

Covid-19 Transport, Travel and Social Adaptation Study

Understanding behaviour change with neighbourhood characteristics

September 2021

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About this report

The analysis presented in this report was funded by the Department for Transport. The analysis draws on data collected as part of a wider study funded by UK Research and Innovation and a range of governmental partners. Full details can be found on the [Covid19-Transas website](#) with further information about the wider project and our data. The views expressed in the report are those of the authors and do not necessarily represent those of the funders.

The data in this project has been assembled through a wider project collaboration with Dr Llinos Brown of ITS Leeds and Professor Iain Docherty of the University of Stirling. The neighbourhood level statistics were compiled by Dr Malcolm Morgan, Dr Kadambari Lokesh and Dr Ian Philips without whom this assessment would not have been possible. We are also grateful to the administration teams at DecarboN8 and CREDS who make the research possible. Any errors or omissions in the analysis are, however, the sole responsibility of the authors.

Reference

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More details on the [Covid19 Transport, Travel and Social Adaptation Study website](#).

Addendum:

Figure 27 on page 45, percentages shown on the third group of blocks (I/my partner currently often drop-off or pick up my child(ren) as part of my journey to or from work) have been amended to match the underlying data in the graph blocks.

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Executive summary

This research aims to understand the longer term behavioural responses to Covid-19 and how they varied across different areas and different socio-economic groups. It draws on a panel survey collected by the University of Leeds and the University of Stirling across 10 areas in England and Scotland. This data set has been combined with spatial data to enable the behaviour of individuals to be connected to characteristics of their local area. This report summarises the key findings relating to work from home, grocery shopping and mode use focusing on aspects of behavioural change which are most relevant for policy makers in months ahead.

The data

The survey was administered by a market research company (YouGov). The sampling approach included quotas by region, age, gender and social grade, in addition to ethnicity for London, and the data was subsequently weighted to be representative of each region. The areas covered were Aberdeen, Ayrshire, Bristol, Edinburgh, Glasgow, Lancashire, Liverpool, London, Manchester and Newcastle. The findings are generalizable to the areas sampled. However, in interpreting the findings, it is important to note that the sample is not nationally representative and has an urban bias, although it covers types of area much more diverse than central urban cores.

The survey was conducted in two waves. The first survey (Wave 1) was conducted in July 2020 and focused on behaviour in February and early March 2020 just before the first national lockdown and behaviour during the first period of national lockdown (spring 2020). The second survey (Wave 2) was in December 2020 and focused on behaviours since the initial lockdown and in October. 9,362 participants were in Wave 1 with 6,302 of the same participants continuing in Wave 2. The three time periods used for reporting results are:

- Before lockdown/Covid-19 outbreak (representing the first UK wide lockdown in February and early March 2020)
- During lockdown (representing late March to early June 2020)
- October (representing October 2020 when some restrictions had been eased)

Travel to work and working from home

When reporting on changes to patterns of journey to work or working from home we only include those people who were working in both waves of the survey.

Before the Covid-19 outbreak not working from home at all was by far the most prevalent working practice undertaken, reported by 76% of those in work in the study areas and this remained the case for 44% of workers in October 2020. Nevertheless, almost half of workers who did not work from home (WFH) before lockdown transitioned to WFH and were still doing this in October, around a third of those in work overall. Around half (55%) of those in employment worked from home some (17%) or all (38%) of the time in October.

The job sectors which accounted for the most WFH included financial services, IT and telecoms, media and marketing, accountancy, legal and real estate. Together these sectors accounted for just over half of all days undertaken WFH both before Covid-19 and in October 2020 even though they only employed 19% of the workers. The proportion of workers claiming to involve driving as a primary part of their role (e.g. taxi drivers, couriers) was between 7% and 8% before Covid-19 and in October 2020.

Car commuters were less likely to work from home before and during lockdown

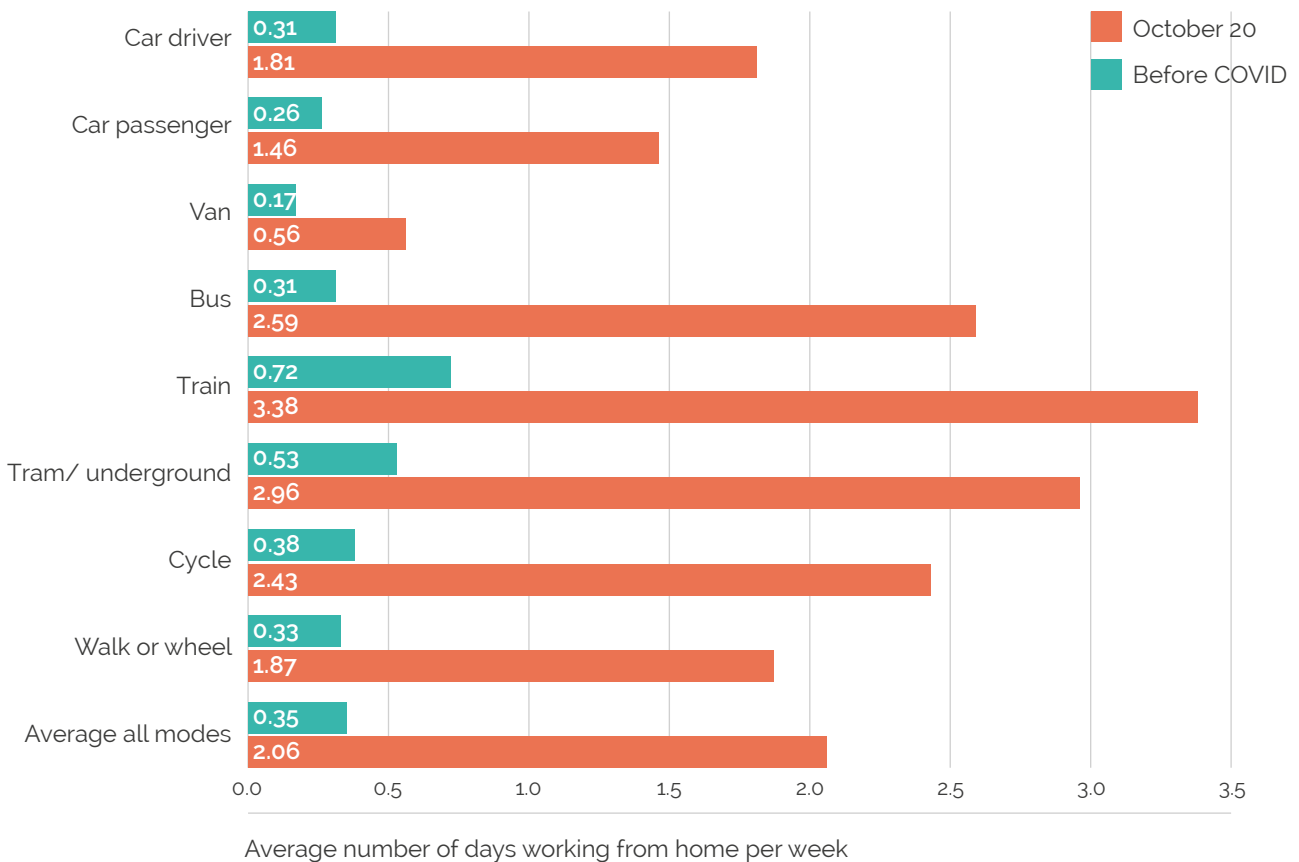


Figure 1: Average days per week worked from home according to 'before' commute mode. Only employees who had the same job throughout and left the house to work at least one day per week. Unweighted, N=2,560 (before), 2,334 (October 2020).

Using average number of days worked from home or the percentage of all days worked by each mode user, a clear picture emerged of car commuters being most likely to be in jobs that did not allow home working. Car driving commuters were the least likely, other than car passengers and van drivers, to work from home before Covid-19 (0.31 days a week, or 6% of total days worked by car drivers in the sample) and train commuters the most likely (0.72 days rising to 3.38 or 3% rising to 65%). The tendency for less WFH among car commuters holds strong even when those with jobs involving driving are not included in the analysis and also when London is removed from the analysis to account for the greater use of public-transport among those in job sectors more conducive to WFH.

The lower prevalence of WFH among car commuters is explained by the fact that those who did not WFH before or during the pandemic tended to live in areas that are the least accessible to employment opportunities and town centres. They were the most likely to live in areas with above average proportions of car commuting. Even though the average distance to work of those who did not work from home was shorter (10.0 miles) compared to people who started to WFH during the pandemic (13.4 miles), car commuting was relatively high (56% vs 47%) and very stable. Of those who drove to work before lockdown and had the same job in both survey waves, only 4% had moved away from the car in October. In addition, those who did not WFH before or during the pandemic had higher average car ownership than others in employment, higher overall frequency of using the car and for specific purposes such as the journey to school and to supermarkets. Those who did not WFH before or during the pandemic also lived in areas with higher levels of deprivation whereas people who started to WFH during the pandemic were more likely to live in less deprived areas, indicating a widening of the gap between average deprivation levels for home workers and non-home workers.

Before the Covid-19 outbreak, those who worked from home all of the time were more likely than partial home workers to live in areas with above average proportions of car commuting. By contrast, those who reported partial home working pre-pandemic were more likely to live in areas with greater train, underground and bike commuting. During the pandemic, partial home workers and many previous non-home workers began to WFH full time, and both groups were most likely to live in areas with better accessibility by most travel modes, as measured by shorter travel times to areas of local employment and to local services.

Rates of home working vary hugely across different areas

Overall, the data suggests that working from home has been widespread in all the areas studied, varying from an average of 28% of working days for people living in sparse countryside areas to 68% of those living in London cosmopolitan areas. This very different level of working from home may impact significantly on commuter traffic levels and mode share in the longer term.

Job sector has an influence on rates of WFH and explains the spatial patterning to some extent. Those Local Authority subgroups with the greatest proportion of WFH in October 2020 (London Cosmopolitan, City Periphery, University Towns and Cities) also had the greatest proportion of workers employed in the six job sectors accounting for the most WFH. Whilst job type is important to propensity to work from home, other factors which might be expected to influence preferences to work from home, such as broadband speed and access to public greenspace, did not explain differences in those WFH or not.

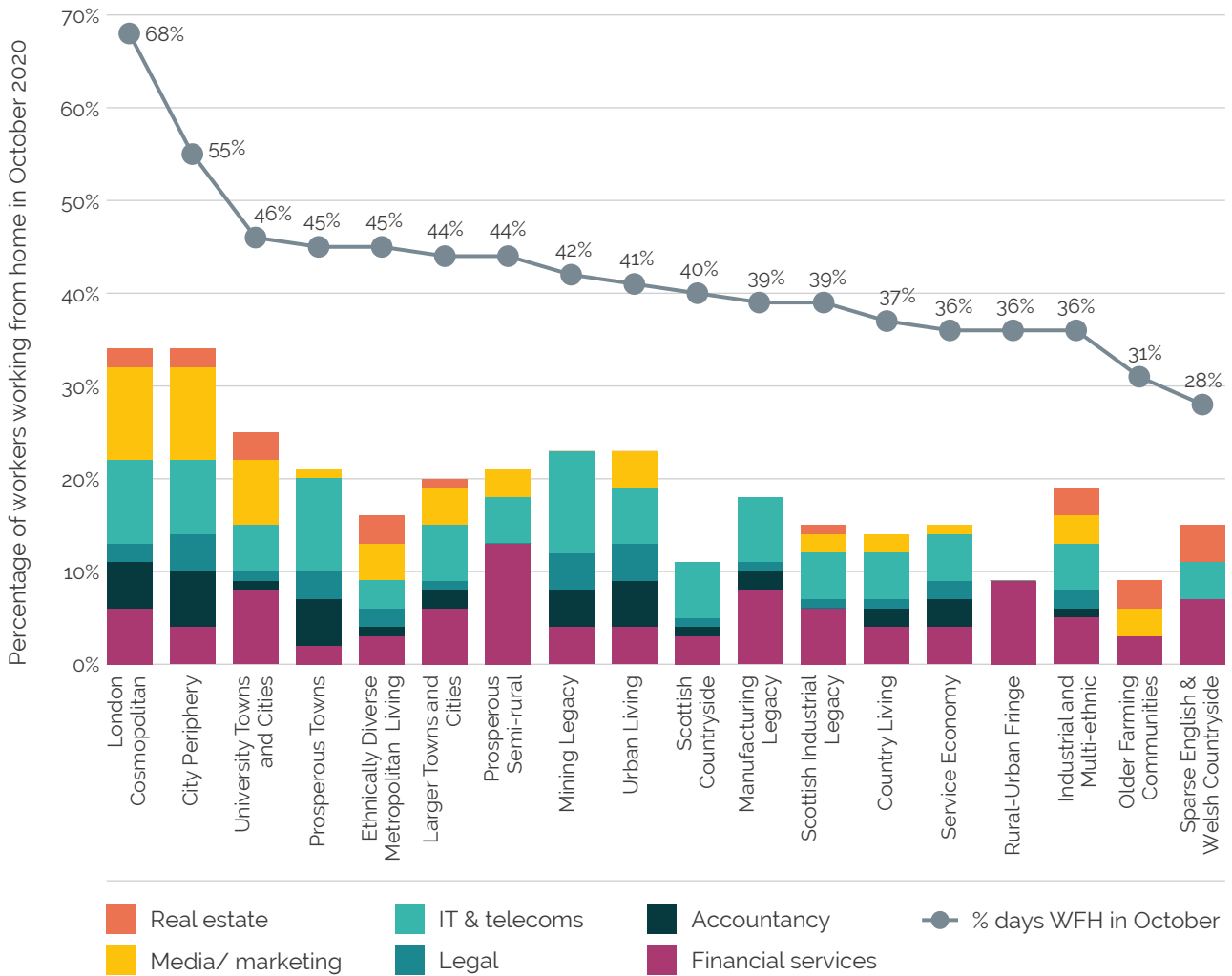


Figure 2: Percentage of workers in each of the top six job sectors responsible for the most working from home in each Local Authority Subgroup. N=3,236.

In-person and online grocery shopping

People shopped less often for groceries but spent more

By October the average number of trips to both large supermarkets and smaller food shops was lower than before the spring 2020 lockdown. There were small increases in both types of shopping trips between the spring lockdown and October, although they remained well below pre-lockdown levels. The total number of in-person shopping trips fell from 3.1 before lockdown to 2.2 during lockdown and 2.3 in October. Online shopping frequency increased from 0.22 times per week pre-lockdown to 0.27 during spring 2020 lockdown and increased further to 0.35 by October 2020.

Whilst there has been a net reduction in the combined in-person and online shopping frequency of around 0.6 trips per week, over a half of people said they had increased spending on household groceries compared to less than a fifth who said the opposite.

Increases in on-line grocery shopping were linked to personal health risks and amount of home working

Around a third (32-36%) of the reduction in visits to small food shops or supermarkets were at least partially substituted by online deliveries. Before the pandemic, 17% of households reported receiving home grocery deliveries once a month or more and this increased to 37% of households in October.

The growth in home delivery was greatest among households with people who were shielding and also high among those with other health risks. Twice as many households that were shielding started home deliveries as did those with no health risks (16% vs 8%).

Increases in online shopping are also related to working from home. Before lockdown, there was no discernible pattern between rates of WFH and frequency of supermarket visits. However, from the spring 2020 lockdown onwards, higher levels of WFH were associated with less frequent visits to supermarkets but with more home grocery deliveries, with 45% of the people who started receiving home deliveries during the pandemic also starting to WFH, compared to 33% on average. Changes in online grocery shopping were not related to pre-pandemic income, nor self-reported increases or decreases in income by October 2020.

There was no evidence of a switch to local shops

The proximity of one type of grocery shop was not associated with the increase or reduction of the other type of in-person grocery shop. Whilst it has been suggested that people might be switching to more local shops we see no evidence to support a "switch". It is clear, though, that longer journeys were more likely to be reduced and smaller food shops had lower reductions in frequency of use than supermarkets.

People had generally good access to food shopping with 89% reporting travelling less than five miles to a supermarket and 98% less than five miles to a smaller food shop before lockdown. Over three quarters (77%) of people live within one mile of the smaller shop they use and 31% within a mile of the supermarket they use. Supermarkets closer than one-mile were visited more often than those further away and this was a consistent pattern over time. However, reductions in visits were greater for those supermarkets that were further away (more than five miles), with people opting to reduce their frequency of visits rather than switching to closer supermarkets instead. The car remained the dominant mode for supermarket trips (just under three quarters of trips). Walking increased from 15% to 19% of supermarket trips, but mostly replacing taxi and public transport ones.

There was considerably more change in the frequency and the modes used for trips to smaller food shops. Around a fifth of those who stopped or reduced trips to supermarkets had either started or increased trips to smaller shops. The average frequency of trips to small shops reduced, particularly for those without a car (-33% for those without a car compared to -6% for those with a car), and the proportion of trips to smaller shops that were more than five miles from home increased. Walking to smaller shops increased for trips of less than five miles, but car use increased for journeys of over five miles. Before the Covid-19 outbreak, smaller shops were visited much more frequently by households without a car, but by October this pattern had reversed.

Mode use across a variety of journey purposes

As seen in the national trends, car and public transport use decreased significantly in the spring 2020 lockdown, but car use recovered more than public transport in the Autumn. Unless otherwise stated mode use reported here is people reporting using that mode three times a week or more.

Walking was the only mode to still be higher than pre-lockdown levels in October, at 154% of pre-lockdown levels. Moreover, we can see that walking had not reached its highest point during the spring lockdown (where it was 114% of pre-lockdown levels) but had continued to increase as the pandemic continued, despite the weather not being as favourable to walking as it was during the Spring.

Changing mode use relates to changing activity patterns during the pandemic

Whilst attention has been on the decrease in public transport use, the dominant factor in mode use appeared to be the reduction in the frequency of visits to different activities. Each activity had a different association with the types of modes typically used for these journeys: for example, rail use was particularly low because there was proportionally a lot of rail-based commuting and business travel. Mode share also varied across areas with some places being more public transport dependent (e.g. Glasgow) or with higher bike commute mode shares (e.g. Bristol). By October bus use as a proportion of pre-pandemic levels was at its lowest at 21% (Ayrshire) and highest at 50% (Lancashire).

Individual concern about Covid-19 risks impacted on mode use but regional differences were not found to be important

There was very little influence of the levels of Covid-19 restrictions experienced in October or cumulatively across the period after the first lockdown, on reported travel behaviour in October. At an individual level however, concern about the health impacts of Covid-19 was significantly related to the reduction in the frequency of use of every mode of transport, with the exception of taxis.

Bus use showed a different pattern. As with other modes, high concern about Covid-19 was related to lower bus use. However, people that increased bus use the most also appeared to have relatively high levels of general concern: 61% of bus users agreed that they had "no choice but to use the bus" and so the data does not reflect choice to the same degree as some other modes.

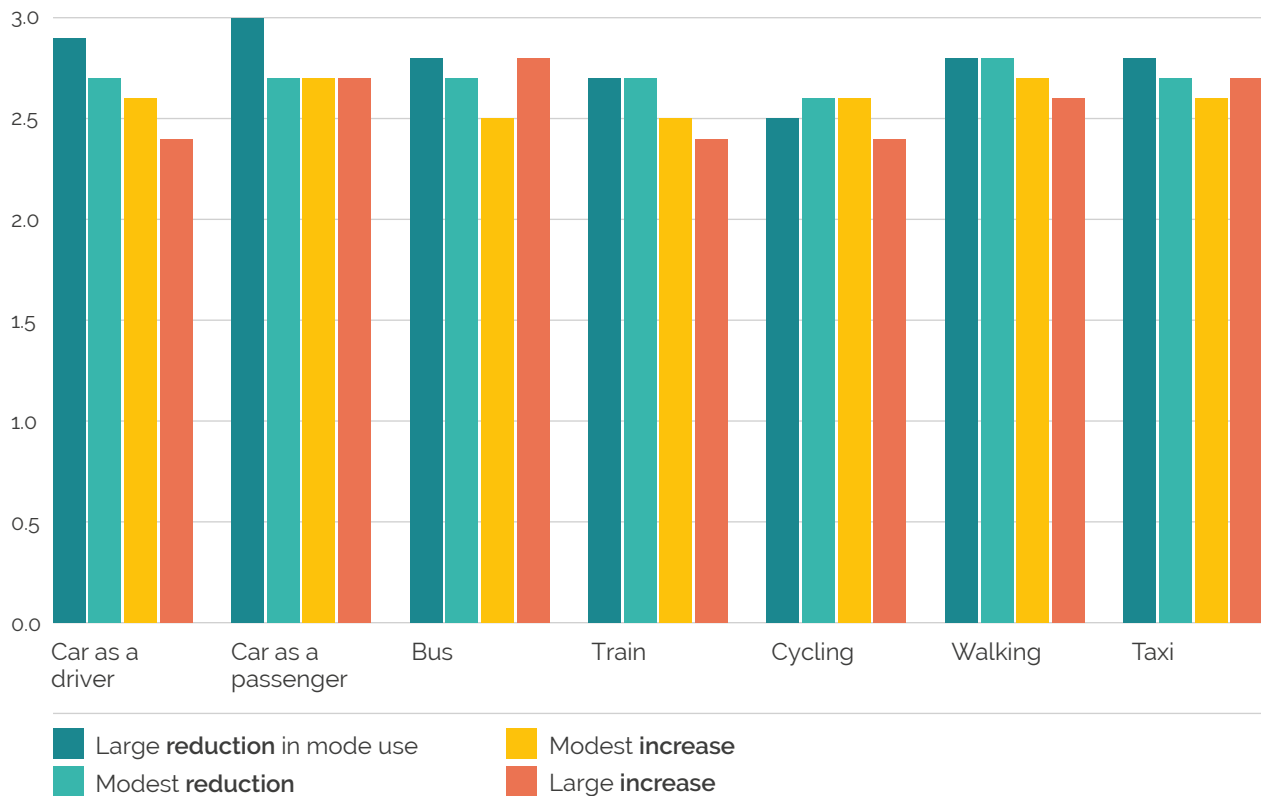


Figure 3: Relationship between the change in mode use between before lockdown and October and the averaged W1/W2 'Covid-19 Concern' score. Weighted, N=6,209.

More people working from home did not result in more sustainable school drop offs

There was a reduction in people who reported walking their children to school from 38% before lockdown to 29% in October. While walking is still undertaken as part of many multi-modal sets of journeys across the week, the general trend appears to have been a greater adoption of the car at least some of the time. Those who used to "drop off [their] children as part of their journey to work, but not at the moment" and who now work from home were, however, more likely to reduce their car only trips to school. This was just over a quarter of those who worked from home full-time in October.

The behavioural adaptations to Covid-19 have been uneven across society

The report details a range of adaptations by specific socio-demographic groups which shows how varied the pandemic behavioural responses have been. Some differences have reduced or disappeared, some have been reinforced and others remain unchanged. Some key points are that:

- Gender differences were exacerbated across the two time points. Women reduced their frequency of use of all modes apart from walking by a greater relative proportion than men, thereby opening up the differentials in car driving and cycling that already existed. Before the pandemic men and women used the train in roughly equal proportions but by October men were twice as likely to be using the train.
- Participants from ethnic minority backgrounds had lower levels of car driving but higher levels of bus and train use before lockdown. This pattern continued into October and became exacerbated with respect to public transport use: people from ethnic minority backgrounds did not reduce their use of buses and trains as much as people from other backgrounds.
- Household income continued to be a factor that strongly differentiated travel behaviour and this differential has been maintained since spring 2020. Income was positively associated with car driving, train use and cycling, but negatively associated with bus use. Walking was undertaken evenly across income groups before lockdown but higher income groups were walking more in October, reflecting greater leisure walking opportunities for this group that also increased how often they worked from home.

Policy implications

How much home working continues is a critical uncertainty?

It remains unclear, even in summer 2021, exactly what the return to work patterns for those people currently working from home will be. If those working at home in October 2020 continue to do so for half of their working weeks, then our estimate is that this could reduce miles travelled on the commute by between 15% (for walking) and 27% (for train journeys) in the areas studied compared to pre-pandemic. The reduction in car miles travelled on the commute would be 17%, and cycling and bus use would both see reductions of around 21%. This would have a significant impact on congestion levels, crowding, fare income and the demand for parking. These reductions would potentially improve the quality of the journeys that are made and reductions in traffic could also reduce noise, air quality impacts and climate change emissions.

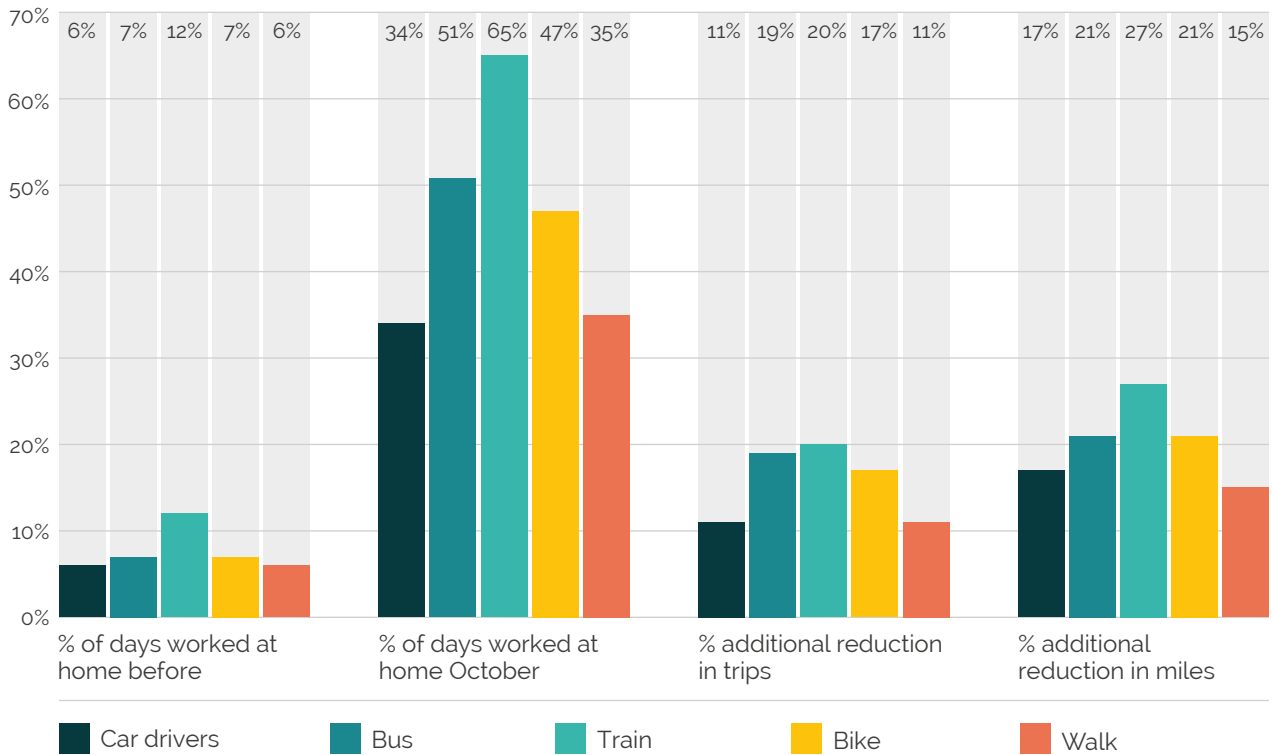


Figure 4: Comparison of potential percentage reduction in commute trips and miles per mode.

The benefits of home-working will be impacted by housing relocation decisions

Previously, those who have worked from home have tended to live further from work. Our data suggests that the pandemic has created a new group of people capable of working from home who are living in areas with better access to employment opportunities more locally. They also have access to local facilities and may be able to develop less car dependent lifestyles, if provided with good alternatives such as more walkable neighbourhoods and safer cycling routes. The increase in home working has also contributed to an increase in other home-based servicing activity such as online shopping, as people are more likely to be at home to receive deliveries. The switch to home working impacts on where people spend their time and where economic activity will happen.

Encouraging a shift to more sustainable journeys to school is critical for the autumn

The increase in people working at home has not led to an increase in walking trips accompanying children to school. Some of the school travel patterns that existed pre-pandemic were part of a home-to-work trip chain and may not be as easy to substitute by walking. As work patterns begin to be re-evaluated there are opportunities to re-engage with the travel to school agenda to encourage a mode shift from the car. Our evidence suggests that it cannot be assumed this will just happen anyway despite the general increases in levels of walking.

Different areas are likely to require different levels of public transport transition subsidy

The industrial structure in different areas has resulted in different levels of home working and so monitoring how the return to work differs across places will be important in the coming months. Public transport commuter markets have been impacted in different ways across our survey areas and the recovery trajectory and relative subsidy needs of different places seems likely to vary.

The pandemic has shown parts of the economy to be able to grow with less travel and this could be critical for future climate emission reduction strategies

In transport, it has generally been assumed that an increase in travel is associated with increased economic activity. However, our data on home grocery shopping challenges this assumption. Overall, Kantar estimate spend on groceries for home consumption to have increased by £15.2 billion during the pandemic and, on average, our data indicates that people also spent more at home over this period despite a near 20% reduction in grocery shopping transaction frequency. People have done more whilst travelling less. Longer car journeys to supermarkets have reduced and this could contribute to emissions savings in support of climate change commitments. Reduction in car-based shopping frequency could also enable smaller footprints for parking at supermarkets to be agreed by local authorities. Whilst the shift to online will undoubtedly add to delivery van traffic in residential areas, indications are that online deliveries do not offset reductions in personal miles travelled (Braithwaite 2017).

2. Report aims and basis

This report was commissioned by the Department for Transport to understand the longer term behavioural responses to Covid-19 and how they varied across different areas. It draws on a panel survey collected by the University of Leeds and the University of Stirling (N=9362 Wave 1 and N=6302 Wave 2) across 10 areas in England and Scotland. The survey locations and sample sizes are shown in Table 1.

The surveys were funded by the Engineering and Physical Sciences Research Council with additional top up sampling by national and local partners, including Transport Scotland. The survey was administered by a market research company (YouGov). The sampling approach included quotas by region, age, gender and social grade, in addition to ethnicity for London, and the data was subsequently weighted to be representative of each region.

In interpreting the findings, it is important to note that whilst the sample is representative in each of the 10 sample areas, it is not fully nationally representative and has an urban bias. Nevertheless, the sample covers types of area much more diverse than central urban cores with more rural areas found in Lancashire and Ayrshire and the Aberdeen and Edinburgh urban fringes. All eight Local Authority classification¹ 'Supergroups' and 18 of the 24 'Subgroups' are represented with sample sizes of 50 or above in each.² Using this classification, the sample represents 59% of Local Authorities and 63% of the UK population. When we compared changes in traffic levels observed 'on the ground'³ between February 2020 and April 2021 in our sampled Local Authorities compared to the UK average, travel declined more rapidly in the sample areas during the first lockdown and appears to be recovering more rapidly than the UK average. This analysis therefore provides in-depth understanding of places where mobility patterns may be most fluid and uncertain in the UK.

1 ONS 2011 residential-based area classifications

2 The missing areas are: Expanded Areas, Northern Ireland Countryside, Seaside Living, Ageing Coastal Living, Rural Growth Areas and Affluent Urban Areas

3 Using Google mobility data: Google LLC [Google Covid-19 community mobility reports](#). Accessed: March 2021

The survey was conducted in two waves. The first survey (Wave 1) was conducted in July 2020 and focused on behaviour in February and early March 2020 just before the first national lockdown and behaviour during the first period of national lockdown. The second survey (Wave 2) was in December 2020 and focused on behaviours since the initial lockdown and in October. The three time periods used for reporting results are:

- Before lockdown/Covid-19 outbreak (representing the first UK wide lockdown in February and early March 2020)
- During lockdown (representing late March to early June 2020)
- October (representing October 2020 when some restrictions had been eased)

In this report, we summarise the key findings of deep dives into the following topics:

- Travel to work and working from home
- Grocery shopping
- Mode Use across a variety of journey purposes

The benefits of a panel survey are that we can compare not just average shifts in behaviour over time, but we can understand how these average changes are made up of different changes in different directions by different groups of people. The report presents those changes using the following terms:

- Nevers – reported never doing a particular behaviour pre-pandemic or during
- Stoppers – reported doing a behaviour pre-pandemic but then stopped
- Reducers – reported doing a behaviour pre-pandemic but then reduced
- Consistents – were unchanged in their behaviours pre-pandemic to during
- Increasesers – reported doing a behaviour pre-pandemic and then increasing it
- Starters – reported never doing a particular behaviour pre-pandemic but then starting to do so during the pandemic

	Wave 1 03–22 June 2020	Wave 2 01–11 December 2020	W1–W2 Continuation rate
Aberdeen	968	622	64%
Edinburgh	973	655	67%
Glasgow	982	665	68%
Ayrshire	659	492	75%
Bristol	966	604	63%
Lancashire	960	647	67%
Liverpool	968	659	68%
Manchester	959	624	65%
Newcastle	977	656	67%
London	950	585	62%
Total	9362	6209	66%
Scotland	3582	2434	68%
England	5780	3775	65%

This report provides a summary of the most policy relevant findings from an in-depth analysis across the survey sites including linkage to wider data sets on topics such as census-derived area characteristics, levels of deprivation, access to employment and services, Covid-19 tiers of activity restriction, infection rates, quality of broadband services and access to green space.⁴ This enabled us to link survey findings to the characteristics of the area in which the respondent resides. Where findings are compared between groupings or areas then the differences presented are statistically significant unless otherwise stated.

⁴ We are grateful to the wider project team at ITS Leeds (Dr Malcolm Morgan, Dr Kadambari Lokesh, Dr Ian Phillips and Dr Llinos Brown) for their invaluable input to assembling the data sets.

3. Travel to work and working from home

The advice to 'work from home if you can' has been a key driver of behavioural adaptation during the pandemic to date. The extent to which these behaviours stick, for whom and how this relates to mode use is fundamental to a range of transport policy questions such as congestion and overcrowding in the peaks. Where people are during the day also has important spatial economic implications for where activities might take place.

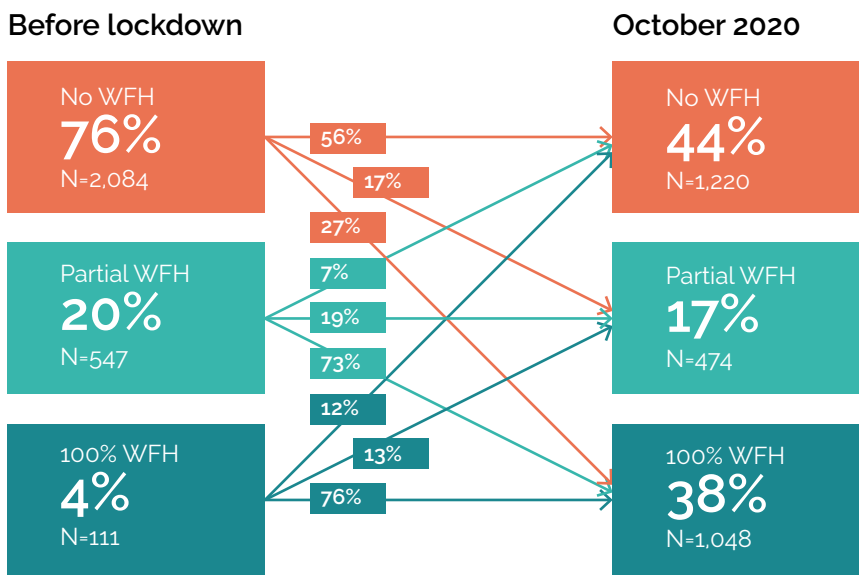


Figure 5: Change in working location from before lockdown to October. Unweighted, N=2,742.

This section looks at the split between working from home (WFH)⁵ and continuing to travel to work and the adaptations in both. Figure 1 below shows the behavioural shifts in the sample of workers. The data is based on the percentage of the working week that is worked from home, so that a part-time worker who works two days a week and did both of those at home would count as WFH all of the time. The data shows, for example, that 76% of people never worked from home before the pandemic.

⁵ WFH is used to abbreviate working from home and work from home from hereon.

By October 56% of those people still never worked from home, 17% transitioned to partially WFH and 27% to always WFH. Overall, 44% of respondents did not WFH in October. As well as those people who continued to never WFH a small number of people (12% of the 111 pre-pandemic full time home workers and 7% of the 547 partial home workers) also shifted to not WFH in the pandemic. Other changes across work from home groups can be understood by following the arrows of percentage change from before lockdown to October.

Figure 6 shows the distribution of changes in WFH rates across different Local Area Classifications as defined by the Office for National Statistics. It shows differences of between 4% and 18% of days worked from home before the pandemic. Everywhere has had a significant increase in the percentage of days worked from home with even the lowest scoring area (sparse English and Welsh Countryside) seeing over a quarter of days worked from home. London Cosmopolitan saw over two-thirds of days worked from home and City Periphery 55%. The pre-lockdown and October results might be seen to be upper and lower bounds of the proportions of WFH which will emerge as physical distancing rules are relaxed. Section 3.2 explores WFH in more detail.

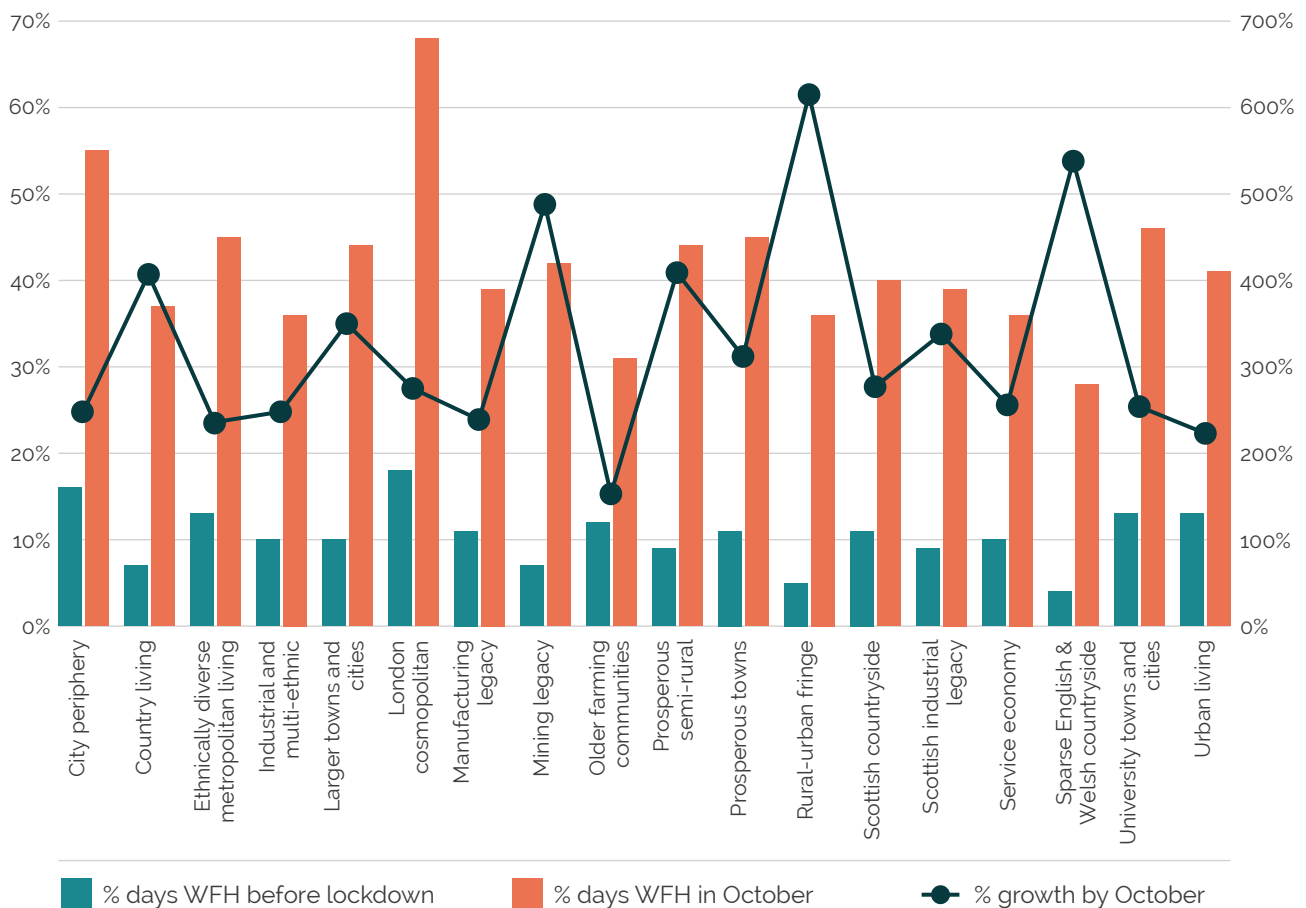


Figure 6: Mean percentage of days working from home before lockdown and in October 2020 in each LA Subgroup. Weighted, N=4,925 (before), N=2,813 (October).

3.1 Travel to work

Not working from home at all was by far the most prevalent working practice undertaken both before lockdown (76% of workers) but also in October (44%). Car commuting was very stable among those who continued to travel to work, with 96% of those who drove to work before lockdown and had the same job in both survey waves, continuing to do so in October (Figure 7). The largest percentage changes in commute mode were seen from car passenger to car driving (13%) and away from bus or tram use to a whole mixture of modes.

It is important to note that shifts in car passenger behaviour can be difficult to interpret. Some may be the result of the lift giver no longer travelling to work. Some may be the result of a vehicle now being available as another household worker is working from home. In aggregate, our data has not shown an increased propensity for car ownership and both the new and second hand car markets have been depressed during the pandemic (Marsden et al 2021; SMMT 2021a; SMMT 2021b). The shift from car passenger seems unlikely to have been the result of additional car ownership.

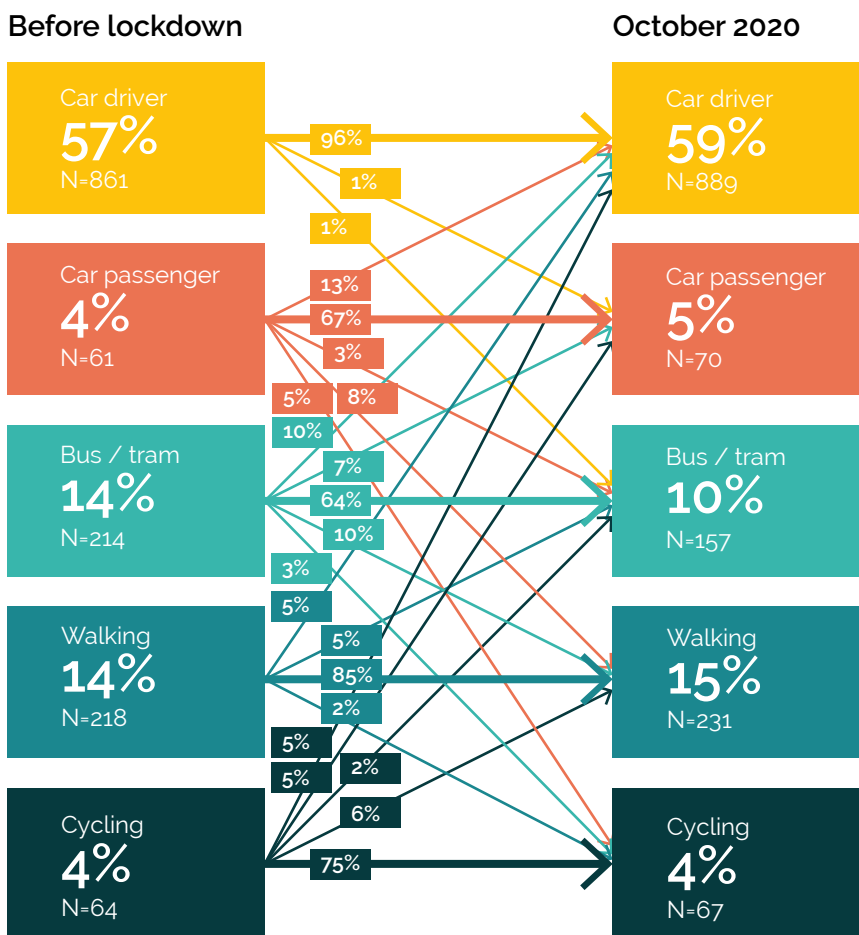


Figure 7: Change in mode used to travel to work from before lockdown for those still travelling to work in October. Unweighted, N=1,518⁶

⁶ Rail was not included in this figure as the sample size was especially small (N=52 workers who travelled by train, held the same job and continued to travel outside of home to work). Of these 52 train commuters, 67% of them continued to use the train, 19% switched to car driving, 6% to bus/tram, 4% to car passenger, 2% to walk and 2% to cycle.

Figure 8 shows the average index for multiple deprivation split by working arrangements. The index ranks the least deprived area as one and other areas are rank ordered from there. Higher values indicate greater deprivation. Those who, before lockdown, never worked from home lived in areas with higher levels of deprivation than those who worked from home. With the shifts to homeworking during the pandemic this difference has become even more pronounced. Those who never WFH ('No WFH' on Figure 4) is now much higher in relative terms in places such as Industrial and Multi Ethnic areas and Manufacturing Legacy but also in Country Living. This is not surprising, but it does confirm the spatially uneven ability and potential for some areas to adapt working patterns.

Those who never WFH tend to live in areas with the worst accessibility, in terms of journey time, to employment opportunities and town centres. They are also very highly correlated with areas with disproportionately large car driving mode shares to work according to Census journey to work data). Our analysis suggests that those driving to work have commutes which are shorter in length (10.1 miles) and duration (20.2 minutes) than those who are able to do some or all of their work from home. For example, people who had started working from home during the pandemic and who used to drive to work reported commute distances of 16.6 miles and journey times of 25.4 minutes.

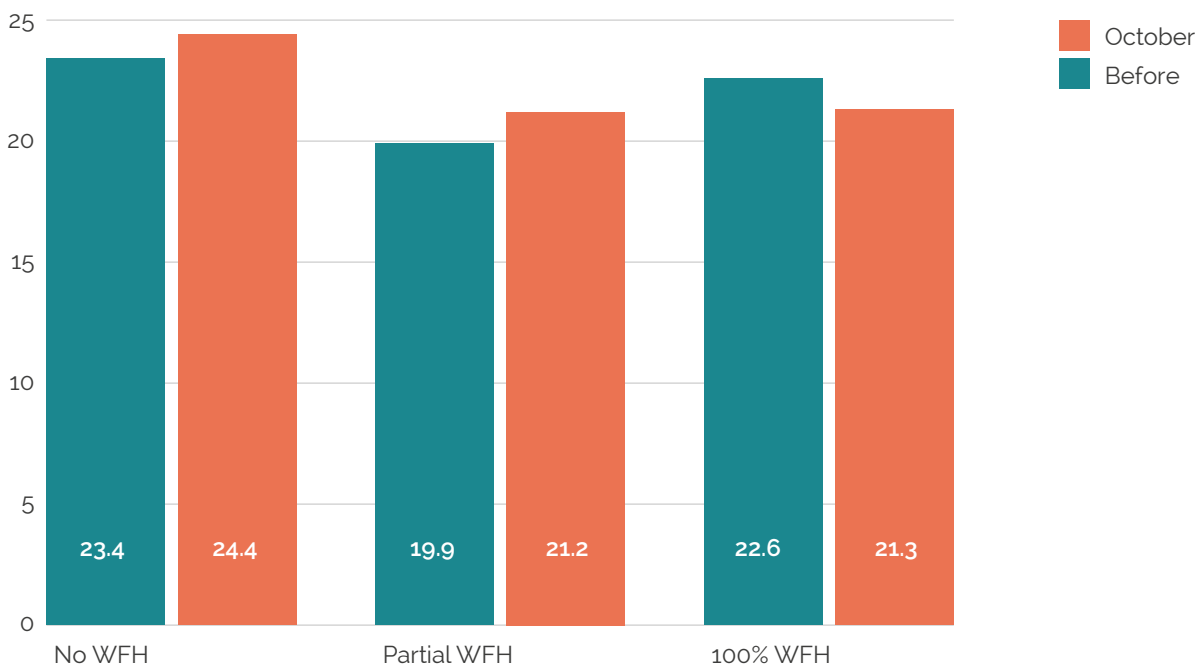


Figure 8: Changes in Average Index of Deprivation from before lockdown to October. The index has been combined and harmonised across England and Scotland. The higher the score, the less deprived the area. All differences between the three groups are significant at $p > 0.01$.

3.2 Working from home

There has been a very substantial shift in those who are WFH either part of the time or all of the time (as shown in Figure 1). Almost half of those people who did not WFH before the first national lockdown transitioned to WFH and were still doing this in October. These WFH 'Starters' made up a third of the sample overall.

Figure 6 showed the variation in working from home by area classification. This section breaks the analysis down to explore what factors explain the differences in WFH.

The job sectors which account for the most WFH in this study include financial services, IT and telecoms, media and marketing, accountancy, legal and real estate. Together these sectors account for just over half of all WFH days undertaken both before Covid-19 and in October 2020, even though they only employed 19% of the workers. The proportion of workers claiming to involve driving as a primary part of their role (e.g. taxi drivers, couriers) was between 7% and 8% before Covid-19 and in October 2020.

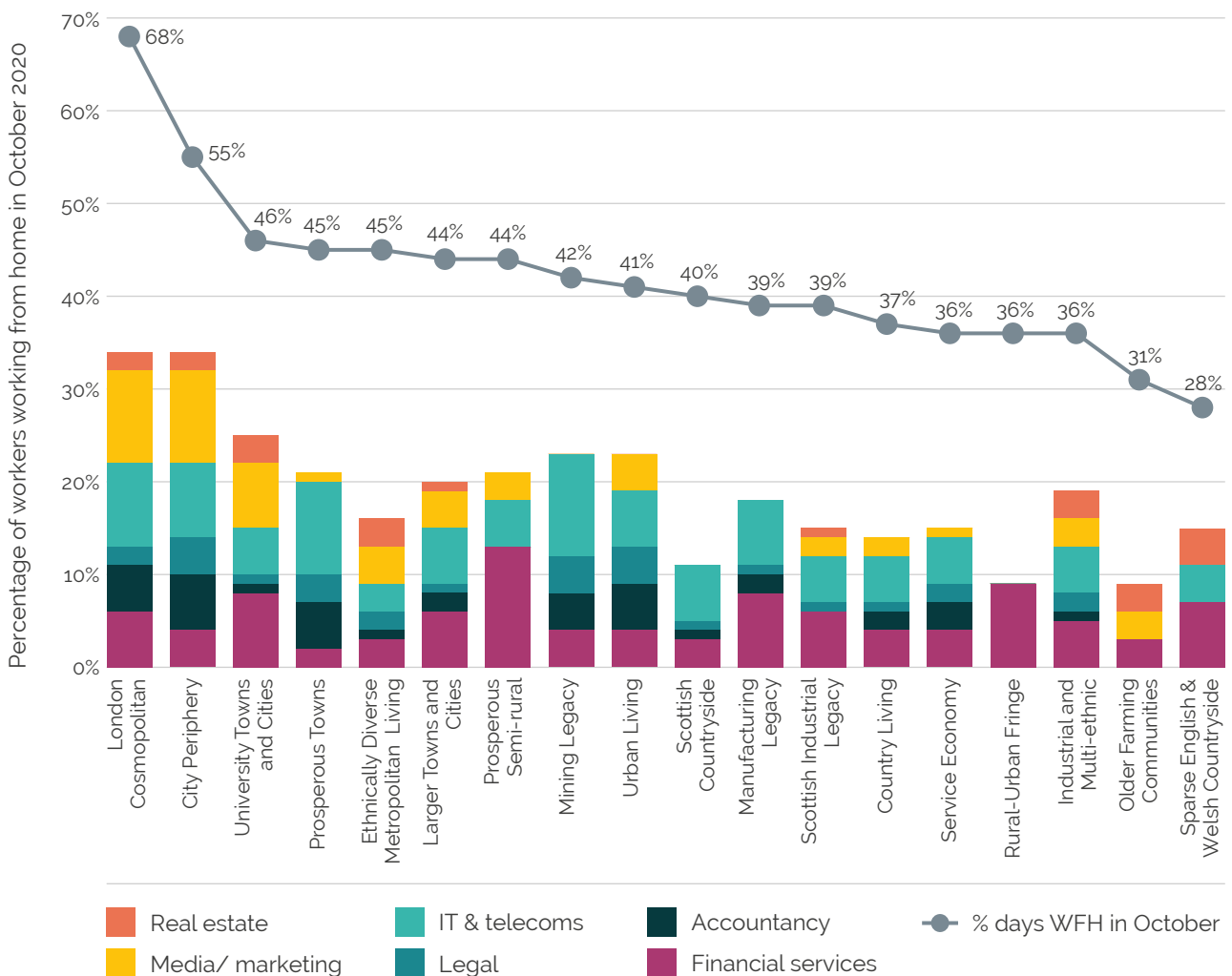


Figure 9: Percentage of workers in each of the top 6 job sectors responsible for the most working from home in each Local Authority Subgroup. N=3,236.

Job sector has an influence on rates of WFH and explains the spatial patterning to some extent. Figure 9 shows those Local Authority subgroups with the greatest proportion of WFH in October 2020 (London Cosmopolitan, City Periphery, University Towns and Cities) also had the greatest proportion of workers employed in the top six job sectors accounting for the most WFH.

It has been observed elsewhere that job type and role within a particular industry are important explanatory variables of the likelihood of being able to work from home or not and the extent to which this is possible (Marsden et al 2021). Our analysis adds to this by determining the features of those areas and the mode use associations which those who work from home have relative to those who do not.

Figures 10 and Figure 11 show the commute characteristics of all residents living in the respondent's local area as measured in the 2011 Census. In our sample, the areas with the highest samples of pre-pandemic home workers coincided with the same areas with the highest amounts of WFH reported in the 2011 Census. Before Covid-19, both those who worked from home 100% of the time and those who did not WFH at all were associated with areas of higher car and van driving as well as car passenger travel to work. By contrast, those who reported partial WFH were more likely to live in areas with greater train and bike commuting.

The relationship at the area-level between WFH and pre-Covid-19 Census commute mode shares changed as WFH became more widespread in October 2020 as partial home workers and many previous non-home workers began to WFH full time. Most notably, those who were unable to work from home became even more clearly associated with the highest levels of car driver or passenger commuting (Figure 11). This relationship holds strong even if London is not included in the analysis or when those with jobs involving driving are removed.

The pattern found at the area-level for car commuters to be the least likely and cycle commuters to be among the most likely to WFH also ties with findings at the sample-level. Figure 12 shows the average number of days worked from home before Covid-19 and in October 2020 according to the commute mode that was used before Covid-19. Car driving commuters are the least likely, other than car passengers and van drivers, to work from home before Covid-19 but particularly in October 2020. In October, those who had kept the same job and had driven to work before the pandemic only spent an average of 1.81 days a week working from home compared to 3.38 by train, 2.59 by bus and 2.43 by bicycle. The lower rates of WFH among car commuters holds strong even when those with jobs involving driving are not included and also when London is removed from the analysis to account for the public-transport bias there and the relative abundance of jobs in sectors more conducive to WFH.

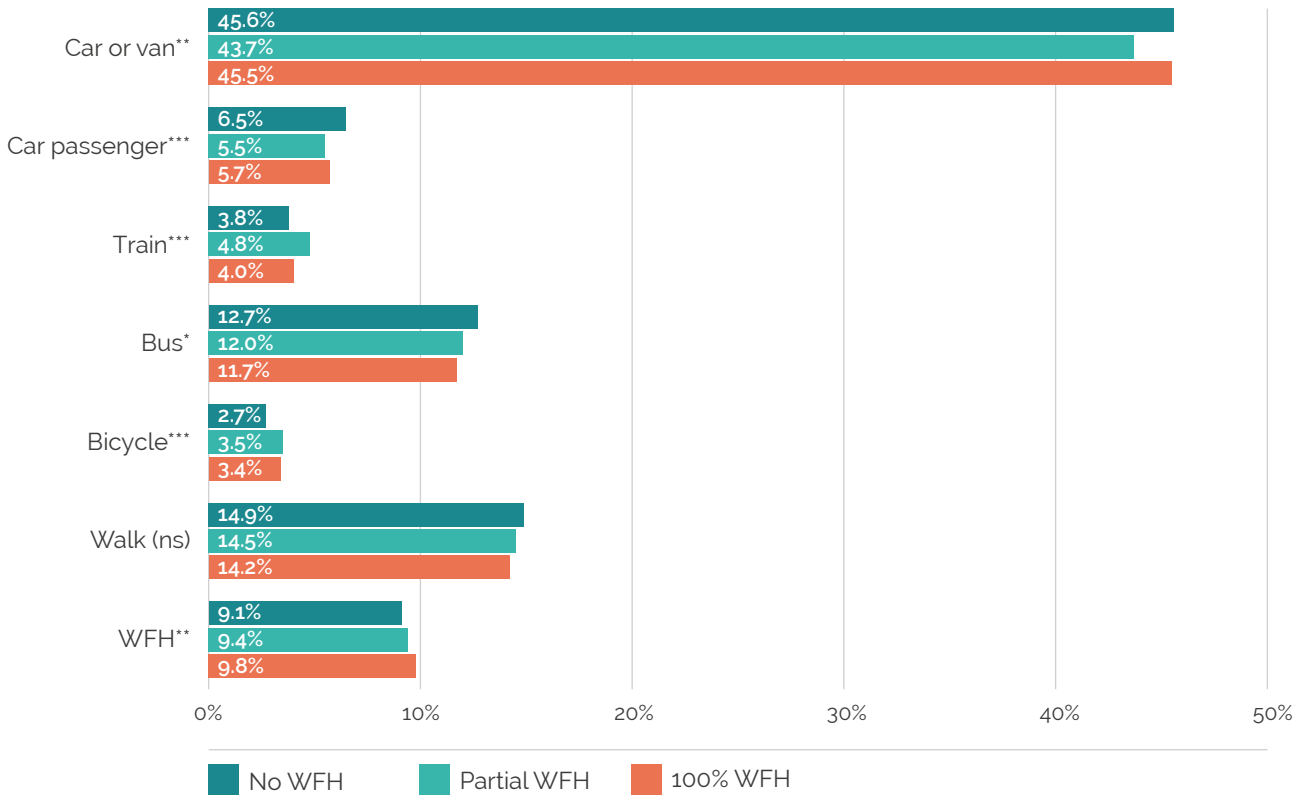


Figure 10: Commute mode share in respondent's residential area according to 2011 Census by pre-lockdown work pattern. Weighted, N=4,925. Statistical difference: ***p<0.001, **p<0.01, *p<0.05 or not significant (ns).

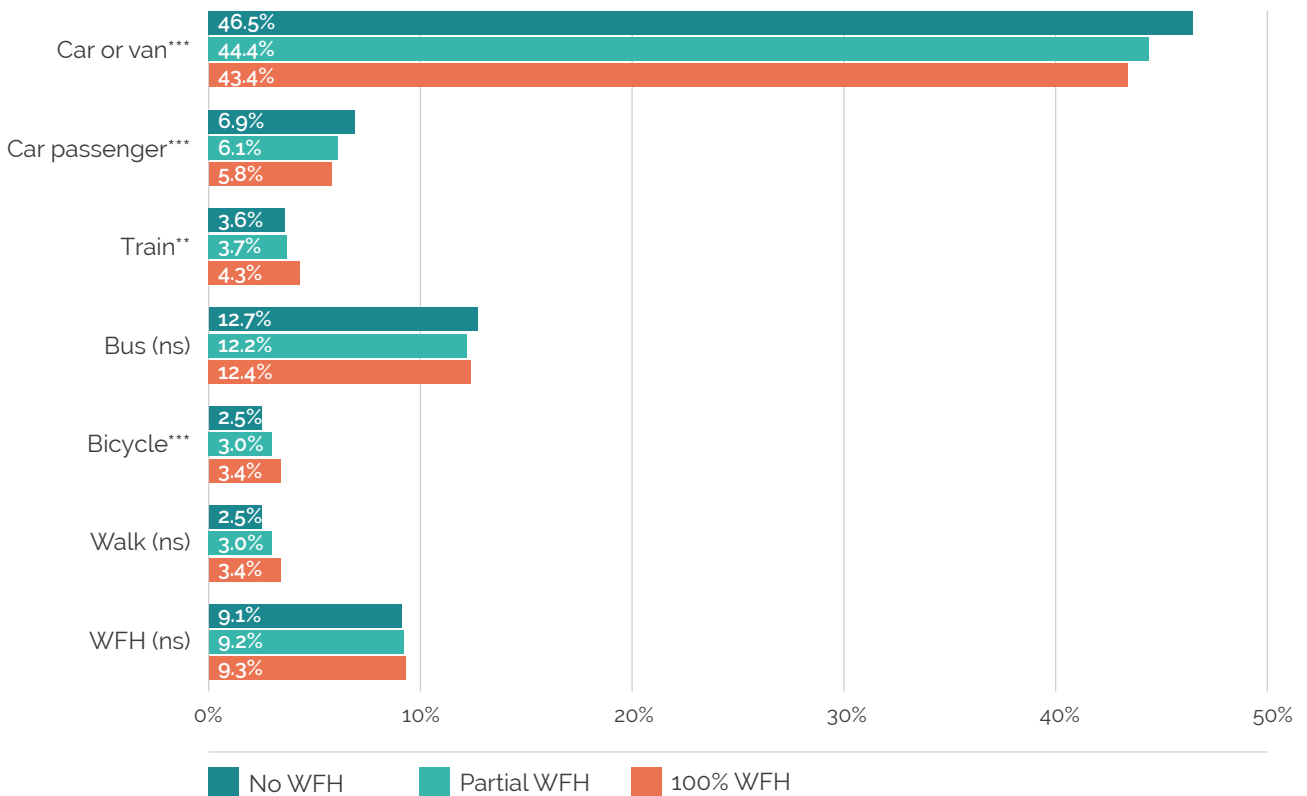


Figure 11: Commute mode share in respondent's residential area according to 2011 Census by October work pattern. Statistical difference: ***p<0.001, **p<0.01, *p<0.05 or not significant (ns).

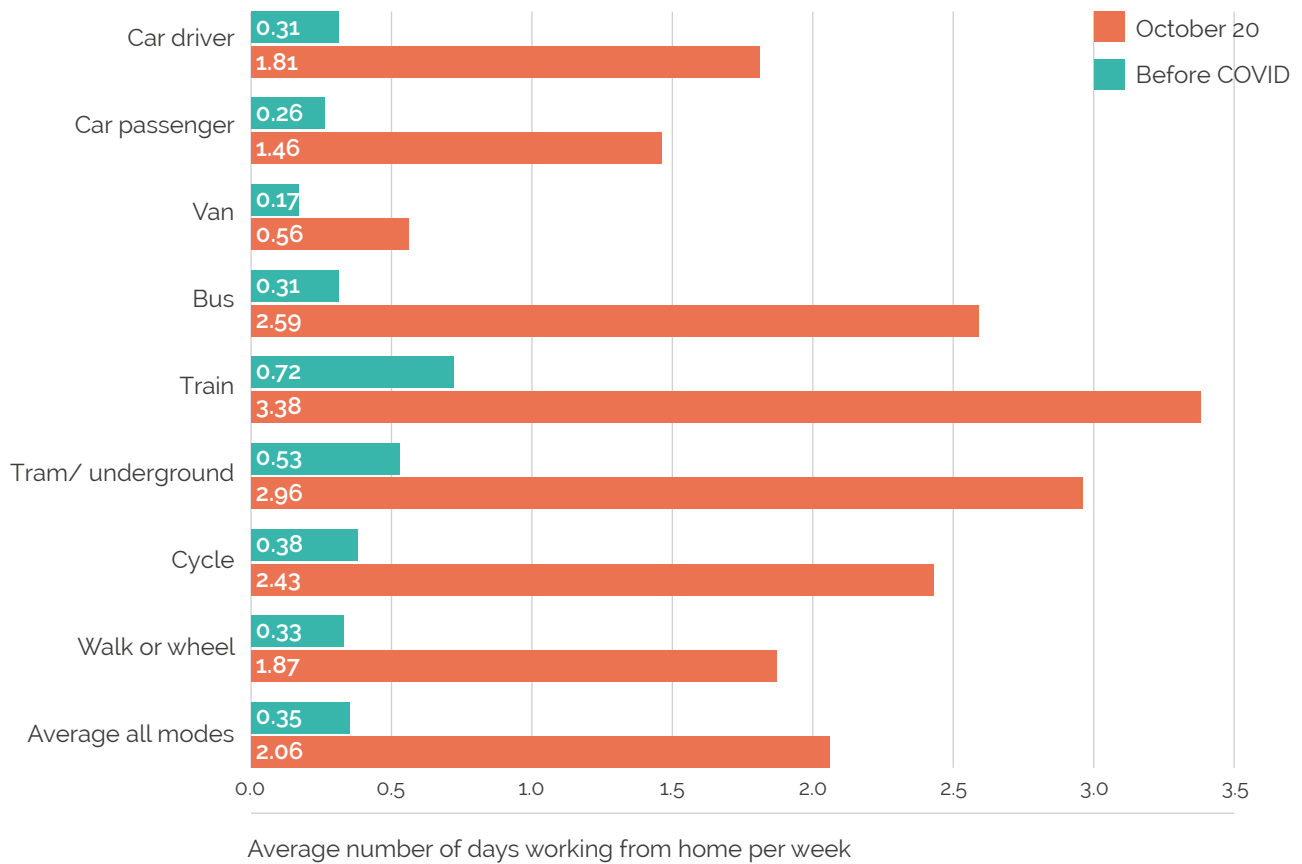


Figure 12: Average days per week worked from home according to 'before' commute mode.

The tendency for those who WFH to live in more accessible areas is also demonstrated by other measures of accessibility at the area level such as travel times to centres of local employment and to local services. Those who worked from home before the pandemic, whether fully or partially, were more likely to live in areas with better accessibility by most travel modes as measured by shorter travel times to both local employment and services. This pattern became even clearer by October 2020 (see Figure 13).

The large group of respondents who never worked from home before the pandemic (76% of the workforce) split into two almost equally sized groups (those who carried on never WFH and those who started working from home). One of the reasons that the relationship between car commuting and not working from home grew during the pandemic is because these two groups tend to live in quite different types of locations. The 'WFH Starters' reside in less car dependent but more walkable commuting areas according to the Census commuting statistics. The accessibility indicators show this segment as being relatively well served with respect to journey times, including by walking and cycling, to town centres and other destinations.

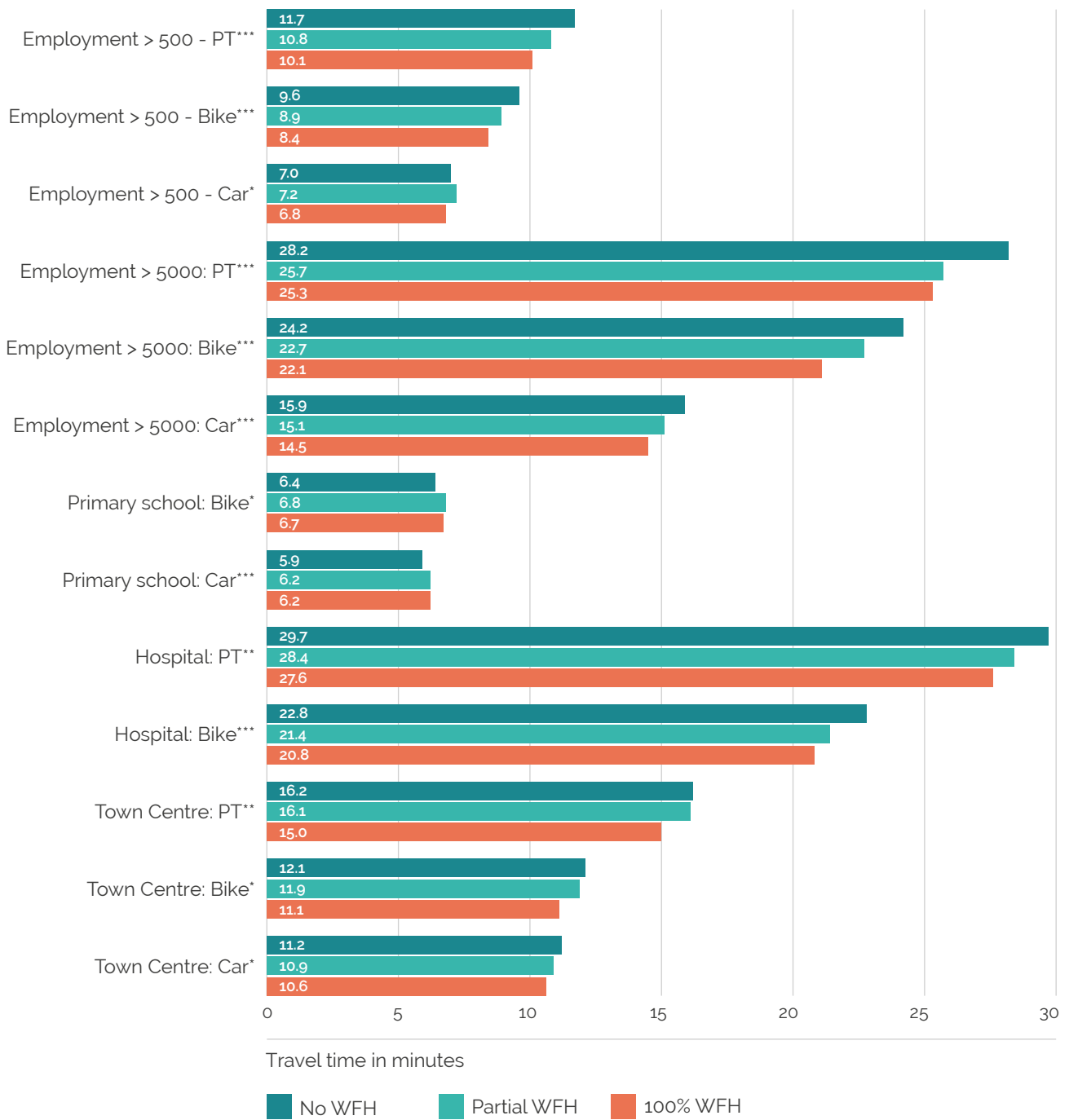


Figure 13: Differences in travel times by car, bike and public transport to town centres, schools, hospitals and employment centres by October work pattern. Weighted, N=2,791.

Table 2 summarises key comparator statistics for workers who did not WFH and those who did in October 2020. This shows how, at the individual level, those who did not work from home use the car more in total but also consistently demonstrate higher car use for the school run and supermarket shopping as well as for commuting to work.

Table 2: Differences in level of car using before Covid between those who WFH or did not WFH in October (unweighted)

	No WFH	WFH
% with personal access to a car before Covid (N=2,883)**	93.4%	90.5%
% using car at least 5 days a week before Covid (N=2,883)***	48.4%	40.8%
% car driving as main mode to work before Covid (N=2,654)***	55.8%	46.9%
% car driving as main mode to school before Covid (N=795) ***	70.6%	59.6%
% car driving as main mode to supermarket before Covid (N=2,843)**	63.6%	62.7%
Distance to work before Covid (miles) (N=2,463)***	10.0	13.4
Differences between No WFH/ WFH on each variable: *p<0.05; ** p<0.01; ***p<0.001		

Whilst job type is important to the propensity to work from home, other factors which might be expected to influence preferences to work from home, such as broadband speed and access to public greenspace, did not explain differences in those WFH or not.

We explored the relationship between rates of working from home and both the broadband average speed and broadband Gigabit availability, but none were found. Access to green spaces in the local neighbourhood also do not currently explain who was more likely or not to work from home. These indicators might be anticipated to be positively associated with choosing to work from home. However, the shift to working from home has been so swift and significant in scale that it has changed the average characteristics of home workers. There has almost certainly not yet been time to allow many people to make adjustments to their residential locations to enable preferences for different kinds of home location and facilities for working from home to emerge. Those who did not work from home lived in areas with better average air quality. This may relate to the more central and urbanised nature of the sample of home workers in this sample.

Overall, the data suggests that working from home has been enacted at scale everywhere, although the extent of the potential impacts on total trip numbers, car traffic levels and on public transport markets varies considerably across places. It appears that, on average, people who are working from home live in areas with good accessibility to local facilities and employment. This contrasts with previous research on home-working which has shown homeworkers to trade off fewer commutes with longer commutes and less accessible home locations. There appears, therefore, to be potential to lock-in the benefits of working from home by also enabling short non-car based local trips on foot or by bike to good local neighbourhood facilities.

3.3 Where next on working from home?

By using data on the number of days worked, the proportion of days worked from home before Covid-19 and again in October 2020, and the main commute mode and distance, we can calculate the trips and mileage that would potentially be saved should half the level of WFH that was being undertaken in October were to be maintained. Table 3 and Figure 14 present data on levels of WFH according to main commute mode for a subsample of participants who were both working (i.e. not furloughed or made unemployed) in both Wave 1 and Wave 2 and had the same job throughout.

Table 3: Calculation of potential percentage reduction in commute trips and miles per mode					
	Car driver	Bus	Train	Cycle	Walk
N=2038	1198	288	130	98	324
Total days worked in one week before	5588	1331	606	475	1549
Total days worked from home before	330	88	76	34	99
Percentage days worked from home before	5.9%	6.6%	12.5%	7.2%	6.4%
Total days worked in one week in October	5466	1322	594	458	1519
Total days worked from home in October	1879	677	384	217	531
Percentage days worked from home in October	34.4%	51.2%	64.6%	47.4%	34.9%
Percentage of days WFH if 50% of October level was maintained by each individual	17%	26%	32%	24%	17%
Total days working from home if maintain 50%	960	341	196	113	270
Additional WFH days compared to pre-Covid levels	631	253	120	79	171
Percentage additional reduction in car / bus/ train trips	11%	19%	20%	17%	11%
Total miles commuted by this subset before	78,423	10,297	13,771	2,039	4,069
Total miles saved if maintain 50% WFH	13,157	2,184	3,697	428	591
Percentage additional reduction in car / bus / train miles	17%	21%	27%	21%	15%
1 Subsample of only those who had the same job and continued working in Wave 1 and Wave 2 and had used either car driver, bus or train to work pre-Covid (N=2,038)					
2 Each worker indicated how many days per week they worked on paid employment and also the total days spent working from home instead of travelling to the workplace. From this, the sum of days worked by each main commute mode was calculated.					
3 These are the days in addition to those that were already worked before Covid					
4 This assumes that the days that are spent physically commuting to work use the same mode as previously					
5 This is the sum of each individual's commute miles (calculated by multiplying the total days travelling to the workplace in one week x their commute distance (taking the mid-point of the chosen distance band))					

Table 4: Average commute distance by mode for those who did or did not WFH

Average mileage by	Car drivers	Bus	Train	Bike	Walk
WFH before Covid-19	22.3	11.0	29.1	3.9	2.5
No WFH before Covid-19	12.2	7.2	20.7	4.4	2.7
WFH in October 2020	17.3	7.5	26.4	4.7	2.7
No WFH in October 2020	11.2	7.3	15.4	3.8	2.7

The dark greyed out boxes indicate strong statistically significant differences between those who did or did not WFH for that mode; lighter grey = weak significance; no shading = no significance. no significance = $p > 0.05$, weak is $p = 0.001 - 0.05$; strong = $p < 0.001$

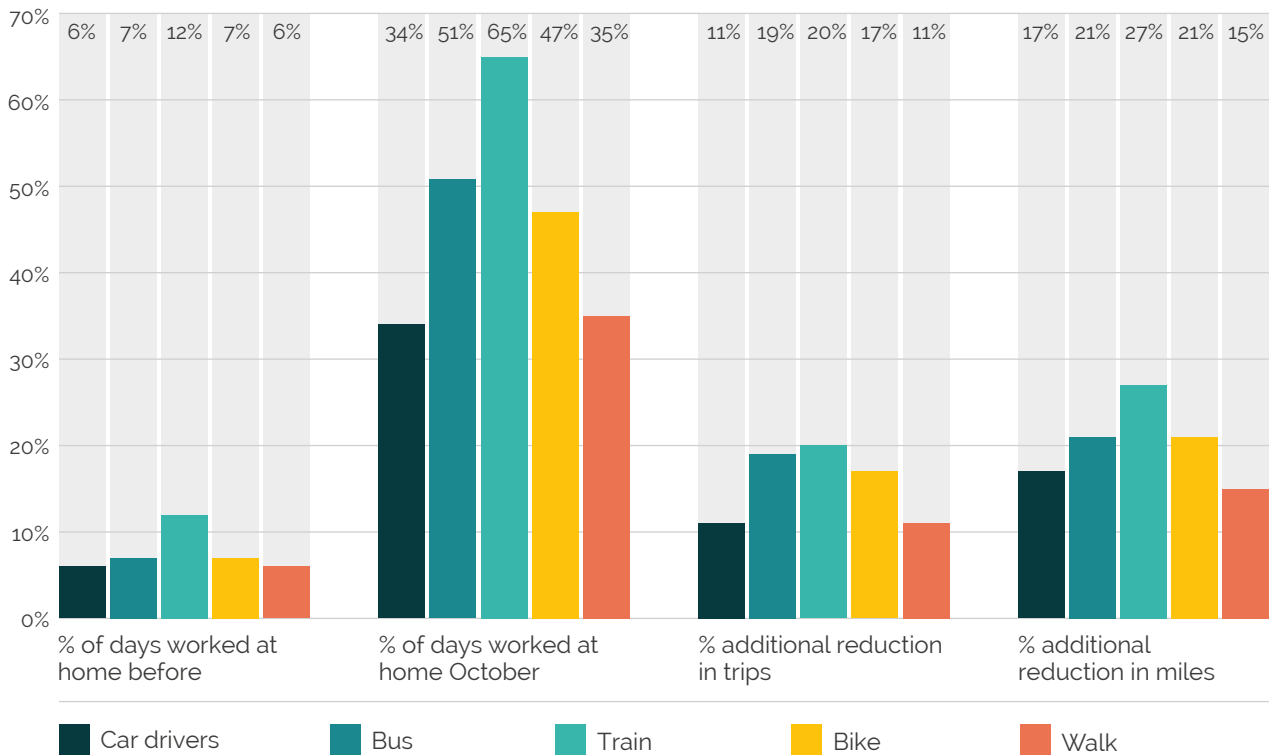


Figure 14: Comparison of potential percentage reduction in commute trips and miles per mode.

Table 3 shows that car driving commuters were the least likely of all the modes to WFH both before and in October, and train commuters the most likely. Before Covid-19, cyclists were the second most likely to WFH, but in October, bus commuters took this position.

The calculations suggest that 11% of car commuting trips and 17% of distance could be reduced if 50% of these commuters' levels of WFH were maintained. Table 2 presents the average distances travelled by commuters who did and did not WFH in both periods.

Car drivers who WFH drive significantly longer distances to work than those who do not and this explains why the proportion of distance saved by WFH is much greater than the proportion of trips. Whilst these proportions are lower than all other modes except for walking, this could represent a significant change in traffic levels. On the other hand, cycle commuting could also experience a significant fall (17%/21% of trips/distance) which could have implications for the development of social norms around cycling and growth of a critical mass known to influence later adopters of this mode.

Reductions are potentially greatest for train commuters with 20% fewer trips and 27% lower mileage. Reductions in bus trips and distances are roughly equal at around 20% suggesting that, unlike the train, bus commuters who WFH do not tend to travel greater distances than those who do not (unlike the train – see Table 4).

Note that these figures are the *additional* percentage trips and mileage savings over and above the level of WFH that had been undertaken before, but they assume that commuters do not switch to any other modes for the remaining days that they do travel into their workplace.

In Section 5 we further explore the changes in patterns of mode use. However, we caution against extrapolating these too far in the case of home working. The mode use data observable in the December survey shows the preferences of users for the trips they could make within the constraints in place in October 2020. We do not yet know what the longer term feedbacks would be. In particular, home working is important as the number of days of commuting may impact a wide range of factors including:

The desirability of holding a season ticket for public transport;

- The attractiveness or necessity for having a car or access to multiple cars in a household due to lower daily utilisation;
- The potential for lift giving and lift sharing;
- Decisions on the location of childcare choices;
- Where shopping and leisure activities take place; and
- Home and work location decisions.

Other evidence suggests that people who can work from home have traded off this convenience against longer commutes when they do commute, thus opening up residential choice but not having such a significant impact on journey lengths (Hook et al 2020). Our data supports this to some extent, with those who continued working at home some of the time from before lockdown to October having the longest car commutes (18.8 miles compared to 12.3 miles for those who never work from home). However, the data also finds that, on average, those who did some home working before lockdown were less likely to drive when they did commute and more likely to commute by train or bike than those who did not work from home at any point. The new WFHs are currently located in much more accessible locations for employment and local services.

4. Grocery shopping

Before the pandemic, the National Travel Survey showed that shopping was the most frequent trip purpose and represented the third highest journey purpose for distance travelled per person, behind commuting and visiting friends and relatives but ahead of business, school trips and holidays. Over 90% of the population are estimated to go food shopping at least once or twice a week and a third of these go three or more times per week (Department for Transport 2015).

Pre-pandemic online shopping had been rising as a proportion of all retail sales by value and comprised around 18% in late 2019. For groceries, this was around 5% by value in the UK. Data from the ONS shows that online grocery shopping doubled at the start of the pandemic to around 10% by value and has maintained this throughout (ONS 2021). Overall, spend on groceries for home consumption is estimated to have increased by £15.2 billion, with more restaurants closed or operating with restrictions, increased home working and home schooling meaning more dining in (McKevitt 2021).

As Figure 15 shows, the average number of trips to both large supermarkets and smaller food shops has reduced since before lockdown and whilst both exhibited small increases between the first lockdown and October 2020, remained well below pre-lockdown levels. The total number of visits or orders fell from 3.4 before lockdown to 2.8 in lockdown and 2.9 in October. The key finding here, therefore is that travelling less for shopping has been accompanied by higher retail spend both per trip and in absolute terms.⁷

⁷ Our survey asked whether people increased or decreased their spend across each shopping channel. Whilst both increases and reductions were reported there was a clear majority who increased their spend.

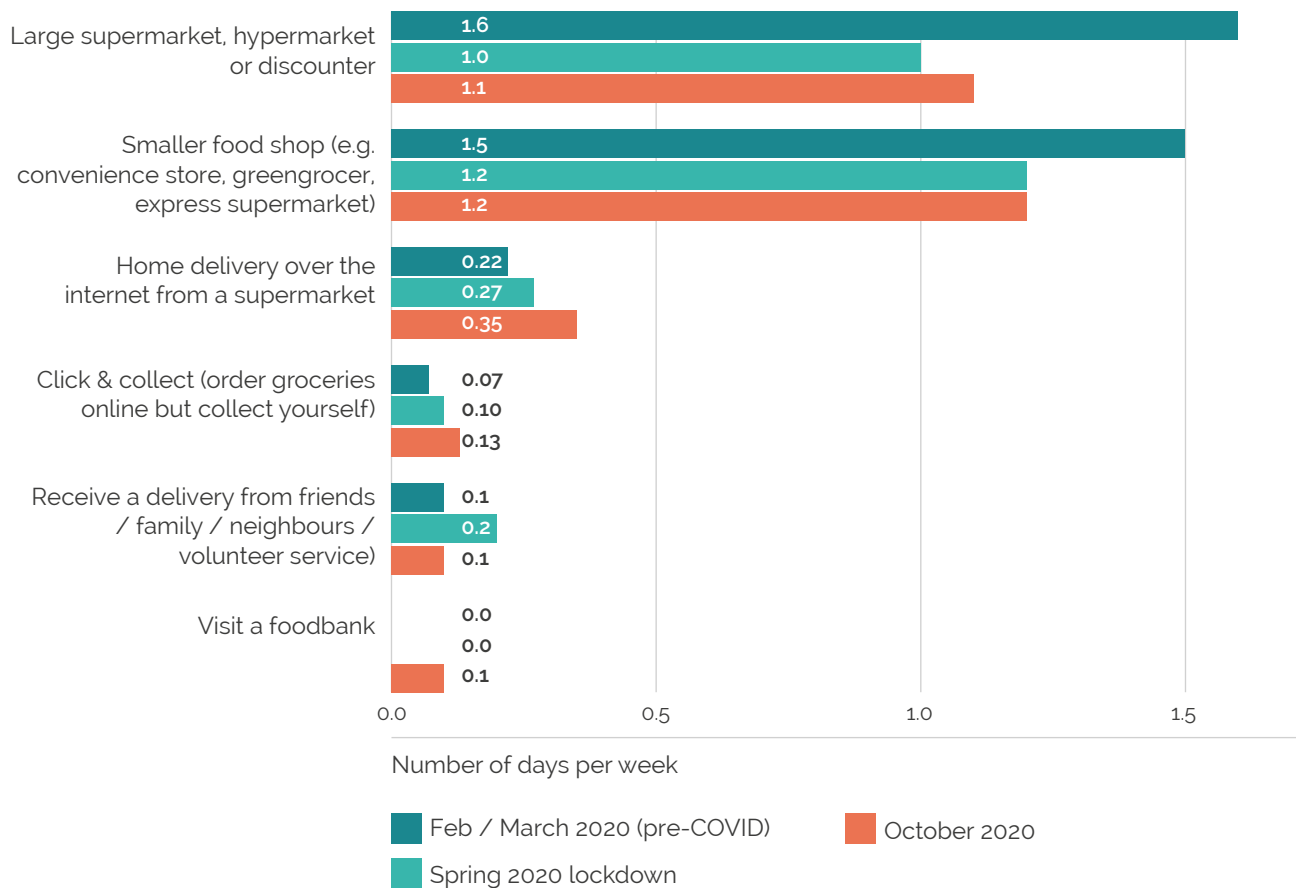


Figure 15: Average frequency of shopping by grocery channel over time. Weighted, N=9,362 (before and during), 6,209 (October).

4.1 In-person grocery shop trips

There was a drop off in the frequency with which physical food shops were accessed during the spring 2020 lockdown and this reduction was still apparent in October. As Table 5 shows, the impacts were more significant for supermarkets. Supermarkets went from accounting for the greatest proportion of food shopping visits for around a third of the sample, to less than a quarter as people diversified their sources of food shopping.

Indicator	Time period	Supermarket	Smaller shops
Percentage never visiting a supermarket or smaller shop	Before lockdown	2%	4%
	During lockdown	17%	17%
	October 2020	17%	19%
At least once a week	Before lockdown	70%	58%
	During lockdown	52%	49%
	October 2020	51%	49%
Reduction in days per week visited	Before lockdown to October 2020	34% 1.6 to 1.1 days/wk	21% 1.5 to 1.2 days/wk

There was little evidence of people switching the location of the supermarkets they use, only the frequency. This may reflect generally good access to food shopping with 89% of the sample reporting travelling less than five miles to a supermarket before lockdown and 98% less than 5 miles to a smaller food shop. Over three quarters of our sample live within one mile of the smaller food shop they use and 31% within a mile of the supermarket they use. People already shop very locally.

Stopping or reducing supermarket trips was strongly associated with the distance people were from a supermarket before lockdown. Just under a quarter (23%) of respondents with supermarket journeys that were more than five miles stopped using supermarkets altogether during lockdown, compared to only 13% of those who were less than one mile from their supermarket. Similarly, 29% of respondents with journeys to small shops that were more than 5 miles away stopped using them altogether during lockdown, compared to only 13% of those who were closer than a mile. A one per cent reduction in the frequency of shopping trips will therefore correspond to a greater than one per cent reduction in the average length of a shopping trip compared with before the pandemic.

The proximity of one type of grocery shop was not associated with the increase or reduction of the other type of in-person grocery shop. Whilst it has been suggested that people might be switching to more local shops we see no evidence to support a "switch". It is clear, though, that longer journeys were more likely to be reduced and smaller food shops had lower reductions in frequency of use than supermarkets.

Figures 16 and Figure 17 show the changes in mode use for accessing supermarkets and smaller shops from before lockdown to October. The supermarket behaviours appear fairly stable. As expected, shopping is dominated by car-based access and 93% of those users remained driving. Whilst 6% of people who used to drive stopped doing so (the majority, 5%, shifted to walking) as many people changed other modes resulting in no overall change. Almost a fifth of walkers to supermarkets before lockdown shifted to the car, as did a quarter of public transport users and 14% of cyclists. Walking increased slightly from 15% to 19% of journeys despite a fifth of walkers switching to the car. Around a quarter of public transport users and cyclists switched to walking.

For local shops, the car was only used for 35% of trips before lockdown, with walking dominating (56%). Walking made the greatest net gain as a quarter of car users switched to this mode. There were also large percentage shifts away from public transport, cycling and 'other' (mostly taxi) users but absolute numbers were small. Some public transport users, cyclists and walkers also switched to the car although overall it was broadly stable (34% of trips during October). Clearly, behavioural shifts have gone in many different directions.

It is important to note that some people were shopping less frequently which will have increased the weight of goods carried for each shop. This will be likely to have had some impact in explaining some shifts away from active modes. Notwithstanding this caveat, walking was the greatest gainer in both local and supermarket shopping and so weight of shopping was not a constraint for all.

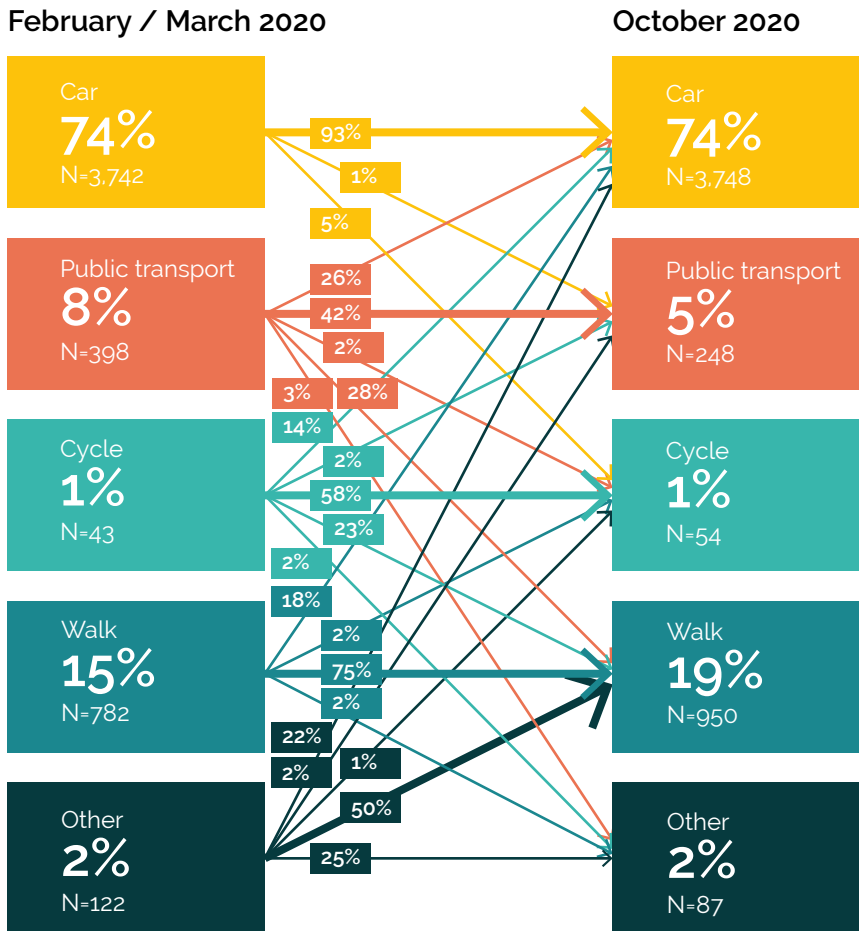


Figure 16: Changes in mode share to supermarkets between February/early March 2020 (pre-Covid) and October 2020. Unweighted, N=1,518. Note lines that are missing are due to less than 1% shift.

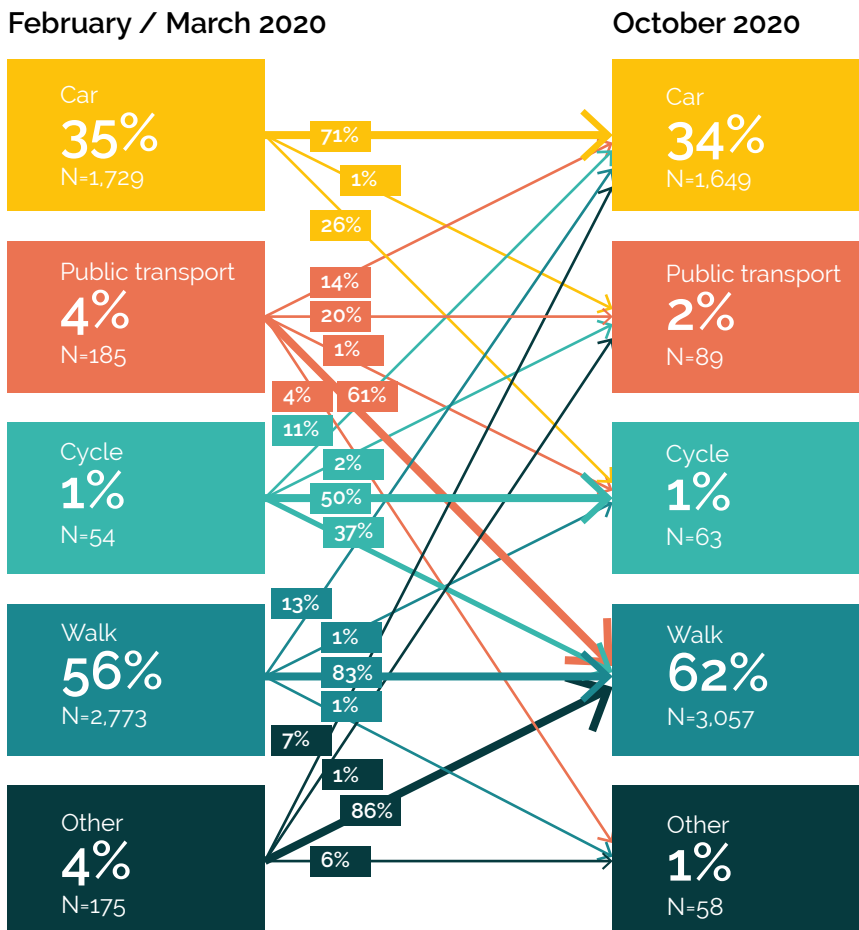


Figure 17: Changes in mode share to small shops between February/early March 2020 (pre-Covid) and October 2020. Unweighted, N=1,518. Note lines that are missing are due to less than 1% shift.

4.2 Online grocery shopping

Figure 15 showed that the average number of days per week on which online home deliveries were received had increased steadily between each time point, from around once a month before lockdown to around once every three weeks during October. Before the pandemic, 17% of households reported receiving home grocery deliveries once a month or more and this increased to 37% of households in October. Before lockdown almost no-one (0.3%) indicated that they used home delivery for *all or most* of their food shopping, during lockdown this rose to 6% before dropping back slightly to 5% in October. So, whilst there is a group of very intensive users there has been a significant shift in the proportion of the population regularly shopping online for groceries.

Around one half of the sample never used online grocery delivery. This increased from just under a half before lockdown to just over a half by October. Figure 18 shows the changes in home delivery behaviour over time. There were 16% of people who stopped using online grocery deliveries during the first lockdown. These were people who used to use online shopping less frequently (0.3 days per week on average) before lockdown than those who continued during lockdown (0.6 days per week). Around 10% of the sample had started online grocery shopping during lockdown. A further 10% started between the first lockdown and October.

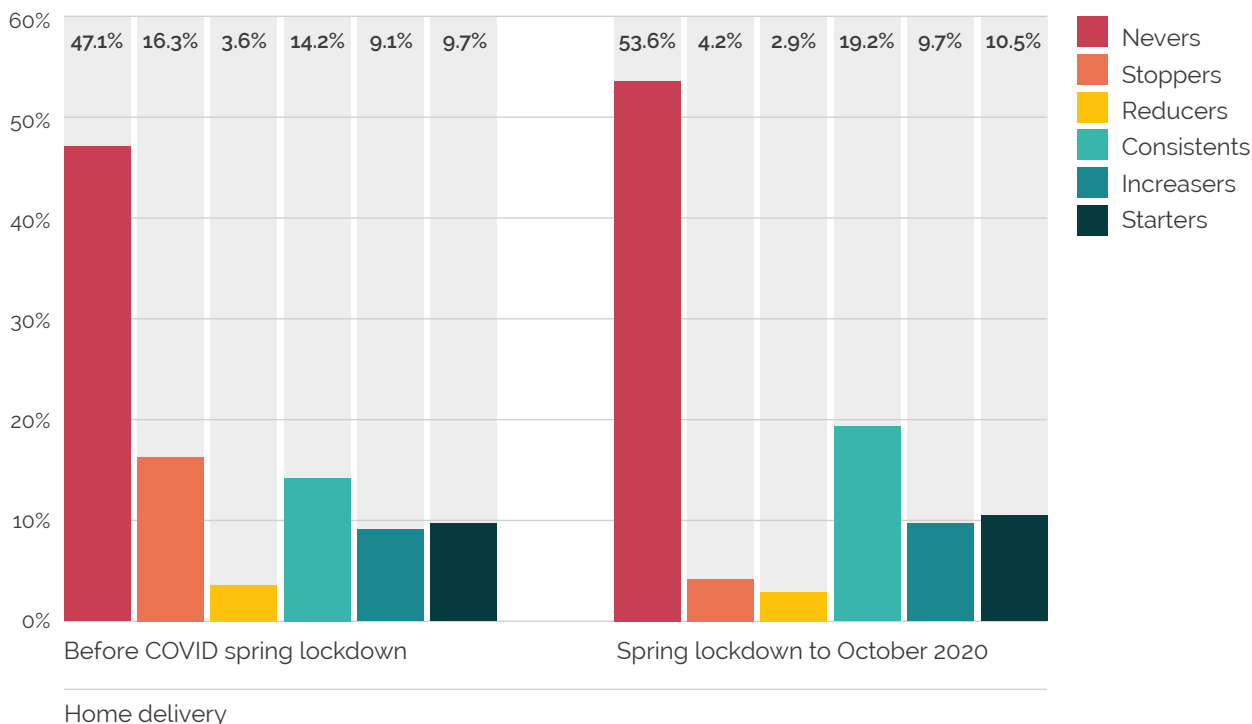


Figure 18: Proportion of the sample in each home delivery change segment.⁸ N=9,362 (before), N=6,209 (October).

⁸ The definitions of Nevers, Stoppers, Reducers, Consistents, Increasesers and Starters are on page 15.

Not only were more people shopping online, but the average frequency of home deliveries increased between spring and October (Figure 19) despite the restrictions on social activities being eased in most of the survey areas.

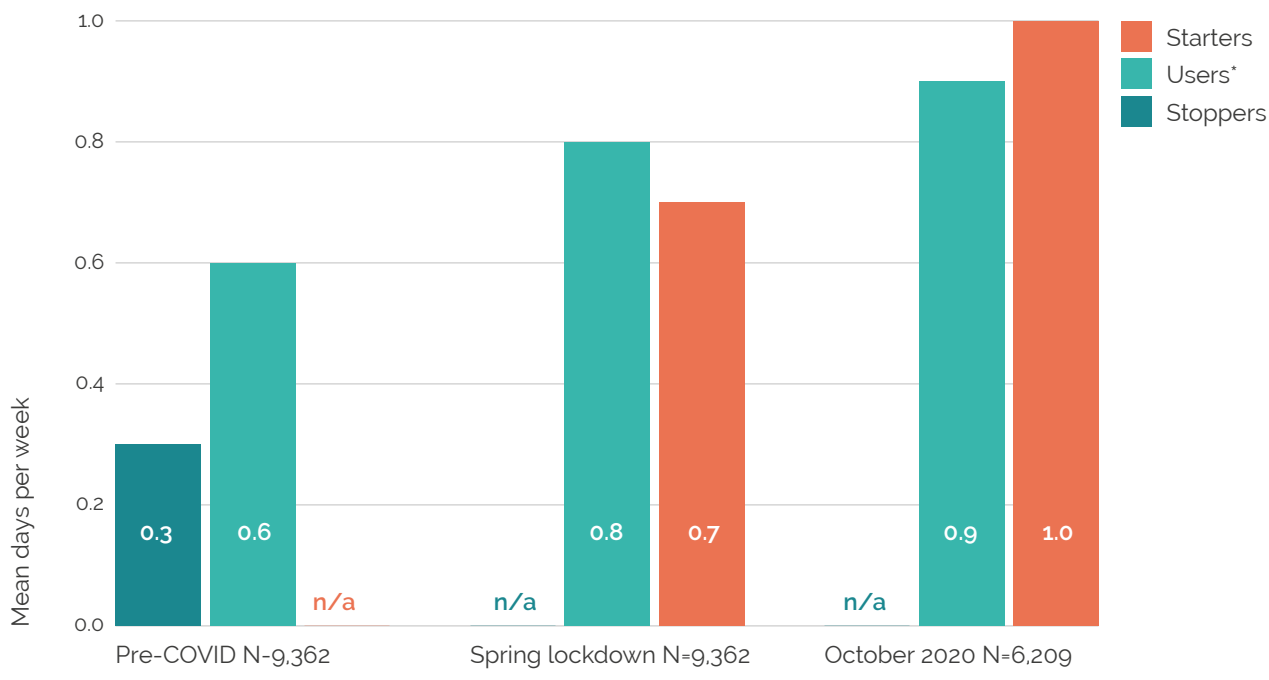


Figure 19: Mean days per week each shopping change segment used home delivery.

Table 6 shows how behaviours changed over time. It demonstrates that the trends reported in this section were not just the result of a surge in activity during the spring lockdown, but sustained growth until at least October. To summarise, the key effects were that the increase in home delivery of groceries is the combined product of:

1. a sustained growth in new participants with relatively frequent usage from the outset; and
2. a substantial increase in frequency of shopping activity by existing users.

Analysis shows that these two changes contributed equally to the net increase in home deliveries. Participation had increased so that around a third of the households in our sample were getting a delivery at least once a month and, although just over half were not participating at all, 60% of the sample had received an online delivery at some point by October 2020.

Table 6: How members of the spring lockdown Home Delivery Change Segments changed again by October (N=6,209)

		Direction of change between spring lockdown and October				
		Stayed same	Stopped	Reduced	Increased	Started
Change Segment in spring lockdown	Nevers	89%	n/a	n/a	n/a	11%
	Stoppers	67%	n/a	n/a	n/a	33%
	Reducers	27%	2%	2%	68%	n/a
	Consistents	55%	5%	5%	35%	n/a
	Increasesers	59%	17%	17%	7%	n/a
	Starters	53%	19%	7%	20%	n/a

The growth in home delivery activity was disproportionately high among individuals with high health risks or living with other household members with such risk. In both waves of the survey participants were asked how many people in their household were at "Very high risk/extremely vulnerable from coronavirus (received a letter from the NHS about specific pre-existing medical conditions)". We classify these participants as shielding and 18.2% of the sample had had at least one household member shielding at some point in either Wave 1 or Wave 2 (15% in both Wave 1 and Wave 2).

Participants were also asked about other health risks to Covid-19 that did not fall within the shielding category (Any household members with "High risk from coronavirus (due to age, pregnancy, lung conditions, kidney disease, learning disability etc...)"). Just over a third of the sample in each wave registered at least one household member with these risks. This resulted in half of the participants (51%) having at least one of these types of risk in their household at some point.

Figure 20 shows that the growth in home delivery (Starters and Increasesers) was greatest among households with someone shielding and also high among those with other health risks. Twice as many households who were shielding started home deliveries as those with no health risks (16% vs 8%). As would be anticipated, whilst the reductions in frequency of shopping applied across all age groups they were notably higher for over 70s within the sample, particularly those not working.

It is difficult to be definitive about substitution effects because people tend to conduct a blend of shopping activities. Figure 21 shows the proportions of people doing 65% or more of their shopping through one shopping channel and how this changed by October. The arrows show changes to different main modes of shopping. They do not add to 100% because some people no longer had a 'main mode'. So, whilst online grocery picked up more supermarket shoppers than from smaller food shops, both types of shopper switched. Some online grocery shoppers also moved the other way.

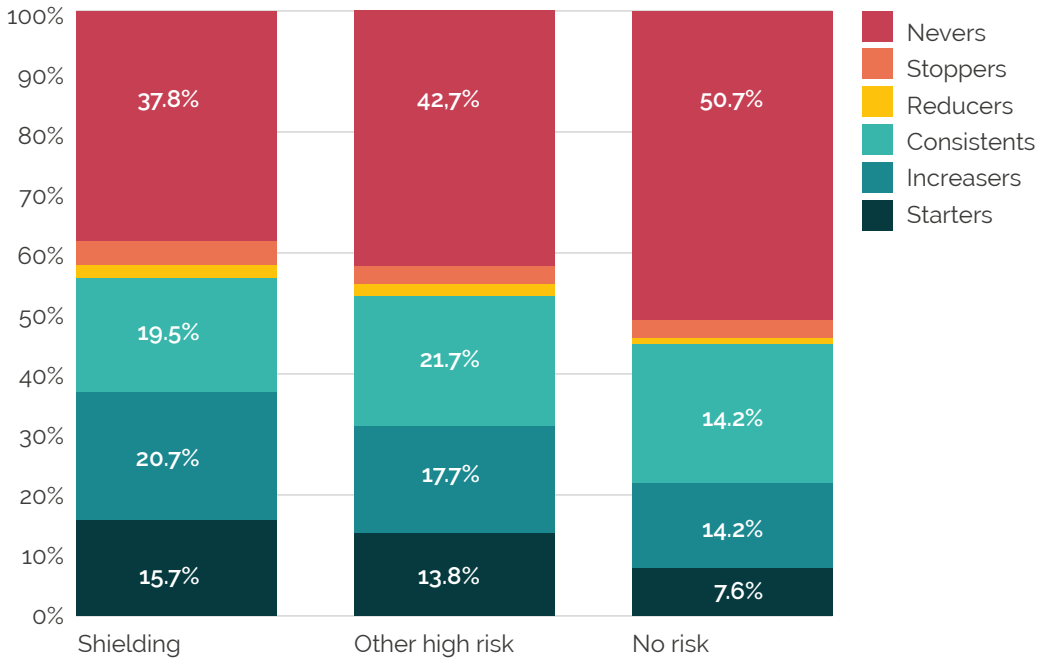


Figure 20: Proportion of those with or without any household member shielding from Covid-19 in either survey wave. Weighted, N=6,209. Differences in all risk categories are $p < 0.001$.

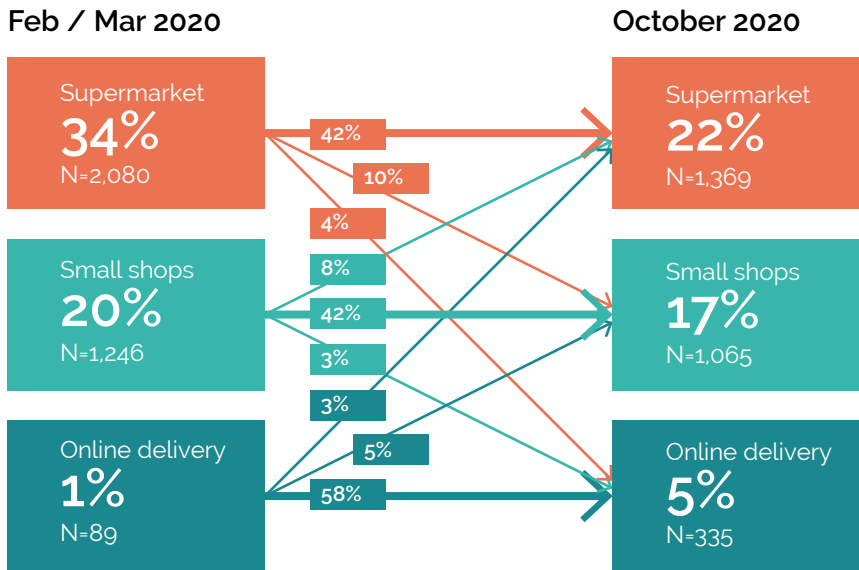


Figure 21: Change in uses of 'main' food shopping channels between February/early March 2020 (pre-Covid) and October. Unweighted, N=6,120. Note that percentages do not add up to 100% as the figures are only for those who use the shopping channel for >65% of their shopping trips, but most people use a range of channels rather than just one >65%

The extent to which people work from home is an important factor in how they shop. This may have important longer term implications for understanding behaviour. There were significant differences at each time point in the average visits per week to each shopping channel depending on the proportion of work days spent working at home (Figure 22).

Before lockdown, there was no discernible pattern between rates of working from home and frequency of supermarket visits. However, from the spring 2020 lockdown onwards, the greater the proportion of working from home, the less frequent were visits to supermarkets.

Those with a hybrid commuting pattern ('Some WFH') had a tendency before lockdown and again in October to use smaller shops most frequently. These commuters also had the most frequent home deliveries during lockdown with steady growth by October. Those not working from home at each time point are the most frequent users of supermarkets.

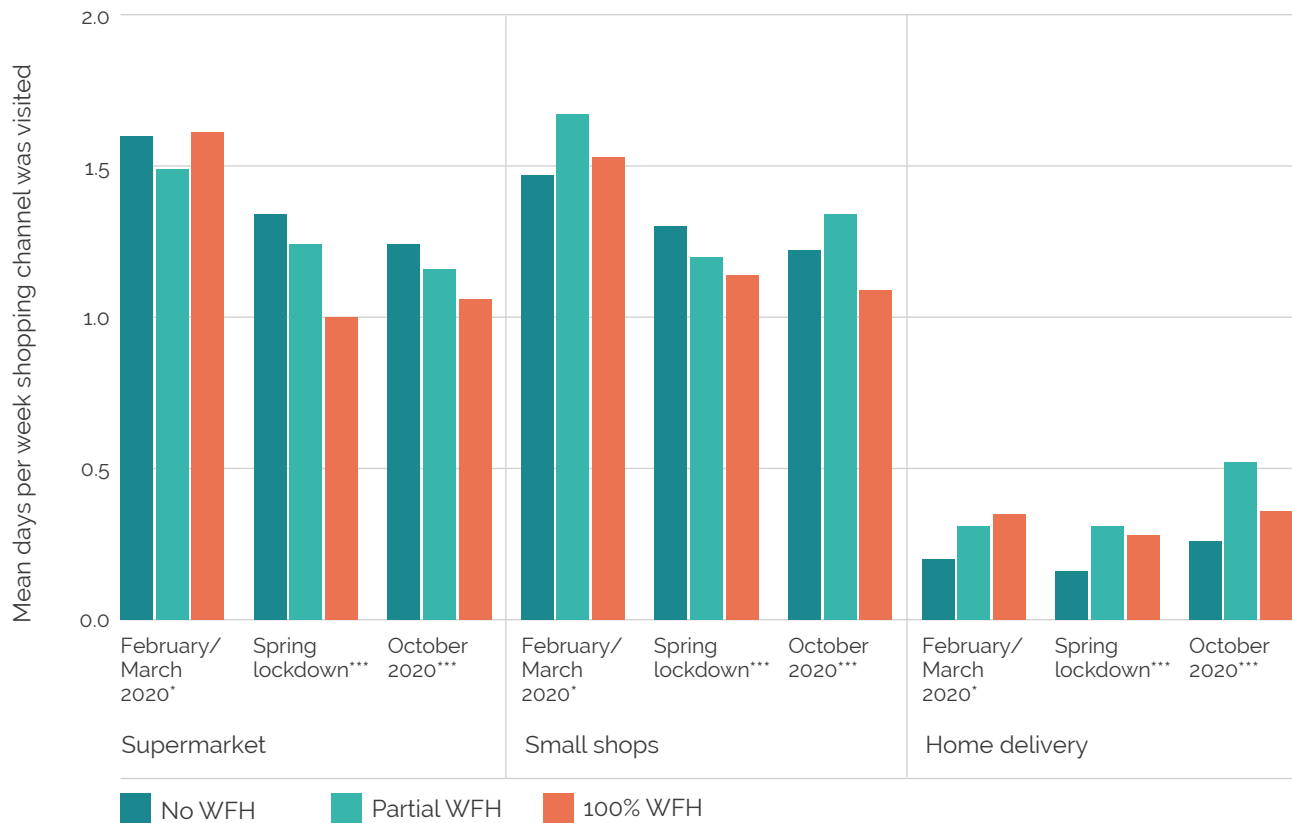


Figure 22: Average days per week visiting each shopping channel at each time point associated with level of working from home at that point. Weighted, N=5,418 (February to March) 2020, 3,772 (Spring), 3,074 (October).

The analysis shows clearly that any increases in online shopping are related to working from home. Figure 23 shows how those who started receiving home food shopping deliveries were much more likely to be the same people who started working from home for the first time too. 45% of the home delivery starters also started to work from home compared to 33% of the sample on average. The WFH Starters were also much less likely to be the ones to have given up on home deliveries by stopping or reducing them by October 2020. In general, those who increased working from home also increased home deliveries. On the other hand, those who stopped home deliveries were much more likely to never work from home.

The same analysis has been undertaken for changes in the frequency of visits to supermarkets or small shops to see whether working from home led to a reduction in in-person trips. Stopping going to the supermarket is associated with starting or increasing working from home. By contrast, those who never work from home are the least likely to have stopped or the most likely to have started using supermarkets.

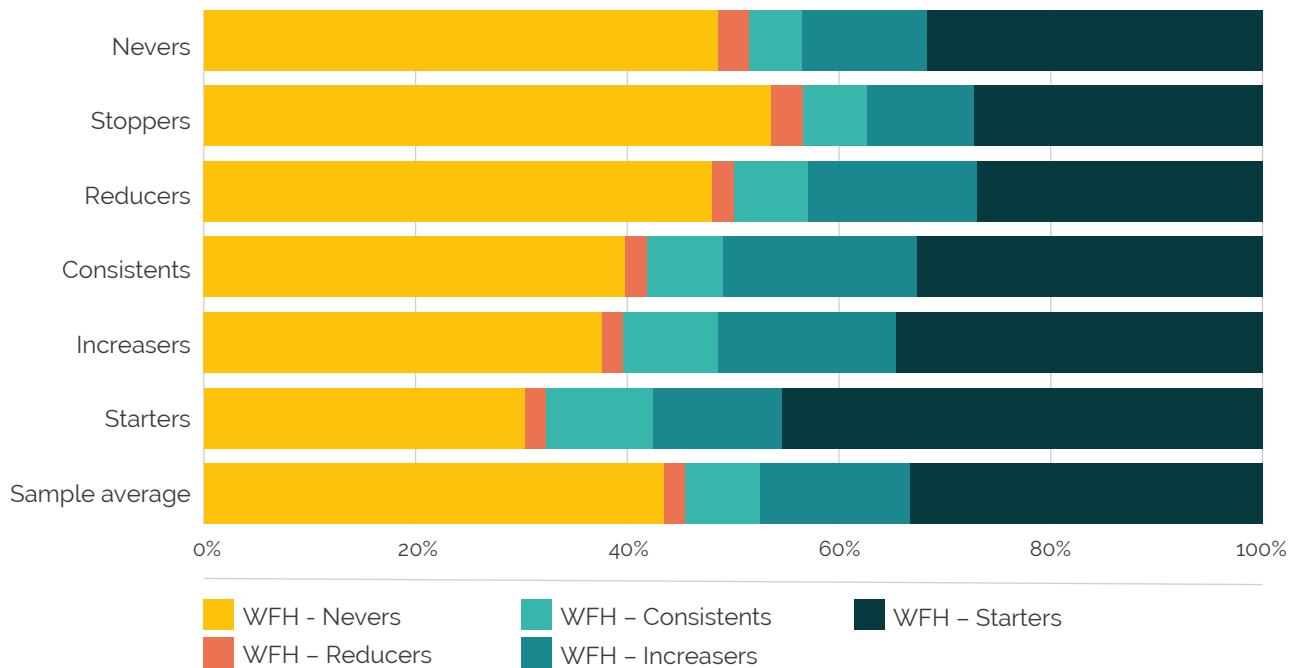


Figure 23: Relationship between the home delivery frequency change segments and the working from home change segments ($p > 0.001$). Unweighted, N=2,593 (workers in October who had not moved home).

4.3 Other channels

Whilst the study looked at other channels for accessing groceries such as food banks and click and collect, these are smaller as a proportion of overall grocery access and more important to understanding what other kinds of adaptive capacity has been used rather than on having a significant bearing on the direction of change for future travel patterns.

Participation in Click and Collect was around a third of the level of home delivery at each time point (0.07 and 0.13 per week respectively). Around a fifth of the sample participated but as many people stopped as started using it during lockdown.

The proportion of the sample receiving deliveries from friends and family at least once a month increased in proportion and frequency, more than tripling from 4% to 13% during lockdown and only dropping back to 11% during October.

The proportion of the sample using a Food Bank at least once a month almost doubled between pre-Covid and October, although from a small base (from 1.6% to 3.0%). None of the food bank users relied on this for all of their grocery shopping needs.

5. Mode use across a variety of journey purposes

This section highlights some of the key findings on how the use of different modes has changed. The initial section provides the figures for change over time. We note that the data changes rapidly as restrictions ease and this data relates to, in its latest time period, October 2020. The emphasis in this section overall is on differences within the data which might act as important markers for understanding who, where and for what change has been greatest and what it may be most interesting to focus analytical and policy attention on as we emerge from lockdown.

5.1 Overall mode shift

People's mode share was estimated by examining the frequency with which they travelled by modes from five days a week or more to never. Figure 24 shows the changes in use of each mode three times a week or more (what we consider to be frequent usage). On average across all survey locations, car use reduced to around a third of its pre-lockdown levels during the spring 2020 lockdown but had returned to 70% of its pre-lockdown levels by October. This varied from 64% in Manchester to 78% in Aberdeen. Bus use fell from 16% to 2% during lockdown but had recovered to 6% by October. By October bus use as a proportion of pre-pandemic levels was at its lowest at 21% (Ayrshire) and highest at 50% (Lancashire). Rail fell from 5% to 1% and recovered to 2% over the same period. This broadly mirrors the national picture where car use rebounded much more strongly than public transport, where the message in England was to avoid unnecessary travel and leave the capacity for those with no alternatives.

Walking was the only mode to still be higher than pre-lockdown levels in October at 156% of pre-lockdown levels. Moreover, we can see that walking had not reached its highest point during the spring 2020 lockdown but had continued to increase between lockdown (114% of pre-lockdown) and October, despite the weather not being as favourable to walking as it was during the first national lockdown. This is particularly surprising given that this is a measure of frequent walking: walking at least three days a week.

Frequent cycling decreased slightly by October, although this is likely to reflect the reduction in commuting and this varied across areas. Cycling as a commuting mode pre-pandemic? was disproportionately high for those people who could work from home during the pandemic (Section 3.2). Therefore, areas where cycling was relatively high for commuting pre-lockdown (e.g. London, Bristol) were the areas to experience the greatest drop-off. The use of a three day a week threshold as a measure of frequent use will not capture occasional leisure cycle use which more participants reported increasing than reported stopping.

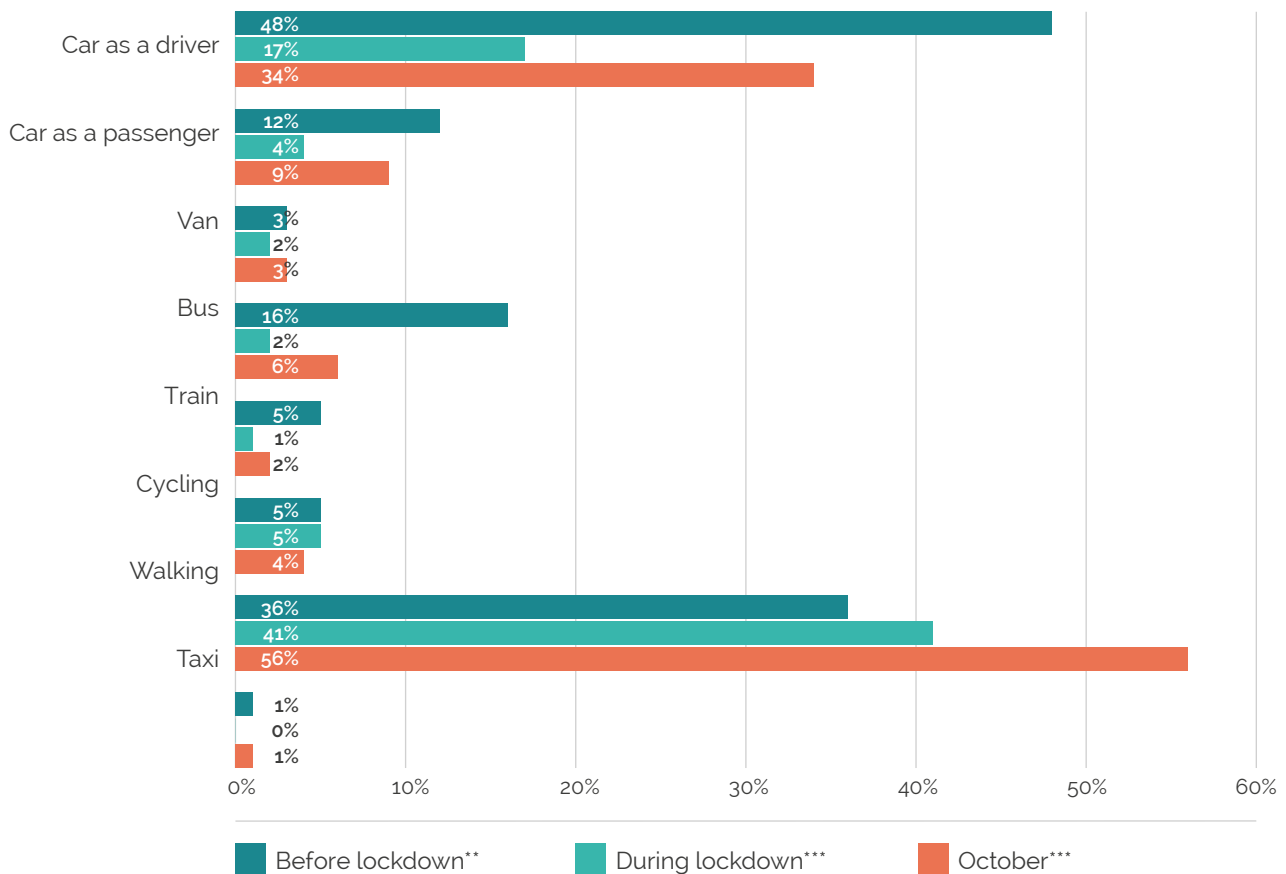


Figure 24: Percentage of people using each mode at least three times a week at each time-point. Weighted, N=9,362 (before), 9,362 (during), 6,209 (October).

Table 7 shows the reported changes in frequency for different journey purposes by modes. The findings confirm that the restriction of many activities resulted in a net reduction in the frequency of all activities by all modes, with the exception of going for a run or cycle somewhere (without driving there first) and grocery shopping by bike (highlighted in bold in Table 7).

As discussed in the working from home section (Figure 3) and the grocery shopping section (Figure 10 and Figure 11), the dominant factor in mode use appears to be the reduction in frequency of trips to different activities coupled with the association of what types of modes are typically used for these journeys.

This is one reason why rail patterns remain so low as they are strongly associated with travelling to work. Walking saw a growth in the proportion of journeys for local shopping. However, total trips for these purposes fell. It has only been the use of cycling and walking for exercise that significant increases in frequencies have been seen.

Table 7: Self-reported change in transport use in October 2020 'compared to this time last year' for a selection of journey purposes and modes

		Car	Cycling	Walking	Bus	Train
Work	More	3.9%	5.3%	5.0%	2.0%	5.2%
	Less	-29.9%	-12.9%	-16.2%	-14.7%	-25.8%
Business	More	1.1%	0.6%	1.0%	0.7%	2.9%
	Less	-19.3%	-5.0%	-7.9%	-7.5%	-22.2%
Carer (Outside home)	More	5.0%	1.9%	3.6%	0.9%	3.0%
	Less	-12.5%	-5.2%	-7.2%	-6.5%	-8.8%
Errands for someone outside the home	More	13.8%	5.2%	10.1%	1.9%	3.2%
	Less	-27.0%	-7.4%	-14.5%	-12.0%	-12.7%
Grocery shopping	More	9.7%	8.9%	18.7%	2.3%	4.3%
	Less	-44.4%	-8.8%	-23.5%	-19.3%	-16.6%
Non-food shopping	More	5.8%	4.7%	8.8%	1.5%	3.4%
	Less	-66.3%	-9.5%	-32.0%	-27.3%	-29.4%
Visiting friends and relatives	More	3.5%	9.9%	13.0%	1.6%	5.3%
	Less	-79.1%	-16.0%	-41.7%	-31.4%	-48.1%
Day trip	More	4.7%			1.1%	7.0%
	Less	-72.4%			-25.7%	-50.6%
Just going for a walk/run/ cycle or somewhere for exercise	More	15.1%	27.6%	32.4%	2.4%	5.3%
	Less	-35.9%	-21.7%	-19.3%	-16.6%	-25.8%

Figure 25 shows the change in frequency of walking over time across the survey periods. From a health perspective, it is important to note that there has been a reduction in the percentages of people reporting no walking trips from 44% to just 12%. High frequency walking has gained most with 57% of the sample doing this three times a week or more (up from 37% before lockdown) but walking one or two times a week also more than doubled (from 10% to 22%).

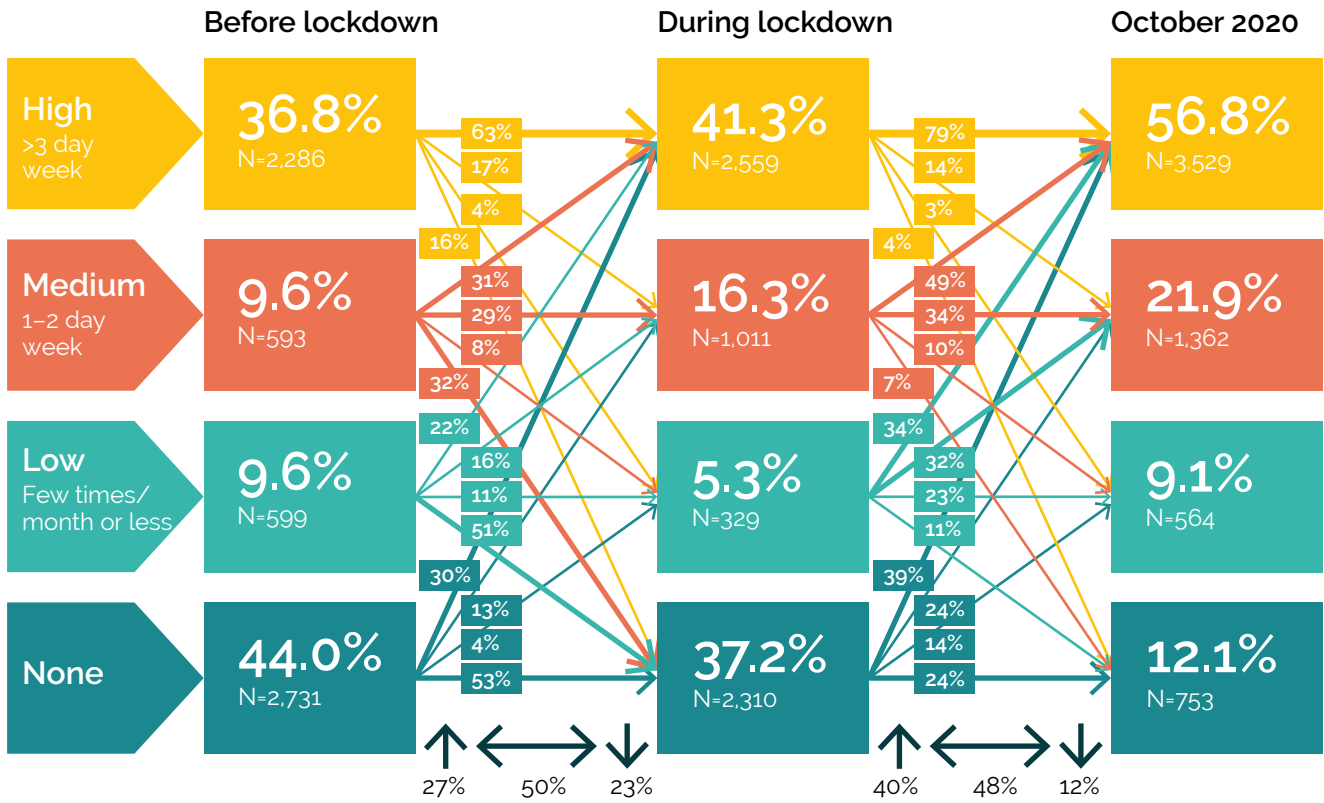


Figure 25: Proportion of the sample in each walking frequency segment and their movement between these at each time point. Weighted, N=6,207.

The propensity to travel by different modes varied significantly across our different survey areas. Table 8 shows the difference in levels of frequent use of bus and train across the survey sites. By October, bus use had higher levels of frequent use in Aberdeen, Manchester and Lancashire than it did in Edinburgh, Liverpool, Bristol or Newcastle for example. Rail use recovered much more in Bristol, Newcastle and Manchester than it did in Glasgow, Edinburgh or Liverpool. We explore different factors which may influence the differential recovery rates in sections 5.3 to 5.5 below. What is important however is that there have been important regional differences and it is possible that these will persist during the recovery.

Table 8: Levels of bus and train use (at least three times a week) (a) during lockdown (b) October as a proportion of pre-lockdown levels

	Aberdeen	Edinburgh	Glasgow	Ayrshire	Bristol	Lancashire	Liverpool	Manchester	Newcastle	London	Total
(a) During lockdown											
Bus	13.3%	15.4%	16.5%	11.3%	9.0%	11.1%	21.1%	14.9%	15.7%	18.0%	15.0%
Train	0.0%	13.9%	11.5%	9.5%	40.9%	5.3%	14.5%	30.8%	9.1%	13.2%	14.6%
(b) October											
Bus	46.0%	32.4%	33.3%	20.7%	29.7%	49.5%	37.8%	44.6%	38.5%	36.5%	35.8%
Train	41.4%	8.2%	18.9%	0.0%	58.1%	39.1%	27.7%	47.2%	54.2%	36.9%	30.0%

5.2 Mode choice for school

Isolating the mode choice impacts of Covid-19 on school travel is challenging. We only included households who had at least one child across the same combination of schools as before lockdown. This resulted in around half of the households with children at school being excluded from the analysis. Participants were asked to choose all the modes they use on the school run, not just the main mode. Those that ticked more than one mode are classed as 'multimodal'.

Figure 26 presents the change in modes from before lockdown to October. This analysis shows considerably greater change in mode use for the school journey as compared to the commute. There was a reduction in 'dedicated' walking to school from 38% of this sub-sample before lockdown, to 29% in October. By 'dedicated' we mean only being walked to school. Walking is still undertaken as part of many multimodal journeys, but the general trend in this picture appears to have been a greater adoption of the car for the school run, at least some of the time.

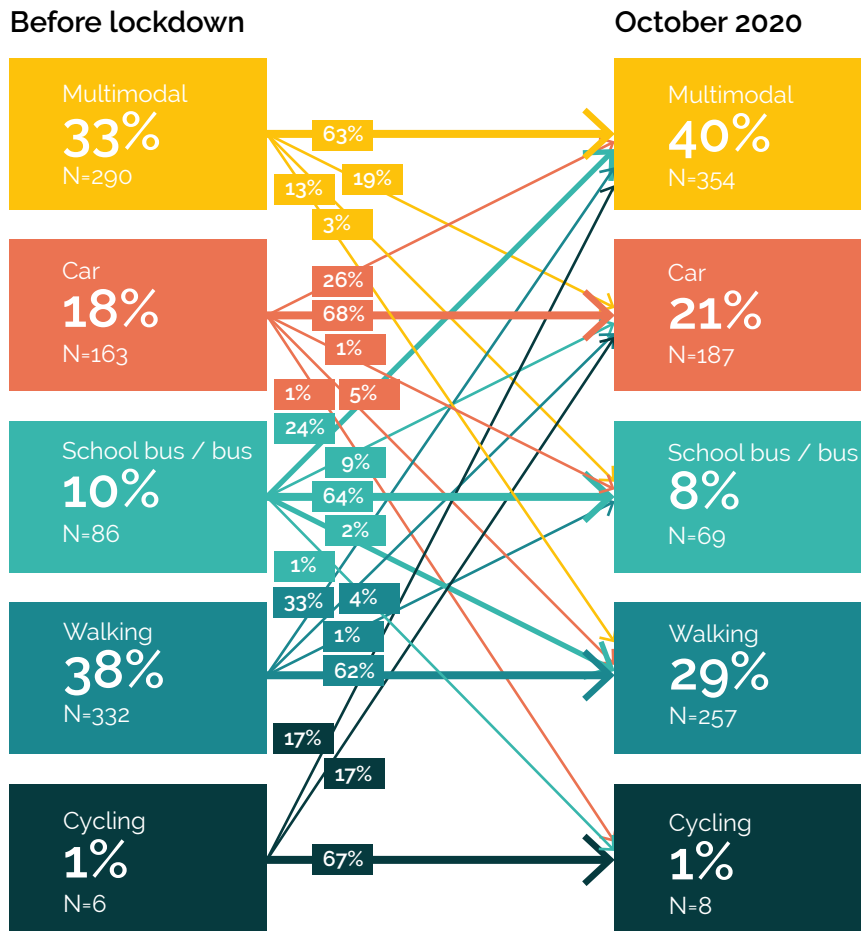


Figure 26: Mode shift on the journey to school among those with children at the same schools in both W1 and W2. Unweighted, N=883. Note missing lines are due to less than 1% shift.

Further analysis isolated the portion of this sample who also had at least a 50% increase in the proportion of their workdays spent working from home. This was to test the idea that the school run is often part of the commute and therefore may become less car oriented once people have more flexibility of working at home. Only 193 participants were taking children to the same combination of schools as before lockdown whilst having personally increased their WFH. Nevertheless, this sub-sample shows a small reduction in dedicated car journeys on the school run (from 23% to 21%) and a smaller drop in dedicated walking journeys (from 31% to 27%). Once again, it was multi-modal activity that increased the most (from 35% to 44%). We might infer from this that working from home has introduced some greater flexibility around the school run, but any enhanced flexibility that may have been introduced by home working has not led to any obvious increase in the use of active travel on the journey to school.

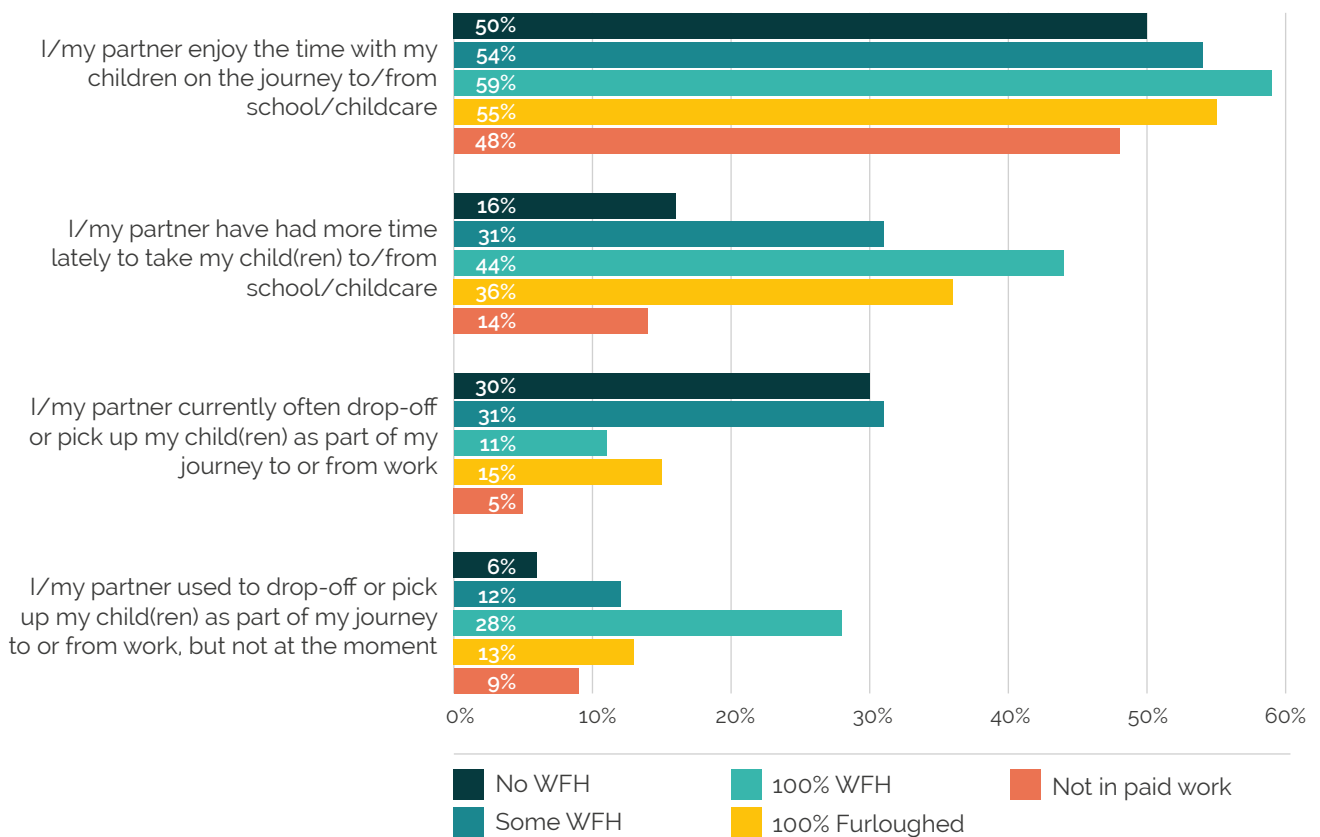


Figure 27: Mode shift on the journey to school among those with children at the same schools in both W1 and W2. N=1,088.

To explore this further, Figure 21 presents agreement (% saying 'Yes') to questions relating to the school run compared across different work from home and work-status segments. Those working from home all of the time are consistently most likely to say that they enjoy the time spent with their children on the school run and have enjoyed that time more 'lately'. It is notable, however, that over a quarter of those working from home all of the time in October said that they "used to drop off their children as part of their journey to work, but not at the moment" and this has implications for what may happen if and when workers return to their workplaces.

However, further examination of this group shows that they were no more car dependent for their commute than the sample average, and so this 'drop off' was not necessarily by car. Those who said that they feel that they have more time for the school run lately were no more likely to have increased walking on the school run. Another observation is that those not in any paid work were significantly less likely to say they have had more time lately or that they enjoy this the time on the school run with their children.

5.3 Differences in behaviours by level of restriction

Once the first national lockdown was eased, our survey locations were subject to a variety of levels of restrictions at different times over the subsequent months. A series of estimates were made, standardising for the nature of the restriction (Tiers and Levels were not always consistent in classification across England and Scotland) for different types of activities over time. It was concluded that trying to explore the relationship between the behaviour in any specific month and the levels of restriction in that month had limitations. This was in part due to adjacent areas having different restrictions which might impact on travel patterns but also because the cumulative exposure to restrictions might condition individual's responses. This analysis is presented where low restrictions scored 1, medium restrictions 2 and high restrictions 3 with Figure 28 showing how this varied across our survey locations.

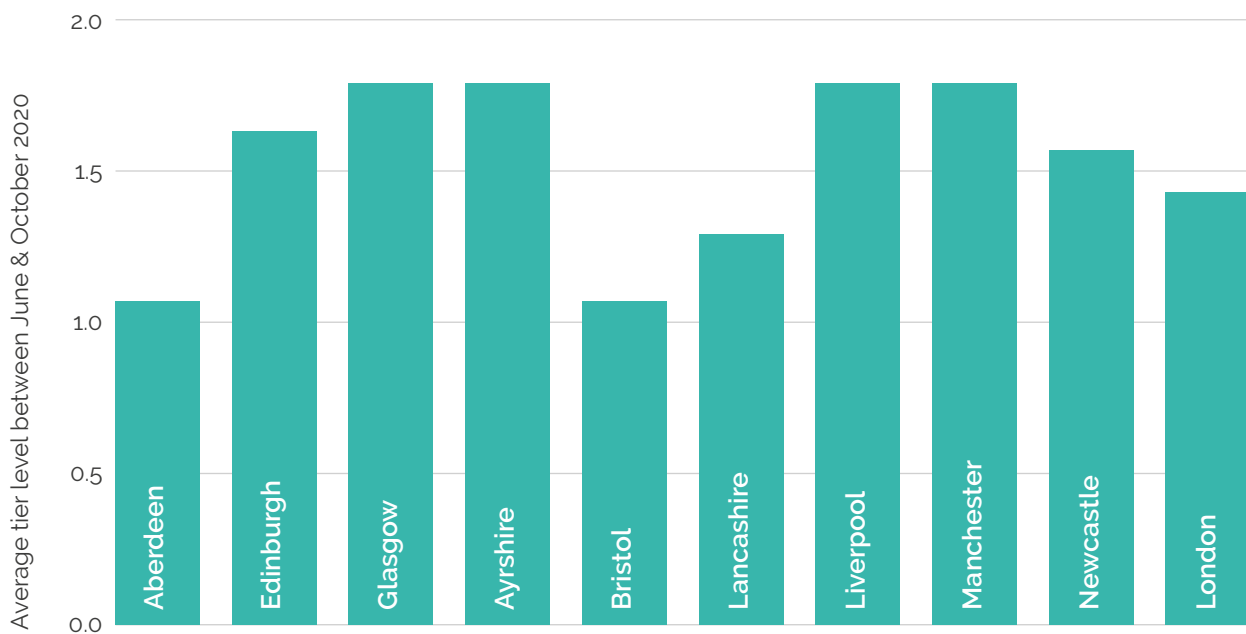


Figure 28: The average level of restrictions (Tier level) experienced between June and October in each survey location. N=5,645.

Figure 29 shows the average level of change in mode use in places which had on average low (<1.4) or medium (>1.4) restrictions over those months. Walking and cycling show no statistically significant relationship to the tier levels. All remaining modes, aside from bus, show a modest impact in the direction we would expect – i.e. greater reductions in areas that had been under greater restrictions. Bus use shows the opposite trend which may be indicative of people having to continue to use the bus for work or other key journeys in areas with high infection (see Section 5.4).

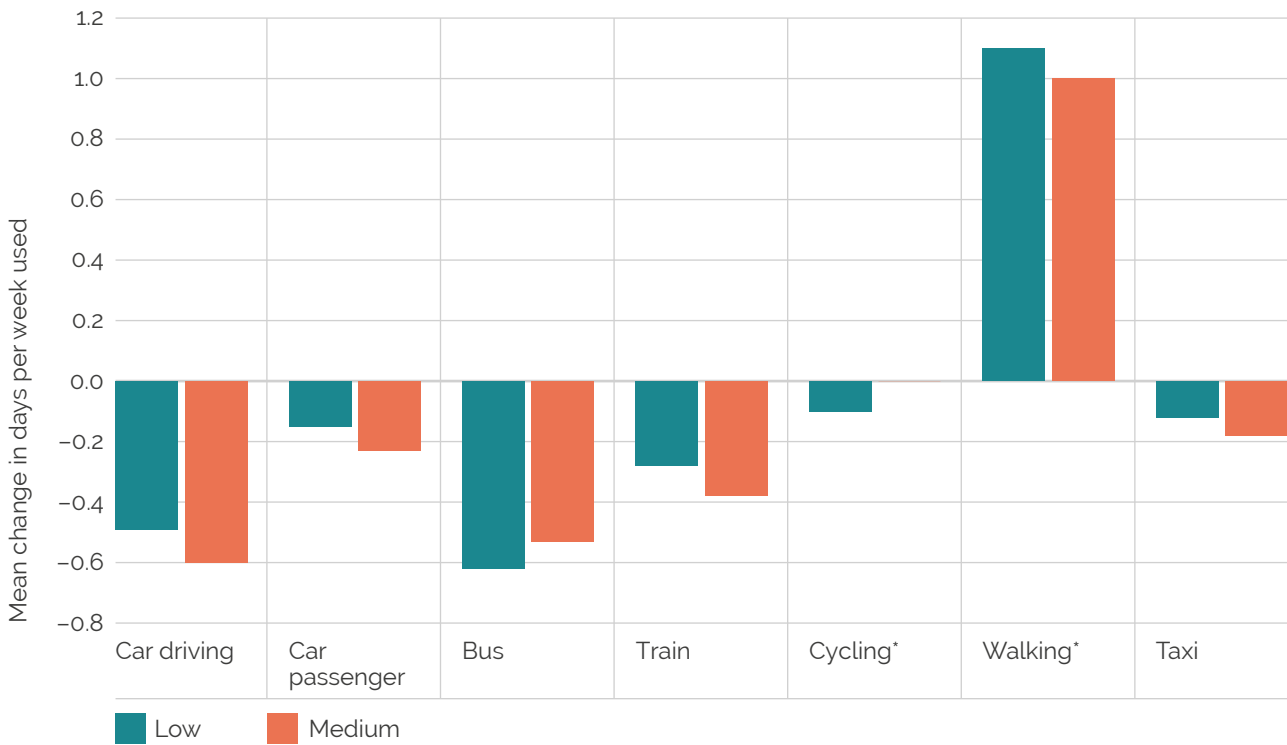


Figure 29: The association between changes in frequency of mode use and average level of tier restrictions. Weighted, N=5,645. *Differences between tier levels not statistically significant.

5.4 Differences in behaviours by perceptions of health risk

Analysis showed little clear relationship between attitudes to travelling and the levels of Covid-19 restrictions in a given area. We focus here, therefore, on the importance of attitudes to travel as they relate to individual differences by health risks. In both waves the question was asked: "How worried or not have you been about catching coronavirus?" [(1) Not at all ... (5) Extremely worried]. Figure 30 shows how this concern changed over time. Just over half of the sample maintained their same level of concern from the first wave to the second with the remaining half split equally between increases or decreases in concern. Those who started out at one end of the spectrum or another ('not at all concerned' or 'extremely concerned') were the most stable in their views.

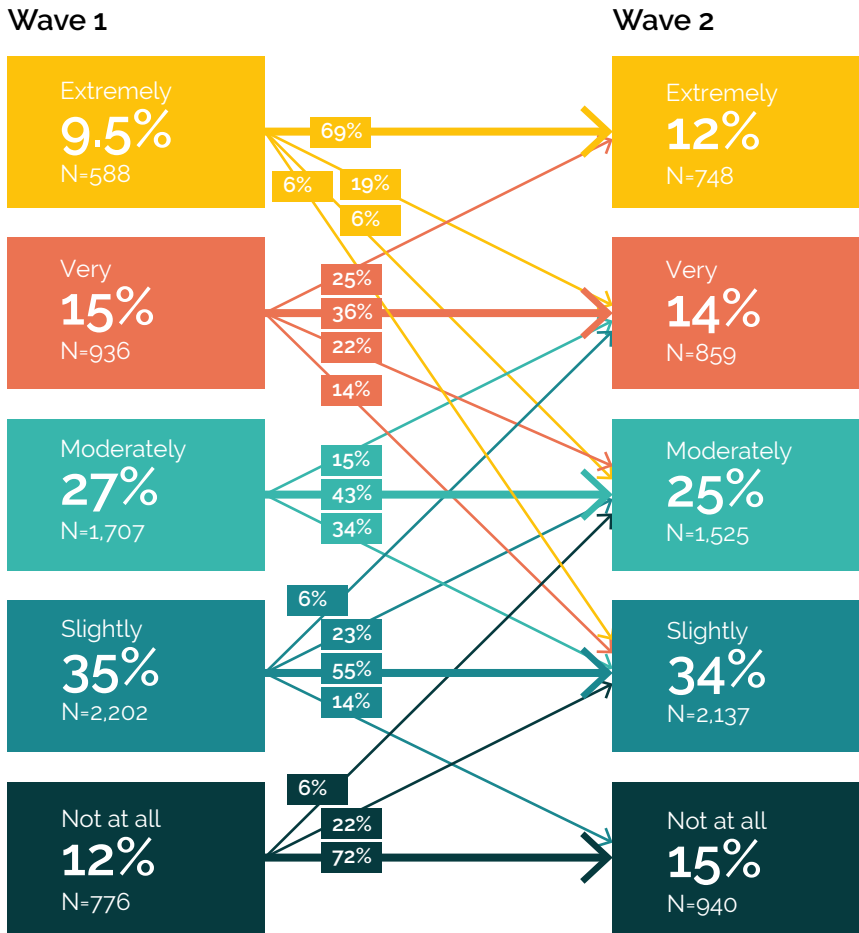


Figure 30: Shift in individual levels of concern about Covid-19 by participants in both waves. Unweighted, N=6,209. Only shifts >5% are shown.

For each individual, we have created a 'concern score' which is the average of their Wave 1 and 2 scores on the above question. The distribution of concern is skewed towards being less concerned although one in six scored their average response as four or higher.

More general concern about Covid-19 is significantly related to the reduction in the frequency of use of every method of transport, except taxi use (Figure 31). However, it is interesting to note that bus use shows a non-linear pattern whereby high concern is related to lower bus use, but relatively high levels of general concern also exist for those using the bus more.⁹ It could also be that the direction of causality is the other way around – that concern increased as a result of using the bus. 61% of bus users (56% of train users) agreed that they had "no choice but to use the bus (train)" for the journeys they made. These we refer to later as 'captive users'.

⁹ This pattern was also apparent in taxi use, but the relationship between the two variables here is not significant.

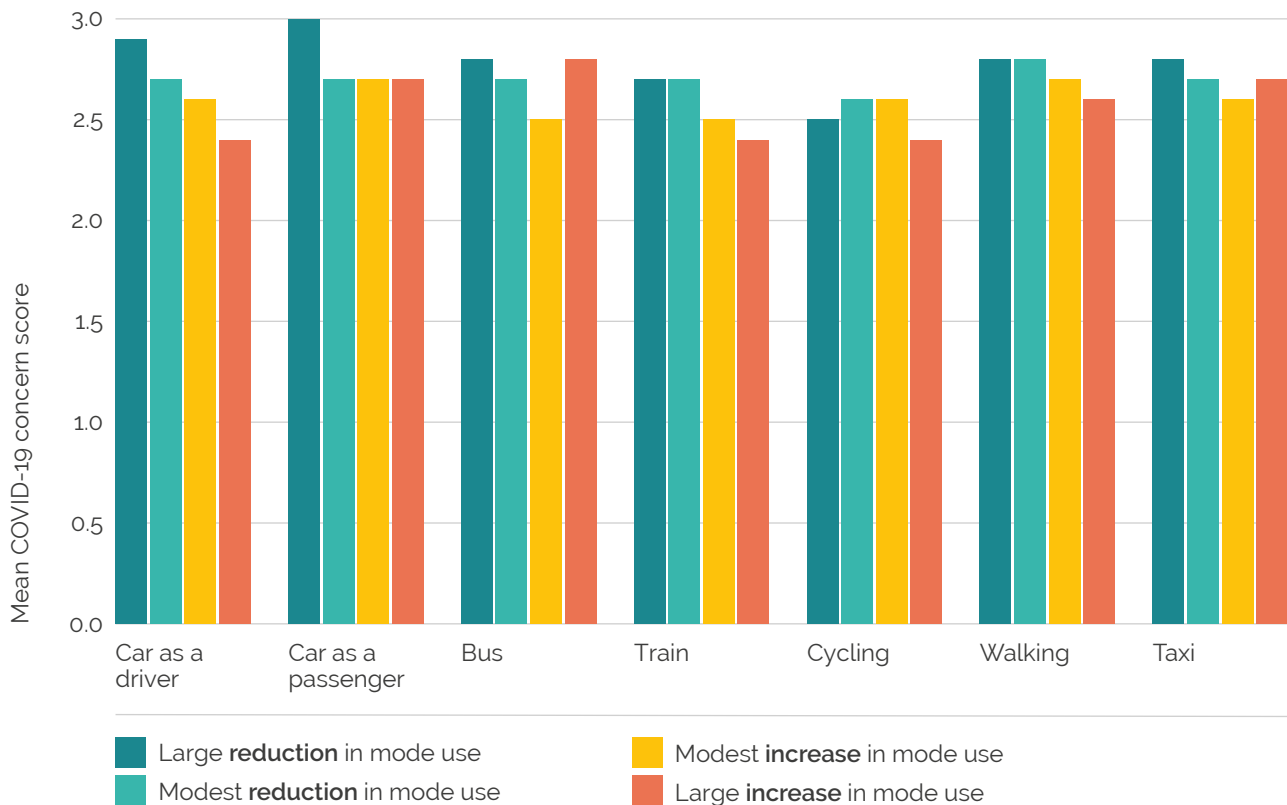


Figure 31: Relationship between the change in mode use between before lockdown and October and the averaged W1/W2 'Covid-19 Concern' score. Weighted, N=6,209.

We explored the extent to which people might have reduced their use of modes because of worries about Covid-19 risk at the destination rather than on the journey. There was a net switch (Figure 32) from agreeing to disagreeing with the statement which means that more people increased their relative concern about transport vis a vis public places than decreased it (32% vs 27% of the total sample). Looking at a combined index for this question across the two survey periods we find that on average, slightly more people believe that travelling is a higher risk than being in public places (37% vs 32%). This suggests that addressing perceived risk of travelling on public transport may require specific targeted messaging.

Understanding the relationship between levels of concern and mode use is complicated. If a person had increased their use of bus, train or taxis (a very small part of the sample), they were disproportionately more likely to have dismissed the idea that travelling was more dangerous than being out and about. The strength in the other direction was not so strong – i.e. a greater belief that travelling was more dangerous did not lead to a disproportionately greater reduction in use of these modes.

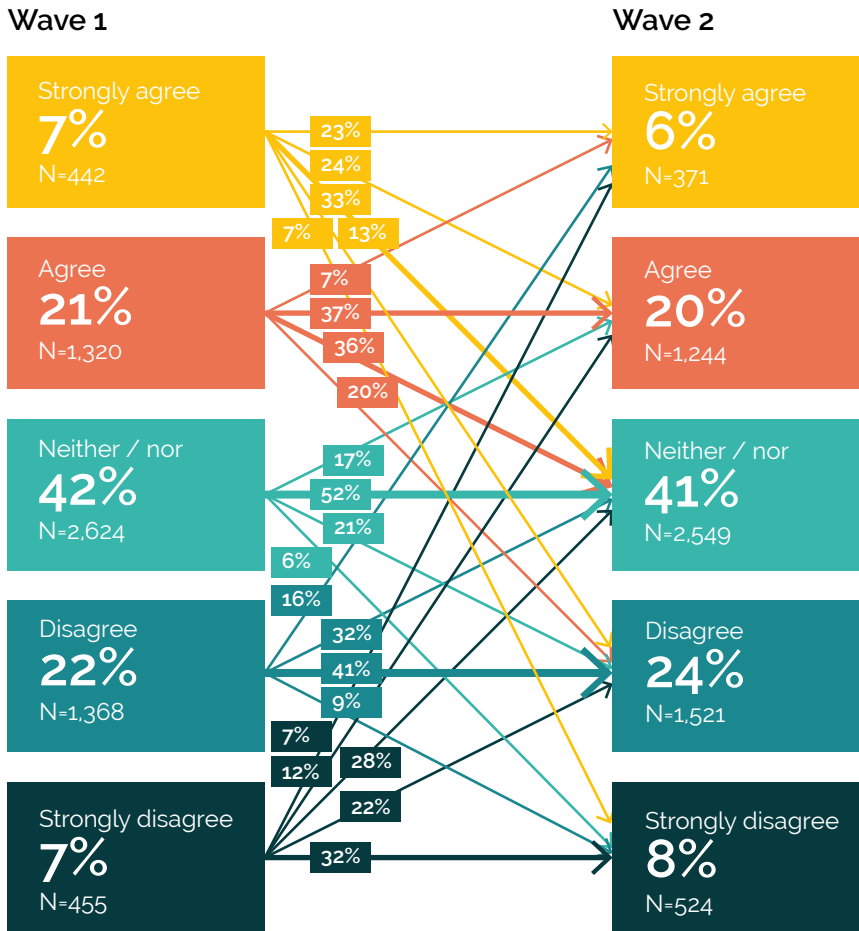


Figure 32: Shift in individual agreement with being more worried about getting CV19 from visiting places rather than from the travelling itself by participants in both waves. Unweighted, N=6,209. Only shifts >5% are shown.

To examine the feelings around Covid-19 safety on public transport, more detailed questions were included in Wave 2. The questions were worded slightly differently whether someone had used a bus or a train in October, or whether they had not. Figure 33 contrasts the results for the users and non-users for bus and Figure 34 for train use.

In both cases, users of buses or trains were more likely to express agreement or disagreement about non-pharmaceutical interventions than non-users. Users of each mode had, on balance, positive views in relation to compliance with mask wearing and sanitisation. However, views were not as positive around social distancing, particularly on buses. For both buses and trains, around twice as many people agreed that they were concerned about spreading or catching Covid-19 on each mode than disagreed with this statement. It appears non users were less worried about catching Covid-19 from these modes, but this is likely to be a product of asking them about something that they did not do and did not feel concerned with, which will elicit more neutral responses.

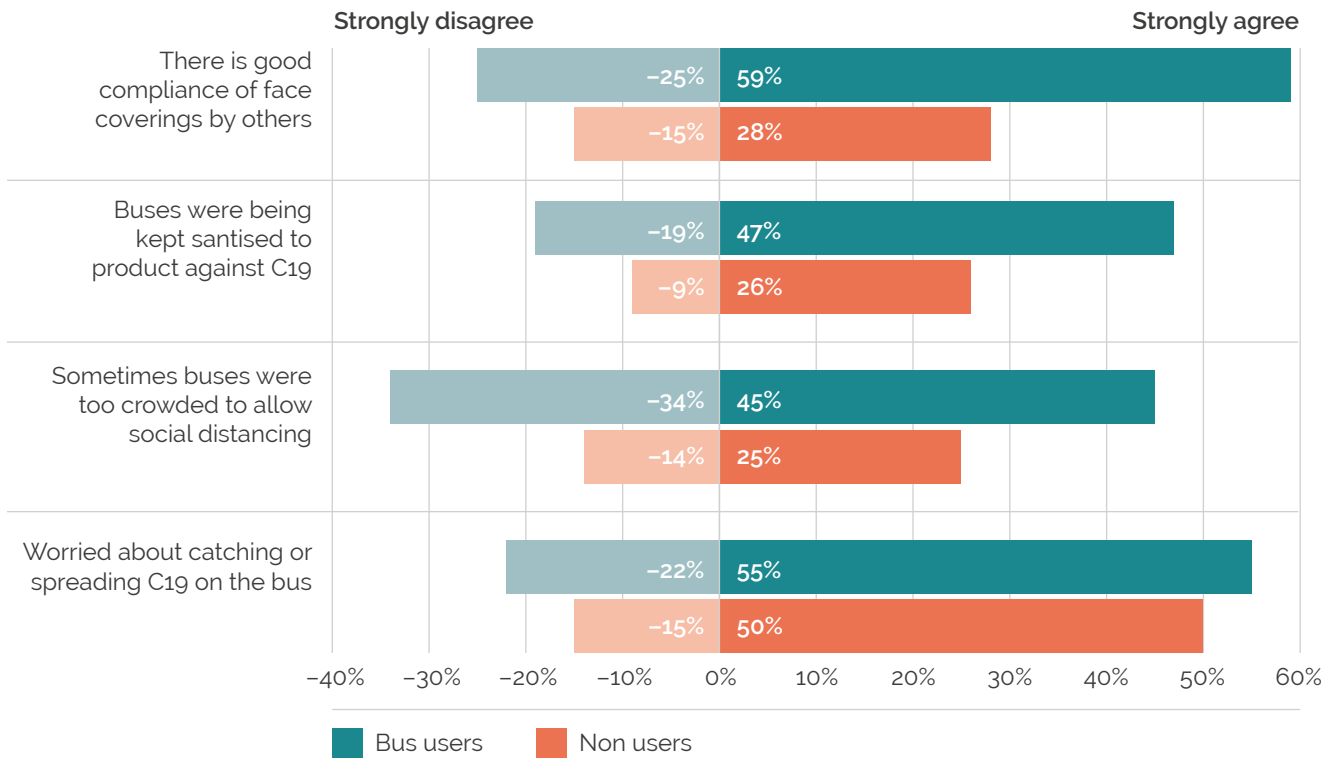


Figure 33: Agreement with Covid-19 safety statements of bus users and non-users. N=1,688 bus users, 4,521 non users.

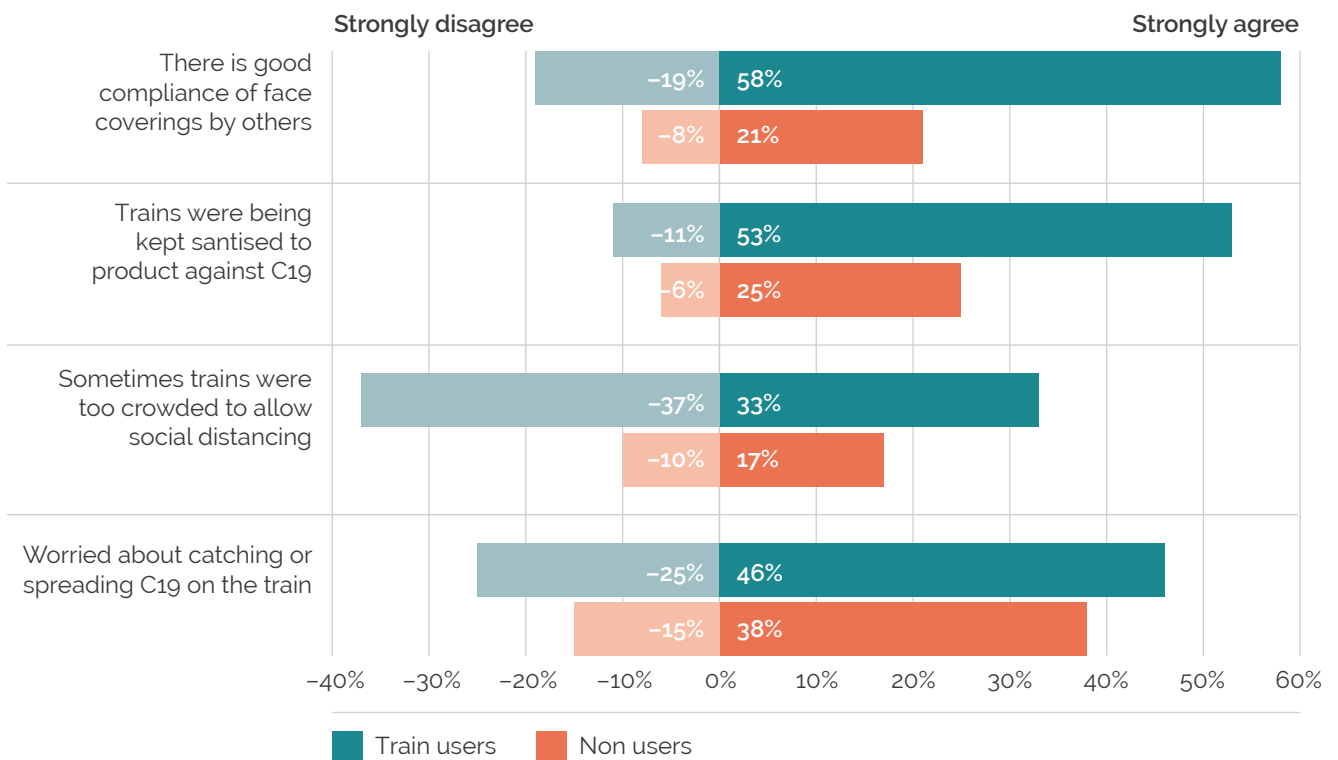


Figure 34: Agreement with Covid-19 safety statements of rail users and non-users. N=874 train users, 5,335 non users.

It is possible to look at the attitudes of only those people who told us that they had no choice but to use either the bus or the train in October ('captive' users). Figure 35 shows that captive bus and train users were more concerned than their respective non-user counterparts although train users were also much more likely to say they were not worried than non-train users, suggesting more people with a positive experience and/or attitude.

Whilst attitudes to Covid-19 are clearly an important factor, it is the distribution of attitudes¹⁰ which may be important in understanding who is and is not returning to public transport on the basis of risk rather than because their lifestyle and working arrangements have changed.



Figure 35: Comparison of users and non-users of buses and trains as to their concerns about catching Covid-19 on each mode.

5.5 Differences between socio-demographic groups

There are a very large number of potential relationships between changing travel behaviours and socio-demographic variables. We review how these relationships varied in the following subsections, split by mode.

¹⁰ See also on-going research by [Transport Focus](#).

5.5.1 Walking

Walking was associated with higher education and lower car ownership pre-pandemic and this has not changed. Gender and ethnicity made no difference to walking rates over time either.

Before lockdown, there were no differences in walking rates between income levels and, perhaps surprisingly, between those with or without a long-term illness. By October, those with higher incomes and those without a long-term illness were walking more. Before lockdown, walking was the only mode which was not differentiated by income. However, the highest income households (>£80k p.a.) increased the average days per week on which they walked more than low income (<£20k p.a.) ones (+71% vs +56%) so that by October the differences were statistically significant. More people on high incomes were able to work from home which explains some of this shift.

Before lockdown, those without children and younger people walked more, but in October, those with or without children and all age groups were walking about the same amount.

Some important differences in walking rates continued into lockdown. Those without a car, those with a higher education degree and dog owners still tended to walk more in October as they had done pre-pandemic. Nevertheless, those with a car increased their rates of walking more than non-car owners (+64% vs +45%) and so the gap between these two groups was reduced.

5.5.2 Cycling

Cycling has remained gender biased towards men, those in employment and higher incomes. Whilst before the pandemic those without children tended to cycle a little more, this difference had disappeared by October.

In addition to men continuing to cycle more than women, younger people (<44 years) as well as those with higher education qualifications, higher income, those in employment and those without a car continued to cycle more. Cycling was undertaken more than twice as frequently by men before lockdown (12% cycling at least once a week (an average of 0.47 times per week) compared to 6% (0.22) for women) and this remained the case in October (12% (0.36) vs 5% (0.16)) particularly as women reduced their cycling by a little more on average than men. In October cycling levels reduced with all age groups reducing their cycling by the same amount. Cycling levels continued to be higher for those with higher levels of education and greater income with no substantial closing of these gaps.

There was no relationship in our sample between changing cycling levels and those with or without outdoor space, those with or without dogs or ethnicity, although the latter warrants further investigation as those from ethnic minority backgrounds represent only 7.3% of the sample.

5.5.3 Rail

Men and women used the train the same amount pre-pandemic (10% using the train at least once a week (an average of 0.5 times per week), but by October, men were using the train at least half as much as women (4.9% (0.18) vs 3.2% (0.13)).

Train use remained associated with 0.1e, higher income, working, non-dog owning, people from ethnic minority backgrounds and non-car owning individuals. These differentials either remained or were exaggerated between pre-pandemic and October. For example, workers went from travelling twice as much by train as non-workers pre-pandemic, to only a third as much afterwards. On the other hand, the gap between ethnic minority/ other backgrounds and non-ethnic minorities widened with the former having halved their train use, whereas the latter reduced by 80%. Having children was not a differentiator on changing train use.

5.5.4 Bus

Before lockdown, women were slightly more likely than men to use the bus (30% using the bus at least once a week (an average of 1.1 times per week) compared to 27% (1.0) for men), but this difference had disappeared by October (13% (0.41)). Those without children tended to use the bus a little less before the pandemic but this difference had also disappeared by October.

Before lockdown, the very youngest (18–24 years) and oldest (70+) used the bus most (1.4 and 1.0 times per week compared to 0.9 for the remaining age groups on average) and during October the youngest were still using it most frequently (their usage had dropped off less steeply (-41%)) but the elderly population had reduced their use considerably (-69%). Greater bus use remained associated with lower education, low income (<£20k per annum), being in employment, having an ethnic minority background, and not owning a car.

5.5.5 Car

Frequency of car driving was statistically significantly different across all main demographic boundaries measured in the data before Covid-19 and these differences were not erased by the changes in mobility during the pandemic (Table 9). Increased car driving was associated with: men, middle age groups, middle education groups, white ethnicity, higher income, having children, being in employment and dog owning. Although there were reductions in car driving across all groups, the pandemic did not erase the general pattern of differences among the socio-demographic segments. Nevertheless, there were many differences in the magnitude of the car use reductions. For example, the youngest age group hardly reduced their car use in comparison to other age groups and so, whilst their levels of driving were still lower, the gap closed slightly between this age group and others. Work status, however, became a bigger differentiator as those in work reduced their car use less than those out of work. However, low and high income households reduced their car use at the same rates, with middle income households reducing the most.

The youngest age group hardly reduced their car use in comparison to other age groups and so, whilst their levels of driving were still lower, the gap closed slightly between this age group and others. Work status, however, became a bigger differentiator as those in work reduced their car use less than those out of work. However, low and high income households reduced their car use at the same rates, with middle income households reducing the most.

For car passengers, before lockdown there was no difference between those employed or not, but in October those in work were more likely to be travelling this way.

Table 9: Demographic differences in frequency of car driving before Covid-19 and in October 2021

		Average days per week on which a car is driven		
		Before	October	Difference
Gender	Male	2.6	2.1	-20%
	Female	2.2	1.6	-26%
Age	18-24	1.3	1.2	-6%
	25-44	2.2	1.7	-22%
	45-54	2.7	2.1	-21%
	55-69	2.7	1.9	-27%
	70+	2.6	1.9	-30%
Education	No Education	1.7	1.3	-24%
	School to aged 16	2.4	1.9	-20%
	A Level, Degree, Professional	2.5	1.9	-22%
	Postgraduate and PhD	2.3	1.7	-27%
Children	Kids	2.8	2.3	-17%
	No Kids	2.2	1.7	-24%
Employment status	Working - Yes	2.7	2.2	-17%
	No	2.0	1.4	-28%
Income	Low income (< £20k)	1.6	1.2	-21.2%
	Medium income (£20-£50k)	2.7	2.1	-22.7%
	High income (£50k-£80k)	3.0	2.3	-21.4%
	Very high income (>£80k)	2.8	2.2	-21.6%

		Average days per week on which a car is driven		
		Before	October	Difference
Change in income	Decreased a lot	2.6	2.0	-22%
	Decreased a little	2.5	2.0	-20%
	Stayed the same	2.4	1.9	-24%
	Increased a little	2.1	1.6	-22%
	Increased a lot	2.3	2.0	-12%
Socio-economic grade	ABC1	2.6	1.9	-28%
	CD2E	2.1	1.8	-16%
Health	Long term health issue – yes	2.0	1.4	-32%
	no	2.5	2.0	-20%
Ethnicity	White	2.4	1.9	-22%
	BAME	1.7	1.3	-27%
Dog owning	Dog(s) – yes	2.9	2.3	-19%
	No	2.2	1.7	-23%

The differences between the different demographic subgroups (eg males vs females) are all statistically significant at at least $p > 0.05$ unless the text is light grey. For instance, the rate with which car use reduced for those with and without children was not statistically significant.

6 Policy implications

This report focused on trying to understand spatial differences and differences between different types of travellers accessing a range of activities. As the data shows, the impacts will fall differently in different places and across different groups. In this section, we explore some of the early policy implications of these differences.

How much home working continues is a critical uncertainty?

It remains unclear, even in summer 2021, exactly what the return to work patterns for those people currently working from home will be. If those working at home in October 2020 continue to do so for half of their working weeks, then our estimate is that this could reduce miles travelled on the commute by between 15% (for walking) and 27% (for train journeys) in the areas studied compared to pre-pandemic. The reduction in car miles travelled on the commute would be 17%, and cycling and bus use would both see reductions of around 21%. This would have a significant impact on congestion levels, crowding, fare income and the demand for parking. These reductions would potentially improve the quality of the journeys that are made and reductions in traffic could also reduce noise, air quality impacts and climate change emissions.

The benefits of home-working will be impacted by housing relocation decisions

Previously, those who have worked from home have tended to live further from work. Our data suggests that the pandemic has created a new group of people capable of working from home who are living in areas with better access to employment opportunities more locally. They also have access to local facilities and may be able to develop less car dependent lifestyles, if provided with good alternatives such as more walkable neighbourhoods and safer cycling routes. The increase in home working has also contributed to an increase in other home-based servicing activity such as online shopping, as people are more likely to be at home to receive deliveries. The switch to home working impacts on where people spend their time and where economic activity will happen.

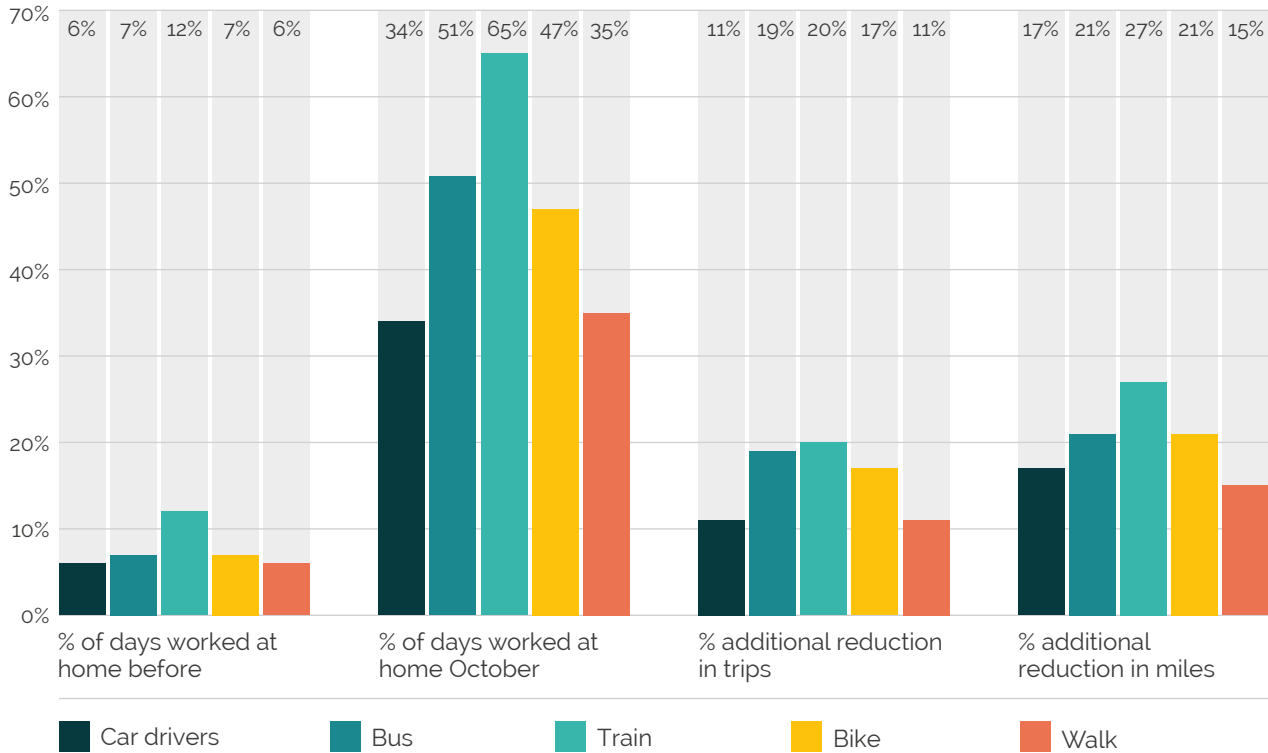


Figure 36: Comparison of potential percentage reduction in commute trips and miles per mode.

Encouraging a shift to more sustainable journeys to school is critical for the autumn

The increase in people working at home has not led to an increase in walking trips accompanying children to school. Some of the school travel patterns that existed pre-pandemic were part of a home-to-work trip chain and may not be as easy to substitute by walking. As work patterns begin to be re-evaluated there are opportunities to re-engage with the travel to school agenda to encourage a mode shift from the car. Our evidence suggests that it cannot be assumed this will just happen anyway despite the general increases in levels of walking.

Different areas are likely to require different levels of public transport transition subsidy

The industrial structure in different areas has resulted in different levels of home working and so monitoring how the return to work differs across places will be important in the coming months. Public transport commuter markets have been impacted in different ways across our survey areas and the recovery trajectory and relative subsidy needs of different places seems likely to vary.

The pandemic has shown parts of the economy to be able to grow with less travel and this could be critical for future climate emission reduction strategies

In transport, it has generally been assumed that an increase in travel is associated with increased economic activity. However, our data on home grocery shopping challenges this assumption. Overall, Kantar estimate spend on groceries for home consumption to have increased by £15.2 billion during the pandemic and, on average, our data indicates that people also spent more at home over this period despite a near 20% reduction in grocery shopping transaction frequency. People have done more whilst travelling less. Longer car journeys to supermarkets have reduced and this could contribute to emissions savings in support of climate change commitments. Reduction in car-based shopping frequency could also enable smaller footprints for parking at supermarkets to be agreed by local authorities. Whilst the shift to online will undoubtedly add to delivery van traffic in residential areas, indications are that online deliveries do not offset reductions in personal miles travelled (Braithwaite 2017).

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About DecarboN8

DecarboN8 is an EPSRC-funded network to bring together business, government and academia across the North of England. It aims to trial and accelerate the adoption of low carbon transport solutions. DecarboN8 is funded by UK Research and Innovation, Grant agreement number EP/S032002/1

About CREDS

The Centre for Research into Energy Demand Solutions (CREDS) was established as part of the UK Research and Innovation's Energy Programme in April 2018, with funding of £19.5M over 5 years. Its mission is to make the UK a leader in understanding the changes in energy demand needed for the transition to a secure and affordable, net-zero society. CREDS has a team of over 140 people based at 24 UK universities.

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