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


© Noralí Nayla / Unsplash

Prof. Sonja Kahlmeier, FFHS, Zurich Switzerland
WHO affiliate
For the HEAT coordinating team

ITF workshop
Assessing Health Impacts of Low Carbon Transport Scenarios in Urban Areas
21 March 2024, online

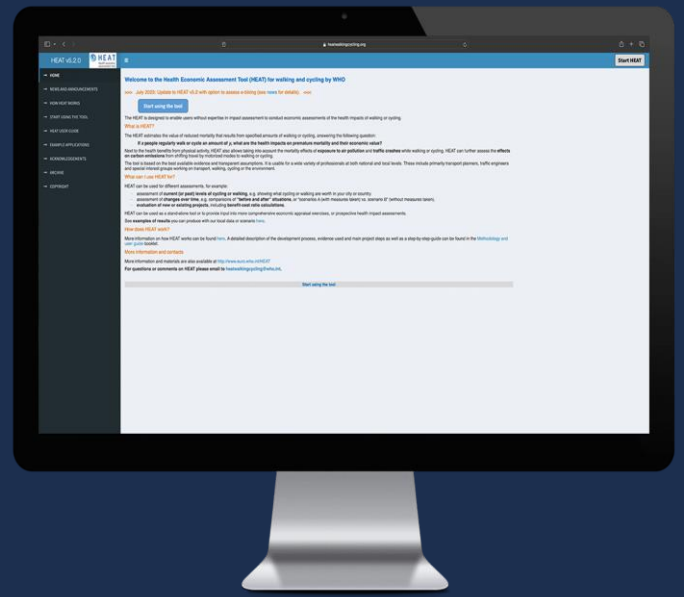
HEAT
Health economic assessment tool

Goal: promote physical activity through transport and urban appraisals and planning

- Need to make health benefits of cycling and walking "visible" to **transport and urban planners**
- Need to **speak their "language"**
- Importance of **economic analysis** in transport planning –
- In many countries, the benefit-cost ratio is essential
- Transport investment will only go ahead if the benefits are seen to outweigh the costs
- To do this, each 'side' of the equation needs to be valued

What is the HEAT?

- Online tool www.heatwalkingcycling.org
- Designed for transport planners and non-health experts
  - no in-depth health or economic expertise required
- Economic assessment of health benefits of walking or cycling
- Effects on mortality ‘only’
- Evidence-based



Worldwide use

- Project website visited by about 5,000 users per year
- Out of 13’000 sessions
  - 60% are one-time visitors
  - 10% are repeated users (more than 10 sessions)

frontiers | Frontiers in Sports and Active Living

Brief Research Report
26 May 2023

The Health Economic Assessment Tool (HEAT) for walking and cycling - experiences from 10 years of application of a health impact assessment tool in policy and practice

Sonja Kahlmeier, Nick Cavill, Meelan Thondoo, Harry Rutter, Thiago Herick de Sa, Francesca Racioppi and Thomas Gotschi

HEAT use in 2021 (Google Analytics)

Source: Front. Sports Act. Living, 26 May 2023
Volume 5 - 2023 | https://doi.org/10.3389/fspor.2023.1146761

HEAT – A collaborative project

Project coordinating team:
Francesca Racioppi, WHO Regional Office for Europe, Sonja Kahlmeier, Swiss Distance University of Applied Science (FFHS), Switzerland,
Thomas Götschi, University of Oregon, USA, Abraham Mwaura, WHO Headquarters

Project advisory and expert groups:
Karim Abu-Omar, Heba Adel Moh'd Safi, Yousaf Ali, Lars Bo Andersen, Hugh Ross Anderson, Nelzair Araujo Vianna, Alex Bigazzi, Olivier Bode, Tegan Boehmer, Jessica Bourne, Nils-Axel Braathen, Christian Brand, Hana Bruhova-Foltynova, Fiona Bull, Daniel Buss, Juan Castillo, Nick Cavill, Dushy Clarke, Andy Cope, Baas de Geus, Audrey de Nazelle, Thiago Herick de Sa, Ardine de Wit, Hywell Dinsdale, Damien Dussaux, Rune Elvik, Santiago Enriquez, Mark Fenton, Jonas Finger, Francesco Forastiere, Richard Fordham, Charlie Foster, Virginia Fuse, Eszter Füzeki, Aslak Fyhri, Rogerio Gama, Frank George, George Georgiadis, Regine Gerike, Eva Gleissenberger, Rahul Goel, Shifalika Goenka, Anna Goodman, Thomas Götschi, Maria Hagströmer, Mark Hamer, Yahaya Hassan Said, Holger Haubold, Eva Heinen, Thiago Herick de Sa, Marie-Eve Heroux, Max Herry, Gerard Hoek, Stefanie Holzwarth, Luc Int Panis, Nicole Iroz-Elardo, Luis Jorge Hernandez, Sonja Kahlmeier, Paul Kelly, Meleckidhesi Khayesi, Caryl Koinange, Michal Krzyzanowski, SM. Labib, I-Min Lee, Christoph Lieb, Jose Lobo, Mazen Malkawi, Brian Martin, Marco Martuzzi, Markus Maybach, Adriannah Mbandi, Guy Mbayo, Gabriel Michel, Irina Mincheva Kovacheva, Hanns Mooshammer, Pierpaolo Mudu, Carlos Muñoz Piña, Marie Murphy, Nanette Mutrie, Bhash Naidoo, Keiko Nakamura, Daisy Narayanan, Maria Neira, Amanda Ngabirano, Mark Nieuwenhuijsen, Åse Nossum, Pekka Oja, Edith Patouillard, Uttam Paudel, Genandrialine Peralta, Laura Perez, Ian Philips, Julie Powel, Francesca Racioppi, Hussain Rasheed, Lisa Robinson, Patrick Rérat, Amund Riiser, David Rojas Rueda, Gabe Rousseau, Candace Rutt, Harry Rutter, Randy Rzewnicki, Kjartan Saelensminde, Elin Sandberg, Alexander Santacreu, Andreia Santos, Parth Sarathi Mahapatra, Lucinda Saunders, Daniel Sauter, Shari Schaftlein, Peter Schantz, Tom Schmid, Peter Schnohr, Christoph Schreyer, Christian Schweizer, Nino Sharashidze, Heini Sommer, Jan Sørensen, Joe Spadaro, Gregor Starc, Dave Stone, Marko Tainio, Robert Thaler, Vo Thi Hue Man, Meelan Thondoo, Miles Tight, Sylvia Titze, Lan Wang, Miriam Weber, Wanda Wendel Vos, Paul Wilkinson, James Woodcock, Tian Xiangyang, Hou Xiaohui, Mulugeta Yilma, Masud Yunesian.

Development team: Tomasz Szreniawski, Thomas Götschi, Alberto Castro Fernandez, Vicki Copley, Ali Abbas, Duy Dao, Hywell Dinsdale

Expertise involved:

- Transport Economics
- Transport Planning
- Policy Making
- Practice / Advocacy
- Epidemiology /Public Health
- Environmental Science
- Air Pollution
- Health economics

HEAT “core principles”

Scientific robustness

Transparency

Approach and assumptions

Adaptable

Conservative

‘Smallest’ value chosen when there is a range

Usability

- Minimal data input requirements
- Availability of default values
- Clarity of prompts/questions
- Design and flow of the tool

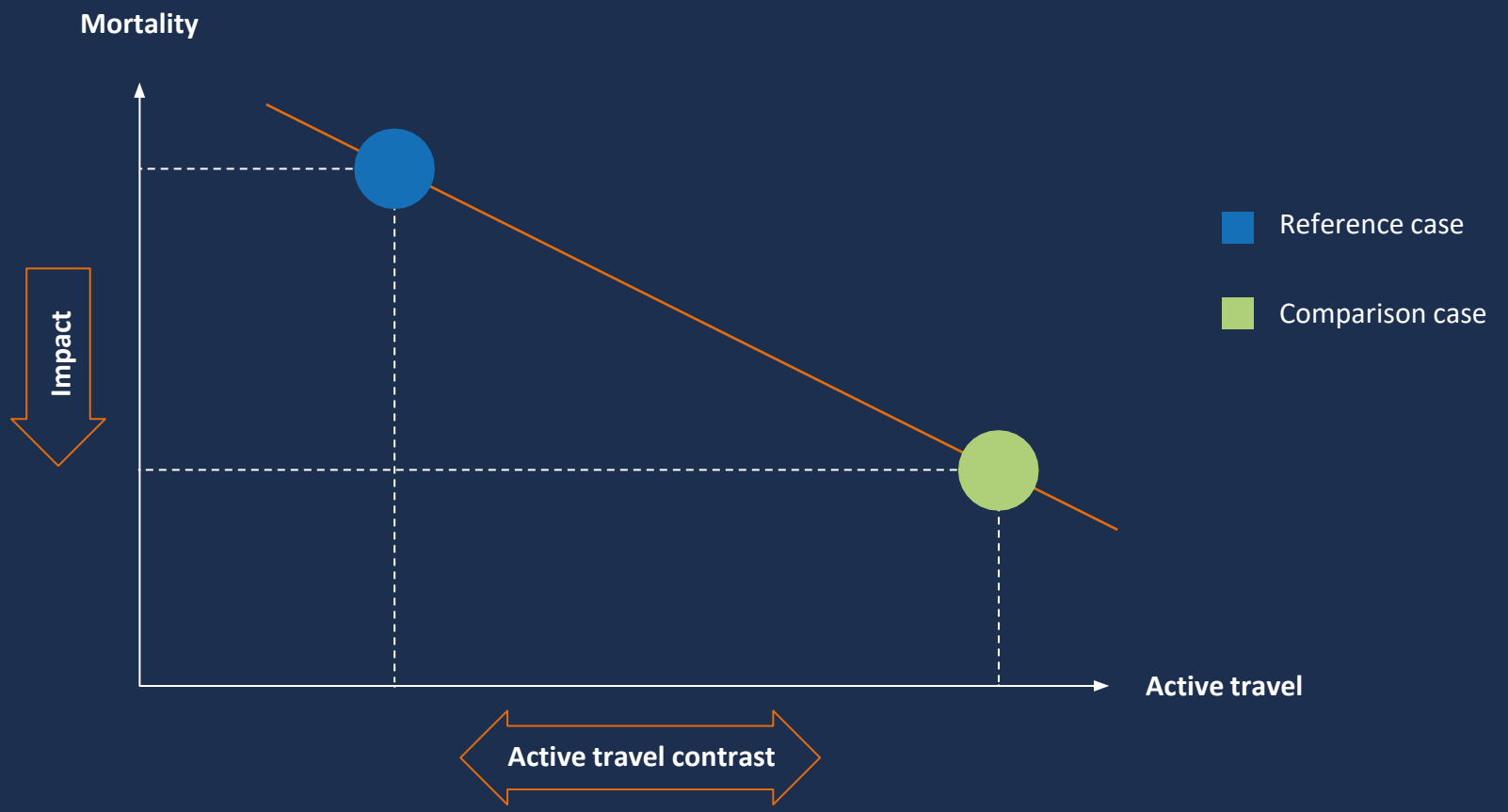
Modular

The HEAT question

If **x people walk or bike an amount** y on most days:

- What are the health impacts on mortality and their economic value as a result of:
  - **physical activity?**
  - exposure to air pollution (while walking or biking)?
  - risk of traffic crashes?
- What are the impacts on carbon emissions as a result of shifts from motorized modes to active travel?

Comparative risk assessment



What can HEAT be used for?

Assessing current (or past) levels of walking/cycling

- What is walking/cycling worth now in my city, region, country?

Assessing changes/differences in walking/cycling

- “before –after”, “scenario A vs. B”

Evaluating new or existing projects

- Value of health benefits/risks
- Relative to investments: benefit– cost ratios

Target audiences

- No in-depth health expertise required
- Main audiences are:
  - Transport planners
  - Civil servants
  - Staff supporting policy makers
  - Officers/experts locally responsible for transport and urban planning
  - Non-governmental organizations and advocates

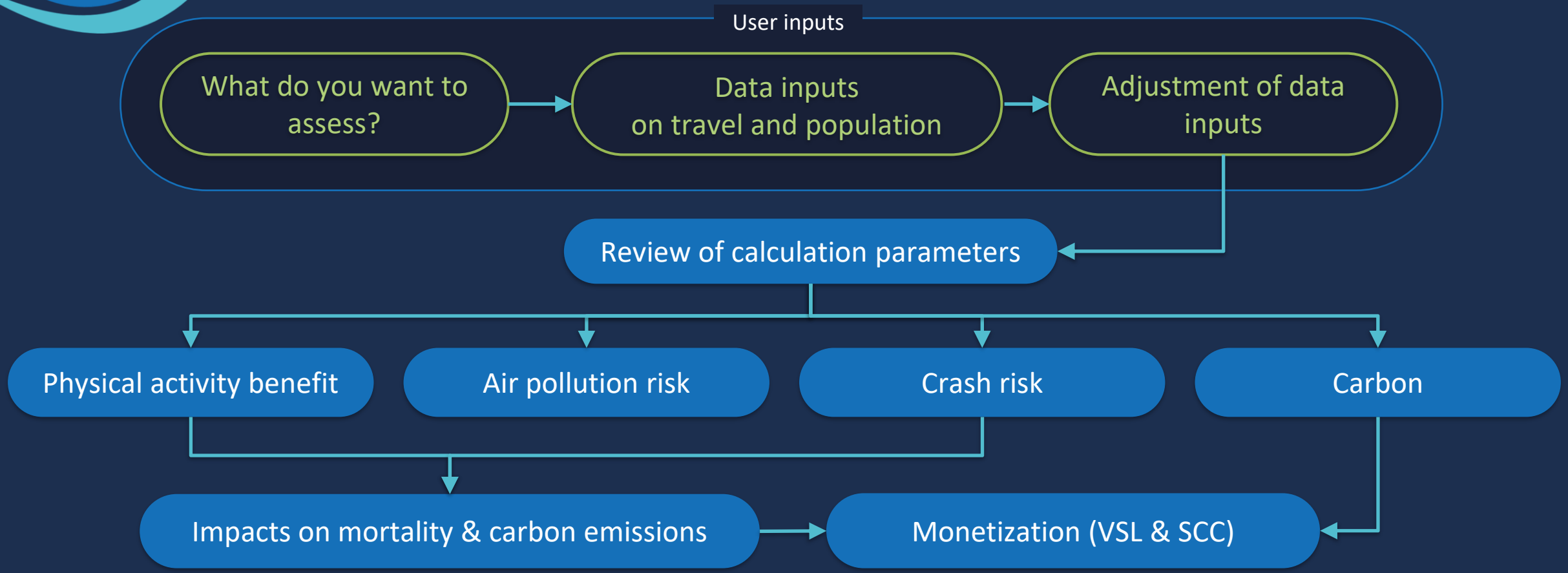
Data used by HEAT

Data provided by user
on travel and population assessed in local case study

Default parameters
provided by the tool, often modifiable

Background data
from public databases where available, otherwise provided by user

HEAT workflow



Statistical value of a life

- HEAT monetizes impacts on mortality (“premature deaths avoided”) with the “Value of Statistical Life” (VSL)
- VSL aggregates individuals’ willingness to pay to secure a marginal reduction in the risk of premature death
- VSL used by HEAT are based on a comprehensive review of VSL studies published by OECD (2012) and adjusted to local (country) values based on local economic parameters
- Users should adjust to local value, if available (e.g. used by local governmental agencies)

“Your assessment”

“Use case criteria” define data needs and assumptions:

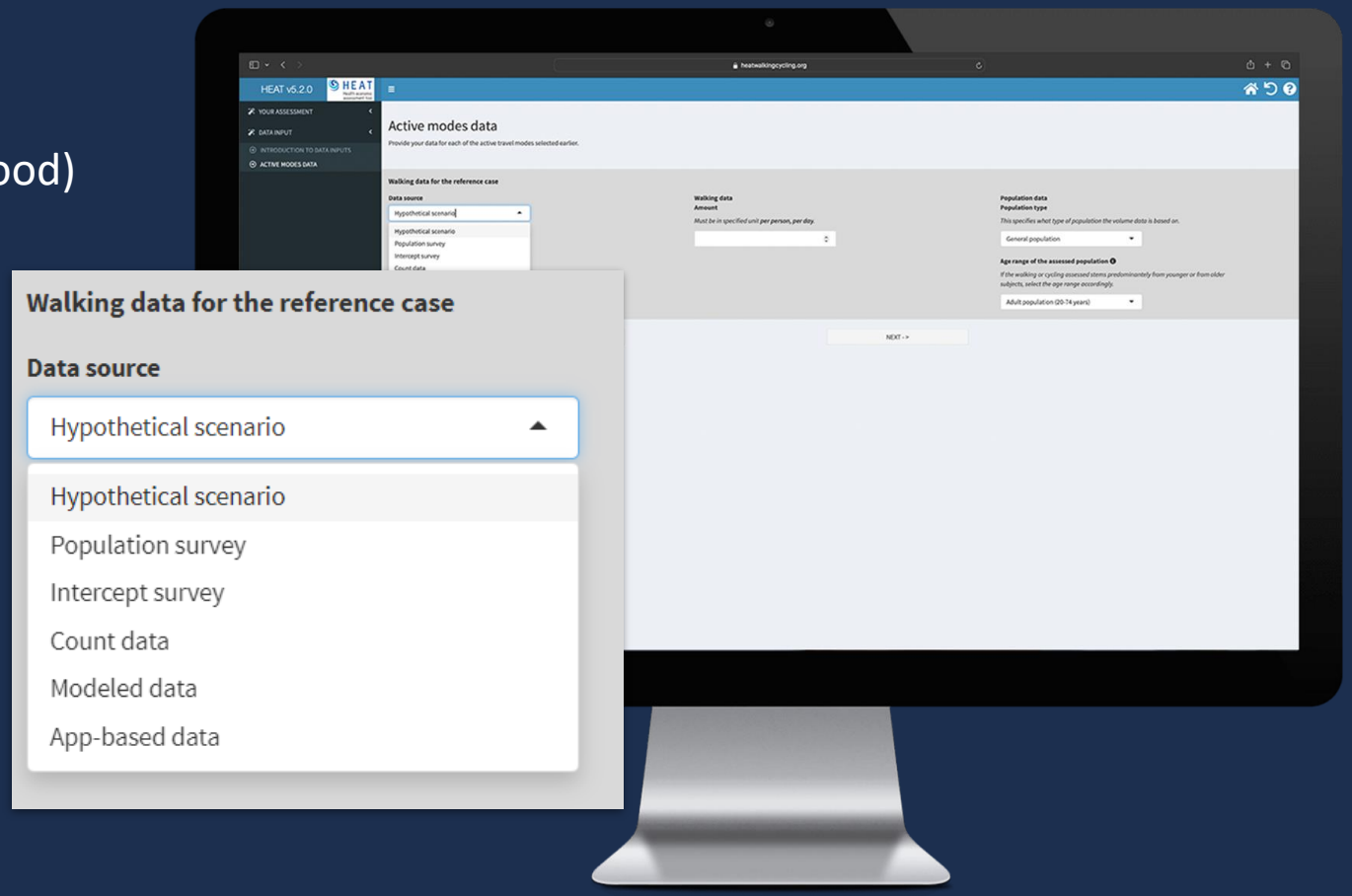
- Active travel modes
  - walking, cycling and/or e-biking
- Geographic scale
  - country, city
  - sub-city (project level)
- Comparison and time scale
  - single case vs. two cases
  - assessment time
- Impacts
  - physical activity, Air pollution, Crashes, carbon emissions
- Motorized modes data
  - if assessing carbon

Data inputs

- Key inputs: volume of walking/cycling
  - number of people (population size)
  - amount they walk and/or bike
- Several options to specify these
- If no data available, can use “hypothetical scenario”
- Later
  - several options for “data adjustments”

Data sources for walking/cycling

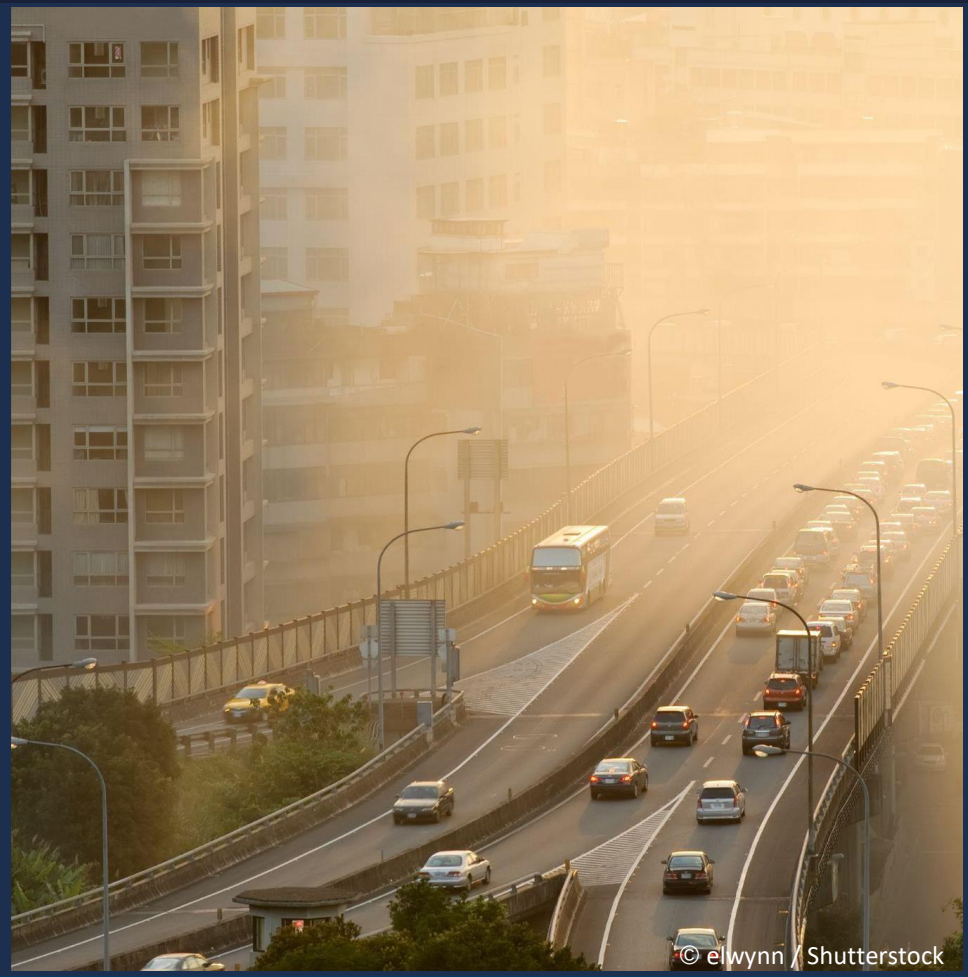
- Area-wide (country, city, neighborhood)
  - population survey
- Location-based (e.g. bike path)
  - count data
  - intercept survey
- Other
  - modeled data
  - app-based data



Air pollution concentration

Fine particulate matter: $PM_{2.5}$ (or PM_{10} x 0.6)

- Prefilled for countries and cities, if available
- If not available for city, country value is used
- User can overwrite



Air pollution assessment in active travelers

- Relative risk 1.08 (1.06–1.09) (Chen et al. 2020)
- Default PM2.5 values for city/country level from WHO databases
- Exposure: duration, mode of transport & ventilation rate
- Taking into account if active travel near/away from roads and for leisure or transport

- PA & air pollution modules in parallel
  - relative PA risk adjusted to what they would be if the physical activity studies had been conducted in non-polluted environments & AP exposure separately

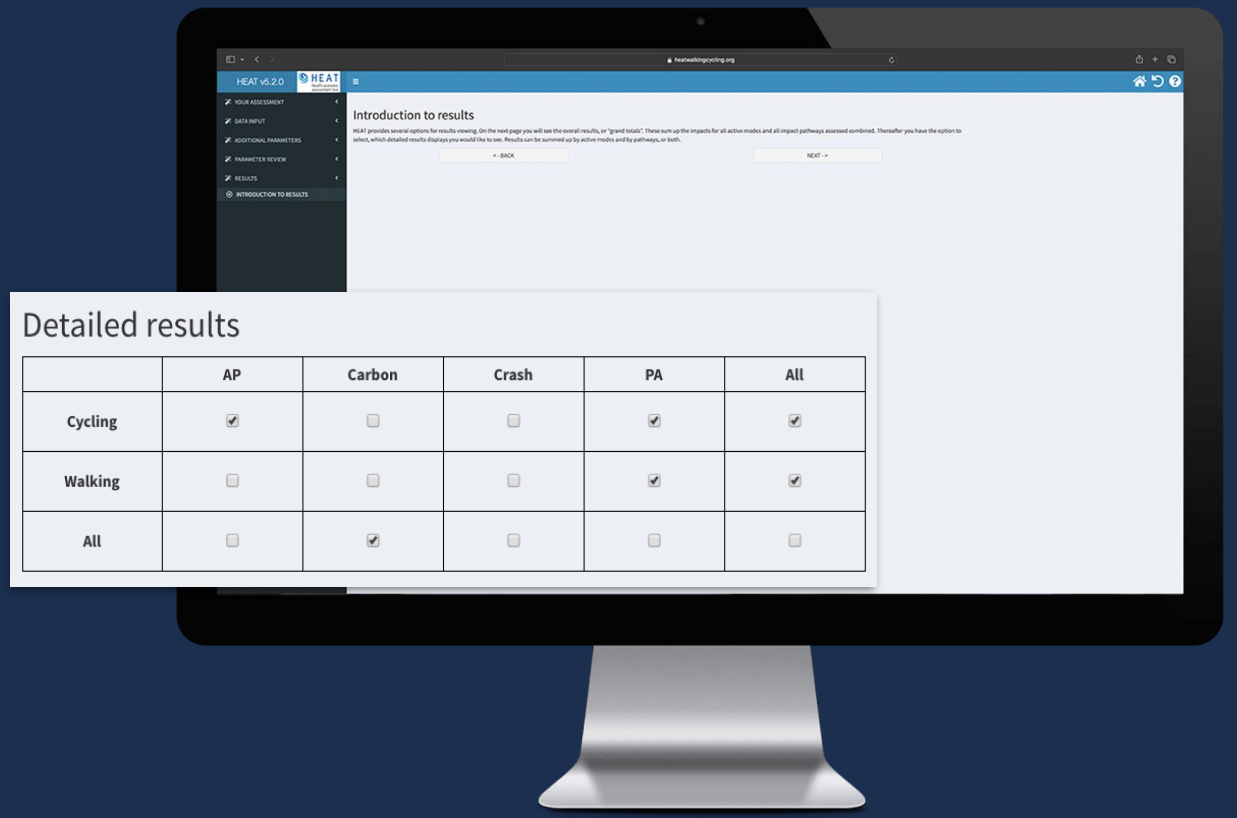
E.g. for cycling / e-biking:

- un-adjusted: RR = 0.903
- adjusted for air pollution: RR = 0.899

Source: Chen J et al. Long-term exposure to PM and all-cause and cause-specific mortality: A systematic review and meta-analysis. Environment International 2020 (143): 105974. https://doi.org/10.1016/j.envint.2020.105974

“Results”

- General results
  (grand totals: all modes and all pathways)
- Detailed results
  - mode specific (walking/cycling)
  - pathway specific
- Impacts
  - deaths prevented/caused
  - carbon emissions avoided/caused
- Economic value
  - monetized with VSL and SCC
  - cost-benefit ratio



Case study: Bikeways and Ciclovia in Bogotà, Colombia during COVID-19 pandemic

- **Type**: Impact analysis for 2020 vs. 2019 (physical activity)
- **Setting**: March 2020: start of strict lockdown with opening of 117 km of temporary bikeways (many on the Ciclovia corridors) and 550 km of existing bikeways
- **Data**: Surveys in Ciclovia users
- **Results** (2020):
  - Prevented premature deaths 145
  - Total gross benefit €164 Mio.
    (based on a VSL of €1.13 Mio)
  - Additional results e.g. safety and quality of life
- **Practical implications**:
  Data was used by the mobility secretariat to support the development of temporary bikeway

www.elespectador.com

Source: Wilches-Mogollon et al. Impact assessment of an active transport intervention via systems analytics. Transp Res Part D, 2024. https://doi.org/10.1016/j.trd.2024.104112

Case study: value of cycling in the Netherlands

- **Type**: Study
- **Setting**: Netherlands
- **Data**: Travel survey (2012)
  - 27% of all trips in the Netherlands by cycling
- **Results**

Premature deaths prevented	6500/year
Societal value (VSL)	€ 19 Bn.
Increased life expectancy in cyclists	6 months
Value as % of GDP	3%
Benefit cost ratio (investments of ca. €0.5 billion /year)	ca. 38 : 1

Source: Fishman et al. Quantifying the Health and Related Economic Benefits", American Journal of Public Health 105, no. 8 (August 1, 2015): pp. e13-e15

HEAT: key lessons learned

- Fostering HIA in transport remains a key approach, as contribution of walking and cycling to reaching policy goals is substantial
- HEAT is finding widespread use
- Key barrier: access to systematically collected data on walking and cycling
- Striving balance between usability and scientific robustness is often challenging
- Strategic communication, capacity building and dissemination remains a key task

Thank you!


© Norali Nayla/ Unsplash

Prof. Sonja Kahlmeier
kahlmeiers@who.int **sonja.kahlmeier@ffhs.ch**

https://www.heatwalkingcycling.org

HEAT
Health economic assessment tool