Ministerie van Infrastructuur en Waterstaat

The relationship between health and active travel

Mathijs de Haas

The Netherlands Institute for Transport Policy Analysis (KiM)

Introduction

- Research shows that physical activity positively influences health
  - Reduces the risk of diabetes, cardiovascular diseases, depression etc.
- Worldwide around a third of all adults do not reach public health guidelines for recommended levels of physical activity
  - In The Netherlands this amounts to almost 50%
- Promoting active travel could potentially be effective in increasing physical activity levels
  - And thereby contributing to physical and mental health

Research questions

- How are subjective health and body-mass index (BMI) related to mode use in the Netherlands?
- To what extent does active travel contribute to reaching physical activity recommendations?
- Does BMI influence mode use, or does mode use influence BMI?

Data

- MPN wave 5, 6 and 7 (2017 – 2019)
- MPN has two indicators of health
  - BMI = weight (kg) / (length (m))^2
    - Healthy weight = BMI <25
    - Overweight = BMI ≥ 25 & BMI <30
    - Obese = BMI ≥ 30

Class	Share
Healthy weight (<25)	48,3%
Overweight (25-30)	35,0%
Obese (30+)	16,7%

  - ‘Subjective’ health = how healthy people find themselves

- Physical activity: the time people are cycling or walking

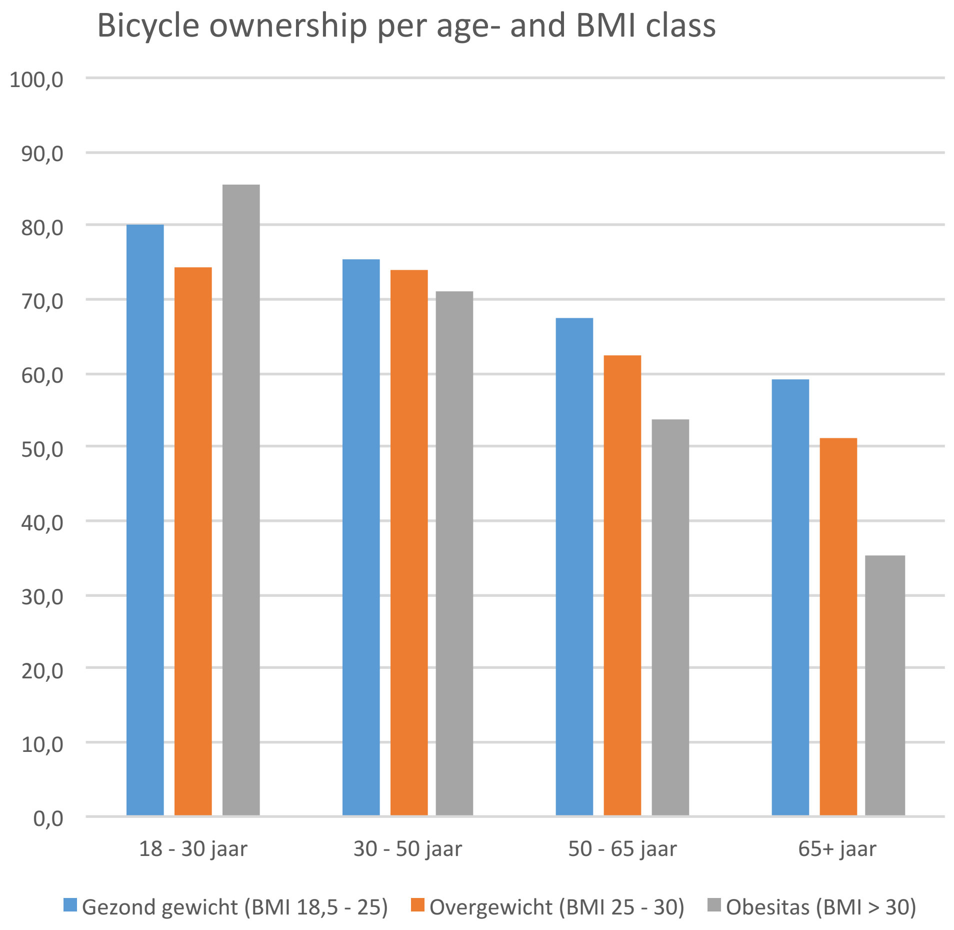
Methods

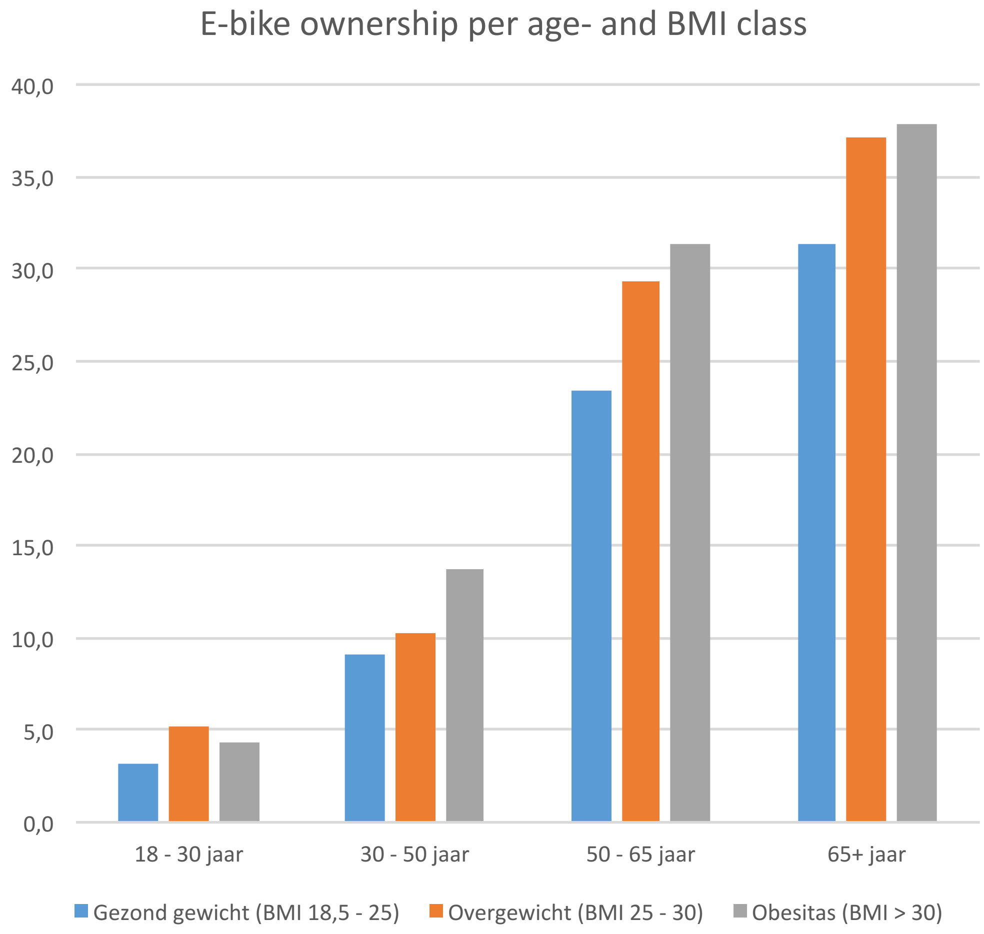
- Relation between subjective health and BMI and mode use
  - Multivariate regression models

- Active travel and physical activity guidelines
  - Latent class analysis

- Assessing whether health influences mode use or vice versa
  - Random Intercept Cross-Lagged Panel Model

Bicycle and e-bike ownership per BMI class





Health and mode use

- Multivariate linear regression models to assess whether health and the use of individual travel modes are related (cross-sectional)
- Control for counfounding variables:
  - Gender
  - Work status
  - Level of education
  - Age
  - Income
  - Country of origin of respondent

Health and mode use - results

	Trips (# per three days)				Distance (kilometres)			
	Overweight (ref. healthy weight)	Obese (ref. healthy weight)	Good subj. health (ref. bad subj. health)	Average trips	Overweight (ref. healthy weight)	Obese (ref. healthy weight)	Good subj. health (ref. bad subj. health)	Average distance
Car as driver	**0.56 (0.00)**	**0.75 (0.00)**	0.29 (0.07)	3.20	**9.45 (0.00)**	**9.34 (0.01)**	**8.67 (0.02)**	55.8
Car as passenger	-0.06 (0.23)	**-0.19 (0.00)**	-0.05 (0.42)	0.79	-0.62 (0.69)	**-4.20 (0.03)**	-1.04 (0.60)	16.3
Train	0.00 (0.92)	0.00 (0.88)	0.00 (0.94)	0.23	-0.46 (0.77)	-0.07 (0.97)	0.80 (0.70)	12.4
BTM	-0.01 (0.65)	0.00 (0.97)	-0.03 (0.26)	0.17	-0.47 (0.27)	-0.14 (0.80)	**-1.36 (0.02)**	2.5
Bicycle	**-0.32 (0.00)**	**-0.50 (0.00)**	**0.71 (0.00)**	1.62	**-1.25 (0.01)**	**-2.37 (0.00)**	**2.87 (0.00)**	5.3
E-bike	0.01 (0.92)	**0.17 (0.02)**	0.08 (0.28)	0.52	0.09 (0.77)	0.07 (0.86)	0.67 (0.10)	2.3
Walking	-0.07 (0.37)	**-0.35 (0.00)**	0.17 (0.11)	1.48	**-0.50 (0.00)**	**-0.94 (0.00)**	**0.46 (0.01)**	2.0
Total	0.08 (0.65)	-0.01 (0.97)	**0.88 (0.00)**	8.30	6.08 (0.10)	3.33 (0.48)	**10.43 (0.03)**	101.8

P-values are presented in parentheses, parameters with p<0.05 are bold

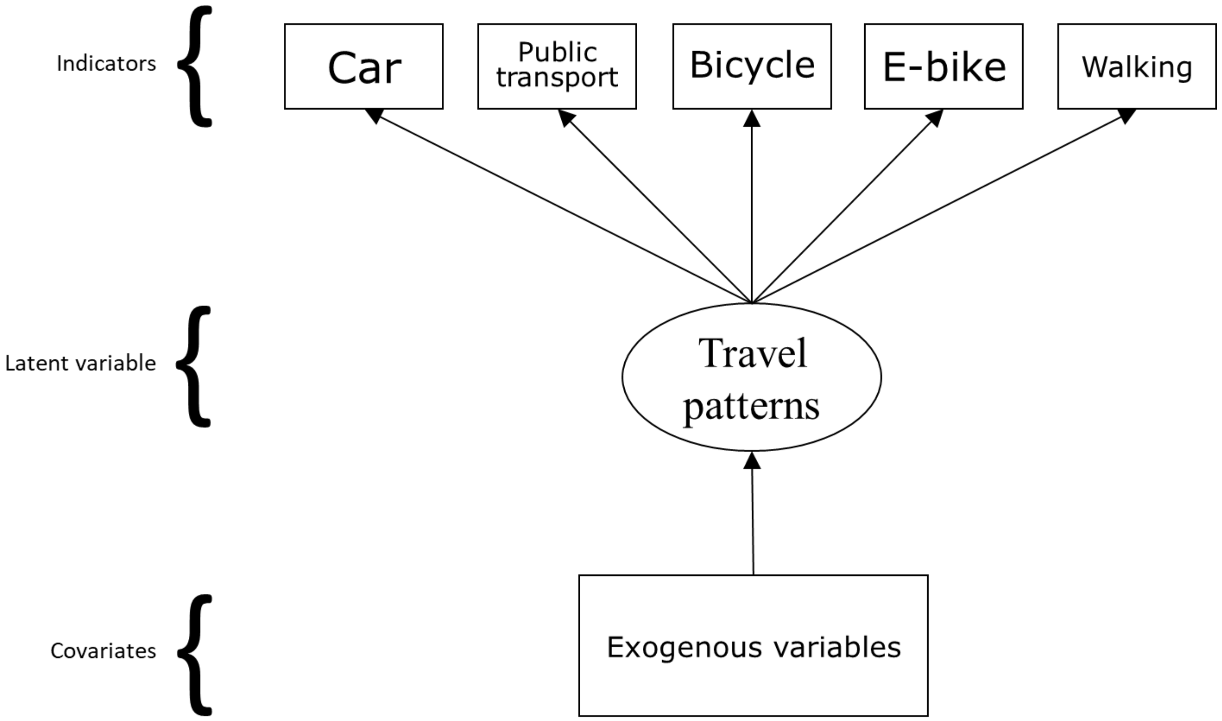
Most significant effects are found for car as driver, bicycle and walking

Active travel as physical activity

- WHO recommends 150 minutes of physical activity per week
  - Cycling (regular bicycle and e-bike) and walking are also considered physical activity
- MPN has a three day travel diary → minimum 64 minutes of active travel to meet the guideline
- How many people meet this guideline with their daily mobility?

Physical activity per travel pattern

- Latent class analysis
- Five travel modes:
  - Car
  - Public Transport
  - Bicycle
  - E-bike
  - Walking



Seven different travel patterns

- Seven different travel patterns
- Not only differences in travel behaviour, also differences in background characteristics
- For example:
  - Car users are generally employed men with relatively good incomes
  - Low mobility class have low incomes and low level of education

	Pattern 1	Pattern 2	Pattern 3	Pattern 4	Pattern 5	Pattern 6	Pattern 7
	Car	**Low mobility**	**Car + bicycle**	**Car + walking**	**Bicycle**	**E-bike**	**Public transport**
Modal Share	27.8%	17.7%	13.4%	11.7%	11.6%	9.1%	8.7%
Number of Trips							
Car	7.5	0.6	6.3	4.3	0.7	2.9	1.2
Public Transport	0.1	0.0	0.1	0.3	0.2	0.1	3.2
Bicycle	0.0	0.2	3.9	0.6	7.3	0.3	1.4
E-bike	0.0	0.1	0.0	0.1	0.1	5.2	0.0
Walking	0.6	0.2	0.8	6.4	1.8	1.2	1.1

Physical activity per travel pattern

- In total, ±33% of people meet the physical activity recommendation with their daily mobility
- Large differences in meeting the physical activity recommendation per travel pattern

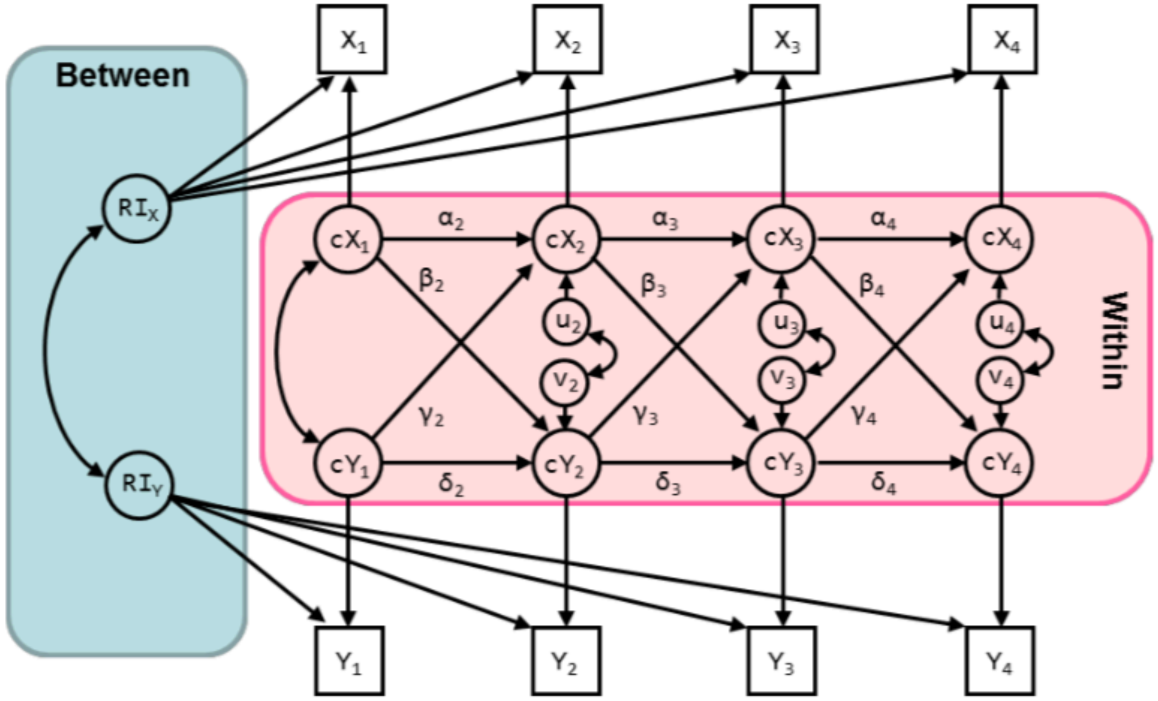
- Only 7% of strict car users meet the recommendation with their daily mobility
- 80% of people who primarily use the bicycle do so

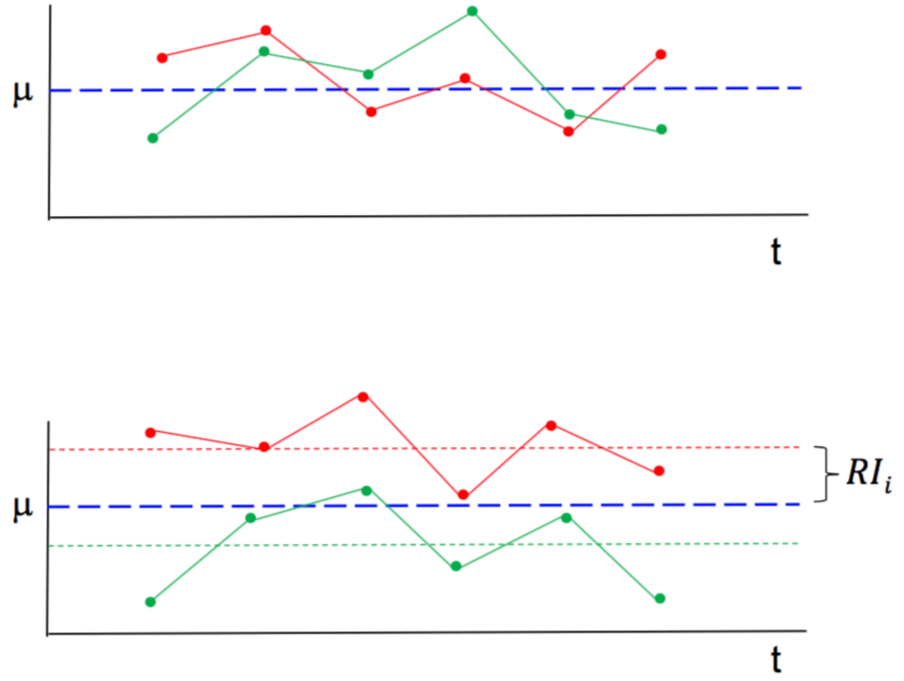
- Of course, people can meet the recommendation with other physical activities besides cycling or walking

	Pattern 1	Pattern 2	Pattern 3	Pattern 4	Pattern 5	Pattern 6	Pattern 7
	Car	Low mobility	Car + bicycle	Car + walking	Bicycle	E-bike	Public Transport
Active travel over three days (minutes)	14	9	75	124	144	116	75
Percentage meeting physical activity standard (150+ min. physical activity)	7%	4%	43%	69%	80%	69%	48%

Causal relation between health and active travel?

- MPN allows for studying the relationship between health and active travel over time
- Random Intercept Cross-Lagged Panel Model (RI-CLPM)





RI-CLPM results – trips and BMI

- **Preliminary results!**
- No significant effects ($p<0.05$).
- At $p<0.10$ effects of BMI on trips in the ‘Bicycle total’ and ‘Total active modes’ model

Model	Cross-lagged relation	Parameter (p-value)
Bicycle	Trips -> BMI	*
	BMI -> trips	*
E-bike	Trips -> BMI	*
	BMI -> trips	*
Bicycle total	Trips -> BMI	*
	BMI -> trips	*
Walking	Trips -> BMI	*
	BMI -> trips	*
Total active modes	Trips -> BMI	*
	BMI -> trips	*

RI-CLPM multigroup results – trips and BMI

- **Preliminary results!**
- Significant effects in non-obese group of BMI on trips
- No significant effects in obese group

Model	Cross-lagged relation	Parameter (p-value) (BMI<30)	Parameter (p-value) (BMI=>30)
Bicycle	Trips -> BMI	*	*
	BMI -> trips	*	*
E-bike	Trips -> BMI	*	*
	BMI -> trips	*	*
Bicycle total	Trips -> BMI	*	*
	BMI -> trips	*	*
Walking	Trips -> BMI	*	*
	BMI -> trips	*	*
Total active modes	Trips -> BMI	*	*
	BMI -> trips	*	*

Conclusions (1)

- Clear differences in mode use between people from different BMI classes and with different subjective health levels
  - Higher BMI: less cycling and walking, more car use
    - Obese: more e-bike!
  - Better subjective health: Higher total mobility. More car use, cycling and walking.

- Active travel is an important factor in meeting the physical activity guideline of 150 minutes per week
  - 80% of people with a cycling-only travel pattern meet the guideline
  - Only 7% of strict car users does

Conclusions (2)

- Does BMI influence mode use, or does mode use influence BMI?
  - Number of trips with active modes does not seem to influence BMI in a following year
  - There is a significant negative effect of BMI on active mode use for non-obese people
  - So, an increase in BMI leads to lower active mode use, but active mode use does not lead to a lower BMI

  - Relation between active travel and travelled distances and subjective health over time not yet assessed

Questions?