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San Diego 2015

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Health economic assessment tools (HEAT) for walking and for cycling

What is the HEAT?

- Online tool www.heatwalkingcycling.org
- Economic assessment of health benefits of walking or cycling
- Reduced mortality ‘only’

HEAT approach

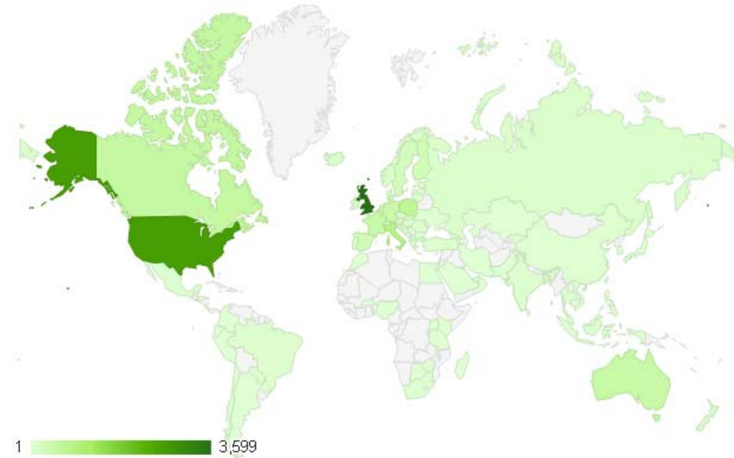
- Practical tool designed for transport planners
- Recognises importance of economic analysis in transport: benefit-cost ratio is king
- Evidence-based
- Transparent
- Adaptable
- ‘Do once and share’

“for a given volume of walking or cycling within a defined population what is the economic value of the health benefits?”

Costs	**Benefits**
Construction	Congestion
Maintenance	Journey ambience
Inconvenience	CO_2
Casualties	Mortality
Environmental	Absenteeism
	Morbidity

Applications

- Project website visited over 40,000 times by over 26,000 visitors;
- Modelling; interventions; ‘steady state’
- Used by policymakers; academics; advocates
- Method adopted by UK government



Journal of Physical Activity and Health, 2010, 7(Suppl 1), S120-S125

“Health in All Policies” in Practice: Guidance and Tools to Quantifying the Health Effects of Cycling and Walking

Sonja Kahlmeier, Francesca Racioppi, Nick Cavill, Harry Rutter, and Pekka Oja

Background: There is growing interest in “Health in All Policies” approaches, aiming at promoting health through policies which are under the control of nonhealth sectors. While economic appraisal is an established practice in transport planning, health effects are rarely taken into account. An international project was carried out to develop guidance and tools for practitioners for quantifying the health effects of cycling and walking, supporting their full appraisal. ***Development process:*** A systematic review of existing approaches was carried out. Then, the products were developed with an international expert panel through an extensive consensus finding process. ***Products and applications:*** Methodological guidance was developed which addresses the main challenges practitioners encounter in the quantification of health effects from cycling and walking. A “Health Economic Assessment Tool (HEAT) for cycling” was developed which is being used in several countries. ***Conclusions:*** There is a need for a more consistent approach to the quantification of health benefits from cycling and walking. This project is providing guidance and an illustrative tool for cycling for practical application. Results show that substantial savings can be expected. Such tools illustrate the importance of considering health in transport policy and infrastructure planning, putting “Health in All Policies” into practice.

Keywords: economic assessment, transport, physical activity, Europe

A collaborative project

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What can I use it for?

- Planning new projects
  – Value the estimated use of the scheme
- Evaluating past projects
  – Value of health benefits of increased use
- Modelling
  – Projections of future levels
- Assessments of current use
  – Eg how much is walking or cycling worth in my city?

What data do I need to start?

- Number of people affected
- Data on levels of walking/cycling
- Average duration or distance walked/cycled

Volume of walking/cycling per person
duration/distance/trips/steps
(entered by user)

Protective benefit (reduction in mortality as a result of walking/cycling) =

$$(1 - RR^{\dagger}) * \left(\frac{\text{User's volume of walking/cycling}}{\text{Reference volume of walking/cycling}^{\dagger\dagger}} \right)$$

Population that stands to benefit
(entered by user or calculated
from return journeys)

General parameters
Intervention effect, build-up period, mortality rate, time frame (changeable default values)

Estimate of economic savings
using VSL
(changeable default value)

Requires user input

†RR = relative risk of death in underlying studies (walking: 0.89 and cycling: 0.90 *(20)*).

††Volume of cycling per person calculated based on 100 minutes per week for 52 weeks per year at an estimated speed of 14 km/hour. Volume of walking based on 168 minutes per week at 4.8 km/hour.

Read the user guide!

- www.euro.who.int/HEAT or www.heatwalkingcycling.org

- Background
- Methods
- Assumptions
- Tips

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Example

- Across a town of 150,000 adults, if everyone cycled an extra 10 minutes a day…

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Welcome to the WHO/Europe Health Economic Assessment Tool (HEAT).

29 October 2014

New dates for free online trainings in English and German

Thanks to support from the Swiss Federal Office for Public Health and the collaboration with the European Cyclists' Federation we are pleased to announce the continuation of the free live online trainings in English and German on how to use HEAT. Please see here for the new dates and registration:

http://www.heatwalkingcycling.org/training/

Introduction

This tool is designed to help you conduct an economic assessment of the health benefits of walking or cycling by estimating the value of reduced mortality that results from specified amounts of walking or cycling.

The tool can be used in a number of different situations, for example:

- **when planning a new piece of cycling or walking infrastructure.**
  HEAT attaches a value to the estimated level of cycling or walking when the new infrastructure is in place. This can be compared to the costs of implementing different interventions to produce a benefit–cost ratio (and help to make the case for investment)
- **to value the reduced mortality from past and/or current levels of cycling or**

More information

What data do I need?

Before you begin, check that you have the data you need to produce an assessment.

more...

http://www.heatwalkingcycling.org/training/

Introduction

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- **when planning a new piece of cycling or walking infrastructure.**
  HEAT attaches a value to the estimated level of cycling or walking when the new infrastructure is in place. This can be compared to the costs of implementing different interventions to produce a benefit–cost ratio (and help to make the case for investment)
- **to value the reduced mortality from past and/or current levels of cycling or walking**, such as to a specific workplace, across a city or in a country. It can also be used to illustrate economic consequences from a potential future change in levels of cycling or walking.
- **to provide input into more comprehensive economic appraisal exercises, or prospective health impact assessments.**
  For example, to estimate the mortality benefits from achieving targets to increase cycling or walking, or from the results of an intervention project.

More information is available at http://www.euro.who.int/HEAT

Start using HEAT for walking   Start using HEAT for cycling

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Scope for the use of HEAT Cycling

Please read these explanations carefully to make sure HEAT is applicable to your case.

1) **HEAT is to be applied for assessments on a population level, i.e. in groups of people, not in individuals.**

2) **This tool is designed for habitual behaviour, such as cycling for commuting, or regular leisure time activities.**
Do not use it for the evaluation of one-day events or competitions (such as cycling days etc.), since they are unlikely to reflect long-term average activity behaviour.
HEAT is meant to be applied for an average cycling speed of about 14km/h (see also box for more information).

3) **HEAT is designed for adult populations (aged approximately 20-64 years).**
This is the age range for which the used relative risk estimate is applicable (see box "more information on the relative risk estimate used"). Information on the relative risk in younger or older populations is insufficient for inclusion. If the age distribution in the assessed population is significantly different (much younger, much older) HEAT may over or under estimate the resulting benefits. In such cases, it is important to adjust the mortality rate which depends strongly on the age of the assessed population. However, HEAT should not be applied to populations of children, very young adults, or older people, since the relative risk used by HEAT does not include these age groups.

4) **Studies on the benefits of physical activity for decreasing premature mortality have typically been conducted in the general population where very high average levels of physical activity are uncommon.**
Thus, the exact shape of the dose-response curve is uncertain but seems to level off above physical activity levels that are the equivalent of perhaps 1 hour of cycling per day

More information

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show...

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more...

More information on how the HEAT uses the relative risk estimates to value walking and cycling
more...

More information on cycling speed used
more...

What data do I need?

Before you begin, check that you have the data you need to produce an assessment.

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4) **Studies on the benefits of physical activity for decreasing premature mortality have typically been conducted in the general population where very high average levels of physical activity are uncommon.**
Thus, the exact shape of the dose-response curve is uncertain but seems to level off above physical activity levels that are the equivalent of perhaps 1 hour of cycling per day. Therefore, the **tool may not be suited for populations with very high average levels of cycling** (i.e. about 1.5 hours per day or more, e.g. bicycle couriers) which go beyond activity levels common in an average adult population.

5) **Knowledge of the health effects of cycling is evolving rapidly.** These projects represent first important steps towards an agreed harmonized methodology. In developing these tools, on several occasions the advisory group made expert judgements based on the best available information and evidence. Therefore, the accuracy of results of the HEAT calculations should be understood as estimates of the order of magnitude, much like many other economic assessments of health effects. Further improvements will be made as new knowledge becomes available.

HEAT is composed of 16 questions in total; depending on the route you take, some questions will be skipped.

More information on the relative risk estimate used in HEAT for cycling
more...

More information on how the HEAT uses the relative risk estimates to value walking and cycling
more...

More information on cycling speed used
more...

What data do I need?

Before you begin, check that you have the data you need to produce an assessment.
more...

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HEAT for cycling

▲ HEAT for cycling

Q1: Single or before / after

Q1: Your data: amount of cycling from a single point in time, or before and after an intervention

- (●) Single point in time
- ( ) Before and after

Click on “next question” or “back” to move between questions; do not use the back-button of your internet browser. You can also go back to a previous question by clicking on it in the flow chart of questions on the left-hand side of the screen. If you make changes, click on “save changes” before you continue.

Please note that the HEAT tool does not support multiple sessions. Carrying out several calculations in parallel will affect the stability of the HEAT tool. It is recommended to run only one calculation at a time, and to start a new one only once you finished your current assessment.

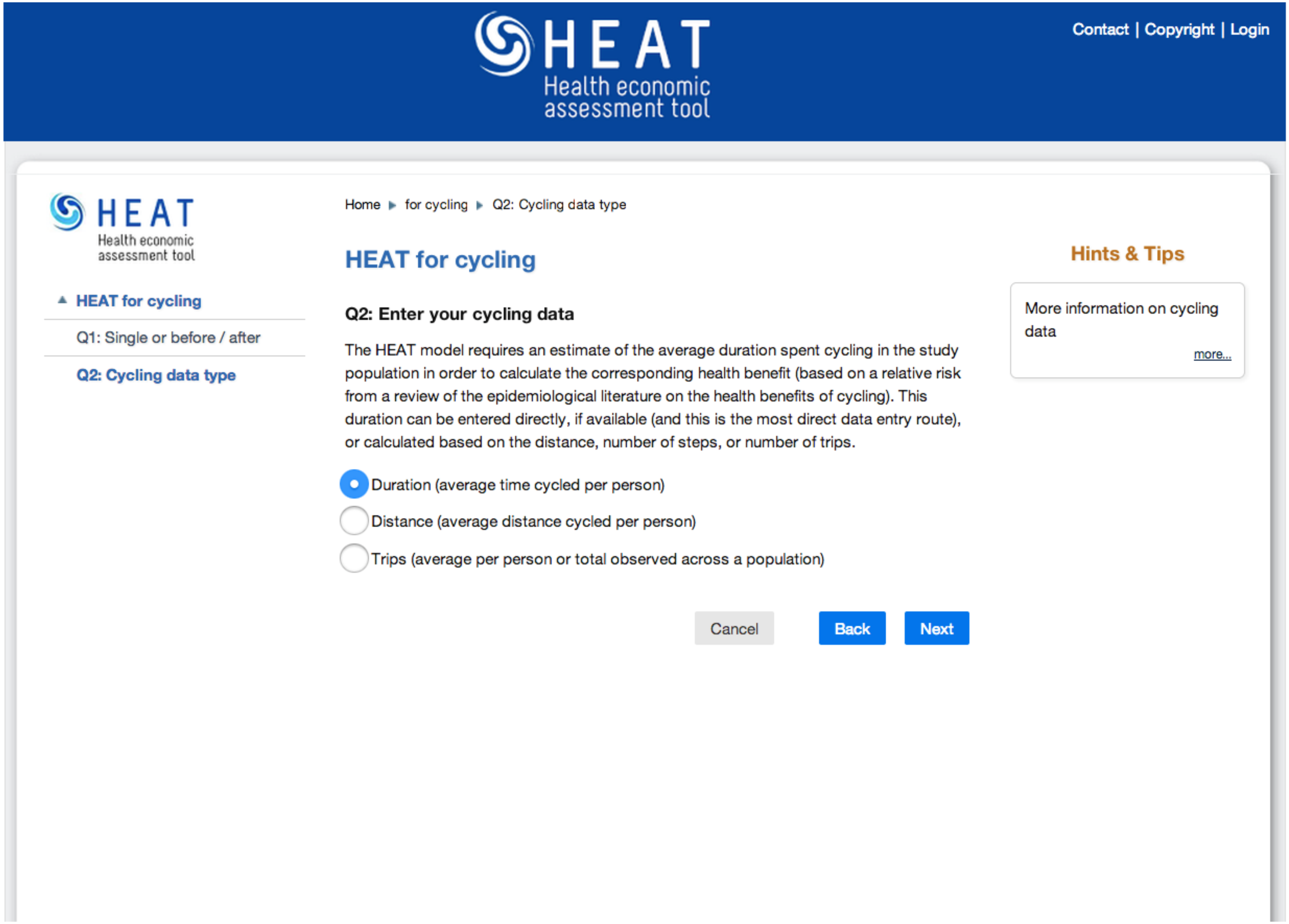
Cancel | Back | Next

Hints & Tips

If you select 'Single', you will be asked to enter data on levels of cycling only once.

If you select 'Before and after', the tool will prompt you to enter two sets of cycling data.

The difference in levels of cycling between the pre- and post-measures will be used to calculate the health benefits and associated financial savings.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HEAT for cycling
Q1: Single or before / after
Q2: Cycling data type
Home ▸ for cycling ▸ Q2: Cycling data type
HEAT for cycling
Q2: Enter your cycling data
The HEAT model requires an estimate of the average duration spent cycling in the study population in order to calculate the corresponding health benefit (based on a relative risk from a review of the epidemiological literature on the health benefits of cycling). This duration can be entered directly, if available (and this is the most direct data entry route), or calculated based on the distance, number of steps, or number of trips.
Duration (average time cycled per person)
Distance (average distance cycled per person)
Trips (average per person or total observed across a population)
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More information on cycling data
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- HEAT for cycling
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- Q2: Cycling data type
- **Q3: Duration**

Home ▸ for cycling ▸ Q3: Duration

HEAT for cycling

Q3: Average time spent cycling

Enter the average time spent cycling per person per day:

10 minutes

How many days per year do people cycle this amount?

124 days per year

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Hints & Tips

If this amount of cycling is done every day (or represents an average value per year, e.g. from a travel survey), enter 365. However, most individuals do not cycle every day. If you are unsure how many days are cycled a year, 124 is recommended as a default (the observed number of days in Stockholm*).

Sources

*Schantz, P, Stigell E (2008a): Distance, time and velocity as input data in cost-benefit analyses of physically active transportation. In: Proceedings from the 2nd International Congress on Physical Activity and Public Health, Amsterdam, 13-16 April, 2008:270 (http://www.gih.se/upload/Forskning/Rorelse_halsa_miljo/)

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- ▲ **HEAT for cycling**
- Q1: Single or before / after
- Q2: Cycling data type
- Q3: Duration
- **Q7: Population**
- Cycling Summary

Home ▸ for cycling ▸ Q7: Population

HEAT for cycling

Q7: How many people benefit?

The tool now requires information on the number of individuals doing the amount of cycling you entered in the previous questions.

In most cases, this will also be the number of people who stand to benefit from the reported levels of cycling. If the trips data you have entered is based on a representative sample of a larger population, you may need to change this number. In this case, you need to enter the total population number, rather than the number in your sample (e.g. in case of a national travel survey that is representative for the whole population, use the total number of population here, not the sample size of the travel survey). If you use survey data that has already been extrapolated to the whole population, the previously entered value is already the number of the total population and no change is required here.

It is important to ensure the right population figure is entered here, as this can substantially affect the resulting calculations.

Important note: Please bear in mind that HEAT works for averages across the population under study and not individual persons. The larger the study population is the more accurate the results will be.

Number of cyclists:

150000 persons*

* Please enter full number without delimiters such as commas or full stops

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  - Q3: Duration
  - Q7: Population
  - Cycling Summary

Home ▸ for cycling ▸ Cycling Summary

HEAT for cycling

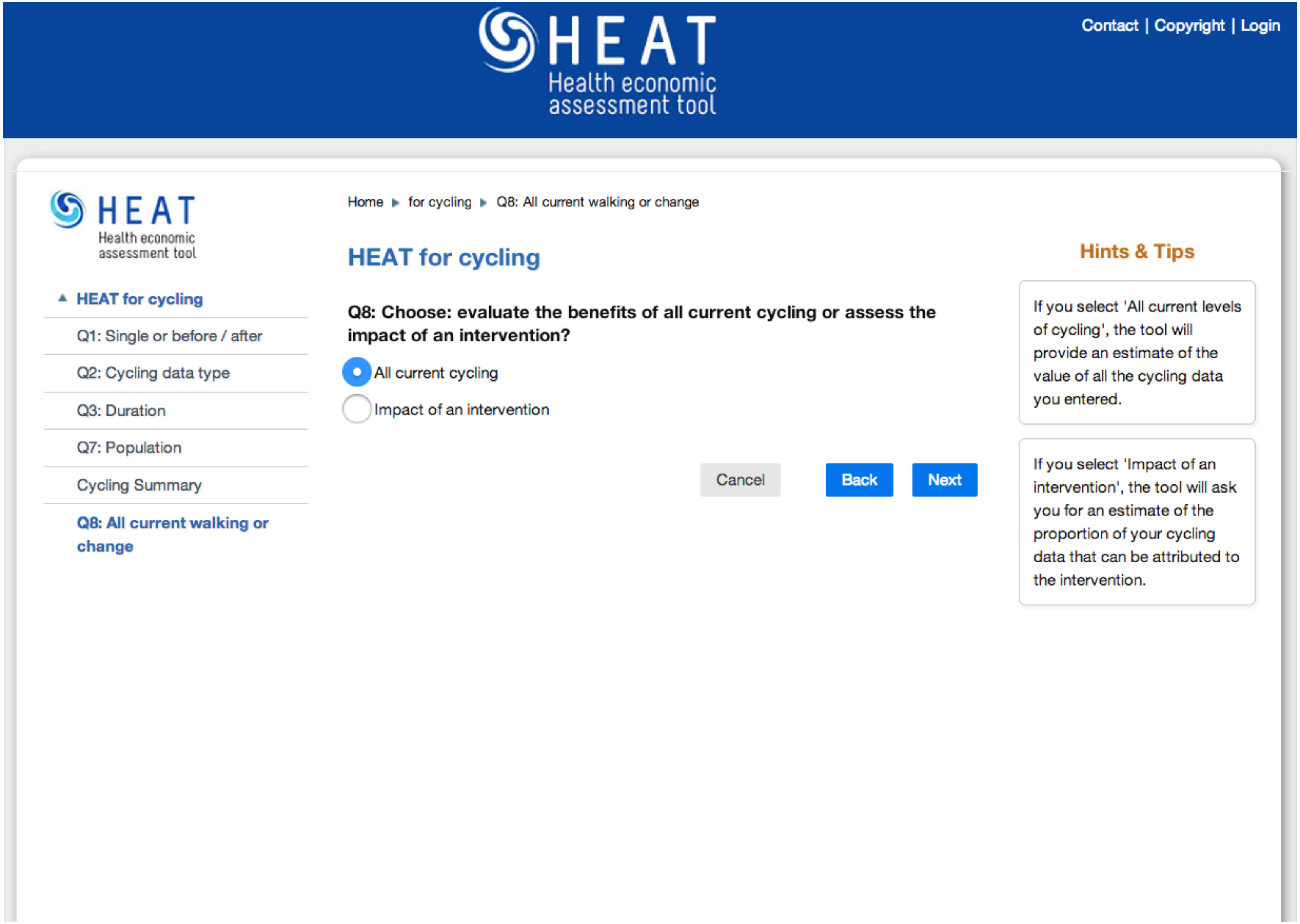
Summary of cycling data

Review your entered data

Average number of hours spent cycling per person per year: **20.67**
This level of cycling is likely to lead to a reduction in the risk of mortality of: **2 %**
Total number of individuals regularly doing this amount of cycling: **150,000**

Please bear in mind that HEAT is to be applied for assessments on a population level, i.e. in groups of people, not in individuals. HEAT does not calculate risk reductions for individual persons but an average across the population under study. The results should not be misunderstood to represent individual risk reductions.

Back | Next question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Q8: All current walking or change
Home ▸ for cycling ▸ Q8: All current walking or change
HEAT for cycling
Q8: Choose: evaluate the benefits of all current cycling or assess the impact of an intervention?
All current cycling
Impact of an intervention
Cancel
Back
Next
Hints & Tips
If you select 'All current levels of cycling', the tool will provide an estimate of the value of all the cycling data you entered.
If you select 'Impact of an intervention', the tool will ask you for an estimate of the proportion of your cycling data that can be attributed to the intervention.

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HEAT for cycling

Q11: Mortality rate

Health benefits are calculated based on a reduced probability of death for people who cycle. The mortality rate used in HEAT should reflect the rate of the population being studied. It is recommended to use the local crude mortality rate for the population aged 20-64 years, unless the age range of cyclists in your population is substantially different.

The default value is for all adults aged 20-64 years across the WHO European region, calculated using data from the countries and years shown in the drop down menu.

It is possible to use a mortality rate for a different age group, for example one which matches the age range of the population participating in the cycling assessed. However, it must be noted that HEAT is not appropriate for populations consisting mainly of children, very young adults, or older people, as the underlying relative risk would not be applicable as it applies to the age range of 20-64. You have the option to select default mortality rates for an average population (about 20-64 years old), a younger average population (about 20-44 years old) or a predominantly older average population (about 45-64 years old).

Please choose for which age range you wish to carry out your calculation:

- (●) average population (about 20-64 years old)
- ( ) younger average population (about 20-44 years old)
- ( ) older average population (about 45-64 years old)

Please enter a figure for mortality data either by selecting the value for your country from the WHO Mortality database, or by entering your own value. If your national value is not available, it is suggested to use the WHO European Region average value.

Select mortality data for your country using the drop down menu below:

Hints & Tips

This drop down menu allows you to select the most recent mortality data available for all adults aged 20-64 years in European countries, obtained from the WHO's European Detailed Mortality Database.
more...

If entering your own value, it is recommended that you use the crude mortality rate for adults aged 20-64 years in your own country.

More information on age range
More information on the recommended age range can be found in the scope for the use of HEAT for cycling.
more...

More information on death rates
more...

Please choose for which age range you wish to carry out your calculation:

- (selected) average population (about 20-64 years old)
- younger average population (about 20-44 years old)
- older average population (about 45-64 years old)

Please enter a figure for mortality data either by selecting the value for your country from the WHO Mortality database, or by entering your own value. If your national value is not available, it is suggested to use the WHO European Region average value.

Select mortality data for your country using the drop down menu below:

✓ WHO European Region average
Albania (2004)
Armenia (2012)
Austria (2011)
Azerbaijan (2007)
Belarus (2009)
Belgium (2010)
Bosnia and Herzegovina (2011)
Bulgaria (2012)
Croatia (2012)
Cyprus (2011)
Czech Republic (2012)
Denmark (2011)
Estonia (2012)
Finland (2011)
France (2010)
Georgia (2010)
Germany (2012)
Greece (2011)
Hungary (2012)
Iceland (2009)

ons per year (crude rate)

e cell below:

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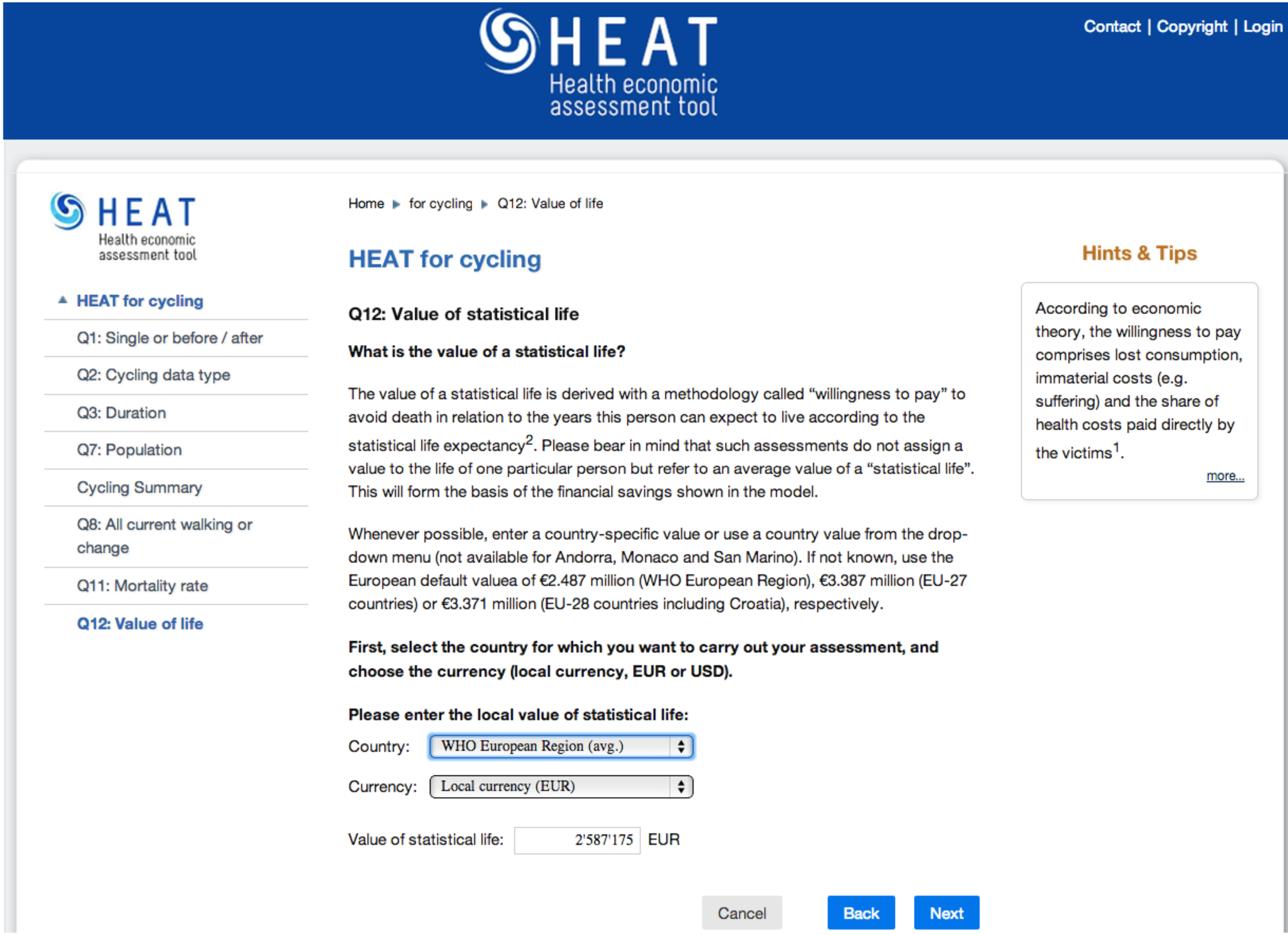
More information on age range

More information on the recommended age range can be found in the scope for the use of HEAT for cycling.

more...

More information on death rates

more...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Q8: All current walking or change
Q11: Mortality rate
Q12: Value of life
Home ▸ for cycling ▸ Q12: Value of life
HEAT for cycling
Q12: Value of statistical life
What is the value of a statistical life?
The value of a statistical life is derived with a methodology called “willingness to pay” to avoid death in relation to the years this person can expect to live according to the statistical life expectancy[2]. Please bear in mind that such assessments do not assign a value to the life of one particular person but refer to an average value of a “statistical life”. This will form the basis of the financial savings shown in the model.
Whenever possible, enter a country-specific value or use a country value from the drop-down menu (not available for Andorra, Monaco and San Marino). If not known, use the European default valuea of €2.487 million (WHO European Region), €3.387 million (EU-27 countries) or €3.371 million (EU-28 countries including Croatia), respectively.
First, select the country for which you want to carry out your assessment, and choose the currency (local currency, EUR or USD).
Please enter the local value of statistical life:
Country: WHO European Region (avg.)
Currency: Local currency (EUR)
Value of statistical life: 2'587'175 EUR
Cancel
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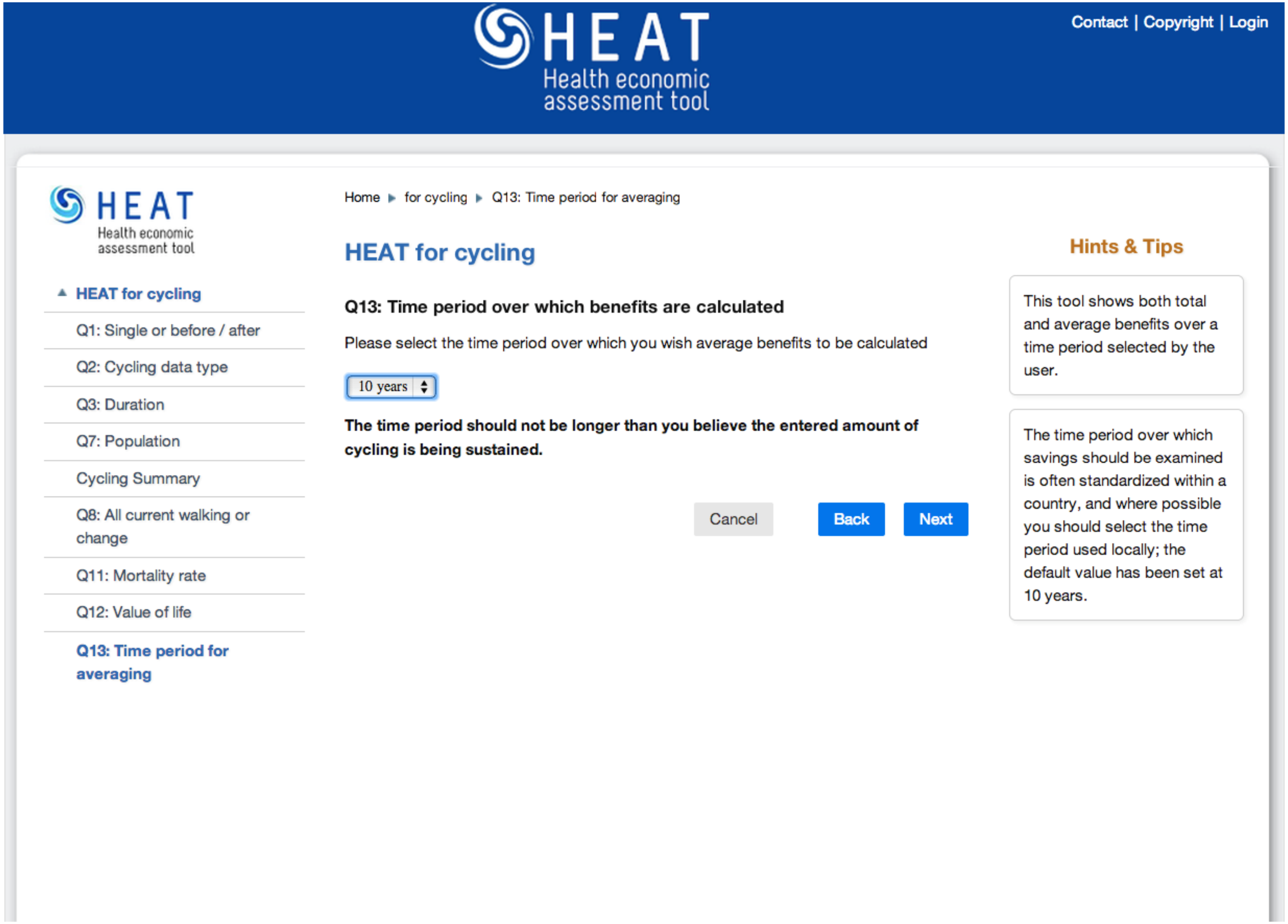
Hints & Tips
According to economic theory, the willingness to pay comprises lost consumption, immaterial costs (e.g. suffering) and the share of health costs paid directly by the victims[1].
more...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Q12: Value of life
Q13: Time period for averaging
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HEAT for cycling
Q13: Time period over which benefits are calculated
Please select the time period over which you wish average benefits to be calculated
10 years
The time period should not be longer than you believe the entered amount of cycling is being sustained.
Cancel
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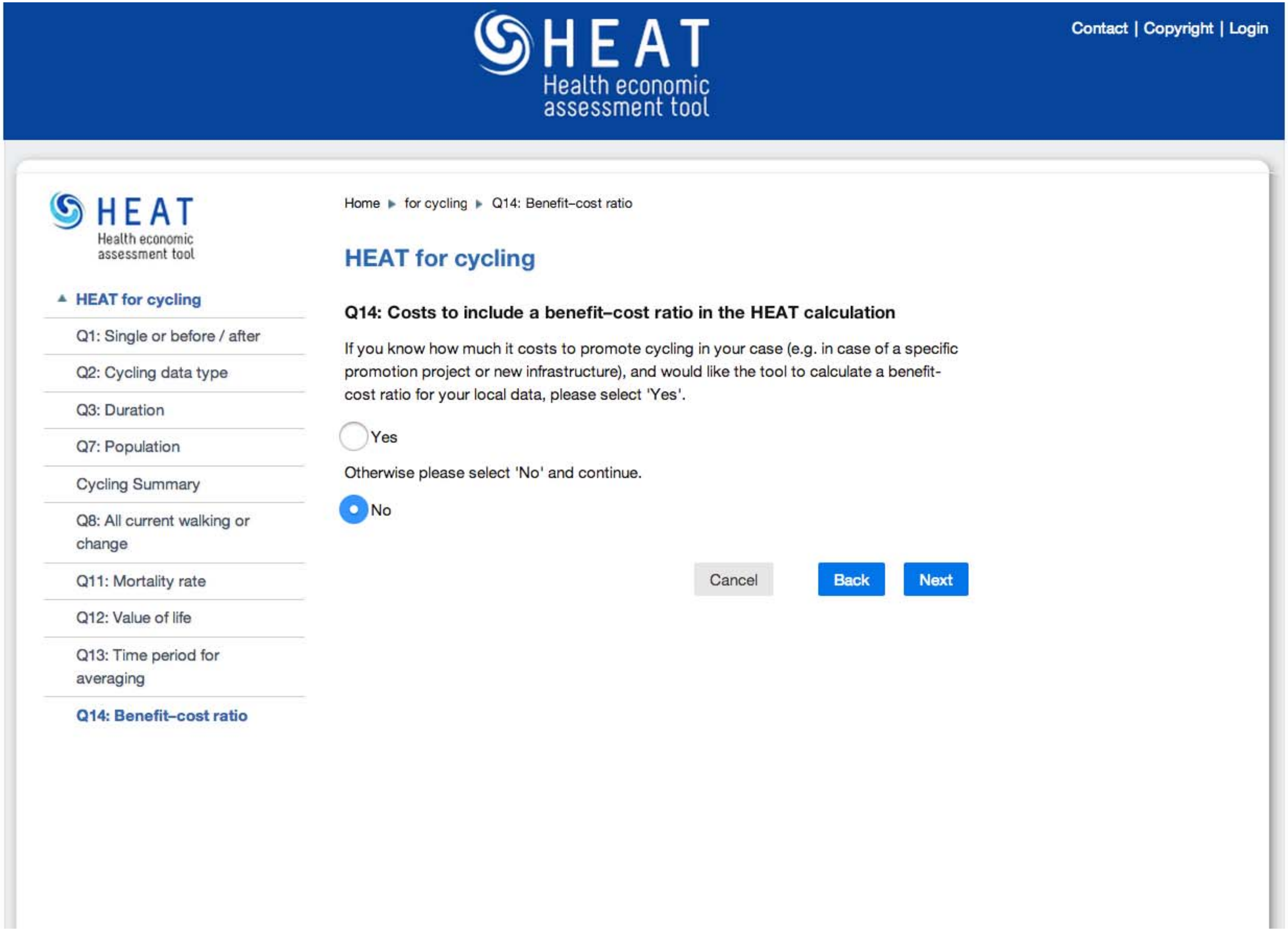
Hints & Tips
This tool shows both total and average benefits over a time period selected by the user.
The time period over which savings should be examined is often standardized within a country, and where possible you should select the time period used locally; the default value has been set at 10 years.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Q12: Value of life
Q13: Time period for averaging
Q14: Benefit–cost ratio
Home ▸ for cycling ▸ Q14: Benefit–cost ratio
HEAT for cycling
Q14: Costs to include a benefit–cost ratio in the HEAT calculation
If you know how much it costs to promote cycling in your case (e.g. in case of a specific promotion project or new infrastructure), and would like the tool to calculate a benefit-cost ratio for your local data, please select 'Yes'.
Yes
Otherwise please select 'No' and continue.
No
Cancel
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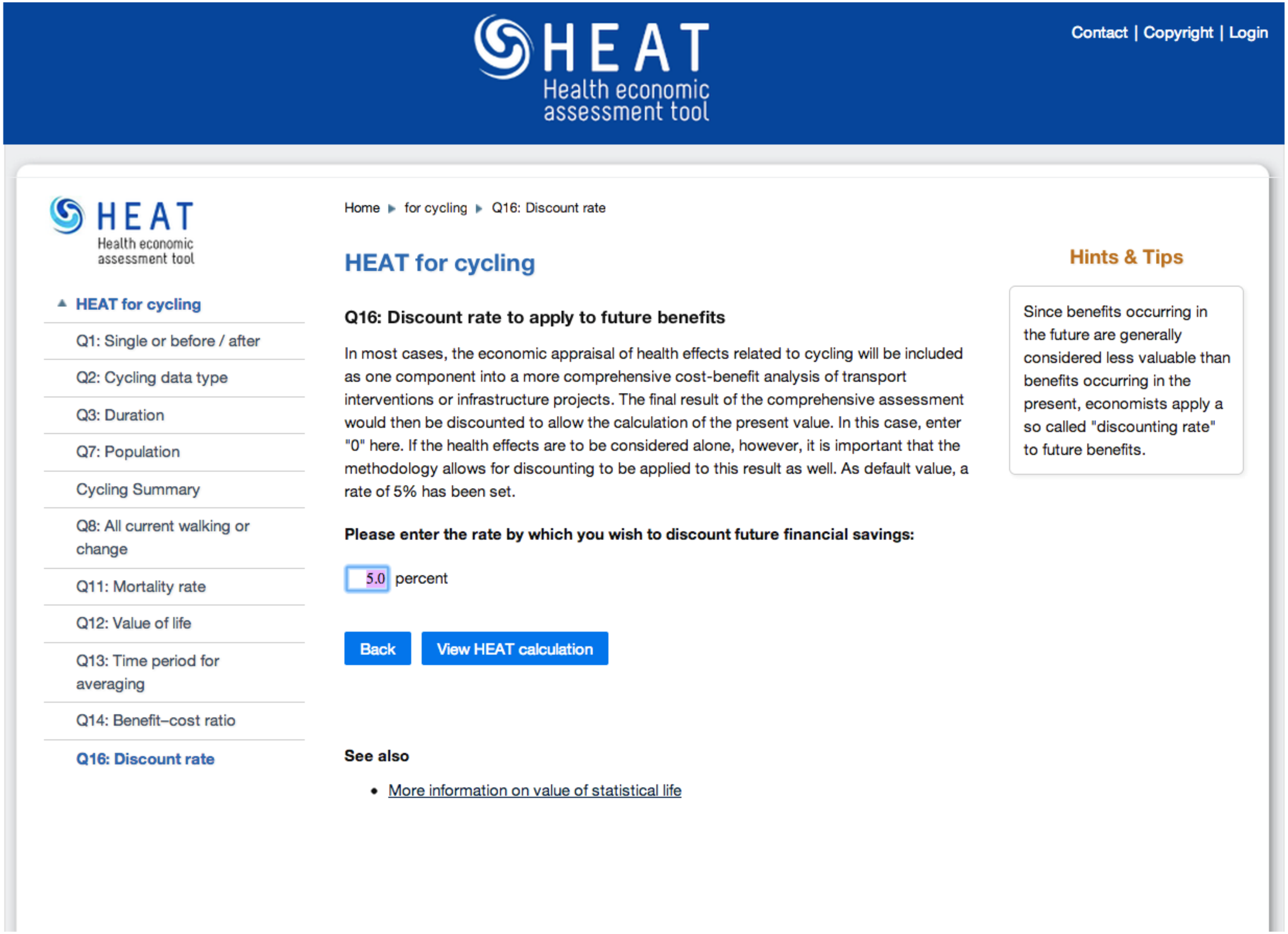
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Q11: Mortality rate
Q12: Value of life
Q13: Time period for averaging
Q14: Benefit–cost ratio
Q16: Discount rate
Home ▸ for cycling ▸ Q16: Discount rate
HEAT for cycling
Q16: Discount rate to apply to future benefits
In most cases, the economic appraisal of health effects related to cycling will be included as one component into a more comprehensive cost-benefit analysis of transport interventions or infrastructure projects. The final result of the comprehensive assessment would then be discounted to allow the calculation of the present value. In this case, enter "0" here. If the health effects are to be considered alone, however, it is important that the methodology allows for discounting to be applied to this result as well. As default value, a rate of 5% has been set.
Please enter the rate by which you wish to discount future financial savings:
5.0 percent
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View HEAT calculation
See also
More information on value of statistical life
Hints & Tips
Since benefits occurring in the future are generally considered less valuable than benefits occurring in the present, economists apply a so called "discounting rate" to future benefits.

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▲ HEAT for cycling

Q1: Single or before / after

Q2: Cycling data type

Q3: Duration

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Cycling Summary

Q8: All current walking or change

Q11: Mortality rate

Q12: Value of life

Q13: Time period for averaging

Q14: Benefit–cost ratio

Q16: Discount rate

Result

Home ▸ for cycling ▸ Result

HEAT estimate

Reduced mortality as a result of changes in cycling behaviour

The cycling data you have entered corresponds to an average of **20.67** hours per person per year.

This level of cycling provides **an estimated** protective benefit of: **2 %** (compared to persons not cycling regularly)

From the data you have entered, the number of individuals who benefit from this level of cycling is: **150000**

Out of this many individuals, the number who would be expected to die if they were not cycling regularly would be: **371.64**

The number of deaths per year that are prevented by this level of cycling is: 9

Financial savings as a result of cycling

Currency: EUR, rounded to 1000

The value of statistical life applied is: **2,587,000**	
The annual benefit of this level of cycling, per year, is:	**22,928,000**
The total benefits accumulated over **10** years are:	**229,280,000**
When future benefits are discounted by **5 %** per year:	
the current value of the average annual benefit, averaged across 10 years is:	**17,704,000**
the current value of the total benefits accumulated over 10 years is:	**177,044,000**

Please bear in mind that HEAT does not calculate risk reductions for individual persons but an average across the population under study. The results should not be misunderstood to represent individual risk reductions. Also note that the VSL not assign a value to the life of one particular person but refers to an average value of a "statistical life".

It is important to remember that many of the variables used within this HEAT calculation are estimates and therefore liable to some degree of error.

You are reminded that the HEAT tools provide you with an approximation of the level of health benefits. **To get a better sense for the possible range of the results, you are strongly advised to rerun the model,** entering slightly different values for variables where you have provided a "best guess", such as entering high and low estimates for such variables.