THE PEP Workshop on working together for healthy and sustainable urban transport
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Bringing health into transport planning: unlocking the value of walking and cycling

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Often urban environments / land use planning favour motorized transport…

… and hinder walking and cycling

Why has the health sector an interest in transport and urban development policies?

Transport and the urban environment play a role in several of the leading risk factors for health

Health outcomes	Risk factor related to urban/transport policies
High blood pressure	**Physical activity / diet**
High body mass index	**Physical activity / diet**
Respiratory diseases	**Urban air pollution**
Cardiovascular diseases	**Urban air pollution, physical activity, diet, noise**
Cancer (some)	**Physical activity / diet**
Injuries	**Road traffic**

The burden

- **Physical inactivity is estimated to cause:**
  - **21–25% of breast and colon cancer burden**
  - **27% of diabetes burden**
  - **30% of ischaemic heart disease burden**

The potential

- **Risk reductions for:**
  - **20-30% for CHD and CVD morbidity and mortality**
  - **Cancer risks:**
    - 30% for colon cancer
    - 20% - 40% for breast cancer
    - 20% for lung cancer
    - 30% for endometrial cancer
    - 20% for ovarian cancer
  - **30% for developing functional limitations**
  - **30% for premature all-cause mortality**

Physical Activity Guidelines Advisory Committee. Physical Activity Guidelines Advisory Committee Report, 2008. Washington, DC: U.S. Department of Health and Human Services, 2008.

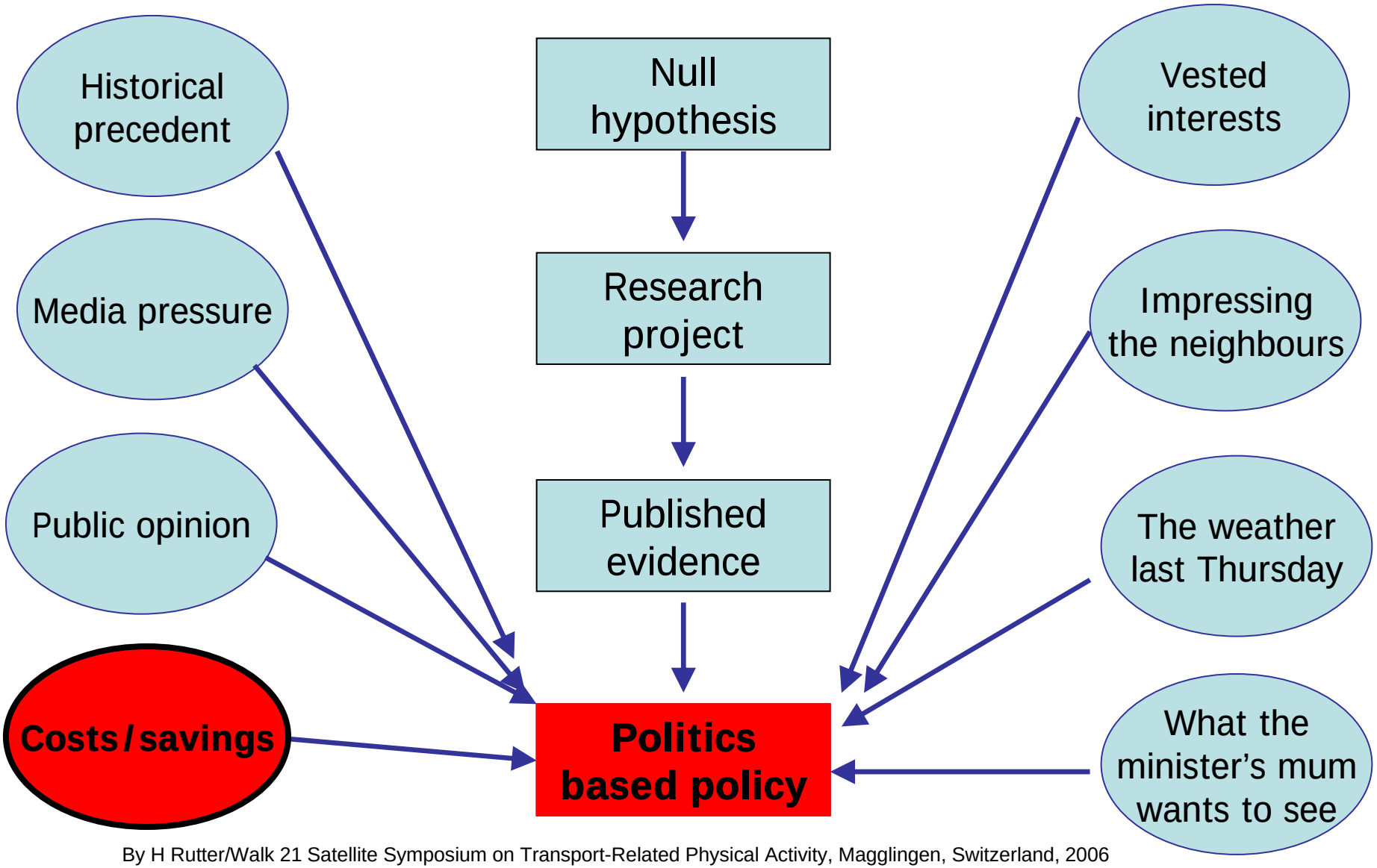
Why walking and cycling?

- **It can have a big impact!**
  - **In Europe, many car trips are short**
    - 10% shorter than 1km, 30% shorter than 3km and 50% shorter than 5km
  - **Shifting some of these trips to walking and cycling can help to**
    - Reduce congestion
    - Reduce energy consumption and CO2 emissions
    - Improve road safety, air quality and noise
    - Reduce need for more infrastructure for cars
    - Improved accessibility and quality of urban life
    - Complement technological improvements to vehicles and fuels

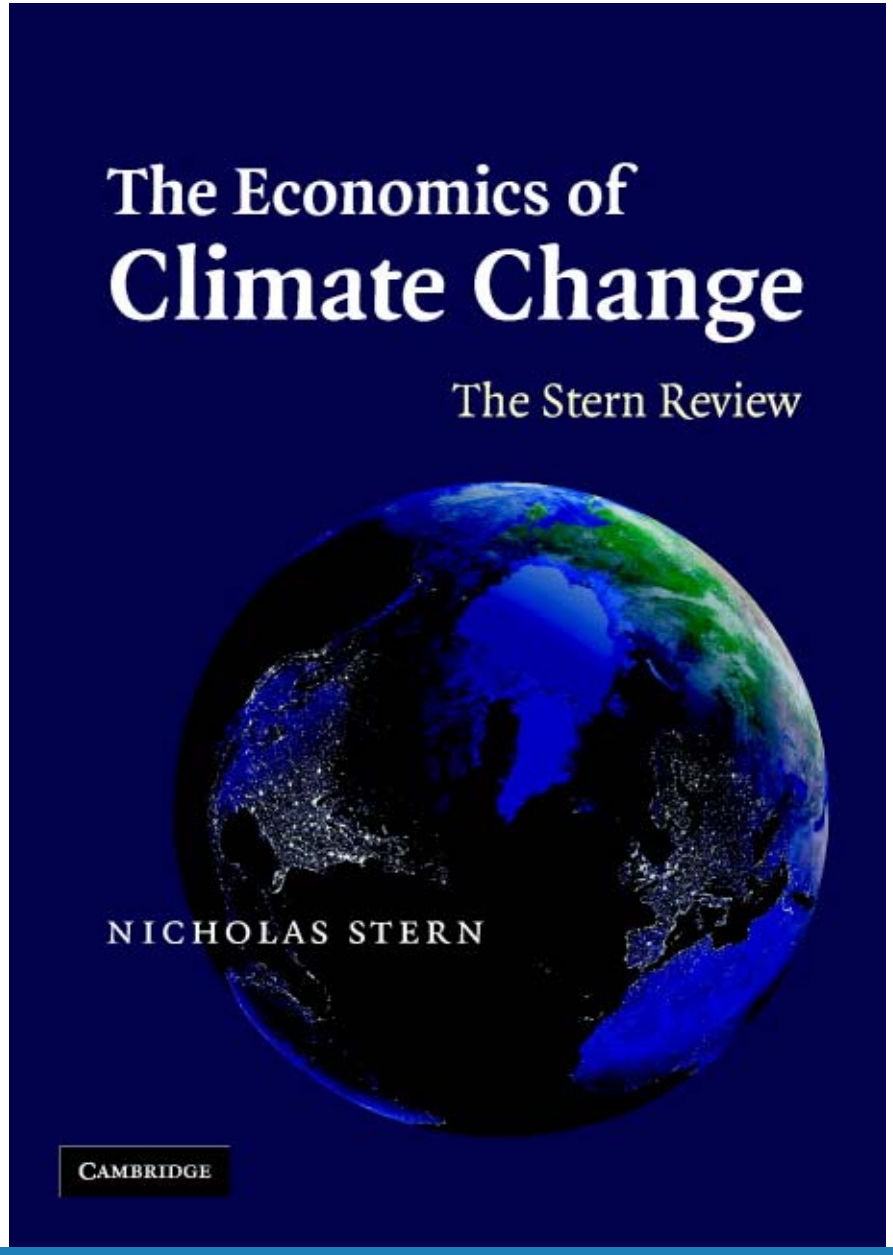
Why walking and cycling?

- **It's easy!**
  - Avoids dependence on facilities for physical activity
  - Most people can do it: equitable and easily accessible
  - Does not require much extra time
  - Minimal investment of household income

- **It can make transport a lot healthier!**
  - Most of these trips could be done by walking or cycling
  - Contributing to the recommended daily dose of at least 30 minutes of moderate-intensity physical activity



By H Rutter/Walk 21 Satellite Symposium on Transport-Related Physical Activity, Magglingen, Switzerland, 2006



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Health Dividends from Green Growth

- Much greater health gains from shifting to rapid transit/public transport and walking and cycling
- than from improving fuel and vehicle efficiency
- Consider all costs and benefits of Green Growth strategies!

Health in the green economy

Co-benefits to health of climate change mitigation

TRANSPORT SECTOR *Preliminary findings – initial review*

Key messages

Health gains/risks

- **A shift to active transport (walking and cycling) and rapid transit/public transport combined with improved land use** can yield much greater immediate health "co-benefits" compared with improving fuel and vehicle efficiency, yet the latter has been the mitigation strategy most emphasized by the Intergovernmental Panel on Climate Change (IPCC).[3]
- **Potential health gains of a shift from private motorized transport to walking, cycling and rapid transit/public transport** include reduced respiratory and cardiovascular disease from air pollution and less exposure to traffic injury risks and noise stress. In addition, large benefits are expected from increased physical activity leading to the prevention of obesity, diabetes, heart disease and cancer, as well as greater health equity achieved by better access to goods and services among groups without private motor vehicles.[2–4]
- **Shifting from gasoline- to diesel-powered engines to lower CO_2 emissions could increase emissions of health-damaging small particulates (PM_{10}, $PM_{2.5}$) per unit of travel.**[6] IPCC's review of diesel technology's potential does not consider potential health impacts; yet large shifts to diesel fuels in European cities in the last decade are considered to be a cause of stable (not lower) PM_{10} levels in European cities in the last decade and no decline in the health impacts of air pollution – despite the introduction of cleaner diesel technologies.[6]
- **Transport-related health risks currently affect millions of people.** For example, urban air pollution (much of it transport-generated) and traffic injuries together kill about 2.5 million people every year, mostly in low- and middle-income countries. Active transport can help prevent the 3.2 million deaths annually attributable to physical inactivity.[7,8]

About Health in the Green Economy

Many strategies to reduce climate change have large, immediate health benefits. Others may pose health risks or tradeoffs. Examined systematically, a powerful new dimension of measures to address climate change emerges.

WHO's *Health in the Green Economy* series, to be published in spring 2011, is reviewing the evidence about expected health impacts of greenhouse gas mitigation strategies in light of mitigation options for key economic sectors considered in the *Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, 2007* (IPCC).[9]

The aim is to propose important health co-benefits for sector and health policy-makers, and for consideration in the next round of IPCC mitigation reviews (*Working Group III – Fifth Assessment Report* (AR5)). Opportunities for potential health and environment synergies are identified here for key economic sectors, including transport.

The climate footprint of transport

Global transport emissions comprised an estimated 23% of direct CO_2 emissions in 2008, with land transport accounting for the largest share (16%). Under "business as usual" scenarios, emissions are projected to rise rapidly in absolute terms.[1]

"Win-win" health and transport mitigation strategies

- **Health co-benefits (and potential risks) of transport mitigation strategies have not received systematic analysis,** as reflected in IPCC's Fourth Assessment Report on mitigation options for the transport sector.[1]
- **Improved active transport, rapid transit/public transport and land use strategies can be cost-effective in many settings, including rapidly developing cities.** For instance, relocating educational facilities in proportion to residential locations in Santiago, Chile, was estimated to potentially reduce transport emissions by 12% at a cost of only US$ 2 per ton of carbon reduction over 20 years.[10]

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Integration of health effects in transport assessments: challenges

- Complex methodological questions for transport planners:
  - which health endpoints to include?
  - form of the relationship between exposure and effect?
  - activity substitution
  - which costs to include?
  - how to calculate costs?
  - which time lag periods to apply before benefits/costs occur?

  ⇨ easy to use tools needed!

The question

- If *x* people walk/cycle a distance of *y* kilometers on most days, what is the economic value of the health benefits that occur as a result of the reduction in mortality due to their physical activity?

The answer

http://www.euro.who.int/HEAT

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The Health Economic Assessment Tool for walking and cycling (HEAT)

- Easy tool to calculate the economic value of the health benefits of regular walking and cycling
- Recognises importance of economic analysis in transport: benefit-cost ratio is king
- New and updated version just launched end of May 2011 at the International Transport Forum in Leipzig

The Health Economic Assessment Tool for walking and cycling (HEAT)

- Effective public health:
  - action outside as well as within the health sector
  - identify levers
  - working upstream
  - Helps efficient use of public resources
- Evidence-based, transparent and adaptable
- Conservative

Collaborative project

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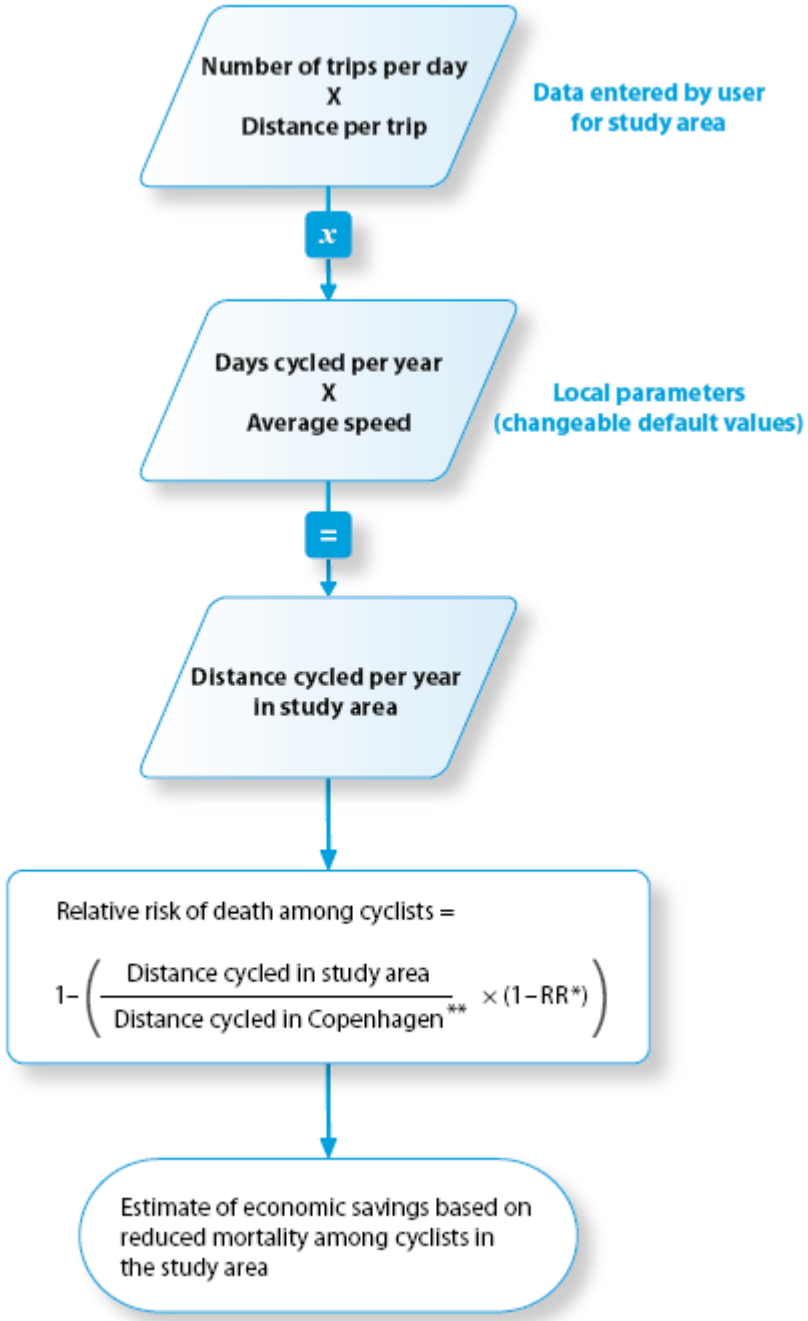
Number of trips per day
X
Distance per trip
Data entered by user for study area
x
Days cycled per year
X
Average speed
Local parameters (changeable default values)
=
Distance cycled per year in study area
Relative risk of death among cyclists =
1 − (Distance cycled in study area / Distance cycled in Copenhagen** × (1 − RR*))
Estimate of economic savings based on reduced mortality among cyclists in the study area

HEAT
Health economic assessment tool

HEAT estimate

Reduced mortality as a result of changes in cycling behaviour

The cycling data you have entered corresponds to an average of **450** km per person per year.

This level of cycling provides **an estimated** protective benefit of: **9.31 %** (compared to persons not cycling regularly)

From the data you have entered, the number of individuals who benefit from this level of cycling is: **60000**

Out of this many individuals, the number who would be expected to die if they were not cycling regularly would be: **436.27**

The number of deaths per year that are prevented by this level of cycling is: **40.64**

Financial savings as a result of cycling

Currency: EUR

The value of statistical life applied is: **1,000,000 EUR**	
The annual benefit of this level of cycling, per year, is:	40,635,000 EUR
The total benefits accumulated over **10** years are:	406,353,000 EUR
When future benefits are discounted by **5 %** per year;	
The current value of the average annual benefit, averaged across 10 years is:	31,377,000 EUR
The current value of the total benefits accumulated over 10 years is:	313,775,000 EUR

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

In order to be sure of the validity of the figures outlined above, you are advised to rerun the model entering slightly different values for variables where you have provided a 'best guess' – for example

HEAT ▸ for walking ▸ Result

HEAT
Health economic assessment tool

- HEAT for walking
  - Q1: Single or before / after
  - Q2: Walking data type
  - Q4: Distance
  - Q7: Population
  - Walking 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 walking data you have entered corresponds to an average of **3** km per person per day.

This level of walking provides **an estimated** protective benefit of: **26.54 %** (compared to persons not walking regularly)

From the data you have entered, the number of individuals who benefit from this level of walking is: **60,000**

Out of this many individuals, the number who would be expected to die if they were not walking regularly would be: **436.27**

The number of deaths per year that are prevented by this level of walking is: **115.79**

Financial savings as a result of walking

Currency: EUR

The value of statistical life in your population is:	**1,000,000 EUR**
The annual benefit of this level of walking, per year, is:	**115,789,000 EUR**
The total benefits accumulated over **10** years are:	**1,157,888,000 EUR**
When future benefits are discounted by **5 %** per year;	
The current value of the average annual benefit, averaged across 10 years is:	**89,409,000 EUR**
The current value of the total benefits accumulated over 10 years is:	**894,090,000 EUR**

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

In order to be sure of the validity of the figures outlined above, you are advised to rerun the model

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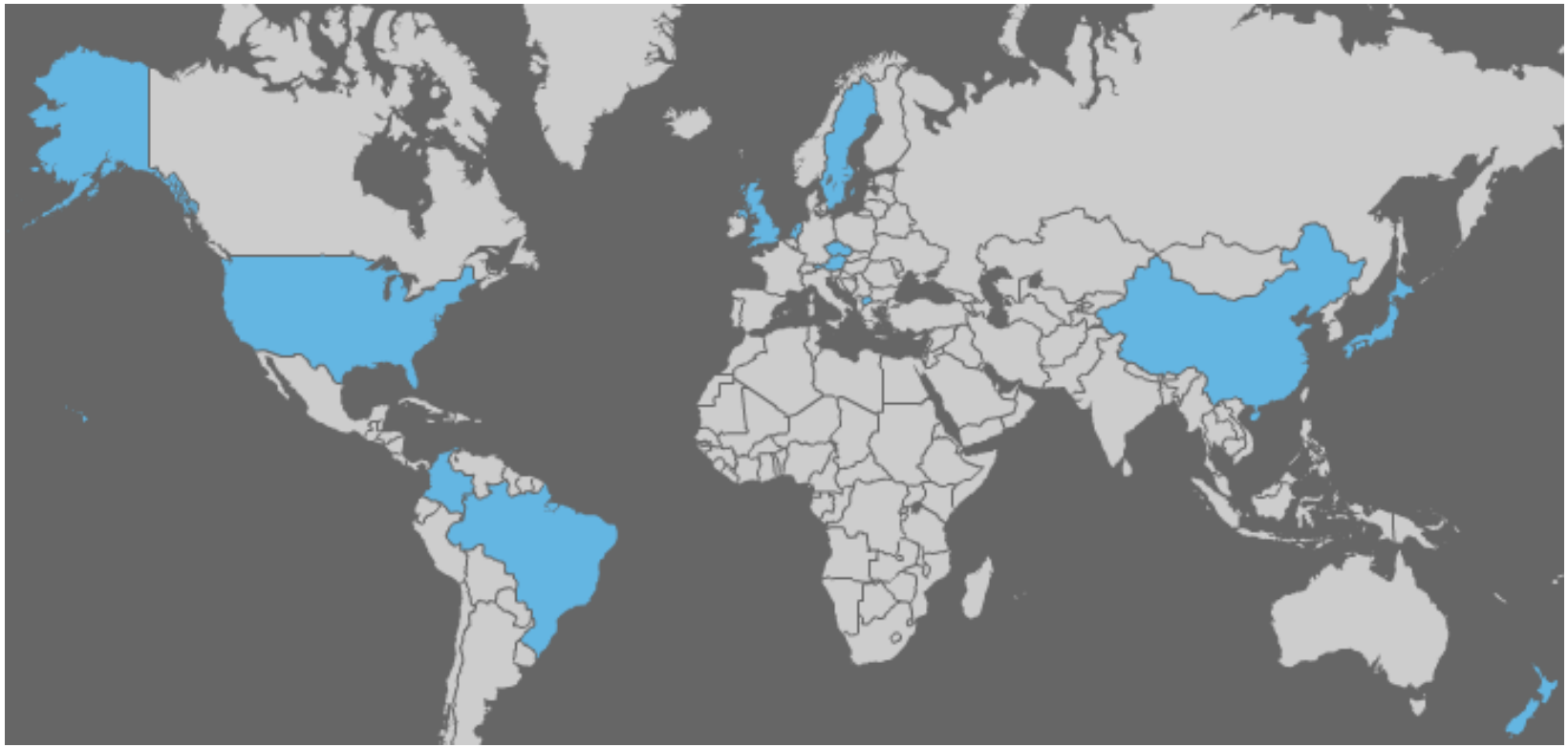
HEAT for cycling: selected applications



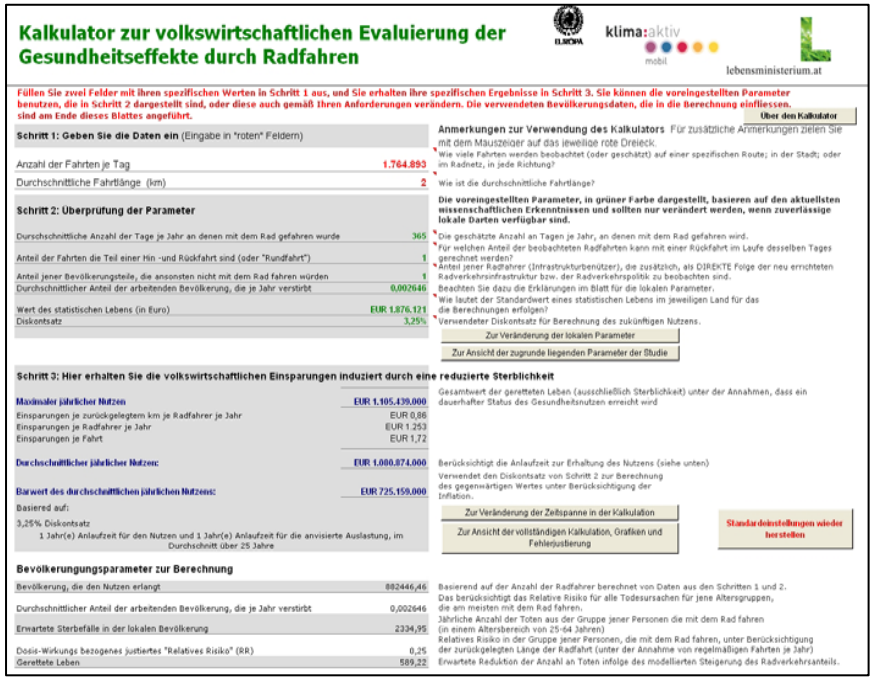
Austrian Masterplan Cycling 2006
National strategy to promote cycling

- Goal: doubling of the Austrian cycling modal share from 5% to 10% by 2015
- Large potential
- Positive effects for the environment
- Positive effects for the economy
- Mid-term evaluation:
  - First success: increase of cycling modal share from 5% to 7% (2010)
  - New measure “Cycling as health promotion” as a result of applying HEAT for Cycling

Applying HEAT for Cycling Austria

- 2008 HEAT for Cycling used to calculate the economic benefits of 10% cycling modal share in 2015
- Input data:
  - 2.5 Mio. daily cycling trips in Austria
  - 2 kilometres mean trip length
- Set of Austrian parameter:
  - Value of Life: EUR 1,876,121 (UNITE)
  - Discount rate: 3.25% (gov bonds)
  - 7 year build-up of uptake and benefit (2008-2015)

Applying HEAT for Cycling Austrian results



Kalkulator zur volkswirtschaftlichen Evaluierung der Gesundheitseffekte durch Radfahren

klima:aktiv mobil

lebensministerium.at

Füllen Sie zwei Felder mit Ihren spezifischen Werten in Schritt 1 aus, und Sie erhalten Ihre spezifischen Ergebnisse in Schritt 3. Sie können die voreingestellten Parameter benutzen, die in Schritt 2 dargestellt sind, oder diese auch gemäß Ihren Anforderungen verändern. Die verwendeten Bevölkerungsdaten, die in die Berechnung einfliessen, sind am Ende dieses Blattes angeführt.

Über den Kalkulator

Schritt 1: Geben Sie die Daten ein (Eingabe in "roten" Feldern)

Anzahl der Fahrten je Tag: 1.764.893

Durchschnittliche Fahrtlänge (km): 2

Anmerkungen zur Verwendung des Kalkulators Für zusätzliche Anmerkungen ziehen Sie mit dem Mauszeiger auf das jeweilige rote Dreieck.

Wie viele Fahrten werden beobachtet (oder geschätzt) auf einer spezifischen Route; in der Stadt; oder im Radnetz, in jede Richtung?

Wie ist die durchschnittliche Fahrtlänge?

Schritt 2: Überprüfung der Parameter

Die voreingestellten Parameter, in grüner Farbe dargestellt, basieren auf den aktuellsten wissenschaftlichen Erkenntnissen und sollten nur verändert werden, wenn zuverlässige lokale Darten verfügbar sind.

Durschschnittliche Anzahl der Tage je Jahr an denen mit dem Rad gefahren wurde	365
Anteil der Fahrten die Teil einer Hin -und Rückfahrt sind (oder "Rundfahrt")	1
Anteil jener Bevölkerungsteile, die ansonsten nicht mit dem Rad fahren würden	1
Durchschnittlicher Anteil der arbeitenden Bevölkerung, die je Jahr verstirbt	0,002646
Wert des statistischen Lebens (in Euro)	EUR 1.876.121
Diskontsatz	3,25%

Die geschätzte Anzahl an Tagen je Jahr, an denen mit dem Rad gefahren wird.

Für welchen Anteil der beobachteten Radfahrten kann mit einer Rückfahrt im Laufe desselben Tages gerechnet werden?

Anteil jener Radfahrer (Intrastrukturbenützer), die zusätzlich, als DIREKTE Folge der neu errichteten Radverkehrsinfrastruktur bzw. der Radverkehrspolitik zu beobachten sind.

Beachten Sie dazu die Erklärungen im Blatt für die lokalen Parameter.

Wie lautet der Standardwert eines statistischen Lebens im jeweiligen Land für das die Berechnungen erfolgen?

Verwendeter Diskontsatz für Berechnung des zukünftigen Nutzens.

Zur Veränderung der lokalen Parameter

Zur Ansicht der zugrunde liegenden Parameter der Studie

Schritt 3: Hier erhalten Sie die volkswirtschaftlichen Einsparungen induziert durch eine reduzierte Sterblichkeit

Maximaler jährlicher Nutzen	EUR 1.105.439.000
Einsparungen je zurückgelegtem km je Radfahrer je Jahr	EUR 0,86
Einsparungen je Radfahrer je Jahr	EUR 1.253
Einsparungen je Fahrt	EUR 1,72
Durchschnittlicher jährlicher Nutzen:	EUR 1.000.874.000
Barwert des durchschnittlichen jährlichen Nutzens:	EUR 725.159.000

Gesamtwert der geretteten Leben (ausschließlich Sterblichkeit) unter der Annahmen, dass ein dauerhafter Status des Gesundheitsnutzen erreicht wird

Berücksichtigt die Anlaufzeit zur Erhaltung des Nutzens (siehe unten)

Verwendet den Diskontsatz von Schritt 2 zur Berechnung des gegenwärtigen Wertes unter Berücksichtigung der Inflation.

Basiered auf:

3,25% Diskontsatz

1 Jahr(e) Anlaufzeit für den Nutzen und 1 Jahr(e) Anlaufzeit für die anvisierte Auslastung, im Durchschnitt über 25 Jahre

Zur Veränderung der Zeitspanne in der Kalkulation

Zur Ansicht der vollständigen Kalkulation, Grafiken und Fehlerjustierung

Standardeinstellungen wieder herstellen

Bevölkerungungsparameter zur Berechnung

Bevölkerung, die den Nutzen erlangt	882446,46
Durchschnittlicher Anteil der arbeitenden Bevölkerung, die je Jahr verstirbt	0,002646
Erwartete Sterbefälle in der lokalen Bevölkerung	2334,95
Dosis-Wirkungs bezogenes justiertes "Relatives Risiko" (RR)	0,25
Gerettete Leben	589,22

Basierend auf der Anzahl der Radfahrer berechnet von Daten aus den Schritten 1 und 2.

Das berücksichtigt das Relative Risiko für alle Todesursachen für jene Altersgruppen, die am meisten mit dem Rad fahren.

Jährliche Anzahl der Toten aus der Gruppe jener Personen die mit dem Rad fahren (in einem Altersbereich von 25-64 Jahren)

Relatives Risiko in der Gruppe jener Personen, die mit dem Rad fahren, unter Berücksichtigung der zurückgelegten Länge der Radfahrt (unter der Annahme von regelmäßigen Fahrten je Jahr)

Erwartete Reduktion der Anzahl an Toten infolge des modellierten Steigerung des Radverkehrsanteils.

- 811 Mio. Euro mean annual benefit
- 824 'saved lifes' per year
- 1253 Euro annual savings per cyclists
- Strong arguments for the promotion of cycling in particular for investments in cycling infrastructure

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Department for Transport

Cycling Demonstration Towns Development of Benefit-Cost Ratios

February 2010

Table 2. Benefits and Costs of Cycling Demonstration Towns

Impact	Estimate of benefits and costs over 10 year period (£m, 2007 prices and values)
Reduced mortality	Benefit of £45 million
Decongestion	Benefit of £7 million
Reduced absenteeism	Benefit of £1-3 million
Amenity	Benefit of £9 million
Accidents	Disbenefit of £0-£15 million
TOTAL BENEFITS	**£47-64 million**
Costs	£18 million
Benefit-Cost Ratio	2.6 – 3.5

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HEAT in Russian

- Complete HEAT website to be available in English and Russian by end 2011
- HEAT for cycling is now available also in Russian thanks to the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

Conclusions

- Identifies a major public health issue and uses effective lever to promote it
- Works outside traditional health care paradigm to achieve health gain
- Uses language of the target sector, not health
- Highly influential
- Cheap and sustainable
- Effective demonstration of using evidence to drive practice

“I thought of that while riding my bicycle.”

Albert Einstein
on the theory of relativity


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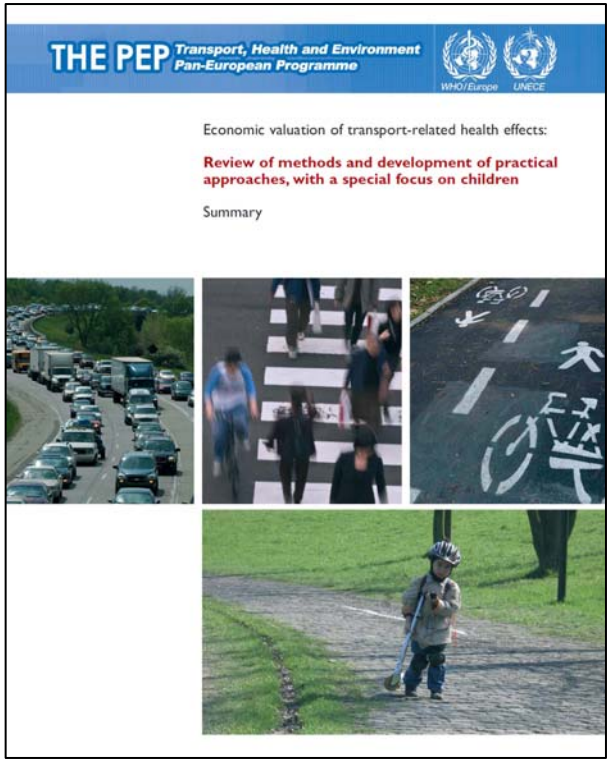
Costs: Economic valuation of transport-related health effects

- Selection of health effects in adults and children
- Relationships between exposure and health effect
- Estimated fraction of exposure coming from transport
- Assign costs to health effects
- Practical guidance for quantification of health effects of air pollution, injuries, noise and physical inactivity



Look for “win-win-win” opportunities

- Environmental, health and economic benefits
- Opportunities that address each sector’s goals
- For example: safe walking and cycling in urban areas

Example data from Switzerland

	Passenger transport								Freight transport				Total
	Car	Public bus	Trolley	Tram	Private coach	Motor-bike	Moped or scooter	Total	Delivery van	Heavy goods vehicle	Articulated lorry	Total	
Costs in millions of US dollars													
Road crashes	3675		53[a]		119	923	438	5208	251	113	54	419	5627
Air pollution	461	33	3	NA	8		19[b]	523	126	176	91	393	916
Noise	365	18	0	1	9	165	1	559	72	114	57	243	802
Total	4470		108 [a]		135	1547 [b]		6290	449	404	202	1054	7345
Costs in US dollars per vehicle-km								Average					Average
Road crashes	0.071		0.177 [a]		1.12	0.449	2.99	0.095	0.076	0.079	0.077	7.7	0.094
Air pollution	0.009	0.143	0.096	N.A.	0.073		0.009 [b]	0.010	0.038	0.124	0.129	7.2	0.015
Noise	0.007	0.08	0.007	0.022	0.08	0.080	0.007	0.010	0.022	0.080	0.08.0	4.5	0.013
Total	0.087		0.361		1.273	0.701 [b]		0.115	0.14	0.283	0.286	18.9	0.122

Find more information at:

- Quantification of health benefits of cyling and walking: www.euro.who.int/transport/policy/20070503_1
- Transport, Health and Environment Pan European Programme (THE PEP): www.thepep.org
- HEPA Europe (European network for promotion of health-enhancing physical activity): www.euro.who.int/hepa

Thank you!

HEAT

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HEPA Europe
European network for the promotion of health-enhancing physical activity

Transport, Health and Environment Pan-European Programme THE PEP

THE PEP Transport, Health and Environment Pan-European Programme
United Nations Economic Commission for Europe (UNECE)
World Health Organization Regional Office for Europe (WHO / Europe)
WHO / Europe United Nations

Pollution reductions options network

PRONET

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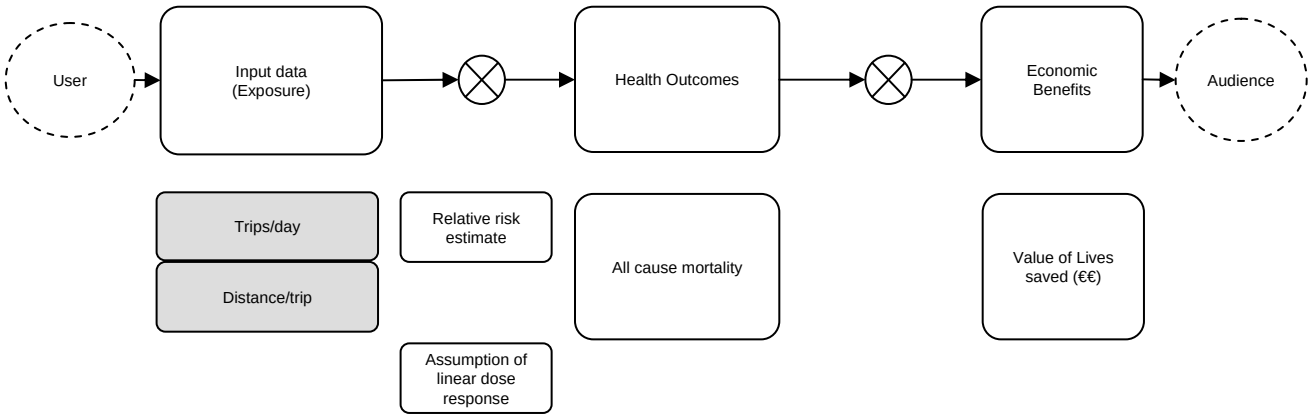
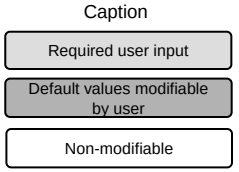
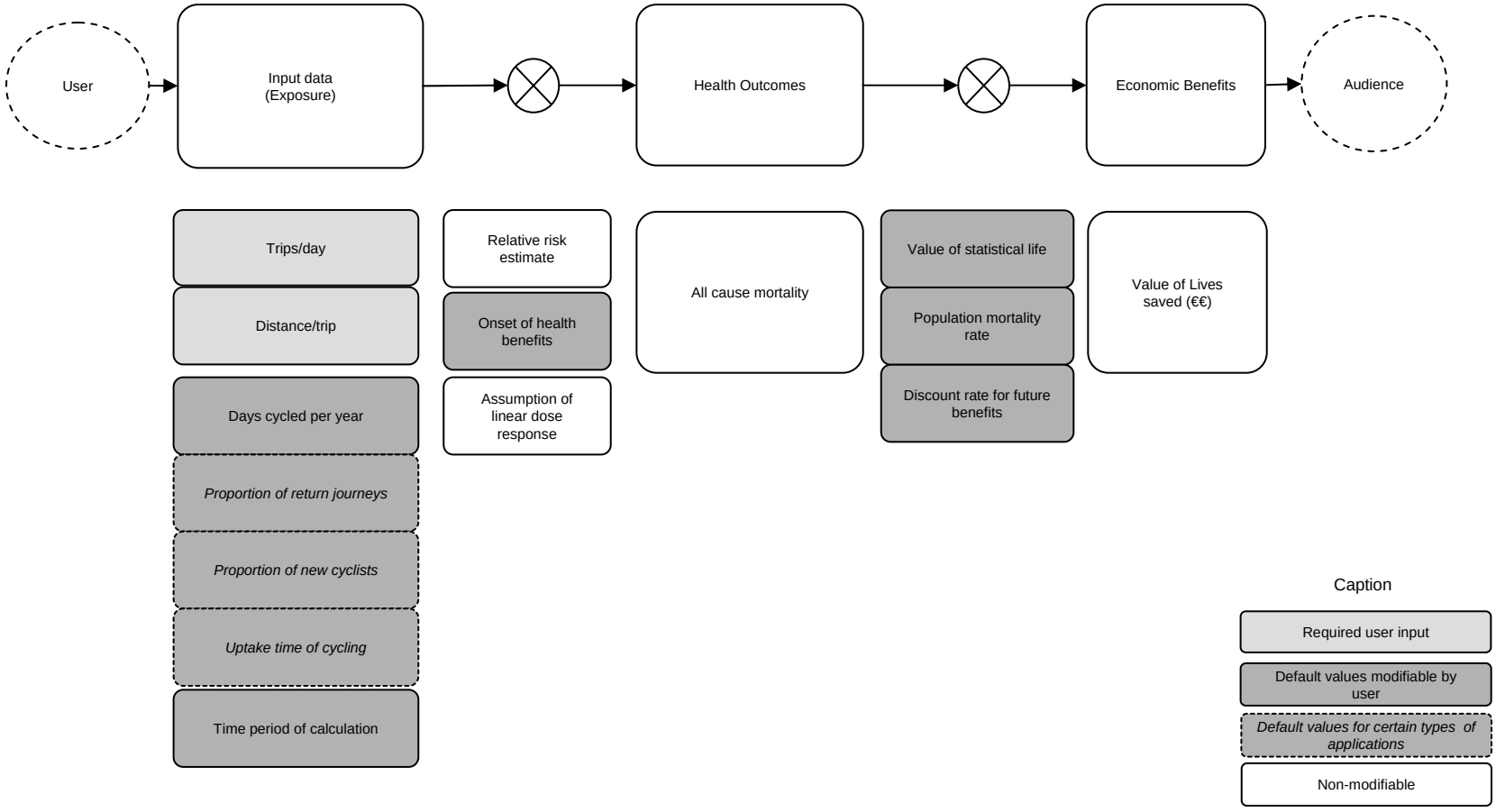
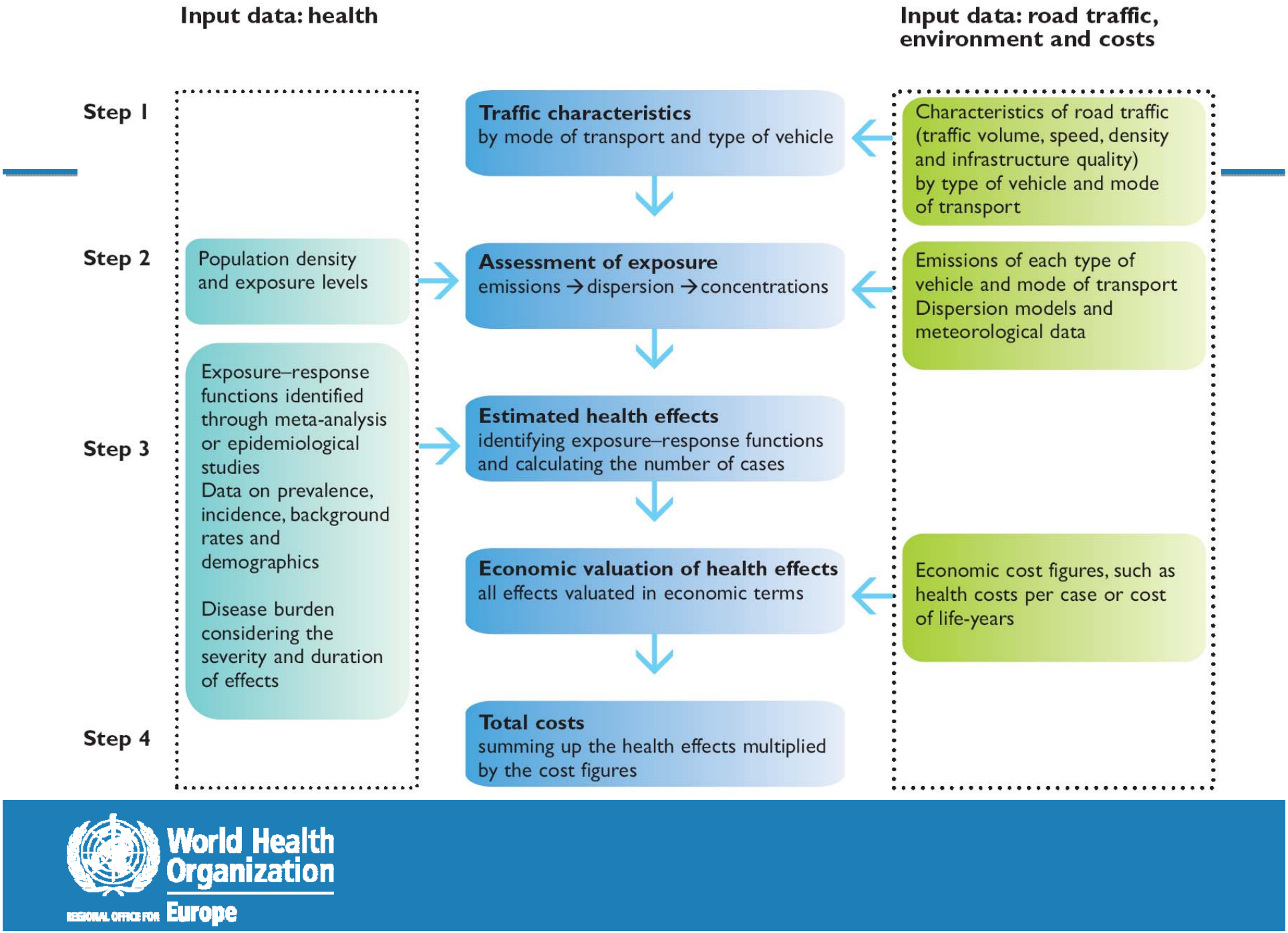
HEAT for cycling





HEAT for cycling




Input data: health
Input data: road traffic, environment and costs
Step 1
Step 2
Step 3
Step 4
Traffic characteristics
by mode of transport and type of vehicle
Characteristics of road traffic (traffic volume, speed, density and infrastructure quality) by type of vehicle and mode of transport
Population density and exposure levels
Assessment of exposure
emissions → dispersion → concentrations
Emissions of each type of vehicle and mode of transport
Dispersion models and meteorological data
Exposure–response functions identified through meta-analysis or epidemiological studies
Data on prevalence, incidence, background rates and demographics
Disease burden considering the severity and duration of effects
Estimated health effects
identifying exposure–response functions and calculating the number of cases
Economic valuation of health effects
all effects valuated in economic terms
Economic cost figures, such as health costs per case or cost of life-years
Total costs
summing up the health effects multiplied by the cost figures

Underlying study: Copenhagen cohorts

- 6,954 regular cycle commuters
- total study population of 30,640
- followed up for an average of 14.5 years
- mean journey time of 3 hours per week
- relative risk of death 0.72 (95%CI 0.57-0.91)
- adjusted for age, sex, educational status, leisure time physical activity, body mass index, blood lipid levels, smoking and blood pressure

Source: Andersen *et al. Arch Intern Med. 2000;160:1621-1628*

Why has the health sector an interest in transport and urban development?

Transport and the urban environment play a role in several of the leading risk factors for health

	Risk factors related to transport/urban policies
High blood pressure	Physical activity/diet
High Body Mass Index	Physical activity/nutrition
Respiratory diseases	Urban air pollution
Cardiovascular diseases	Urban air pollution, physical activity, diet
Cancer (some)	Diet, physical activity
Injuries	Road traffic

Collaborative project: econ valuation

Main partners:

- WHO Regional Office for Europe
- Ecoplan (Switzerland) – economic aspects
- RIVM (Netherlands) and contributors – epidemiological aspects

Contributors

Lars Bo Andersen, Norway; Fiona Bull, United Kingdom; Nick Cavill, United Kingdom; Luis Cifuentes, Chile; Paul Fischer, Rob Jongeneel, Erna van Balen, Hannah van den Bogaard, the Netherlands; Christoph Lieb,Switzerland; Francesco Mitis, Pierpaolo Mudu, WHO Regional Office for Europe; Pekka Oja, Sweden; Larissa Roux, Canada

- **Advisory group** of 18 experts from 10 countries and WHO
- 3 **external reviewers**
- **Synergy** with key related initiatives:
  - OECD/EC VERHI project
  - THE PEP/HEPA Europe project on quantification of health benefits of cycling and walking
  - ENHIS/WHO guidelines for HIA air pollution, noise
  - INTARESE

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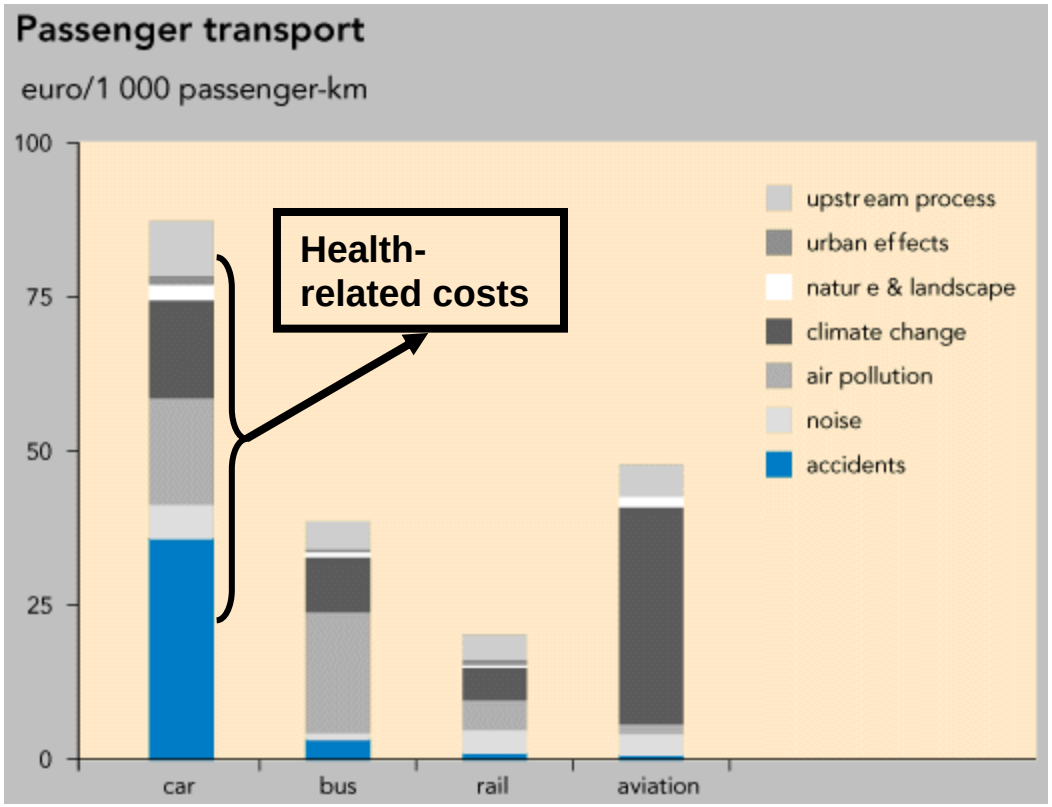
Supported by:

Health effects represent the largest part of the external costs of transport



- The external costs of transport are estimated at ca 8 % of GDP in the EU(*)
- Savings from improved health could be re-invested in other societal priorities;

(*) Source: EEA indicators, http://themes.eea.europa.eu/Sectors_and_activities/transport/indicators/cost/TERM25,2002/index_html

Why should the transport and urban development sectors have an interest in health?

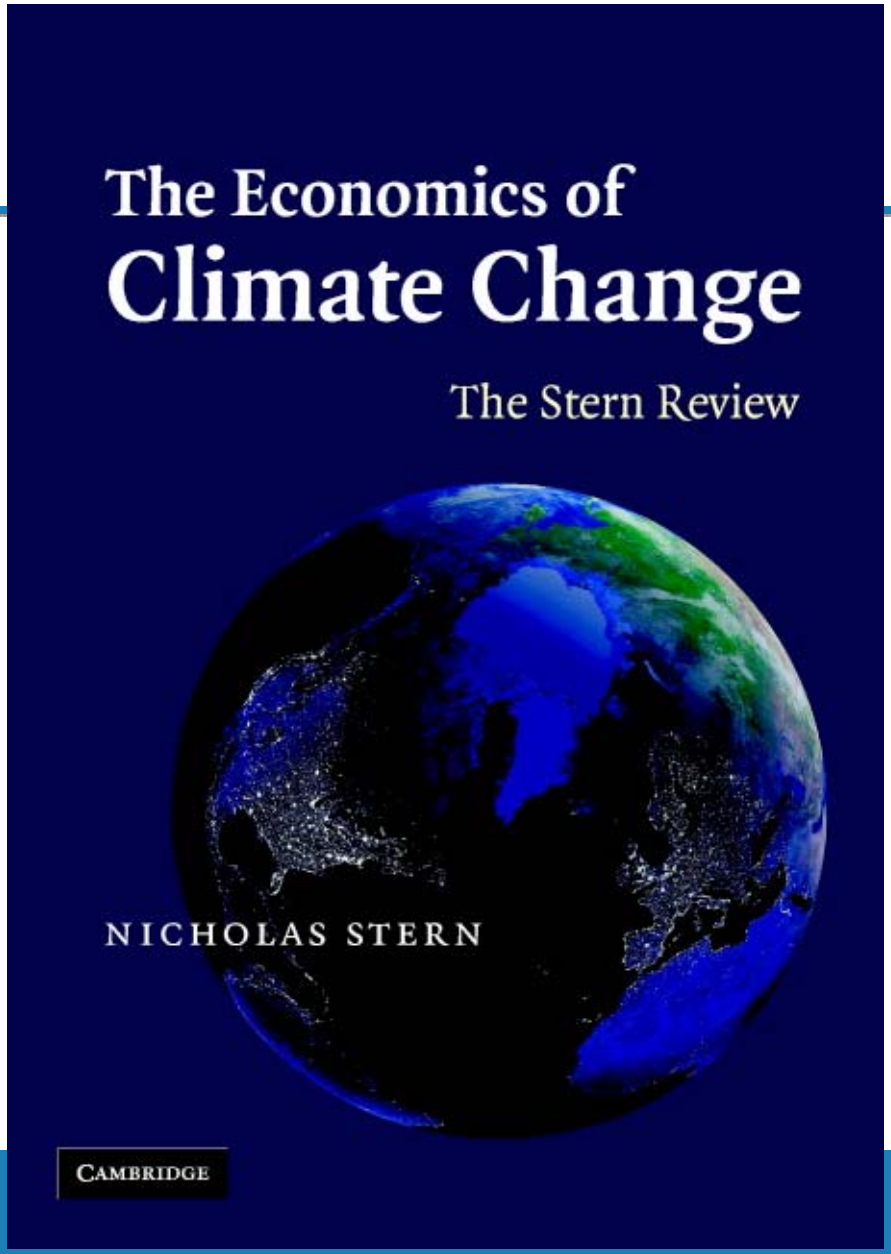
Which Goals?	Whose Interest?
Reduce emissions of: –air pollutants; –greenhouse gases; –noise	Environment Health Transport Urban Development
Reduce congestion	Transport
Reduce road traffic injuries	Transport Health
Reduce investments in infrastructure to cater for more cars	Transport
Improve accessibility and quality of urban life	Transport Urban development Health
Complement technological improvements to vehicles and fuels	Transport
Increase physical activity	Health
Facilitate access to healthy diets	Health
Promote tourism	Tourism and leisure industry, urban development
Creation of new jobs	Economy, welfare, labour, urban development

Selected applications

- **Czech Republic** used HEAT for cycling used to calculate potential benefits from cycling in the city of Pilsen
  - **USD 1.2million** if 2% of population took up regular cycling
- **Swedish Government** adopted HEAT for cycling as part of official toolbox for the economic assessment of cycling infrastructure
- **UK/England DfT:** adopted HEAT for cycling as part of official toolbox for the economic assessment of cycling infrastructure
- **UK/Scotland**: HEAT used to estimate benefit from reaching cycling targets
  - **USD 1.5-3 billion** per year if modal share goal of 13% reached
  - Recommended that Scottish Transport Appraisal Guidance should include health benefits from cycling and walking
- **New Zealand:** University of Auckland used HEAT to value adding cycling and pedestrian facilities to the Auckland Harbour Bridge
  - **900.000USD** per 1000 regular bike commuters
- **United States:** adaptation of tool for the US underway (by CDC)
- **Austria:** used HEAT for cycling to calculate current savings from cycling in Austria

Unlocking the value of cycling and walking

Sonja Kahlmeier | Nick Cavill | Francesca Racioppi



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HEAT approach

- Effective public health:
  - action outside as well as within the health sector
  - identify levers
  - working upstream
  - efficient use of public resources
- Recognises importance of economic analysis in transport: benefit-cost ratio is king
- Evidence-based
- Conservative
- Transparent

Collaborative project

Core group

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THE PEP
Transport, Health and Environment Pan-European Programme
United Nations Economic Commission for Europe (UNECE)
World Health Organization Regional Office for Europe (WHO / Europe)
WHO / Europe
United Nations
NATURAL ENGLAND
lebensministerium.at
Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra
Financially supported by the European Union in the framework of the Health Programme 2008-2013 (Grant agreement 2009 52 02). The views expressed herein can in no way be taken to reflect the official opinion of the European Union

Development of HEAT

- Use economic levers to influence transport appraisal
- Find best format for transport planners
- International advisory group including transport; health; economics; practice
- Review the evidence
- Generate a tool based on the evidence
- Test with range of experts and refine
- Disseminate; evaluate; develop further

Key steps

1. Literature reviews (economics; health)

Contents lists available at ScienceDirect

Transport Policy

journal homepage: www.elsevier.com/locate/tranpol

Economic analyses of transport infrastructure and policies including health effects related to cycling and walking: A systematic review ☆

Nick Cavill [b,*], Sonja Kahlmeier [a], Harry Rutter [b], Francesca Racioppi [a], Pekka Oja [b]

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ARTICLE INFO

Available online 24 January 2009

Keywords:
Economic
Health
Walk
Cycle

ABSTRACT

We reviewed published and unpublished studies that presented the findings of an economic valuation of an aspect of transport infrastructure or policy, and included data on walking and/or cycling and health effects in the valuation. We included 16 papers, of which three were classified as 'high; six as 'moderate' and seven as 'low' quality. There is a wide variation in the approaches taken for including the health effects of physical activity in economic analyses of transport projects. This is not helped by a lack of transparency of methods in many studies. A more standardised approach is called for, including a clearer description of the applied methods and assumptions taken.

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Key steps

1. Literature reviews (economics; health)
2. Issues and draft tool

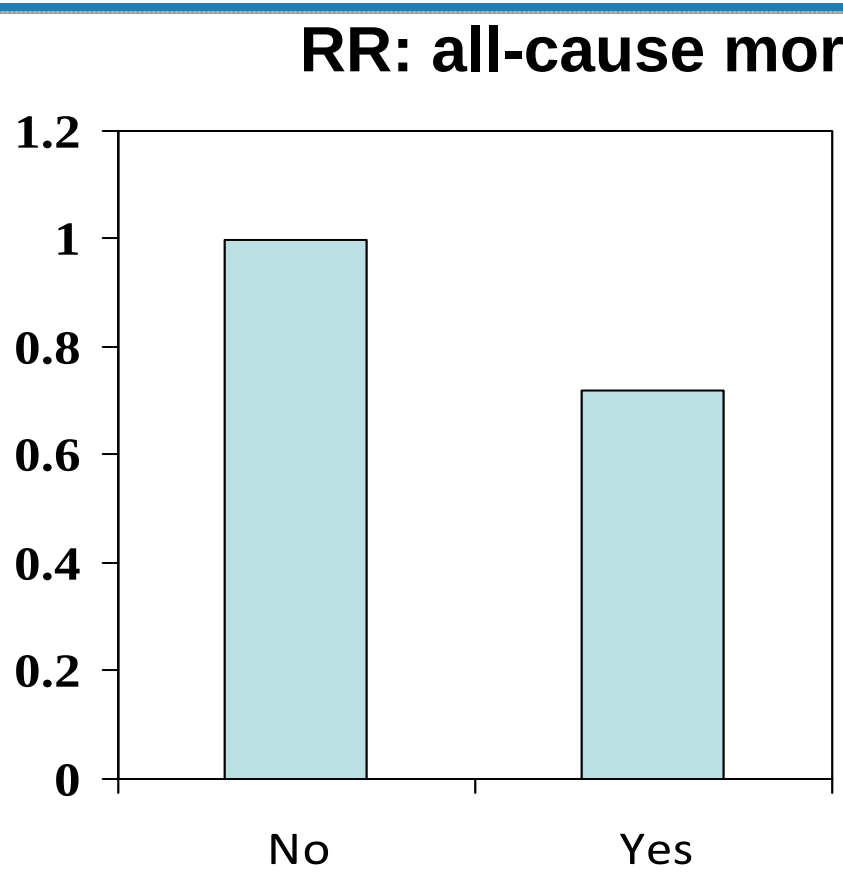
Issues

- Which health benefits: mortality, morbidity or both?
- Physical activity and health relationship: linear or non-linear? Threshold?
- Unique effects of cycling /walking vs. other forms or physical activity?
  Activity substitution?
- Costs applied

Key steps

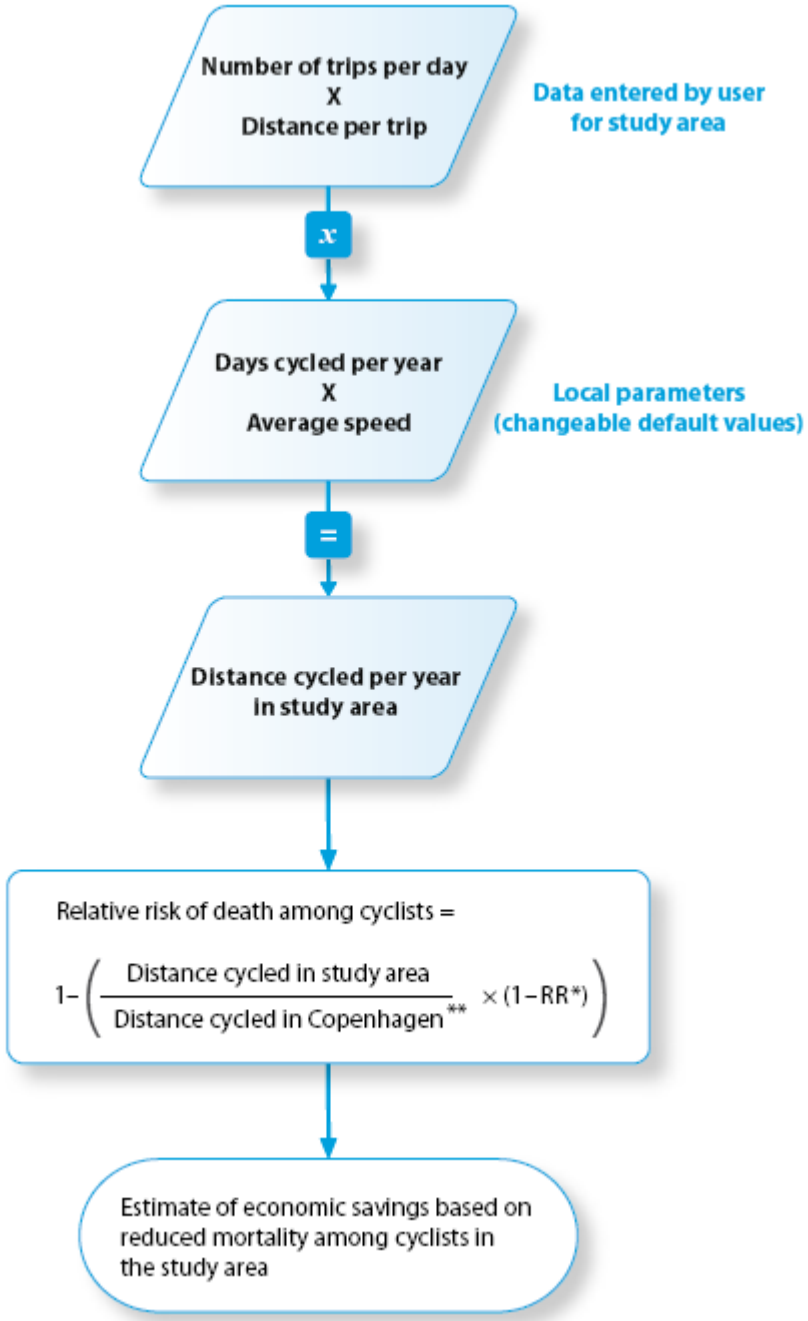
1. Literature reviews (economics; health)
2. Issues and draft tool
3. Consensus event – cycling
4. Develop HEAT cycling (Excel)
5. Literature reviews

Risk reduction for all-cause mortality for regular cycle commuters



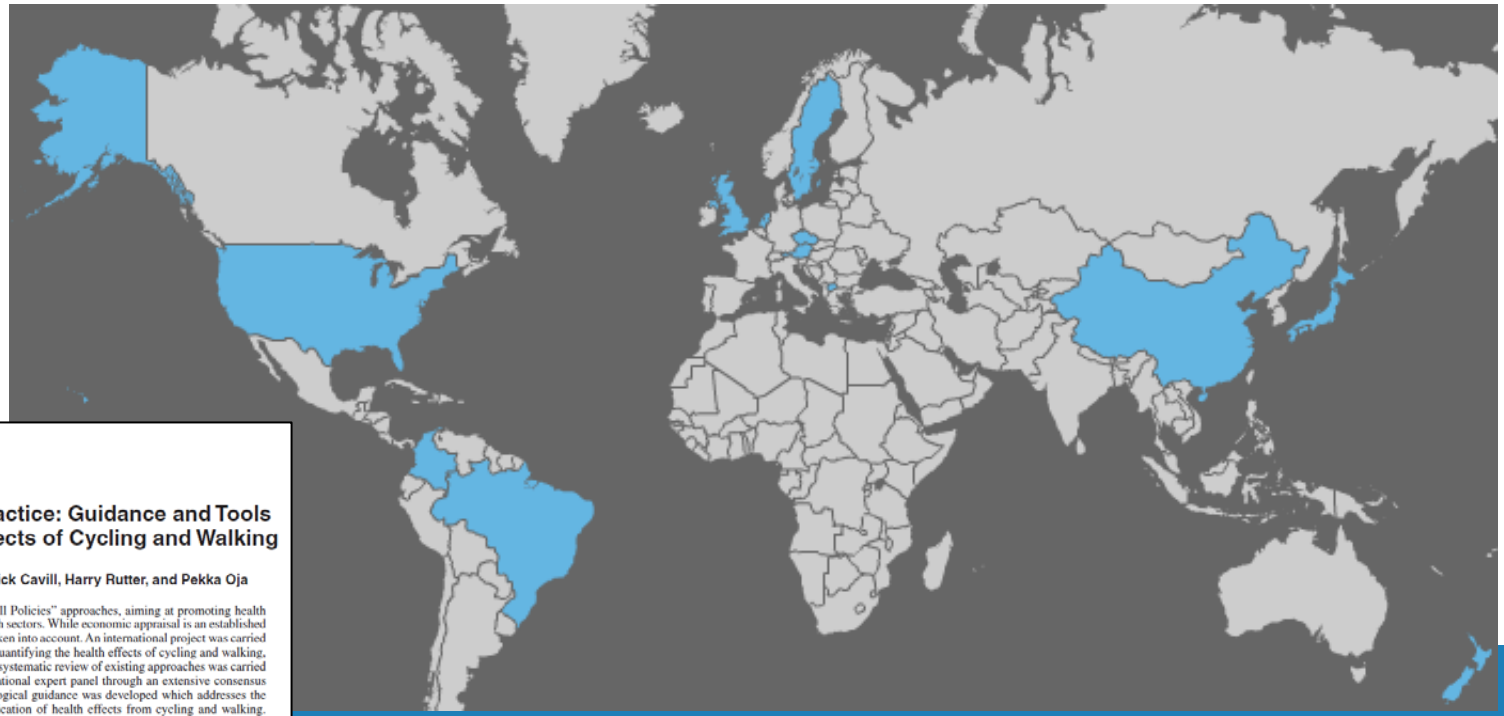
- Data from 3 population studies in Copenhagen combined
- 6,171 men and 783 women including 2,291 deaths
- RR 0.72 (95% CI: 0.57-0.91)
- Adjusted for age, sex, educ. level, blood pressure, weight, leisure time physical activity, cholesterol and smoking
- Results consistent with other cycling studies and literature on physical activity eg Matthews, Paffenbarger

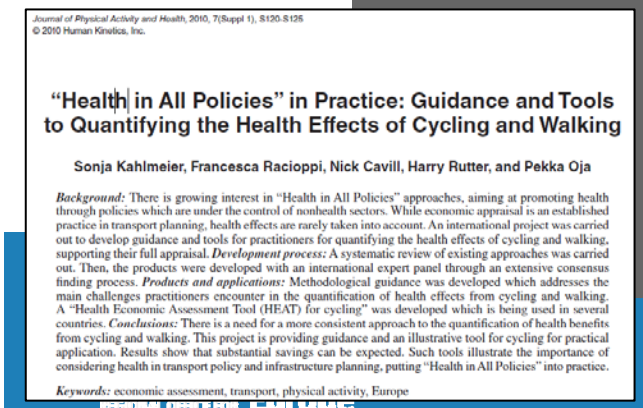
Andersen, L B, Schnohr, P, Schroll, M, Hein, H O, (2000) All-Cause Mortality Associated With Physical Activity During Leisure Time, Work, Sports, and Cycling to Work, *Archives of Internal Medicine*, Vol. 160, pp1621-1628


Number of trips per day
X
Distance per trip
Data entered by user for study area
x
Days cycled per year
X
Average speed
Local parameters (changeable default values)
=
Distance cycled per year in study area
Relative risk of death among cyclists =
1 − (Distance cycled in study area / Distance cycled in Copenhagen** × (1 − RR*))
Estimate of economic savings based on reduced mortality among cyclists in the study area

Applications

Project website visited over 6000 times, products downloaded over 600 times





Journal of Physical Activity and Health, 2010, 7(Suppl 1), S120-S126
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"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

HEAT walking

Systematic review

- PubMed search for keywords ‘Walking’ and ‘Relative risk’ in studies that
  - specified walking as an independent behavior
  - reported a relative risk for mortality or morbidity
- Meta-analysis of 9 studies (controlled for leisure time physical activity)
- RR = 0.78 (0.64-0.98) for all-cause mortality from walking 29 mins per day on 7 days/week

HEAT walking

Economic studies

- Updated systematic review of economic studies
- 8 studies included; 5 good quality
- Few methodological advances
- Showed HEAT approach remained valid for walking

What's new?

- Step-by-step online tool
- Assessment of walking data with a brand-new HEAT walking
- More data entry options:
  - *(before: cycling trips only)*
  - New:
    - Trips
    - Distance
    - Duration
    - Steps (for walking)

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More explanations, tips and hints on every step

HEAT
Health economic assessment tool

Welcome to the WHO/Europe Health Economic Assessment Tools (HEAT) for walking and for cycling.

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:

1. 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), or as an input into a more comprehensive economic appraisal exercise.

2. To value the reduced mortality from 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.

3. 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.

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

Next step

- Start using HEAT for walking
- Start using HEAT for cycling

More information

What data do I need?

To produce an assessment, you need to provide data on the number of people walking or cycling, and the amount of walking they are doing (or are projected to do).

more...

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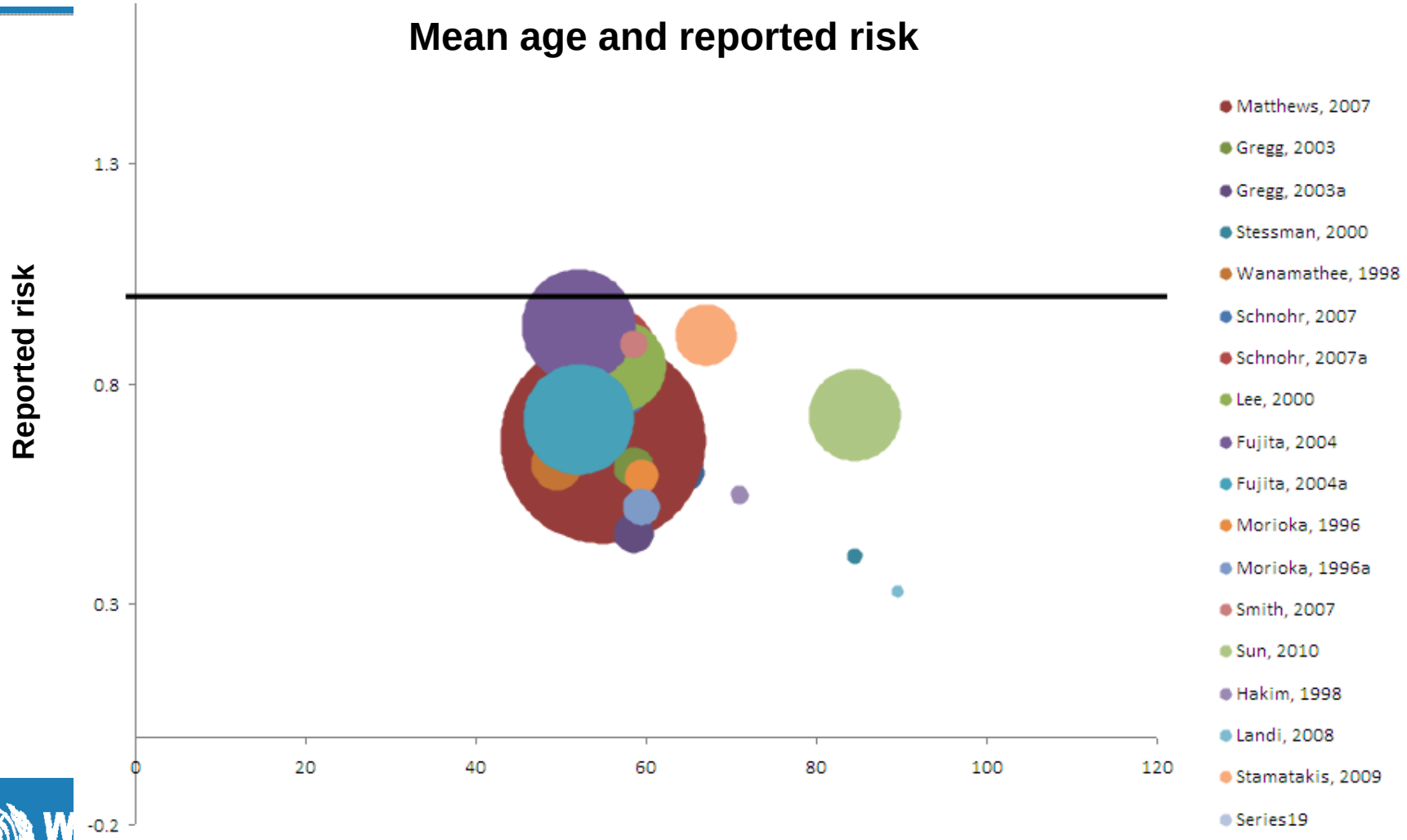
Conclusions

- Identifies a major public health issue and uses effective lever to promote it
- Works outside traditional health care paradigm to achieve health gain
- Uses language of the target sector, not health
- Highly influential
- Cheap and sustainable

Mean age and reported risk



Benefits outweigh the risks

EPIDEMIOLOGY

De Hartog et al, 2011

Epidemiology:
January 2011 - Volume 22 - Issue 1 - pp S76-S77
doi: 10.1097/01.ede.0000391897.18320.1d
Abstracts: ISEE 22nd Annual Conference, Seoul, Korea, 28 August-1 September 2010: Travel-time Air Pollution Exposure, Energy Expenditure, and Health Outcomes: Use of New Technologies and Results

Conclusion:

The health benefits of cycling are 11 times larger than the risks relative to car driving for the individual subjects shifting mode of transport. Societal benefits are even larger due to a modest reduction in air pollution emissions and traffic accidents.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Why cycling and walking?

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Sonja Kahlmeier[2]
Carlos Dora, Tim Armstrong, Vanessa Candeias[3]

[1] WHO Regional Office for Europe, European Centre for Environment and Health
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[3] World Health Organization Headquarters, Department of Chronic Diseases and Health Promotion

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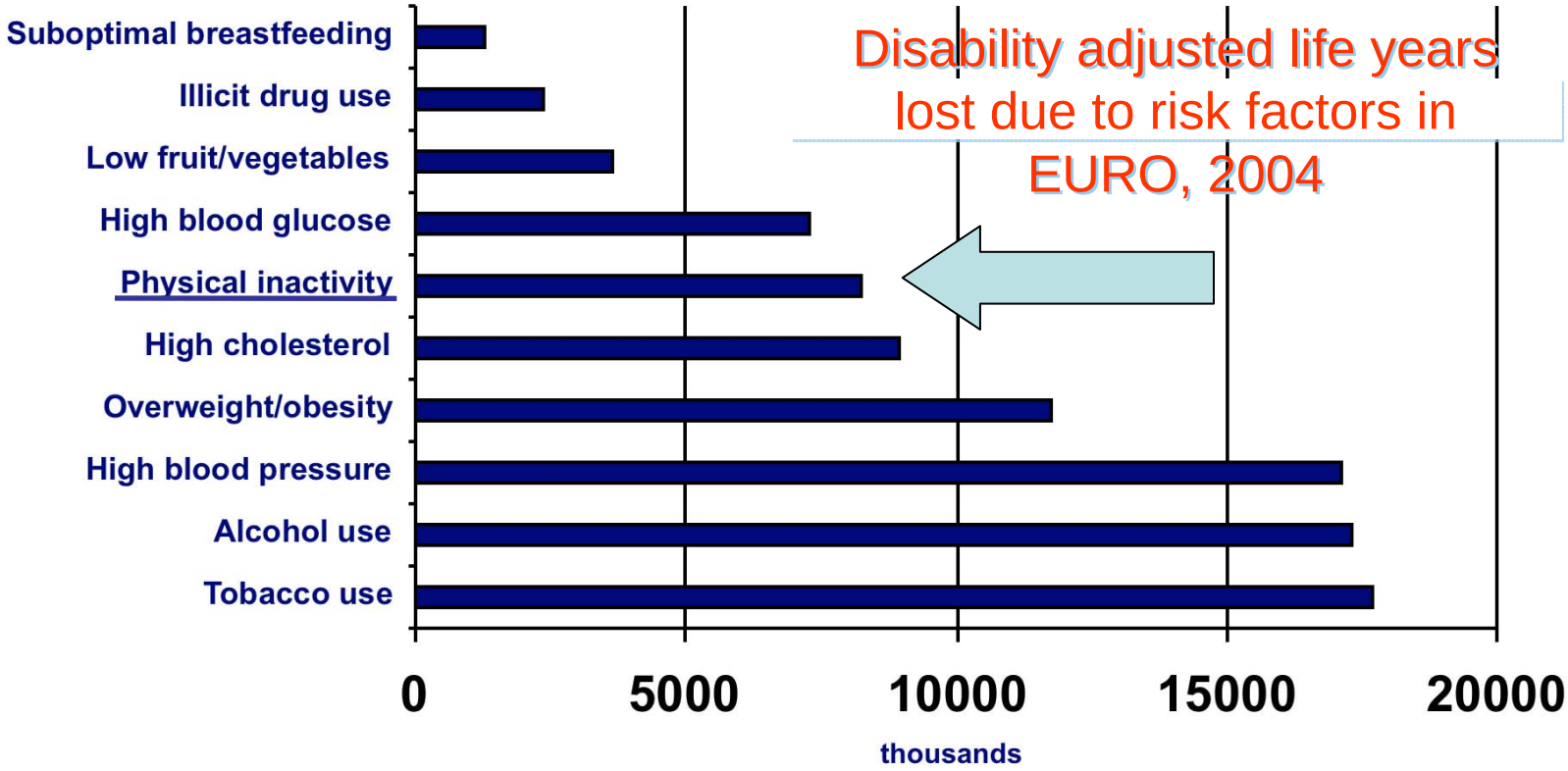
In this presentation:

- Physical activity and health: what do we know?
- WHO Global Recommendations on Physical activity for Health
- Why cycling and walking?
- Health dividends from Green Growth Strategies

Physical activity and health:

what do we know?

Physical inactivity is a leading risk factor for health in Europe, associated to nearly 1 million deaths/year



Source: Global Health Risks.. Geneva, World Health Organization, 2009 (http://www.who.int/healthinfo/global_burden_disease/global_health_risks/en/index.html/).

Inactivity status in the European Region

- WHO estimates that in adults :
  - 63% are not reaching the minimum recommended level of physical activity
  - 20% of those are rated as “inactive”
  - 38% are sufficiently/highly active
- 40% of EU citizens say that they play sport at least once a week
- Citizens of Mediterranean and central European countries tend to exercise less
- 22% of 11-year old girls and 30% of boys report at least one hour of daily moderate to vigorous PA (MVPA)

Global Health Risk Report, World Health Organization, 2009

Eurobarometer 72.3. Special Eurobarometer 334: Sport and PA

Health Behaviour in School Aged Children 2005/06 Survey

World Health Organization
Europe

Physical inactivity estimated to cause:

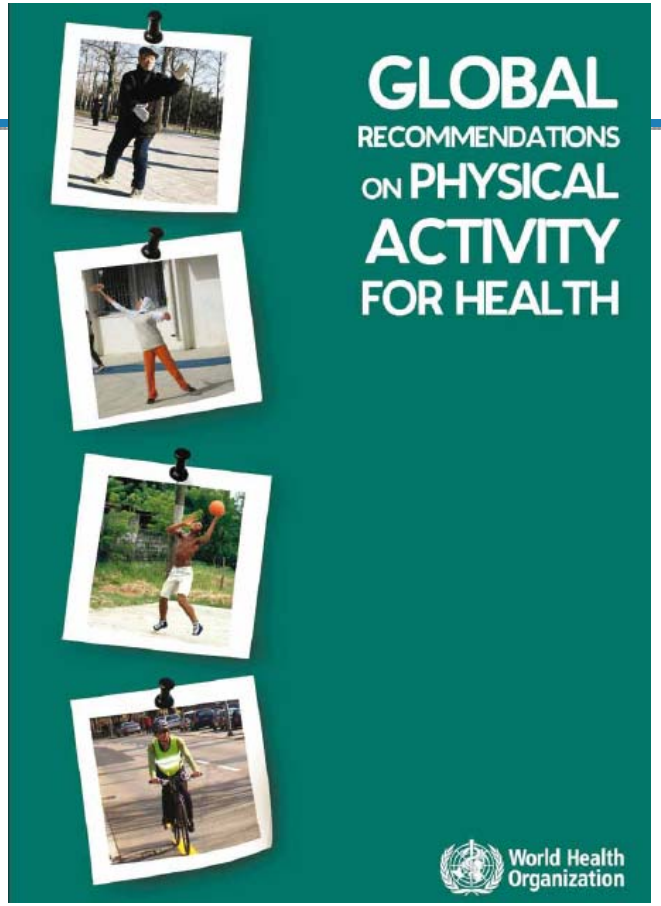
21–25% of breast and colon cancer burden
27% of diabetes burden
30% of ischaemic heart disease burden

Physical Activity Guidelines Advisory Committee. Physical Activity Guidelines Advisory Committee Report, 2008. Washington, DC: U.S. Department of Health and Human Services, 2008.

Magnitude of benefits from reaching minimum recommendations for physical activity

- **Risk reductions for:**
  - **20-30% for CHD and CVD morbidity and mortality**
  - **Cancer risks:**
    - 30% for colon cancer
    - 20% - 40% for breast cancer
    - 20% for lung cancer
    - 30% for endometrial cancer
    - 20% for ovarian cancer
  - **30% for developing functional limitations**
  - **30% for premature all-cause mortality**

WHO Global recommendations on physical activity for health



Adults aged 18

- **At least 150 minutes** of Moderate intensity PA spread throughout the week

  OR

  at least 75 minutes of Vigorous PA spread throughout the week

  OR

  an equivalent combination of those two

- Bouts of at least **10 minutes**.

WHY CYCLING AND WALKING?

Cycling and walking: a great way to meet the recommendations for healthier life!

- Do not require making a time slot available for that
  - *"I have no time for physical activity"*
- Equitable and accessible options
- Feasible
  - 10% of trips made in car in Europe cover distances of less than 1 km
  - more than 30% less than 3 km and 50% of less than 5 km
- Most people can do it
- Is enjoyable!!!!

Photo courtesy of BASPO

The benefits of physical activity come as a "package" and are reflected on overall reduction in total mortality - 1/2

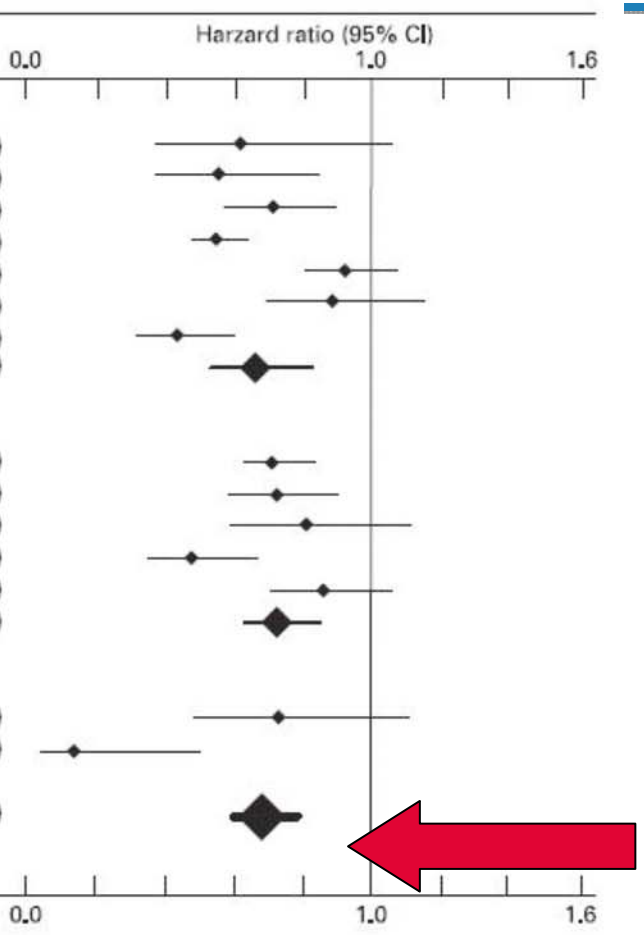
Cycling and effects on total mortality

	FINDINGS	Reduction in risk for all cause mortality
Andersen et al (2000) Copenhagen Hearth Study	Danish adults reporting cycling to and from work: RR = 0.72 (95 % CI: 0.6, 0.9) for all cause mortality	28 %
Matthews et al (2007) Shangay Women's Health Study	Chinese women reporting regular cycling for transportation: RR=0.79 (0.61-1.01) (0.1-3:4METs) and 0.66 (0.40-1.07) (>3.5METs) for all-cause mortal.	21-34%

The benefits of physical activity come as a "package" and are reflected on overall reduction in total mortality - 2/2

Meta-analysis results show nearly 30 % reduced all-cause mortality for regular walkers

	Authors (year)	Exposure	Sample size	Hazard ratio (95% CI)
Male				
1	Wannamethee *et al* (1998)[11]	Walking > 1 hour/day	4311	0.62 (0.37 to 1.05)
2	Hakim *et al* (1998)[12]	Walking > 3.2 km/day	707	0.55 (0.37 to 0.83)
3	Bijnen *et al* (1998)[13]	Walking > 1 hour/week	802	0.71 (0.58 to 0.88)
4	Davey Smith *et al* (2000)[19]	Brisk walking	6702	0.55 (0.48 to 0.63)
5	Fujita *et al* (2004)[24]	Walking > 1 hour/day	20 004	0.92 (0.80 to 1.06)
6a	Schnohr *et al* (2007)[26]	Walking > 2 hours/day	3204	0.89 (0.69 to 1.14)
6b	Schnohr *et al* (2007)[26]	Brisk walking	3204	0.43 (0.32 to 0.59)
	Subtotal		38 934	0.66 (0.53 to 0.83)
Female				
1	Gregg *et al* (2003)[23]	Walking > 898 kcal/week	9518	0.71 (0.62 to 0.82)
2	Fujita *et al* (2004)[24]	Walking > 1 hour/day	21 159	0.72 (0.59 to 0.89)
3a	Schnohr *et al* (2007)[26]	Walking > 2 hours/day	4104	0.81 (0.59 to 1.10)
3b	Schnohr *et al* (2007)[26]	Brisk walking	4104	0.48 (0.35 to 0.66)
4	Matthew *et al* (2007)[27]	Walking > 10 MET-hours/day	67 143	0.86 (0.71 to 1.05)
	Subtotal		106 028	0.72 (0.62 to 0.84)
Male and female				
1	LaCroix *et al* (1996)[10]	Walking > 4 hours/week	1645	0.73 (0.48 to 1.10)
2	Stessman *et al* (2000)[18]	Walking > 4 hours/week	456	0.14 (0.04 to 0.50)
	Total		147 063	0.68 (0.59 to 0.78)
	Test for heterogeneity			$\chi^2(13) = 31.35$, $p < 0.001$
	Test for overall effect			$\chi^2(1) = 57.86$, $p < 0.001$



The association between walking and all-cause mortality in men and women. The referent group refers to the lowest walking (volume/intensity) group and hazard ratios of less than 1.0 suggest benefits of walking. MET, metabolic equivalent.

Source: Hamer and Chida, 2008

Walking and cycling: an option that helps different sectors achieving *their* own goals

Goals	Interest
Reduce emissions of: –air pollutants; –greenhouse gases; –noise	Environment Health
Reduce congestion	Transport
Reduce road traffic injuries	Transport, Health
Reduce investments in infrastructure for more cars	Transport
Improve accessibility and quality of urban life	Transport, Health
Complement improvements to vehicles and fuels	Transport
Increase physical activity	Health
Promote tourism	Tourism and leisure industry
Creation of new jobs	Economy, welfare, labour

Health dividends from Green Growth Strategies

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Active transport as part of policies to reduce greenhouse gases emissions provides important health benefits

Scenarios for urban transport in London

* ***Health effects attributable to physical activity, air pollution, injuries per million population in 1 year, compared to "business as usual". Negative numbers indicate a reduction in the disease burden.***

	Low emissions vehicles	Increase in active mobility	Combining low emissions vehicles and active mobility
Health effects*			
Premature mortality	-17	-530	-541
Years of Life Lost (YLL)	-160	-5188	-5295
Years of Life lived with Disability (YLD)	0	-2144	-2144
Disability Adjusted Life Years (DALYs)	-160	-7332	-7439

Source: Woodcock et al – Public health benefits of strategies to reduce greenhouse-gas emissions - :urban land transport – 2009 Lancet published online November 25, 2009

Evidence: physical activity and health linked to urban modal split

Factor	Studies finding improved outcomes	Studies finding worse outcomes
Use of different travel modes		
More active transport (walking, cycling)	Increased physical activity[88,185–197] Reduced BMI or obesity[35,109,118,148,188,199–205] Reduced air pollution-related effects[23] Improved quality of life or reported health status[167,183,206] Reductions in specific health problems[188,206] Lower mortality / higher life expectancy[36,37,207]	Increased stress and psychological distress[198] Increased road traffic injury[23]
More use of public transport	Increased walking, cycling or active transport[208] Increased physical activity[185,209,210] Reduced BMI or obesity[148,203,212] Reduced air pollution-related effects[70,213]	Increased air pollution-related effects[185] Increased risk of tuberculosis[211]
Lower car use, car ownership and traffic volumes	Increased walking, cycling or active transport[94,129,132,134,141–143,149,150,152,178,179,214–217] Increased physical activity[160,181,191,218] Reduced BMI or obesity[73,109,148,164,218–221] Improved reported health status[166] Reductions in specific health problems[222]	

Review of studies on urban travel mode, physical activity and health –

WHO/Health in Green Economy (forthcoming)

…and to mode of *infrastructure investment*

Infrastructure for different travel modes (including presence and proximity of infrastructure)		
More infrastructure facilitating walking (including general assessments of "walkability" of neighbourhoods as well as presence of specific features, e.g. pavements)	Increased walking, cycling or active transport[94,133,138,144,146,147,154,175,223–229] Increased physical activity[104,154,155,160,176,184,223,228,230–239] Reduced BMI or obesity[111,118,119,165,224,234,238–240] Reduced air pollution-related effects[234] Improved reported health status[224] Reductions in specific health problems[222,224] Lower mortality / higher life expectancy[47]	Less active transport[179]
More infrastructure facilitating cycling	Increased walking, cycling or active transport[94,136–139,141,144,171,175,241–243] Increased physical activity[27,104,157,159,161,184,244]	
More infrastructure facilitating public transport use	Increased walking, cycling or active transport[44,133,140,146] Increased physical activity[103,140,157,159,182] Reduced BMI or obesity[113,117] Reduced air pollution-related effects[246]	Less walking, cycling or active transport[89,94,150,152,179,245]
Less infrastructure facilitating car travel (including parking, motorways)	Increased walking, cycling or active transport[245,247] Reduced BMI or obesity[73]	

Review of studies on infrastructure investment, physical activity and health –

WHO/Health in Green Economy (forthcoming)

Health Dividends from Green Growth

Conclusion:

Much greater health gains from shifting to rapid transit/public transport walking and cycling

than from improving fuel and vehicle efficiency

Consider all costs and benefits of Green Growth strategies!

Health in the green economy

Co-benefits to health of climate change mitigation

TRANSPORT SECTOR *Preliminary findings – initial review*

Key messages

Health gains/risks

- **A shift to active transport (walking and cycling) and rapid transit/public transport combined with improved land use** can yield much greater immediate health "co-benefits" compared with improving fuel and vehicle efficiency, yet the latter has been the mitigation strategy most emphasized by the Intergovernmental Panel on Climate Change (IPCC).[1]
- **Potential health gains of a shift from private motorized transport to walking, cycling and rapid transit/public transport** include reduced respiratory and cardiovascular disease from air pollution and less exposure to traffic injury risks and noise stress. In addition, large benefits are expected from increased physical activity leading to the prevention of obesity, diabetes, heart disease and cancer, as well as greater health equity achieved by better access to goods and services among groups without private motor vehicles.[2–4]
- **Shifting from gasoline- to diesel-powered engines to lower CO_2 emissions could increase emissions of health-damaging small particulates (PM_{10}, $PM_{2.5}$) per unit of travel.**[5] IPCC's review of diesel technology's potential does not consider potential health impacts; yet large shifts to diesel fuels in European cities in the last decade are considered to be a cause of stable (not lower) PM_{10} levels in European cities in the last decade and no decline in the health impacts of air pollution – despite the introduction of cleaner diesel technologies.[6]
- **Transport-related health risks currently affect millions of people.** For example, urban air pollution (much of it transport-generated) and traffic injuries together kill about 2.5 million people every year, mostly in low- and middle-income countries. Active transport can help prevent the 3.2 million deaths annually attributable to physical inactivity.[7,8]

About Health in the Green Economy

Many strategies to reduce climate change have large, immediate health benefits. Others may pose health risks or tradeoffs. Examined systematically, a powerful new dimension of measures to address climate change emerges.

WHO's *Health in the Green Economy* series, to be published in spring 2011, is reviewing the evidence about expected health impacts of greenhouse gas mitigation strategies in light of mitigation options for key economic sectors considered in the *Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, 2007* (IPCC).[9]

The aim is to propose important health co-benefits for sector and health policy-makers, and for consideration in the next round of IPCC mitigation reviews (*Working Group III – Fifth Assessment Report* [AR5]). Opportunities for potential health and environment synergies are identified here for key economic sectors, including transport.

The climate footprint of transport

Global transport emissions comprised an estimated 23% of direct CO_2 emissions in 2008, with land transport accounting for the largest share (16%). Under "business as usual" scenarios, emissions are projected to rise rapidly in absolute terms.[1]

"Win-win" health and transport mitigation strategies

- **Health co-benefits (and potential risks) of transport mitigation strategies have not received systematic analysis,** as reflected in IPCC's Fourth Assessment Report on mitigation options for the transport sector.[1]
- **Improved active transport, rapid transit/public transport and land use strategies can be cost-effective in many settings, including rapidly developing cities.** For instance, relocating educational facilities in proportion to residential locations in Santiago, Chile, was estimated to potentially reduce transport emissions by 12% at a cost of only US$ 2 per ton of carbon reduction over 20 years.[10]

World Health Organization

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How much is reduced mortality from regular walking and cycling worth?