

Changes in activity-travel behaviour of London Underground users during and after the COVID-19 pandemic

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Motivation

COVID-19 transmission occurs via droplets/aerosols (World Health Organization, 2020). Infections are more likely in confined spaces with poor ventilation (Chen et al., 2021; World Health Organization, 2020).

Public health officials mandate non-pharmaceutical interventions including masks, social distancing, working from home.

There is an actual and a perceived risk of COVID-19 infection on public transportation and during various activities.

Motivation

The COVID-19 pandemic has resulted in significant changes in activity-travel behaviour:

Drop in public transport ridership

Wide-spread adoption of working from home (WFH)

Travel mode	All workers (N=798)			Workers who commuted		
	Nov-19	Jun-20	Jan-21	Nov-19	Jun-20	Jan-21
Bus/tram	74	54	62	9%	13%	14%
Underground	542	168	190	69%	39%	42%
Car	39	69	67	5%	16%	15%
Taxi/ridesharing/ Carpool	2	12	12	1%	4%	4%
Bicycle/walk	30	84	73	4%	20%	16%
Rail	93	38	41	12%	9%	9%
I did not travel to work	14	371	349			

Motivation

There is an urgent and essential need to understand how the epidemic situation and (non-)pharmaceutical interventions influence activity-travel behaviour in the short-, medium- and long-term.

- Advanced epidemiological modelling and simulation
- Supply of transportation infrastructure and services
- Integrated transport and land use planning

Objectives

Estimate demand for public transport (London Underground) and working-from-home (WFH) relative to epidemic situation and (non-)pharmaceutical countermeasures

Survey design

Discrete choice experiments

- Travel pro le choice for trips by London Underground

- Willingness to work from home

Background questions

- Socio-economic characteristics

- Lifestyle, travel patterns

- Attitudes towards public health measures and working from home

Travel pro le choice

Travel time is pivoted on the travel time of the respondent's most frequent trip by London Underground.

Partial pro le design (8 choice situations, 3 blocks).

Dual response design:

Which of the two travel profiles would you prefer the most?

Would you really take the chosen travel profile in practice or not?

3 choice situations per respondent

Attributes and levels:

Mask comp. at workplace: no/ yes, at desk / yes, always

Mask comp. during travel: no / yes (with logical constraint)

Single response design: Would you work from home or travel to work under these circumstances?

Respondents instructed to assume that employer has given flexibility to work from either home or at the workplace.

Data collection and cleaning

Eligibility criteria:

- Older than 18 years,
- Used London underground for 3 or more round trips per week in 2019,
- Spent more than 9 months in London during 2020,
- Plan to spend more than 9 months in London during 2021.

Conducted Between March and May 2021.

Cleaning, i.e. removed respondents with

- response time $\geq 0.4 * \text{median response time}$,
- household size $\geq (\text{no. of workers} + \text{no of children})$,
- straight liners (chose same choice across all eight choice situations).

Sample composition and representativeness

1080 respondents completed the survey; 961 respondents remain for the final analysis after cleaning.

Demographic distribution across sample and population:

Travel pro le choice: MXL estimates

Preferences for WFH (yes/no): MNL estimation results

	Value	Std err	t-test	p-value
ASC	0.770	0.220	3.503	0.000
B_female	-0.270	0.051	-5.290	0.000
B_age_18_29	-0.294	0.137	-2.141	0.032
B_age_50_59	0.183	0.134	1.365	0.172
B_age_60_plus	-0.059	0.152	-0.388	0.698
B_num_child	-0.177	0.069	-2.548	0.011
B_single_hh	-0.145	0.122	-1.181	0.238
B_spec.attention	0.396	0.178	2.221	0.026
B_edu_bachelor_plus	0.463	0.107	4.326	0.000
B_emp_professional	0.474	0.109	4.369	0.000
B_equipment_okay	0.981	0.115	8.532	0.000
B_manage_1_5	-0.231	0.122	-1.897	0.058
B_manage_21_plus	-0.696	0.153	-4.540	0.000
B_manage_6_20	-0.262	0.143	-1.836	0.066
B_mask_travel	-0.465	0.244	-1.908	0.056
B_mask_work_always	0.045	0.233	0.193	0.847
B_mask_work_ex_desk	-0.226	0.228	-0.989	0.323
B_new_case	0.009	0.003	3.280	0.001
B_vaccination_prop	-2.081	0.257	-8.099	0.000

Attitudes and preferences for WFH

Preferences for WFH

Conclusions and outlook

Respondents are sensitive to epidemic situation and (non-)pharmaceutical interventions when making activity-travel choices.

Next steps:

- Estimation in crowding multiplier space in analogy to willingness to pay space.

- Explore utility specifications with interaction effects.

- Develop latent class models to explain heterogeneity in preferences.

- Develop integrated choice and latent variable models to include attitudes.

Thank you

References I

- Chen, L., Ban, G., Long, E., Kalonji, G., Cheng, Z., Zhang, L., and Guo, S. (2021). Estimation of the sars-cov-2 transmission probability in confined traffic space and evaluation of the mitigation strategies. *Environmental Science and Pollution Research*, pages 1{13.
- World Health Organization (2020). Transmission of sars-cov-2: implications for infection prevention precautions. Technical report.