WORKING PAPER

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Insights into the Impact of COVID-19 on Household Travel and Activities in Australia – The Early Days of Easing Restrictions

By
Matthew J. Beck and David A. Hensher

Institute of Transport and Logistic Studies (ITLS), The University of Sydney Business School, Sydney Australia

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ABSTRACT:

The COVID-19 disease continues to cause unparalleled disruption to life and the economy world over. This paper is the second in what will be an ongoing series of analyses of a longitudinal travel and activity survey. In this paper we examine data collected over a period of late May to early June in Australia, following four-to-six weeks of relatively flat new cases in COVID-19 after the initial nationwide outbreak, as many state jurisdictions have begun to slowly ease restrictions designed to limit the spread of the SARS-CoV-2 virus. We find that during this period, travel activity has started to slowly return, in particular by private car, and in particular for the purposes of shopping and social or recreational activities. Respondents indicate comfort with the idea of meeting friends or returning to shops, so authorities need to be aware of potential erosion of social distancing and appropriate COVID-safe behaviour in this regard. There is still a concern about using public transport, though it has diminished noticeably since the first wave of data collection. We see that working from home continues to be an important strategy in reducing travel and pressure on constrained transport networks, and a policy measure that if carried over to a post-pandemic world, will be an important step towards a more sustainable transport future. We find that work from home has been a generally positive experience with a significant number of respondents liking to work from home moving forward, with varying degrees of employer support, at a level above those seen before COVID-19. Thus, any investment to capitalise on current levels of work from home should be viewed as an investment in transport.

KEY WORDS: ***Coronavirus, COVID-19, travel activity, working from home (WFH), household surveys, attitudes, behaviours, longitudinal study, employer support.***

AUTHORS: **Beck and Hensher**

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CONTACT:

INSTITUTE OF TRANSPORT AND LOGISTICS STUDIES (H73)

The Australian Key Centre in Transport and Logistics Management

The University of Sydney NSW 2006 Australia

Telephone: +612 9114 1824

E-mail: business.itlsinfo@sydney.edu.au

Internet: http://sydney.edu.au/business/itls

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1. Headline Results

1.1. Key Findings

- Aggregate travel has increased by 50% since initial restrictions, but is still less than two-thirds of that which occurred prior to COVID-19.

- Motor vehicle travel rebounding more than other modes, though those who are planning a return to train and bus intended to do so strongly.

- Concerns about public transport are lower than initial restrictions, but still significantly higher than prior to COVID-19.

- Large increases in activity planned for shopping and social and recreation purposes, with people feeling most comfortable about meeting with friends, going to the shops and also relatively comfortable visiting restaurants.

- Working from home continues, though concern about safety of work environment is widely varied.

- Work from home has been largely positive for those who have been able to do so, and the majority of respondents would like to work in increased proportion of days from home in the future. There is good employer support for doing so.

- Concern about the risk of COVID-19 to the community, to someone known to the respondents or to the respondent themselves, has decreased significantly since the initial outbreak.

1.2. Policy Implications

Authorities need to be vigilant as restrictions are eased, particularly with respect to social activity. There is evidence that the desire to return to some form of personal interaction is stronger than a return to other kinds of activity. Twinned with a falling perception of the risk of COVID-19, this could be problematic should appropriate social distancing and COVID safe behaviours diminish. There may be a need to limit travel for the purposes of recreation, particularly to venues where socialising is the norm and behaviours might be conducive to the transmission of the virus.

Work from home may be one behaviour that lasts into the longer term, and it is clear that any action that can embed a greater degree of working from home now will be a sound investment in transport needs and priorities for the future. Measures should be taken to understand how the benefits can be communicated to those less keen to continue to work from home to some degree, in a post-pandemic environment. Government should work with business to understand the appropriate mix of policy and incentives to encourage ongoing uptake. Given that the experiences has been largely positive for many, including employers, authorities should be seeking to capitalise on that experience now, particularly as new habits are formed.

2. Introduction

2.1. The Current Australian Experience

By now the effects of COVID-19 are well known and across the globe the experiences with the virus, in terms of transmission and new cases differs substantially, with the scale of the economic impact and the disruption to economic activity unprecedented outside of war and depression. Australia has been somewhat successful in combatting the first wave of COVID-19 infections through a series of regulations which were quickly implemented to halt the rise in transmissions. Figure 1 displays the number of daily new COVID-19 cases in Australia, which reached an initial peak in late March and at the time of writing this paper, the country has experienced a relatively low number of new daily infections almost exclusively restricted to what is now the largest risk factor in Australia; citizens returning from abroad. While Beck and Hensher (2020) present analysis of data collected in the first wave of study conducted immediately after the peak of transmissions, this paper presents the findings from data collected during the period of relatively low new infections where talk is turning towards a staged relaxation of restrictions.

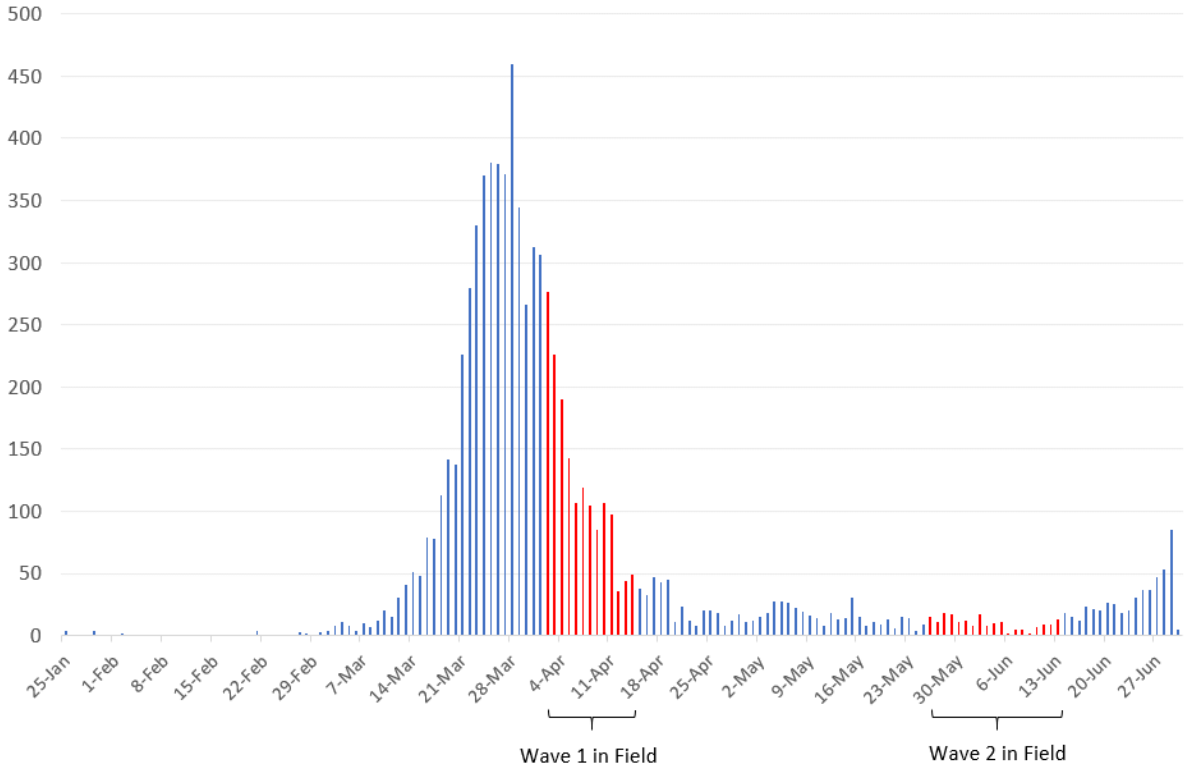

Figure 1: Daily New Cases of COVID-19 in Australia

Figure 2 and Table 1 provide an overview of the key events in the period between Wave 1 and Wave 2, most regarding the staged relaxation of restrictions designed to control the rising spread of COVID-19 that was observed in March. Throughout the entire period, state borders remain largely closed, except for NSW and Victoria which remained open throughout. Two key prongs in the Australian strategy for controlling COVID-19 and resuming more normal activity, are the adoption of a tracking and tracing application (COVIDSafe) and a carefully staged relaxation of restrictions.

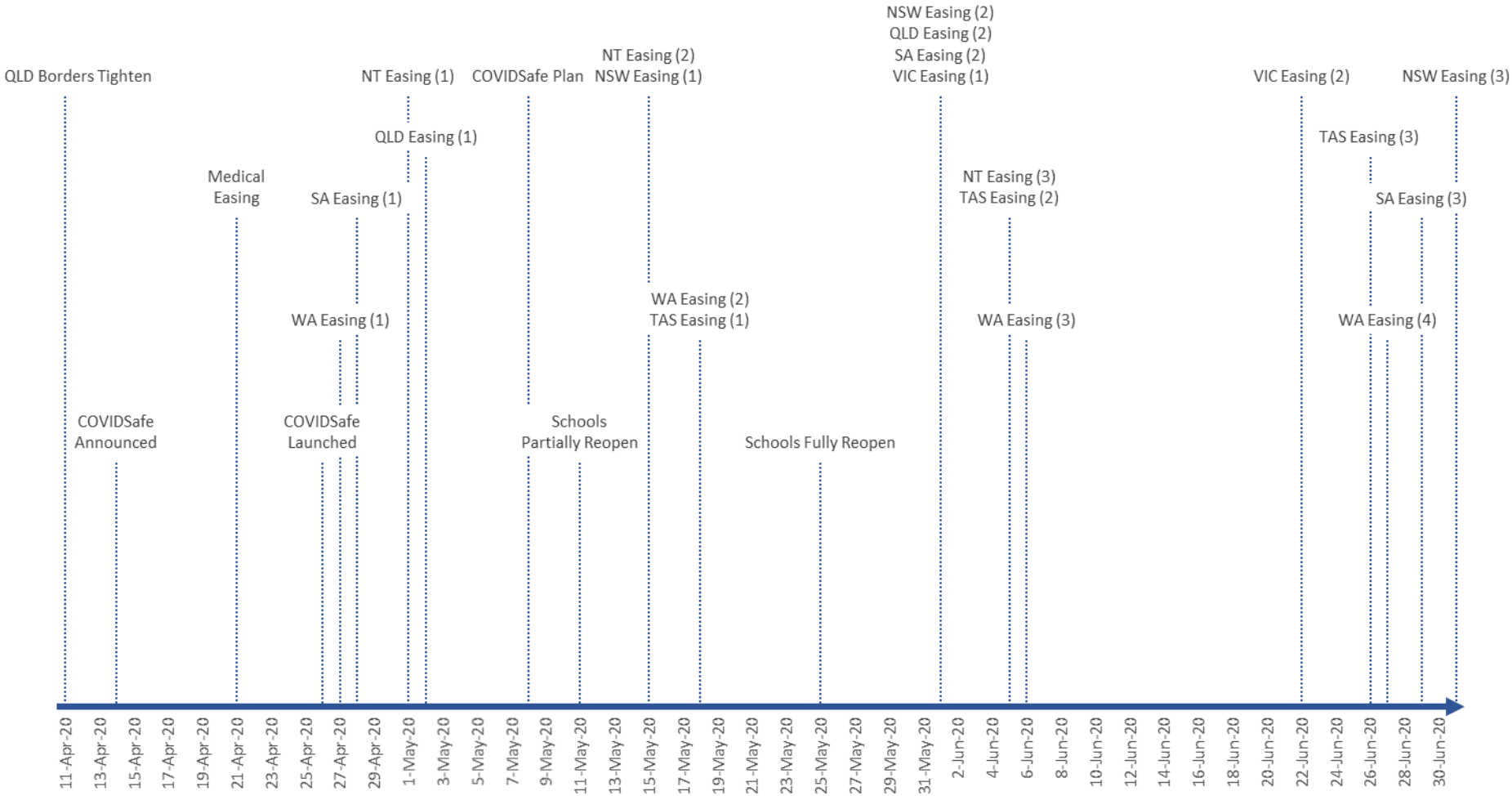

Figure 2: Ongoing Timeline of Key COVID-19 Events

Table 1: Summarising Key Events in Ongoing COVID-19 Timeline

11-Apr-20	QLD Borders Tighten	Entry passes required including for QLD residents VIC and NSW borders remain open; all others remain closed
14-Apr-20	COVIDSafe Announced	Development of COVID-19 track and trace app announced
21-Apr-20	Medical Easing	Restrictions on elective surgery will gradually ease from Tuesday 28 April
26-Apr-20	COVIDSafe Launched	Uptake reaches 5 million by 5th of May (plateaus at this approx. number)
27-Apr-20	WA Easing (1)	Indoor and outdoor non-work gatherings of 10 Outdoor training and recreational activities
28-Apr-20	SA Easing (1)	Non-work gatherings of up to 10 Cafes and restaurants open limit of 10
1-May-20	NT Easing (1)	Non-work gatherings of up to 10, Cafes and restaurants open limit of 10 Outdoor gathering restrictions relaxed, access given to NT Parks and Reserves
2-May-20	QLD Easing (1)	Gatherings in home of up to 5 guests, limit of 10 on outdoor and large spaces Recreational travel up to 150km from home, cafes and restaurants open limit of 10
8-May-20	COVIDSafe Plan	National Cabinet announces nationwide 3 step guidelines for easing restrictions
11-May-20	Schools Partially Reopen	Most schools across Australia open for attendance of at least one day per week
15-May-20	NT Easing (2)	Almost all activities resume, limited to 2 hours and 4sqm rule applies
	NSW Easing (1)	Gatherings in homes of up to 5 guests, outdoor gatherings of up to 10 Cafes and restaurants can seat 10, places of worship open with limit of 10
18-May-20	WA Easing (2)	Indoor and outdoor non-work gatherings of 20 Cafes, Restaurants, Pubs, Bars open with 20-person limit (with 4sqm rule)
	TAS Easing (1)	Gatherings in homes of up to 5 guests, outdoor gatherings of up to 10 Cafes and restaurants can seat 10, outside gyms allowed up to 10 people
19-May-20	**100 Deaths Nationally**	
25-May-20	Schools Fully Reopen	Most schools across Australia open for fulltime attendance
1-Jun-20	NSW Easing (3)	Pubs, clubs, cafes, and restaurants limit of 50 customers
	QLD Easing (2)	Gatherings of up to 20 in homes and public spaces, gyms and non-contact sport allowed, Museums and galleries open, no limit on recreational travel
	SA Easing (2)	Non-work gatherings of up to 20 Cafes and restaurants open limit of 20, pubs and clubs remain closed
	VIC Easing (1)	Up to 20 people can gather at homes, indoor, outdoor, or public space gatherings Cafes, Restaurants, Pubs, Bars open with 2 person limit (with 4sqm rule)
5-Jun-20	NT Easing (3)	All but 4sqm resumes, some small venues allowed 2sqm per person
	TAS Easing (2)	Gatherings increase to 20 people at a time for indoor and outdoor Visitors to households increase to 10 people at any one time
6-Jun-20	WA Easing (3)	Revision of spacing to 2sqm, non-work gatherings limited to 200 Venues with appropriate space limit of 300, gyms, cinemas and galleries reopen
22-Jun-20	VIC Easing (2)	Cafes, Restaurants, Pubs, Bars, museums, galleries have 50-person limit Cinemas, concert venues, theatres open with limit of 50 (with 4sqm rule)
26-Jun-20	TAS Easing (3)	Gatherings at households remain limited to up to 20 people Space require now 2sqm, upper limit of 250 indoors and 500 outdoors
27-Jun-20	WA Easing (4)	All existing gathering limits and the 100/300 rule removed All events permitted except for large scale, multi-stage music festivals
29-Jun-20	SA Easing (3)	No limit on non-work gatherings other than 4sqm rule 2sqm rule may apply to smaller venues, nightclubs remain closed
1-Jul-20	NSW Easing (4)	All businesses, can reopen with exception of night clubs No limit of numbers other than 4sqm rule being observed

The national approach to the relaxation of restrictions was announced on the 8th of May, based on the underlying principles of: maintaining a distance of 1.5m from those not in the family unit; regular and thorough hygiene and sanitisation practices, staying at home if unwell, and a COVIDSafe plan for workplaces and premises. The plan involved three stages: (1) allowing groups of people to be together in homes and in the community to reconnect with friends and family; (2) slightly larger gatherings and more businesses reopening, but tight restrictions remaining on activities deemed high risk; and (3) a commitment to reopening business and the community with minimal restrictions, but underpinned by COVIDSafe ways of living. Each state was given the responsibility to enact the staged easing within their state, in a timeframe that best suited that jurisdiction. As can be seen, in both Figure 1 and Table 1, most Australian states had progressed towards the roll-back of restrictions as the number of new cases plateaued.

2.2. Aggregate Impact on Travel Activity

Since the peak of the initial outbreak, the experience in Australia has been one of a steady state of low numbers of new cases, up until most recently[1]. This staging easing of COVID-19 restrictions has resulted in a slow increase in travel and activity in the largest economic and population centres in the country, Sydney (NSW) and Melbourne (VIC). The aggregate data collected by the CityMapper Mobility Index (CityMapper 2020) is presented in Figure 2 and shows that, relative to the baseline period, mobility has been trending upward at a slightly faster rate in Sydney than Melbourne, and while double the amount of activity is now seen compared to early April, mobility is still less than half that measured during the baseline period (4 weeks between Jan 6th and Feb 2nd, 2020).

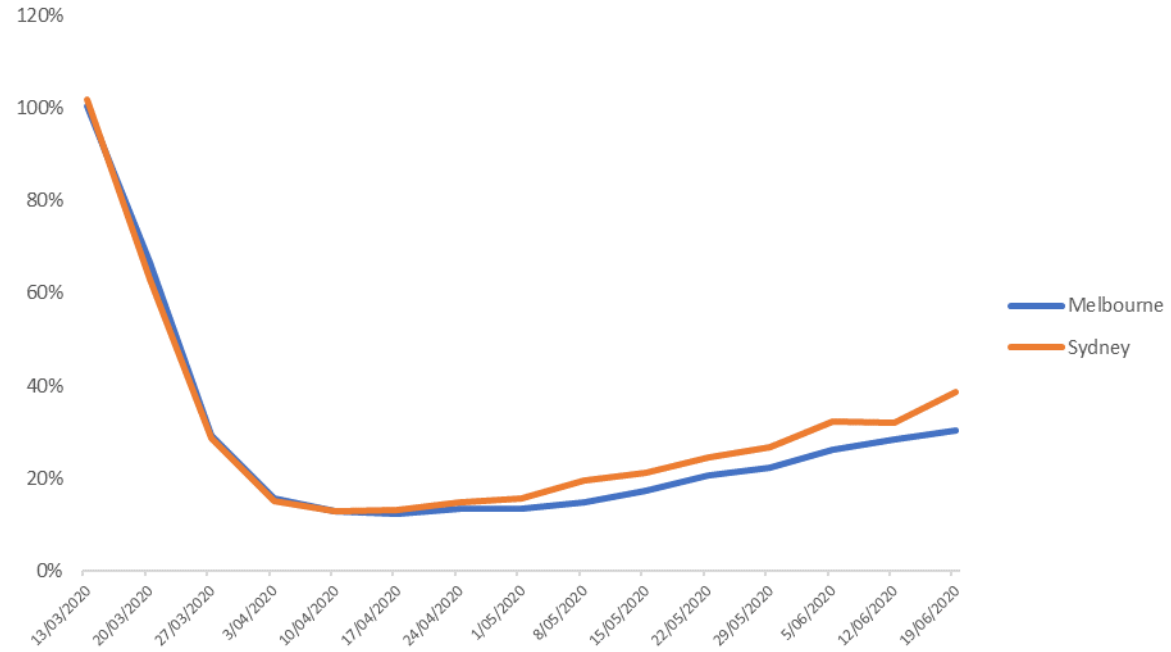

Figure 2: CityMapper Mobility Index Weekly Averages

[1] Following the initial draft of this paper, it was discovered that there were serious lapses in the quarantine protocol implemented by the Victorian government, linked to laxed practices of private sector guards used in hotels where returning overseas residents are quarantined. All cases in the growing community transmission in New South Wales have been linked to Victoria, as a result of not closing the border between the two states.

Likewise, the Google Community Mobility Report (Google 2020) presented in Figure 3 (which aggregates data across Australia and compares to the median value for the corresponding day of the week during the 5-week period Jan 3–Feb 6, 2020 as a baseline) shows a sustained increase in time spent at work, retail and recreation, and parks, while time at home has slowly diminished. The data shows that time at transit stations is recovering at the same rate of increase as other activities but remains lower due to the larger slump that occurred in early April. In totality these two figures seemingly indicate that Australia was returning to some degree of normality given the work and retail results, though in the major capital cities travel for work might be suppressed, particularly travel on public transport.

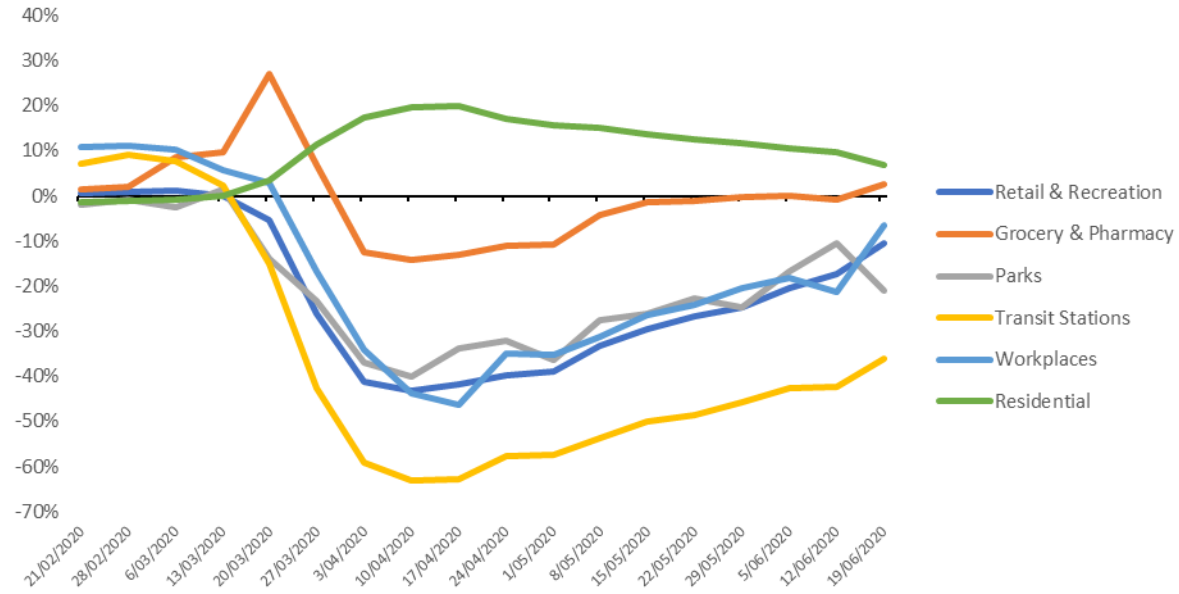

Figure 3: Google Mobility Report Weekly Averages for Australia

In this paper we present analysis on working from home and commuting data collected in the second wave of the ongoing travel survey into the impact of COVID-19. The paper, where possible, compares and contrasts aggregate results from Wave 1 and Wave 2 data collected at different points in the COVID-19 curve, but we also introduce new insights as we focus more on working from home and changes therein. Overall we attempt to continue to update policy makers and those in the transport community on the conditions surrounding travel and work as COVID-19 transmissions patterns change, but also as the restrictions on movements and activities change in response to the shifting conditions of the pandemic. The rest of this paper is structured as follows: section two provides an overview of the sample collected for Wave 2; section three discusses the results of overarching analysis; section four provides a discussion of the results and the potential policy implications that arise from the result found herein; section five discusses limitations of this study and identifies areas for future research; and section six provides the conclusion.

Note that we limit ourselves to aggregated analysis in this paper, given the desire to share timely information and the already large number of results discussed in this work. We recognise that understanding the dynamics of changing behaviour at an individual level is crucial and as the panel nature of the data grows, ongoing work will seek to examine change and adaption at an even more disaggregate level.

3. Sample Description

The second wave of the ongoing COVID-19 Travel Survey was in field from the 23rd of May to the 15th of June, with data being collected in two segments. Firstly, respondents from Wave 1 were approached to complete the survey to begin the panel nature of the survey with as robust a sample size as possible. The Wave 2 data comprises 1,457 observations made up of 762 respondents who participated in Wave 1 of the survey, and an additional 695 new recruits to supplement Wave 2. As with Wave 1, the online survey company PureProfile was used to sample respondents, and the survey was available across Australia in order to examine the widespread impact of COVID-19. A summary of the Wave 2 sample is provided in Table 2.

Table 2: Overview of Survey Sample

Female	58%
Age	48.2 (σ = 16.2)
Income	$92,891 (σ = $59,320)
Have children	35%
Number of children	1.7 (σ = 0.9)

New South Wales	32%
Australian Capital Territory	2%
Victoria	24%
Queensland	18%
South Australia	11%
Western Australia	10%
Northern Territory	1%
Tasmania	3%

For the purposes of this overarching analysis and to be consistent with the same headline analysis in Beck and Hensher (2020), socio-demographics differences are explored based on gender, age (younger (18 to 34, n=361); middle-age (35 to 54, n=461); older (55 or older, n=635)), and household income (lower income (less than $100,000, n=793); middle income ($100,000 to $200,000, n=340) and high income (more than $200,000, n=62). Given that the focus of Wave 2 was to establish a panel that was as large as possible, quotas were not introduced on those completing the survey, other than ensuring representation from all states and territories. The impact of COVID-19 is, however, sufficiently widespread that no demographic can escape the disruption caused.

4. Results

4.1. Travel Activity

4.1.1. Impact of COVID-19 on Overall Travel

Unsurprisingly, and as was the case in Wave 1, the results from Wave 2 presented in Figure 4 in the survey mirror the aggregate findings, and generally also show a comparable rate of trip generation as that found in the weekly GPS tracking project conducted in Switzerland (MOBIS-COVID19 2020). In terms of this overall travel, we see a reported 50% increase in the number of household trips over the week, from Wave 1 to Wave 2, but household travel remains significantly suppressed. In terms of changes to the current level of travel activity, the majority of respondents (83%) report that they are planning to maintain household travel at Wave 2 levels, however among the 17% of households who are planning change we can see a dramatic increase, with the level of planned activity among this group almost returning to that which was reported prior to COVID-19.

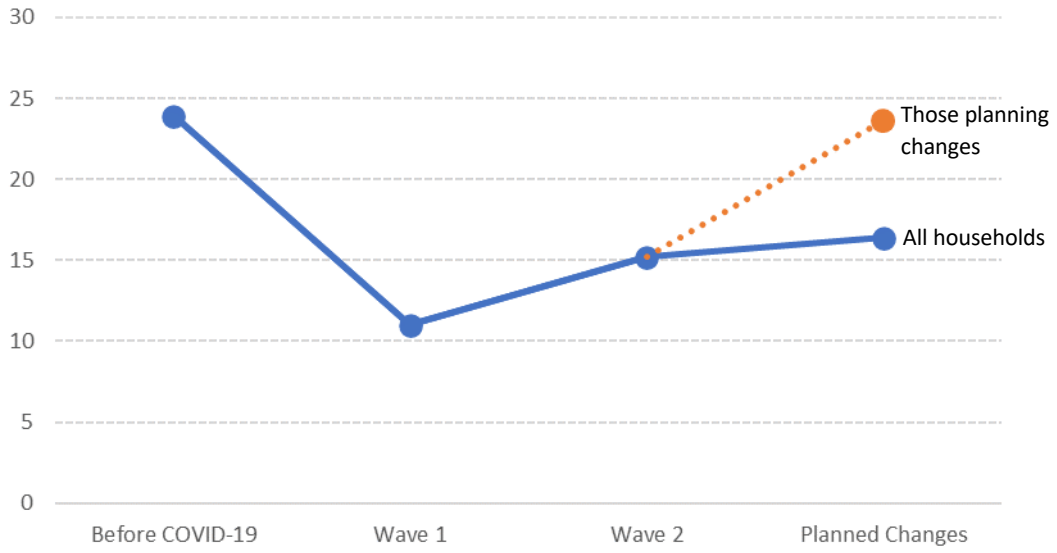

Figure 4: Impact of COVID-19 on Reported Household Weekly Trips

With respect to trips reported in Wave 2, younger respondents are exhibiting a significantly higher average number of household trips (19.8) than both middle-aged (15.8) and older (11.9) respondent households. The difference between middle-aged and older respondents is also significant. This travel behaviour is perhaps a function of the relative risk attitudes and the perceived and/or real threat presented by COVID-19 to each age group. Higher income (22.7) and middle income (18.2) households report significantly more average trips in Wave 2 than lower income households (13.6). There are no differences by gender for household trips reported in Wave 2 or planned in the upcoming week, nor are there differences in planned travel by age and income groups.

4.1.2. Travel by Mode & Purpose

Figure 6 and Figure 7 show reported household travel before the outbreak of COVID-19, during Wave 1 and Wave 2, and projects planned household travel for the upcoming week following Wave 2 data collection. In every instance we see a rebound in travel by mode and for every purpose. As anticipated by many, there is a strong bounce back in travel by car and in aggregate, active transport activity has returned to pre-COVID-19 levels. General shopping has increased, and there is a slight rebound in education and childcare trips, along with general shopping. Commuting and work business trips remain relatively flat, with working from home perhaps proving a more viable option than many initially thought (of course increased unemployment may also play a role in suppression commuting travel).

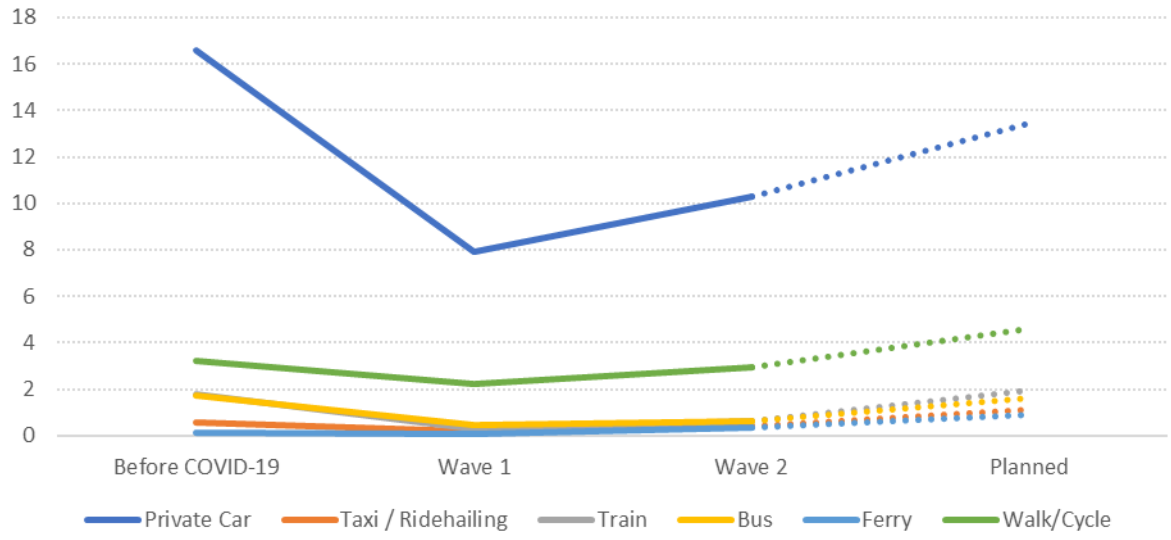

Figure 6: Reported Weekly Household Trips by Mode

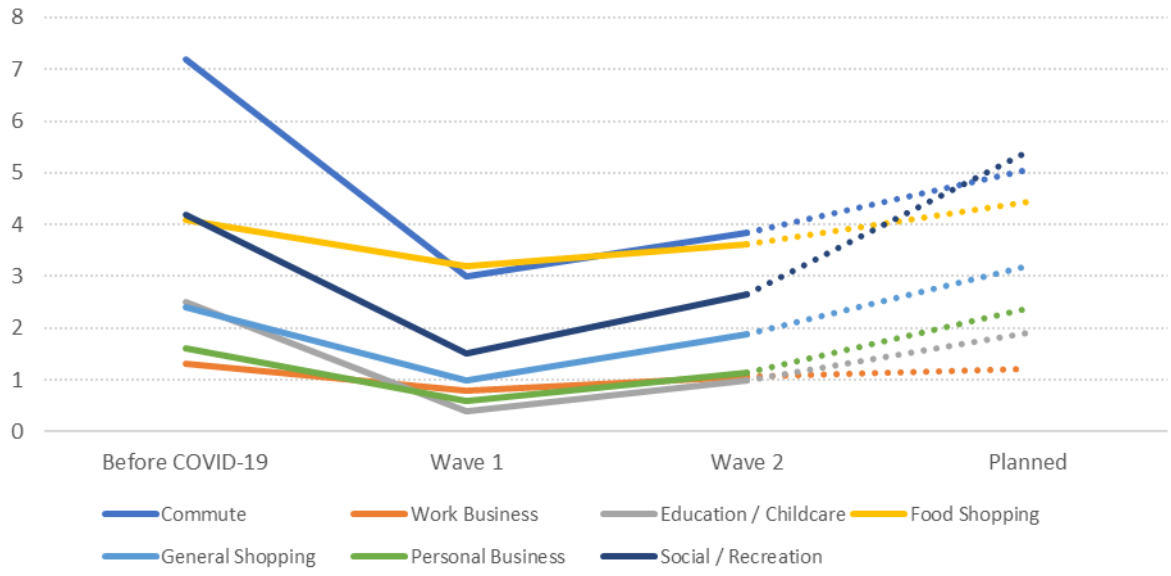

Figure 7: Reported Weekly Household Trips by Purpose

In terms of household plans, we can see that the private motor vehicle is expected to continue the strong return to pre-COVID-19 levels. Interestingly, we also see stated intentions to return to public transport modes of buses and trains, as well as a reported spike in active transport modes of walking and cycling. With respect to travel by purpose, the projected growth in shopping (food and general), personal business, and social and recreation trips suggests that non work trips are more than returning to "normal", indeed households may even be making up for lost time with respect to these activities. This is particularly true of social and recreation activity, where the planned number of trips in the upcoming week is significantly larger on average, than the number of trips made in the Wave 2 data collection period.

With respect to broad socio-demographic differences, females report an intention to use trains at a significantly higher average amount, exhibit significantly higher average trips for education and childcare purposes (both in Wave 2 and the number of future trips planned), and also plan to engage in more food shopping and social and recreational trips in the week moving forward.

Higher and middle-income households both report a significantly higher average number of trips made by private car than lower income households. High income households also report more train trips than middle-income and lower income households, and taxi or ride-hailing trips than lower income groups. They also plan to take more ferry trips. Higher income and middle-income households report a higher average number of trips for commuting purposes than lower income, higher income groups also report more work-related business trips than households on lower incomes. Higher income households also report significantly more travel for social and recreational purposes than both middle-income and lower income households. Planned travel for different purposes is invariant across income groups.

Younger respondents report higher average household trips by private car, train, and bus during Wave 2 than both middle-aged and older respondents, as well as more active trips on average than older respondents. Younger respondents are also planning significantly more travel by taxi, train, bus, and ferry than older respondents. With respect to travel for different purposes, younger respondents also report more commuting trips, trips for education and childcare, food shopping and general shopping than middle-aged and older respondents. Older respondents plan on making less trips for work-related business and education and childcare than middle-aged and younger respondents, and significantly less trips for food shopping than those in the youngest age category.

4.1.3. Relative Mode Use Changes

Given the anecdotal evidence in new media sources about increased use of active travel modes (Abano 2020, Landis-Hanley 2020) and greater use of public spaces for exercise and recreation (O'Sullivan 2020), questions were included in Wave 2 around whether or not respondents had felt they had increased or decreased use of different modes in the previous week, and how they were planning to change their use as restrictions were eased. The results of these questions are shown in Figure 8. Note that in Wave 1 questions were not asked about the relative change in active transport modes, but were added to the Wave 2 set given the anecdotal evidence from new media that active transport had increased.

Motor vehicle use exhibits the biggest fluctuations in usage, especially compared to the result from Wave 1 when 66% of respondents had decreased car use. Now, however, half of respondents are using their car the same as they did the week prior, 25% have decreased car use relative to the previous week and 16% have increased usage. In terms of planned future use, in the week following

data collection a small majority of respondents are planning to use their car the same amount (52%), but we start to see the number of people planning to increase car use exceed those who are planning to decrease. Older respondents are less likely to increase car use than the middle-aged and younger age groups.

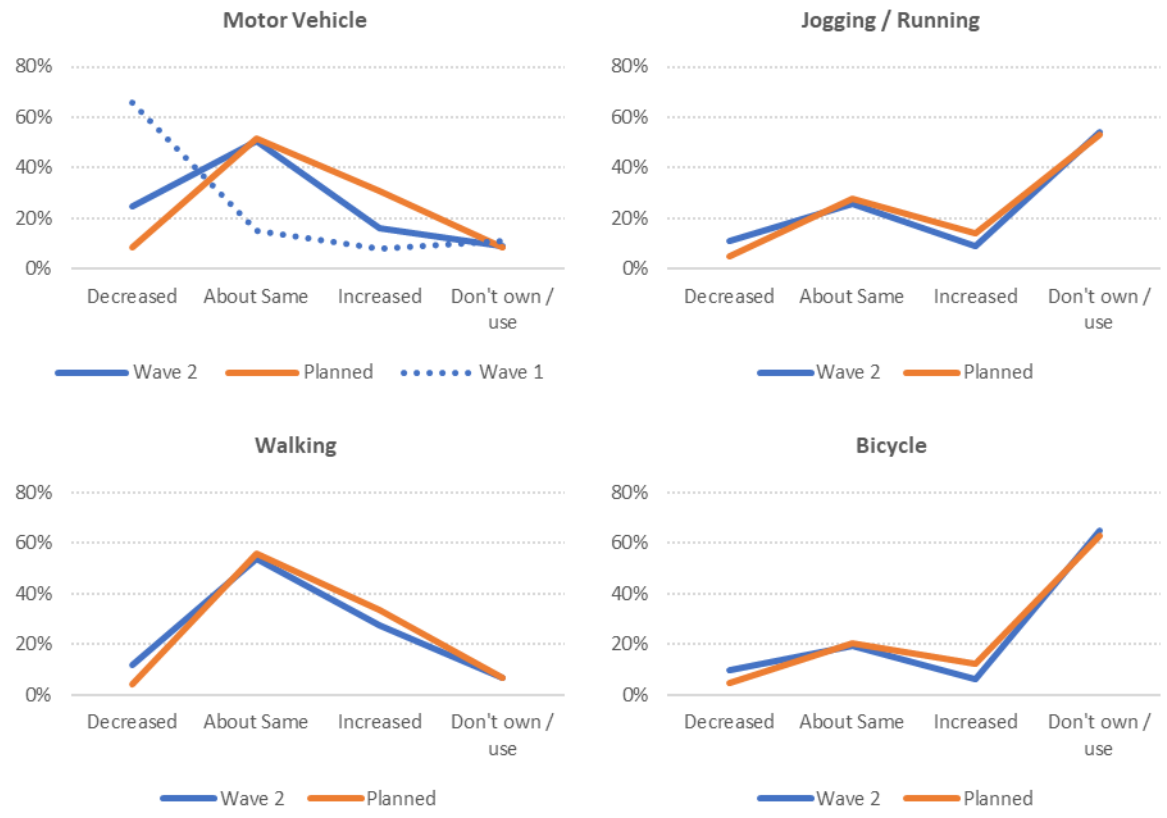

Figure 8: Changes to Use of Active Modes and Motor Vehicle

Breaking down changes in car use in a little more detail, for those respondents who said they decreased use of their car, the average reduction is 59% (σ = 28%), which is largely the same result as discovered in Wave 1 (μ = 60%, σ = 27%). For those that stated increased car use, the average increase is 37% (σ = 27%), which also mirrors Wave 1 (μ = 35%, σ = 30%). Across the sample, including those who stated they use their car about the same (0% change), there is an overall average reduction in car use of 7.8% (σ = 34%). These averages are invariant to gender, age, or income.

In terms of the active modes, what is most striking in these figures is how reported use in Wave 2 and planned use moving forward are largely identical. With respect to walking, more respondents reported an increase in Wave 2 (27%) than a decrease (12%), with younger respondents more likely to have reported an increase. With regards to running or jogging, the number who have increased (9%) or decreased (11%) are roughly balanced, younger people again are more likely to have stated an increase in this activity and unsurprisingly older respondents are more likely to not engage in running. The number of people who reported an increase in bicycling (15%) exceeds the number who have decreased use (4%), again older respondents are less likely to engage in this activity.

In terms of future use, for each of the active modes more respondents report an intention to increase their use of that activity than decrease: 34% vs 4% for walking (with younger respondents more likely to plan an increase in use); 14% vs 5% for walking (with younger respondents more likely to plan an increase in use); and 12% versus 4% for bicycling. While there is evidence that participation in these activities has increased overall, it is has not grown by a sizeable amount, though perhaps growth may be more pronounced in metropolitan areas even more so in locations where population density is high. Interestingly while more respondents plan to increase their use of active modes as compared to decrease, it remains to be seen if this behaviour will eventuate or if it just an indication of good intentions.

4.2. Concern about Public Transport

The perception that people have about the cleanliness and hygiene of public transport was also tracked in Wave 2, and the results are shown in Figure 9. Compared to Wave 1 we have seen a large moderation in concern, with reduction in the number of people extremely concerned about these modes of transport. Indeed, the average response to the concern scale in Wave 2 ($\mu = 3.7$) is significantly lower than in Wave 1 ($\mu = 4.3$), however average concern still remains at a level that is significantly higher than that prior to COVID-19 ($\mu = 2.4$). Females are significantly more concerned about the cleanliness of public transport, as too are younger respondents relative to those in middle-aged and older age categories, this last result perhaps explaining why train, bus and ferry use in this age bracket is significantly higher in Wave 2, and planned to be higher than other age groups moving forward.

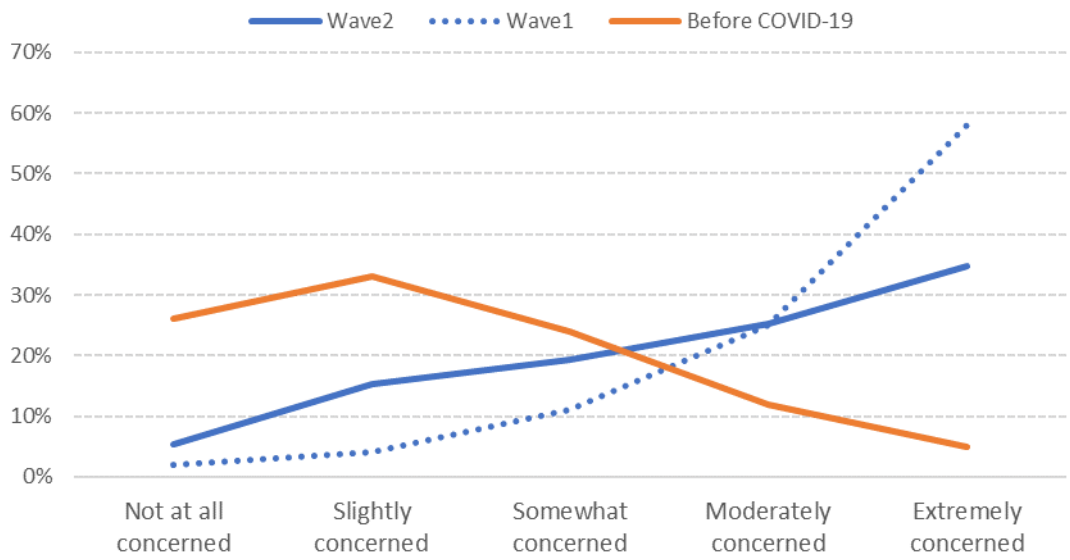

Figure 9: Reported Weekly Household Trips by Mode

4.3. Work and Working from Home

4.3.1. Changes to Work and Work Location

The impact of COVID-19 on the nature and availability of work continues to be profound. The government regulations designed to limit the spread of COVID-19, while in the process of being eased, ripple through the economy, as shown in Figure 10a and 10b. Only 37% of sample have not been impacted by government regulations, just over a quarter have been personally impacted, one in five (18%) also report someone in their household having been impacted and one-third know someone whose employment has been impacted as a result of the restrictions. Those in the younger age group are more likely to have been personally impacted (43%) and/or have a household member who has been impacted (23%). Respondents were also asked if their pay had been impacted by COVID-19 measures and while the impact here is lesser than that on employment (two-thirds have not been impacted), a number of respondents are working for less income than prior to COVID-19.[2]

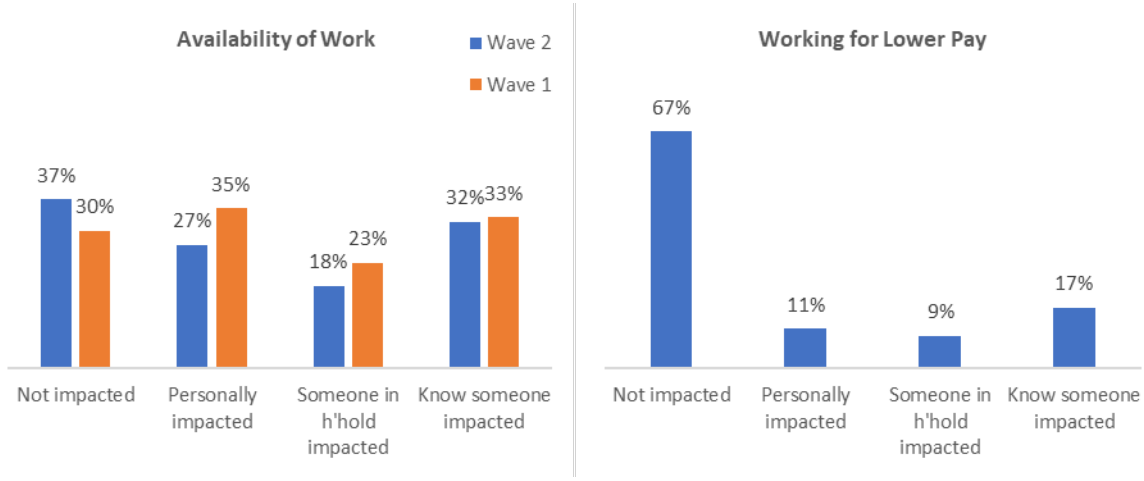

Figure 10a and 10b: Impact of COVID-19 Restrictions on Work and Pay

Looking at the impact on households in more detail, Figure 11a and 11b show the number of household members (including the respondent) who were working fulltime and part-time before COVID-19 and during the Wave 2 data collection period. Note that while these figures are in aggregate and includes respondents who are unemployed, retired or home makers, the number of households who report zero household members in fulltime employment rises from 38% before COVID-19 to 47% in the Wave 2 data, an increase of approximately 25%. The impact on part-time employment thus far, has been less extreme.

In terms of the number of days worked over the last week among those who were working prior to COVID-19, the average number of days has increased from 3.0 days in Wave 1, to 3.4 days in Wave 2, but remains significantly less than the average of 4.3 days, before COVID-19. The number of people working zero days has fallen from 26% in Wave 1 to 17% in Wave 2. Males are working more days on average in Wave 2, and middle-aged respondents are working more on average than those in the younger age group. With respect to working from home, levels still remain well above those prior to COVID-19 (μ = 1.8 days), with respondents spending an average of 3.0 days working from home per week., however this number is down from the Wave 1 average of 3.3 days.

[2] In both waves, with the exception of "Not Impacted", respondents were able to select more than one option.

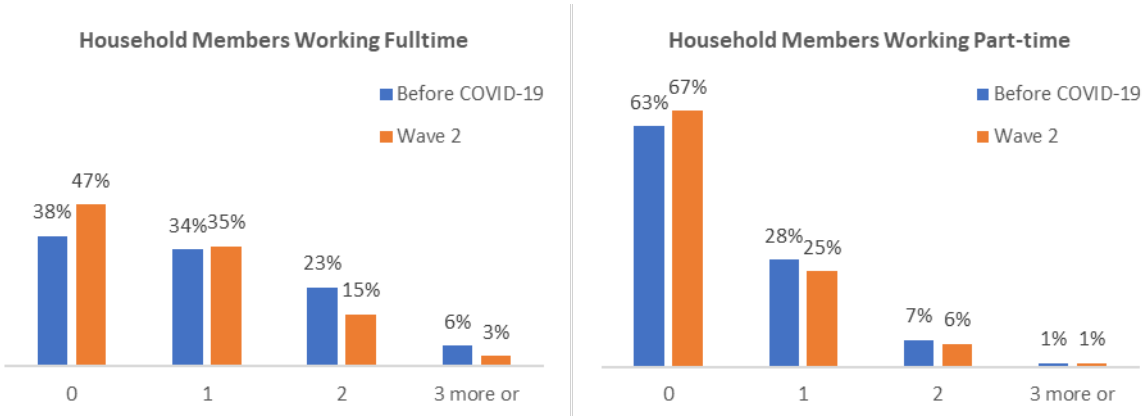

Figure 11a and 11b: Impact of COVID-19 on Household Employment

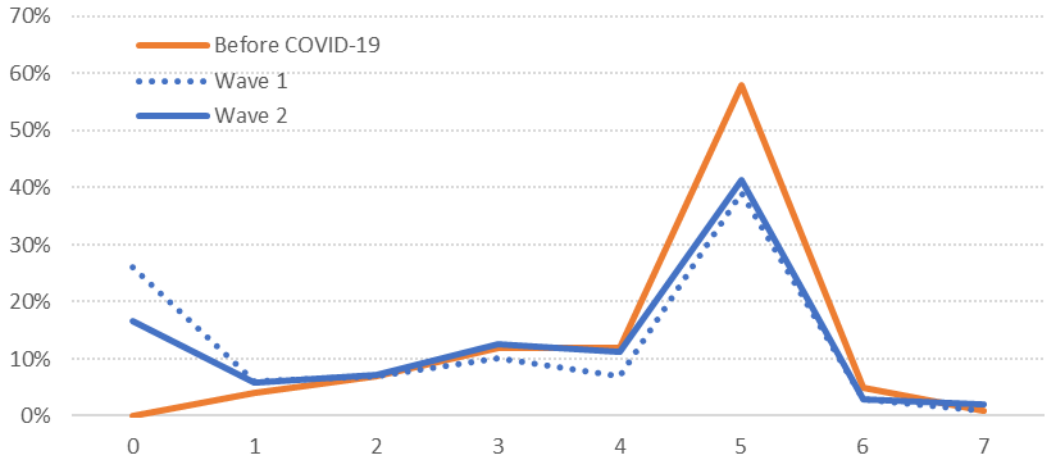

Figure 12: Number of Days Worked in Last Week

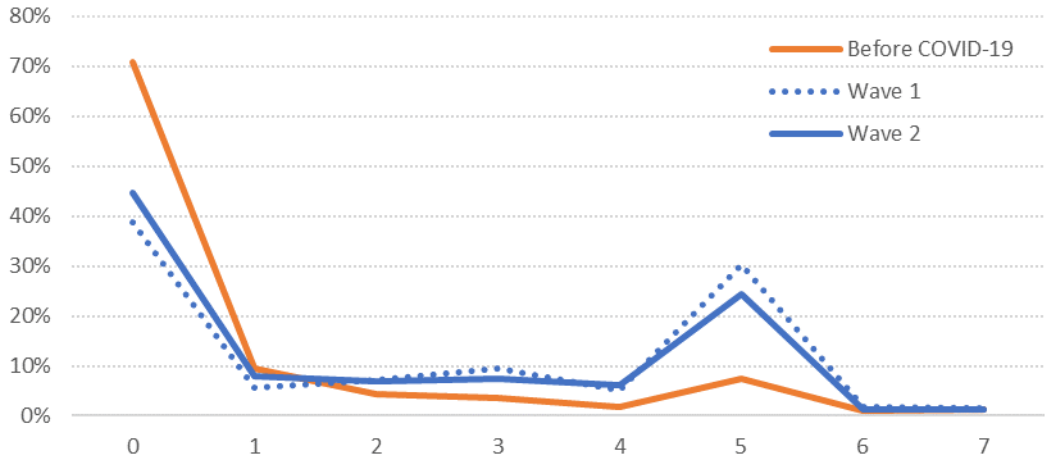

Figure 13: Number of Days Worked from Home Last Week

Respondents were further asked to nominate the type of environment they normally work in, the results of which are shown in Figure 14. The "Other" category predominantly includes those who work from home, out of vehicle, or in hospitals or schools. Females are more likely to work in open plan or shared space offices (32% vs. 23%) and retail environments (14% vs. 9%), whereas males are more likely to have their own office (28% vs. 19%). Younger respondents are less likely to have their own office (19%) and more likely to work in retail environments (19%). Lower income groups are more likely to work in retail environments, indoor spaces with small teams, or outdoor spaces with small teams and less likely to work in open plan offices. As income increases, respondents are more likely to have their own office.

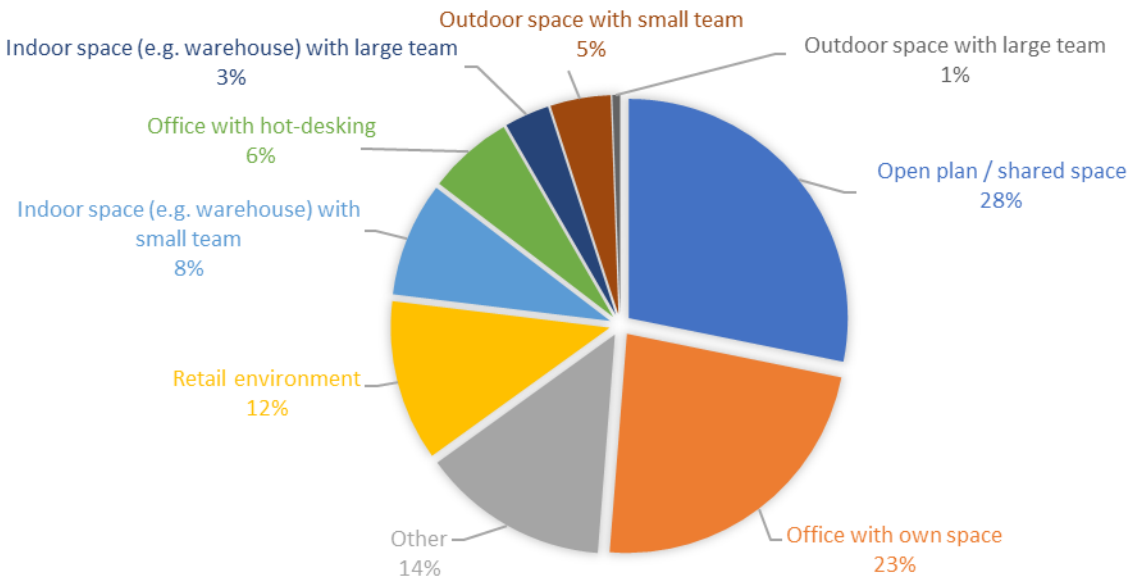

Figure 14: Type of Physical Work Environment

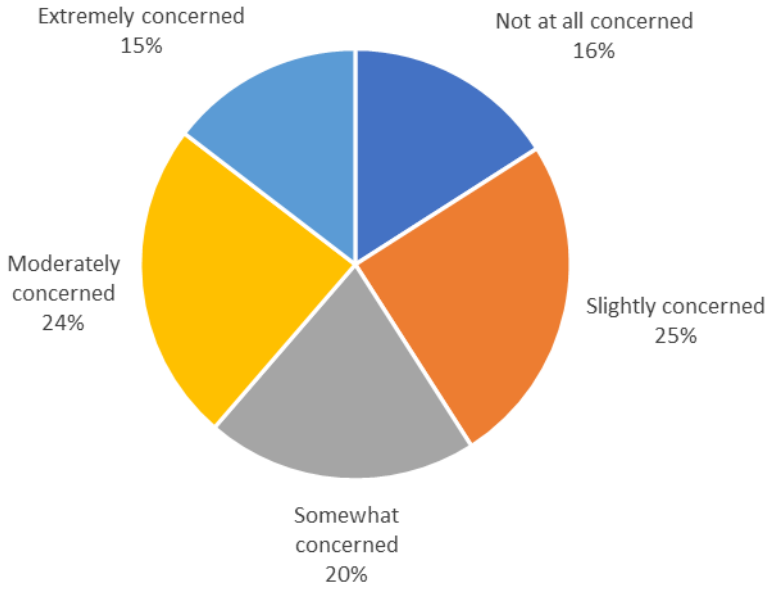

Figure 15: Concern about COVID-19 Given Work Environment

Respondents were also asked to state their level of concern about COVID-19 given the nature of the environment in which they worked. While the average is at the middle point of the scale ($\mu = 3.0$ $\sigma = 1.3$), Figure 15 shows a wide variety of views with approximately the same number of respondents exhibiting either no or slight concern as showing moderate or extreme concern; females are significantly more concerned on average.

4.3.2. Examining the Work from Home Experience

Following the noted increase in working from home observed in Wave 1, Wave 2 attempted to explore the experiences with working from home in more detail (introducing new questions) to better understand the scope of experiences, given that for many there was little time to prepare and while it may work well for some, others face barriers such as children, other household members working from home, inadequate space for working from home, and so on.

With respect to the ability of a respondent to work from home, Figure 16 shows a decrease in the number of respondents whose work cannot be done from home, but an increase in the number whose work place has no plans for working from home and, unfortunately those whose work place has closed. We also observe a reduction in the number of employees who are directed to work from home, perhaps reflecting the erosion in the average number of days worked from home in the last week, discussed in the previous section.

Males are more likely to be employed in workplaces that have no current plans to allow working from home, and females more likely to be in workplaces that are now closed. Respondents in the younger age category are more likely to be employed in a position where work cannot be completed from home. Lower income groups are more likely to be in workplaces that have no plans to allow work from home, or whose workplace has closed. As income increases, it is more likely that a respondent works in a position where they are being directed to work from home.

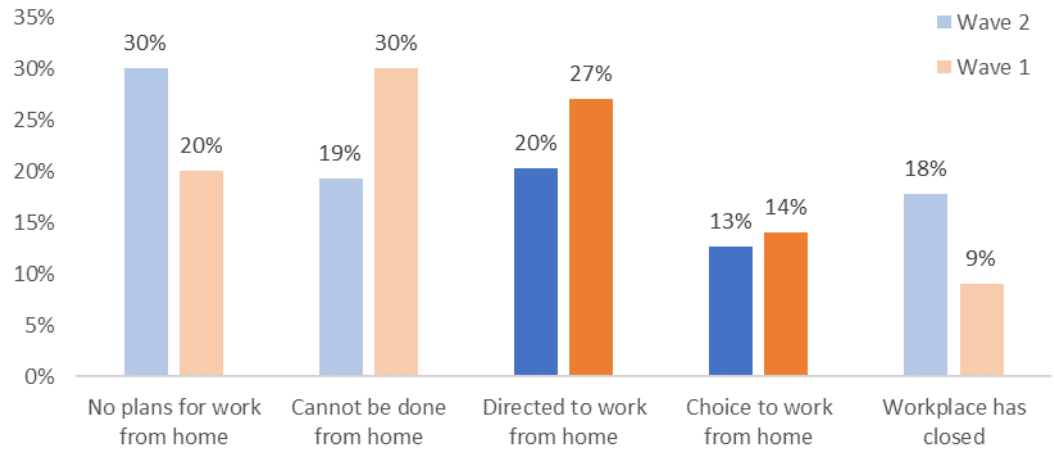

Figure 16: Ability to Work from Home

Respondents were also asked how many hours of work they feel they can complete when working from home. As displayed in Figure 17, 60% of the sample complete somewhere between 5 to 8 hours of work, with an approximate average of 6.2 hours. Those on higher incomes are more likely to report

a higher number of hours worked per day, when working from home. Respondents were also asked to assess their level of productivity when working from home, and the sample average of 3.1 ($\sigma = 1.1$) indicates that in aggregate those working from home perceive little difference in productivity. Indeed, almost double the number of respondents find working from home to be a lot more productive (12%) than a lot less (7%). Middle-aged respondents and those on higher incomes report high levels of productivity, on average.

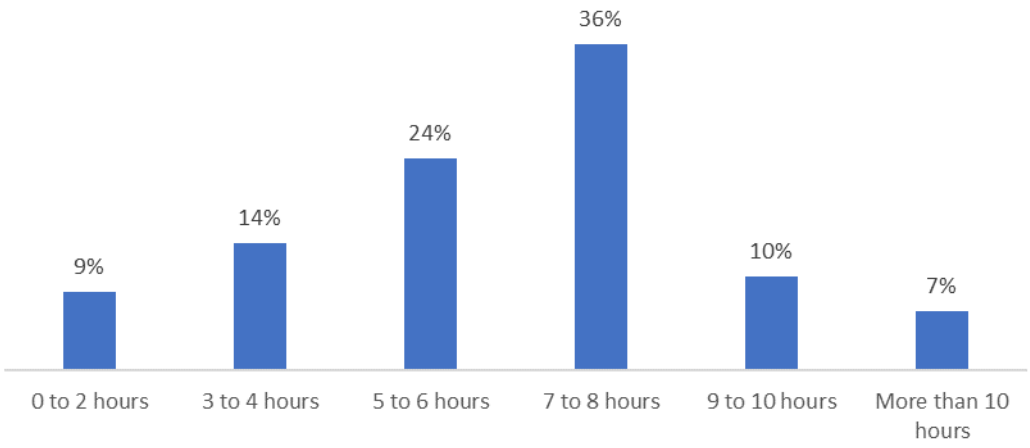

Figure 17: Hours of Work Completed when Working from Home

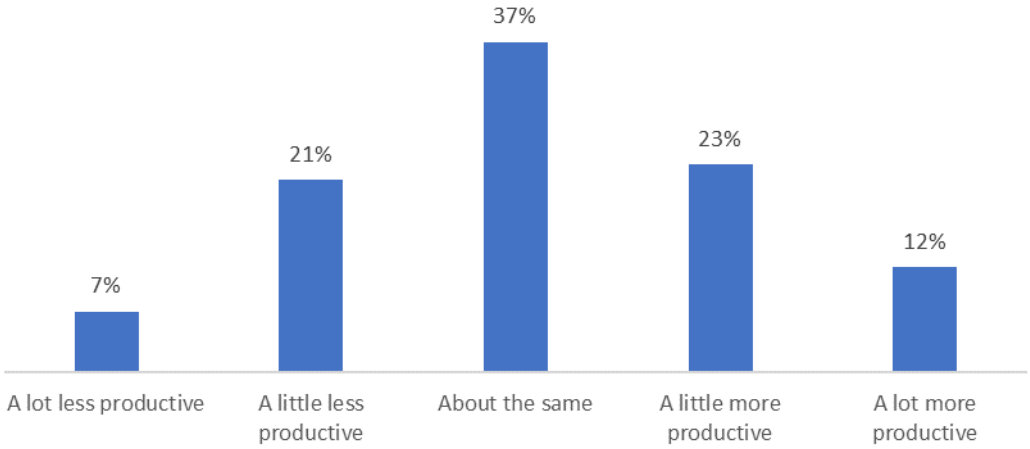

Figure 18: Hours of Work Completed when Working from Home

To understand the positive and negatives of working from home, and thus obtain insight into what measures may be needed as restrictions ease in order to maintain current levels of work from home, respondents were asked to rank the benefits and challenges that they experience when doing so. The results of this task are presented in Figure 19. With respect to the benefits, the highest ranked benefit is not having to commute followed by the creation of a more flexible work schedule. Males are more

likely to rank flexible work schedule as the biggest benefit as are those in the younger age bracket. Older respondents are less likely to rank no commute as the biggest benefit than other age groups. With respect to the challenges of working from home, the disruption from family and children is the one most often ranked highest, but overall the ability to concentrate on work is perhaps the challenge faced by most (with the exception of older respondents who are less likely to rank this challenge as the biggest or second biggest relative to other age groups).

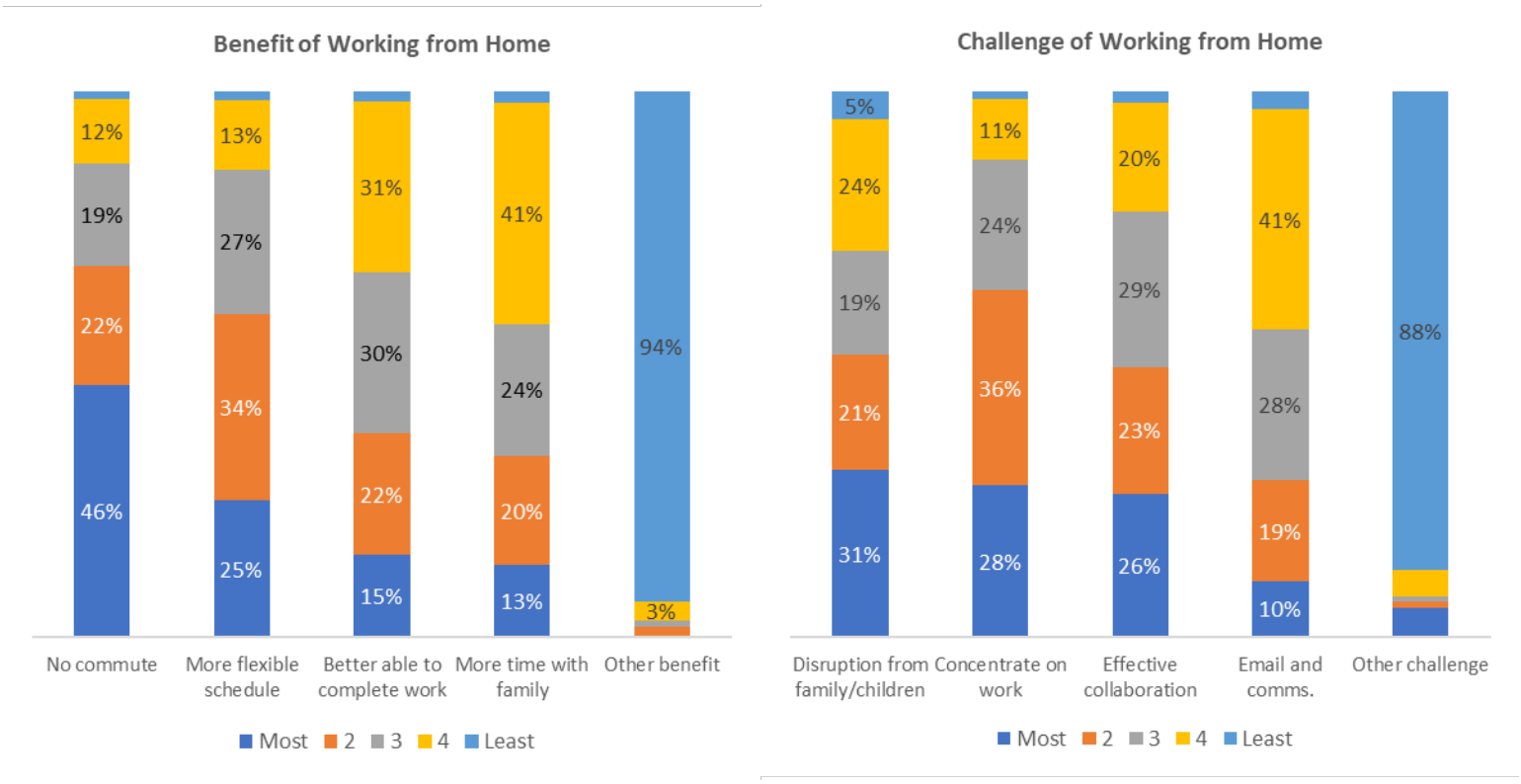

Figure 19: Benefits and Challenges of Working from Home

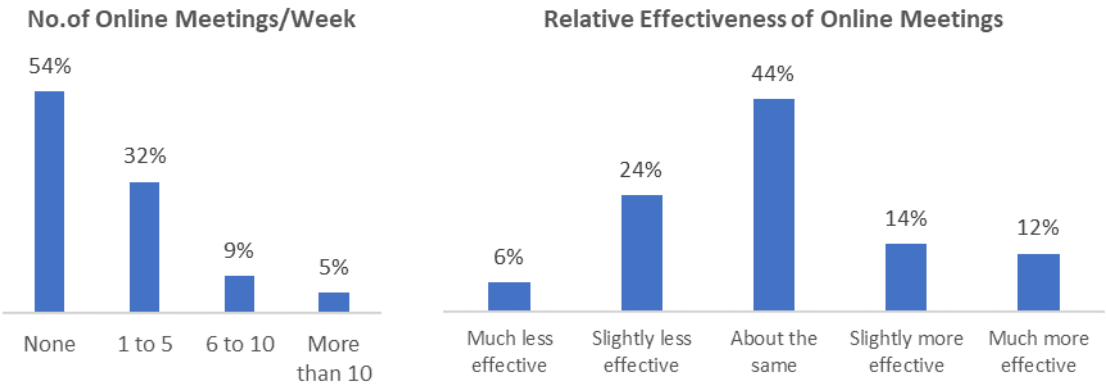

Figure 20: Online Meetings and Relative Effectiveness

Additional questions were asked about the number of online meetings that are had and their relative effectiveness, the results of which are shown in Figure 20. While many respondents do not have online meetings over the course of working from home (54%), among those that do the most common frequency is 1 to 5 per week. In terms of how productive the meetings are, in aggregate it appears that respondents find online meetings just as productive as face-to-face meetings, with those in the middle age reporting a significantly higher average productivity than other age categories. It should also be noted that there is no correlation between the number of online meetings a respondent has per week and their rating of the relative productivity of those online meetings.

Given the benefits and challenges experienced over the previous 2-3 months of working from home as a result of COVID-19, respondents were asked how much they agreed or disagreed with a series of statements related to working from home and more flexible work, the results of which are displayed in Figure 21. Overall agreement is similar across all statements, but there is more agreement (agree and strongly agree) that the appropriate balance between work and not working can be found, and that the space at home is appropriate for work. Older respondents and higher income categories are more likely to agree that they have an appropriate space at home from which to work, and older respondents also are more likely to be able to find the balance between paid and unpaid work. Higher and middle-income groups agree more so than low income groups that more flexible work schedules would be preferred in the future.

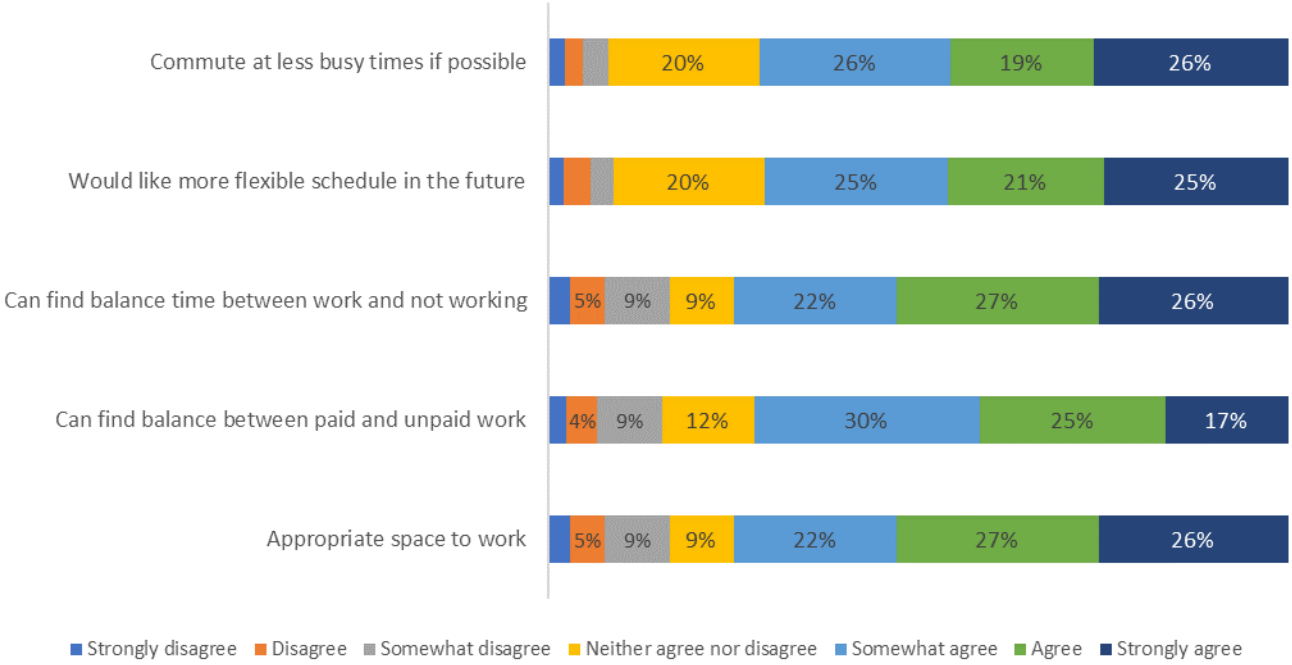

Figure 21: Attitudes about Work from Home and Flexible Work

To gauge the likelihood of working from home being a larger part of the transport mix moving forward, the final question in this set asked respondents whether working from home had been a positive experience for them. As seen in Figure 22, overwhelmingly the experience has been positive with almost half the sample agreeing or strongly agreeing that this is the case, with 71% of agreement overall. As the work from home experience becomes more embedded and new routines are formed,

it is also likely that the experience will improve. Interestingly, females report a significantly higher average level of agreement, as do those on higher incomes. Younger respondents report significantly less positive experience than other age categories.

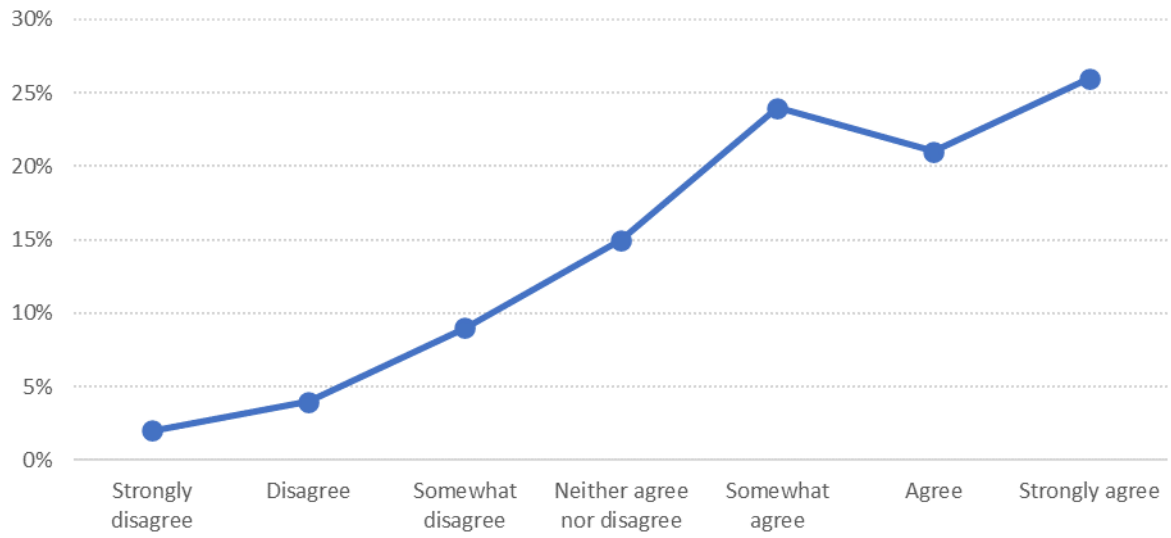

Figure 22: Work from Home has been a Positive Experience

4.3.3. Exploring the Future of Work from Home

To build further on the likelihood of travel and commuting being disrupted by an increased take up of working from home, a series of questions about work in the future were asked. Figure 23 shows the number of days respondents would like to work moving forward as restrictions ease. Interestingly the number of days worked moving forward, while higher than now, is less than the level of employment prior to COVID-19. This may be a function of people overall wanting to work less, but also being somewhat tentative when thinking about how much work might be available as we move forward. The average number of days is invariant across gender, age, and incomes.

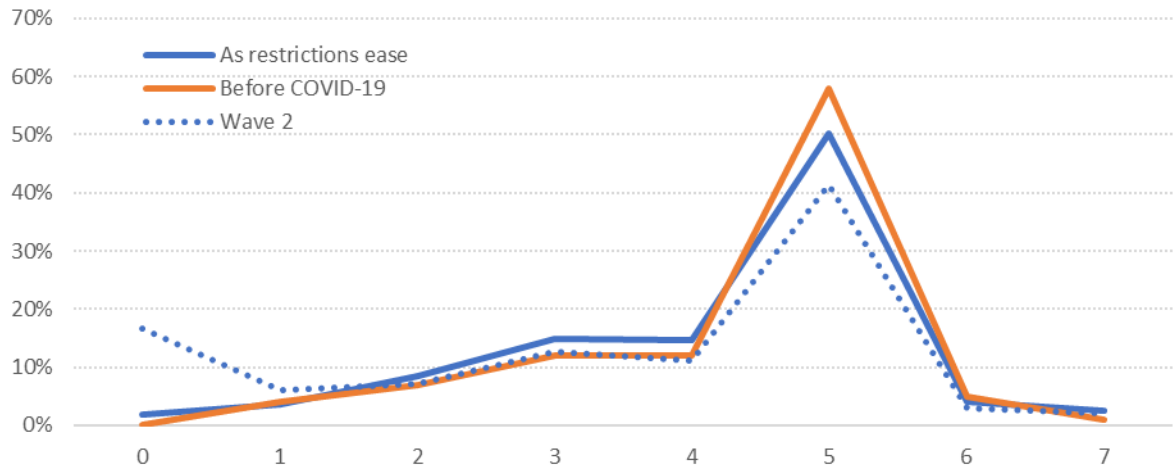

Figure 23: Days Wanting to Work

The future of working from home, shown in Figure 24, follows a similar pattern to the numbers of days worked: the levels of working from home are lower than they are now, but respondents would like to work from home more than they did before COVID-19. Younger and middle-age respondents would, on average, like to work more days from home as restrictions ease, than older respondents.

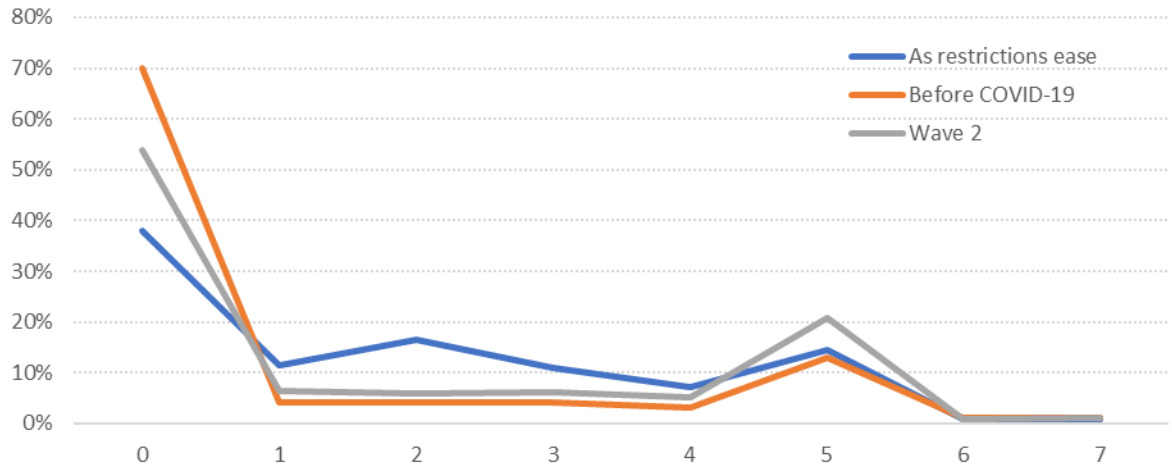

Figure 24: Days Wanting to Work from Home

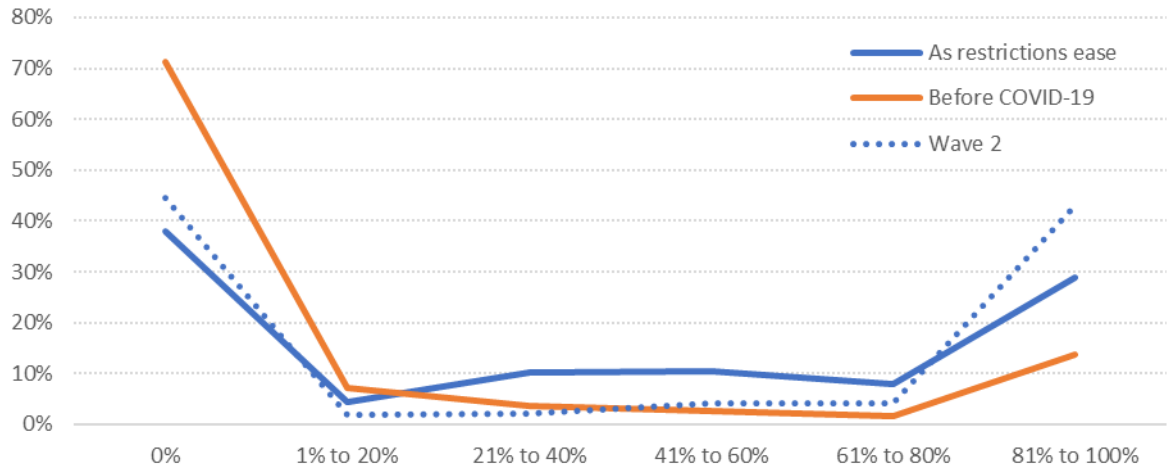

Figure 25: Days Wanting to Work from Home as Proportion of Days Worked

To accommodate the different number of days worked by respondents, the number of days worked from home was converted to a proportion of the total number of days worked and is shown in Figure 25. What is revealed in this graph is the interesting finding that right now, working from home is an all or nothing proposition, with the numbers working 1% to 80% of their days at home being very small, and the number working 80% of more having spiked to 45% during Wave 2. However, as restrictions ease, we see a desire for the extreme levels of work from home to decrease, but a small albeit sustained rise in the number seeking to work somewhere between 20% to 80% from home.

Interestingly, there is a significant positive correlation between the proportion of time spent working from home now and the proportion of time someone would like to work from home in the future.

An important component of increased work from home into the future is the ongoing support of companies and employers. As shown in Figure 26, overall, there is an even split between workplaces that have had conversations about working from home and those that have not, which holds across employees, managers and employers.

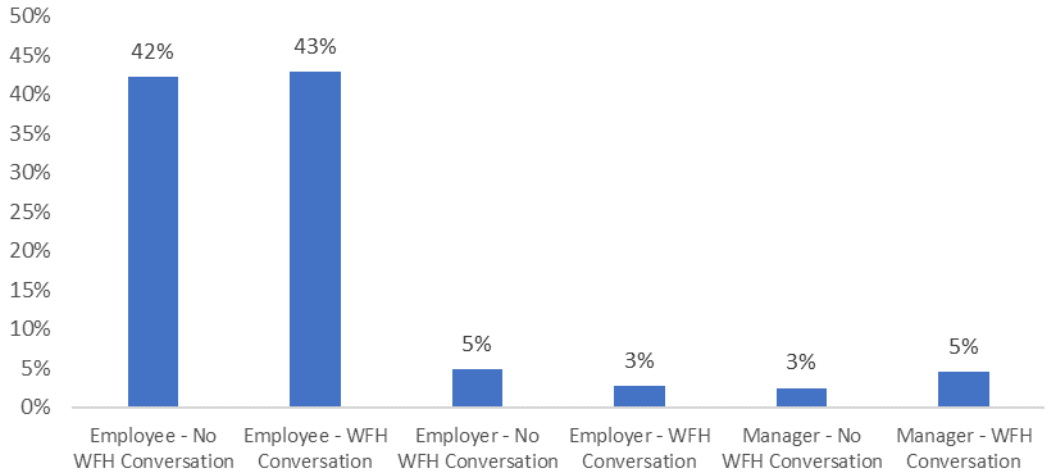

Figure 26: Workplace Conversations about Working from Home (WFH)

Figure 27 shows the perspective of employees about how they think their employer might support working from home. Respondents who are managers are asked what they think the position of the company might be as well, and both managers and employers are asked to provide their personal view on what would be appropriate. The differences observed in the position that work cannot be done from home is likely a function of the nature of the industry employees versus employers are in, but also that managers and employers are able to take a more overarching view of the work done in the company rather than an individual function which would be the focus of the employee. Nonetheless, support for some balance between working from home and the office is markedly higher among managers and employers than employees themselves.

Older employees are less likely to state that their employer would prefer a return to the office, middle-aged employers are less likely to be in roles where work cannot be completed from home and are more likely to state that their employer would support work from home as often as desired and that a balance would be support, relative to other age groups. In terms of the personal views of the employer or manager, as income increases there is a lower likelihood of stating the work of employers cannot be done at home; those on higher incomes are more likely to support working from home as often as desired and along with those on middle incomes, also support the balance of working from home and the office. It should be noted the majority of managers can either approve both the ability to work from home and the number of days (41%); or approve working from home but not the number of days (45%).

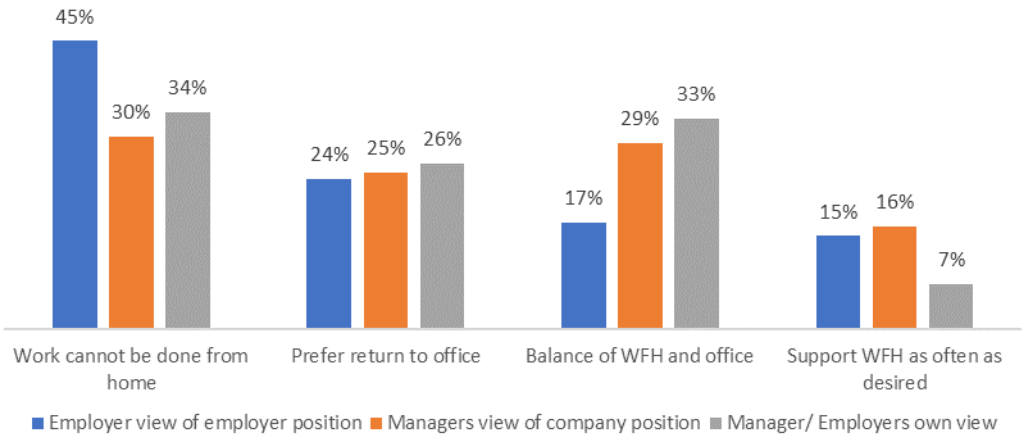

Figure 27: Support for Work from Home (WFH)

Managers and employers were also asked what number of days they felt was appropriate for an employee to work from home and why. Figure 28 shows the diversity of opinion surrounding the number of days, either at the extreme of no work (zero days = 20%) or all work (five or more days = 23%) being done from home, or some balance around two to three days. When asked to explain the reason for the number of days given, those arguing for high levels of work from home did so because it works, it minimises office space or they believe staff like it. Those advocating for a balance tended to cite reasons around maintaining collegiality, keeping connections, generating value through interaction, the need for face to face meetings, and mentoring.

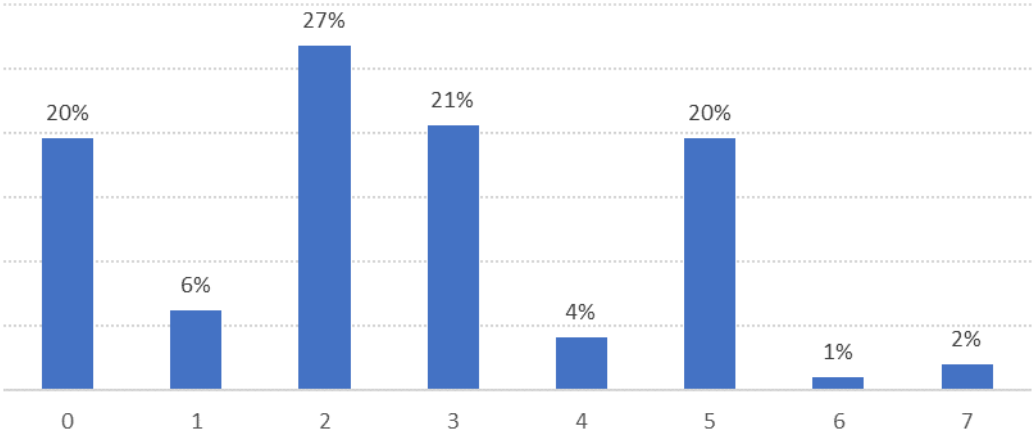

Figure 28: Appropriate Number of Days for Staff to Work from Home

Lastly, in exploring working from home, managers and employers were asked to rate the productivity of staff whilst working from home. Additionally, employees were also asked to give their perspective on the productivity of other staff for comparative purposes. Plotted on Figure 29 are the result of this question, as well as the measure of productivity respondents gave *themselves*. The general pattern of productivity scores is generally similar across three measures, but interestingly employees assign a significantly lower average score to other staff than they assign themselves. Though this is the only difference on average, managers and employers are more inclined to believe that productivity is about

the same than either employees, and the rating respondents give themselves, but respondents also rate their own productivity marginally higher than their employer or other employees might. Overall, the results indicate that importantly, the majority of employers and managers believe staff have been as productive working from home as they would be at the office, if not slightly more so.

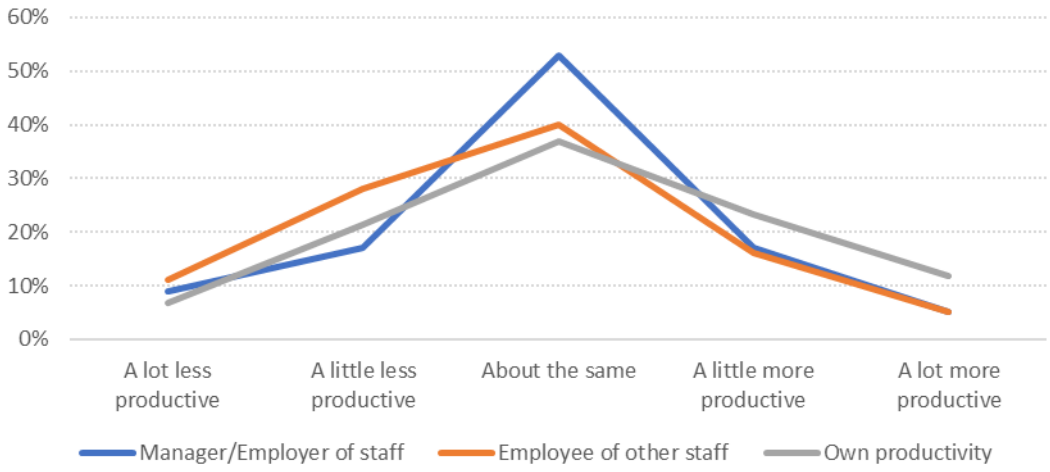

Figure 29: Productivity of Staff (and Others) while Working from Home

4.4. Occupation and Work from Home

Data was collected on employment as per the Australian and New Zealand Standard Classification of Occupations (ANZSCO), and there are significant variations in the workplace policy with regards to working from home, as can be seen in Figure 30. Machine operators and drivers, community and personal service workers and labourers work in places where there are either no plans to work from home, or occupations where the work cannot be done from home. On the other hand, a large number of managers and professionals are being given the choice to work from home or being directed to do so.

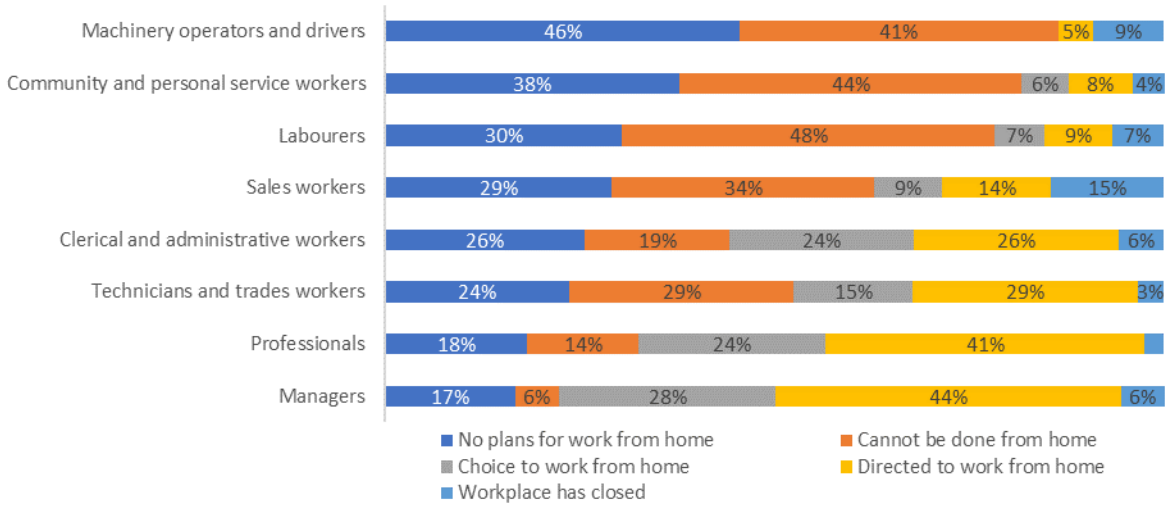

Figure 30: Workplace Policy for Work from Home by Occupation

The workplace policy clearly translates to differences in the incidence of working from home observed in the last week, as shown in Figure 31. Machine operators and drivers, community and personal service workers and labourers are less able to do work from work, whereas clerical workers, professionals and managers have a greater propensity to do so. While different occupations have differing ability to work from home, and thus different preferences with regard to how many days they would like to work from home moving forward (Figure 32), it is interesting to also note that in every occupation there are some respondents who like to do some of their jobs from home. Given this desire, it might be possible for employers to work together with employees to apportion some work to be done at home where feasible.

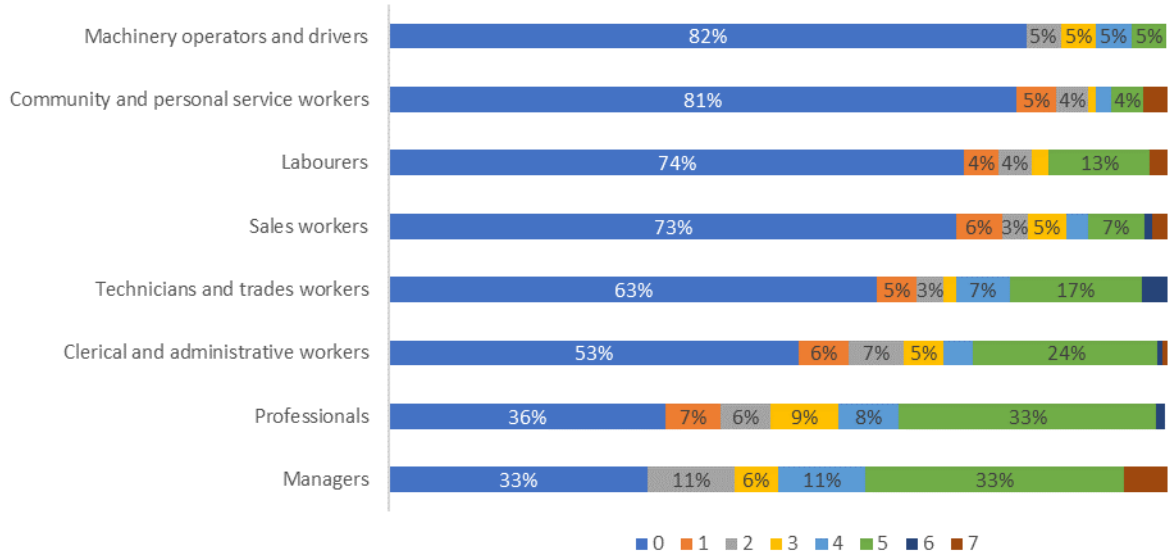

Figure 31: Number of Days Worked from Home in Last Week by Occupation

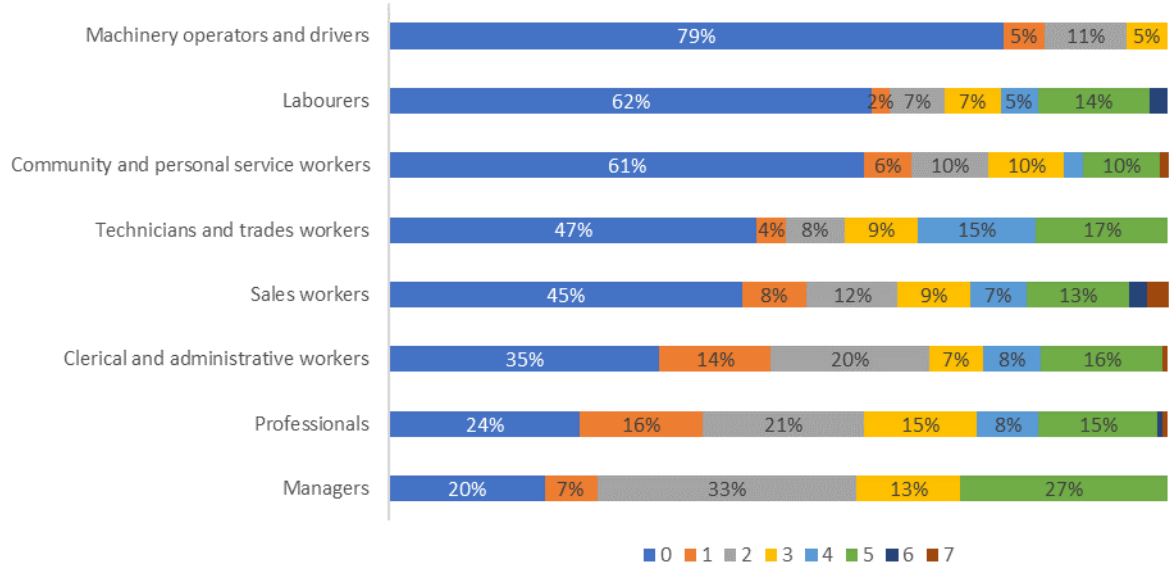

Figure 32: Number of Days Like to Work from Home in the Future by Occupation

Similar patterns also emerge based on the type of work environment, with the work place policy differing (see Figure 33), the number of days worked from home in aggregate differing (Figure 34), and the number of days respondents would like to work from home moving forward also differing by work environment (Figure 35). Again, while some employees may like to work from home, it may not be feasible, but where some component of the work could be done from home for some respondents, employers could think innovatively about how they assign work and the location in which that work is done.

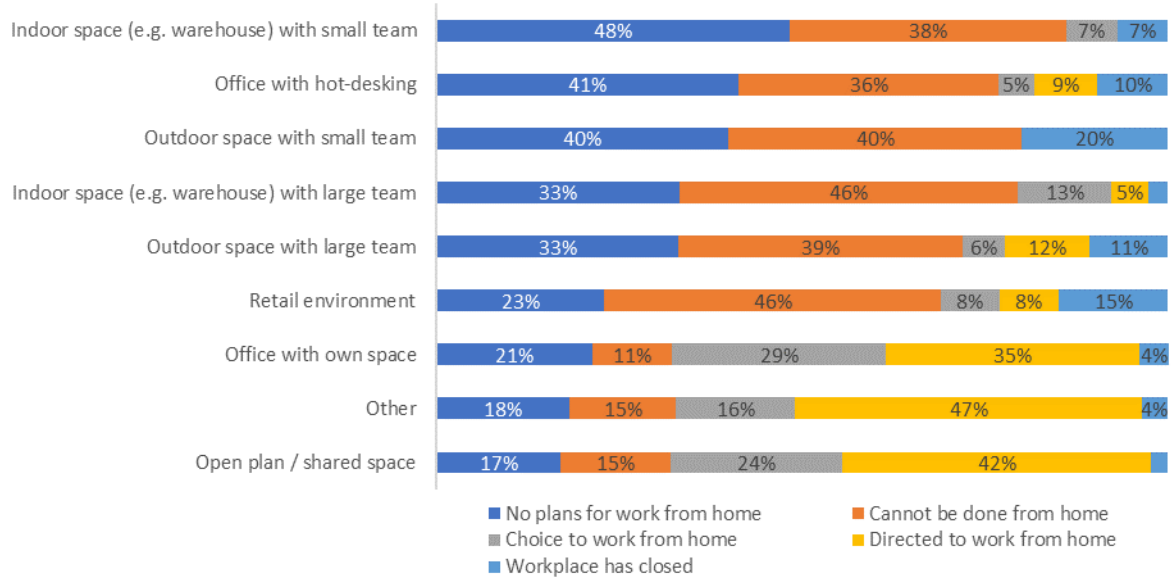

Figure 33: Workplace Policy for Work from Home by Work Environment

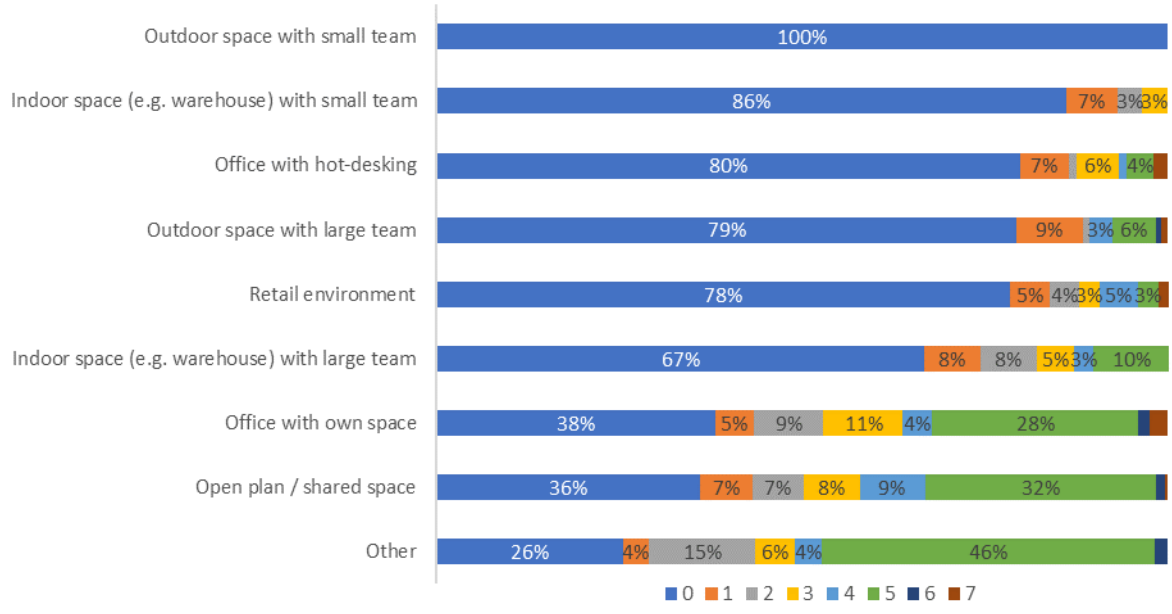

Figure 34: Number of Days Worked from Home in Last Week by Work Environment

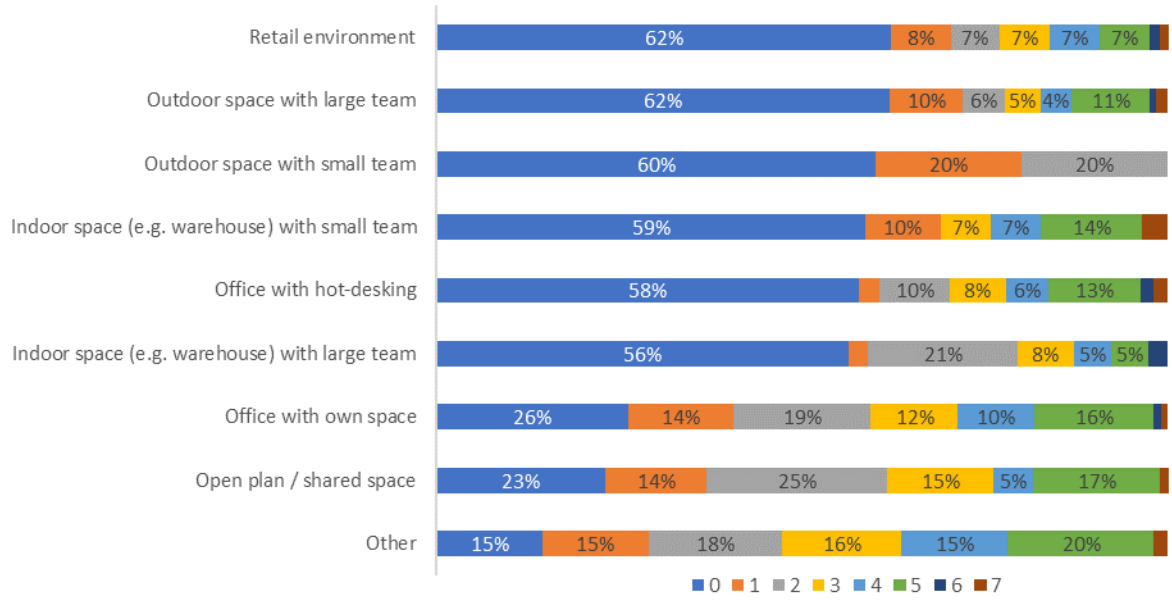

Figure 35: Number of Days Like to Work from Home in the Future by Work Environment

4.5. COVIDSafe – Track and Trace Application

Though not directly related to travel or activity, the Australian government has developed the COVIDSafe track and tracing mobile application, designed to identify and contact people who may have been exposed to COVID-19. The application uses Bluetooth to look for other devices that have the app installed. It takes a note of a contact when it occurs, through a digital handshake. If a person tests positive for COVID-19, a state or territory health official will ask that individual (or parent, guardian, or carer) to consent to uploading the digital handshake information. This type of application is not too dissimilar to GPS tracking applications widely used in travel behaviour research. The survey asked respondents if they had downloaded the application, and the results are shown in Figure 36.

As can be seen, while 41% of the sample are using the application, more than half have not downloaded, or are not using it. Owners of Apple[3] mobiles are more likely to be using (47%) it than those who own android based phones (38%), younger respondents are less likely to be using it (34%), compared to those in the middle-age category (40%) who in turn are less likely to be using it than older respondents (45% have downloaded and are using). Lower income groups are more likely to have not downloaded the application (52%), compared to middle (42%) and higher income groups (35% have not downloaded it).

[3] 53% of the sample own an android based mobile phone, 43% own an Apple. Apple ownership is more likely among those in the younger age category (60%) than middle-aged (47%) or older respondents (37%). Apple ownership is higher in the highest (63%) and middle (58%) income brackets than those on lower incomes (35%).

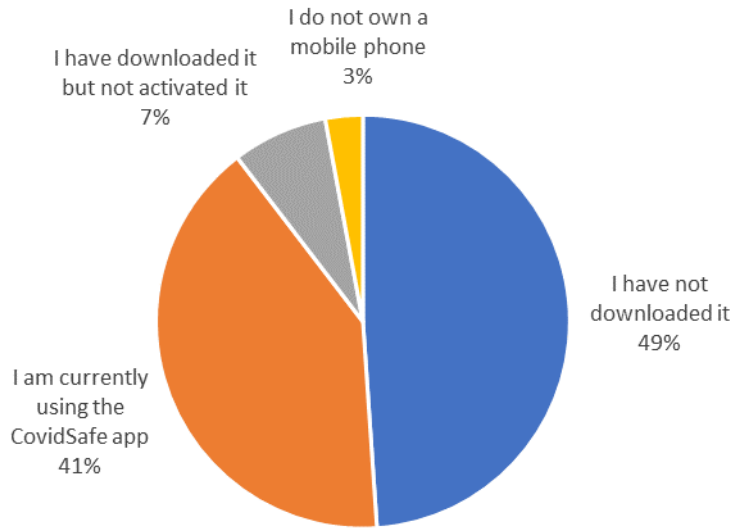

Figure 36: Use of COVIDSafe Track and Trace Application

In terms of reasons given for not downloading the application (Figure 37, the leading reason is that respondents don't trust the government to protect the data (less prevalent among older respondents), and don't want to be tracked in this way (particularly true for middle aged respondents).

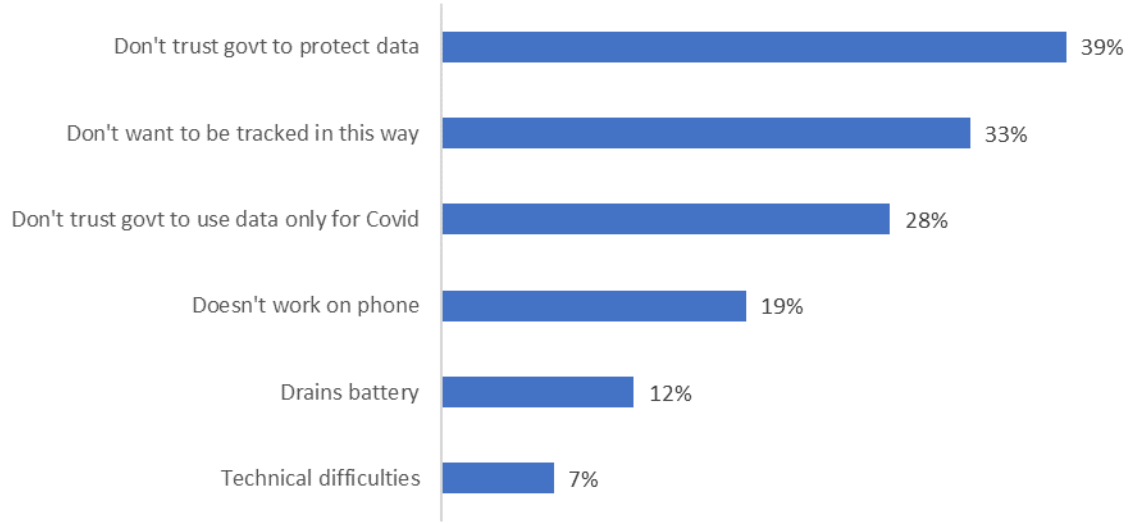

Figure 37: Reasons for Not Using COVIDSafe

4.5. Level of Comfort in Completing Activities

As talk turned towards the easing of restrictions, one moderating factor on the propensity for respondents to begin to vary their travel behaviour would be how confident they would feel engaging in different types of activities. To that end, respondents were asked given the current conditions, how comfortable (1 = very uncomfortable to 7 = very comfortable) would they feel about completing each

of the activities shown in Figure 38 (error bars reflect the 95% confidence interval). The darker bars represent an activity which a higher proportion of respondents stated was a regular activity interrupted by COVID-19 (Beck and Hensher 2020).

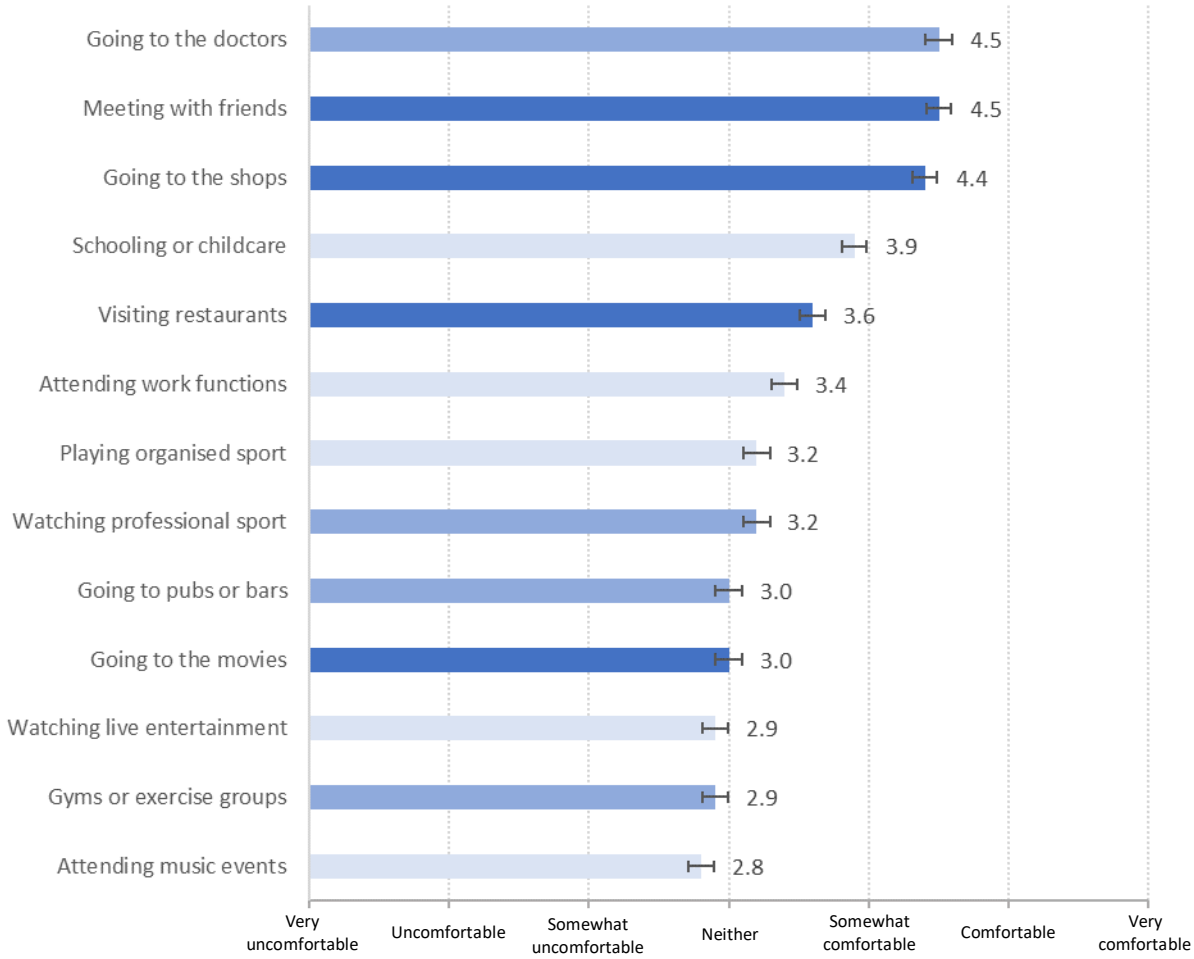

Figure 38: Level of Comfort in Completing Different Activities

Going to the doctors, meeting with friends, and going to the shops are the three activities that respondents feel significantly more comfortable in completing, followed by schooling or childcare activities, in turn followed by visiting restaurants. The level of comfort for the remained activities sit largely at the neutral point, with attending music events and gyms being the activities respondents would feel least comfortable completing.

Overall men generally exhibit a higher degree of confidence, being significantly more comfortable with going to the doctors, going to shops, visiting restaurants, attending work functions, playing organised sport, watching professional sport, going to pubs or bars, watching live entertainment, gyms or exercise groups, and attending music events. Middle income groups are more comfortable going to the doctor. Older respondents are more comfortable going to the shops than other age groups, but less comfortable visiting restaurants, going to the movies, going to pubs or bars, gyms or exercise groups, going to doctors, watching professional sport, attending music events, watching live entertainment, schooling or childcare, playing organised sport, and attending work functions. Younger

respondents are more comfortable than other age groups with respect to going to pubs or bars, gyms, or exercise groups, watching professional sport, attending music events, and watching live entertainment.

4.6. Attitudes towards COVID-19 and Government Response

The attitudes of respondents towards COVID-19 and responses by government, business and the general public were re-examined, with respondents again showing significant agreement (1 = strongly disagree to 5 = strongly agree) with all statements listed in Figure 39, with the exception of the idea of going to work from time to time to avoid social isolation. On average, there is significantly more agreement with the statements that COVID-19 is a serious public health concern that requires drastic measures and will affect travel. Trust in the response of government both now and in the future remains significant[4].

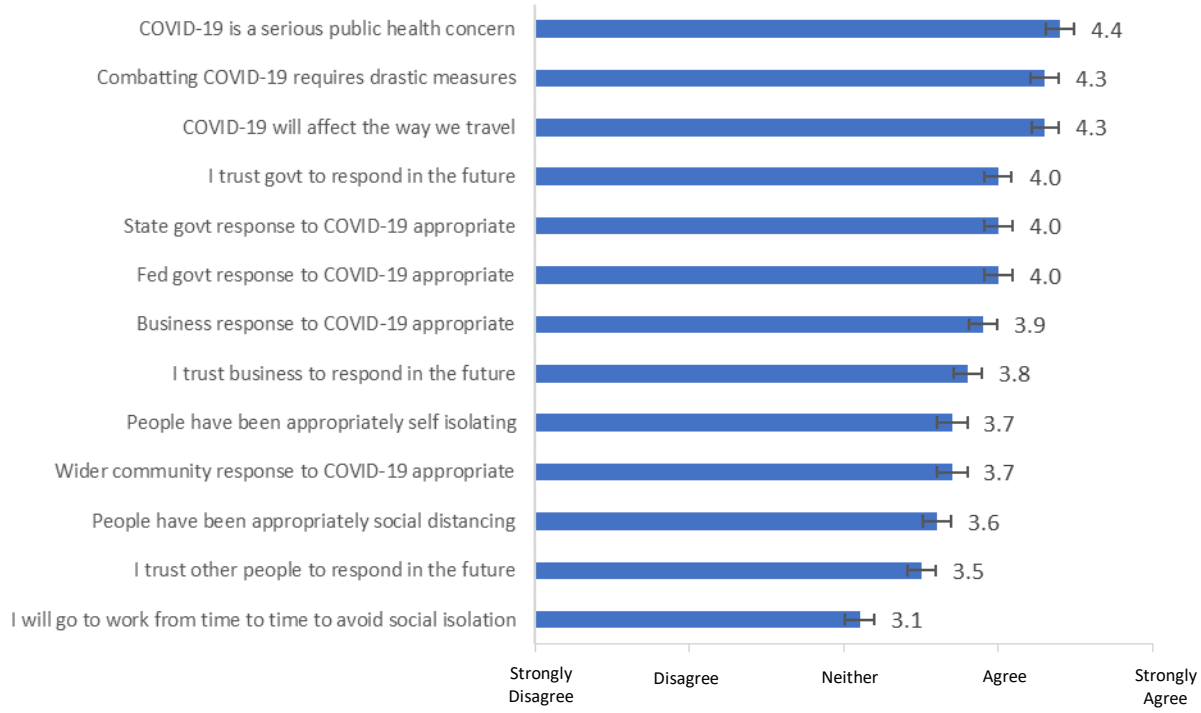

Figure 39: Level of Agreement with Statements regarding COVID-19

Overall, the results mirror those from Wave 1, with a small erosion in the number of people who agree that people can be trusted to respond in the future (overall agreement falling from 66% to 60%), and a large fall in the number who agree that they will go to work from time to time to avoid social isolation (falling from 50% in Wave 1 to 37% overall agreement in Wave 2). Females exhibit significantly higher agreement that COVID-19 is a serious public health concern, that it requires drastic measures, that the state government response has been appropriate, and that business can be trusted to respond in

[4] The questions regarding attitude towards government actions being appropriate and trust in their actions in the future are generic, and not attached to the easing or tightening of restrictions at any point in time, rather the overall appropriateness as felt by the respondent.

the future. Older respondents agree with all statements significantly more so than younger respondents.

Respondents were also asked their perception of the risk COVID-19 presented to health and the economy (see Figure 40). The pattern is identical to Wave 1, in that agreement is significantly stronger for the statement that COVID-19 is a risk to the economy, followed by a risk to someone known to the respondent, a risk to the general public and lastly a risk to themselves. While this pattern is the same, the average strength of agreement is significantly lower for each statement in Wave 2 than it was in Wave 1.

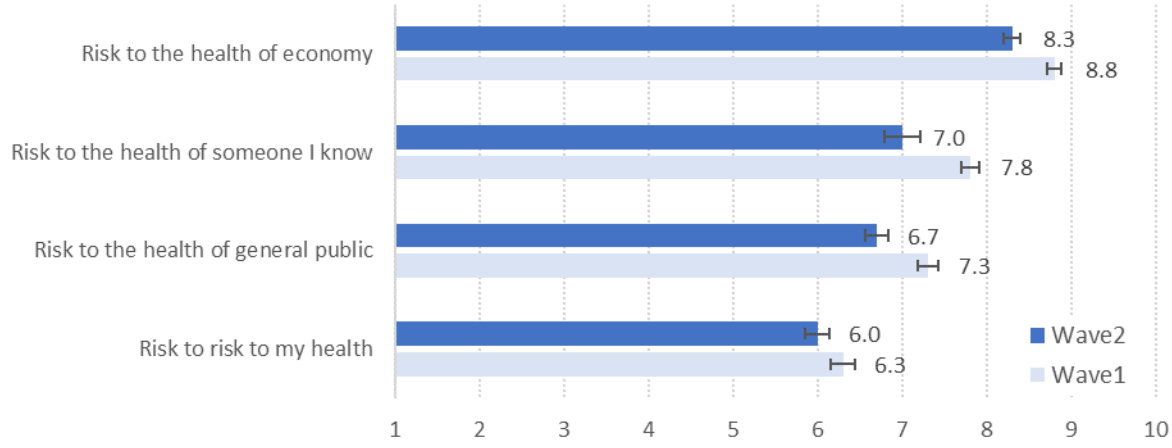

Figure 40: Risk of COVID-19 to Human and Economic Health

As with Wave 1, in Wave 2 females agree significantly more strongly that COVID-19 is a risk to the general public and someone they know, but in Wave 2 females now agree more strongly than men that COVID-19 is a risk to their own health. Lower income groups exhibit significantly less agreement with the risk of COVID-19 to themselves, than those respondents who are in middle or higher-income brackets. With respect to age, younger respondents have a significantly lower perception of the risk COVID-19 presents to their health, and respondents in the oldest age bracket view COVID-19 as a significantly higher risk to the economy than younger or middle-aged respondents.

5. Discussion and Policy Implications

5.1. Implications of Increased Travel

Overall, the results reflect what is happening in Australia as a period of low new COVID-19 cases grows, and restrictions around movement starts to ease. We see an uptake in private vehicle use, as anticipated and people are returning to public transport in a much more measured fashion. While concern about public transport hygiene has diminished, it remains significantly higher than prior to COVID-19. It is our suspicion that confidence might diminish again rather than continue to improve, as more transport users return to the system and individuals become more wary of crowding. It is even more essential that transport authorities continue with demonstrable efforts of cleaning and sanitation to assuage community concern, as before we continue to advocate that it may need to be a requirement to wear a mask while on mass transit to help protect against community transmission, but also make public transport a mode that is more appealing as the number of users start to increase.

In the Sydney context, transport authorities have used signs/stickers to indicate where people may sit on buses and trains to help enforce social distancing, but perhaps authorities should also (or instead) consider labels to indicate where passengers cannot sit or stand, as these stickers are more easily seen (i.e., are not covered by people sitting on them) and perhaps are a better visual or behaviour que that close physical proximity is still not allowed.

With regards to social distancing and travel activity, the data shows that travel for the purpose of social and recreational activities is returning more strongly than other activities, and that these were the activities most interrupted by COVID-19. People express comfort in meeting with friends and social activity is planned to return strongly. As restrictions are slowly rolled back, governments need to think carefully about how they allow the resumption of activities, which activities are indeed allowed, while messaging very strongly that the need for social distancing has not eased and that even close friends could be a source of transmission, or indeed you may be responsible for giving COVID-19 to those you are eager to reconnect with. Authorities need clear and concise messaging, consistently communicated and at most extreme even the adoption of a uniform campaign across the country, about the need to maintain social distancing and think carefully about the difference between essential and non-essential travel.

Lastly, we see some mobility differences across age groups, but also that younger respondents are more comfortable with more social activities than older respondents and exhibit a lower perception of the risk of COVID-19 to their own health. Efforts should be made to ensure that those who are in this age group are aware, not only of the risk posed to them, but to the wider community and potentially their loved ones, should they "lower their guard" with respect to appropriate social distancing and the new behaviours required during the pandemic.

5.2. Implications of Working from Home

Our research continues to explore the prevalence of and experiences with working from home. It is an important mechanism to alleviate the burden on the transport network in the form of increased potential congestion due to strong uptake of private motor vehicle and reduced capacity on transit systems due to physical distancing. Indeed, if positive experiences and lessons learnt can be carried forward into a post-pandemic world, it will likely be the largest tool in the transport tool kit to reduce persistent congestion.

The results herein suggest that the work from home experience is lumpy and more predominantly available to middle and high-income groups. We see that the extent of working from home remains well above the pre-COVID-19 levels, but the degree to which people work from home has diminished from the degree seen in Wave 1 following the initial imposition of restrictions.

Many respondents state that their work cannot be done from home, and while this may be true, there are many who have not yet had a conversation with their employer about the ability to work from home. Given the dividends to the transport network, more conversations about working from home, or the structuring of work so that some component can be completed from home should be encouraged by governments. There are dividends for employers in this regard as well. Many employees stated that they work in open plan offices that would still require appropriate social distancing measures, and environments with hard surfaces that would require regular cleaning. Working from home will enable this to be done more easily and more thoroughly, given that concern about returning to the work environment is split, with a lack of concern with work and trust in some

colleagues being misplaced, making it early in the process of learning to live with COVID-19. Should a business become a hub of transmission, the consequences could be devastating.

Overall, for those engaged in working from home the experience has been largely positive, with employees and employers alike finding productivity to be more or less the same than if the work was completed in the more traditional arrangement. Indeed, our results suggest that it may be possible that employees are understating the degree to which their employer would support some work from home, with many employers suggesting that a balance between working from home and working at the office would be supported.

In terms of that experience, the biggest challenges have been interruptions from family and children, and an inability to concentrate on work. As restrictions ease, however, and children go back to school or families begin to resume normal routines, distractions in the home will likely diminish over time. Governments should look to support research into how the work from home experience can be improved, and business should look to guide staff in how to apportion focus and concentration over the course of a working day, and equally respect the boundaries between home and work.

The biggest benefits of working from home nominated by respondents, are not having to commute and the creation of a more flexible work schedule. These benefits are a positive for transport authorities seeking to solve a congestion problem or encourage peak spreading through the generation of flexible work, and indeed the implications on longer term investment priorities. In totality these are positive initial signs that working from home will be a bigger part of the mix moving forward, and as the work from home experience becomes more embedded and new routines are formed, it is also likely that the experience will improve.

5.3. Implications for Other Countries

While some countries have no overt national response to COVID-19, Australia has pursued a suppression strategy where activities deemed high risk have been curtailed, especially in the main environments that encouraged large groups of people together indoors (hotels, pubs, clubs, gyms, restaurants, religious gatherings), whereas other economies such as New Zealand have opted for elimination, with a large number of restrictions on travel and activity (for example, all schools were closed and all non-essential businesses, including large retailers, were shut, cafes and restaurants were shut and not allowed to provide takeaway). Initially the suppression strategy pursued by Australia was relatively successful in turning around the rate of new cases, and as a result the restrictions were slowly lifted, but in turn we have also seen a rise in the number of new cases.

Travel patterns are the key risk factor in the transmission of COVID-19; the virus can only move if people move. First and foremost, other countries need to eliminate movement in areas or groups where the risk of COVID-19 is high. In Australia, this was not done well enough in the context of hotel quarantine in Victoria, where the use of casually employed untrained security guards to ensure quarantine failed. It is also likely that these casual security guards, working many jobs not just in quarantine hotels, spread the disease across the city. The same issue occurred with aged care homes with rotated casual staff between sites. Jurisdictions will likely need to move swiftly to contain travel from COVID-19 hotspots and err on the side of caution in order avoid mass community transmissions.

It is also likely that, with media reports of the relative success of Australia in combatting COVID-19, risk perceptions dropped as seen in this research, and people who became excited about a return to interrupted social activities, may have been less cognisant of the behaviours that are no longer appropriate when combatting a pandemic. Indeed, pandemic response fatigue is also something that

may occur in a longer attempt at suppression, and this might need to be weighed against the merit of short and sharper responses. More research is needed here, but other nations should resist the urge to lift any restrictions on movement and gatherings too soon.

With regards to working from home, Australia saw a rather swift and widespread adoption of working from home that has thus far persisted even as restrictions have eased. This has meant that traffic congestion and crowding on public transport has not been as bad as could have otherwise been the case. Government at all levels urged companies to support working from home wherever possible, and it seems that this has been supported by the majority of businesses. Other nations may be able to see that, while not perfect for all, working from home is a viable option and that generally staff have been just as productive at home as from the typical work environment. Much like argued in this paper for Australia, other countries should also see that support of and investment in work from home strategies is a significant investment in transportation and ultimately sustainability.

6. Limitations and Future Research

Clearly experiences with travel and work in the context of COVID-19 are still very much nascent stages and will be for some time. Behaviours and attitudes are still in a great state of flux and it would not be possible for research conducted now to be definitive about what the future might look like. However, insights are needed and research, while beginning to be available, remains limited. It is important that ongoing, timely and consistent research be conducted, and will be beneficial in helping to identify trends and potential for positive intervention before "bad habits" are formed. We will continue to track the changing nature of travel and activity in the Australian context. There is also great scope for work to bring together and synthesise the experiences that are being had around the world. Each jurisdiction will no doubt benefit from learning about the experiences of others.

Preliminary research by Currie et al. (2020) indicates that working from home may indeed be the only long term change that will emerge post pandemic (though the study also acknowledges that findings are also at an early stage much like any research conducted now). It is therefore important to examine the dynamics of this experience and those associated with increased work flexibility. One such allied policy response is peak spreading or staggered work hours, which may be as equally impactful a response to change transport demand and capacity, particularly for those unable to work from home. Future research will look at the degree to which people may be able or willing to stagger working times, but there are unintended consequences of peak spreading such as decreased use of public transport, that also need to be examined (Daniels and Mulley 2013).

More research is needed on the prevalence of active transport. Our survey did not detect any strong trends in the aggregate, but in this paper we only present overarching results of analysis, which are already extensive. The concept of working from home, mixed with active travel and places in which travel activity occurs given a rise in working from home continues to be important. If people increase working from home, then there are likely to be significant implications for more localised transport networks, rather perhaps more profound than those arterial links designed to move large numbers of people between residential and employment centres.

Additionally, Australia was approaching the end of autumn during Wave 1 and winter had begun during Wave 2. Colder climates may be a reason why active transport was found to be less prevalent than media would suggest, in this study. However, using Sydney as a proxy, the average temperature during Wave 1 was 22 degrees ($\sigma = 2.0$) and daily rainfall 1.8mm ($\sigma = 2.7$), compared to 19 degrees ($\sigma = 2.2$) and 3.2mm of rain per day ($\sigma = 3.3$). Wave 2 was conducted during a colder period, but only

marginally so. Likewise, any planned changes in activity could be attributable to likely improved weather, those changes in travel were asked for the next week (next 7 days) at the time at which the respondent completed the survey. It is unlikely that their perception of the weather would change too significantly in that time frame when winter had only just started. Lastly, winters are also relatively mild in Australia compared to other parts of the world, so activity pattern changes may be more pronounced in warmer months, or in countries where the climate is more extreme.

Localised amenity may start to become increasingly more important moving forward and there may be more pressure on parking in places where there were previously few concerns. Local streets may require more maintenance or will degrade more quickly with increased local traffic, more formalised organisation of traffic may be required on local roads than is currently the case, and local parks may become more important to wellbeing. Politicians in Australia are already acknowledging that the pandemic had underscored the importance of public space to people's mental, physical and social wellbeing, having launched an ideas competition to reimagine public spaces (O'Sullivan 2020).

Indeed, in the very long term, COVID-19 may change the way in which individuals make decisions about where they live, if working from home grows. Reduced friction from the disutility of commuting (even if a reduced number of days) may mean that people are more able to prioritise the utility of living near social contacts (Guidon et al. 2019). In the very long term, working from home may be an opportunity for regional centres (with cheaper housing and potentially greater local amenity) to capture new residents and new industry, as people may have greater freedom to choose where to live, or in the future need to travel to an urban location significantly less often. These issues are unclear, but research could be devoted to the implications of what we are observing now, desirably through a longitudinal panel survey.

While looking at household travel in terms of repeated or more regular trips, this paper does not examine the impact on tourism or holiday travel. The impact to international travel and both the domestic and international aviation markets are well known and easily observed. What is less well known are future intentions around travel and how preferences towards international and domestic travel may change. In 2019, Tourism Australia (2019) reported that tourism contributed $61 billion towards gross domestic product and makes up approximately 5% of the Australian workforce. Changes to travel choices with respect to tourism will be important to understand, particularly with respect to generating greater domestic tourism when it is allowed.

While these changes may occur, the preliminary finding by Currie et al. (2020) that people initially state that very little may change long-term as a result of COVID-19, adds to the call in this paper for timely and ongoing research. Much like with dealing with the pandemic itself, often a fast response is needed rather than one which is considered but loses efficacy due to its untimely nature. It has been long known in transport that humans are habitual (Hensher 1975, Goodwin 1977, Banister 1978, Verplanken et al. 1994, Aarts and Dijksterhuis 2000) and cognitive dissonance is common (De Vosa and Singleton 2020), and these habits are powerful and hard to change (Bamberg et al. 2010, Walker et al. 2015). Any invention needs to be targeted and dynamic to the changes being experienced now, or it is likely that momentum will be lost. On a positive note, research in other fields suggest that the formation of new habits is possible with the appropriate interventions (Lally and Gardner 2013, Mergelsberg et al. 2020), and reinforcement of positive attitudes (Judah et al. 2012). Interestingly Lally et al (2009) posit that habit formation takes an average of 66 days, a point at which we are now approaching with regards to work and travel with COVID-19. Will new transport and work habits take longer, and are "desirable" habits being formed?

7. Conclusion

In May 2020, the World Conference on Transport Research Society released a Covid-19 Task Force with five recommendations for policy makers who are responsible for deciding when to end the Covid-19 lockdown period (WCTRS 2020). They discussed issues surrounding the timing of restriction relaxation, notably that influential decision makers would typically advocate for a shorter lockdown duration than is socially optimal due to the costs of the virus being spread being an external cost that may be discounted. They also noted a concern around increased private vehicle dependence, with priority investment being needed in transit systems to allow for proper social distancing and cleanliness along with an increased focus on active transportation modes. These recommendations, similar to those found in Beck and Hensher (2020), are worth highlighting in the context of the results outlined in this paper and the discussion thereof.

Human beings are inherently social creatures and it is not surprising that social activities are planned to rebound given the widespread suppression witnessed during Wave 1 of this ongoing study. However, this does represent a known danger for increased community transmissions. Younger people, who show greater propensity to travel, are also more comfortable with interaction in more dense social environments such as pubs and clubs, gyms and exercise and live events. Authorities need to remain vigilant and carefully consider the risk of opening too soon (as is occurring with a spike or second wave in a growing number of locations), against the benefit of increased activity (which may end up being only for the short term). As the lockdown is ended, it is likely that governments will need to act quickly and decisively to quell any increase in transmission, and resist the urge to discount short-term activity over the potential impact of long-term disruption due to a re-emergence. As can be seen in the first figure presented in this paper, the risk of an increase in new COVID-19 cases is on the rise and governments and authorities need to be alert.

If the policy is the desire to return to social activity is strong, how will that translate to the behaviours that are designed to reduce the risk of transmission? Will fatigue or habit erode social distancing and if so, what measures can be deployed to counter-act a lack of community vigilance? This is particularly important for the transport network that moves not only people and freight, but potentially the virus. With regards to the intervention of COVID-19 strategies on transport in the longer term, it is clear that working from home should be viewed as a transport investment and should be encouraged with appropriate spending and support (i.e., investment in facilitating and tax breaks for individual uptake). As highlighted by WCTRS; “this is clearly a unique and rare opportunity for policy makers and transport researchers to work together and seize the momentum to devise new policies in order to change our everyday living and choices toward more environmentally sustainable life and work”.

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