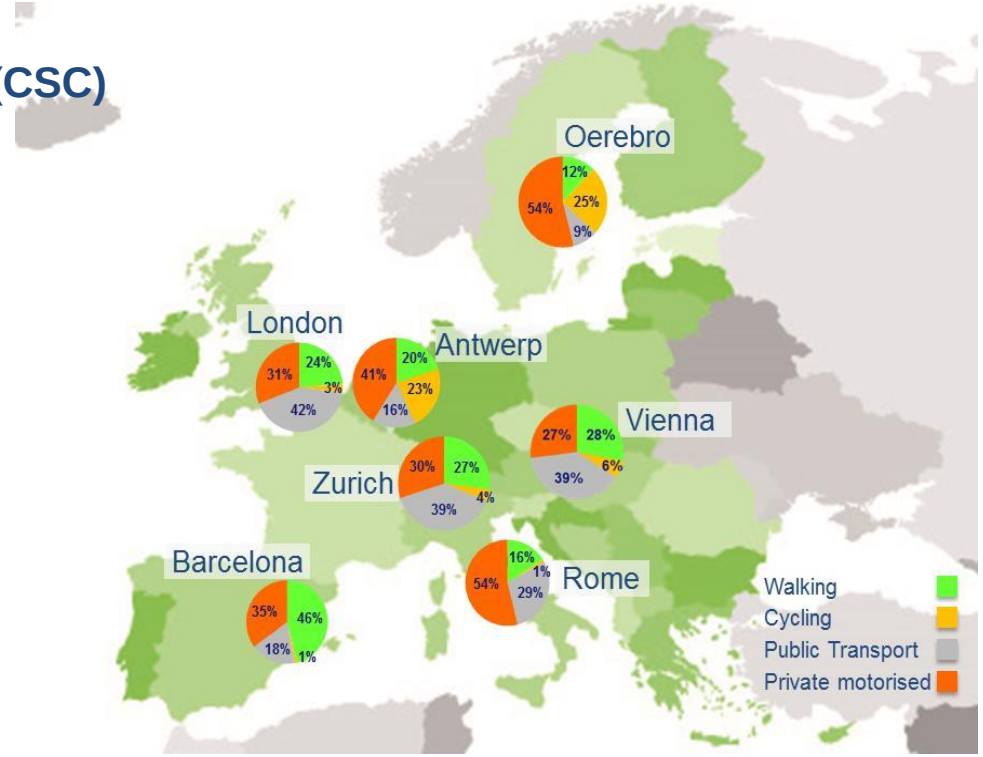

# Fietsen voor het klimaat: Hoe (on)gezond is dat ?

Evi Dons, Vias institute & UHasselt
Luc Int Panis, VITO & UHasselt

## Seven European Case Study Cities (CSC)

## Modal Split

1. Vienna
2. Zurich
3. Antwerp
4. Barcelona
5. Oerebro
6. Rome
7. London
   (Borough of Newham)



THE CONVERSATION
Academic rigour, journalistic flair



https://theconversation.com/cycling-is-ten-times-more-important-than-electric-cars-for-reaching-net-zero-cities-157163



# Cycling is ten times more important than electric cars for reaching net-zero cities

March 29, 2021 3.59pm BST

# Vergelijking van fietsers en niet-fietsers

Gegevens van 4000 mensen in 7 steden
> 10000 dagen met gedetailleerde gegevens over verplaatsingen

Fietsers hebben $CO_2$ emissies die 84% lager liggen dan niet-fietsers !

Een trip met de fiets heeft 30 keer lagere $CO_2$ emissies dan een trip met de auto
(incl. brandstof, aanmaak en transport van materialen, constructie voertuig & wegen,…)

Een trip met de fiets heeft 10 keer lagere $CO_2$ emissies dan een trip met een (kleine) elektrische auto.

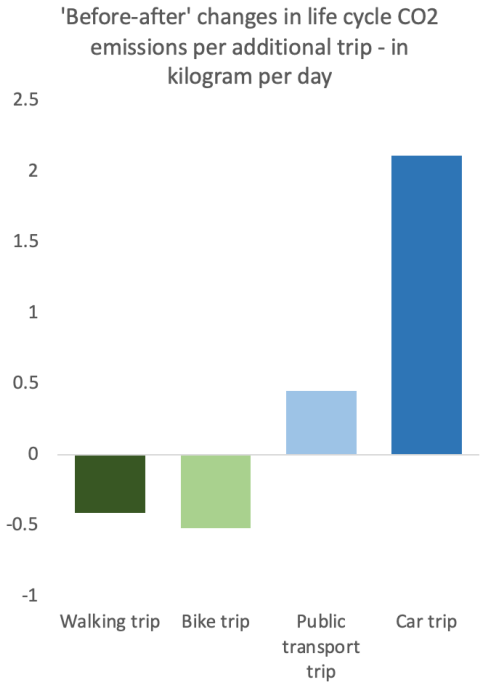
# Wat als we niet-fietsers op de fiets kunnen krijgen?

Gegevens van 4000 mensen in 7 steden >2 jaar opgevolgd
Wat gebeurt er als mensen hun gedrag wijzigen?

Meer fietsen:

- ➢Meer fysieke activiteit
- ➢Maar ook minder gemotoriseerde verplaatsingen

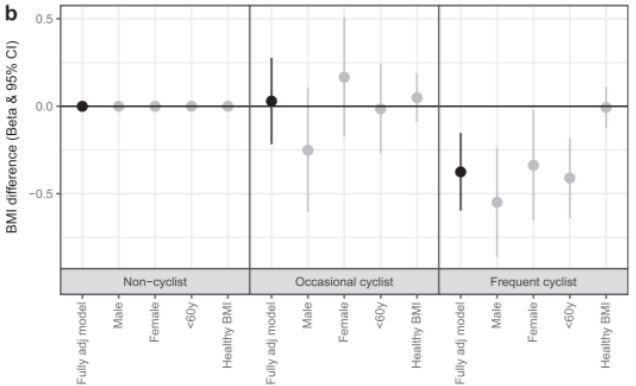
Wie 1 dag per week de fiets neemt ipv de auto, vermindert zijn/haar $CO_2$ footprint met 3,2kg $CO_2$/dag.

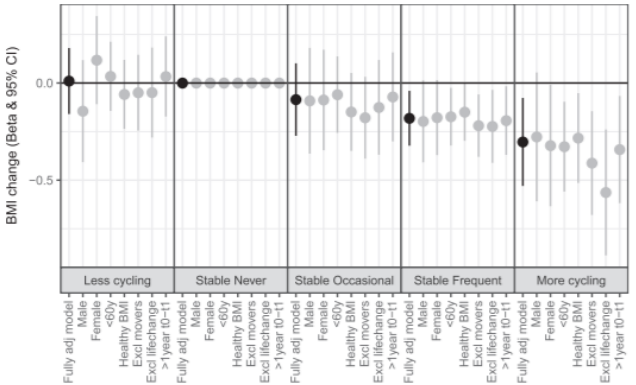


PHYSICAL ACTIVITY THROUGH SUSTAINABLE TRANSPORT APPROACHES

**Hoe krijgen we mensen op de fiets?**

# Fietsen is… goed voor de lijn




Environment International 119 (2018) 109–116

Contents lists available at ScienceDirect

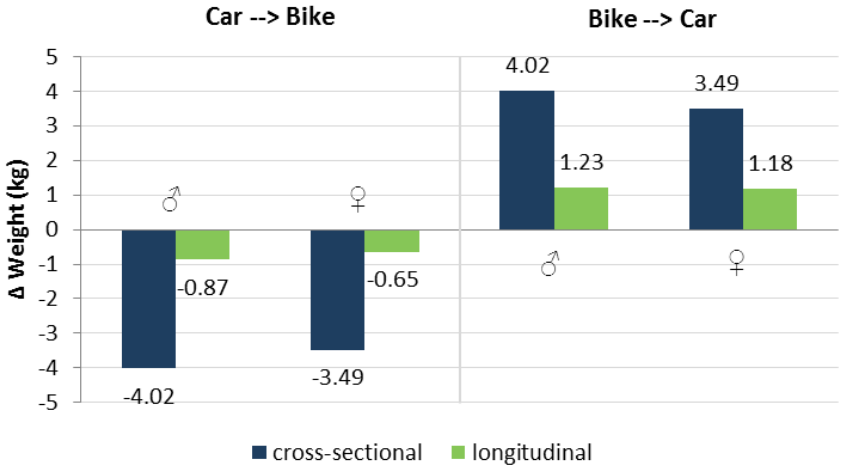
Environment International

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

## Transport mode choice and body mass index: Cross-sectional and longitudinal evidence from a European-wide study

Evi Dons[a,b,*], David Rojas-Rueda[c,d,e], Esther Anaya-Boig[f], Ione Avila-Palencia[c,d,e], Christian Brand[g], Tom Cole-Hunter[c,d,e,h], Audrey de Nazelle[f], Ulf Eriksson[i], Mailin Gaupp-Berghausen[j], Regine Gerike[k], Sonja Kahlmeier[j], Michelle Laeremans[b,m], Natalie Mueller[c,d,e], Tim Nawrot[a,n], Mark J. Nieuwenhuijsen[c,d,e], Juan Pablo Orjuela[f], Francesca Racioppi[o], Elisabeth Raser[j], Arnout Standaert[b], Luc Int Panis[b,m], Thomas Götschi[l]

# Fietsen is… goed voor de lijn



PASTA

PHYSICAL ACTIVITY THROUGH SUSTAINABLE TRANSPORT APPROACHES

sporza. nu 9°C 58km file Nieuwsombuds

vrt NWS Hoofdpunten Regio Kijk Luister

Binnenland

## Fietser gemiddeld 4 kilogram lichter dan automobilist

Belga
wo 10 aug 2016 17:12

Wie regelmatig fietst, weegt gemiddeld vier kilogram minder dan wie vooral de auto neemt. Dat blijkt uit een onderzoek in zeven verschillende Europese steden, waaronder ook Antwerpen. Ook VITO, de Vlaamse Instelling voor Technologisch Onderzoek, werkte mee aan het onderzoek.

HLN NIEUWS SPORT SHOWBIZZ NINA IN DE BUURT VIDEO FUN

BINNENLAND BUITENLAND VTM NIEUWS

© thinkstock

DeMorgen.

POLITIEK | BETER LEVEN | TV & CULTUUR | VOOR U UITGELEGD |

# Fietsers gemiddeld 4 kg slanker dan automobilisten


# Fietsers gemiddeld 4 kg slanker dan automobilisten


**Mensen die regelmatig de fiets nemen, wegen gemiddeld vier kilogram minder dan mensen die vooral de auto nemen om zich te verplaatsen. Dat blijkt uit een onderzoek dat gevoerd werd in zeven verschillende Europese steden, waaronder Antwerpen. Ook VITO (Vlaamse Instelling voor Technologisch Onderzoek) is betrokken bij het onderzoek.**

PHYSICAL ACTIVITY THROUGH SUSTAINABLE TRANSPORT APPROACHES

**Hoe krijgen we mensen op de fiets?**

# Fietsen is goed voor de mentale gezondheid

Environment International 120 (2018) 199–206

Contents lists available at ScienceDirect

Environment International

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

The effects of transport mode use on self-perceived health, mental health, and social contact measures: A cross-sectional and longitudinal study

Ione Avila-Palencia[a,b,c], Luc Int Panis[d,e], Evi Dons[d,f], Mailin Gaupp-Berghausen[g], Elisabeth Raser[g], Thomas Götschi[h], Regine Gerike[i], Christian Brand[j], Audrey de Nazelle[k], Juan Pablo Orjuela[k], Esther Anaya-Boig[k], Erik Stigell[l], Sonja Kahlmeier[h], Francesco Iacorossi[m], Mark J. Nieuwenhuijsen[a,b,c,*]

Bicycling BIKES & GEAR TRAINING NEWS SUBSCRIBE FOLLOW

## Cycling Is One of the Best Activities You Can Do to Banish a Bad Day

INDOOR OR OUTDOOR CYCLING RANKED CLOSE TO THE TOP FOR BEATING STRESS, DEPRESSION, AND POOR MENTAL HEALTH DAYS

EDITION CA HUFFPOST

NEWS POLITICS BUSINESS LIVING PARENTS VIDEO

LIVING 08/15/2018 10:45 EDT | Updated 08/15/2018 13:59 EDT

## Biking To Work Is The Healthiest Commute: Study

Get that bike tuned up!

Relaxnews

You could be this happy biking to work too!

Cycling to work provides the greatest overall health benefits compared to other modes of urban transport, according to a new European study.

Led by the Barcelona Institute for Global Health (ISGlobal), a centre supported by the "la Caixa" Banking Foundation, the new study gathered data taken from the Physical Activity through Sustainable Transport Approaches (PASTA) longitudinal study, conducted over a period of two years in seven European cities.

TIMESONLINE

OUGH
ACHES

NEWS | COMMENT | BUSINESS | MONEY | SPORT | LIFE | TRAVEL | DRIVING

UK NEWS | WORLD NEWS | POLITICS | SCIENCE | ENVIRONMENT | WEATHER | TECH

Where am I? › Home › News › Environment

From The Sunday Times

May 30, 2010

# Toxic cities mock 'healthy' cycle riding

Jonathan Leake, Environment Editor

17 CO

CYCLING
the health
has show
cities inh
toxic nan
breath, at
than drive

The resea
cyclists v
count the
emitted b
air they w

TIMES RECOMME

luchtve

dS De Standaard

# Naar school wandelen of fietsen is ongezond

28/08/2018 om 09:34 door bbd

Foto: Pol De Wilde - Corelio

**Op weg naar school krijgen kinderen – zowel te voet als op de fiets of in de auto – een giftige cocktail binnen van onder meer fijn stof, die**

# Cyklister inhalerer mest i den partikelfyldte storbyluft

g

Cyklister indånder giftige nanopartikler i større omfang end fodgængere og bilister, viser en ny undersøgelse.


De Plantin en Moretuslei scoort in Antwerpen volgens Test-Aankoop het slechtst op gebied van roetdeeltjes in de lucht.
Foto: Jan Van der Perre

VIJF TOT NEGEN KEER MEER

Fietsers ader
in

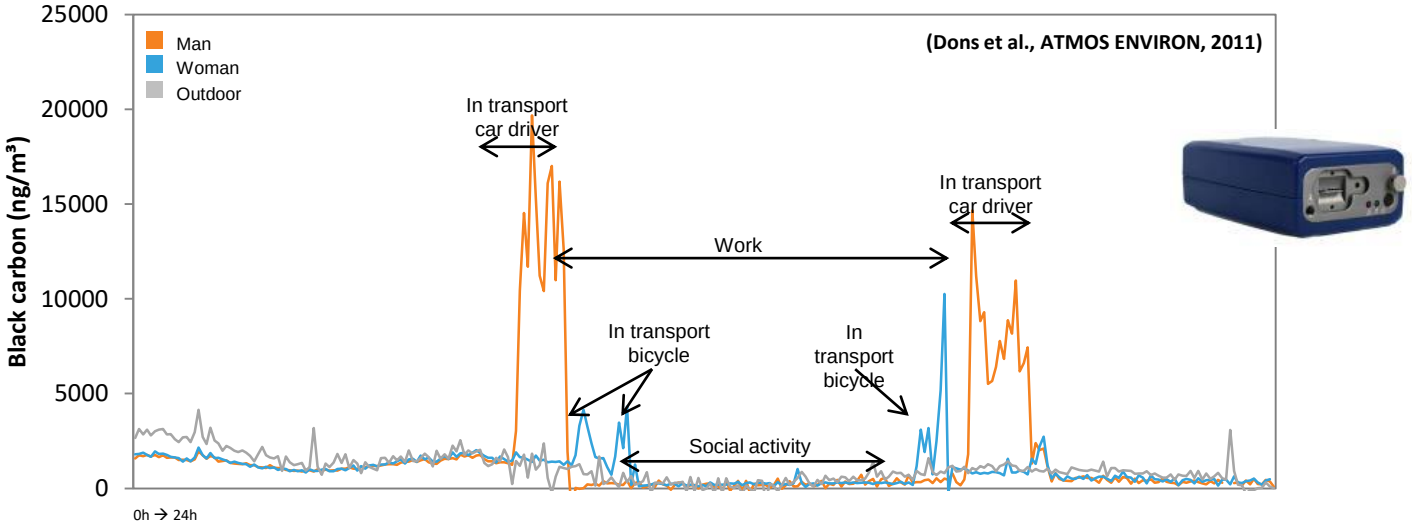
maandag 31 mei 2010 TomLeBac

johan van cutsem

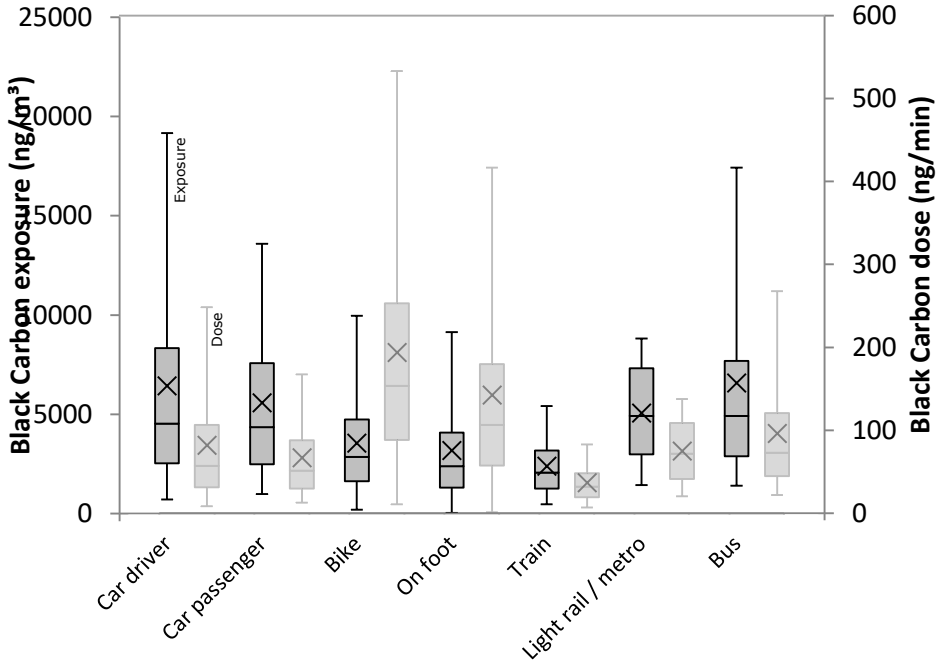
# Fietsen tijdens spitsuur ongezond, Plantin en Moretuslei scoort slechtst

ademt vijf tot negen keer meer fijn stof in dan wie met de auto gaat. 'Fietsers kiezen het best voor rustige wegen en blijven beter zo ver mogelijk weg van het drukke verkeer', zegt onderzoeker Luc IntPanis.

# Fietsers zijn blootgesteld aan hogere concentraties luchtvervuiling



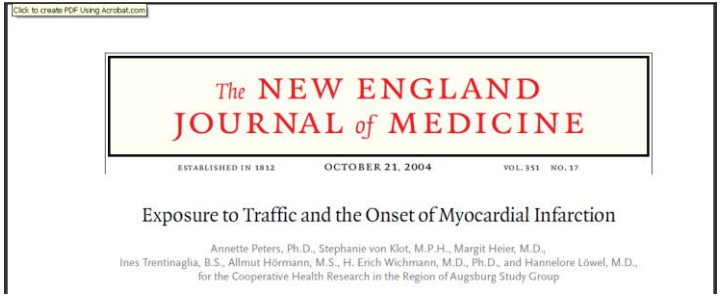
# Fietsers ademen de hoogste dosis aan luchtvervuiling in






Source: Dons et al 2011
https://www.researchgate.net/publication/232070900_Personal_exposure_to_Black_Carbon_in_transport_microenvironments

# Hoger *gezondheids*risico voor fietsers?






**SENSITIVITY ANALYSES**

We used sensitivity analyses to assess whether the [illegible] the selection of the control pe- [illegible] ared the results of the different [illegible] ith the results of the final mod- [illegible] A). The estimate was slightly [illegible] vity analysis (Table 3, models B and C) than in the main analysis. Slightly smaller estimates were observed when only one control exposure 24 hours before the onset was included in the analysis (Table 3, model D). The equivalent of model D was the analysis of discordant pairs with the use of McNemar's test. The odds ratio of 2.86 was derived by dividing 60 cases (of exposure to traffic during the case period but not during the control period) by 21 cases (of exposure to traffic during the control period but not during the case period) (P<0.001). The estimated odds ratios were slightly larger if the case–crossover analyses made use of three control periods that were matched with the case period for time of day (Table 3, models E and F).

The patients' differential recall of their activities before the onset of the myocardial infarction was a major concern. Information on exposure to traffic for the period from 0 (the onset of myocardial infarction) to −23 hours was available for 99 percent of the subjects, for −24 to −47 hours for 94 percent, for −48 to −71 hours for 82 percent, and for −72 to −95 hours for 38 percent. To assess the potential for recall bias within the data, we conducted analyses within the nonrisk periods defined a priori. We selected case periods and control periods from the 24 to 96 hours before onset (Table 3, models G

Table 2. Odds Ratios for the Onset of Myocardial Infarction (MI) after Time Spent in Traffic, According to the Means of Transportation.*

| Type of Transportation and Hours before MI | No. of Subjects | Frequency of Exposure in Case Period on Day of MI (%) | Odds Ratio (95% CI) | P Value |
|---|---|---|---|---|
| Any means of transportation† | | | | |
| Concurrent | 585 | 8.0 | 1.50 (1.07–2.09) | 0.02 |
| 1 hr | 625 | 12.1 | 2.92 (2.22–3.83) | <0.001 |
| 2 hr | 634 | 8.9 | 2.01 (1.49–2.72) | <0.001 |
| 3 hr | 635 | 5.5 | 1.15 (0.79–1.66) | 0.47 |
| 4 hr | 638 | 5.6 | 1.27 (0.89–1.83) | 0.19 |
| 5 hr | 639 | 6.8 | 1.64 (1.17–2.30) | 0.004 |
| 6 hr | 640 | 6.1 | 1.34 (0.93–1.92) | 0.11 |
| Cars | | | | |
| Concurrent | 585 | 5.6 | 1.33 (0.90–1.99) | 0.15 |
| 1 hr | 625 | 8.3 | 2.60 (1.89–3.57) | <0.001 |
| 2 hr | 634 | 6.5 | 1.94 (1.37–2.76) | <0.001 |
| 3 hr | 635 | 4.2 | 1.16 (0.76–1.78) | 0.49 |
| 4 hr | 638 | 4.0 | 1.21 (0.79–1.86) | 0.38 |
| 5 hr | 639 | 5.3 | 1.73 (1.19–2.54) | 0.005 |
| 6 hr | 640 | 5.0 | 1.55 (1.04–2.30) | 0.03 |
| Bicycles | | | | |
| Concurrent | 585 | 1.8 | 2.59 (1.27–5.29) | 0.009 |
| 1 hr | 625 | 2.4 | 3.94 (2.14–7.24) | <0.001 |
| 2 hr | 634 | 1.6 | 2.70 (1.37–5.33) | 0.004 |
| 3 hr | 635 | 1.0 | 1.66 (0.74–3.74) | 0.22 |
| 4 hr | 638 | 0.7 | 1.16 (0.45–2.96) | 0.76 |
| 5 hr | 639 | 0.9 | 1.49 (0.63–3.54) | 0.37 |
| 6 hr | 640 | 0.7 | 1.02 (0.36–2.87) | 0.97 |
| Public transportation | | | | |

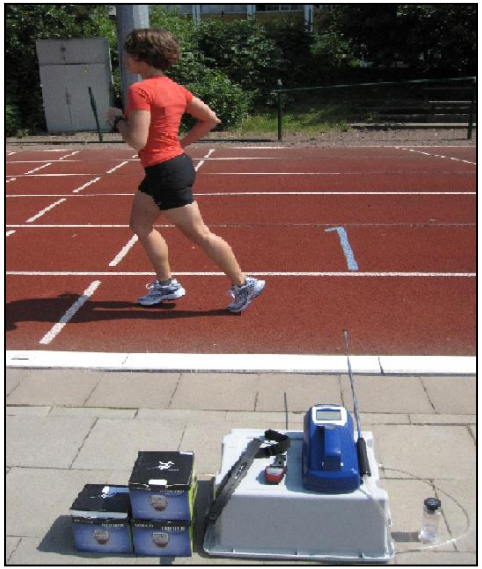
# Start to Run experiment

Effecten van aërobe training
in een stedelijke en een landelijke omgeving
op cognitie, inflammatie & serum BDNF gehalte

Gezonde inactieve vrijwilligers
12 weken Start-2-Run (S2R)
3 sessies/week
UFP- contrast

- S2R in Brussel (n=21)
- S2R in Mol (n=13)

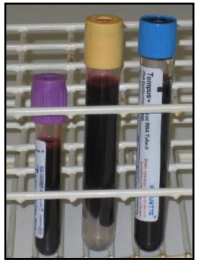
Biologische effectmeting voor & na S2R



# Biologische effectmeting

## Bloedafnames

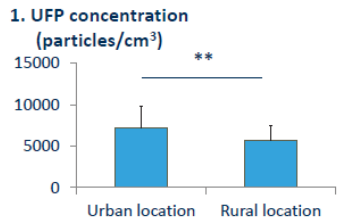
Totale + differentiële leukocyten telling
Serum BDNF gehalte
Genexpressie-profiel witte bloedcellen

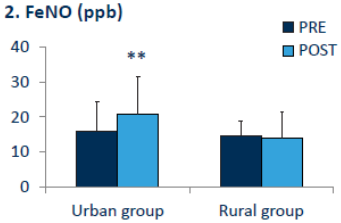


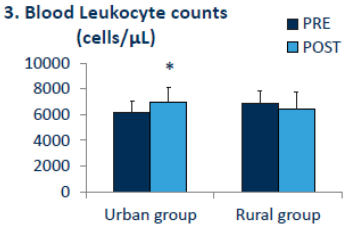
## Cognitieve testen

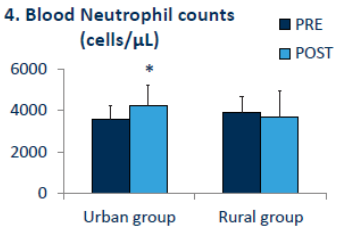
## eNO meting

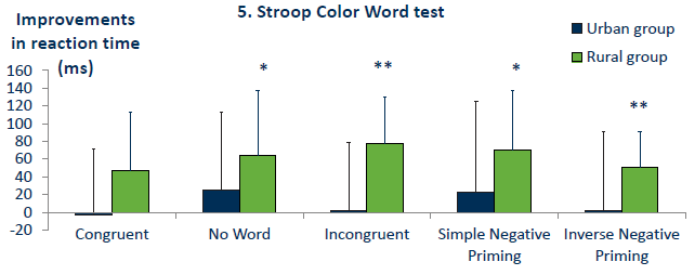
# Resultaten Start-2-Run






https://www.researchgate.net/publication/232277608_Subclinical_Effects_of_Aerobic_Training_in_Urban_Environment

## Conclusie: geen belangrijke effecten gevonden

# Jogging outside could make you stupid - and more likely to suffer mental health problems

- Exercising in busy, traffic-filled areas could actually cause mental decline
- City joggers' brains less able to store new knowledge
- And have higher levels inflammation, linked to mental decline

By ANNA HODGEKISS

**PUBLISHED:** 10:35 GMT, 11 December 2012 | **UPDATED:** 10:38 GMT, 11 December 2012

# Wandelen in Oxford street *vs* Hyde park: Effecten op longen van astmatici

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

## Respiratory Effects of Exposure to Diesel Traffic in Persons with Asthma

James McCreanor, M.R.C.P., Paul Cullinan, M.D., Mark J. Nieuwenhuijsen, Ph.D., James Stewart-Evans, M.Sc., Eleni Malliarou, M.Sc., Lars Jarup, Ph.D., Robert Harrington, M.S., Magnus Svartengren, M.D., In-Kyu Han, M.P.H., Pamela Ohman-Strickland, Ph.D., Kian Fan Chung, M.D., and Junfeng Zhang, Ph.D.

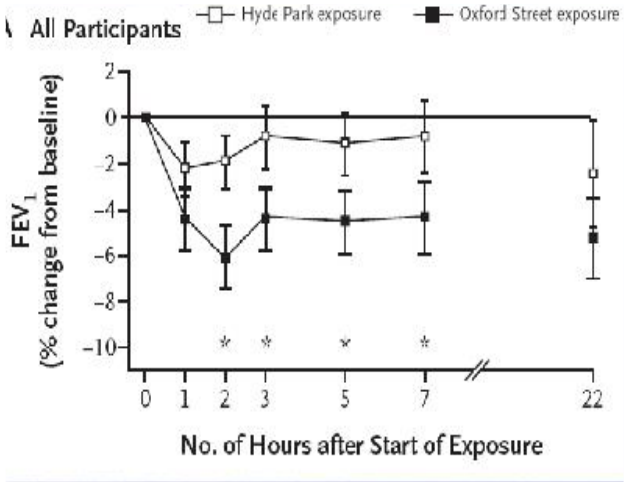
ABSTRACT

BACKGROUND

Air pollution from road traffic is a serious health hazard, and people with preexisting respiratory disease may be at increased risk. We investigated the effects of short-term exposure to diesel traffic in people with asthma in an urban, roadside environment.

METHODS

We recruited 60 adults with either mild or moderate asthma to participate in a randomized, crossover study. Each participant walked for 2 hours along a London street (Oxford Street) and, on a separate occasion, through a nearby park (Hyde Park). We performed detailed real-time exposure, physiological, and immunologic measurements.






McCreanor et al. New Engl J Med. 2007

# Continue monitoring van lichaamsbeweging en luchtvervuiling

Fysieke activiteit

Luchtvervuiling

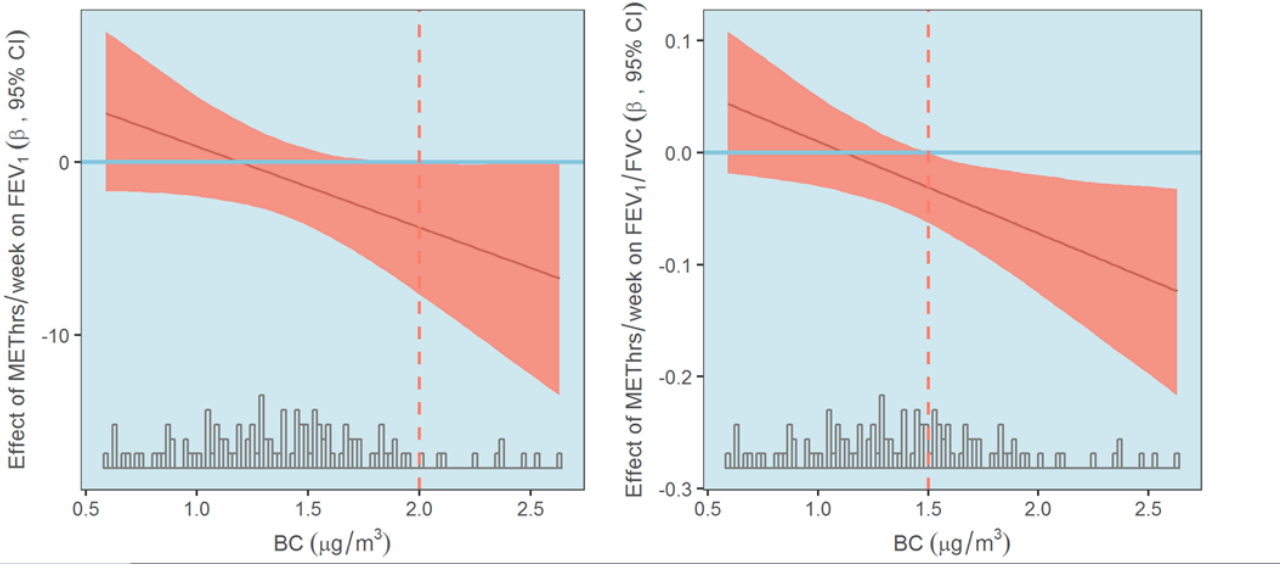
SenseWear armband:
meten van fysieke activiteit

microAethalometer:
een draagbaar toestel voor het meten van black carbon (dieselroet)

# Dagelijkse activiteiten en luchtvervuiling

Geen directe fysiologische veranderingen oiv luchtvervuiling

Het gunstige effect van lichaamsbeweging neemt af bij hogere concentraties black carbon

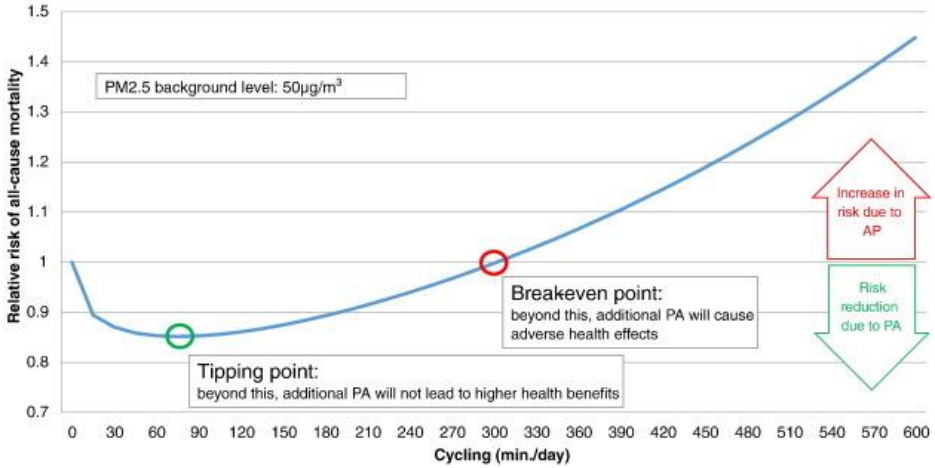





Bron: https://doi.org/10.1249/MSS.0000000000001632

**Is fietsen nu gezond?**

# Overal in België kan je gezond fietsen



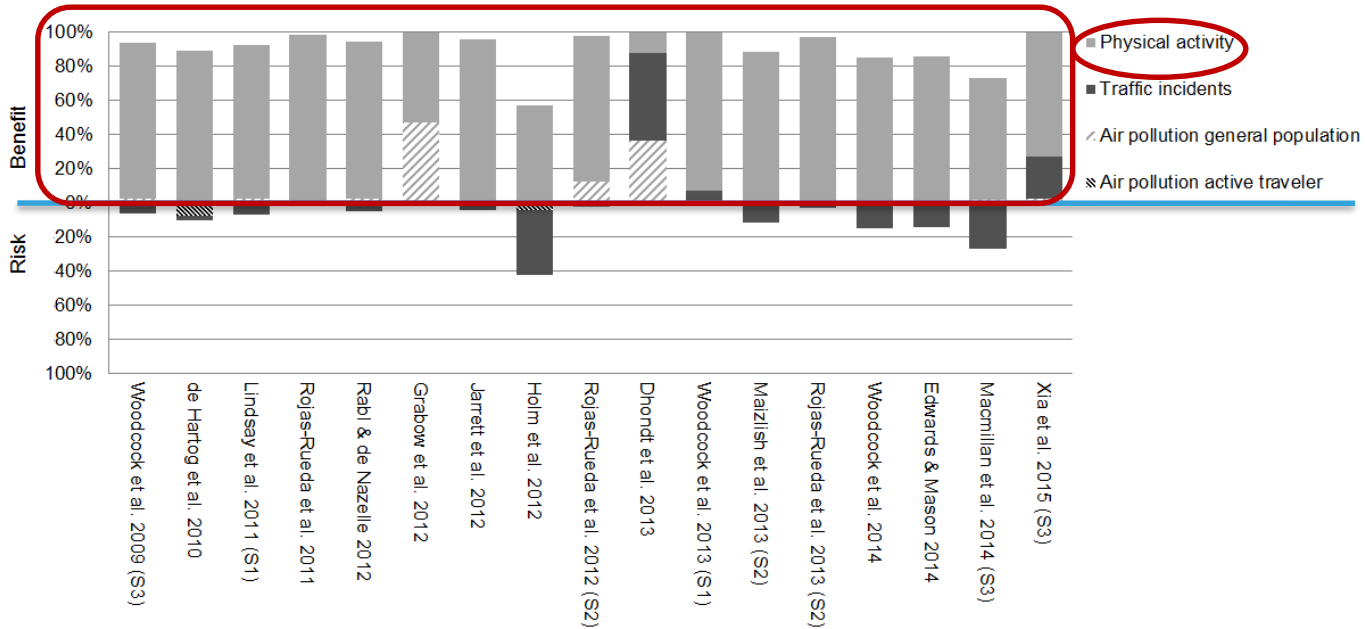

| City/Town means | | PM2.5 | Cycling |
|---|---|---|---|
| Country | City/Town | Annual mean, ug/m3 | Tipping point (h/day) |
| Belgium | AARSCHOT | 16 | 12,5 |
| Belgium | ANDENNE | 13 | «null» |
| Belgium | ANTWERPEN | 17 | 11,25 |
| Belgium | BERENDRECHT | 17 | 11,25 |
| Belgium | BERTRIX | 10 | «null» |
| Belgium | BOOM | 17 | 11,25 |
| Belgium | BRUGGE | 17 | 11,25 |
| Belgium | BRUSSELS | 18 | 10 |
| Belgium | CHARLEROI | 15 | 14,25 |
| Belgium | CHATELET | 14 | «null» |
| Belgium | CORROY LE GRAND | 15 | 14,25 |
| Belgium | DESSEL | 15 | 14,25 |
| Belgium | DESTELBERGEN | 17 | 11,25 |
| Belgium | ENGIS | 17 | 11,25 |
| Belgium | EVERGEM | 19 | 9 |
| Belgium | GENK | 18 | 10 |
| Belgium | GENT | 19 | 9 |
| Belgium | HABAY LA NEUVE | 11 | «null» |
| Belgium | HASSELT | 18 | 10 |
| Belgium | HERSTAL | 13 | «null» |
| Belgium | HOBOKEN | 19 | 9 |
| Belgium | HOEVENEN | 18 | 10 |
| Belgium | LANDEN | 15 | 14,25 |
| Belgium | LIEGE | 15 | 14,25 |
| Belgium | MECHELEN | 17 | 11,25 |
| Belgium | MENEN | 18 | 10 |
| Belgium | MOERKERKE | 16 | 12,5 |
| Belgium | MONS | 16 | 12,5 |
| Belgium | OOSTROZEBEKE | 21 | 7,5 |
| Belgium | RETIE | 15 | 14,25 |
| Belgium | ROESELAERE | 19 | 9 |
| Belgium | SAINTE-ODE | 9 | «null» |
| Belgium | SERAING | 16 | 12,5 |
| Belgium | SOMME-LEUZE | 11 | «null» |
| Belgium | STEENOKKERZEEL | 17 | 11,25 |
| Belgium | TOURNAI | 14 | «null» |
| Belgium | VEURNE | 16 | 12,5 |
| Belgium | VIELSALM | 9 | «null» |
| Belgium | VILVOORDE | 18 | 10 |
| Belgium | VIROINVAL | 10 | «null» |
| Belgium | ZELZATE | 20 | 8 |
| Belgium | ZWEVEGEM | 18 | 10 |
| Belgium | ZWIJNDRECHT | 20 | 8 |

Bron: Tainio et al. Personal communication, 2017



Is urban cycling worth the risk (FT)
https://ig.ft.com/sites/urban-cycling/

# Alle studies vinden dat fietsen altijd gezonder is dan niet fietsen






MUELLER et al. 2015. Health impact assessment of active transportation: A systematic review. *Prev Med,* 76, 103-14.

**Uit de wetensch. literatuur blijkt dat fietsen gezonder is dan niet fietsen.**

## Luchtvervuiling

Blootstelling kan gedurende korte tijd heel hoog zijn
Er zijn fysiologische veranderingen waar te nemen

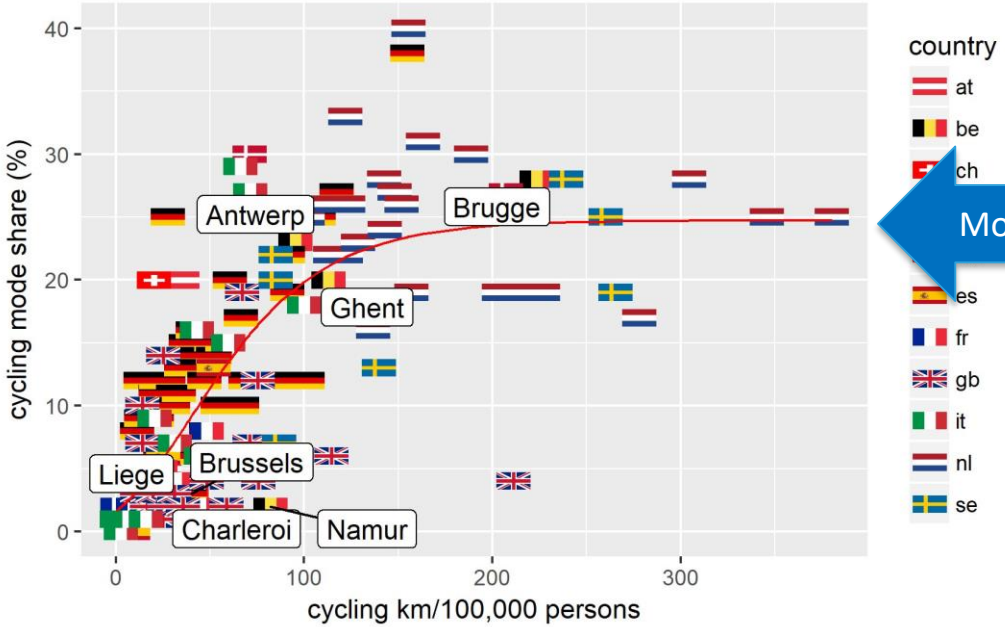
- Wetenschappelijk interessant
- Mogelijk negatieve gezondheidseffecten op langere termijn

⇒ Beleid gericht op reductie van blootstelling

## Ongevallen

Risico op een ‘klein’ ongeval is groot (zelfs bij ervaren fietsers)
De kosten zijn hoog
“*Safety in numbers*” effect ook voor onervaren fietsers ?
⇒ Omzichtig gefaseerd beleid

# Hoe meer fietsinfrastructuur, hoe meer fietsers




Mode share 25%

HIA:

**1 op 4 verplaatsingen per fiets =**
**10.000 minder vroegtijdige overlijdens**
(in 167 Europese steden)



https://doi.org/10.1016/j.ypmed.2017.12.011

PHYSICAL ACTIVITY THROUGH SUSTAINABLE TRANSPORT APPROACHES

**Investeren in fietsen!**

Contents lists available at ScienceDirect

Journal of Transport & Health

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


# Health impact model for modal shift from car use to cycling or walking in Flanders: application to two bicycle highways

Jurgen Buekers [a,*], Evi Dons [a,b], Bart Elen [a], Luc Int Panis [a,c]

[a] Flemish Institute for Technological Research (VITO), Boeretang 200, 2400 Mol, Belgium
[b] Centre for environmental studies, Hasselt University, Agoralaan Building D, 3590 Diepenbeek, Belgium
[c] School for Mobility, Hasselt University, Wetenschapspark 5 Bus 6, 3590 Diepenbeek, Belgium

ARTICLE INFO

*Article history:*
Received 2 June 2015
Received in revised form
18 August 2015
Accepted 21 August 2015

*Keywords:*
Health impact assessment
Cycling
Walking
Crashes
Monetary evaluation
Bicycle highway

ABSTRACT

In Flanders, a European hot spot for air pollution, alternatives to car transport are put in place to increase the daily level of physical activity (PA) among the population and reduce air pollution and global warming. To evaluate the economic impact of increased PA (cycling and walking), a health impact model was developed for a given volume of PA, relative to car use, within a defined population in Flanders. Flanders is an interesting region because of the combination of high air pollution, high cycling volumes and good data availability e.g on crashes and PA. The model uses two health indicators: external costs and DALYs. Considered impacts in the model are: mortality and morbidity related to increased PA, air pollution exposure for society and active individuals and crash risks. In addition to health, external costs for $CO_2$ emission, congestion and noise exposure can be considered. The model was applied to the new bicycle highways Antwerp–Mechelen and Leuven–Brussels, which were built near important traffic axes to provide the densely populated region with an alternative to car use. Different sensitivity analyses with a variable number of cyclists and travelled distances were elaborated to check the robustness of the results. Overall, the conclusion was that increased PA outweighed other impacts. The benefit:cost ratio



https://www.researchgate.net/publication/281612872_Health_impact_model_for_modal_shift_from_car_use_to_cycling_or_walking_in_Flanders_Application_to_two_bicycle_highways

PHYSICAL ACTIVITY THROUGH SUSTAINABLE TRANSPORT APPROACHES

# Hoe gezond is jouw fietsproject? Reken het zelf uit!

HEAT v4.2

HEAT Health economic assessment tool

https://www.heatwalkingcycling.org/

- HOME
- NEWS AND ANNOUNCEMENTS
- HOW HEAT WORKS
- START USING THE TOOL
- EXAMPLE APPLICATIONS
- HEAT USER GUIDE
- HEAT TRAININGS
- ACKNOWLEDGEMENTS
- ARCHIVE

**Welcome to the Health Economic Assessment Tool (HEAT) for walking and cy**

>> May 2019: Update to HEAT v4.2 with new data input page, several bug fixes, and substan (see News for details). <<

The HEAT tool is designed to enable users without expertise in impact assessment to conduct econo impacts of walking or cycling. The tool is based on the best available evidence and transparent assu simple to use by a wide variety of professionals at both national and local levels. These include prim engineers and special interest groups working on transport, walking, cycling or the environment.

The HEAT estimates the value of reduced mortality that results from specified amounts of walking o question:

**If *x* people regularly walk or cycle an amount of *y*, what is the economic value of the healt of the reduction in mortality due to their physical activity?**

In addition, HEAT can now also take into account the health effects from road crashes and air polluti emissions.

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

- **assessment of current (or past) levels of cycling or walking**, e.g. showing what cycling or wa country.
- **assessment of changes over time, e.g. comparisons of "before and after" situations, or "sc** with or without measures taken).
- **evaluation of new or existing projects, including benefit-cost ratio calculations.**

HEAT can be used as a stand-alone tool or to provide input into more comprehensive economic app health impact assessments.

World Health Organization
REGIONAL OFFICE FOR Europe

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


## ECONOMIC ASSESSMENT OF TRANSPORT INFRASTRUCTURE AND POLICIES

# Information and contact for PASTA:

www.pastaproject.eu

@EUPASTA
@PASTA_Antwerpen

This project has received funding from the European Union's Seventh Framework Programme for research; technological development and demonstration under grant agreement no 602624-2.

# Contact

**dr. Evi Dons**

evi.dons@vias.be