseline run to be completed first. The baseline results are then compared to the intervention results to generate the data used for our graph output. Further work will develop this feature so that multiple interventions can be tested.
3. Sorting results by age was requested, however, age is not currently recorded within the results. There is already functionality to choose a particular cohort determined by age so this could be implemented with further work through multiple runs using separate cohorts.

Moving the tool to a different C++ framework may allow us to implement some of the requested features such as allowing tooltips showing hints to stay on the screen longer.

Conclusion

A downloadable tool was developed to enable researchers and policy makers to test the impact of their own interventions upon chronic disease. It provides the user with estimates of future disease burden, in terms of number of diseased, life years, quality of life and costs. Comparing the outcomes of the tool between several intervention options, the user will be able to elicit the best option for the local setting, in terms of cost-effectiveness.

Although comments have shown several possible ways to improve the tool, the tool in its present form is very useful for policy makers and researchers. Continuous work is being done to improve user experience and model accuracy.

The tool can be downloaded here: <http://www.econdaproject.eu/tools.php>