


# Working from home and its integration into agent-based-simulation

**Presentation****Author(s):**

Axhausen, Kay W. 

**Publication date:**

2024-06

**Permanent link:**

<https://doi.org/10.3929/ethz-b-000680055>

**Rights / license:**

In Copyright - Non-Commercial Use Permitted

## Preferred citation style

---

Axhausen, K.W. (2024) Working from home and its integration into agent-based-simulation, *Seminar BIVEC*, Delft Technical University, Delft, June 2024.

# Working from home and its integration into agent-based-simulation

KW Axhausen

IVT

ETH

Zürich

June 2024

 *Institut für Verkehrsplanung und Transportsysteme*  
*Institute for Transport Planning and Systems*

**ETH**

Eidgenössische Technische Hochschule Zürich  
Swiss Federal Institute of Technology Zurich

# Acknowledgements

---

- ETH Zürich
  - D Heimgartner
  - A Meister
  - A Sallard
  - C Winkler
- Projects
  - Swiss New Normal (SNN) (ETH Mobility initiative)
  - TimeUse+ (SNF)

# TimeUse+

---

## Survey of

- Time use based on GPS activity locations
- Expenditure for the activities
- Travel behaviour via GPS tracking

# TimeUse+ protocol

---

- Recruitment survey (official registries)
- Qualified forwarded with a personalised app download link
- 4 week of GPS validation, time use and expenditures
- Reminders, if not enough validation, and exclusion, if needed
- Debriefing survey
- Payment of incentive (28 validated days with a bit of leeway)

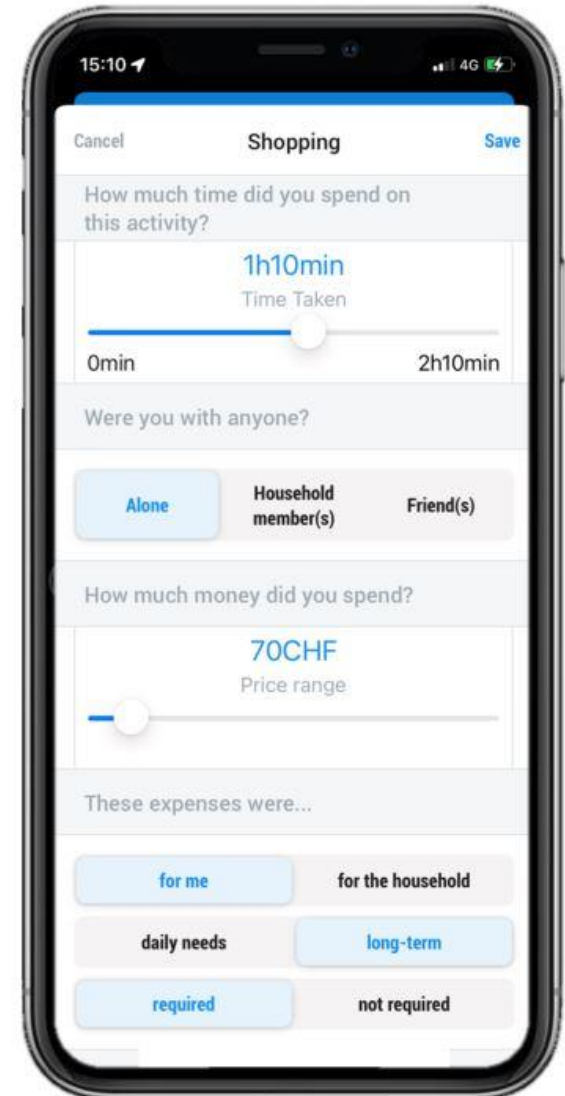
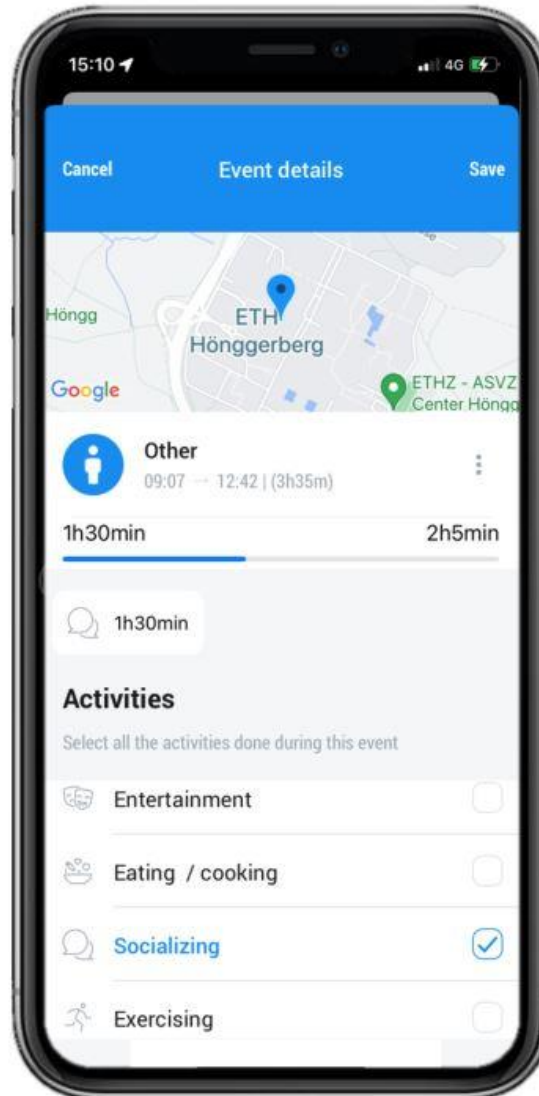
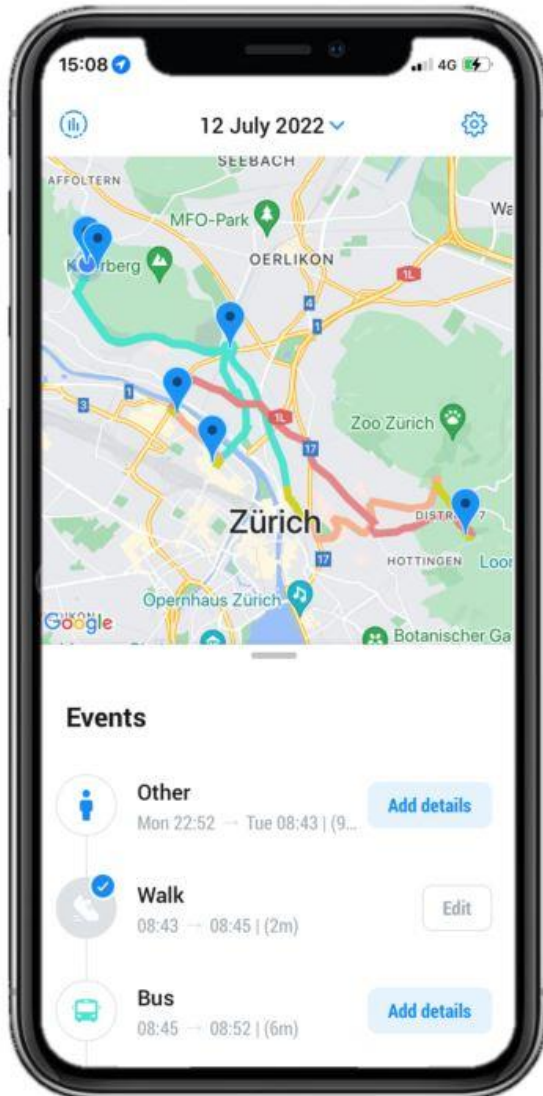
# Necessities for GPS studies

---

- Download and installation, if eligible
  - FAQ leaflet
  - Strong help desk (ready for peak loads, therefore waves are better for the study)
  - Standard answers with blanks for the queries
- Validation
  - Second imputation for later analysis
- Feedback about behaviour (longer studies)
  - Dashboard for continuous observation
  - Pipeline for participant feedbacks
- Debrief survey
  - Questions to check, if they understood the idea tested
- Incentive payment
  - Batch payment, if possible for your finance department



# TimeUse+

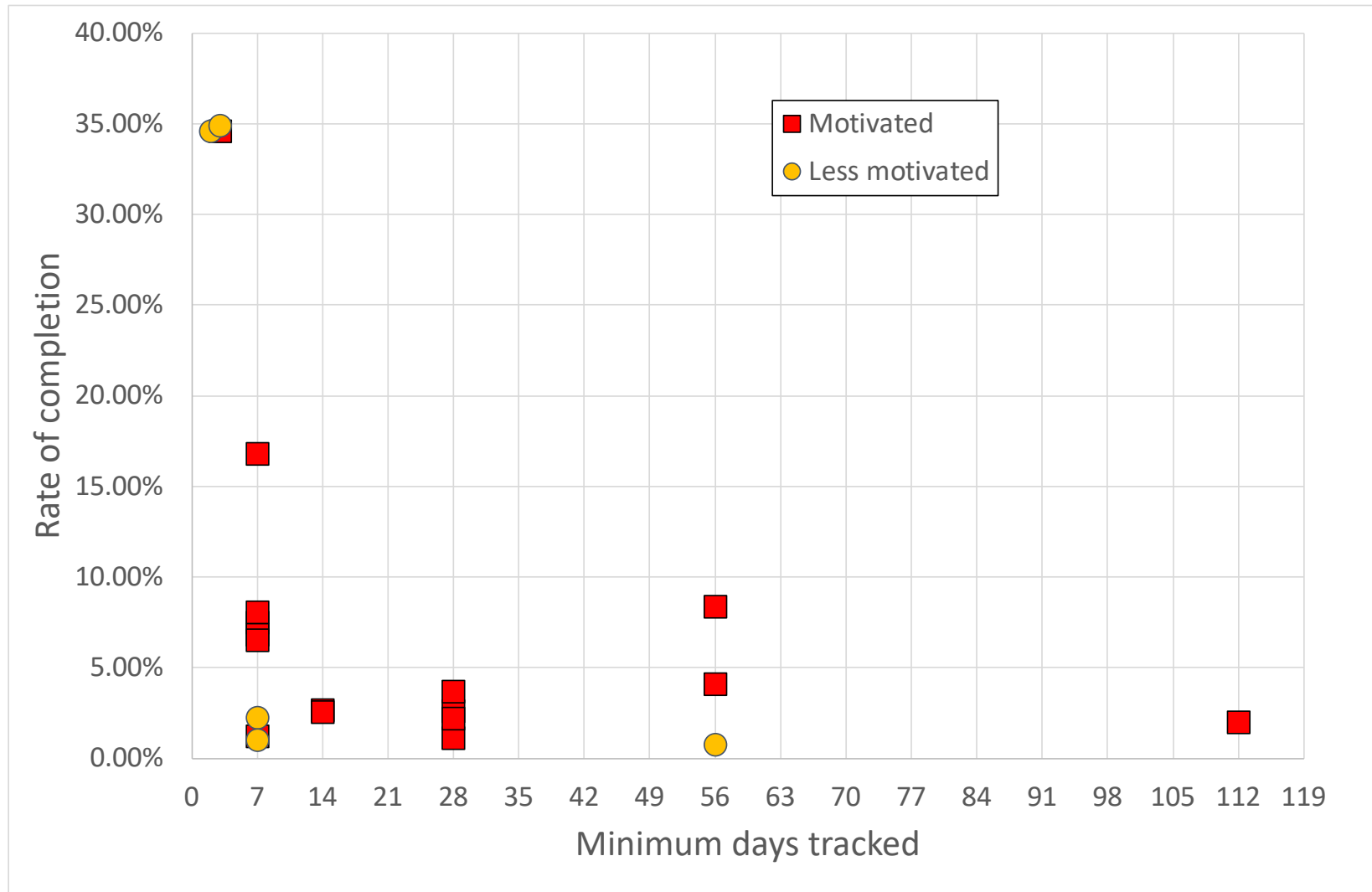


## TimeUse+ 2021 – Pre-test of the incentive level

---

Incentive	Level of detail	Days to track	Contacted	Completed/ Contacted
50	Low	14	122	2.53%
50	Low	28	92	2.20%
50	High	14	124	2.67%
50	High	28	126	2.60%
100	High	28	157	3.67%

# Completion rate by minimum days tracked & «motivation»

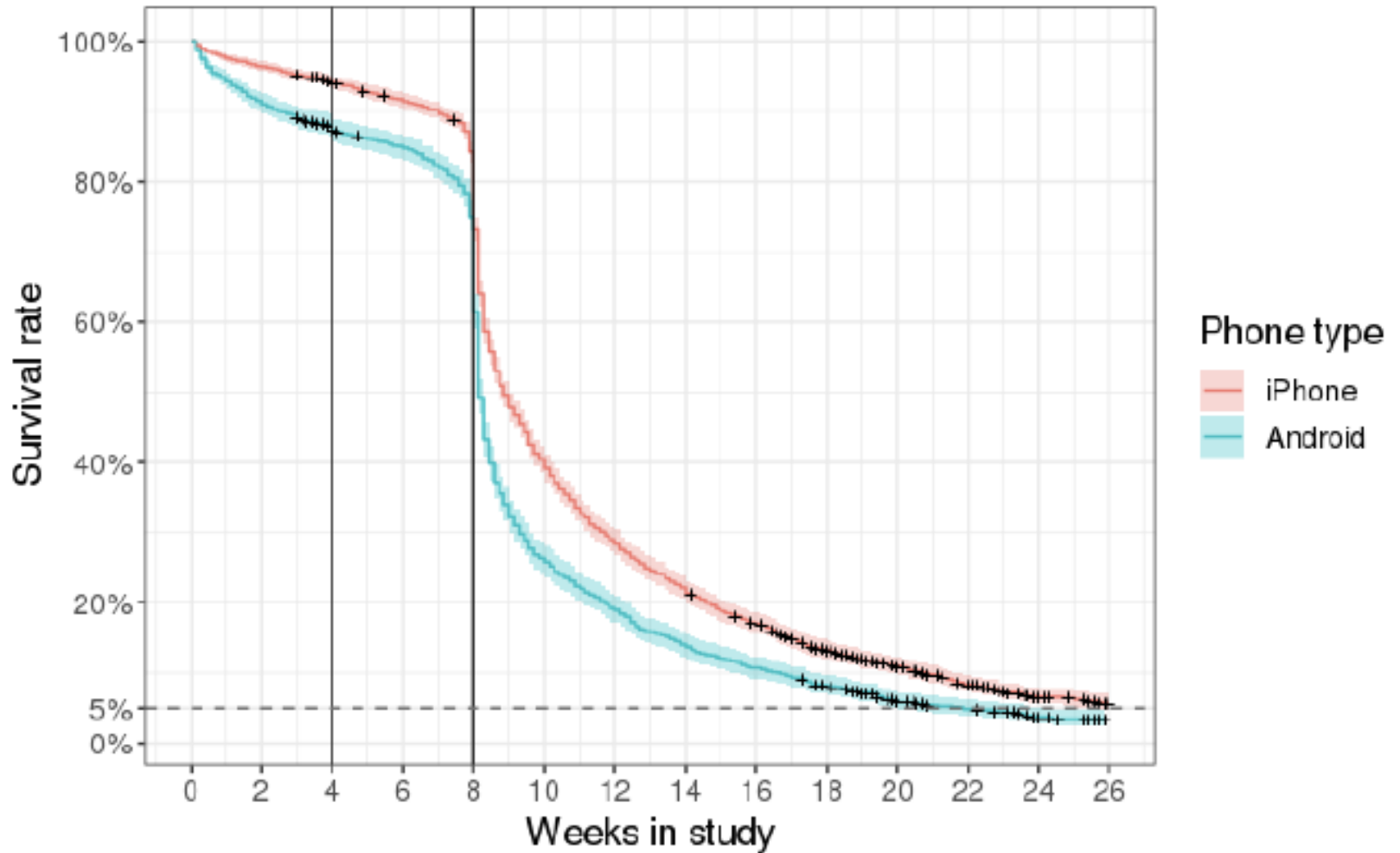


# Methodological issues with GPS tracking

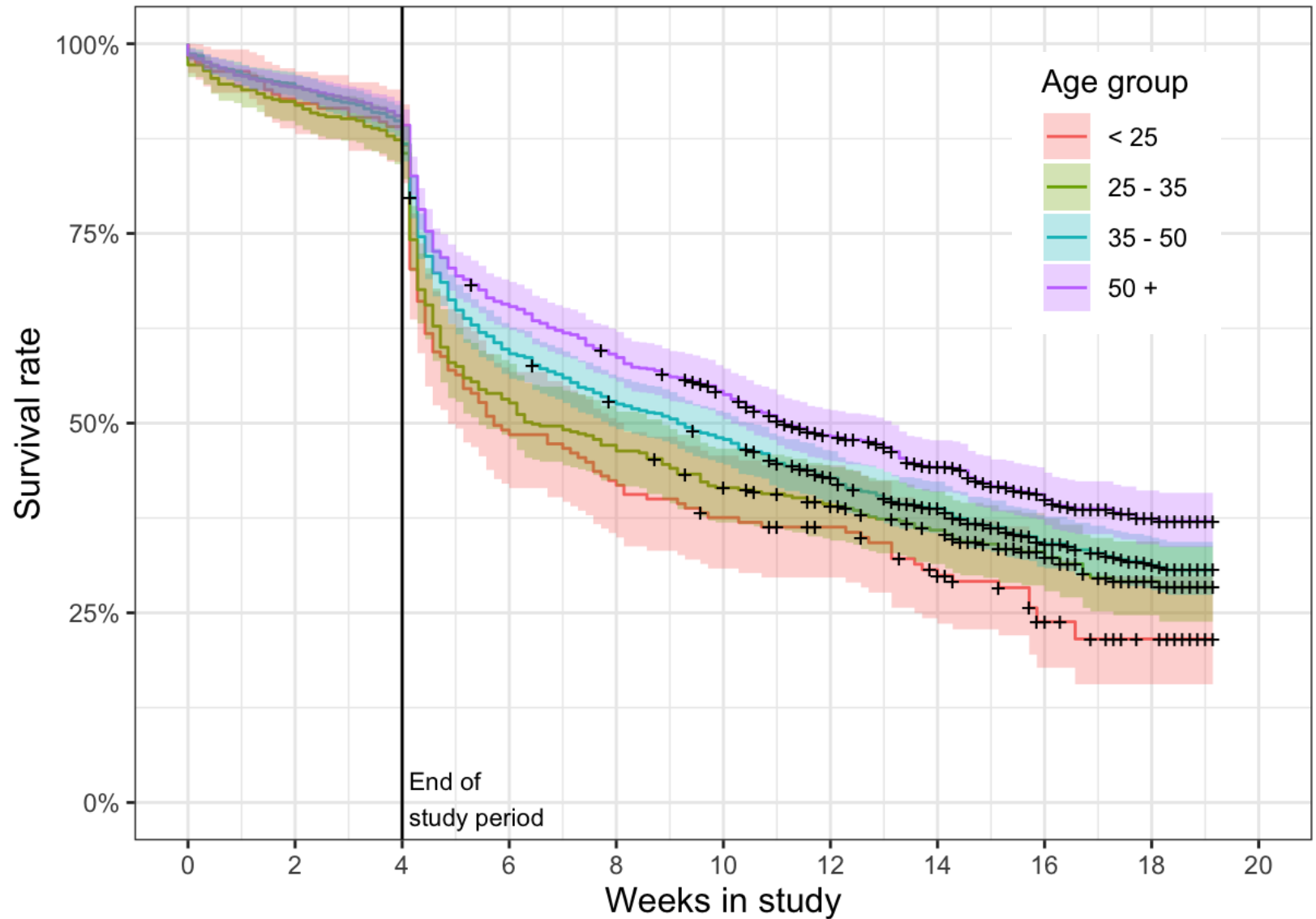
---

# Speed of drop out – MOBIS by OS

---



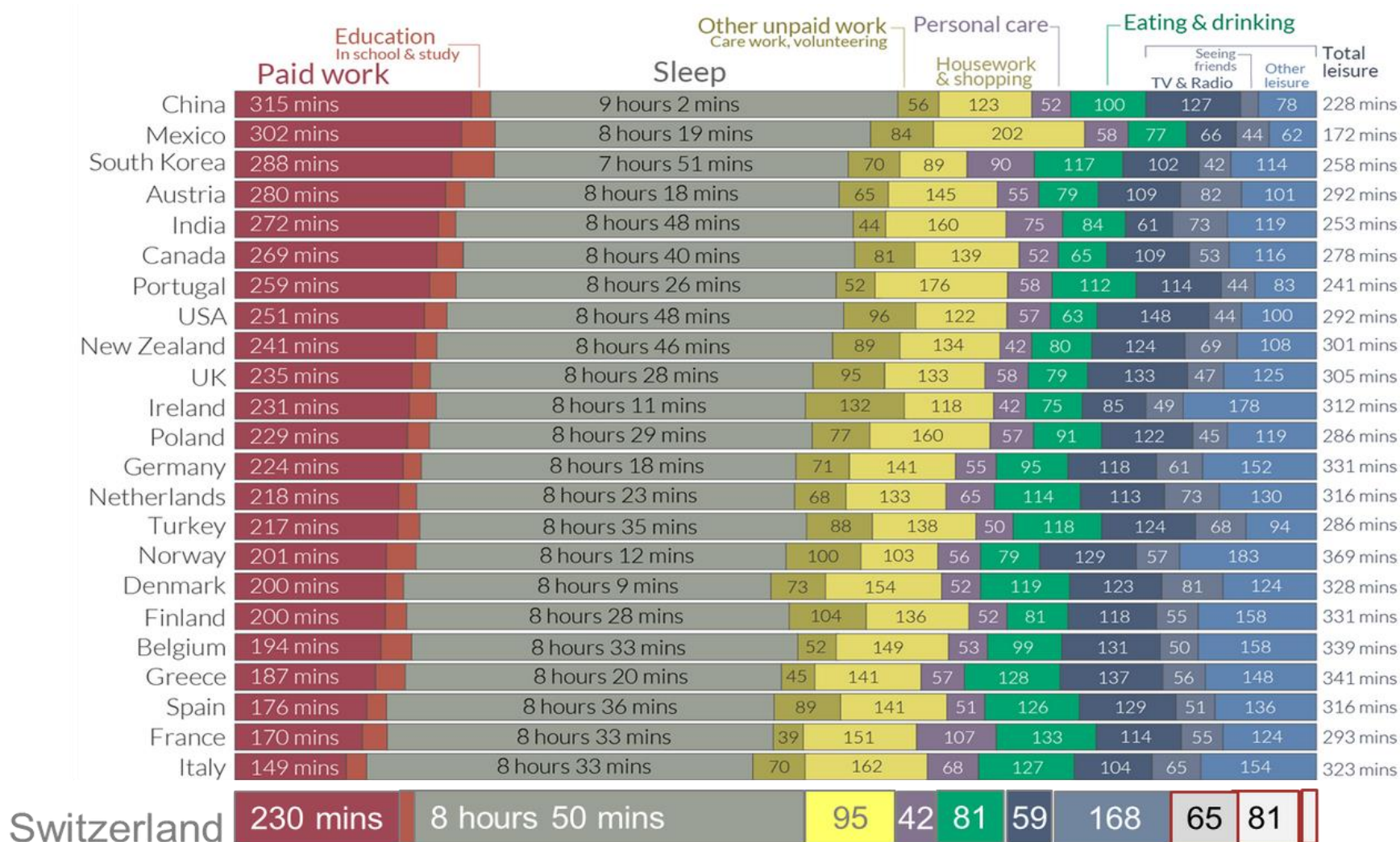
## EBIS: Drop out by age for groups B and C



# Hours worked from home by days WFH

---

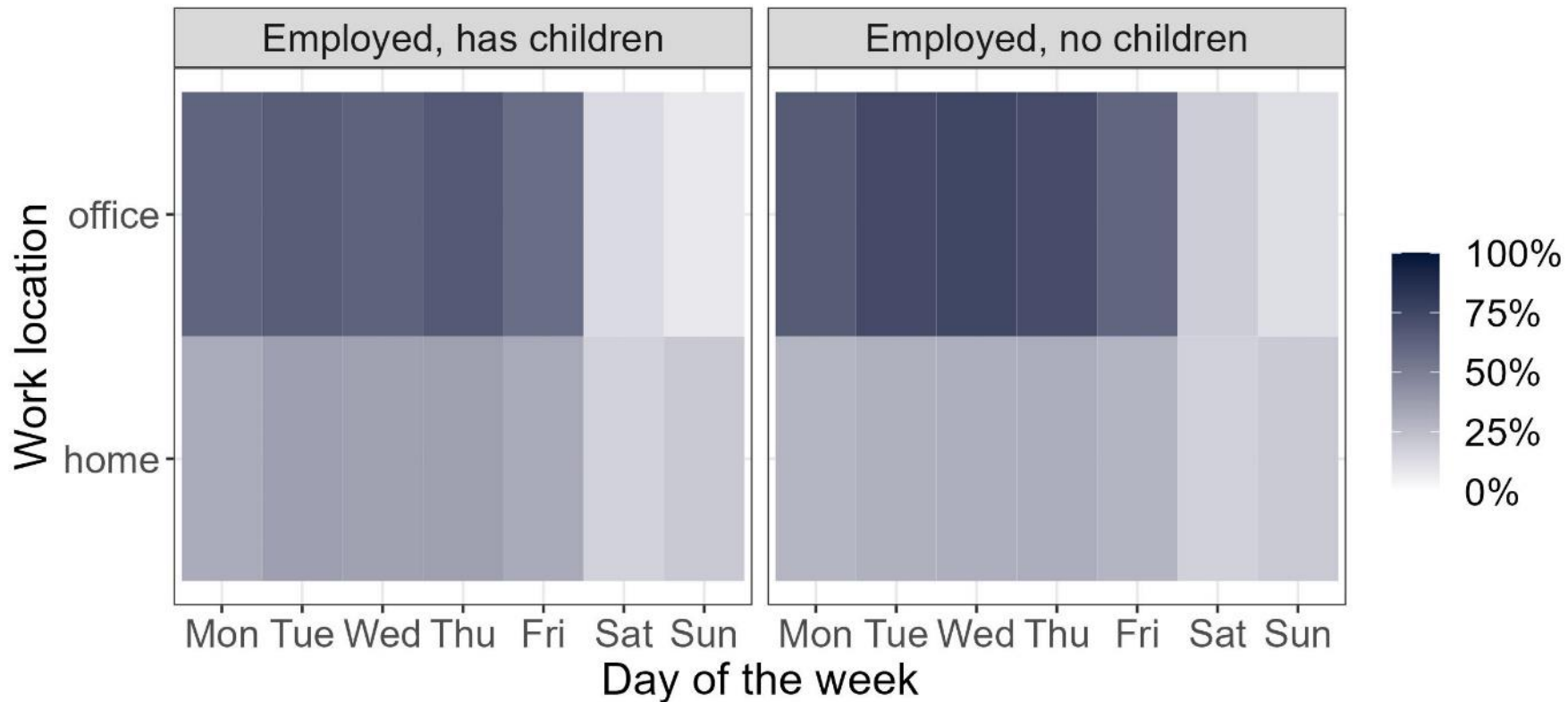
# Swiss time use 2022/23 in comparison



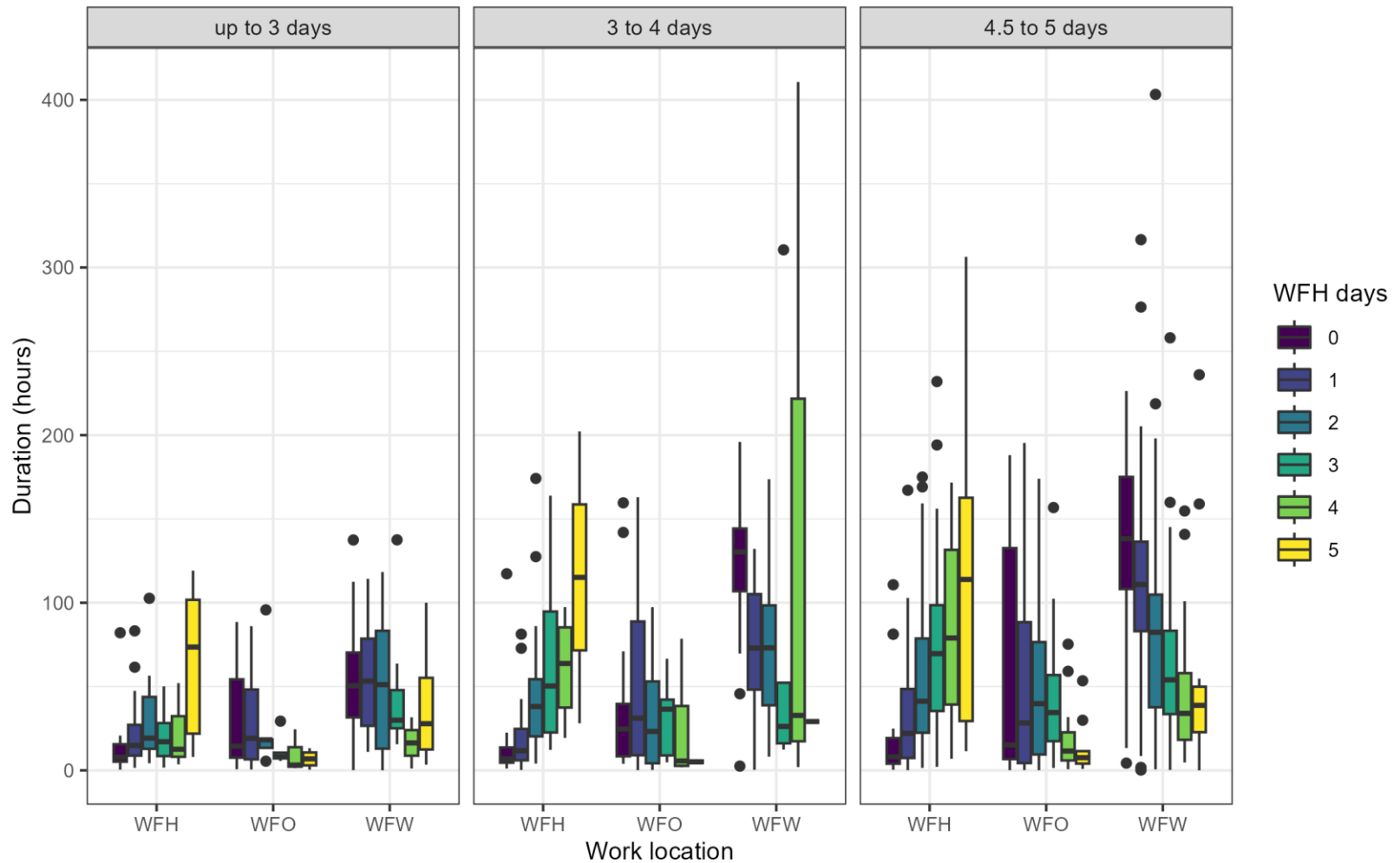


# TimeUse+: WFH by presence of children in the household

---



# TimeUse+: Work duration, location by agreed WFH days



# Integrating WFH in MATSim

---

# Integrating WFH in MATSim – a first attempt

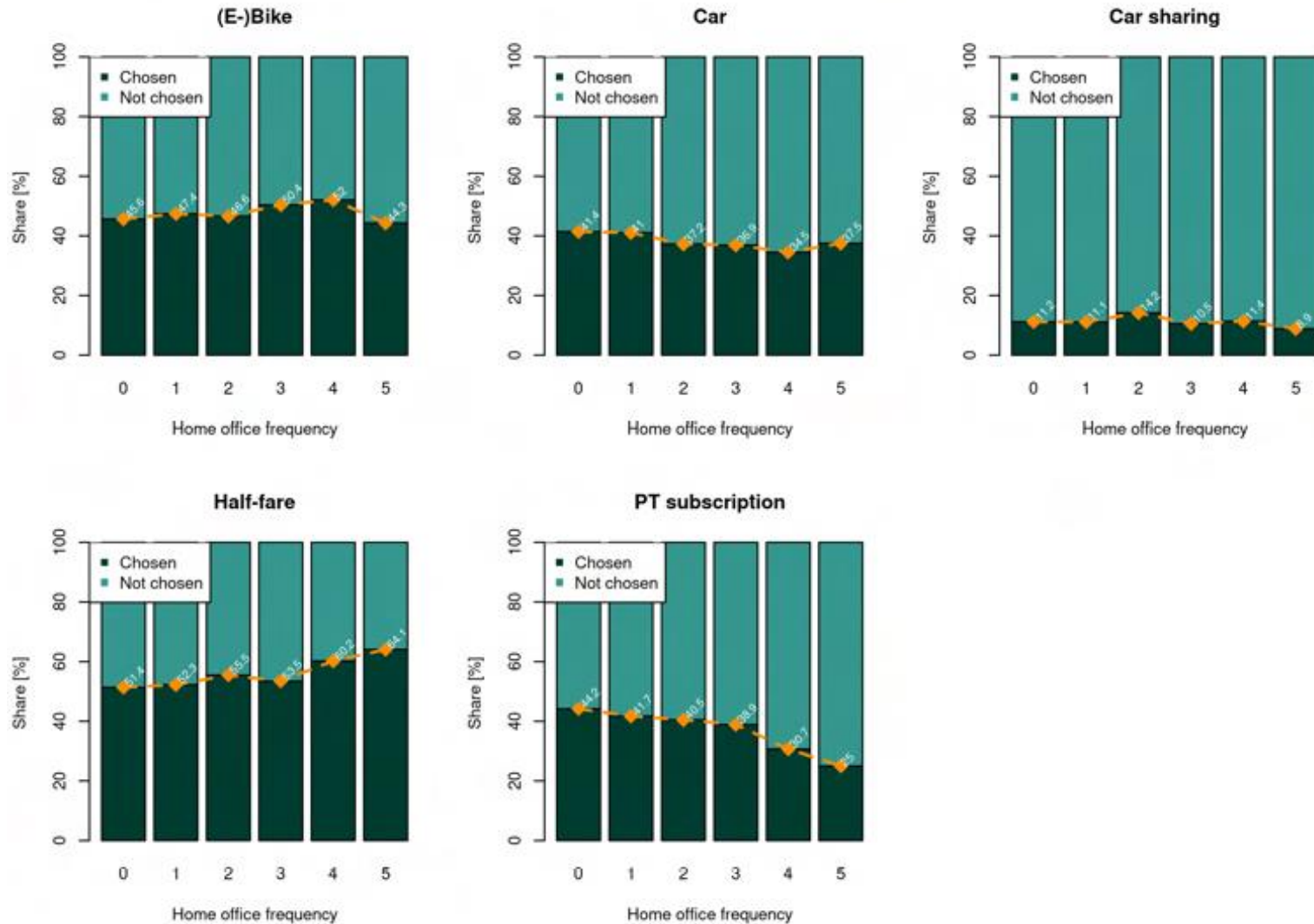
---

# Scenario setup

---

- Population
  - Registry data for persons
  - TimeUse+ and MZ 2015 daily activity patterns
  - Mobility tools based on *Swiss New Normal (SNN)* SP study
- Network
  - IVT Zürich
- Scenarios
  - Extreme cases to assess the possible impact

# SP SNN: Mobility tool ownership and days WFH

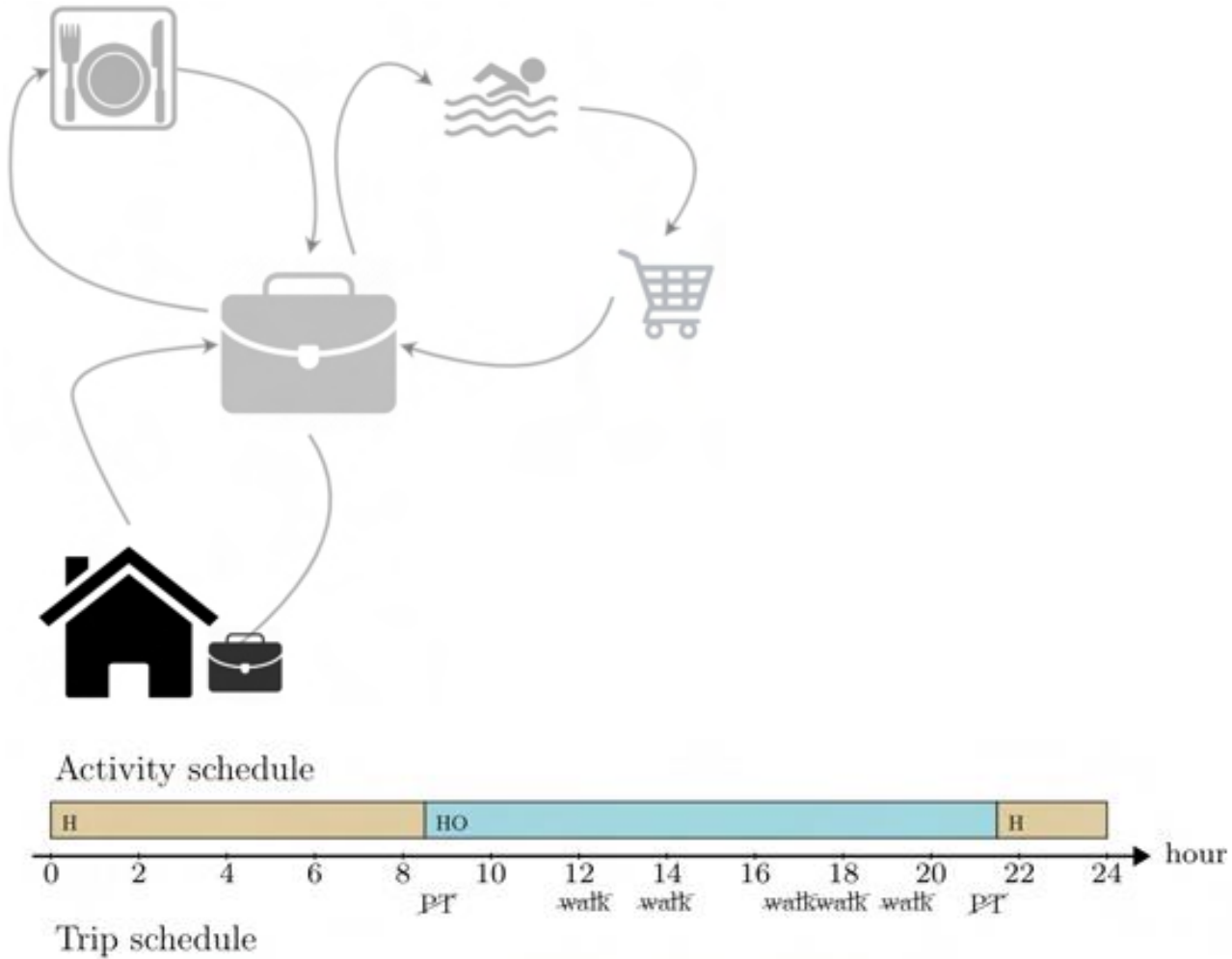


# Scenarios

---

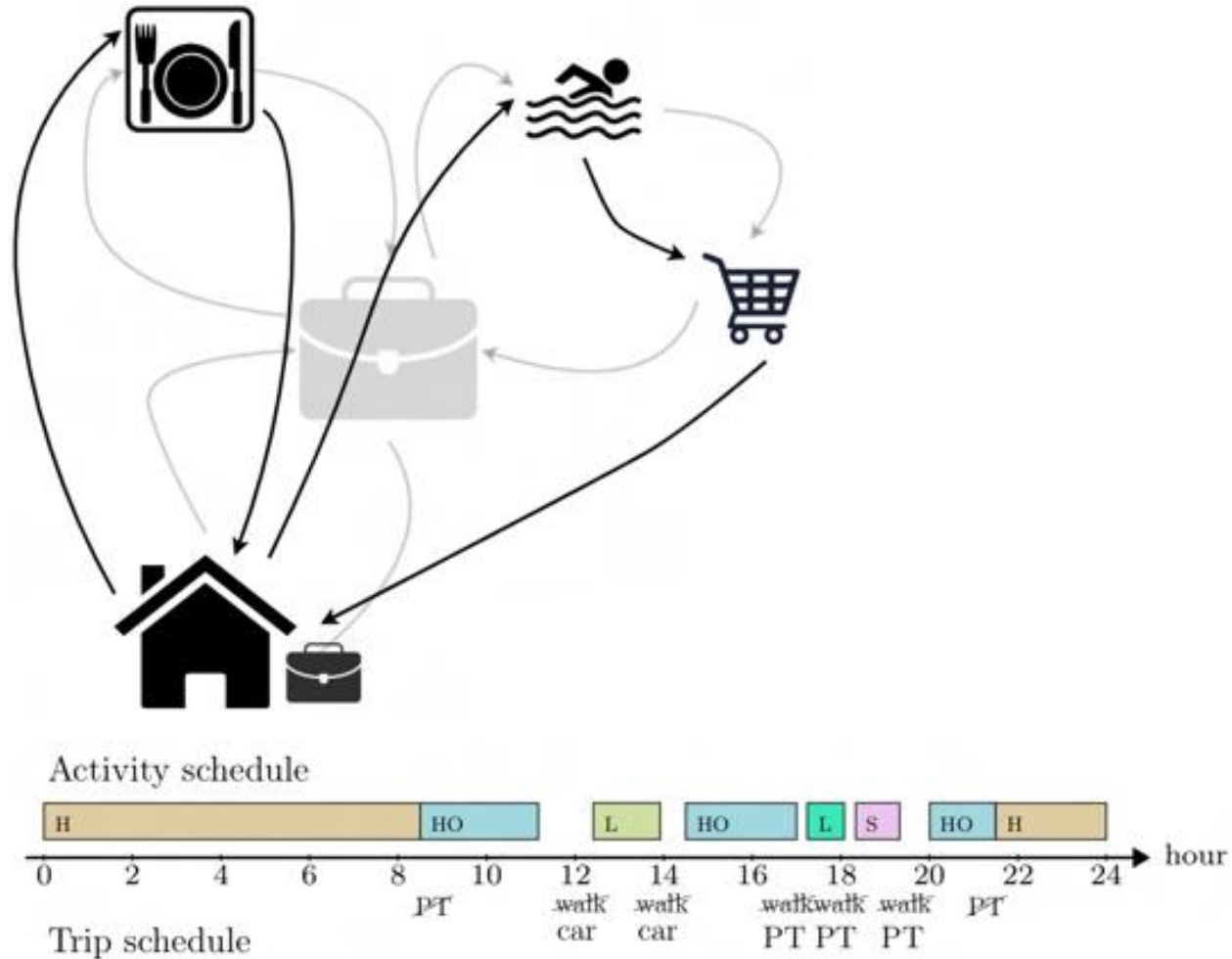
# Scenarios: 1 Cancelling trips

---



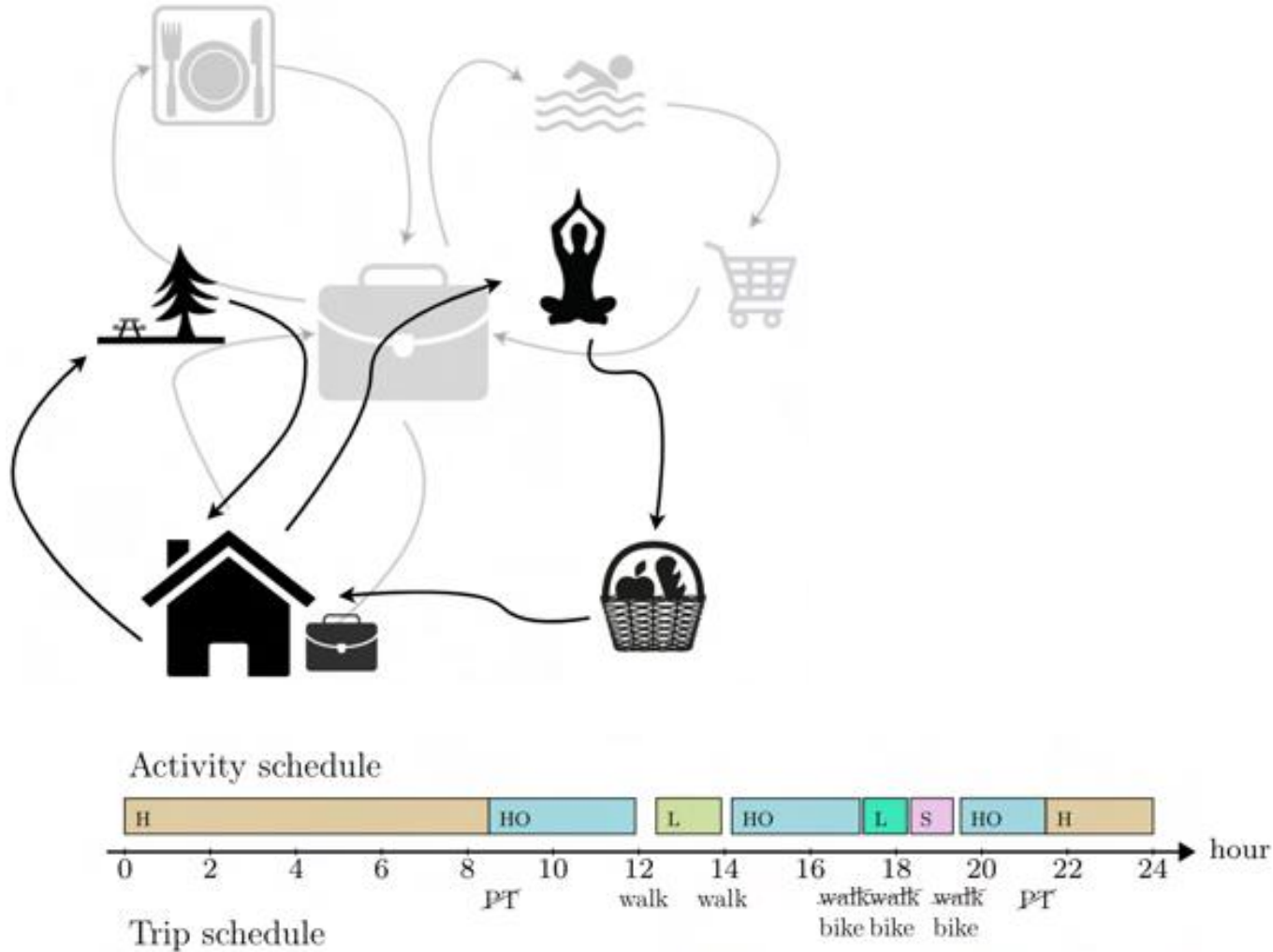


## Scenarios: 2 Hybrid location choice



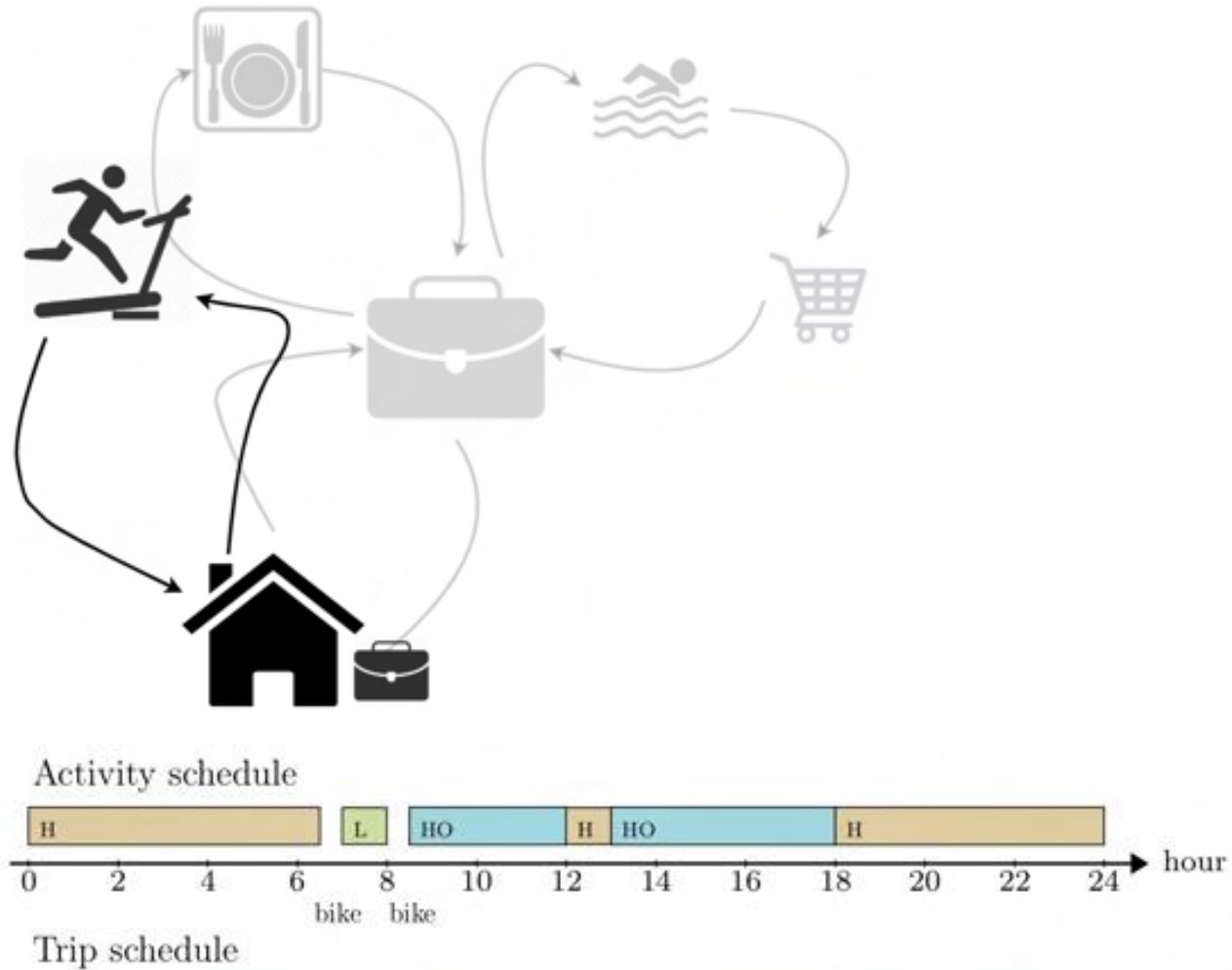
## Scenarios: 3 Updated location choice

---



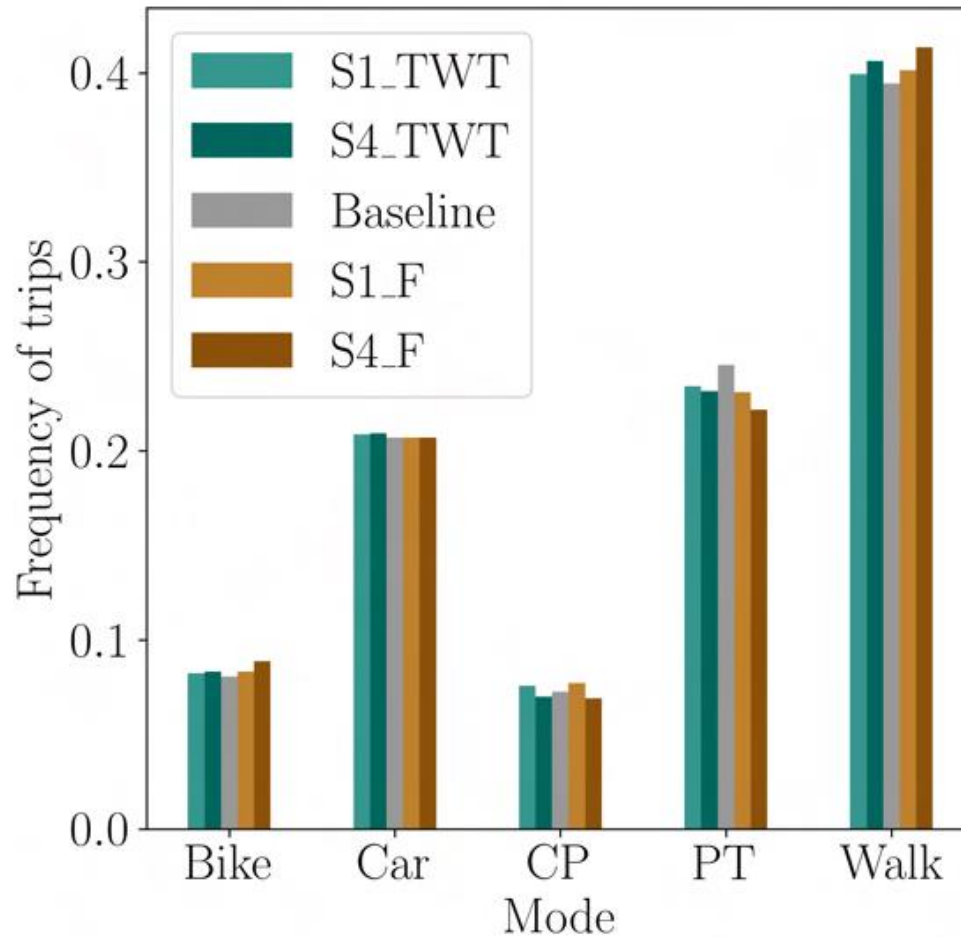
# Scenarios: 4 TimeUse+ days

---



## Scenarios: Mode choice results by day of week

---



# What needs to be done ?

---

- Population
  - Swiss synthetic population
  - New schedules (based on Pougala (2023) thesis)
  - Mobility tools based on SNN SP study, but with the new season ticket types (SBB HT+)
- Network
  - E-bike-city network Zürich
- Scenarios
  - Mobility pricing
  - Number of WFH days model with new constraints

# What needs to be done ?

---

- Survey
  - Repeat of TimeUse+ elsewhere
  - Update of TimeUse+ with the timing of the activities at the locations (and not only duration)
  - Update TimeUse+ to run from 4:00 am to 4:00 am

# What needs to be done? Schedule construction/choice

Approach	Initial authors	DCM	Rules	Alter-natives
Statistical matching			X	
Activity based models	Bowman Ben-Akiva	X		Choice set
Shortest path + core patterns through day	Ordonez		X	Network
Shortest path through day	Feng Timmermans		X	Network
Schedule choice	(Feil); Pugala Hillel Bierlaire	X		Schedules
TASHA	Roorda Miller		X	
ADAPTS	Auld Mohamedian		X	
CTAP	Märki Janzen Penazzi		X	(multi-day)

# E-Bike City: The idea

---

- 50% of road space to cyclists
- Vehicle access to all addresses
- Parking for services and visits within a 200m radius
- Existing transit network



# E-Bike City: A first visualisation

---



Source: Nightnurse for ebikecity



# E-Bike City: A first visualisation

---



# Questions?

---

- [www.ivt.ethz.ch](http://www.ivt.ethz.ch)
- [www.ebikecity.ch](http://www.ebikecity.ch) (storymap)
- [www.ivt.ethz.ch/en/vpl/projects.html](http://www.ivt.ethz.ch/en/vpl/projects.html)

# Appendix

---

# IVT *et al.* GPS tracking studies

---

Project	MOBIS	MOBIS/ COVID19	EBIS	TimeUse+	Basel 2015 Mobility	Basel 2016 Mobiity	Geneva Mobility
Tracker	MotionTag	MotionTag	MotionTag	MotionTag	Studio Mobilita	MotionTag	MotionTag
Country	CH D, F	CH D, F	CH D	CH D	Basel Stadt	Basel Stadt	Geneva
Year	2019	2020-	2022	2022	2015	2020	2019-20
Tracking days	56	Open	7,56	28+	7	7	7
Min. incentive	100	None	20,50	50	15	15	20
Validation/ annotation	Optional	Optional	Yes	Yes	Yes	Yes	Yes
Invited persons	90'909	3700+	200'000+	42'595	1'218	1'104	4'108

## Participation rates: GPS studies by 2019

Project	SPOT	in-the-Moment	ATLAS	AKTA	Cincinnati	Atlanta	Reno	Tel Aviv HTS
Tracker	MEILI	rMove	SITSS	Device	Device	Device	Device/App	App
Country	Sweden	USA	NZ	Denmark	USA	USA	USA	Israel
Year	2015	2015	2014	2001-2003	2010	2011	2015-2016	2016-2017
Tracking days	7	7	3	112	3	7	7	2
Min. incentive		\$25		variable	\$25	\$25	\$25	
Validation/annotation	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Invited persons	130'000	1'427	186	25'000	11'118	16'374	25'817	67'199

# References for IVT studies

---

- Axhausen, K.W., J. Molloy, C. Tchervenkov, F. Becker, B. Hintermann, B. Schoeman, T. Götschi, A. Castro and U. Tomic (2021) Empirical analysis of mobility behavior in the presence of Pigovian transport pricing, final report for ASTRA 2017/006, *Schriftenreihe*, **1704**, ASTRA, UVEK, Berne.
- Axhausen, K.W., J. Molloy, C. Tchervenkov, F. Becker, B. Hintermann, B. Schoeman, T. Götschi, A. Castro and U. Tomic (2021) Empirical analysis of mobility behavior in the presence of Pigovian transport pricing, final report for ASTRA 2017/006, *Schriftenreihe*, **1704**, ASTRA, UVEK, Berne
- Becker, H. and K.W. Axhausen (2018) Analyse des Angebots von Catch a Car in Basel, *Arbeitsberichte Verkehrs- und Raumplanung*, **1380**, IVT, ETH Zurich, Zurich
- Becker, H., F. Ciari, M. Brignoni and K.W. Axhausen (2015) Impacts of a new free-floating carsharing system traced with a smartphone app, paper presented at the *14th International Conference on Travel Behavior Research*, Windsor, July 2015.
- Gao, Q., J. Molloy and K.W. Axhausen (2021) Trip purpose imputation using GPS trajectories with machine learning, *ISPRS International Journal of Geo-Information*, 10 (11) 775
- Reck, D.J., T. Schatzmann, D. Stojanovic and K.W. Axhausen (2020) Analyse des Angebots von Catch a Car in Genf, *Arbeitsberichte Verkehrs- und Raumplanung*, **1508**, IVT, ETH Zurich, Zurich.
- Schatzmann, T., D.J. Reck, D. Stojanovic and K.W. Axhausen (2020) Analyse des Angebots von Catch a Car in Basel, *Arbeitsberichte Verkehrs- und Raumplanung*, **1509**, IVT, ETH Zurich, Zurich
- Winkler, C., A. Meister, B. Schmid and K.W. Axhausen (2022) TimeUse+: Testing a novel survey for understanding travel, time use, and expenditure behavior, paper submitted for presentation at the *102nd Annual Meeting of the Transportation Research Board (TRB 2023)*, Washington, D.C., January 2023.