

# Belfast Healthy Cities

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



# What is the HEAT?

- Online tool [www.heatwalkingcycling.org](http://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’

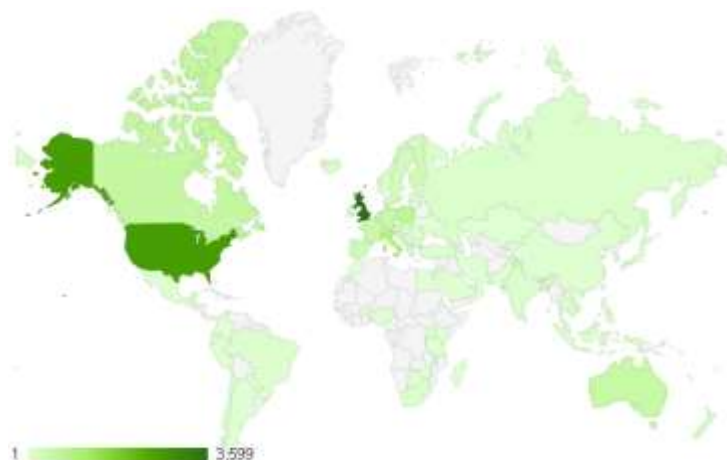
*“for a given volume of walking or cycling within a defined population what is the economic value of the health benefits?”*



Costs	Benefits
Construction	Congestion
Maintenance	Journey ambience
Inconvenience	CO2
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



# A collaborative project



Federal Ministry for the  
Environment, Nature Conservation  
and Nuclear Safety



Schweizerische Eidgenossenschaft  
Confédération suisse  
Confederazione Svizzera  
Confederaziun svizra



## THE PEP

Transport, Health  
and Environment  
Pan-European Programme



World Health  
Organization  
REGIONAL OFFICE FOR  
Europe

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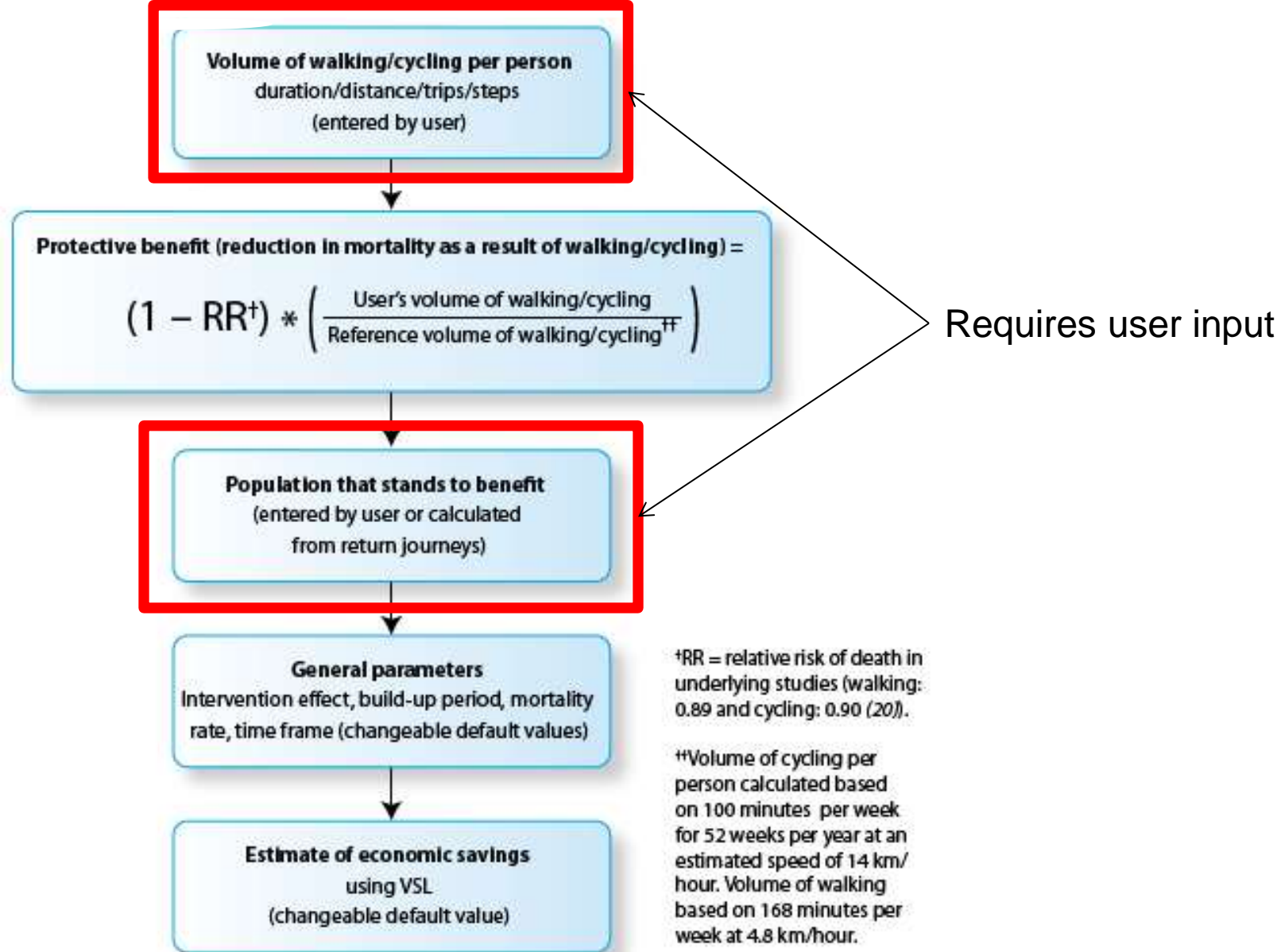
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# What can I use it for?

- 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



# Read the user guide!

- [www.euro.who.int/HEAT](http://www.euro.who.int/HEAT) or [www.heatwalkingcycling.org](http://www.heatwalkingcycling.org)
- Background
- Methods
- Assumptions
- Tips



# Example

- Across a town of 150,000 people, 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...](#)

[Free online training sessions](#)

[Methodology and user guide](#)

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<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 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](#)

## 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

### Acknowledgements

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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...](#)

HEAT for walking

**HEAT for cycling**

Examples of applications

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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...](#)

## HEAT for cycling

### 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.

[▲ 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)

[Cancel](#)[Back](#)[Next](#)

### Hints & Tips

More information on cycling data

[more...](#)

▲ **HEAT for cycling**

Q1: Single or before / after

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:

How many days per year do people cycle this amount?

 days per year

Cancel

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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/](http://www.gih.se/upload/Forskning/Rorelse_halsa_miljo/))

[▲ 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:

 persons\*

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

### ▲ HEAT for cycling

Q1: Single or before / after

Q2: Cycling data type

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.**

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## HEAT for cycling

Q1: Single or before / after

Q2: Cycling data type

Q3: Duration

Q7: Population

Cycling Summary

**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

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## 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.

## HEAT for cycling

### ▲ HEAT for cycling

[Q1: Single or before / after](#)[Q2: Cycling data type](#)[Q3: Duration](#)[Q7: Population](#)[Cycling Summary](#)[Q8: All current walking or change](#)

### Q11: Mortality rate

#### 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:

- ☒ 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)
- Ireland (2009)

#### 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...](#)

ons per year (crude rate)

e cell below:

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### ▲ HEAT for cycling

[Q1: Single or before / after](#)[Q2: Cycling data type](#)[Q3: Duration](#)[Q7: Population](#)[Cycling Summary](#)[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<sup>2</sup>. 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 value 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: Currency: Value of statistical life:  EUR

### 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<sup>1</sup>.

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**HEAT for cycling**

Q1: Single or before / after

Q2: Cycling data type

Q3: Duration

Q7: Population

Cycling Summary

Q8: All current walking or  
change

Q11: Mortality rate

Q12: Value of life

**Q13: Time period for  
averaging**[Home](#) ► [for cycling](#) ► Q13: Time period for averaging**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](#)[Back](#)[Next](#)**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.

### ▲ HEAT for cycling

Q1: Single or before / after

Q2: Cycling data type

Q3: Duration

Q7: Population

Cycling Summary

Q8: All current walking or  
change

Q11: Mortality rate

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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### ▲ HEAT for cycling

Q1: Single or before / after

Q2: Cycling data type

Q3: Duration

Q7: Population

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**

[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:**

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.

▲ HEAT for cycling

Q1: Single or before / after

Q2: Cycling data type

Q3: Duration

Q7: Population

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**

## 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.