Science & (E)Cycling

Beneluxparlement

Septembre 30 2022

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1. Introduction

QUESTIONS 1

- Is (utilitatian) cycling good for health?

Google: Utilitarian Cycling and Health

Google: Utilitarian Cycling and Health

Hazards of cycling

The analogy: Will you drink dirty water then why you breathe dirty air, it is just brilliant! #AirPollution

QUESTIONS 2

- How to increase the number of cyclists?

Is (utilitarian) Cycling good for Health?

Cycling for leisure/sport

Utilitarian Cycling

What about e-cycles (≤250 Watt)?

E-cycle (EAC) (≤250 Watt)

Conventional cycle (CC)

2. Health benefits of (e)cycling

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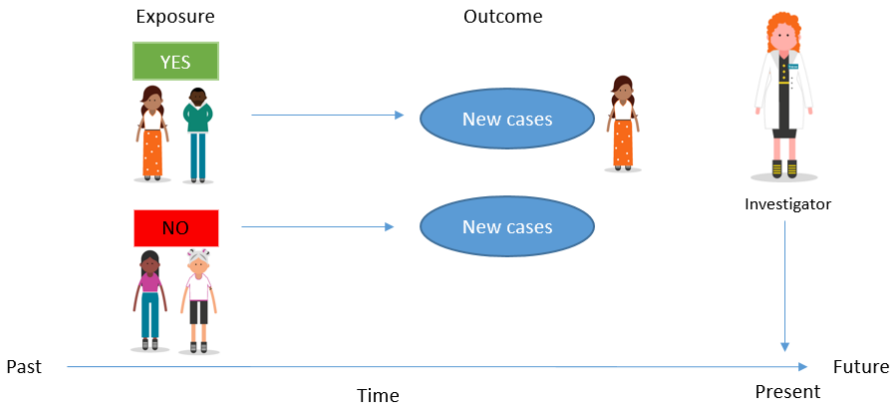
Systematic Reviews – Health benefits of (e-)cycling

Review

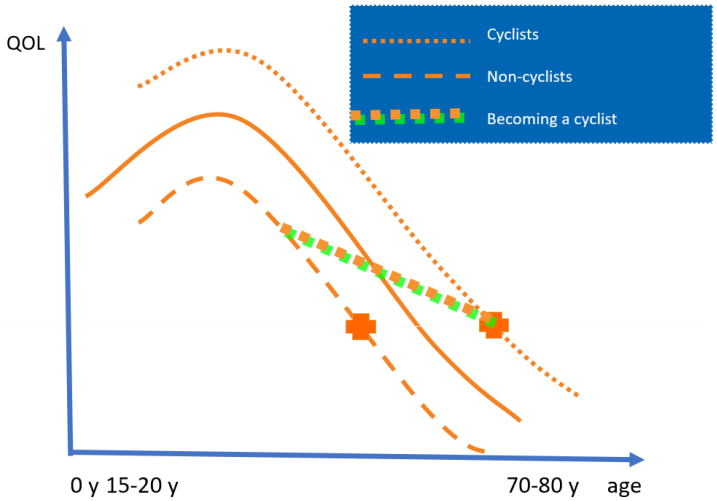
Health benefits of cycling: a systematic review

P. Oja[1], S. Titze[2], A. Bauman[3], B. de Geus[4], P. Krenn[2], B. Reger-Nash[5], T. Kohlberger[2]

Cohort Studies (Retrospective/Historical)



Intervention studies



Cycling - Mental Health

Contents lists available at ScienceDirect

Preventive Medicine

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

Does active commuting improve psychological wellbeing? Longitudinal evidence from eighteen waves of the British Household Panel Survey

Adam Martin [a,b,*], Yevgeniy Goryakin [a,b], Marc Suhrcke [a,b,c]

Results. After accounting for changes in individual-level socioeconomic characteristics and potential confounding variables relating to work, residence and health, significant associations were observed between overall psychological wellbeing (on a 36-point Likert scale) and (i.) active travel (0.185, 95% CI: 0.048 to 0.321) and public transport (0.195, 95% CI: 0.035 to 0.355) when compared to car travel, (ii.) time spent (per 10 minute change) walking (0.083, 95% CI: 0.003 to 0.163) and driving (−0.033, 95% CI: −0.064 to −0.001), and (iii.) switching from car travel to active travel (0.479, 95% CI: 0.199 to 0.758). Active travel was also associated with reductions in the odds of experiencing two specific psychological symptoms when compared to car travel.

Cycling - Sickness absence

Preventive Medicine 51 (2010) 132–135

Contents lists available at ScienceDirect

Preventive Medicine

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

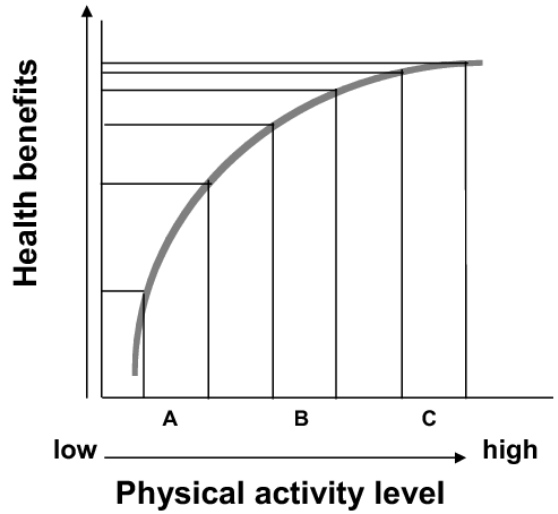
The association between commuter cycling and sickness absence

Ingrid J.M. Hendriksen [a,b,*], Monique Simons [a,b,c], Francisca Galindo Garre [a], Vincent H. Hildebrandt [a,b]

Conclusion. Cycling to work is associated with less sickness absence. The more often people cycle to work and the longer the distance travelled, the less they report sick.

E-cycling & Health benefits ??

- Health benefits conv. cycle ⟷ e-cycling ??



Physical activity level (Dose) =
Intensity x Frequency x Duration

E-cycling: Intensity

- WHO guidelines: health effect → 3-6 METS

Table 2
Descriptive statistics field tests (N=75 trips).

	CC (N=38)	EAC (N=37)
Distance (km)	7.28 ± 1.28	8.08 ± 2.08[a]
Speed (km/h)	15.9 ± 2.3	18.7 ± 3.0[a]
Travel time (min)	26 ± 5	24 ± 4
Height gain (m)	87.0 ± 25.4	87.4 ± 36.7
Slope_P90	2.96 ± 0.99[a]	2.42 ± 0.85
Stops	2.5 ± 2.6	2.9 ± 3.4
METs	6.61 ± 1.62[a]	4.89 ± 1.41
Ventilation (L/min)	49.49 ± 11.95[a]	35.58 ± 7.87
Heart rate (bpm)	129 ± 18[a]	108 ± 18
%HRmax	70.51 ± 8.69[a]	58.99 ± 7.88

Legend: CC=conventional cycle; EAC=electric assisted cycle

Lathouwers et al., 2021

E-cycling: Frequency & Duration

- Fyhri et al 2020:

We found that people who purchased an e-bike increased their bicycle use from 2.1 to 9.2 km per day on average, representing a change in bike as share of all transport from 17 to 49 percent.

- Castro et al, 2019:

	E-cycle	Conventional cycle
Trip distance	9,4 km	4,8 km

	E-cycle	Conventional cycle
MET min/wk (=dose)	4463	4085

Systematic Reviews – Health benefits of (e-)cycling

Review

Health benefits of cycling: a systematic review

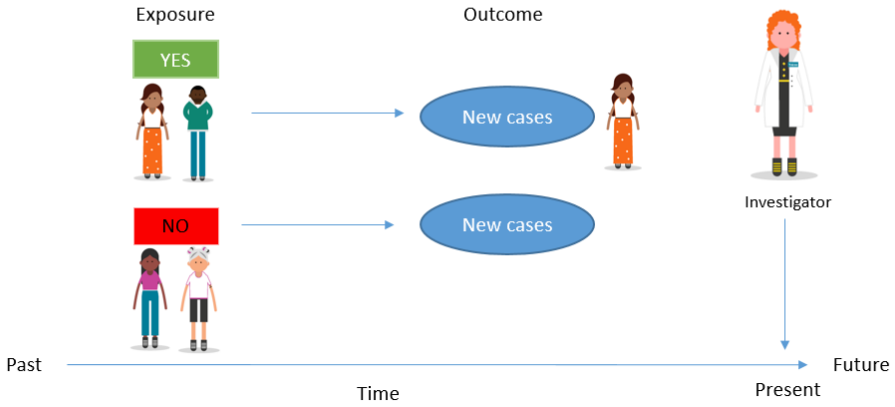
P. Oja[1], S. Titze[2], A. Bauman[3], B. de Geus[4], P. Krenn[2], B. Reger-Nash[5], T. Kohlberger[2]

REVIEW Open Access

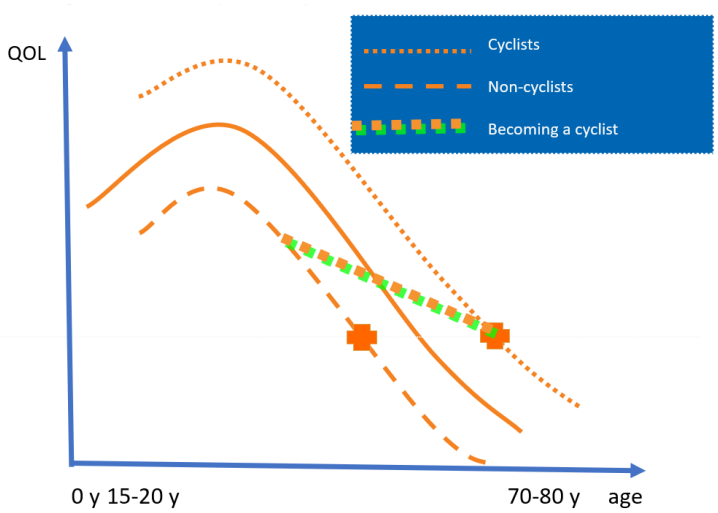
Health benefits of electrically-assisted cycling: a systematic review

Jessica E. Bourne[1,2*], Sarah Sauchelli[2], Rachel Perry[2], Angie Page[1,2], Sam Leary[2], Clare England[1,2] and Ashley R. Cooper[1,2]

Cohort Studies (Retrospective/Historical)



Intervention studies



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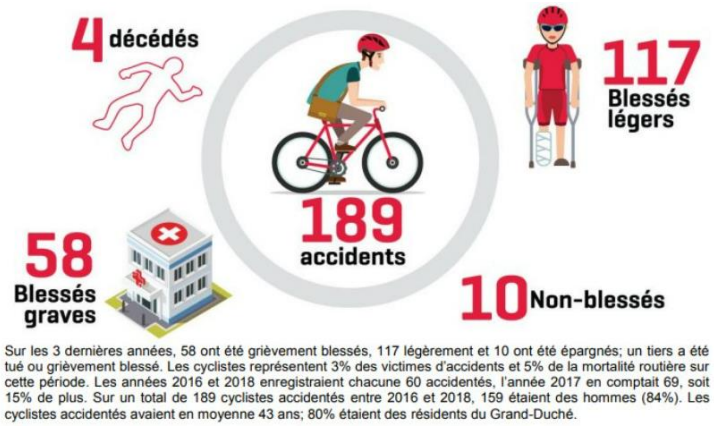
2. (e-)cycle crashes

Absolute number of cycle accidents

	Letsel-ongevallen	Doden 30 dagen	Gewonden	Slachtoffers	Specifieke ongevalsernst
2008	8 931	95	8 997	9 092	10,6
2009	8 797	92	8 910	9 002	10,5
2010	8 517	73	8 668	8 741	8,6
2011	9 673	74	9 802	9 876	7,7
2012	9 181	84	9 068	9 152	9,1
2013	8 814	83	8 955	9 038	9,4
2014	9 684	82	9 866	9 948	8,5
2015	9 187	90	9 268	9 358	9,8
2016	9 511	81	9 594	9 675	8,5
2017	9 199	77	9 220	9 297	8,4
Evolutie 2008-2017	*+3%*	*-19%*	*+2%*	*+2%*	*-21%*

Tabel 9: Kerncijfers m.b.t. verkeersveiligheid van fietsers (2008-2017). Bron: Statbel (Algemene Directie Statistiek - Statistics Belgium); Infografie: Vias institute

Stabel, Belgium



Sur les 3 dernières années, 58 ont été grièvement blessés, 117 légèrement et 10 ont été épargnés; un tiers a été tué ou grièvement blessé. Les cyclistes représentent 3% des victimes d'accidents et 5% de la mortalité routière sur cette période. Les années 2016 et 2018 enregistraient chacune 60 accidentés, l'année 2017 en comptait 69, soit 15% de plus. Sur un total de 189 cyclistes accidentés entre 2016 et 2018, 159 étaient des hommes (84%). Les cyclistes accidentés avaient en moyenne 43 ans; 80% étaient des résidents du Grand-Duché.

Statec, Luxembourg

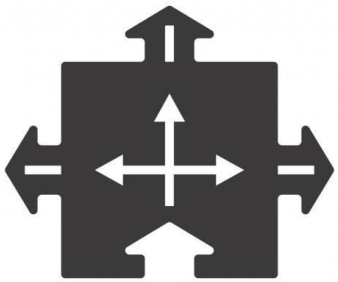
Verkeersdoden naar wijze van vervoer

	2020
Fiets	229
Personenauto	195
Motor	44
Voetganger	41
Scootmobiel	34
Bromfiets/snorfiets	33
Bestel-/vrachtauto	23
Overig	11

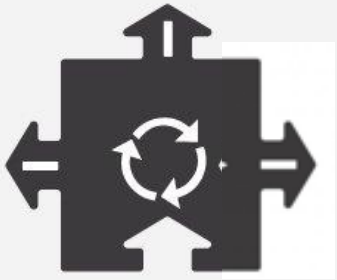
CBS, the Netherlands

Bicycle crashes - Exposure

- Bicycle crashes:
  - Incidence = # crashes
  - Incidence rate = # crashes / exposure = **risk**

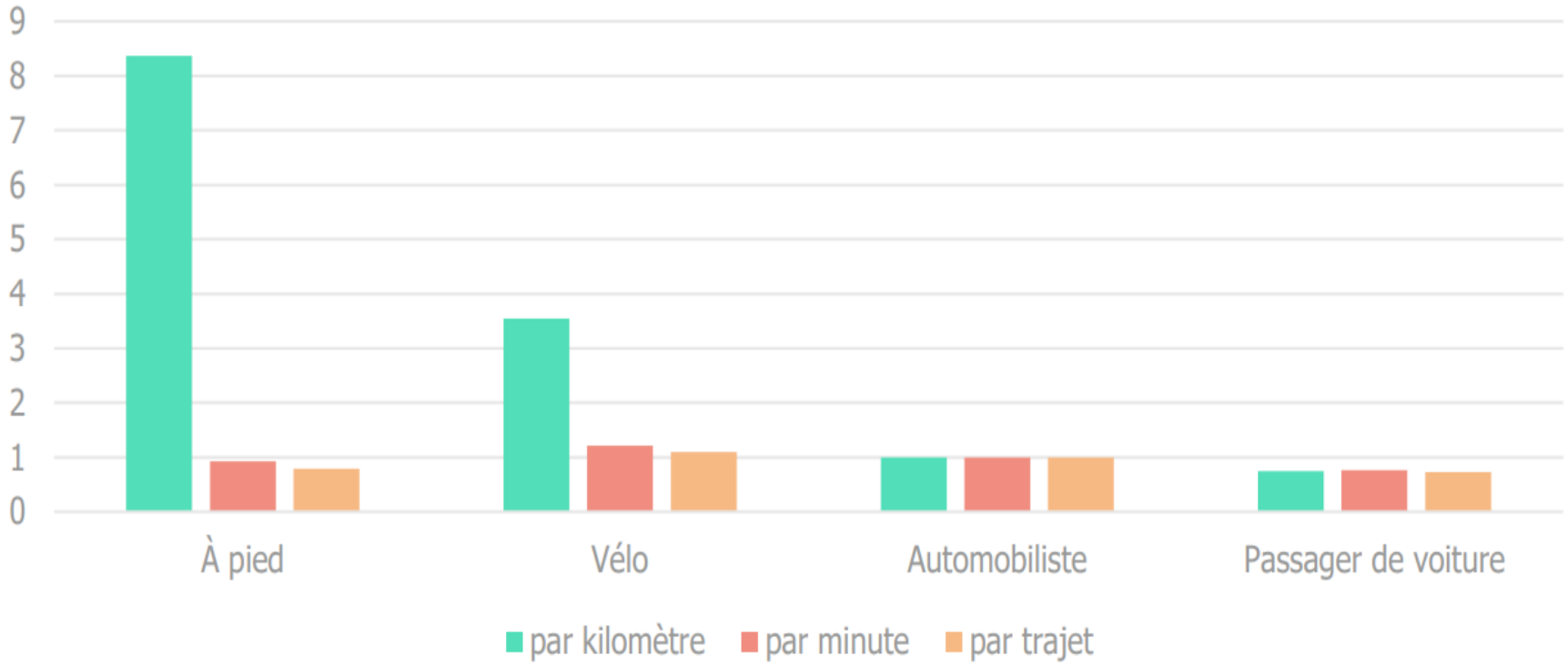


Incidence: 10 crashes / year
Exposure: 1,000 trips / year
Incidence rate: 0.01 crashes / trip



Incidence: 10 crashes / year
Exposure: 10,000 trips / year
Incidence rate: 0.001 crashes / trip

Relative fatality risk by type of road user and exposure unit used



Source : Pelssers, 2020
Belgium

Relative fatal accident risk by mode of transport and age group according to the number of kilometres travelled (in millions) in Belgium

	À pied	Vélo	PTW	Automobiliste	Passager de voiture	En bus
6-17	4,8	2,0	32,5	N/A	0,3	0,0
18-24	5,3	1,0		2,3	1,7	0,0
25-44	4,2	1,1	40,3	0,9	0,7	0,0
45-64	6,5	2,8	14,0	0,7	0,5	0,1
65-74	12,4	8,8	127,6	0,9	0,7	0,2
75 et +	54,2	16,0		2,1	1,8	0,5
Total	**8,4**	**3,5**	**27,0**	**1,0**	**0,7**	**0,1**

PTW (Powered Two-Wheelers): Les deux-roues motorisés tels que les cyclomoteurs ou les motocyclettes

Source : Pelssers, 2020

Belgium

Incidence rate (risk) – minor bicycle crashes

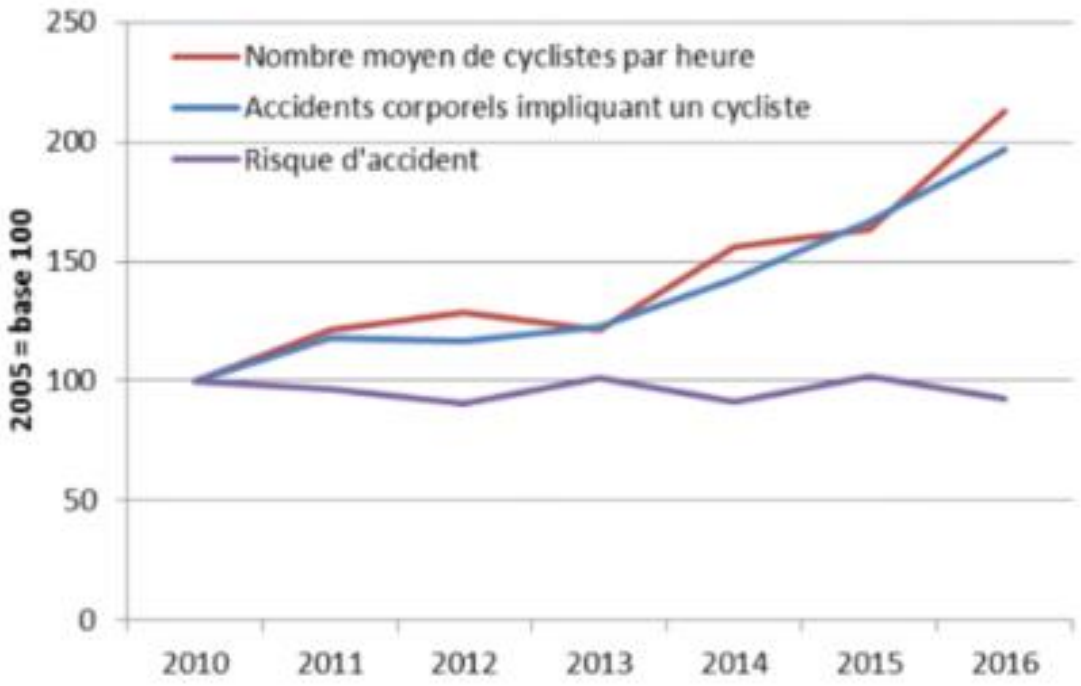
Table 1
Incidence, exposure and incidence rate per region.

	Brussels-capital region	Flanders	Wallonia
Incidence			
Number of injuries (*N*)	28	34	8
Exposure			
Frequency (# of trips)	64,982	116,262	22,920
Time (h)	20,153	45,190	8540
Distance (km)	325,210	909,033	160,873
Incidence rate (95% CI)			
/1000 trips	0.431 (0.271–0.590)	0.292 (0.194–0.391)	0.349 (0.107–0.591)
/1000 h	1.389 (0.875–1.904)	0.752 (0.499–1.005)	0.937 (0.288–1.586)
/1000 km	**0.086 (0.054–0.118)**	**0.037 (0.025–0.050)**	0.050 (0.015–0.084)

Values in Bold indicate a significant difference ($P < 0.05$).
Note: 511 (2.54%) travel diaries could not be attributed to a specific region.

de Geus et al., 2012

Safety-in-Numbers - Brussels



Source : Pro Vélo, StatBel, IBSR (Nuyttens 2017)

E-bicycle crashes – limited number studies

- No unanimity in the (limited) scientific literature:
  - Risk
    - Schepers et al. (2014) did find an elevated risk among EAC users;
    - Schepers et al. (2020) only found an increased risk for older female EAC users;
    - Fyhri et al. (2019) found an increased risk for female but not for male EAC users;
  - Severity
    - Fyhri et al. (2019) and Schepers et al. (2020b) did not find EAC crashes to result in more severe injuries than crashes involving CC;
    - Verbeek et al. (2017) found no difference in frequency and severity of traumatic brain injuries (TBI) receiving treatment at an emergency department after a CC or EAC crash.

E-bicycle crashes – future studies

- Thinking tracks:
  - Who is cycling: young vs old
  - Sociodemographic characteristics: risky cycling behaviour / risk compensation
  - Crash type: single cycle crash / motor vehicle

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better Must do better
better Must do better
better Must do better
better Must do better


HEALTH

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3. Air Pollution & (e)cycling

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Back-ground air pollution – Long-term

Sources: heating, motorised traffic, industry, neighbouring countries

The impact of exposure to air pollution on cognitive performance

Xin Zhang[a,1], Xi Chen[b,c,1], and Xiaobo Zhang[d,e,2]

Cardiovascular Mortality and Long-Term Exposure to Particulate Air Pollution

Epidemiological Evidence of General Pathophysiological Pathways of Disease

C. Arden Pope III, PhD; Richard T. Burnett, PhD; George D. Thurston, ScD; Michael J. Thun, MD; Eugenia E. Calle, PhD; Daniel Krewski, PhD; John J. Godleski, MD

Back-ground air pollution – Vulnerability

Review Article

Adverse effects of outdoor pollution in the elderly

Marzia Simoni[1], Sandra Baldacci[1], Sara Maio[1], Sonia Cerrai[1], Giuseppe Sarno[1], Giovanni Viegi[1,2]

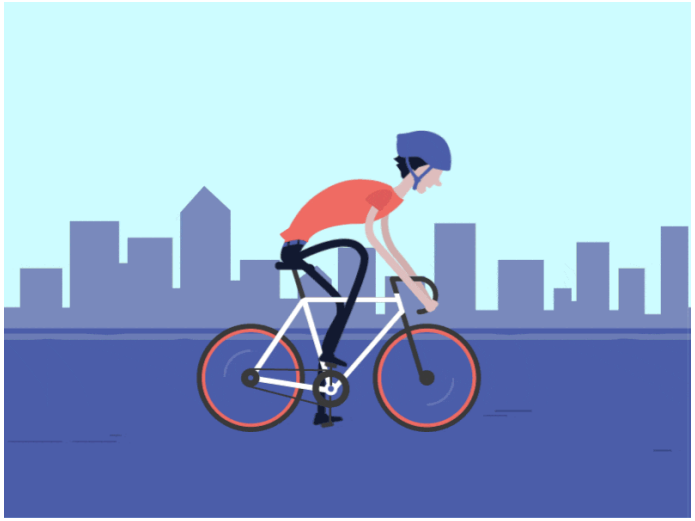
RESEARCH ARTICLE

Association between Traffic-Related Air Pollution in Schools and Cognitive Development in Primary School Children: A Prospective Cohort Study

Conclusions

Children attending schools with higher traffic-related air pollution had a smaller improvement in cognitive development.

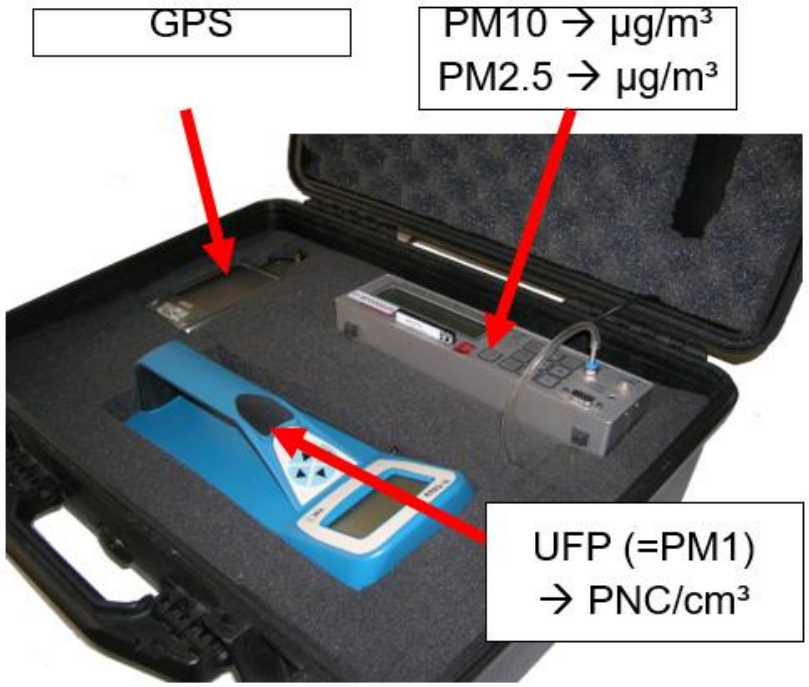
What is forgotten?



➔ Exposure = ventilation x concentration x distance

Materials & Methodes

➔ Exposure = ventilation per distance x concentration x distance



Air pollution exposure cycle – car passenger

Atmospheric Environment 44 (2010) 2263–2270

Contents lists available at ScienceDirect

Atmospheric Environment

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

Exposure to particulate matter in traffic: A comparison of cyclists and car passengers

Luc Int Panis [a,b,*], Bas de Geus [c], Grégory Vandenbulcke [d], Hanny Willems [a], Bart Degraeuwe [a], Nico Bleux [a], Vinit Mishra [a], Isabelle Thomas [d], Romain Meeusen [c]

Table 4
Average inhaled quantities of PNC, PM10 and PM2.5. PNC m^{-1} and µg km^{-1}; mean (SD).

		PNC (SD) #inhaled per meter	PNC #dose per meter	µg PM10 (SD) inhaled km^{-1}	µg PM10 dose km^{-1}	µg PM2.5 (SD) inhaled km^{-1}	µg PM2.5 dose km^{-1}
Brussels	Bike	5,580,195 (1,924,800)	4,631,562[a]	11.5 (4.5)	2.6	3.4 (1.3)	0.8
	Car	1,335,467 (83,365)	841,344[b] 965,696[c]	1.6 (0.6)	0.4	0.6 (0.2)	0.1
	Bike/car ratio	4.50 (2.17)		7.3 (3.0)		5.9 (2.1)	
LLN	Bike	2,023,702 (594,881)	1,679,673[a]	8.4 (1.6)	1.9	3.8 (0.8)	0.9
	Car	305,095 (83,365)	192,210[b] 214,045[c]	0.9 (0.1)	0.2	0.5 (0.1)	0.1
	Bike/car ratio	6.83 (1.68)		9.0 (1.0)		8.0 (0.8)	
Mol	Bike	1,135,046 (435,493)	942,088[a]	8.5 (0.2)	1.9	5.2 (0.2)	1.2
	Car	216,768 (75,832)	136,564[b] 135,956[c]	1.2 (0.2)	0.3	0.7 (0.1)	0.1
	Bike/car ratio	6.05 (3.46)		6.6 (0.3)		7.4 (0.6)	

[a] Avg DF = 0.83, Daigle et al. 2003.
[b] Avg DF = 0.63, Daigle et al. 2003.
[c] Variable DF, Chalupa et al. 2004.

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Review Inhaled dose of Air Pollution

Levels of ambient air pollution according to mode of transport: a systematic review

Magda Cepeda, Josje Schoufour, Rosanne Freak-Poli, Chantal M Koolhaas, Klodian Dhana, Wichor M Bramer, Oscar H Franco

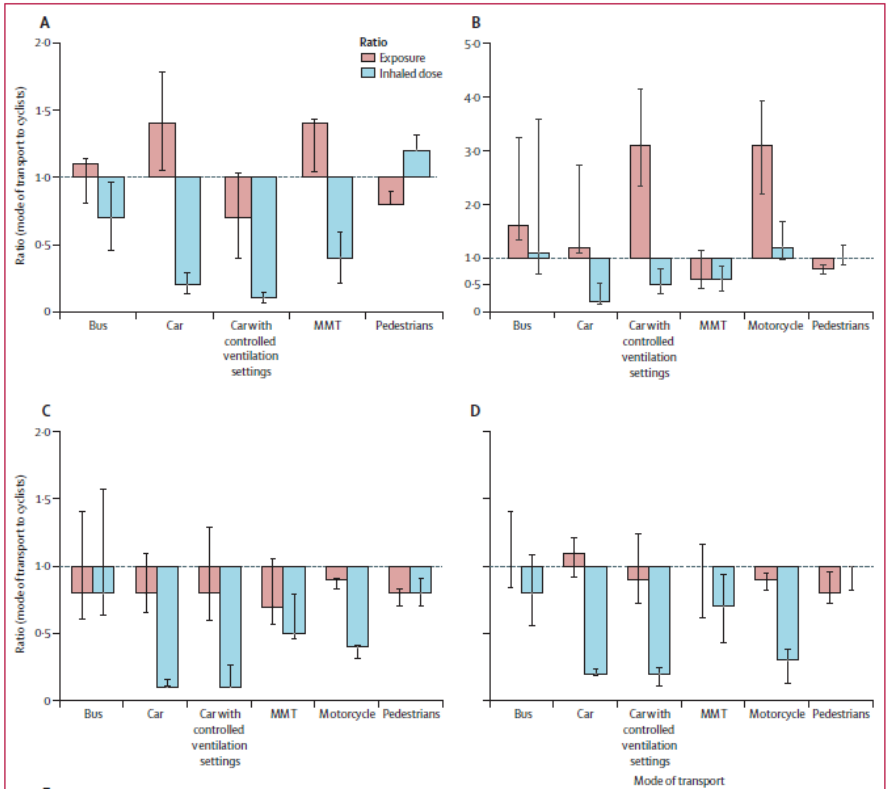

Figure 3: **Comparison of ratio of exposure to pollutants with ratio of inhaled dose of pollutants according to mode of transport and pollutant to that of cyclists**
(A) Black carbon. (B) Carbon monoxide. (C) Coarse particles. (D) Fine particles. (E) NO_2. MMT=massive motorised transport.

Inhaled dose: conventional *vs* e-cycle

Results: Mean respiratory ventilation was predicted based on sex (-7.78 L/min for women), cycle type (-17.61 L/min for EAC), height gain (+0.07 L/min) and speed (+1.30 L/min). Inhaled dose of pollutants both for BC dose/km and BC dose/min was primarily predicted by cycle type (-31.62% and -34.68% for EAC compared to CC, respectively). Results were similar for the other pollutants.

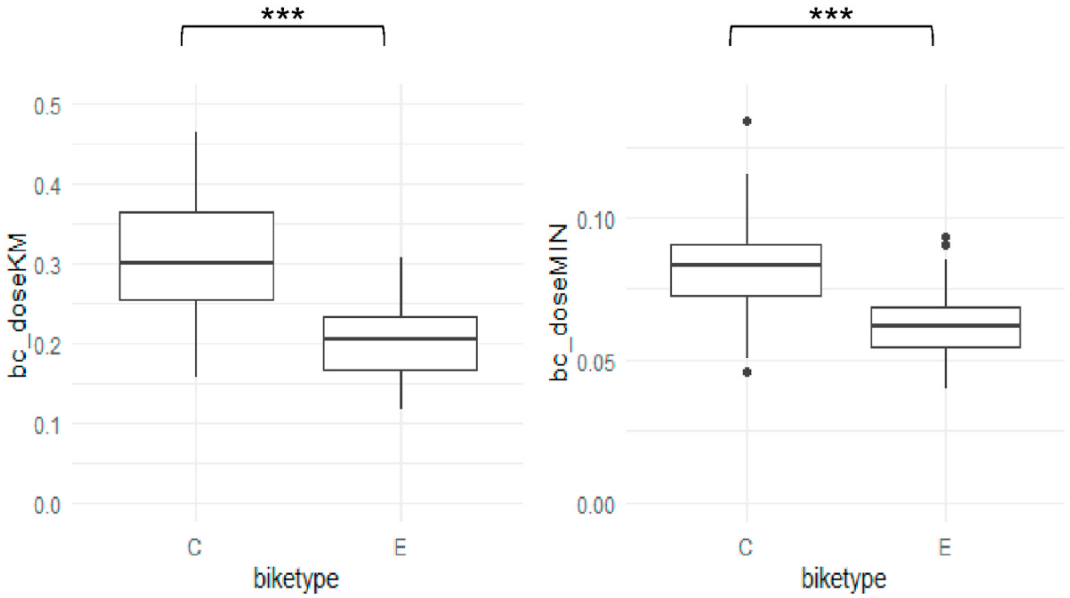

Fig. 2. Black carbon dose/km and dose/min by cycle type.
Represented are the median and the IQR (box), Q1 - 1.5* IQR and Q3 + 1.5*IQR (whiskers), and outliers (dots)Statistical significance: $p<0.001$
***Abbreviations: bc_doseKM = inhaled dose black carbon µg per km; bc_doseMIN = inhaled dose black carbon µg per min; C: conventional cycle, E: EAC.

Lathouwers et al., 2021

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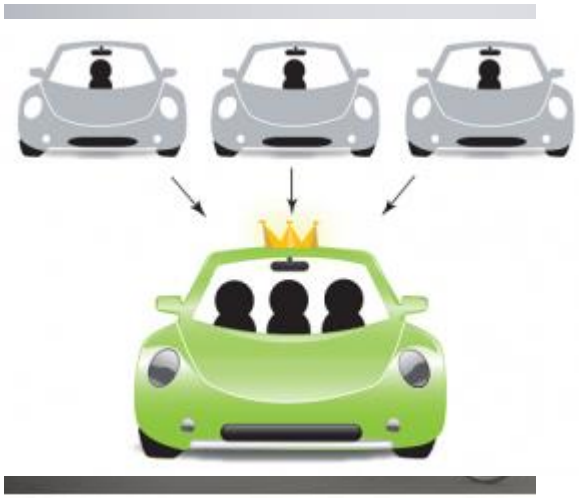

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4. Cost-benefit analysis / Health Impact Assessment

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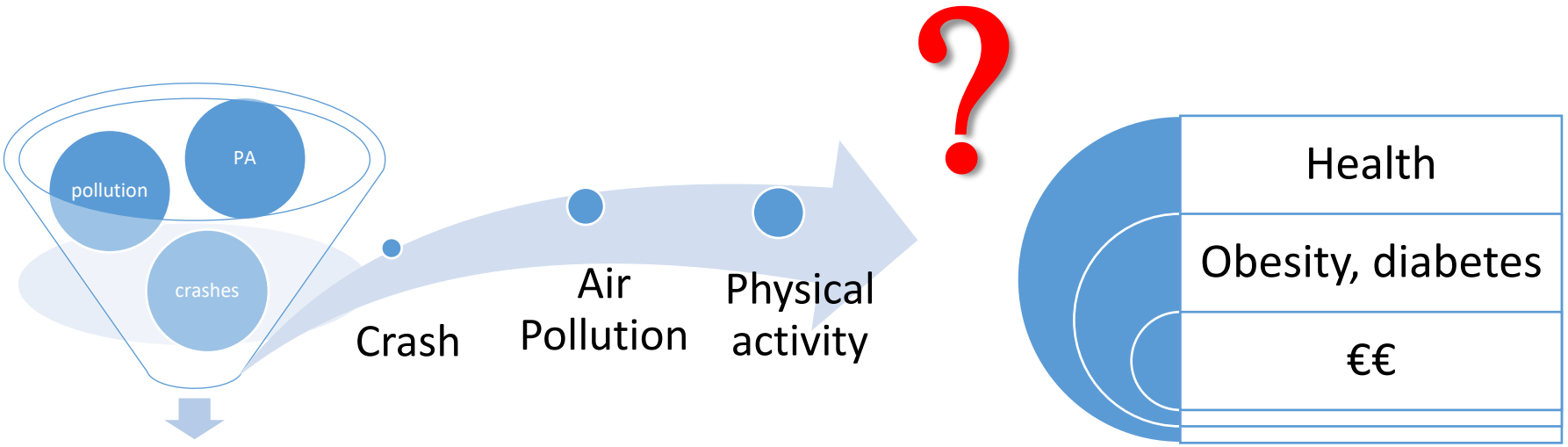
Predictive models – population level



Car driver → conventional cyclist

OR

More cycling

Anno: 2022

Anno: 2062

HIA of active transportation (walking & cycling): A systematic review

Preventive Medicine 76 (2015) 103–114

Contents lists available at ScienceDirect

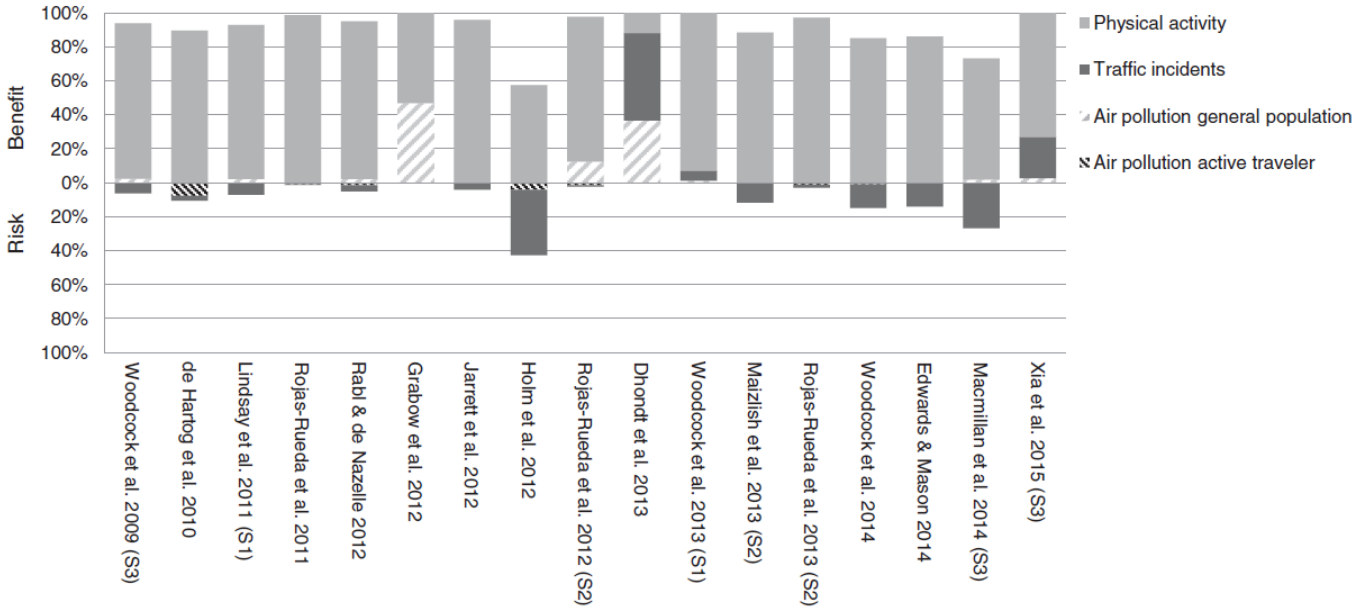
Preventive Medicine

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

Review

Health impact assessment of active transportation: A systematic review

Natalie Mueller [a,b,c,*], David Rojas-Rueda [a,b,c], Tom Cole-Hunter [a,b,c], Audrey de Nazelle [d], Evi Dons [e,f], Regine Gerike [g], Thomas Götschi [h], Luc Int Panis [e,i], Sonja Kahlmeier [h], Mark Nieuwenhuijsen [a,b,c]



Mueller et al. (2015)

HIA & London bicycle sharing system

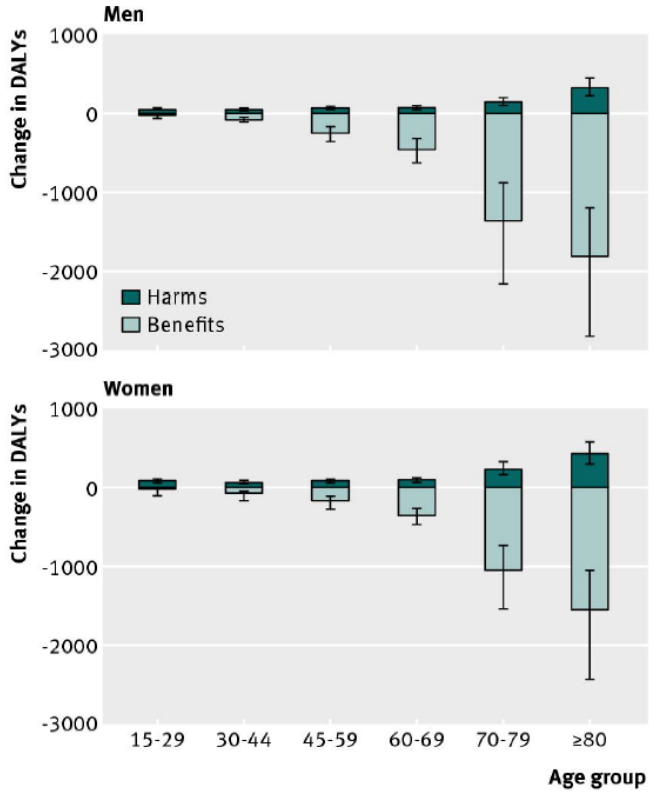


Fig 2 Trade-off of benefits to harms for cycling in central London: effects by age and sex, per million population (although few older people used cycle hire). Benefits come through impacts on diseases related to physical activity, harms come from exposure to road traffic injuries (see table 28 in appendix 4). Results use background injury rates and so should be interpreted as the trade-off for cycling in general in the cycle hire zone and not for specifically using cycle hire bicycles (which may carry lower risks of injury)

Woodcock et al. (2014)

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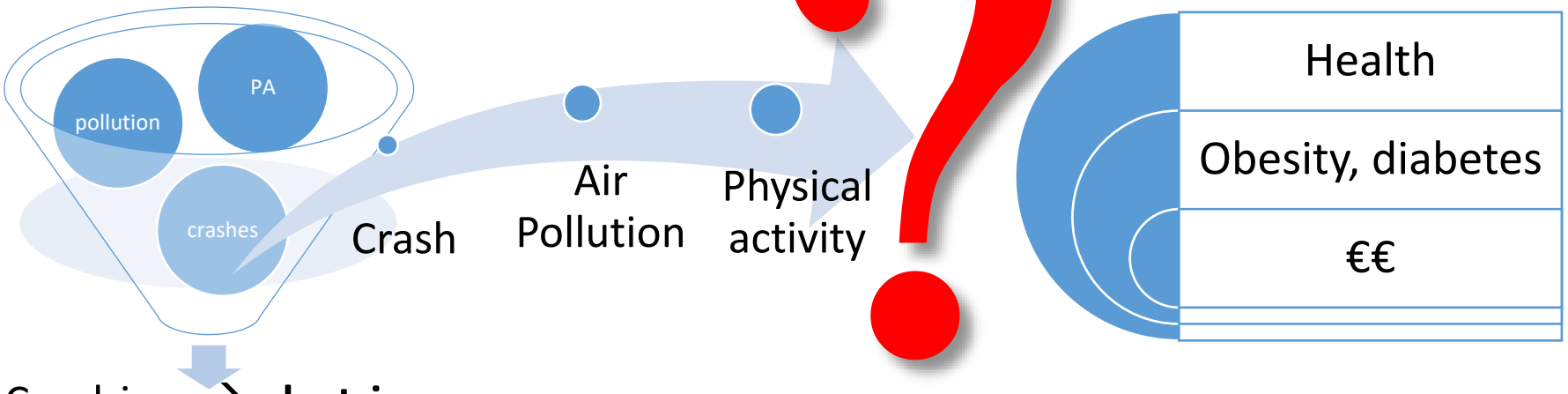
Predictive models – population level



Car driver → **electric** cyclist

OR

More e-cycling

Anno: 2022

Anno: 2062

5. What to do next?

How to increase (safe) cycling?

Should we create safer environments for people to cycle AND/OR
should we protect ourselves in case of a fall or crash?

Answer:

1. we should create safer environments for people to cycle
   → societal responsibility

AND

2. we should protect ourselves in case of a fall or crash
   → individual responsibility

How to increase (safe) cycling?

1. we should create safer environments for people to cycle
   → societal responsibility (traffic or road safety)

Why?

- Because perceived safety is a brake on (starting) to cycle (Pearson et al., 2022)
- Because a safe infrastructure can:
  - ↓ number of crashes: MV-cycle crash + single cycle crashes
  - ↓ severity of injury in case of a crash

Creating a safe cycling environment

1. we should create safer environments for people to cycle
   → societal responsibility

How:

- « overall plan » on a large scale (city level)
- Separated cycling infrastructure (Schepers, 2015)
- Zone 30 to slow down motorised traffic (Aldred, 2018)

Societal Challenges – Sustainabe cities

Good Move - Brussels

Superblocks - Barcelona

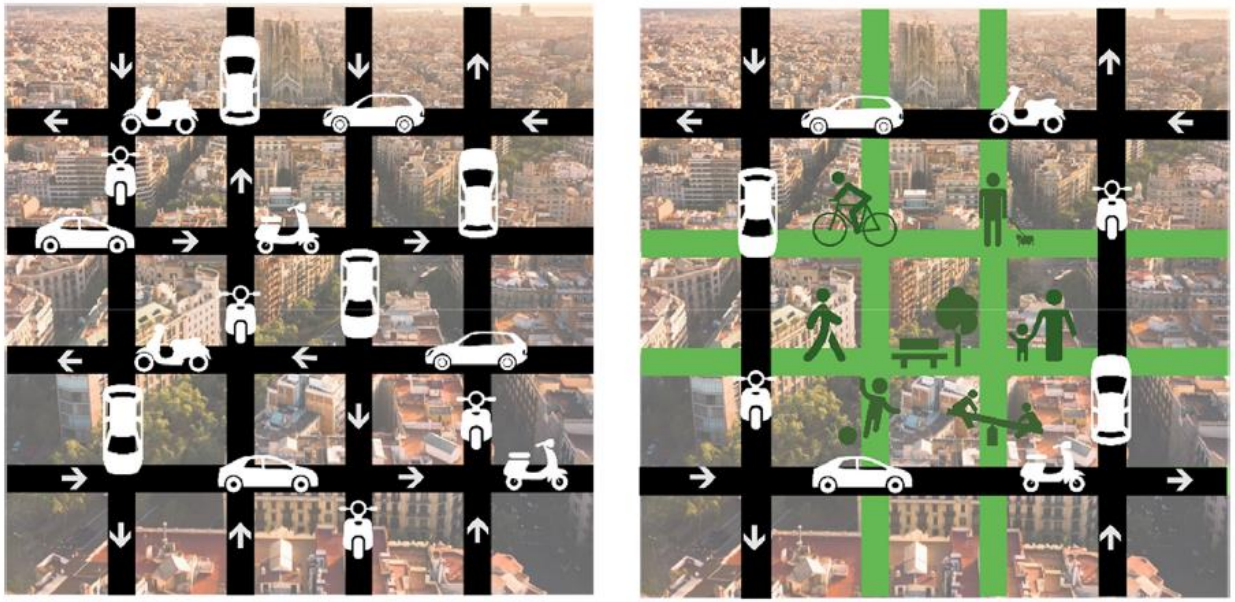


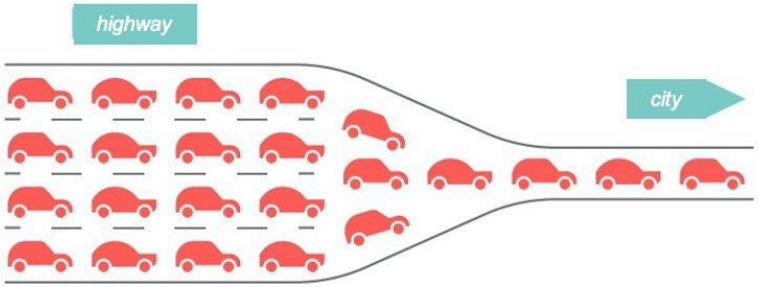
Fig. 2. Traffic flows before and after the Superblock implementation in Barcelona.

Nieuwenhuijsen, 2020

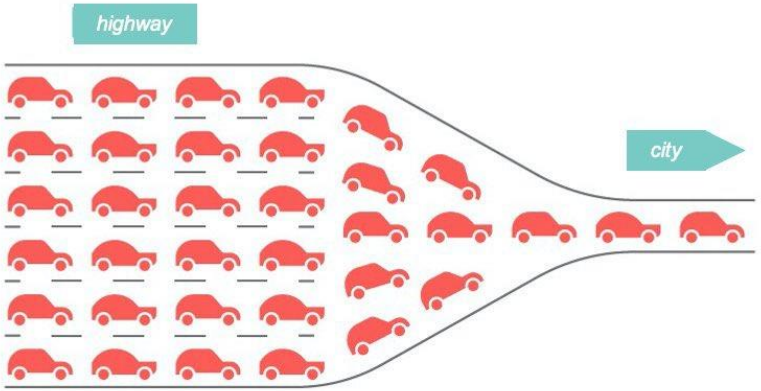
Realocation of road space

The Bottleneck

If this is your problem…



. …then this **isn't** your solution



Why a City 30? Example: study in different UK cities

Study examined the difference between before and after the introduction of zone 30:

- 73% of participants reported that walking was more pleasant
- For those who already cycled, cycling became 50-60% more pleasant
- The proportion of children who reported cycling "spontaneously" increased from 22% 43%
- The use of roller skates and skateboards also increased from 11-19%

→ Reason for this change: slower and less traffic

Webster, 2006

How to increase (safe) cycling?

1. we should create safer environments for people to cycle
   → social responsibility (traffic or road safety)

Only (safe) cycling infrastructure to increase cycling?

No.

Because the decision on whether to cycle is not **only** linked to the infrastructure.

Individual factors:

Cultural and psychological factors like perception, social environment, attitude, and habit are crucial determinants for the modal change (Willis et al., 2014), especially for women.

Creating a safe cycling environment

1. we should create safer environments for people to cycle
   → societal responsibility

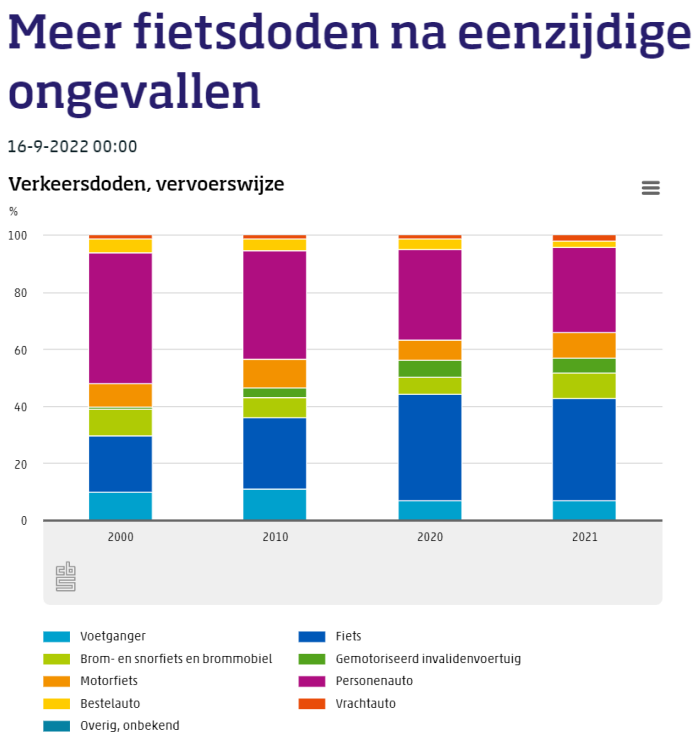
→ Law enforcement: speeding, alcohol intoxication, …
→ Driver education: aggressive car drivers and other road users' behaviour is a major deterrents among cyclists, especially female ones (Graystone, 2022; Otter, 2022).
→ …

How to increase safe cycling?

2. we should protect ourselves in case of a fall or crash
   → individual responsibility

Why?

Because safe cycling infrastructure will never prevent all falls and/or crashes.



CBS, 2022

Individual: cycle safety measurements

Individual: cycle safety measurements

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The effect of a yellow bicycle jacket on cyclist accidents

Harry Lahrmann[a,*], Tanja Kidholm Osmann Madsen[a], Anne Vingaard Olesen[a], Jens Chr. Overgaard Madsen[b], Tove Hels[c]

A B S T R A C T

This study is the first randomised controlled trial (RCT) of the safety effect of high-visibility bicycle clothing. The hypothesis was that the number of cyclist accidents can be reduced by increasing the visibility of the cyclists. The study design was an RCT with 6793 volunteer cyclists – 3402 test cyclists (with a yellow jacket) and 3391 control cyclists (without the jacket). The safety effect of the jacket was analysed by comparing the number of self-reported accidents for the two groups. The accident rate (AR) (accidents per person month) for personal injury accidents (PIAs) for the test group was 47% lower than that of the control group. For accidents involving cyclists and motor vehicles, it was 55% lower. The study was non-blinded, and the number of reported single accidents was significantly lower in the test group than in the control group. This is likely a result of a response bias, since the bicycle jacket was not expected to affect the number of single accidents. To compensate for this bias, a separate analysis was carried out. This analysis reduced the effect of the jacket from 47% to 38%.

Individual: cycle safety measurements

Meta-analyse: the use of bicycle helmets was found to:

- reduce total number of killed or seriously injured cyclists by 34%
- reduce head injury by 48%,
- serious head injury by 60%,
- traumatic brain injury by 53%,
- face injury by 23%

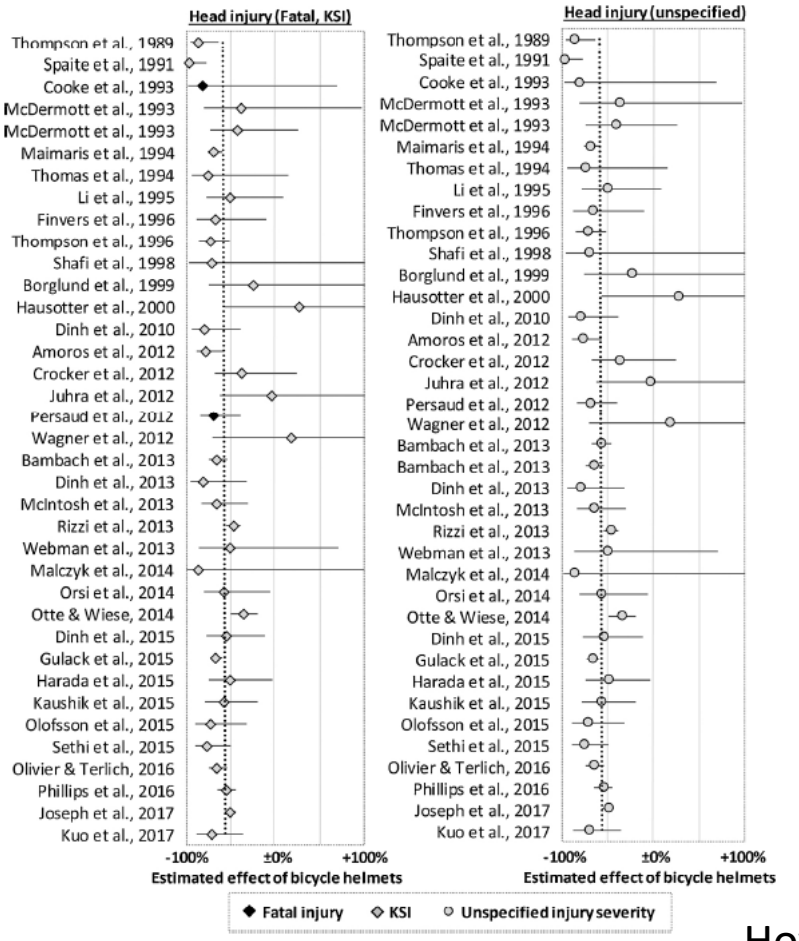

Fig. 1. Forest plots of estimated effects of bicycle helmets on head injury.

Hoye, 2018a

Individual: cycle safety measurements

What if cycle helmet is **mandatory**?

- If all cyclists were wearing helmets, significant numbers of head injuries might theoretically be prevented (Hoye, 2018b);
- Bicycle helmet use is associated with reduced odds of head injury, serious head injury, facial injury and fatal head injury. The reduction was greater for serious or fatal head injury (Olivier, 2017);

➔ From a medical point of view, helmets should be mandatory.

Individual: cycle safety measurements

But (public debate) (mandatory) helmet use is controversial because most of the public debate is based on emotion / feeling of freedom linked to cycling / habit.

Elements of debate on (mandatory) helmet legislation are:

1. ↓ MV-cycle lateral clearance distance?
2. ↓ cycle use?
3. ↑ risk-taking behaviour & risk compensation?

Bycle safety measurements

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Culture

Turns Out, Mandatory Helmet Laws Make Cyclists Less Safe

REQUIRING ALL RIDERS TO WEAR A HELMET HAS PROVEN NEGATIVE EFFECTS.

BY THOMAS DEVITO Published: Oct 26, 2020

Interview

The big bike helmet debate: 'You don't make it safe by forcing cyclists to dress for urban warfare'

Peter Walker

The question of whether cyclists should wear helmets provokes fury – often from those on four wheels. But which has the bigger benefit: increased physical safety, or creating a better environment for people to cycle helmet-free?

Individual: cycle safety measurements

Elements of debate on (mandatory) helmet legislation are:

1. ↓ MV-cycle lateral clearance distance?

- MV-cycle lateral clearance distance ↓ when cyclist wears helmet (Walker 2007, 2019)

- But MV-cycle lateral clearance distance is also influenced by:
  - MV type (Walker, 2007)
  - traffic density (Dozza, 2016; Llorca, 2017)
  - infrastructure type (Mchale, 2014; Shackel, 2014)
  - gender of the cyclist (Walker, 2007)
  - cycling appearance (Walker, 2014)
  - cycling speed (Chapman, 2014)
  - …

(Ampe, 2020)

Individual: cycle safety measurements

Elements of debate on (mandatory) helmet legislation are:

2. ↓ cycle use

Systematic Review of the scientific literature (Olivier, 2018):

- 35 relevant studies, 7 countries, 18 jurisdictions
- Results:
  - 13 studies found no influence
  - 8 studies found mixed results
  - 2 studies found cycling to decreas as a result of helmet law

Individual: cycle safety measurements

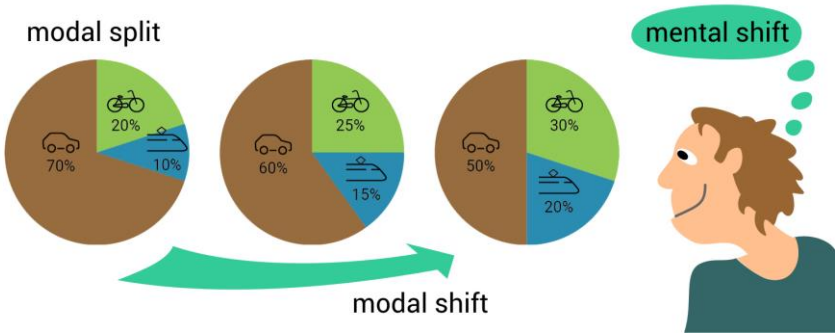
Elements of debate on (mandatory) helmet legislation are:

3. ↑ risk-taking bahaviour & risk compensation

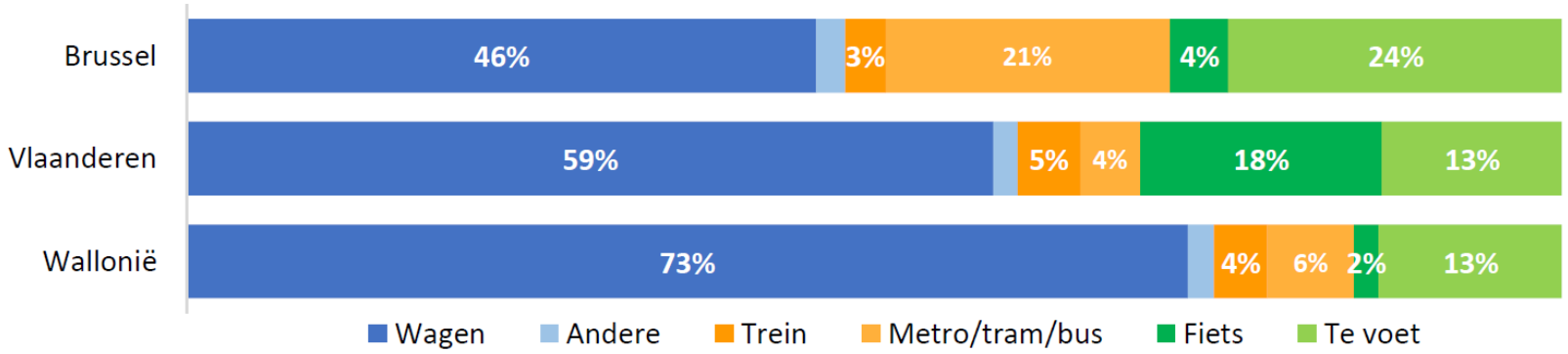
Systematic Review of the scientific literature (Esmaeilikia, 2019):

- 23 relevant studies
- Results:
  - 18 studies found no arguments for risk compensation
  - 3 studies found mixed results
  - 2 studie found increased risk compensation

Where to start? : Modal split (modal share)

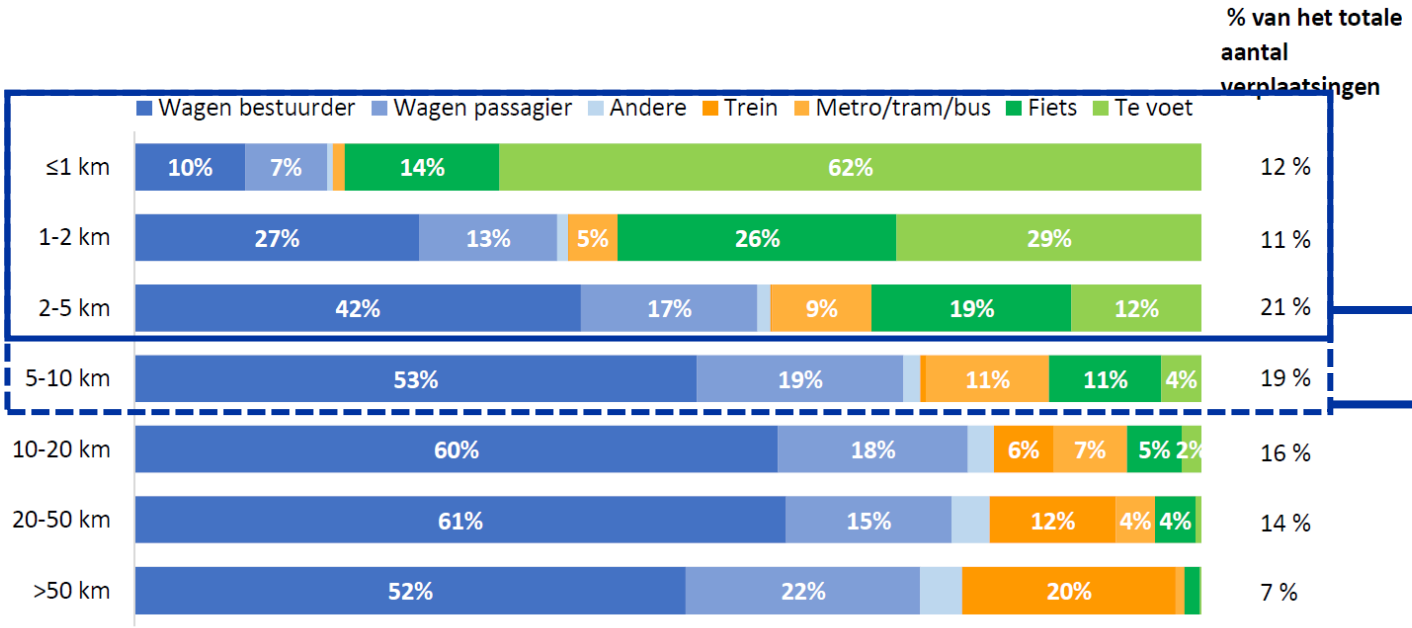


- the Netherlands: 28% (CBS, 2019)
- Luxembourg: 2% (Enquête Luxmobil, 2017)
- Belgium: 12% (MONITOR, 2019)



Grafiek 8 - Modale aandelen per woongewest (in aantal verplaatsingen) (Basis: 25.168 trajecten)

Trips that could be replaced by cycling?



Grafiek 25 - Modale aandelen naargelang de afstand van de trajecten (in aantal verplaatsingen) (Basis: 25.168 trajecten)

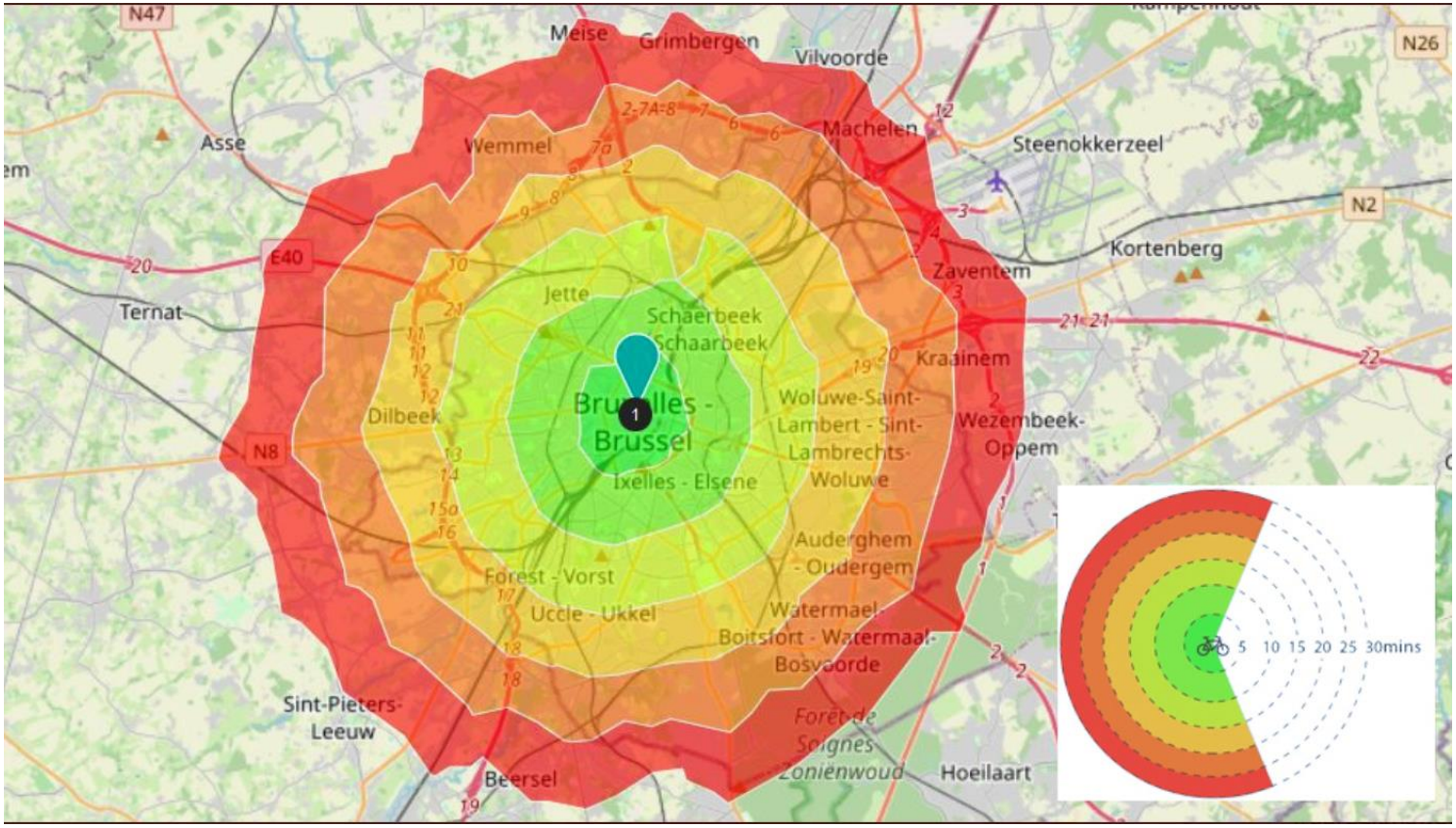
Cycling @
- 15 km/h CC
- 20 km/h EAC

5 km: 20' CC – 15' EAC

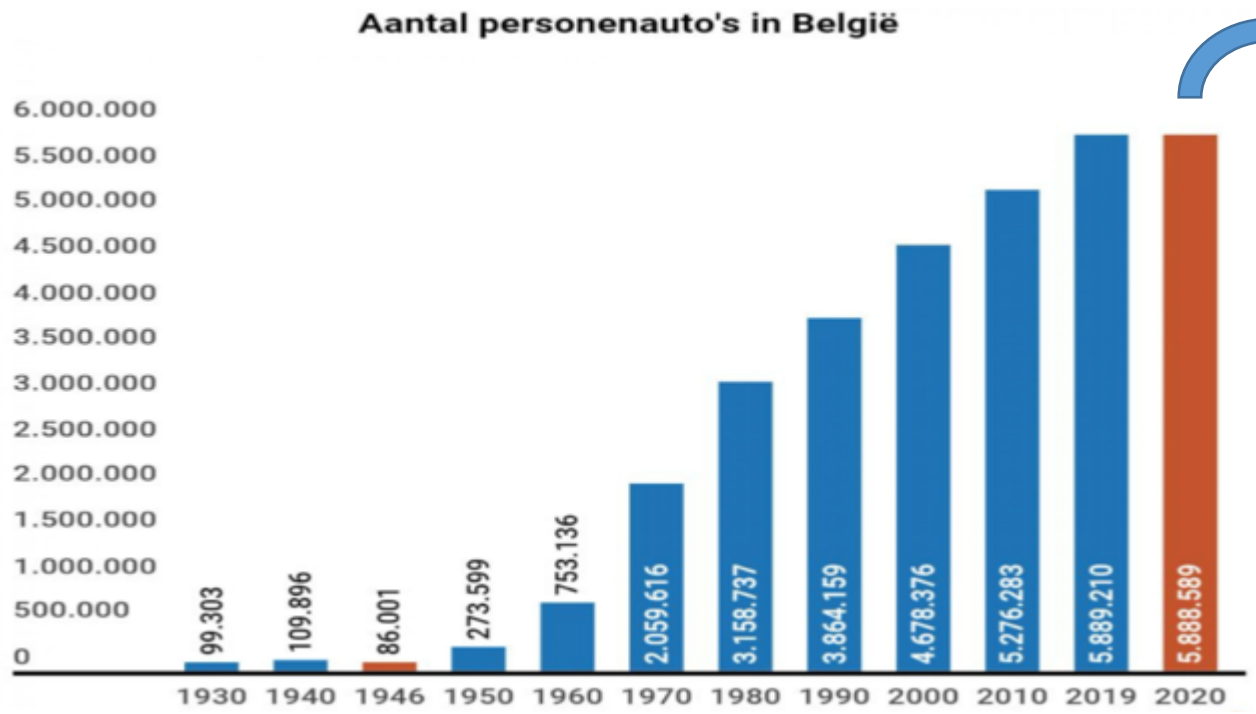
10 km: 40' CC – 30' EAC

How far can I reach by cycle ?

Brussels Capital Region: 161 km²
Luxembourg (city): 51 km²
Amsterdam: 219 km²



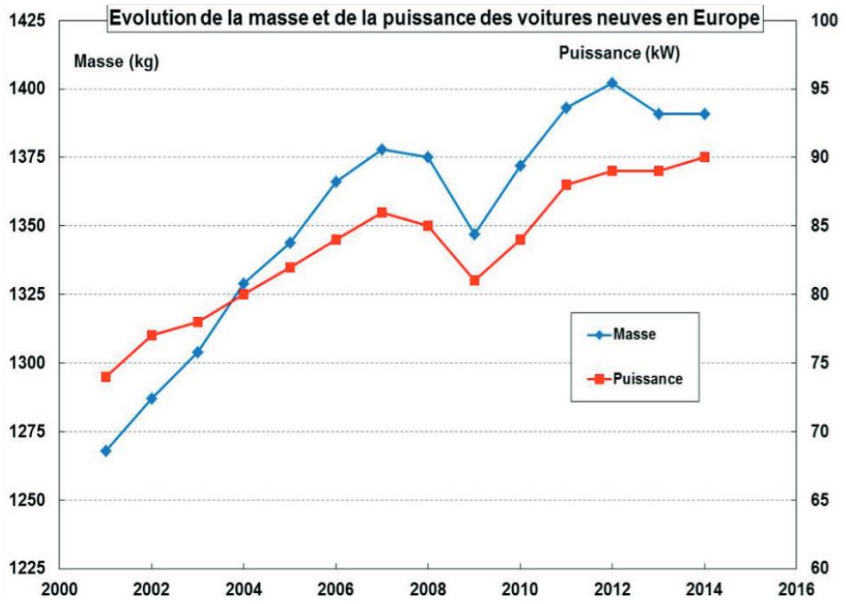
Vehicle fleet



Brussels Capital Region: 492,459 cars

Source: StatBel

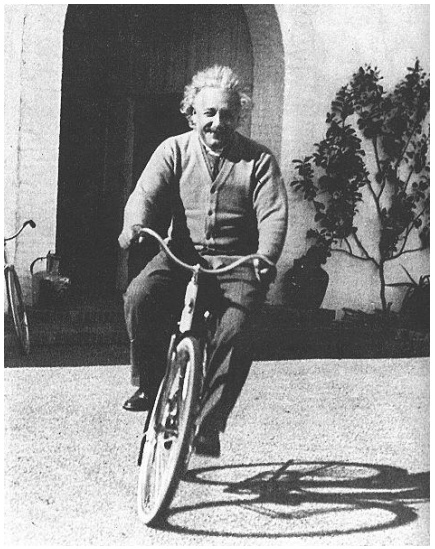
Vehicle fleet



Safety issue:
SUVs are more likely to be involved in crashes where cyclists experience fatal and severe injuries compared to passenger cars (sedans).

Robartes et al., 2017

THANK YOU FOR YOUR ATTENTION



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