Mode-choice behaviour for home-based work trips

The first results of the new Mobility Panel Netherlands (MPN)

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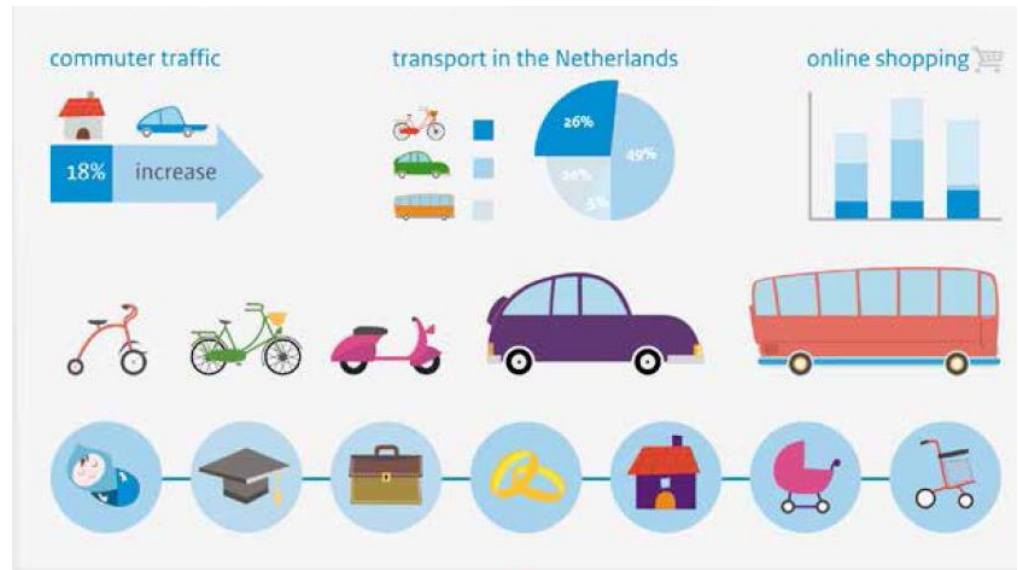
Karst Geurs, University of Twente, the Netherlands

Sascha Hoogendoorn, KiM Netherlands Institute of Transport Policy

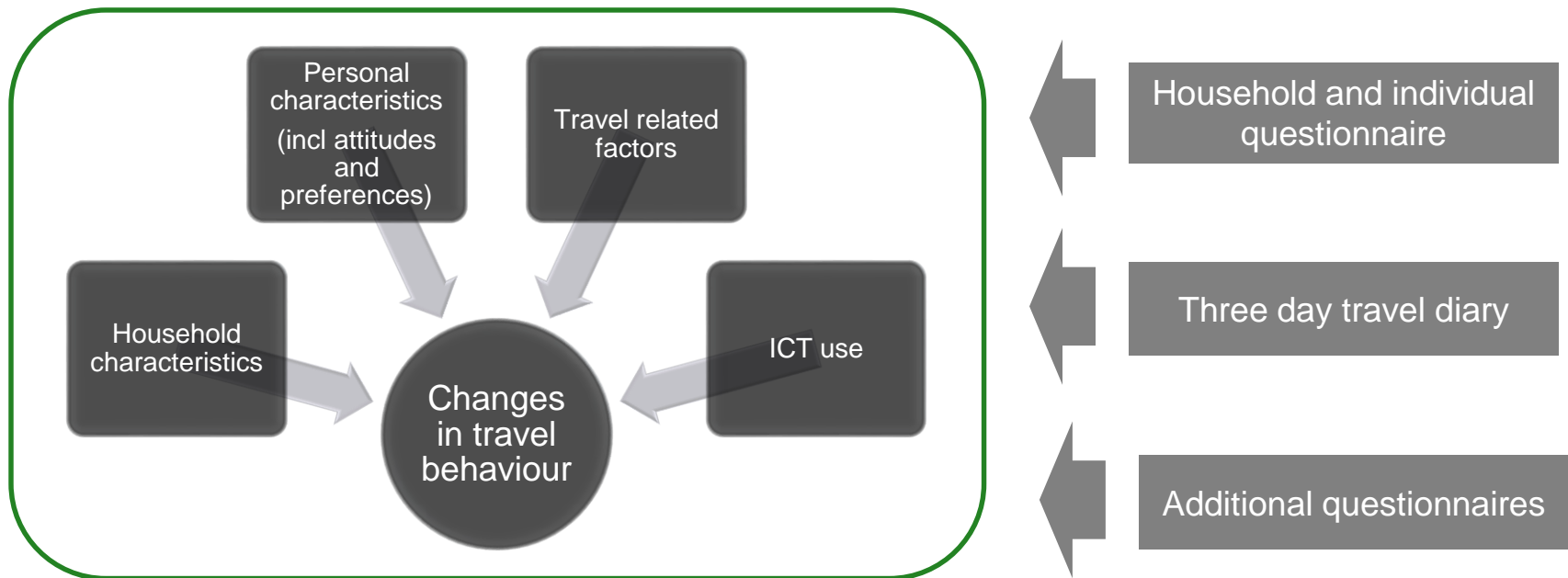Paul van Beek, Goudappel Coffeng

Short impression of the MPN

Main objective of the MPN

To examine changes in individual travel behaviour and specific population segments (e.g., young adults, elderly) over an extended period of time
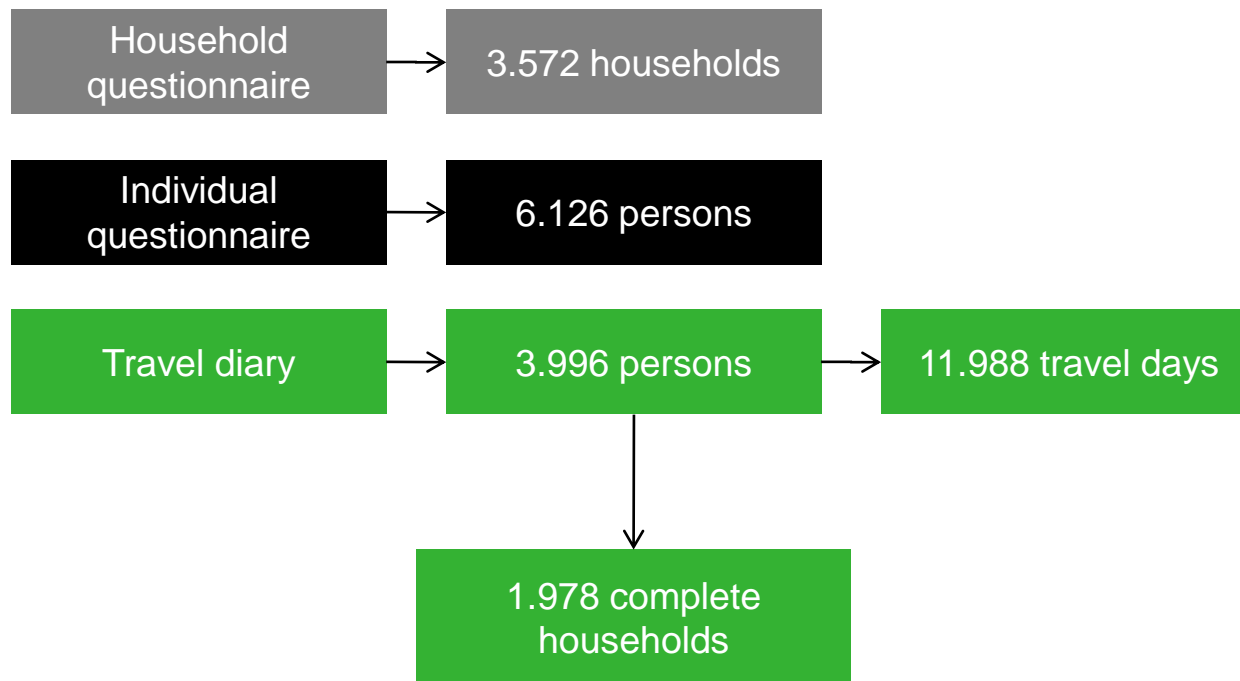
Main research questions

1. How do **life events**, such as changing jobs, births of children and divorce, influence travel behaviour?

2. How do changes in **vehicle ownership** (cars, bicycles) and public transport subscriptions influence travel behaviour?

3. How do **changes in people's preferences** in terms of transport modes, homes and lifestyle influence travel behaviour?

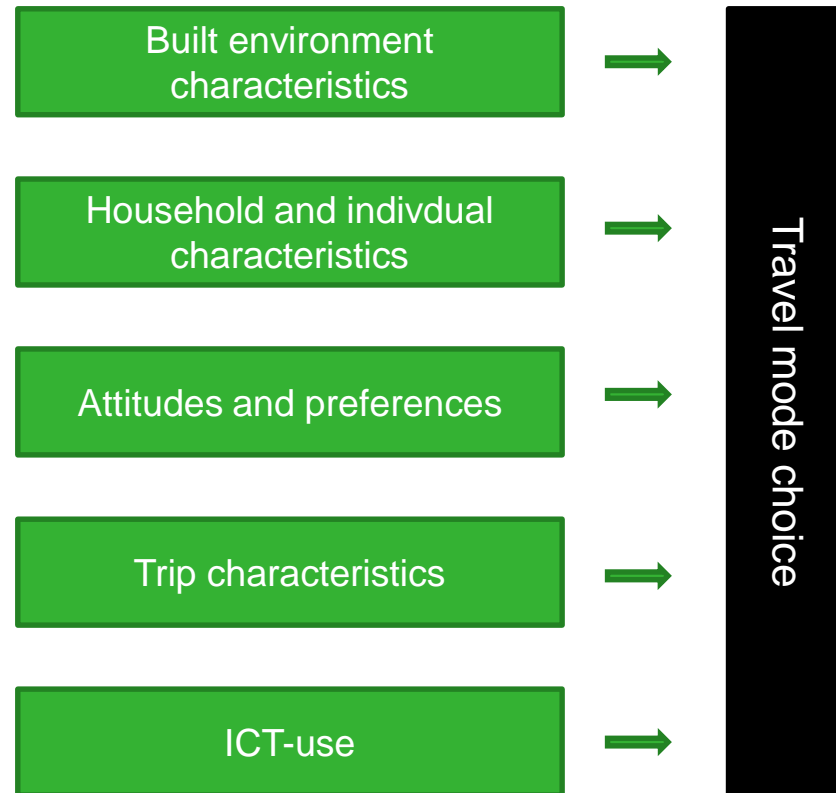4. How do **changes in built environment factors** influence travel behaviour?

Characteristics Mobility Panel for the Netherlands - MPN

- Largest mobility panel (2000 households, 4000 persons)

- Multiple year panel

- Household panel

- Multi-day diary

- Location based diary

- Retrospective questions

- Every two year addtional questions about ICT-use and attitudes

Sample Size Wave 1 (autumn 2013)

Household questionnaire	→ 3.572 households
Individual questionnaire	→ 6.126 persons
Travel diary	→ 3.996 persons → 11.988 travel days

↓

1.978 complete households

Determinants of travel mode choice

Literature review

Source	Trip purpose	Model specification	Individual/ household	Attitude/ preferences	Built environment	Trip characteristics	ICT
Commins and Nolan (2011)	commuting	Conditional Logit Model (CL)	✓		✓	✓	
Kuppam et al. (1999)	general	Multinomial Logit Model (MNL)	✓	✓	✓		
Feng et al.	commuting, leisure	Multinomial Logit Model (MNL)	✓				
Muller et al. (2008)	school	Multinomial Logit Model (MNL)	✓		✓	✓	
De Palma and Rochat (2000)	commuting	Nested Multinomial Logit Model	✓			✓	
Schwanen and Mokhtarian (2005)	commuting	Multinomial Logit Model (MNL)	✓	✓	✓		
Ewing et al. (2004)	School	Multinomial Logit Model (MNL)	✓		✓	✓	
Schwanen et al. (2004)	commuting	Multilevel Regression Analysis	✓		✓		
Vij et al.(2013)	commuting	Latent Class Choice Model (LCCM)	✓			✓	
Scheiner and Holz-Rau(2012)	general	Cluster Robust Regression	✓		✓	✓	
Miskeen et al. (2013)	intercity trips	Multinomial Logit Model (MNL)	✓	✓			
Paulssen et al. (2014)	general	Mixed Logit Model	✓	✓	✓	✓	
Ho and Mulley (2013)	weekend/weekday	Nested Logit Model	✓		✓	✓	
Klöckner and Friedrichsmeier (2011)	school, leisure, work and shopping	Multilevel Model	✓	✓		✓	
McKibben (2011)	work	Multivariate Analysis	✓		✓		

# Shortcomings of current mode choice research

- Mostly based on cross-section data of one specific year

- Not including all types of determinants

- Few differentiate between joint and independent activities

- Little known about the impact of ICT-use

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Hypothesis

1. Including **all types of determinants** in mode choice modelling allows for a better understanding of commuting behaviour

2. Including **joint activities** in mode choice modelling allows for a better understanding of commuting behaviour

3. Including **ICT-use** in mode choice modelling allows for a better understanding of commuting behaviour

4. Including **life-events** in mode choice modelling allows for a better understanding of commuting behaviour

Sample description: home-based work trips (n=1,112)

Travel mode

- Car
- Public transport
- Bicycle
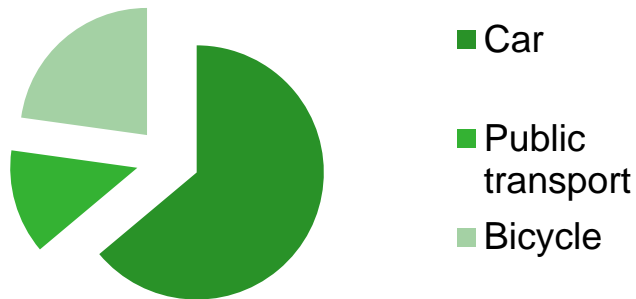
Travel distance (km)

- Car
- PT
- Bicycle
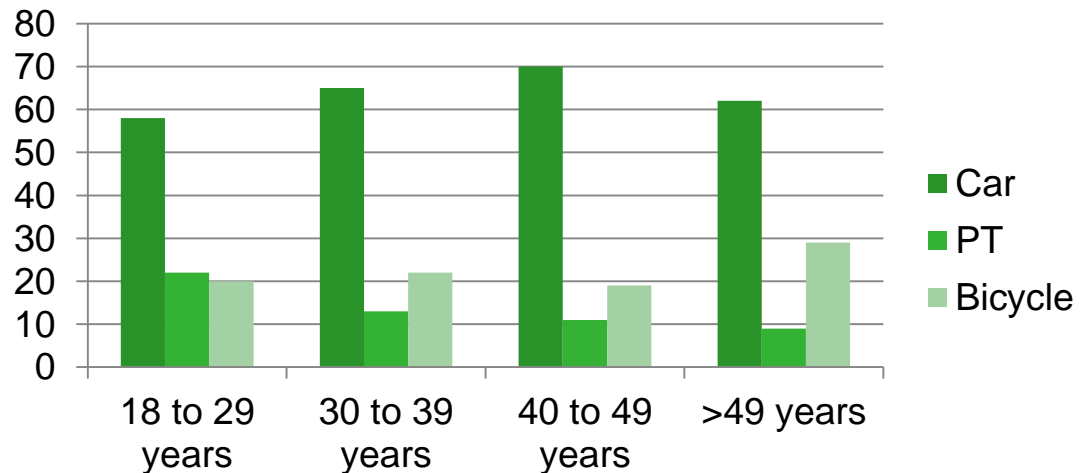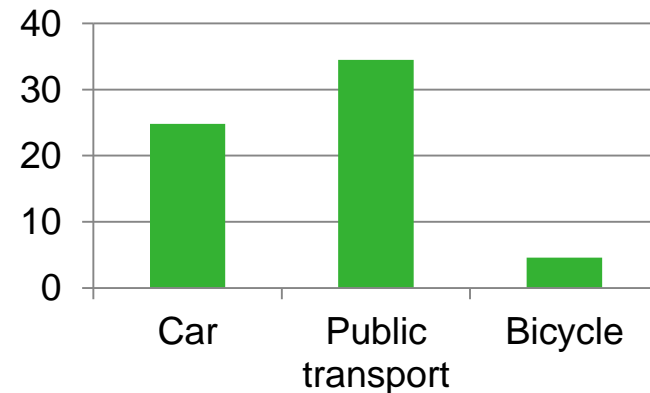
Preferences vs. actual behaviour (commuting trip)

Stated preferences	Actual behaviour		
	Car	**Public transport**	**Cycling**
Car	**93%**	4%	3%
Public Transport	11%	**87%**	3%
Cycling	30%	8%	**62%**

- not every respondent uses preferred mode
- 38% of people with cycling as preferred mode use another way to travel from home to work
- 10% of car users might switch if circumstances change

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Model specification MNL mode choice models

- I: 'standard' variables national travel surveys (age, gender, education level, ethnicity, household type, car ownership),

- II: built environment factors (urban/rural residential location, parking cost)

- III: joint activities

- IV: ICT-use (telework, emailing, e-conferencing)

- V: life-events (job change, working hours, move house)

- VI: preference towards mode

- VII: best combination

Model estimation results

- Including **all types of determinants** has a significant effect on the predictive ability of the model (pseudo r^2 increases from 0.66 to 0.85)

- **Joint activities**: people who travel together with someone from the same household are more inclined to go by car for commuting

- **Life-events**: people who changed working hours are more often car users

- **ICT-use**: no significant effect on mode-choice

- **Preferences towards modes**: strongest effect on explanatory power (as a single factor pseudo r^2 of 0.71)

Further research

- Scope of the analysis:

    - Different models for different distance classes

    - Interaction effects

    - Other trip purposes

- Dynamics in mode choice behaviour

- Enrich MPN data:

    - Characteristics of built environment

    - ICT-variables

    - Travel time alternative modes

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Questions?