

# MOBIS-COVID19/05: Results as of 04/05/2020

Joseph Molloy<sup>1</sup>, Christopher Tchervenkov<sup>2</sup>, Thomas Schatzmann<sup>2</sup>, Beaumont Schoeman<sup>2</sup>,  
Beat Hintermann<sup>2</sup>, and Kay W. Axhausen<sup>2</sup>

<sup>1</sup>IVT ETH Zurich

<sup>2</sup>Affiliation not available

June 09, 2020

## Abstract

On March 16, 2020, 3700 participants who completed the MOBIS study between September 2019 and January 2020 were invited to reinstall the GPS Logger and Travel Diary App ‘Catch-My-Day’, developed by MotionTag, to record their mobility behaviour during the period of special measures implemented to control the spread of the Corona Virus. The first 4 weeks of mobility data from the original MOBIS Study is taken for each participant as a baseline against which to compare current mobility patterns. These 4 weeks start place anywhere between 1st September and 15th November, depending on the participant. Only trips in Switzerland are currently considered, although data on cross border travel is available.



---

## **MOBIS-COVID19/05**

**Results as of 04/05/2020**

**Joseph Molloy**

**Christopher Tchervenkov**

**Thomas Schatzmann**

**Beaumont Schoeman**

**Beat Hintermann**

**Kay W. Axhausen**

**Arbeitsbericht Verkehrs- und Raumplanung 1498**

**May 2020**

## MOBIS-COVID19/05

Joseph Molloy  
IVT  
ETH Zürich  
CH-8093 Zurich  
joseph.molloy@ivt.baug.ethz.ch

Thomas Schatzmann  
IVT  
ETH Zurich  
CH-8093 Zurich  
thomas.schatzmann@ivt.baug.ethz.ch

Beat Hintermann  
WWZ  
University of Basel  
CH-4002 Basel  
b.hintermann@unibas.ch

Christopher Tchervenkov  
IVT  
ETH Zurich  
CH-8093 Zurich  
christopher.tchervenkov@ivt.baug.ethz.ch

Beaumont Schoeman  
WWZ  
University of Basel  
CH-4002 Basel  
b.schoeman@unibas.ch

Kay W. Axhausen  
IVT  
ETH Zurich  
CH-8093 Zurich  
axhausen@ivt.baug.ethz.ch

May 2020

## Abstract

To slow down the spread of the Coronavirus, the population has been instructed to stay at home if possible. This measure consequently has a major impact on our daily mobility behaviour. But who is being affected, and how? The MOBIS-COVID-19 research project, an initiative of ETH Zurich and the University of Basel, is a continuation of the original MOBIS study. The aim of the project is to get a picture of how the crisis is affecting mobility and everyday life in Switzerland.

## Keywords

GPS logger; Travel diary app; COVID-19; Corona virus; MOBIS; Mobility behaviour; Switzerland

## Suggested Citation

Molloy, J., C. Tchervenkov, T. Schatzmann, B. Schoeman, B. Hintermann and K.W. Axhausen (2020) MOBIS-COVID19/05: Results as of 04/05/2020, *Arbeitsberichte Verkehrs- und Raumplanung*, **1498**, IVT, ETH Zurich, Zurich.

## MOBIS-COVID19/05

Joseph Molloy  
IVT  
ETH Zürich  
CH-8093 Zurich  
joseph.molloy@ivt.baug.ethz.ch

Thomas Schatzmann  
IVT  
ETH Zurich  
CH-8093 Zurich  
thomas.schatzmann@ivt.baug.ethz.ch

Beat Hintermann  
WWZ  
University of Basel  
CH-4002 Basel  
b.hintermann@unibas.ch

Christopher Tchervenkov  
IVT  
ETH Zurich  
CH-8093 Zurich  
christopher.tchervenkov@ivt.baug.ethz.ch

Beaumont Schoeman  
WWZ  
University of Basel  
CH-4002 Basel  
b.schoeman@unibas.ch

Kay W. Axhausen  
IVT  
ETH Zurich  
CH-8093 Zurich  
axhausen@ivt.baug.ethz.ch

Mai 2020

## Zusammenfassung

Um die Ausbreitung des Coronavirus zu verlangsamen ist die Bevölkerung angewiesen worden, wenn möglich zu Hause zu bleiben. Diese Massnahme hat daher einen grossen Einfluss auf unser tägliches Mobilitätsverhalten. Doch wer ist davon betroffen und wie? Das Forschungsprojekt MOBIS-COVID-19, eine Initiative der ETH Zürich und der Universität Basel, ist eine Weiterführung der originalen MOBIS-Studie. Ziel des Projekts ist es, ein Bild zu erhalten, wie sich die Krise auf die Mobilität und das Alltagsleben in der Schweiz auswirkt.

## Schlagworte

GPS logger; Travel diary app; COVID-19; Corona virus; MOBIS; Mobility behaviour; Switzerland

## Zitierungsvorschlag

Molloy, J., C. Tchervenkov, T. Schatzmann, B. Schoeman, B. Hintermann and K.W. Axhausen (2020) MOBIS-COVID19/05: Results as of 04/05/2020, *Arbeitsberichte Verkehrs- und Raumplanung*, 1498, IVT, ETH Zurich, Zurich.

## Contents

|    |  |    |
|----|--|----|
| 1  | News . . . . .   | 2  |
| 2  | Introduction . . . . .                                     | 3  |
| 3  | First key points . . . . .                                 | 3  |
| 4  | Risk perception . . . . .                                  | 5  |
| 5  | Average daily distance . . . . .                           | 6  |
| 6  | Active days . . . . .                                      | 6  |
| 7  | Change in kilometers travelled by transport mode . . . . . | 7  |
| 8  | Change in kilometers travelled by: . . . . .               | 7  |
| 9  | Reduction in kilometers travelled by Canton . . . . .      | 9  |
| 10 | Trip duration by transport mode and gender . . . . .       | 9  |
| 11 | Average trip length by transport mode (km) . . . . .       | 10 |
| 12 | Activity space and daily travel radius . . . . .           | 10 |
| 13 | Hourly counts . . . . .                                    | 12 |
| 14 | Activity types and zoning . . . . .                        | 15 |
| 15 | Participation . . . . .                                    | 16 |
| 16 | Differences in the distributions . . . . .                 | 17 |

# 1 News

4 May:

- New chart from online survey with participants on risk perception.
- Key points summary and formatting adjustments.

27 April:

- New chart on the change in activity type by land zoning.

20 April:

- Mobile participants per day.
- Non-mobile participants are now included in the activity-space numbers in addition to a new table on median weekly activity spaces.
- New graphs, including average trip distance by mode.
- Formatting improvements and other small corrections.

13 April:

- Earlier weeks have been grouped and colored grey in certain graphs.

## 2 Introduction

On March 16, 2020, 3700 participants who completed the MOBIS study between September 2019 and January 2020 were invited to reinstall the GPS Logger and Travel Diary App ‘Catch-My-Day’, developed by MotionTag, to record their mobility behaviour during the period of special measures implemented to control the spread of the Corona Virus. The first 4 weeks of mobility data from the original MOBIS Study is taken for each participant as a baseline against which to compare current mobility patterns. These 4 weeks start place anywhere between 1st September and 15th November, depending on the participant. Only trips in Switzerland are currently considered, although data on cross border travel is available.

The following figure shows the number of registered and tracking participants per day. A running panel of around 250 participants were already tracking before the sample was reinvited. This allows results for the weeks before the MOBIS:COVID-19 study was officially started, although the sample size is a lot smaller, and hence the results.

In the MOBIS study, participants were only eligible if they used a car at least 3 days a week - which skews the sample away from the Swiss general population.

The number of tracking participants each day used to calculate the average daily values includes all participants who recorded tracks before or after that date. This allows the consideration of those who stay at home while still allowing for survey dropouts.

The GPS Travel diary used, Catch-My-Day (for iOS and Android) can have a 2-3 day delay before the tracks are available for analysis. The scaling by active participants accommodates for this, but the results of previous reports may change when the report is updated.

## 3 First key points

The MOBIS-COVID tracking study has recorded 64,921 person-days since we mobilized the participants of the MOBIS project in the light of the on-coming COVID19 restrictions: more registered 1,660 than tracked (maximum of 1,431 and a mean of 1,014 persons). In the week of April 25th we also asked them to participate in a short survey. We continue

to use the Catch-a-day app based on motion-tag technology. The sample is roughly comparable in socio-demographics to the latest federal 2015 Mikrozensus, but for a bias towards higher income season-ticket owning better educated males.

Together with the tracking and survey data of the 2019 MOBIS project we are able to show the impact of the COVID19 epidemic in the French and German speaking part of Switzerland. We have a chance to look at the socio-demographic differences in the impacts, which are not fully available in the private Intervista panel or Google data.

The results show that the participants anticipated the “lock down” by starting to reduce travel two weeks in advance of March 16th 2020. The number of trips fell by 40% from about 5 to about 3 per day. The activity spaces, measured as the 95% confidence ellipse around home, collapsed by 80

While the impact of gender and language-spoken is not large, on-going need to work at the work place attenuated the effects. In contrast to many other observations, the effect of income is not strongly varying: the only about 8% between the lowest and highest income groups.

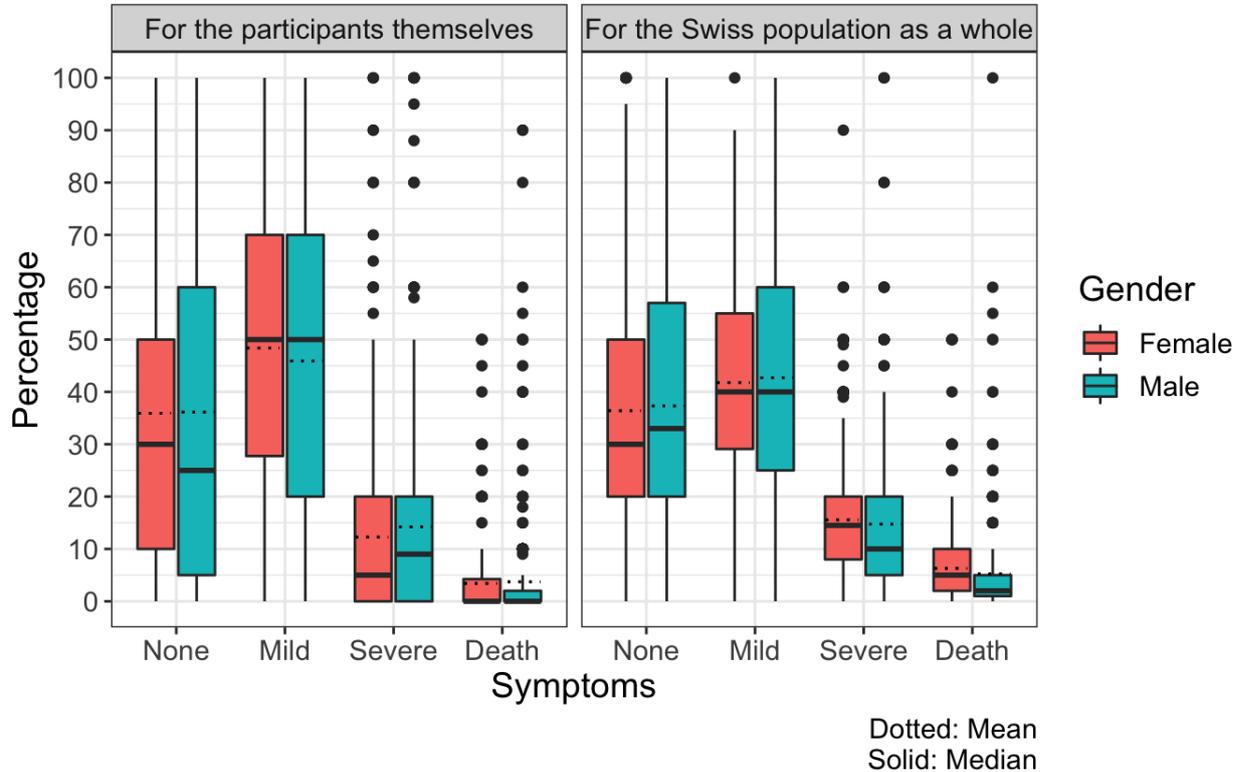
The distances by trip, when undertaken, do not change much, but for walking and cycling. Cycling, in particular, sees a large increase in kilometers travelled. The increase is well beyond what the seasonal increase would imply, still the temporal patterns by time-of-day and type of day indicates its prime use as a fitness tool.

We are looking forward to document the recovery after the step-wise lifting of the restrictions last week.

## 4 Risk perception

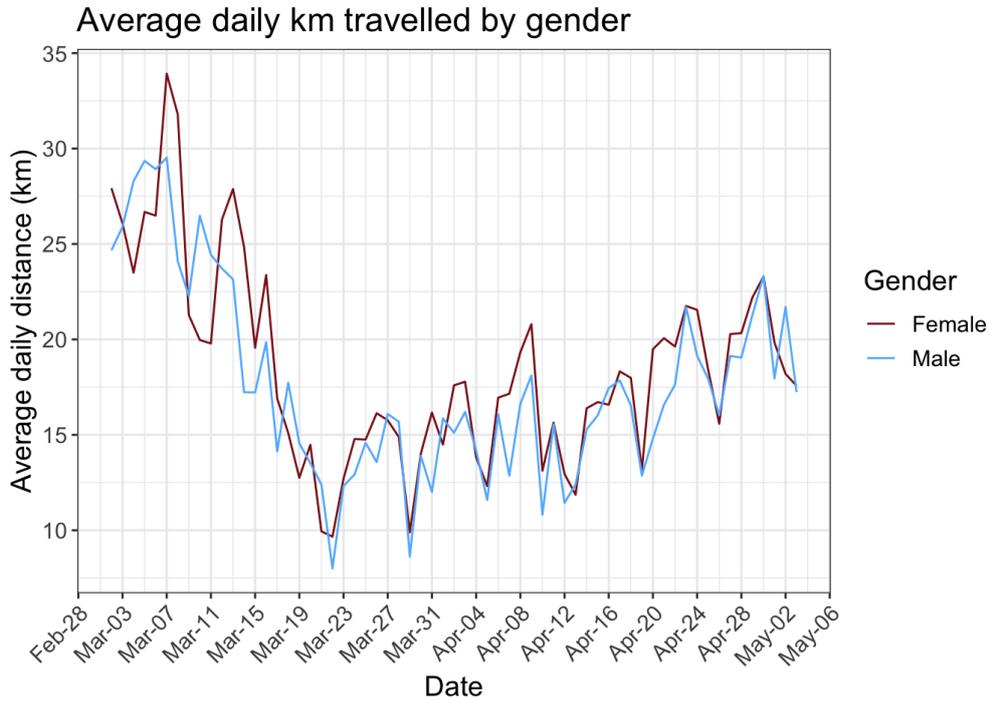
### COVID-19 Survey - May 04, 2020

Risk assessment by gender of participant (N=991)

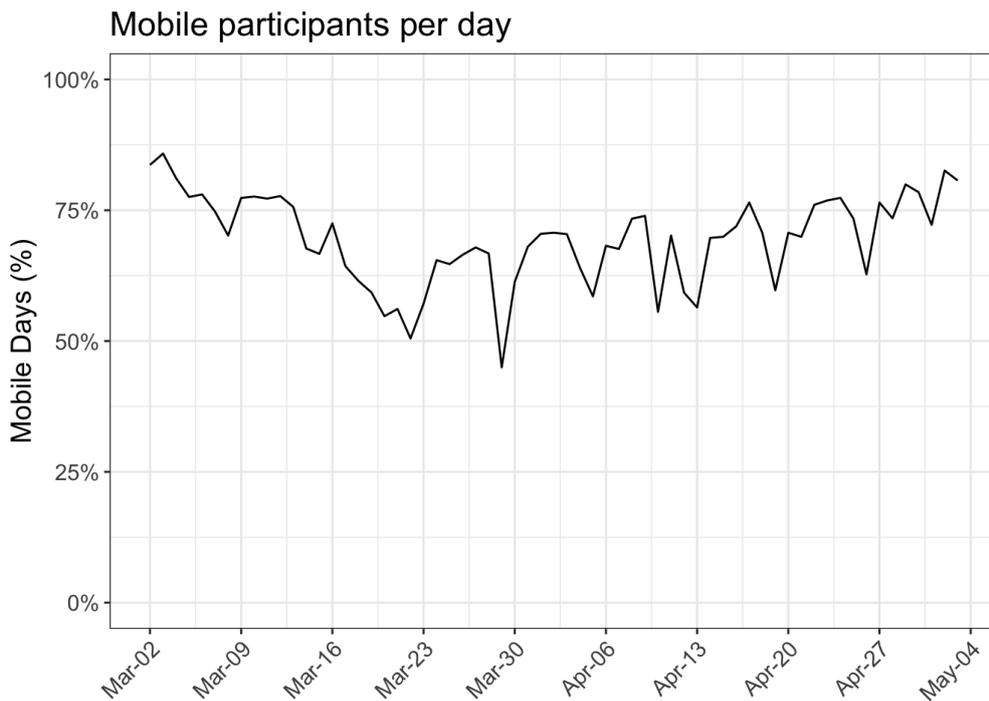


A first analysis from the survey on risk perception in the case of a COVID-19 infection shows that participants evaluate the risks of various outcomes differently for themselves and the Swiss population. The possibility that the participant experiences severe symptoms that require hospitalisation or fatal symptoms is considered somewhat lower by the participants for themselves than for the Swiss population. Both men and women appear to overestimate the probability of death by expecting the “asymptomatic” course to be less likely. While the median values for the various symptom categories do not differ greatly between men and women, the range of values for men is somewhat wider than for women.

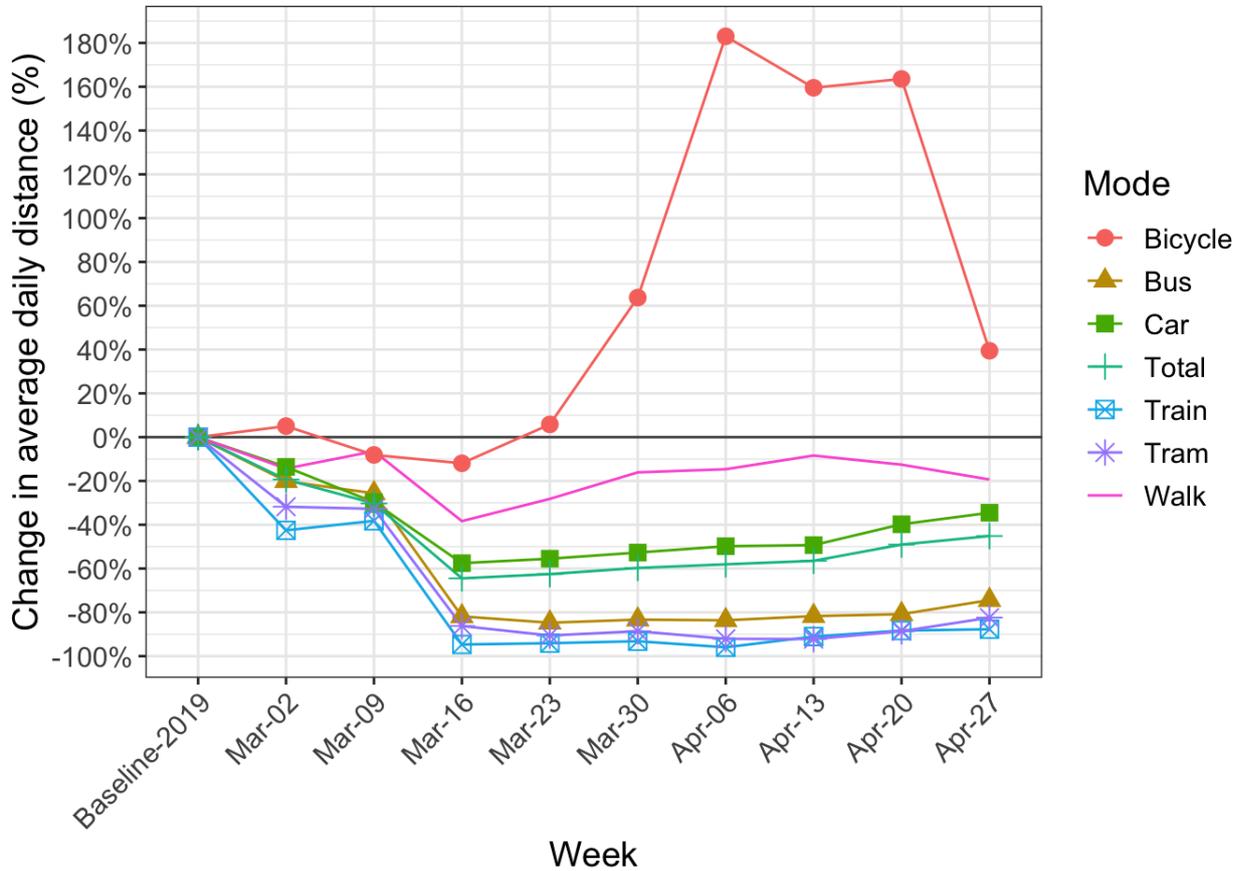
## 5 Average daily distance



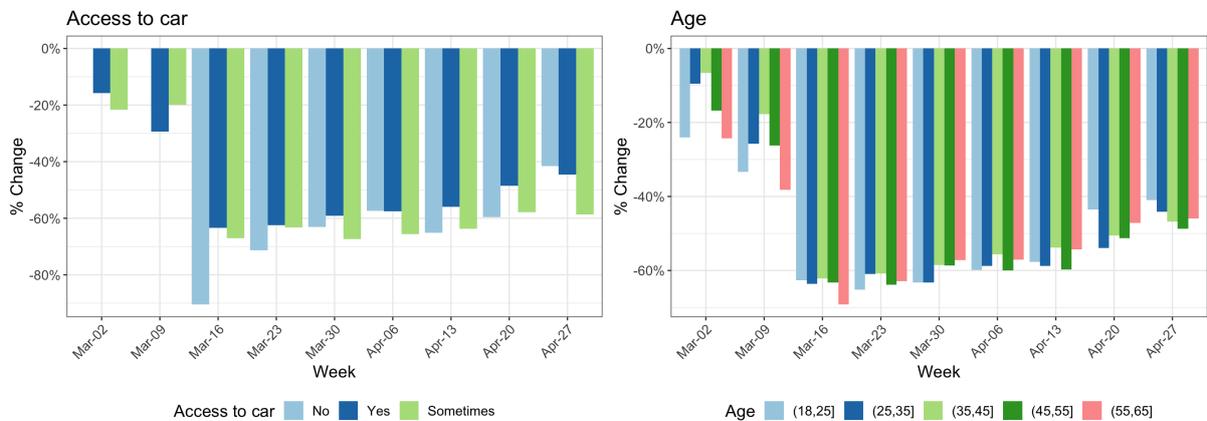
## 6 Active days

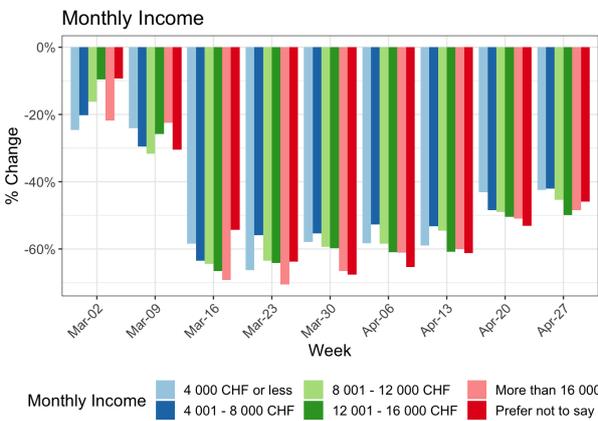
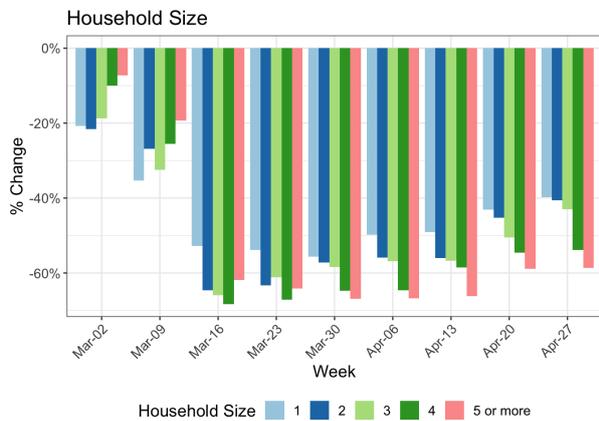
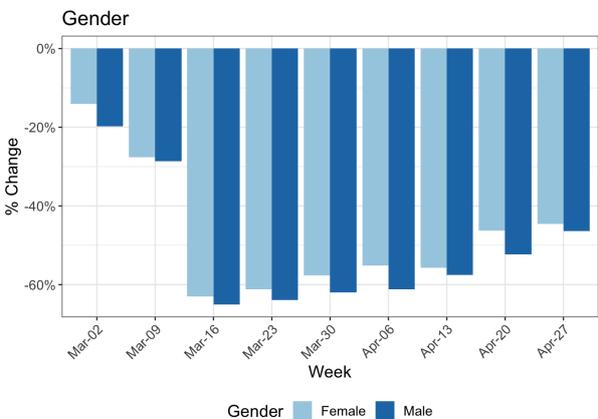
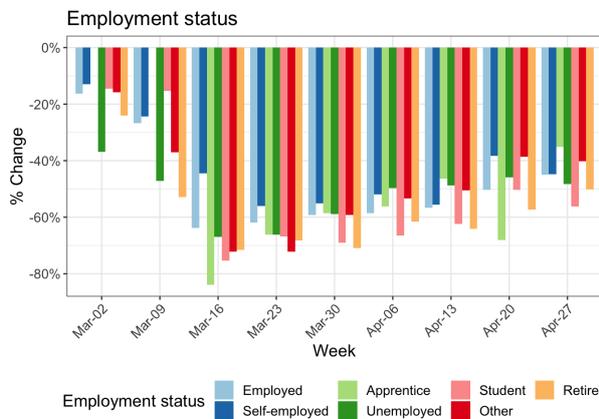
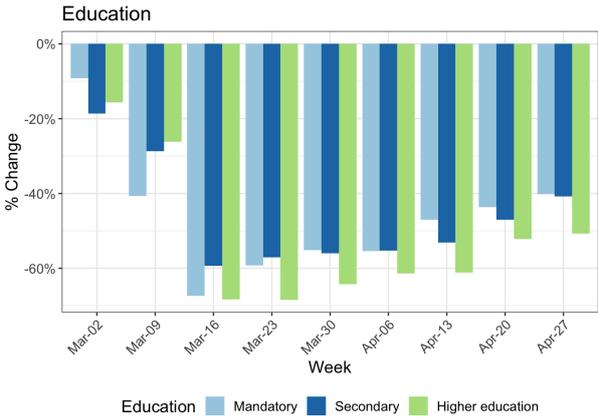
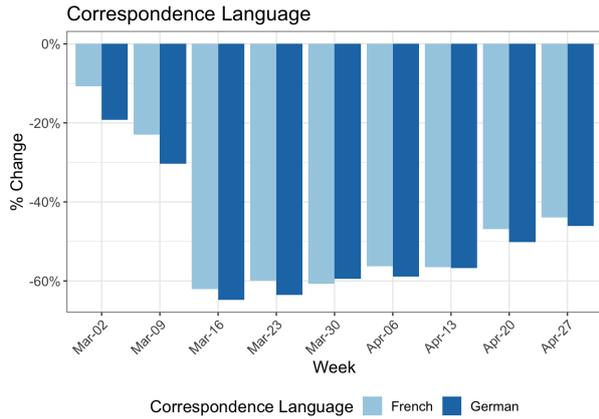


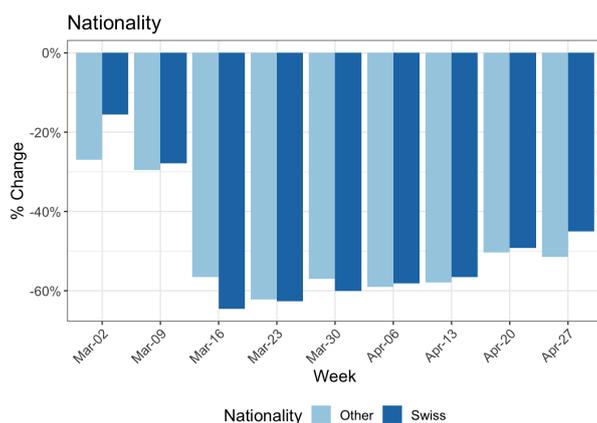
## 7 Change in kilometers travelled by transport mode



## 8 Change in kilometers travelled by:







## 9 Reduction in kilometers travelled by Canton

Table 1: Change in kilometers travelled by home canton (%)

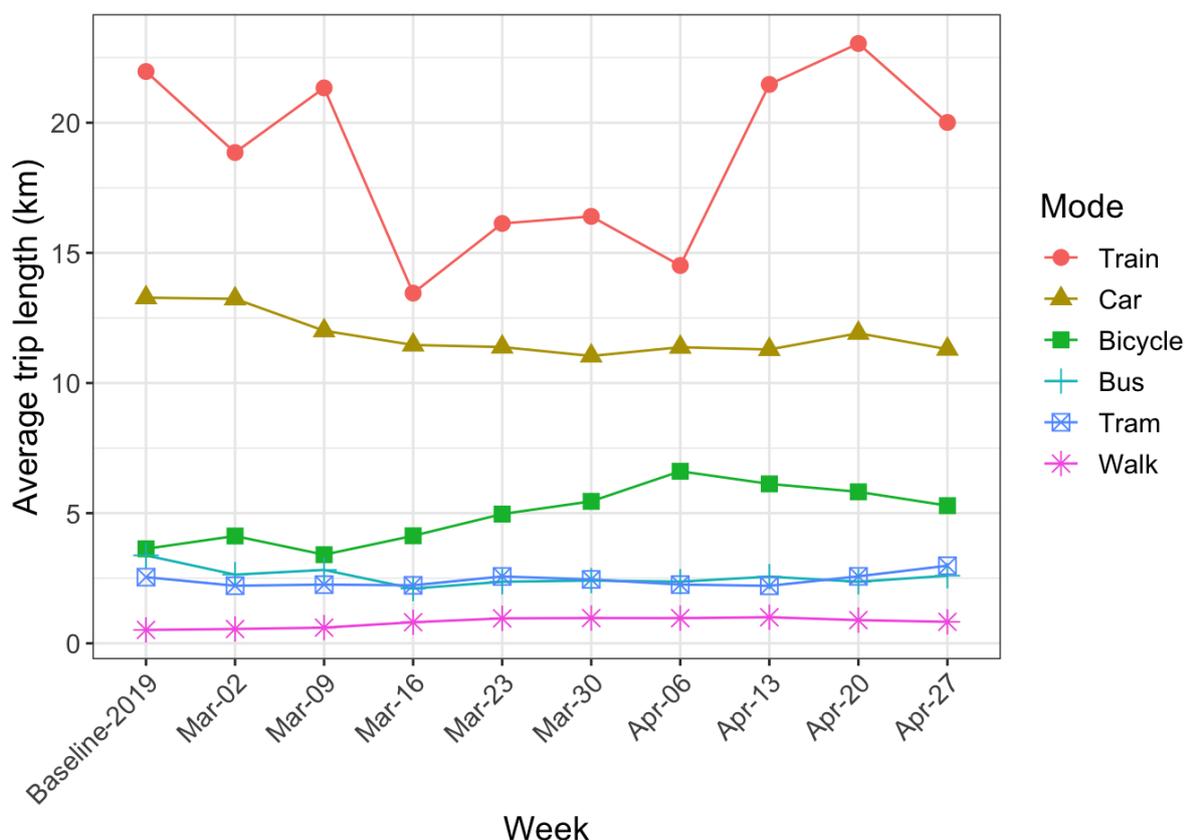
| Canton           | N   | Mar-02 | Mar-09 | Mar-16 | Mar-23 | Mar-30 | Apr-06 | Apr-13 | Apr-20 | Apr-27 |
|------------------|-----|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Aargau           | 55  | -25    | -41    | -71    | -58    | -50    | -57    | -55    | -45    | -46    |
| Basel-Landschaft | 142 | -15    | -11    | -62    | -61    | -60    | -61    | -56    | -54    | -50    |
| Basel-Stadt      | 28  | -14    | -36    | -70    | -75    | -68    | -62    | -66    | -54    | -49    |
| Berne            | 145 | -31    | -36    | -67    | -60    | -57    | -57    | -51    | -48    | -43    |
| Fribourg         | 6   | -61    | -23    | -63    | -56    | -61    | -52    | -44    | -65    | -54    |
| Geneva           | 96  | 10     | -44    | -68    | -62    | -59    | -65    | -56    | -43    | -38    |
| Schwyz           | 12  | -24    | -13    | -55    | -70    | -50    | -48    | -46    | -29    | -9     |
| Solothurn        | 14  | -13    | -41    | -62    | -65    | -53    | -49    | -50    | -30    | -44    |
| Vaud             | 228 | -8     | -22    | -65    | -70    | -68    | -65    | -64    | -55    | -55    |
| Zurich           | 532 | -17    | -25    | -60    | -59    | -57    | -53    | -55    | -46    | -41    |

## 10 Trip duration by transport mode and gender

Table 2: Median trip duration by gender and mode (minutes)

| Mode    | Gender | Baseline-2019 | Mar-02 | Mar-09 | Mar-16 | Mar-23 | Mar-30 | Apr-06 | Apr-13 | Apr-20 | Apr-27 |
|---------|--------|---------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Bicycle | Female | 15            | 15     | 16     | 14     | 19     | 27     | 31     | 39     | 28     | 19     |
|         | Male   | 14            | 14     | 15     | 25     | 24     | 28     | 36     | 32     | 32     | 22     |
| Bus     | Female | 11            | 7      | 8      | 4      | 5      | 6      | 5      | 6      | 5      | 5      |
|         | Male   | 11            | 8      | 9      | 7      | 7      | 6      | 7      | 7      | 6      | 6      |
| Car     | Female | 52            | 41     | 38     | 36     | 36     | 36     | 37     | 36     | 39     | 36     |
|         | Male   | 51            | 47     | 42     | 34     | 34     | 35     | 35     | 35     | 36     | 38     |
| Train   | Female | 35            | 31     | 35     | 19     | 28     | 29     | 16     | 18     | 31     | 23     |
|         | Male   | 35            | 25     | 34     | 12     | 26     | 23     | 19     | 24     | 24     | 26     |
| Tram    | Female | 15            | 13     | 16     | 8      | 14     | 14     | 9      | 8      | 13     | 14     |
|         | Male   | 18            | 20     | 17     | 12     | 11     | 13     | 12     | 11     | 12     | 12     |
| Walk    | Female | 17            | 22     | 21     | 19     | 18     | 21     | 21     | 21     | 20     | 18     |
|         | Male   | 17            | 20     | 20     | 16     | 18     | 20     | 20     | 21     | 19     | 18     |

## 11 Average trip length by transport mode (km)



## 12 Activity space and daily travel radius

A commonly used definition of the activity space is the 95% confidence ellipse of the activity locations, in this case weighted by duration. In the following analysis, the activities at the home location are included, for those that had the app activated on that day. This is an important metric which gives an idea of the area in which travel is being performed. The daily travel radius is also presented.

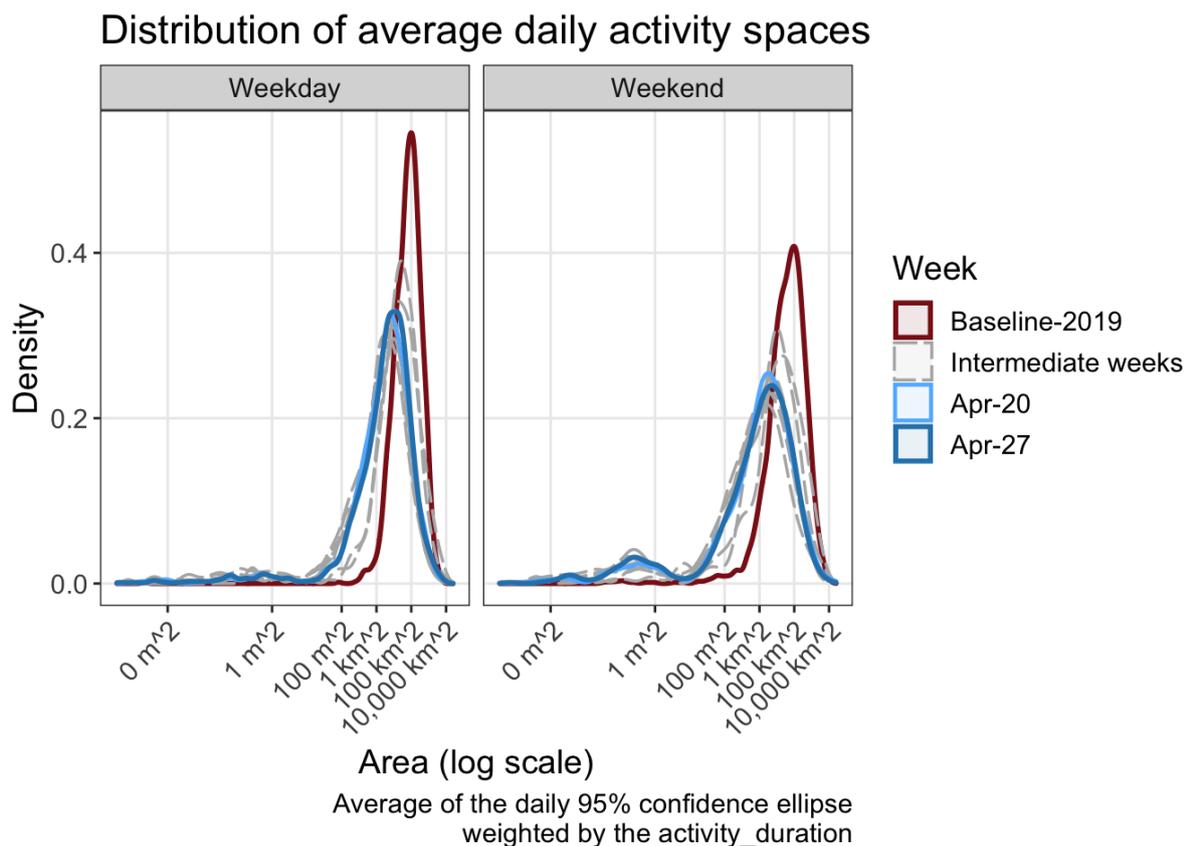


Table 3: Change in average activity space area and average daily radius (%)

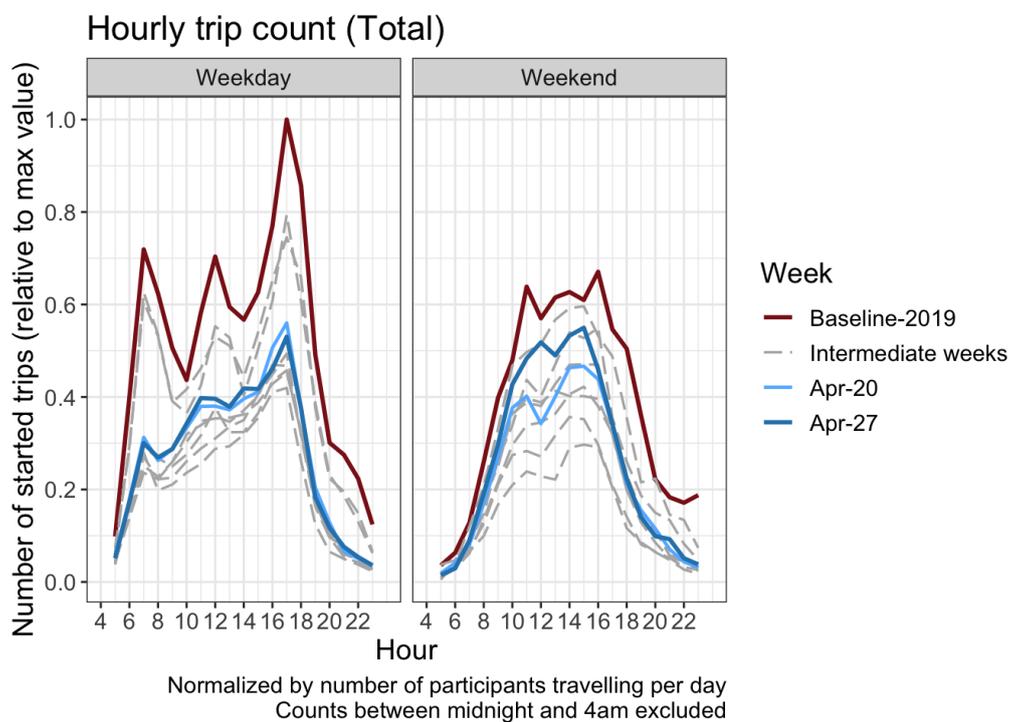
| Week                 |         | # Activities/day | Change | Area (km <sup>2</sup> ) | Change | Daily Radius (km) | Change |
|----------------------|---------|------------------|--------|-------------------------|--------|-------------------|--------|
| <b>Baseline-2019</b> | Weekday | 4.59             |        | 189.53                  |        | 9.59              |        |
|                      | Weekend | 3.80             |        | 218.50                  |        | 9.47              |        |
| <b>Mar-02</b>        | Weekday | 3.79             | -17%   | 179.56                  | -5%    | 7.97              | -17%   |
|                      | Weekend | 3.28             | -14%   | 111.76                  | -49%   | 7.47              | -21%   |
| <b>Mar-09</b>        | Weekday | 3.79             | -17%   | 110.52                  | -42%   | 6.76              | -30%   |
|                      | Weekend | 3.02             | -20%   | 72.89                   | -67%   | 5.32              | -44%   |
| <b>Mar-16</b>        | Weekday | 2.74             | -40%   | 26.84                   | -86%   | 3.64              | -62%   |
|                      | Weekend | 1.96             | -48%   | 16.00                   | -93%   | 2.19              | -77%   |
| <b>Mar-23</b>        | Weekday | 2.59             | -43%   | 33.84                   | -82%   | 3.47              | -64%   |
|                      | Weekend | 2.18             | -43%   | 30.40                   | -86%   | 3.05              | -68%   |
| <b>Mar-30</b>        | Weekday | 2.77             | -39%   | 39.66                   | -79%   | 3.65              | -62%   |
|                      | Weekend | 2.48             | -35%   | 32.51                   | -85%   | 3.52              | -63%   |
| <b>Apr-06</b>        | Weekday | 2.85             | -38%   | 36.21                   | -81%   | 3.90              | -59%   |
|                      | Weekend | 2.69             | -29%   | 40.81                   | -81%   | 3.59              | -62%   |
| <b>Apr-13</b>        | Weekday | 2.87             | -37%   | 40.89                   | -78%   | 4.13              | -57%   |
|                      | Weekend | 2.68             | -29%   | 46.49                   | -79%   | 3.96              | -58%   |
| <b>Apr-20</b>        | Weekday | 3.12             | -32%   | 55.31                   | -71%   | 4.69              | -51%   |
|                      | Weekend | 2.68             | -29%   | 72.86                   | -67%   | 4.64              | -51%   |
| <b>Apr-27</b>        | Weekday | 3.11             | -32%   | 63.66                   | -66%   | 4.92              | -49%   |
|                      | Weekend | 2.73             | -28%   | 43.39                   | -80%   | 4.08              | -57%   |

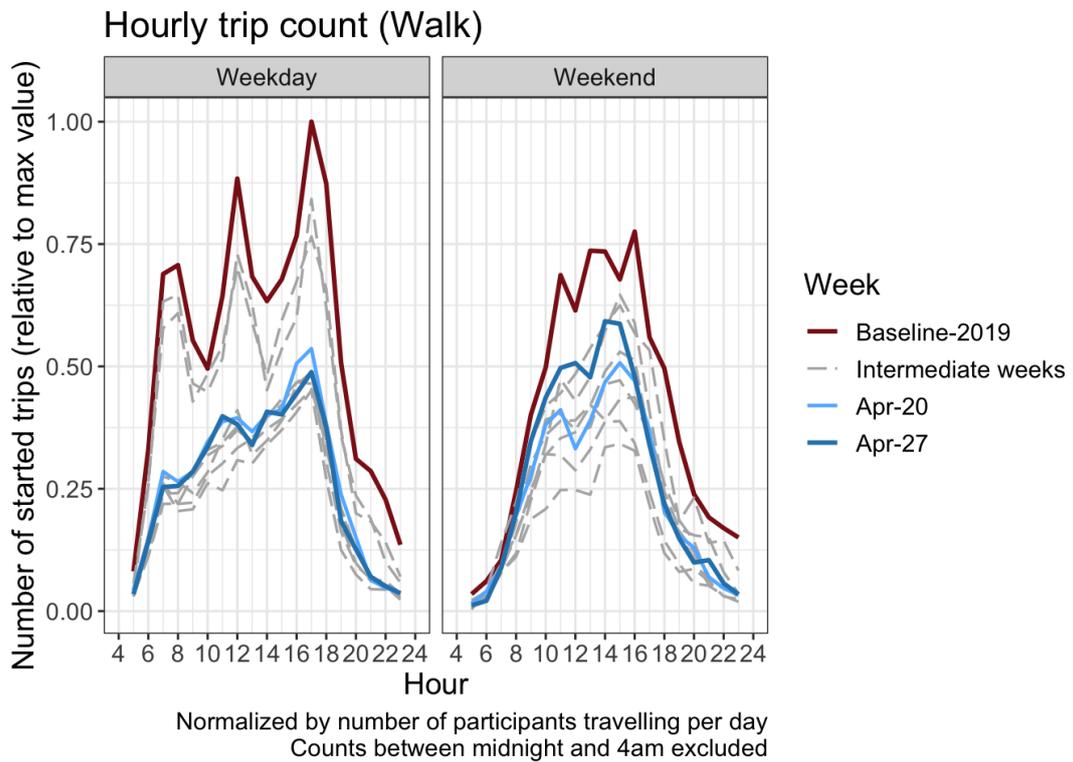
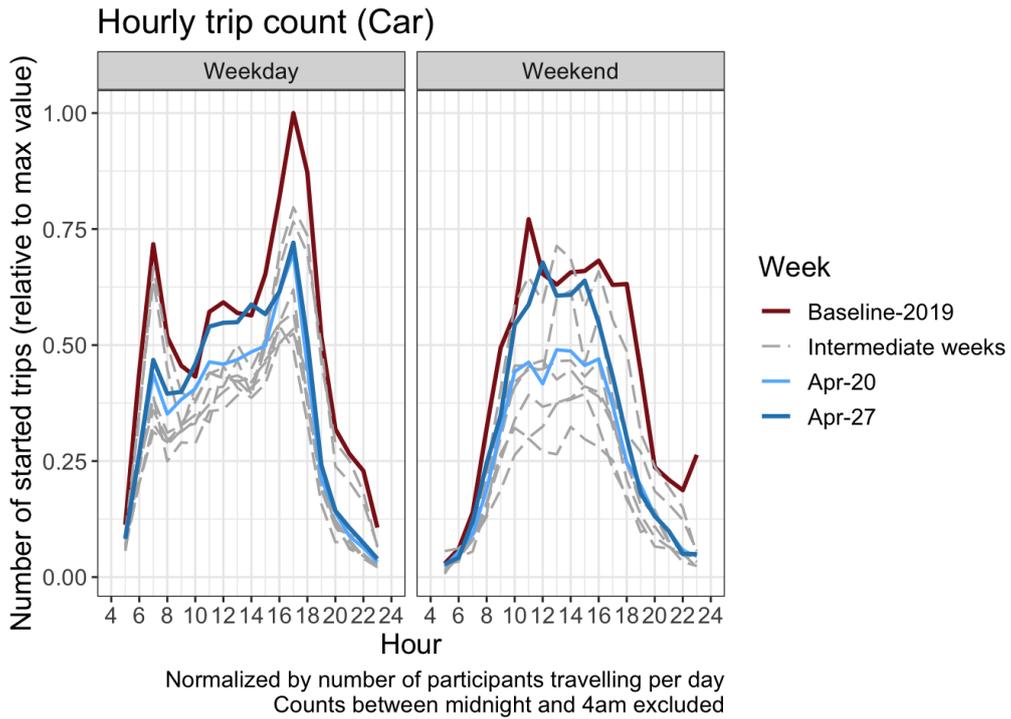
Table 4: Change in median weekly activity space by type of day and age class (km<sup>2</sup>)

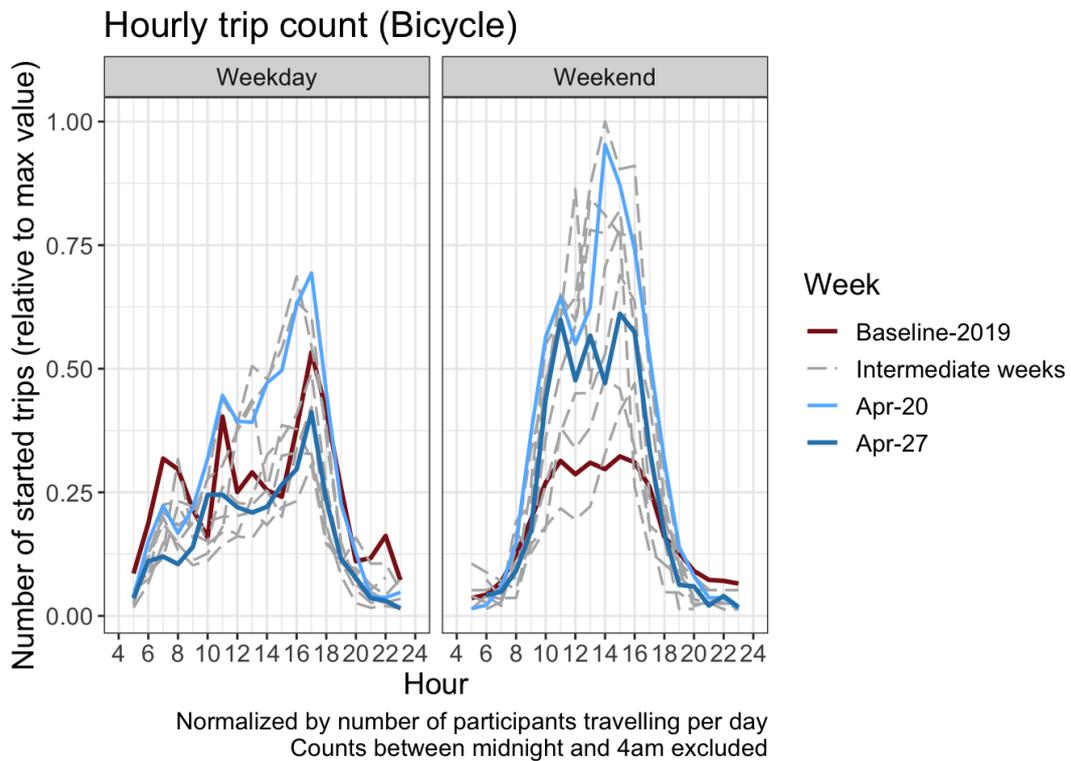
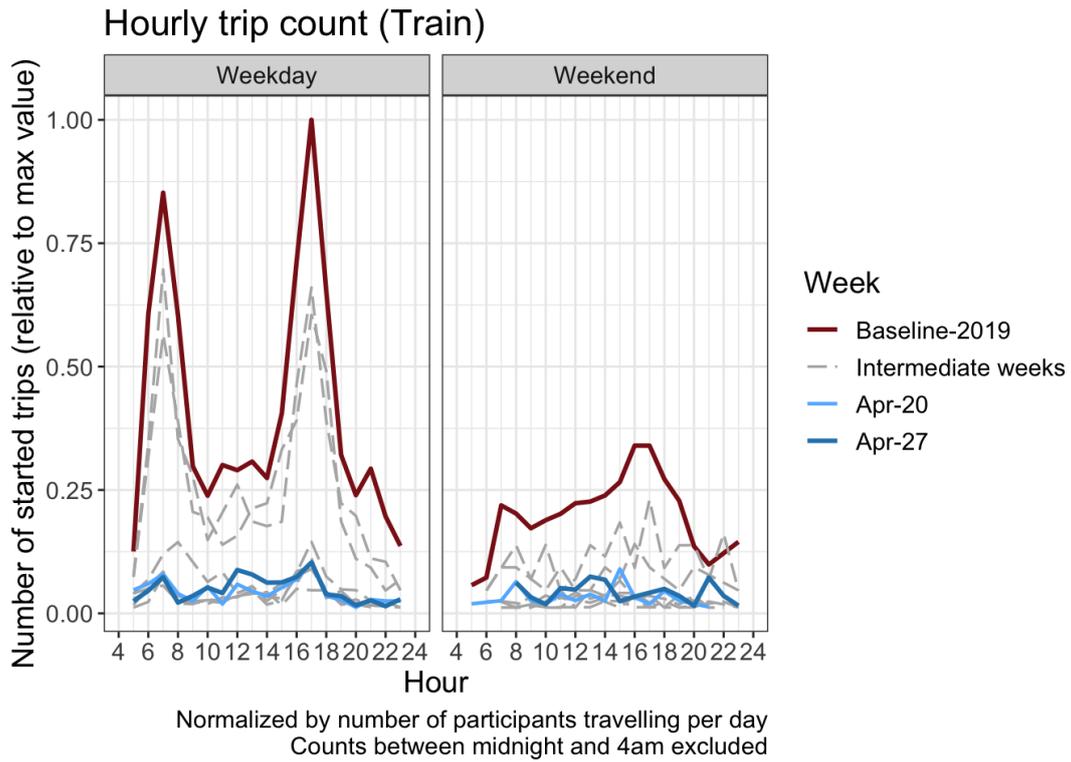
| Age     |         | 2019 | Mar-02 | Mar-09 | Mar-16 | Mar-23 | Mar-30 | Apr-06 | Apr-13 | Apr-20 | Apr-27 |
|---------|---------|------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| (18,25] | Weekday | 63.1 | 35.9   | 48.1   | 6.9    | 2.7    | 3.2    | 5.7    | 7.1    | 10.6   | 10.5   |
|         | Weekend | 35.5 | 5.8    | 9.8    | 0.6    | 0.9    | 0.8    | 1.2    | 1.3    | 2.7    | 4.5    |
| (25,35] | Weekday | 70.9 | 85.2   | 42.6   | 2.3    | 4.9    | 4.6    | 7.4    | 6.3    | 10.5   | 14.1   |
|         | Weekend | 42.4 | 14.5   | 3.3    | 0.4    | 0.6    | 1.4    | 2.3    | 1.8    | 1.9    | 5.6    |
| (35,45] | Weekday | 74.9 | 36.4   | 75.0   | 6.8    | 3.3    | 7.6    | 8.2    | 9.2    | 11.8   | 13.2   |
|         | Weekend | 24.9 | 29.9   | 20.5   | 0.4    | 1.6    | 0.8    | 1.5    | 1.5    | 2.6    | 5.1    |
| (45,55] | Weekday | 73.8 | 40.5   | 53.8   | 4.0    | 3.1    | 4.4    | 6.9    | 5.4    | 10.6   | 13.2   |
|         | Weekend | 27.9 | 13.3   | 7.0    | 0.7    | 1.2    | 1.6    | 1.7    | 2.3    | 2.6    | 2.8    |
| (55,65] | Weekday | 67.4 | 79.9   | 45.0   | 7.3    | 2.8    | 5.8    | 5.1    | 7.3    | 10.1   | 10.1   |
|         | Weekend | 21.5 | 9.1    | 8.7    | 0.1    | 1.2    | 1.1    | 1.2    | 3.8    | 2.3    | 2.3    |

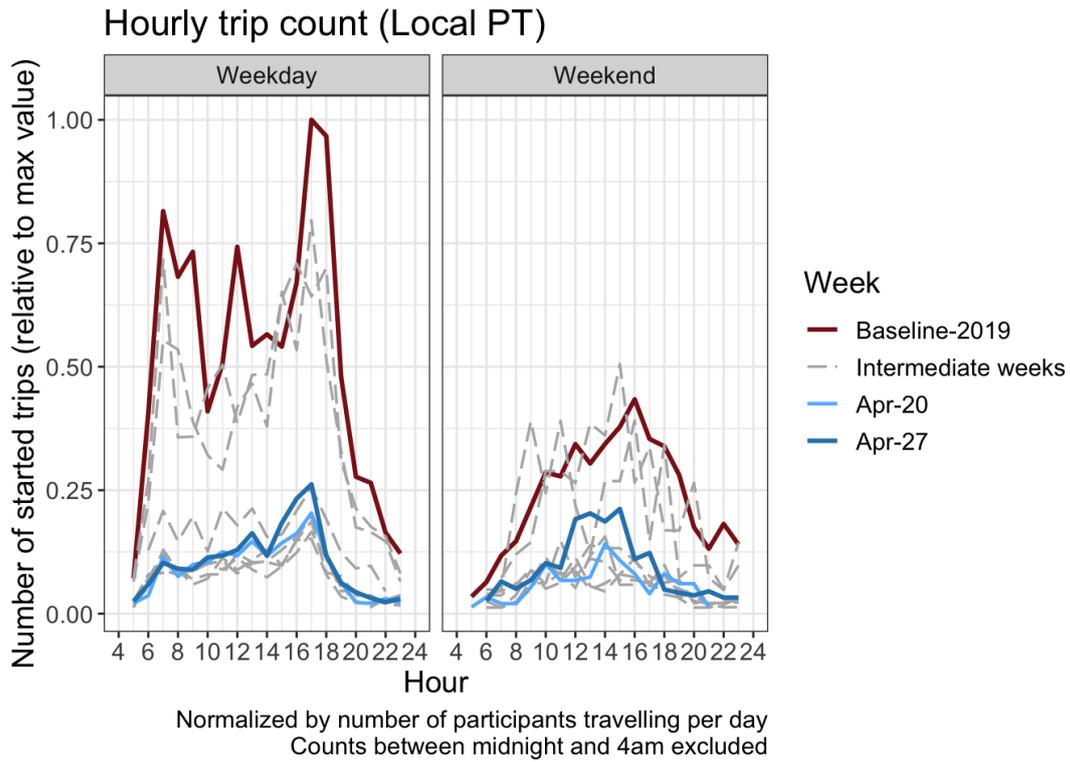
### 13 Hourly counts

The number of trips started per hour. The y axis is normalized by the maximum hourly value in the graph.





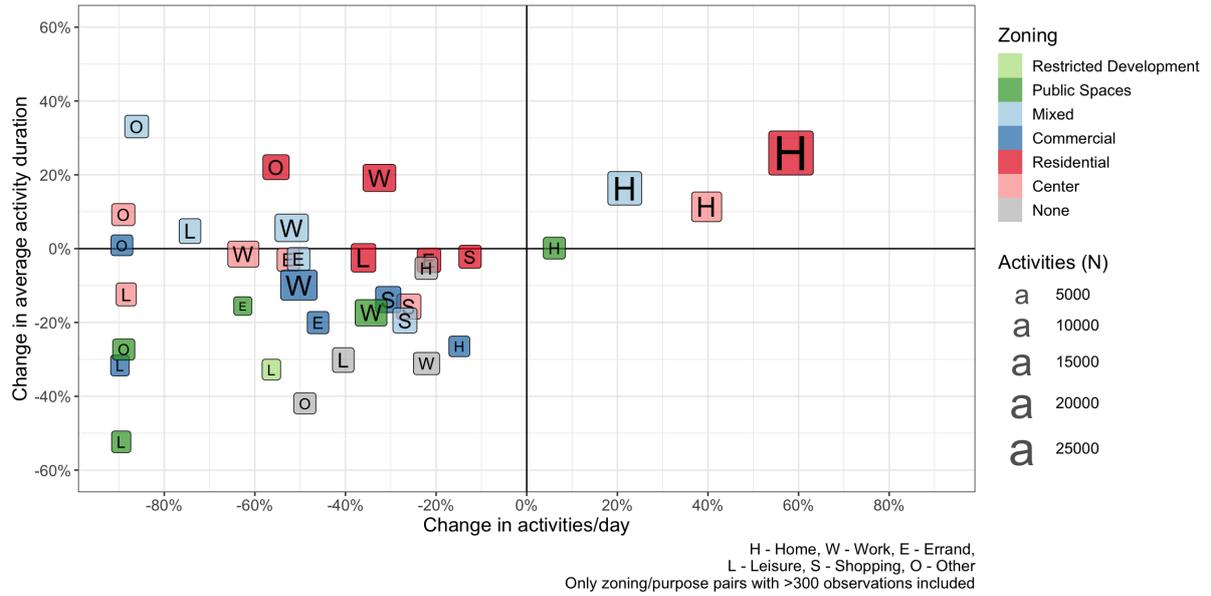




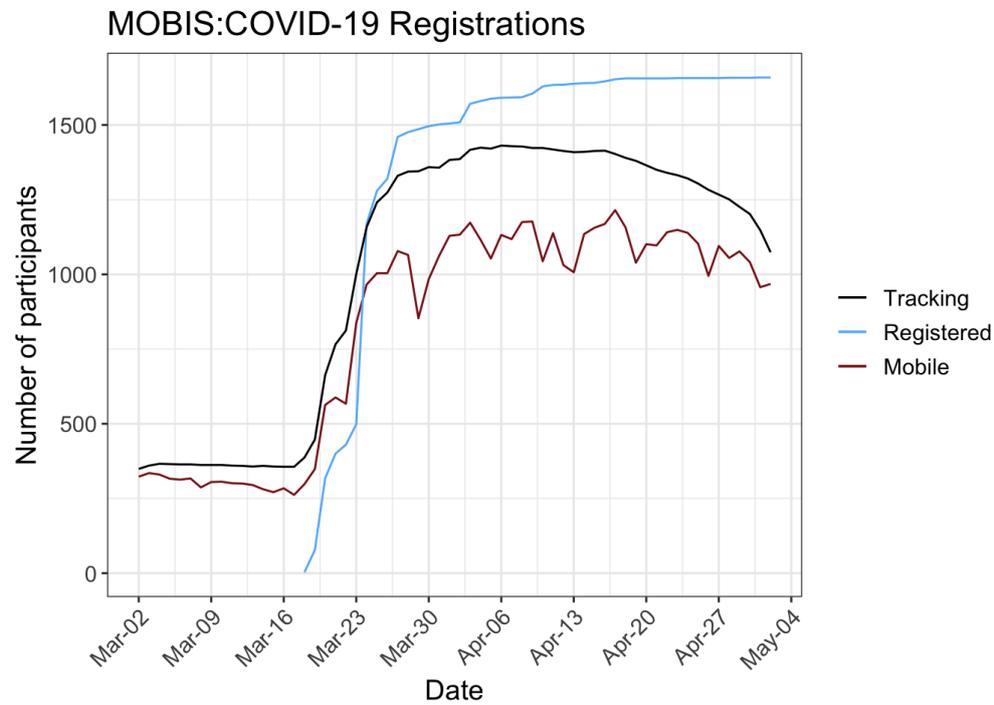
## 14 Activity types and zoning

Around 30% of activities were voluntarily labelled with their purpose by participants using the app. Work is ongoing to impute the purposes for the rest of the activities. Using simplification of the ARE development zoning classification, the activities are assigned with the closest zone classification within a 100m radius. The following graph shows how both the activity duration and the number of activities has changed from the baseline period in 2019 to the COVID-19 period.

Please note that only stationary leisure activities are included, not walking/cycling/hiking/etc



## 15 Participation



## 16 Differences in the distributions

The following charts show the characteristics of the MOBIS:COVID-19 sample compared to the original MOBIS sample. There are some small differences, but generally the samples are consistent. This chart will be extended to compare to the relevant census data.

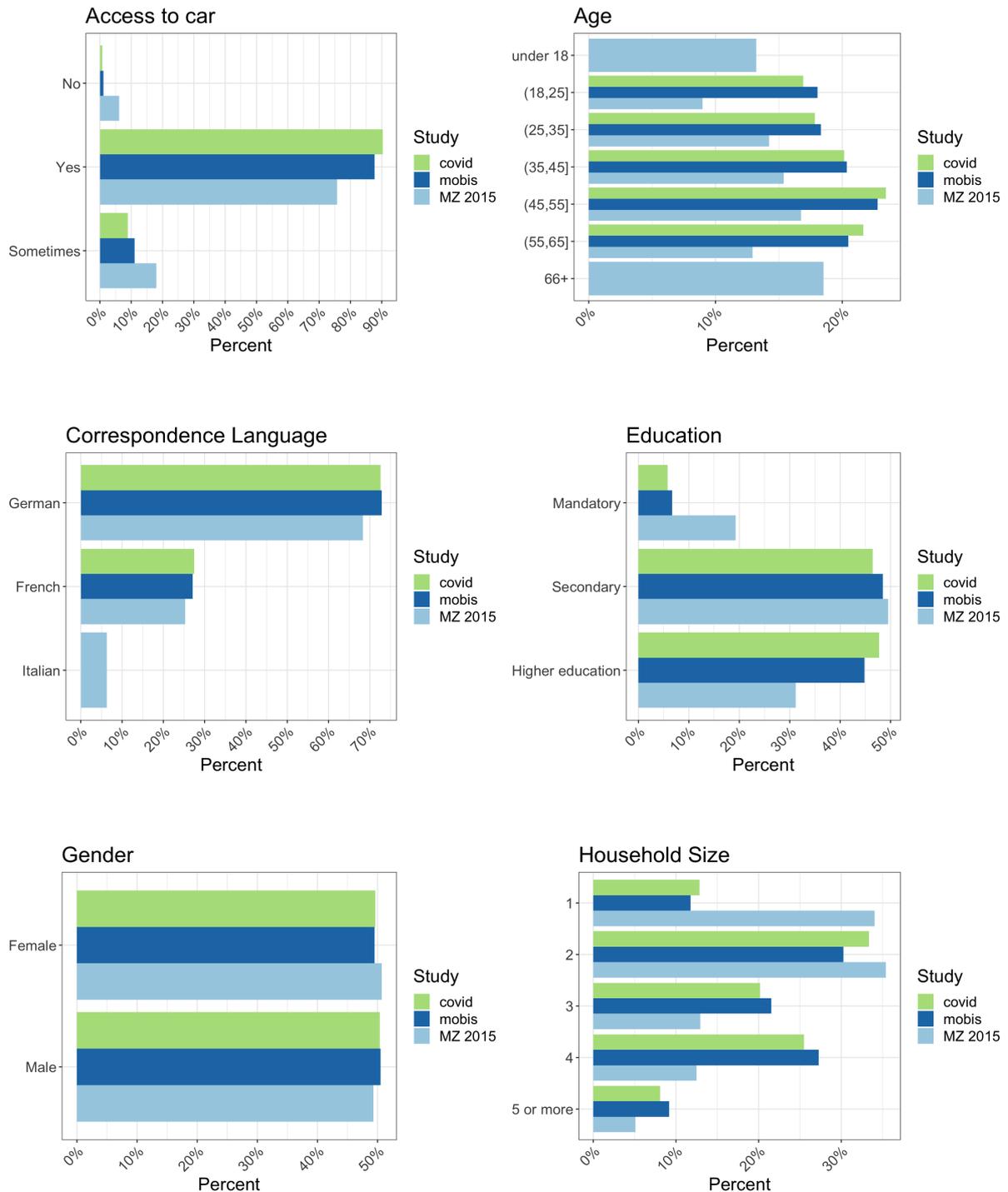




Table 5: Comparison with the last national travel diary Mikrozensus (MZ) 2015

|                         | N     |        | %     |      |
|-------------------------|-------|--------|-------|------|
|                         | Covid | MZ     | Covid | MZ   |
| <b>Aargau</b>           | 81    | 4,325  | 5.0   | 7.6  |
| <b>Basel-Landschaft</b> | 183   | 1,940  | 11.3  | 3.4  |
| <b>Basel-Stadt</b>      | 39    | 1,555  | 2.4   | 2.7  |
| <b>Berne</b>            | 190   | 7,244  | 11.7  | 12.7 |
| <b>Fribourg</b>         | 8     | 1,942  | 0.5   | 3.4  |
| <b>Geneva</b>           | 127   | 3,062  | 7.8   | 5.4  |
| <b>Schwyz</b>           | 17    | 1,005  | 1.1   | 1.8  |
| <b>Solothurn</b>        | 17    | 1,813  | 1.1   | 3.2  |
| <b>Vaud</b>             | 291   | 5,303  | 18.0  | 9.3  |
| <b>Zurich</b>           | 663   | 10,410 | 41.0  | 18.2 |
| <b>Other</b>            | 3     | 18,491 | 0.2   | 32.4 |

This work is licensed under a Creative Commons “Attribution-NonCommercial-ShareAlike 4.0 International” license.

