

# Preferred citation style

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Axhausen, K.W. (2013) Models of daily life and travel: Usage for public health, presentation at a *NUS School of Public Health Research Round*, Singapore, March 2013.

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# Models of daily life and travel: Usage for public health

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March 2013

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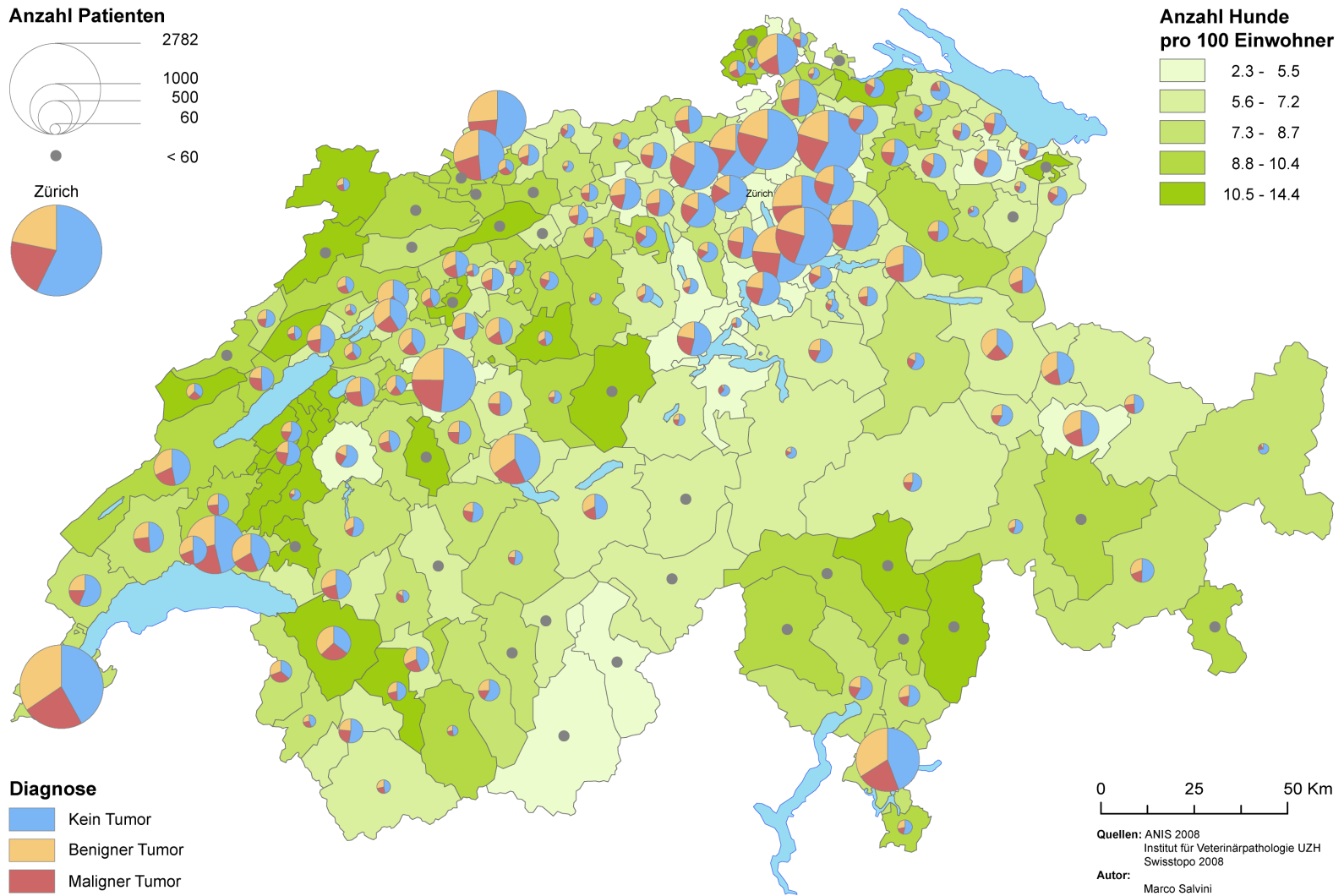
**ETH**

Eidgenössische Technische Hochschule Zürich  
Swiss Federal Institute of Technology Zurich

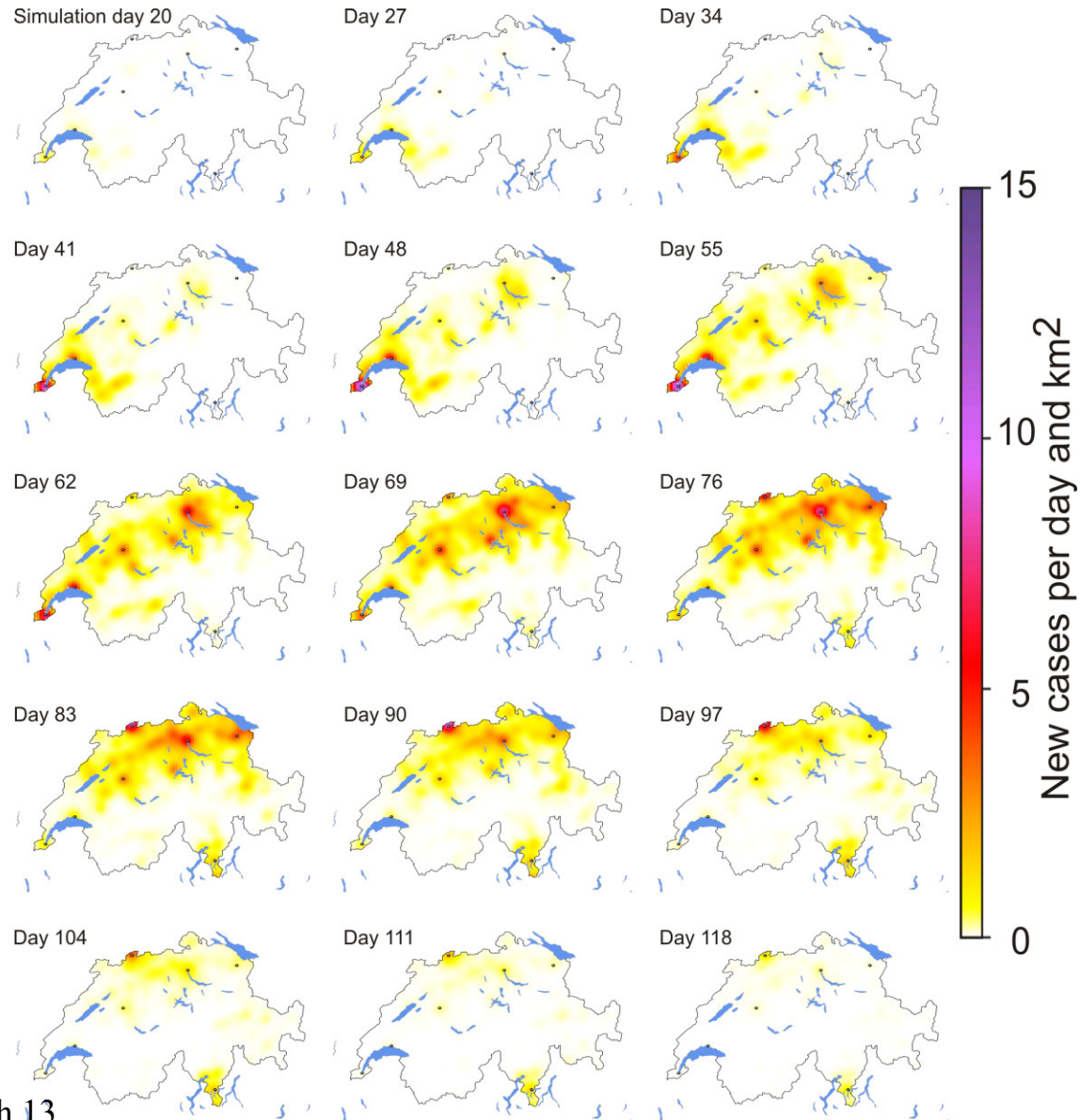
# Current and past involvement

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# 2012 onwards: Towards a Swiss canine cancer register



# 2009: Simulating an influenza epidemic in Switzerland



Public health March 13

Smieszek, T., M. Balmer, J. Hattendorf, K.W. Axhausen, J. Zinsstag and R.W. Scholz (2011) Reconstructing the 2003/2004 H3N2 influenza epidemic in Switzerland with a spatially explicit, individual-based model, BMC Infectious Diseases 2011, 11, 115.

# Task

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# Transport planning models (1)

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Are models of

Daily life

reproducing

who is travelling/present

where (location/route/connection)

when

with which vehicle (bike, car, bus, train etc.;;)

with whom

for how long

for what purpose

in which daily schedule

## Transport planning models (2)

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attempt to describe today's and model future network conditions consistent with:

- The given supply of capacity through
  - Networks
  - Services provided on them
- The known/assumed amounts of desired travel
- The known correlations between the behavioural dimensions/structures, capacity and the prices for travel

imposing a justifiable set of assumptions on the solution of the resulting fixed point problem (or not)



# e.g. agent-based model for Singapore

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# Transport planning models (3): Validation

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Cross-section:

- Time-of-day/day-of-week counts
  - Networks
  - Services provided on them
- The known correlations between the behavioural dimensions/structures, capacity and the prices for travel
- Reasonable implied trade-offs in the choice models, e.g. VTTS

Dynamic:

- Known elasticities
- Before and after case studies, e.g. effects of MRT extension

# Data sources

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# Data sources: Travel behaviour

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- (National) household/personal travel diaries (e.g. HITS)
- GPS tracing studies
- (National) travel panel surveys
- Dedicated stated choice (SC) surveys
  
- Automated traces:
  - Public transport use (e.g. CEPAS data)
  - GSM records
  - Twitter, FourSquare, Google Locations
  - Credit card records

# Data sources: Populations

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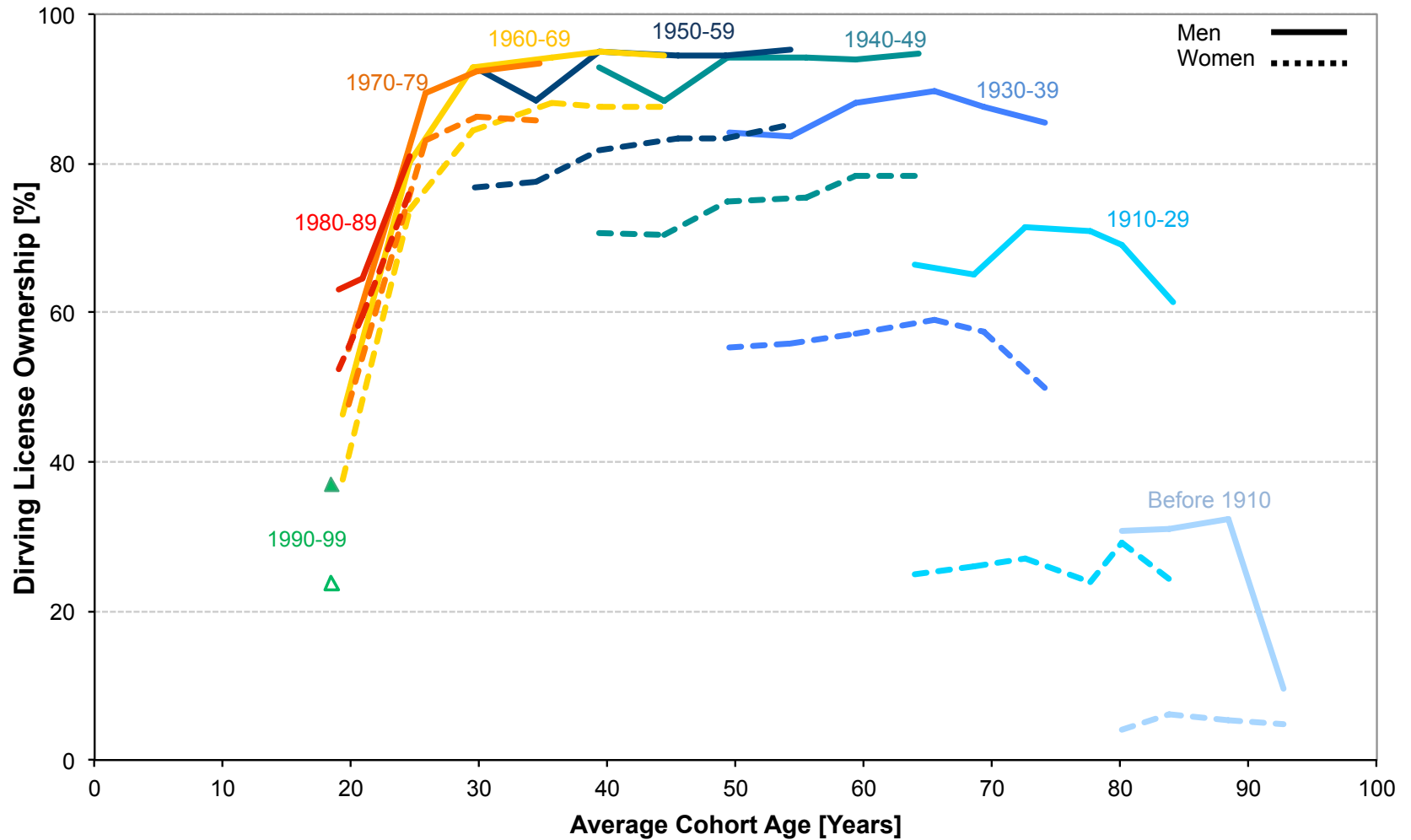
- Census (e.g. Switzerland)
  - Population
  - Firms/Employment locations
- Synthesis based on a
  - (National) household/personal travel diary (e.g. HITS)
  - Public use sample and marginal distributions
- Land use information (e.g. Swiss hectare database)
- Imputation models
  - Car ownership
  - Season ticket ownership
  - Work place

# Data sources: Networks and timetables

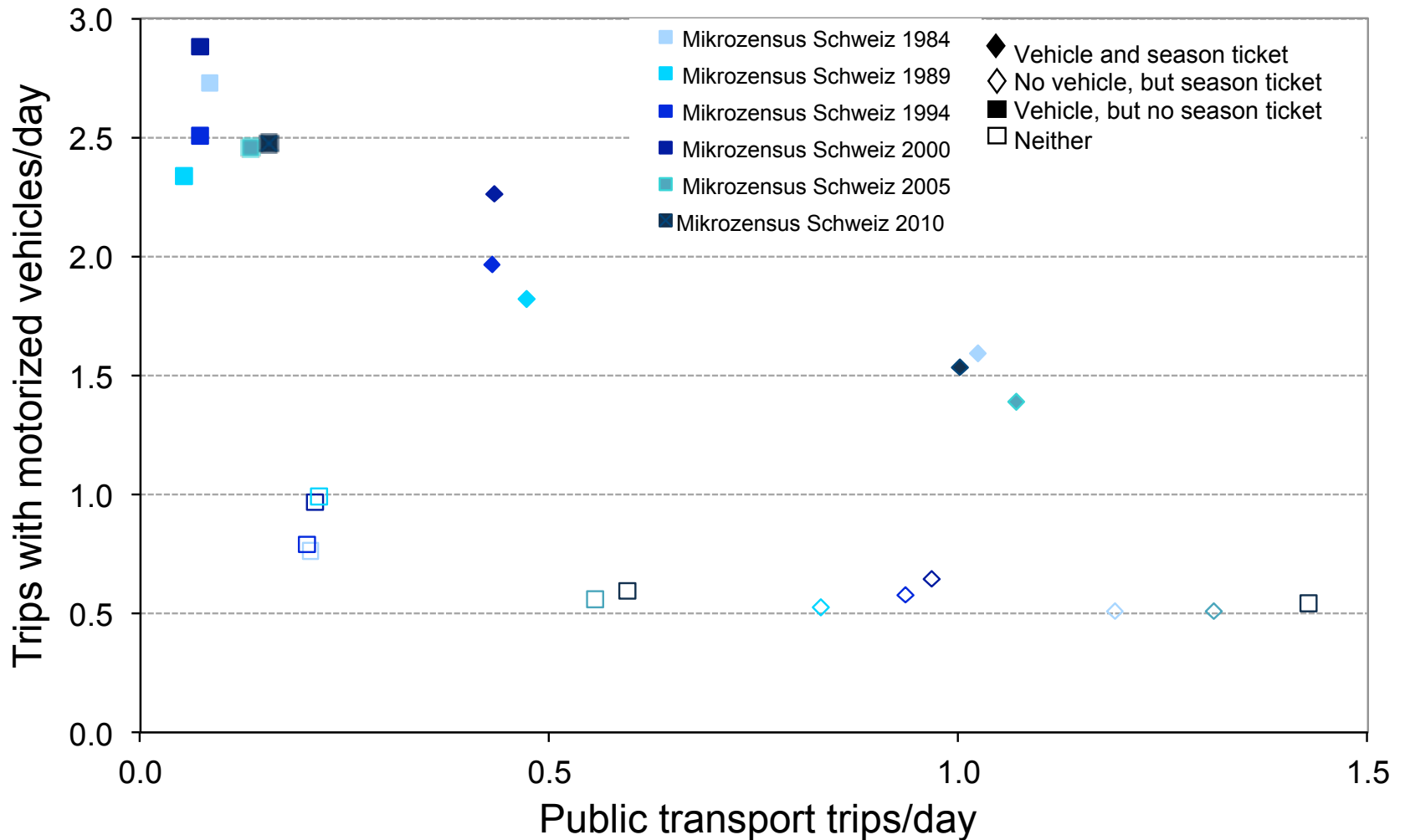
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- Networks
  - Commercial (e.g. TeleAtlas)
  - Open-source, i.e. OSM
- Services
  - National public transport information services
  - Commercial (e.g. GTFS, OAG, HAFAS)

# Long term dynamics: Driving licence holding by gender

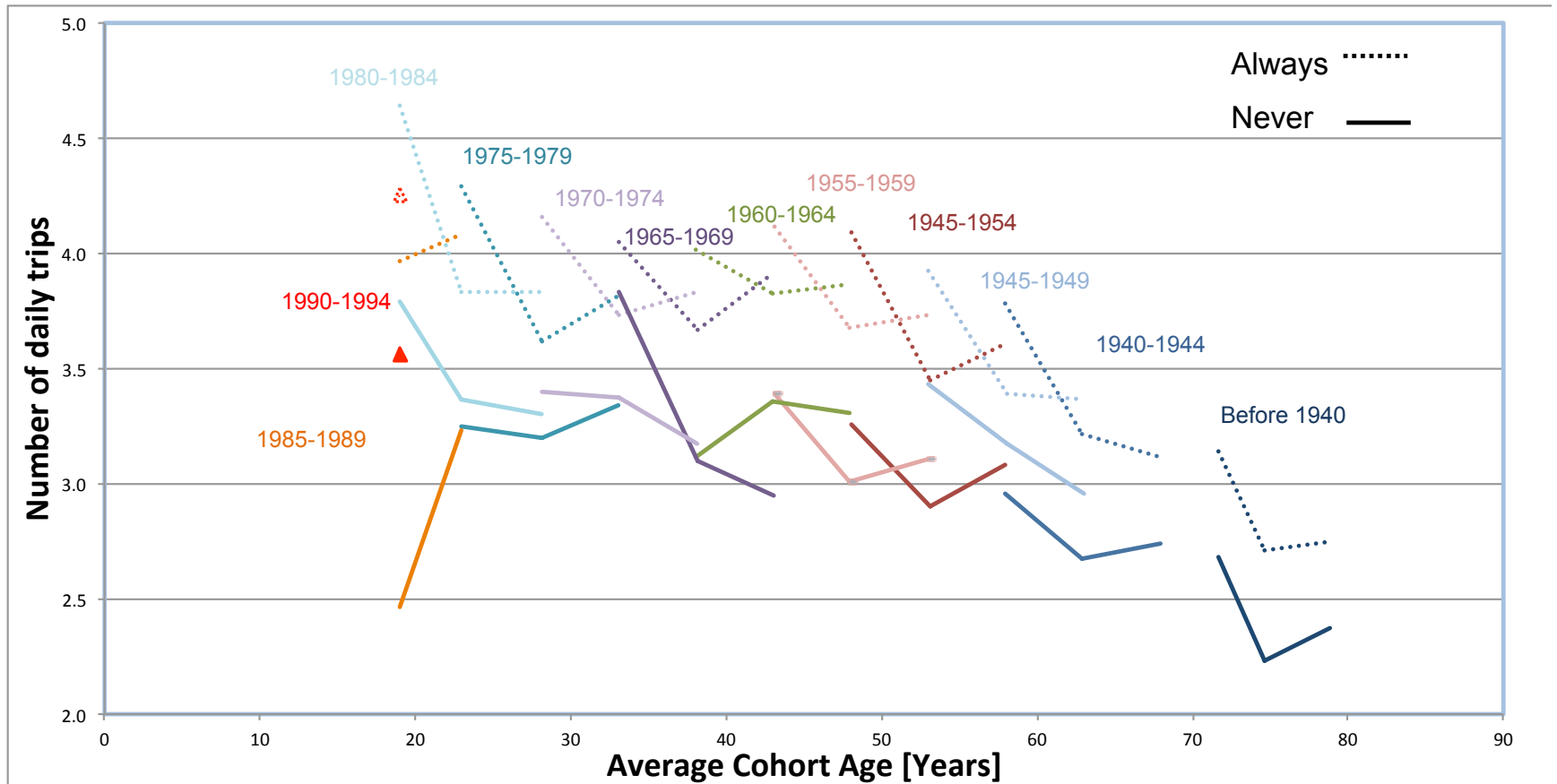


# Long term dynamics: Daily car and public transport trips





# Long term dynamics: Daily number of trips



# MATSim: A GNU public licence software project

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# MATSim: A GNU public licence software project

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## Main partners

- TU Berlin (Prof. Nagel)
- ETH Zürich
- senezon (Dr. Balmer, Dr. Rieser)

## Coordination via:

- User meeting
- Conceptual meeting
- Developer meeting
  
- Code committee
- Regular releases of the code

# Known implementations

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Location	Scale (agents)	Schedules	DTA	Equi- librium
Switzerland	$10^6$	MATSim	MATSim	Yes
Berlin	$10^6$	MATSim	MATSim	Yes
München	$10^6$	MATSim	MATSim	Yes
Singapore	$10^6$	MATSim	MATSim	Yes
Gauteng	$10^6$	MATSim	MATSim	Yes
Cape Town	$10^6$	MATSim	MATSim	Yes
(Seoul)	$10^7$	MATSim	MATSim	Yes
(Shanghai)	$10^7$	MATSim	MATSim	Yes
Tel Aviv	$10^6$	ABM	MATSim	-
Toronto	$10^7$	Tasha	MATSim	-
Los Angeles	$10^7$	CEMDAP	MATSim	-
Netherlands	$10^7$	Albatross	MATSim	-
Dublin	$10^6$	-	MATSim	-
(London)	$10^7$	ABM	MATSim	-

# Schedule detail possibilities (in current **stable MATSim**)

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Number and type of activities

(Feil)

Sequence of activities

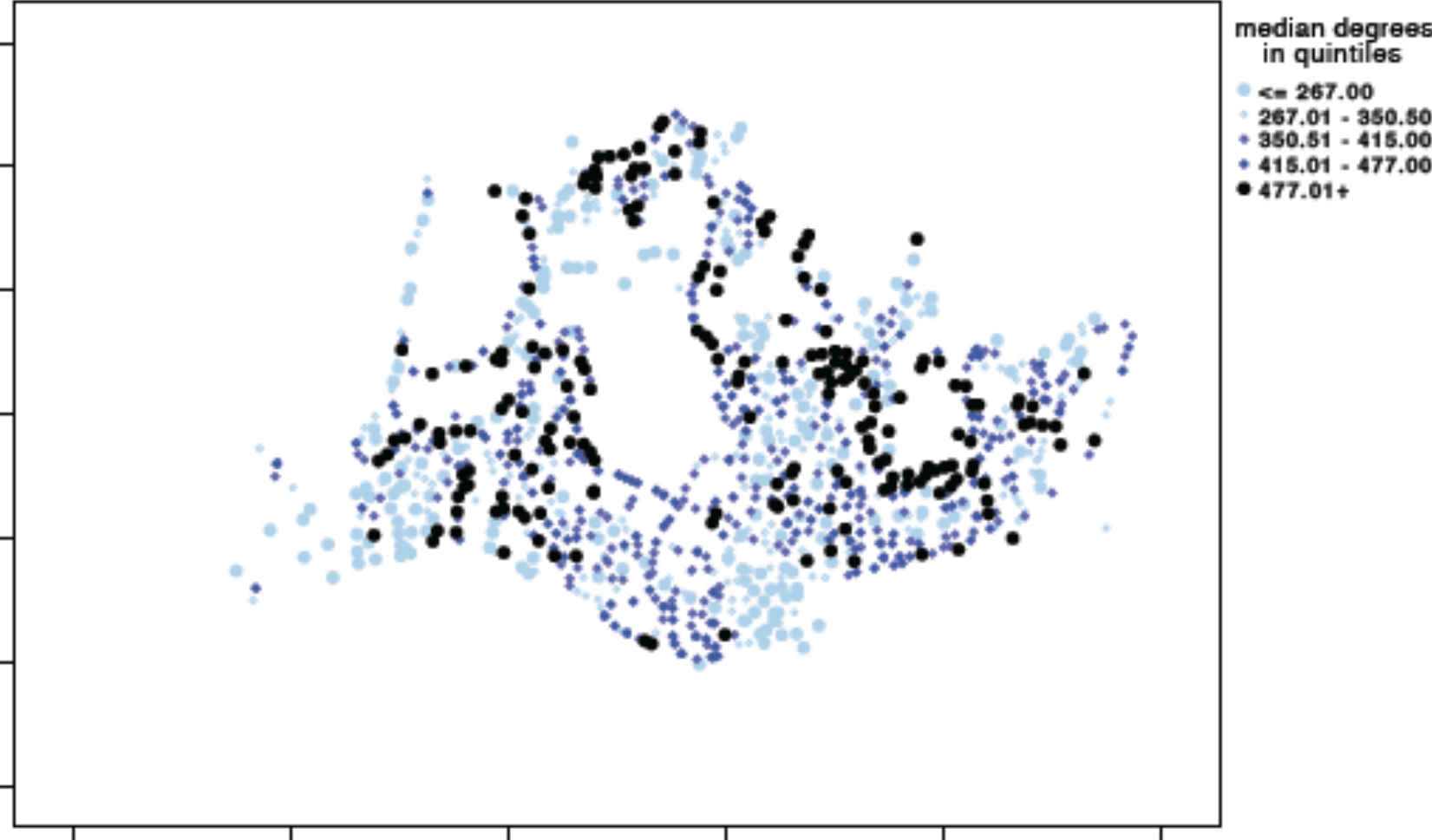
(Ordonez)

- **Start and duration of activity**
- Composition of the group undertaking the activity (Kowald, Tan, **Fourie**)
- Expenditure division
- **Location of the activity** (Horni)
  - Movement between sequential locations
    - **Location of access and egress from the mean of transport**
      - Parking search and type (Waraich)
    - **Vehicle/means of transport** (Ciari)
    - **Route/service** (Chakirov)
    - Group travelling together (Dubernet, **Fourie**)
  - Expenditure division

# Next challenge: Social networks

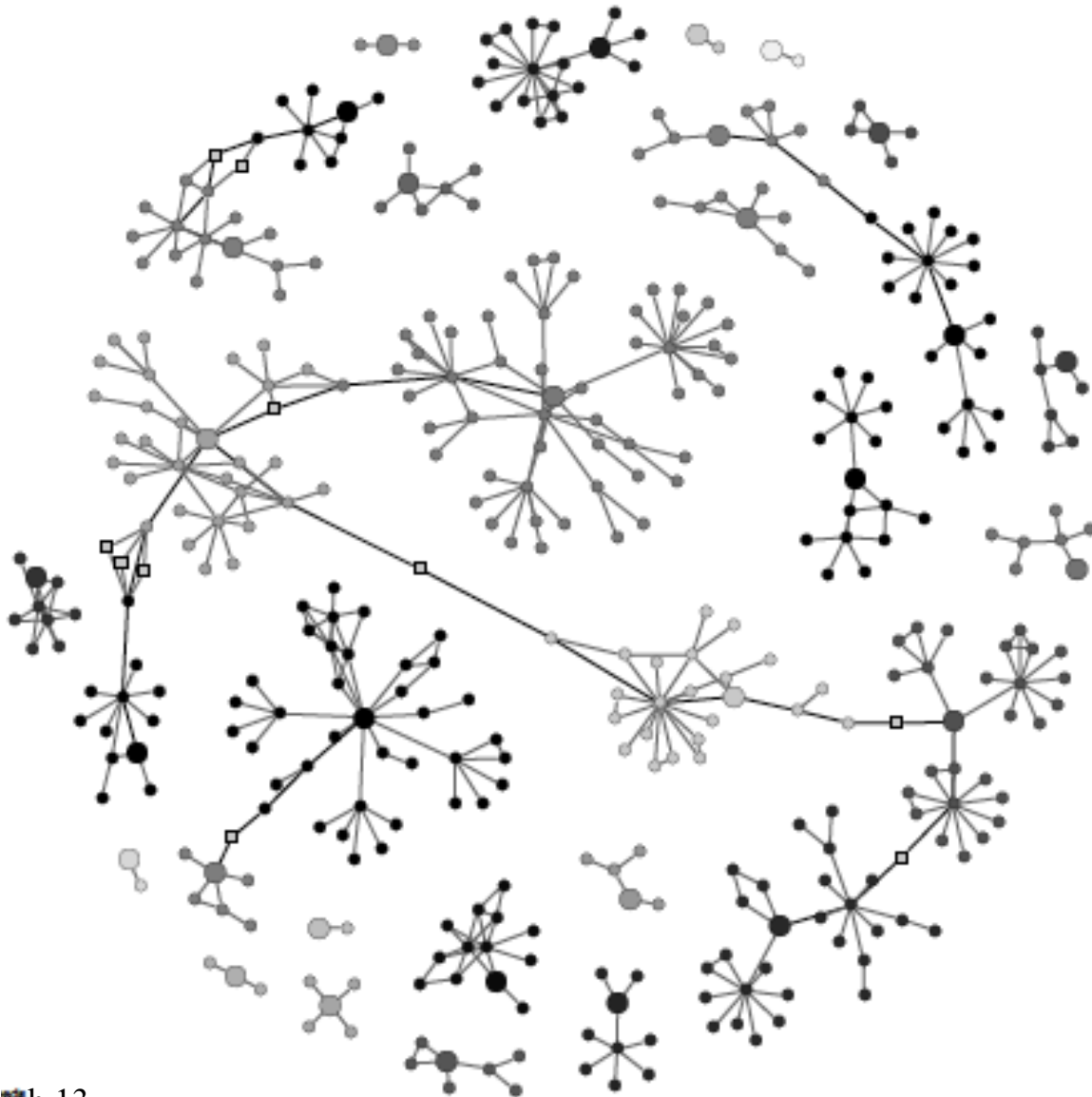
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# Next challenge: Social networks



# Next challenge: Social networks

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# MATSim @ ETHZ, TU Berlin, FCL, Senozon (past & present)

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Michael Van Eggermond

Rashid Waraich

Michael Zilske

# Questions ?

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Paul Frosch around 1925



# Questions ?

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[www.matsim.org](http://www.matsim.org)

[www.ivt.ethz.ch](http://www.ivt.ethz.ch)

[www.futurecities.ethz.ch](http://www.futurecities.ethz.ch)

[www.senozon.ch](http://www.senozon.ch)