

Active Transport – Comparative Analysis Melbourne

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Abstract: This paper explores trends in journey to work activity across metropolitan Melbourne area by active transport (walking and cycling). This will be studied using the Australian Bureau of Statistics (ABS) Census of Population and Housing data from 2001, 2006 and 2011. Using Journey to Work data it examines trends between Local Government Areas (LGAs) across metropolitan Melbourne. With the release of the Victorian Government's *Cycling Strategy* as well as *Plan Melbourne*, the Victorian Government has signalled a clear interest in improving the way people travel by the active modes. This paper will have a particular focus on understanding the spatial and demographic factors that influence the generation of active transport work trips across metropolitan LGAs.

1 INTRODUCTION

A focus of the recently released *Plan Melbourne*, metropolitan planning strategy is the idea of the '20 minute neighbourhood'. It is about encouraging land use and transport integration that supports "living locally" and it reflects a growing interest amongst Victorian policy makers and the community in improving the accessibility of neighbourhoods (Department of Transport, Planning and Local Infrastructure, 2013). An important component of this idea is supporting opportunities for active transport (walking and cycling) as a means of improving health and well being as well as reducing travel costs, congestion and vehicle emissions.

Further to this, the Victorian Government's *Cycling into the Future 2013-23: Victoria's Cycling Strategy* recognises and responds to the growth and diversity of cycling and cyclists in Victoria. It identifies six key directions that aim to improve the understanding of cycling and the types of trips Victorians make by bike and encourage more people to consider cycling as a mode for travel (Department of Transport, 2013).

The growing awareness of the benefits of walking has also changed the way that the Victorian Government manages its road and street space. For example, VicRoads' *SmartRoads* tool, which establishes a hierarchy of road uses by transport mode, time, and place, prioritises pedestrian and cycling movement in all of Melbourne's Activity Areas including the Central Business District (CBD) in its entirety (VicRoads, 2012).

The Department of Transport, Planning and Local Infrastructure has also established a method for developing a Principle Pedestrian Network (PPN). The PPN is currently being applied by local governments to identify and implement priority routes for pedestrians. The Department also jointly chairs the Victorian Pedestrian Advisory Council which provides a forum for State Government agencies and other organisations to consider pedestrian issues.

In order to inform future planning for improving walking and cycling, this paper seeks to understand some of the recent trends in active transport, as well as some of the potential factors that may influence people's choice to access work by walking and cycling. The recent release of the Australian Bureau of Statistics (ABS) 2011 Census of Population and Housing Journey to Work data provides a useful snapshot of travel patterns for the Melbourne metropolitan area. By analysing the Journey to Work data from 2001, 2006 and 2011 Census the paper seeks to respond to the following questions about active transport commuting patterns in Melbourne:

1. What areas in Melbourne have experienced significant changes in walking and cycling journeys to work over the three Census periods from 2001 to 2011?
2. Is there a relationship between distance from the CBD and active transport mode share?
3. Is there a relationship between number of cars per household and active transport mode share?

2 LITERATURE REVIEW

In recent times, policy interest in walking and cycling as modes for travel to work has tended to be driven by a dual desire to both improve the efficiency and sustainability of urban systems and seek greater public health benefits. Evidence of the health benefits of active transport has been growing for

some time. Purcher et. al. (2010) review American and international data and provide a useful overview of some of the key health benefits that can be achieved through increases in walking and cycling. The review found that there is a statistically significant relationship between walking, cycling and health. In a comparison of 14 countries, those with higher levels of active transport also tended to have lower levels of adult obesity. In a comparison of 50 US states and 47 of its largest cities; higher rates of walking and cycling to work were associated with higher percentages of adults who achieved average recommended levels of physical activity as well as lower percentages of obesity and diabetes.

Active travel to work is often seen as having a critical role addressing such health issues, because it is a trip that people make most days. Many previous studies have explored active transport trends in Melbourne, Victorian and Australian contexts. Recently, the Commonwealth Government's 2013 *State of Australian Cities Report* analysed trends in active transport across many of the nation's major cities. The study noted that across all cities active transport as a share of all commuting trips experienced an increase from 2001 (4.6 per cent) to 2011 (5.1 per cent) and noted a slight decrease in mode share between 2006 and 2011. Over the same time period, it reported that Melbourne had a lower active transport mode share, generating a share less than Darwin, Hobart, Sydney, Brisbane and Geelong.

In a longitudinal study on mode share trends for journey to work in Australian cities, Mees and Groenhart (2012) found that between 1976 and 1996 walking to work experienced a steady decline across all Australian capital cities. The paper notes that despite a reasonable bounce back from 1996 to 2011, a small decrease between 2006 and 2011 remained a concern. The authors acknowledge an increase in cycling mode share in Melbourne between 1996 and 2011, but are critical of its importance. They question whether the increase in cycling may have come at the expense of trips by walking. Compared to other cities the study found that Melbourne has the second highest rate of cycling, but a below average rate of walking. Overall Mees and Groenhart are wary of the significance of cycling increases across Australian capital cities and state that any analysis of cycling should be placed in the context of the much larger increases in public transport and private vehicle travel.

In the review of the spatial distribution of journey to work by public transport, walking and cycling Stone and Mees (2011) found that active transport trips increased in concentration in Melbourne's inner suburbs between 2001 and 2006. The paper noted that this growth occurred despite a trend of wider dispersal of workplaces across metropolitan Melbourne. Results indicated that better provision of infrastructure in suburban areas for walking and cycling might have yielded higher active mode share in middle and outer areas.

In a study comparing the factors specifically impacting cycling trends and policies in Melbourne and Sydney Purcher, Garrard and Greaves (2011) paint a more positive picture of cycling trends in Melbourne. Using a variety of data sources and secondary resources the paper observes that overall, cycling levels in Melbourne are roughly two times higher than Sydney and are growing three times as fast. While it was noted that this growth was only really present in inner urban areas, it was suggested that it may be due to the favourable environmental characteristics in Melbourne such as "flatter and more contiguous topography, less rainfall, wider roads with less traffic and greater connectivity with the road network" (Purcher, Garrard and Greaves 2011 p.344). It suggests that Melbourne's cycling policies also had a key role in explaining the difference between the two cities.

As in Melbourne, other world cities have recognised the importance of walking and cycling and have developed plans to encourage or respond to growth in these modes. In the review of cycling and walking policies in large American cities Cerreño and Nguyen-Novotny (2006) identify a range of policy considerations that can influence active transport mode share. The paper suggests that one of the biggest challenges for cities is "balancing the need for connectivity with building to full standards" (2006 p.26). This means that often cities might have a road and street network that favours walking and cycling, but may not have the appropriate level of road or street space or safe conditions that might otherwise encourage active transport. Another factor that was seen as critical is the awareness and acceptance of active transport modes as legitimate ways to travel. The authors suggest that this can be best addressed through education and enforcement that focus on creating safer environments and conditions for the active modes. Lastly, the paper reinforced the need for leadership and partnerships in the planning, delivery and management of walking and cycling infrastructure and programs.

3 METHODOLOGY

3.1 Data Sources

The majority of data utilised in this analysis is drawn from the ABS Population and Housing Census Journey to Work datasets from 2001, 2006 and 2011. Journey to Work data provides details on all the modes that people choose to travel to their place of employment. The data is derived from three key questions regarding:

- Where a person is counted on Census night (Place of Enumeration)
- The mode used to reach their place of work on Census day (Method of Travel to Work)
- The address of a person's usual place of work (Place of work)

The data set can be used to produce a detailed picture of the breakdown between public, private and active transport, as well as the number of people who worked from home or did not go to work. The Census allows for multiple answers in all categories except 'walked only', 'worked at home', and 'did not go to work'.

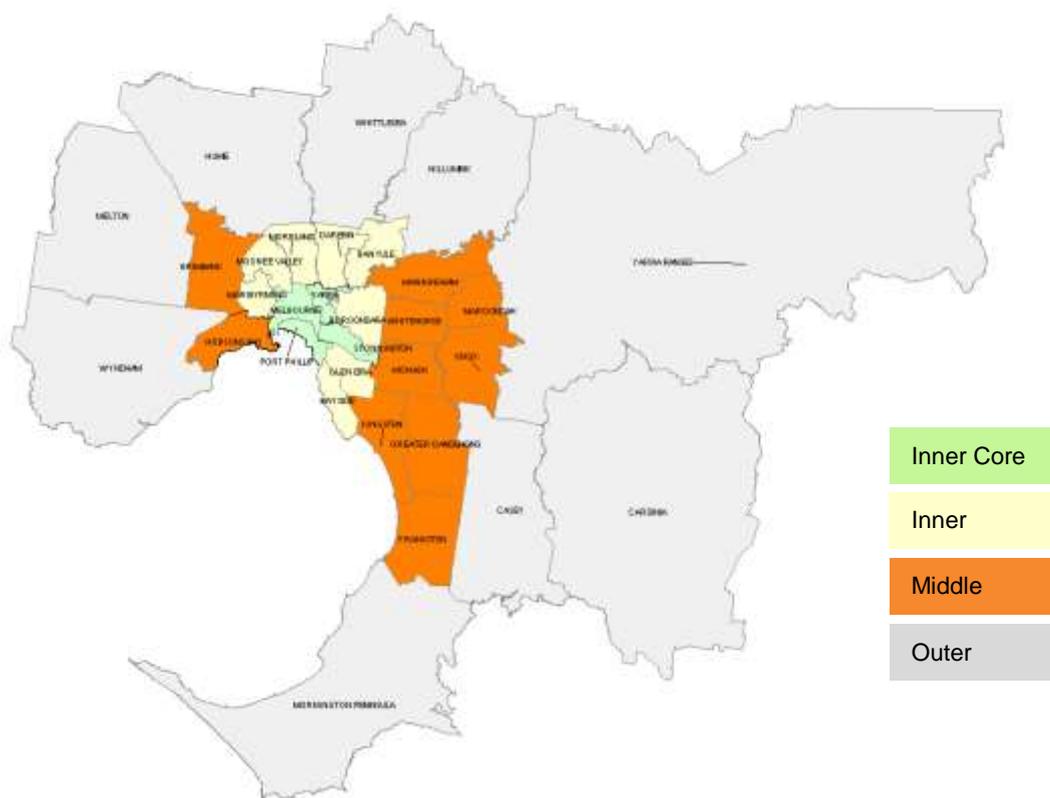
Comparisons between active transport mode share and distance from the CBD and car ownership draw on 2011 dwelling characteristics. This paper also refers to the Victorian Integrated Survey of Travel and Activity (VISTA). VISTA is an ongoing survey of travel and activity. Randomly selected households are asked to complete the VISTA travel diary for a single specified day. By collecting all personal travel information, from walking the dog, through to a flight interstate VISTA data provides important context for understanding the role of active transport journeys to work as part of Melbourne's overall transport task.

3.2 Geography

This paper compares the journey to work figures across three 2001, 2006 and 2011 Census periods for the 31 Local Government Areas (LGAs) that make up metropolitan Melbourne (shown in Figure 1). For comparative purposes the LGAs are grouped into the Inner Core (Melbourne, Port Phillip, Stonnington and Yarra), Inner (Banyule, Bayside, Boroondara, Darebin, Glen Eira, Maribyrnong, Moreland and Moonee Valley), Middle (Brimbank, Frankston, Greater Dandenong, Hobsons Bay, Kingston, Knox, Manningham, Maroondah, Monash and Whitehorse) and Outer (Cardinia, Casey, Hume, Melton, Mornington Peninsula, Nillumbik, Whittlesea, Wyndham and Yarra Ranges). This is drawn from the methodology used by Birrell, Healey, Rapson and Smith (2012) based on areas that have high density housing, detached, established and new housing.

In order to measure proximity to the CBD, centroids for each LGA are used. According to the ABS (2011b) the "centroid is the centre of a digital bounded area" which is assigned a set of latitude and longitude coordinates. In the case of some LGAs that may have a crescent-like shape, such as those that border Port Phillip Bay, the centroid may lie outside the limits of the area. In these cases the centroid is shifted to the next closest point within the LGA boundary.

Figure 1: Inner core, Inner, Middle and Outer LGAs



3.3 Classifications

For the purposes of this paper active transport is defined as travel by walking and cycling only. The ABS Census provides 14 different modes of transport that a person can select to describe their journey to work. Respondents can select multiple modes in order to describe their journey. Trips to work that include cycling and other modes are not counted as cycling. It is also important to note that travel by almost every mode does involve some level of walking. For example one may drive to a car park in the city, and then walk from the car park to their workplace. The Census does not capture these trips as walking trips.

For comparison with other modes 'public transport' comprises all journeys that include at least one public transport mode, (including ferry) and 'other' comprises of journeys by truck and journeys that respondents have specifically selected as 'other'. Overseas visitors as well as those who 'worked from home' or 'did not go to work' on Census day are excluded from this analysis.

3.4 Limitations

The Census is collected in August when the weather in Melbourne tends to be cold and wet, and as a result there may have been fewer walkers and cyclists on Census day. According to the Bureau of Metrology (2011) on 11 August 2011 Census day the daily minimum temperature in Melbourne was 9.6 and the maximum was 16.1. It was also a rainy day with 3.4 mm of rain recorded at the Melbourne Regional Office in the CBD. Weather reports were not available for the 2001 and 2006 Census days.

LGAs in Melbourne tend to vary in size, shape and many other important characteristics that influence people's travel patterns. Because active transport trips often only cover short distances, the use of large and varied geographical classifications such as LGAs in analysis of active trips can result in a loss of nuance.

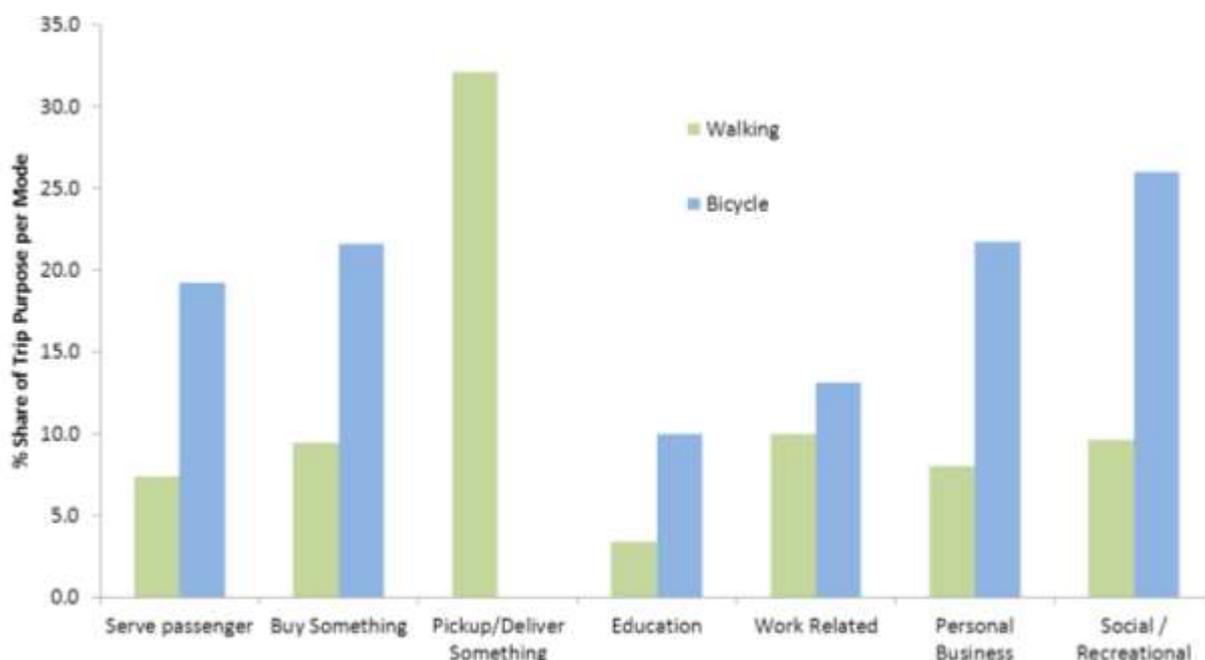
4 ANALYSIS AND DISCUSSION

4.1 Active Transport Journeys to Work in Melbourne

In 2011 there were an estimated 3,940,806 people living in metropolitan Melbourne. Of this number, 1,647,688 travelled to work on Census Day. A further 69,377 worked from home and 181,817 did not go to work. Journeys to work are an important measure used in transport planning and policy development. However, it is important to note that they are not the only type of journey that people make in an average day. Journey to Work data from VISTA 2009 shows that on an average weekday in Melbourne, 20 per cent of all trips are made for the purpose of work and that nearly six per cent of those work trips are made by active transport.

In addition, VISTA data for 2009 also shows that during the am peak period, 1 in 5 people are on the move. Many of these trips are journeys to work, making this one of the most important factors in demand for transport facilities overall. Many journeys to education also occur in the same period and are also of great interest, but data is not available at this stage to consider these trips in any detail. Figure 2 also shows that shopping is a significant purpose of walking trips, and should be considered further in a more detailed study of walking trips.

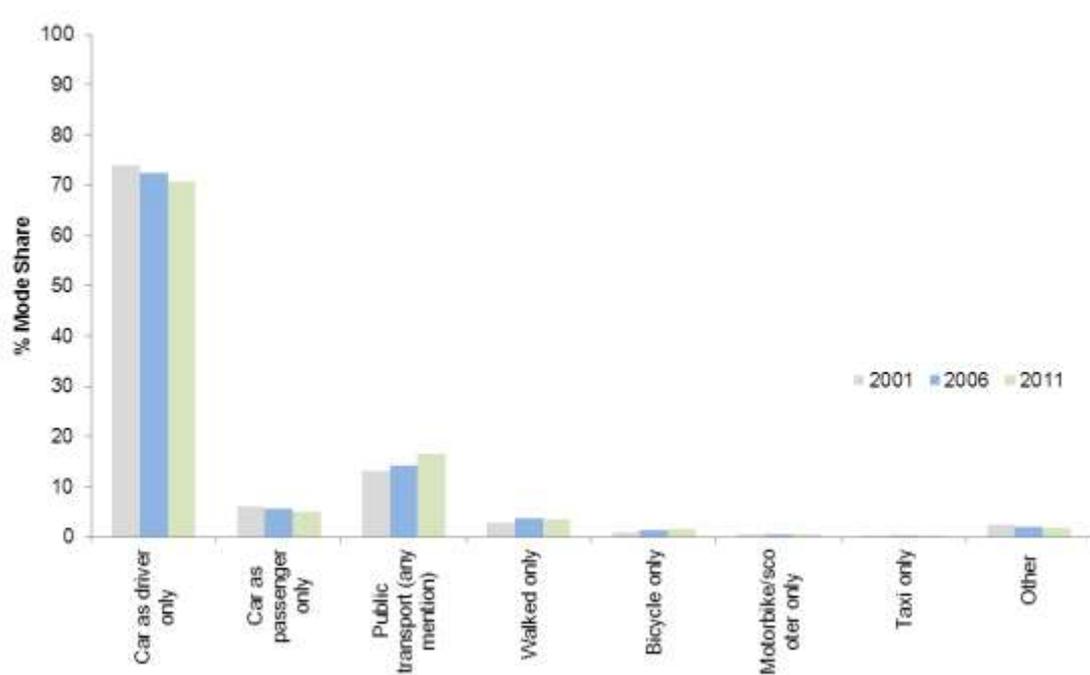
Figure 2: Purpose of Walking and Cycling journeys in the AM peak (2009)



Source: DTPLI VISTA 2009

Of the number that travelled to work on Census Day, the majority (75.9 per cent) travelled by car as either driver or as passenger. Public transport amounted to 16.4 per cent of all work trips, while walking and cycling had mode shares of 3.5 per cent and 1.6 per cent respectively. Motorbike/scooter, taxi and other made up the remaining 2.9 per cent. As presented in Figure 3, overall there were marginal changes in mode share between 2001 and 2011 in 'car as driver' which decreased, and 'public transport' which increased. The combined mode share of walking and cycling increased from 3.9 to 5.0 per cent between 2001 and 2006 and then increased slightly again to 5.1 per cent in 2011.

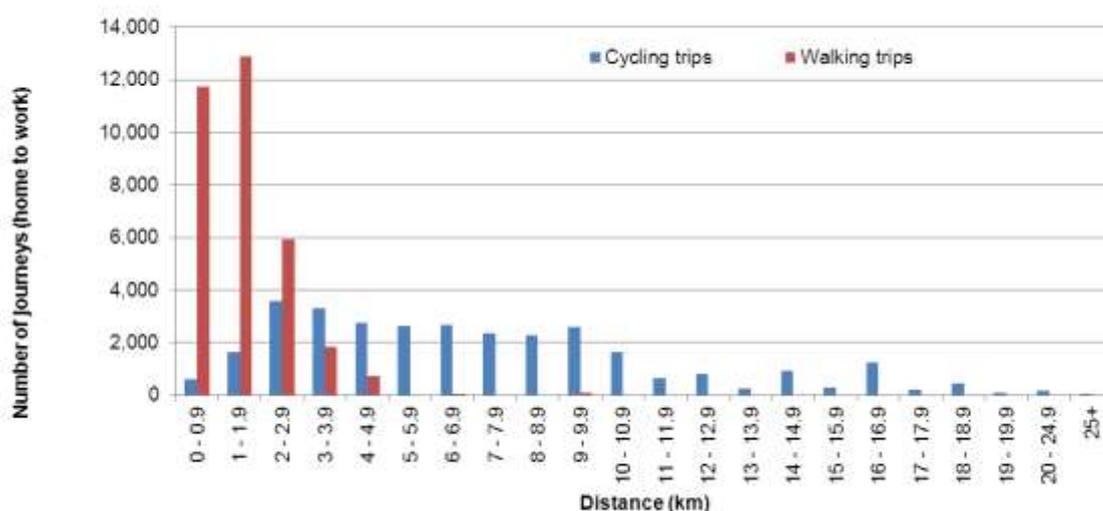
Figure 3: Metropolitan Melbourne Census Mode Share for Journeys to Work 2001, 2006 2011



Source: ABS Census – Journey to Work 2001, 2006 & 2011

Another important aspect of active transport trips to work is the distances that people are able or willing to travel on foot or by bike. As shown in Figure 4 below, according to VISTA 2009, the average distance that people travelled by foot to work was 1.4 km and the average distance travelled by bike to work was 7.2km. These distances may limit the range of available destinations that people are willing to travel to work by active transport compared to other modes, particularly for walking trips. According to Infrastructure Australia’s cycling infrastructure discussion paper (2009), proximity to work is the single major factor in determining whether a person will undertake an active transport trip for journey to work.

Figure 4: Distance of active travel journeys to work



Source: DTPLI VISTA 2009

As both ABS and VISTA data show, active transport trips to work only make a small proportion of overall weekday trips. Travel by foot or by bike are likely to be limited to destinations that are closer to

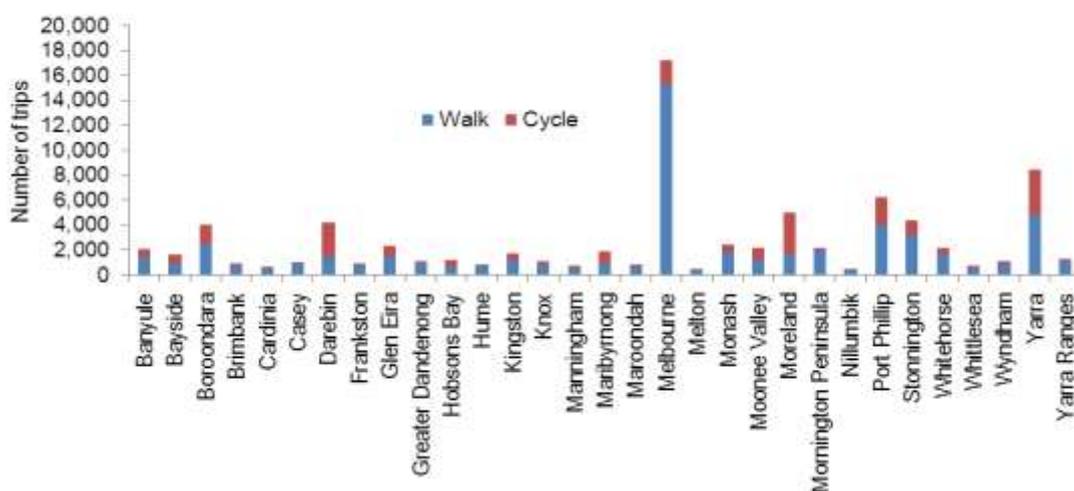
where people live due to distances that people are willing travel. Therefore, do the characteristics of different LGAs play a role in determining active transport's share in the overall journey to work task?

In order to identify the places where active transport plays a larger or a smaller role in how people get to work Section 4.2 will examine the changes in active transport trips to work experienced by different LGAs. Sections 4.3 and 4.4 will explore the relationships between active transport mode share in 2011 and two key characteristics of distance from CBD, and number of cars per dwelling.

4.2 Melbourne LGAs that have experienced change in active transport trips to work

Figure 5 shows the actual numbers of walking and cycling trips by LGA and demonstrates that the inner core LGAs generate the most trips. Changes in the distribution of all active work trips over time helps show where growth and decline in walking and cycling is occurring and whether it is happening more or less rapidly. The LGA of Melbourne has continually generated the largest proportion across the three time points 2001, 2006 and 2011. Other LGAs that have seen a continuous increase in their shares of active travel include the two inner core LGAs of Yarra and Port Phillip, as well as the inner LGAs of Moreland and Darebin.

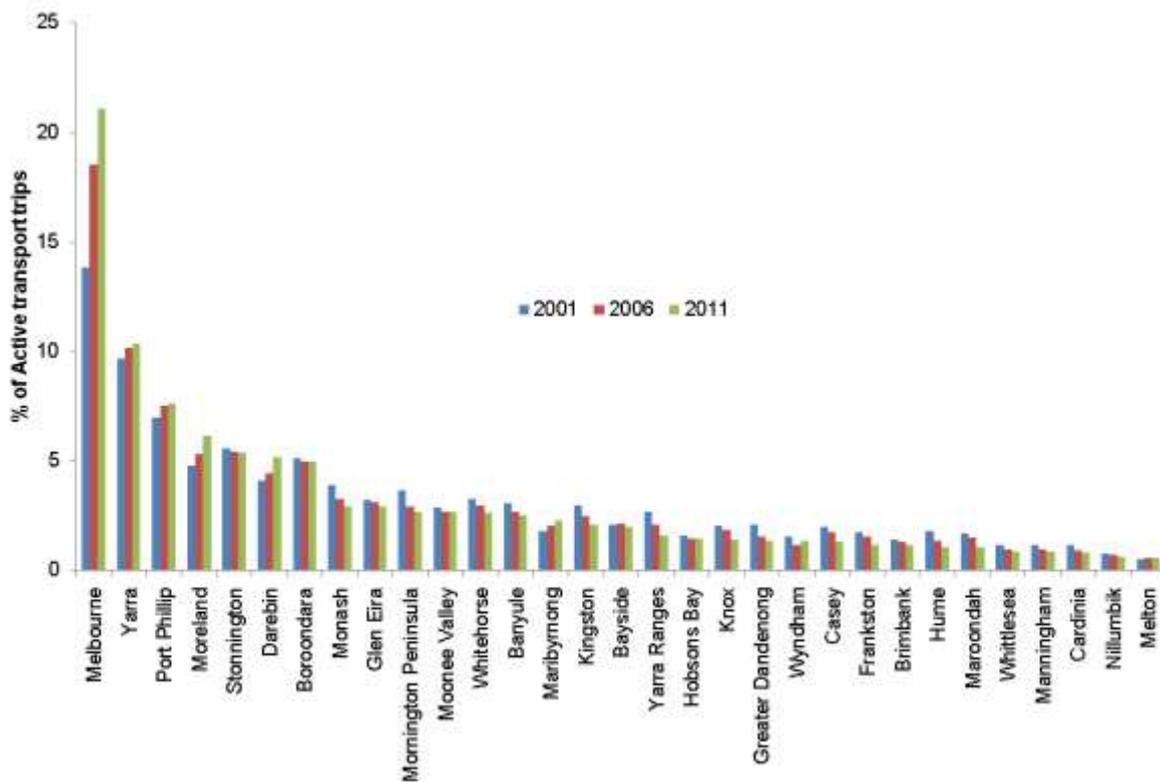
Figure 5: 2011 LGAs that generate the most active transport trips



Source: ABS Census – Journey to Work 2001, 2006 & 2011

The remaining majority of LGAs experienced a decrease in their share of total active trips. Figure 6 shows the areas which had the greatest decline were in the Yarra Ranges, Hume, Maroondah, Greater Dandenong, Casey, Frankston, Cardinia, Knox and Kingston. This is indicated decreases between 0.4 and 0.3 percentage points over the same 10 year period.

Figure 6: Proportion of all metropolitan active transport trips generated in each LGA (2001, 2006, 2011)



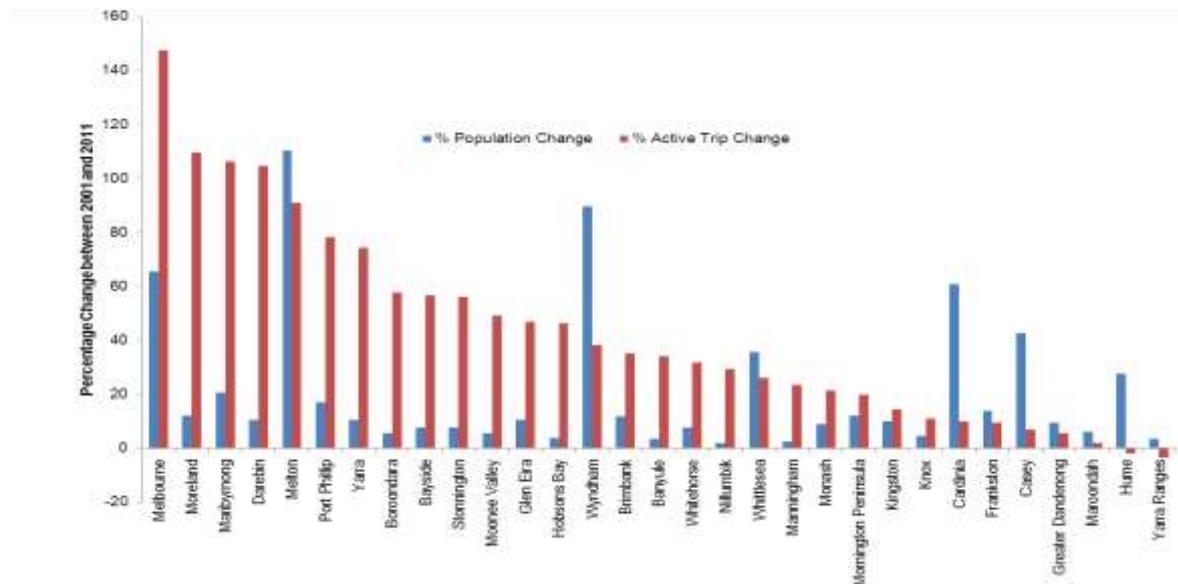
Source: ABS Census – Journey to Work 2001, 2006 & 2011

The top eight LGAs were from the Inner Core and Inner areas. Each generated over five per cent of the total trips and together combined to generate just over 60 per cent of all active transport trips to work. Outer Melbourne LGAs such as Whittlesea, Cardinia, Nillumbik and Melton contributed less than one per cent each of overall proportion of active transport journeys to work.

Population growth between the 2001 and 2011 Census suggests that changes in the number of active transport trips across Melbourne LGAs between 2001 and 2011 cannot be solely explained in changes of the numbers of people living in each. The Outer LGAs of Wyndham, Casey, Melton, Whittlesea, Hume and Cardinia have seen the greatest increases in population over the 10 year period. In particular it is worth noting that Melton more than doubled its population in that period, while Wyndham, Cardinia and Casey grew by 90, 61 and 43 per cent respectively. Figure 7 shows that despite the growth in population, these LGAs generated some of the lowest numbers of active transport trips to work. Of all the outer LGAs that have seen high population growth only Melton has appeared to generate a comparable increase in active transport trips.

Melbourne LGA experienced the fourth highest increase in population since 2001. It has added 66 per cent more residents over that period. This growth may explain some of the increase of over 10,000 walking and cycling trips between 2001 and 2011. This is over 6,300 trips more than Yarra which experienced the next highest increase. Other areas of high active transport include Darebin, Stonnington and Moreland. These LGAs have only seen moderate increases in population of 9 to 12 per cent. Port Phillip has had a slightly higher population increase of 17 per cent. This pattern of population growth compared to increases in active transport trips to work suggests that changes in the number of people in each LGA is not a major driver behind increases in active transport trips.

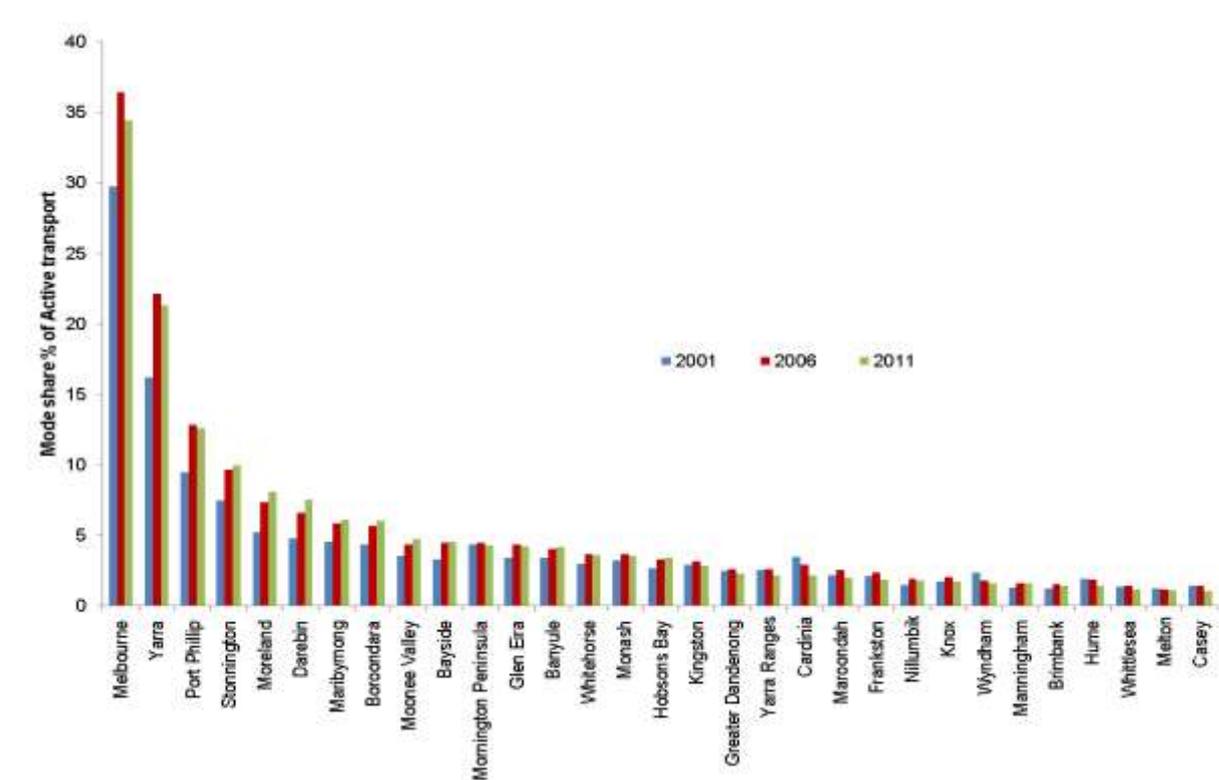
Figure 7: Comparison of % Change in Active Transport Trips and % Change in Population between 2001 and 2011 for each LGA



Source: ABS Census – Basic Community Profile and Journey to Work 2001, 2006 & 2011

Mode share describes the proportion all trips to work that were made by one type of mode or another. As Figure 3 in section 4.1 shows the combined average mode share of walking and cycling for the entire metropolitan Melbourne area, increased a percentage point between 2001 and 2006 and then decreased slightly in 2011. At an LGA level, Figure 8 shows that this pattern of change was reflected across most LGAs between 2006 and 2011. Melbourne experienced the largest drop of 2 percentage points in mode share, followed by Yarra and Cardinia which saw a drop of 0.7 percentage points.

Figure 8: Mode share of active transport trips by LGA 2001, 2006 and 2011



Source: ABS Census – Journey to Work 2001, 2006 & 2011

Despite the decreases between the two most recent census periods, the active transport mode share for work trips has for the most part seen some positive growth since 2001. Melbourne, Yarra and Port Phillip have had the highest share across the three periods. Figure 8 shows that mode share increased by between three and five percentage points in these areas. Many of the Inner Core and Inner LGAs experienced a small steady rise in mode share over the 10 years since 2001. Stonnington, Moreland, Darebin, Maribyrnong, Moonee Valley, Bayside, Glen Eira and Banyule all had increases in active mode share of between 1.2 and 2.8 percentage points from 2001. Cardinia, Wyndham, Hume, Casey, Yarra Ranges, Frankston, Greater Dandenong, Maroondah, Whittlesea, Melton, Kingston, Mornington Peninsula and Knox all saw reductions in active transport mode share from 2001 to 2011. Cardinia saw the greatest reduction of 1.4 percentage points.

4.3 Distance from Melbourne’s CBD and its influence on active transport

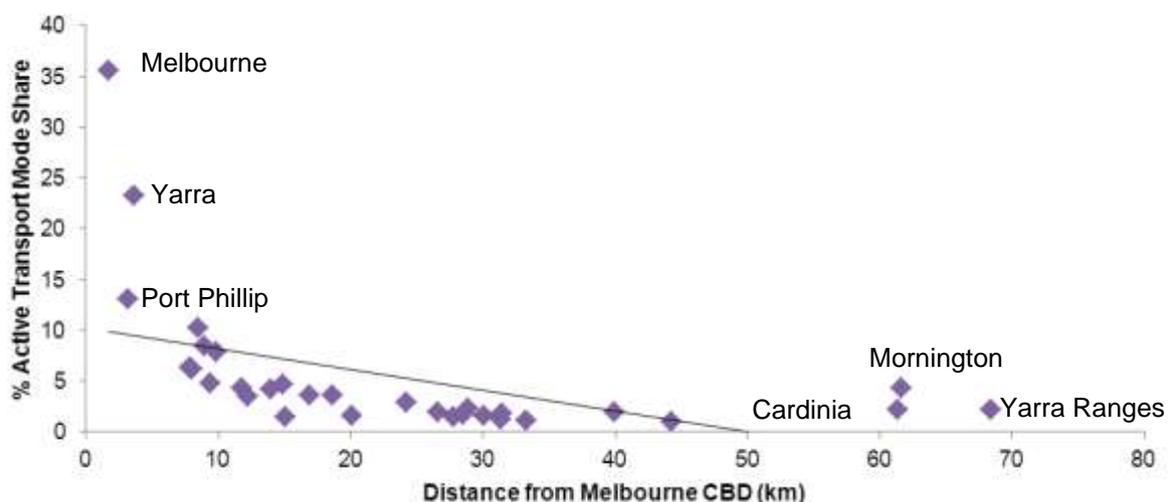
As Section 4.2 suggests, the greatest growth in mode share as well as the highest number of active transport work trips across metropolitan Melbourne area tend to be generated mainly by the Inner Core LGA as well as Inner LGAs such as Boroondara, Moreland and Darebin. This suggests that proximity of an LGA to the CBD and its immediate surrounds may increase the percentage of active transport mode share in that LGA. This section will test that hypothesis by comparing the distance (kms) from each LGA centroid from the General Post Office (GPO) in Melbourne’s CBD against the active transport mode share for each LGA.

Figure 9 shows that there is in fact a moderate negative relationship between active transport mode share and the distance from the LGA centroid to the GPO. This relationship had an R^2 value of 0.3762 which indicates the distance an LGA is located away from the CBD may not be the only factor in explaining the likelihood of whether it will have a high or a low active transport mode share.

As the majority of LGAs shown in Figure 9 are grouped around the trend line, this indicates a weak relationship tends to true for most LGAs. Of the outliers, those with the highest active mode share (Melbourne, Yarra and Port Phillip) are between one and four kilometres from the GPO which if compared with Figure 4 in section 4.1 are all within the maximum distance that people are willing to walk or cycle to work. This suggests that the LGAs that are within this range of the CBD are more likely to generate a higher share of active transport trips.

When active mode share is broken down into individual modes, Melbourne LGA, whose centroid is the closest to the GPO generates a walking mode share almost 31 per cent compared to a cycling mode share of 3.8 per cent. The next closest LGAs to the GPO (Yarra and Port Phillip) also have walking mode shares that are higher than cycling, but the difference between the two modes is much less noticeable. This suggests that nature of active transport commuting in the Melbourne LGA is not only different to the majority of metropolitan LGAs, but also differs to its closest neighbours.

Figure 9: LGA distance from Melbourne GPO and Active Transport Mode share



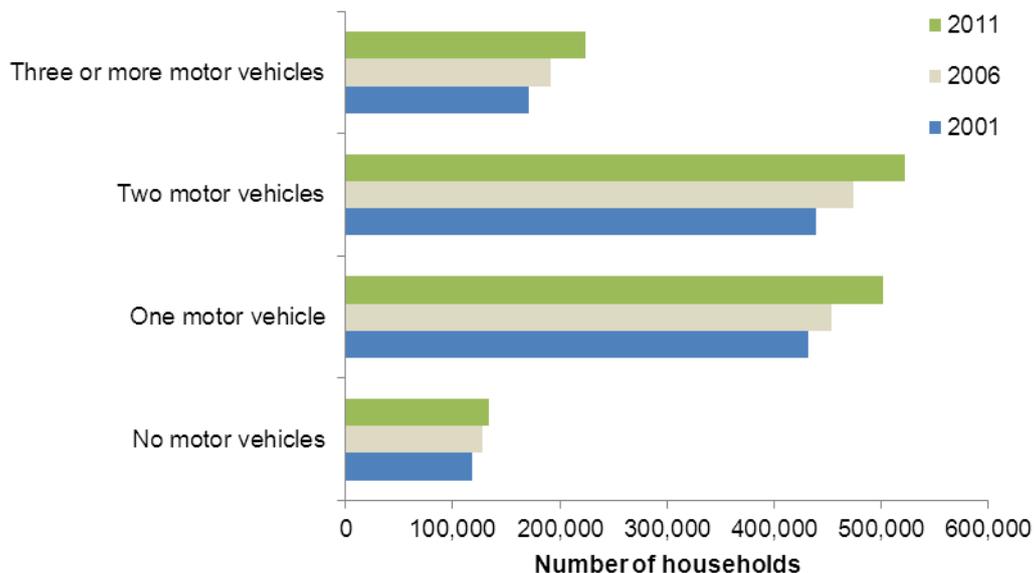
4.4 Car ownership and the relationship to active transport

The analysis in Section 4.3 suggests that there is moderate relationship between distance from the GPO and active transport mode share. This indicates that other factors are at play in explaining the likelihood of an LGA to generate high or low levels of active transport journey to work mode share.

Levels of car ownership per dwelling, on the other hand do provide some further insight. Car ownership acts as a proxy indicator for the range of travel options available to households. Households are more likely to get by with one car or less in areas where reliable and frequent public transport coverage is available, jobs and activities are close by and/or urban form, dwelling size and costs of parking that are prohibitive for multiple car ownership. In areas where public transport is infrequent and sparse, jobs are at a significant distance from homes and there are fewer land-use constraints on parking, multiple car ownership per household is much more common, especially for families with teenagers and young adults with diverse mobility requirements (Currie and Senbergs 2007).

Since the 2001 Census, there has been an increase in overall car ownership per household across metropolitan Melbourne. The change between 2006 and 2011 in the average car ownership in the LGAs has been small. The highest increase was experienced in Mornington Peninsula, which saw an increase of 0.06 cars per dwelling. The biggest decrease occurred in the Melbourne LGA which saw a reduction of 0.05 cars per dwelling (DOT 2012).

Figure 10: Growth in motor vehicle ownership per dwelling 2001, 2006 and 2011



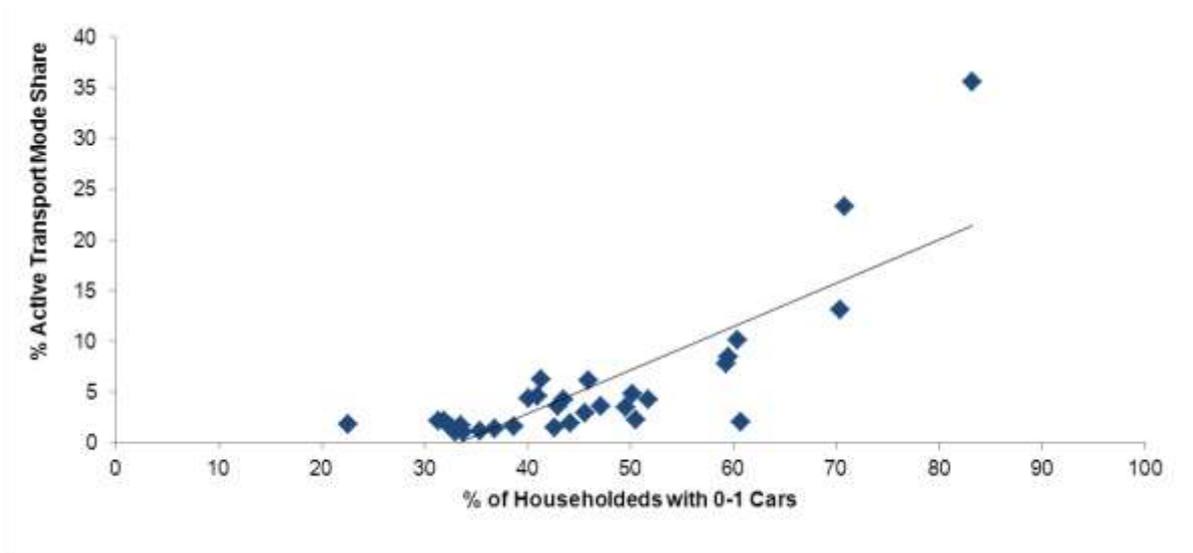
Source: ABS Census – Basic Community Profile

Table 1 suggests that LGAs with the lowest average car ownership are also located in the Inner Core and Inner areas, while the Middle and Outer suburbs generally have a higher percentage of dwellings with three or more cars. To determine whether there is a relationship between number of cars per household and active transport mode share a correlation analysis was conducted. The correlation suggested that the level of car ownership in a LGA does appear to have a statistically significant relationship to the proportion of active transport trips LGA as indicated by a Pearson's $R=0.808$ where $p < 0.01$. The R^2 value of 0.6985 also supports the significant strength of this relationship. This relationship is represented visually in Figures 11 and 12.

Table 1: Highest and Lowest Average Numbers of Cars Per Dwelling Per LGA 2011

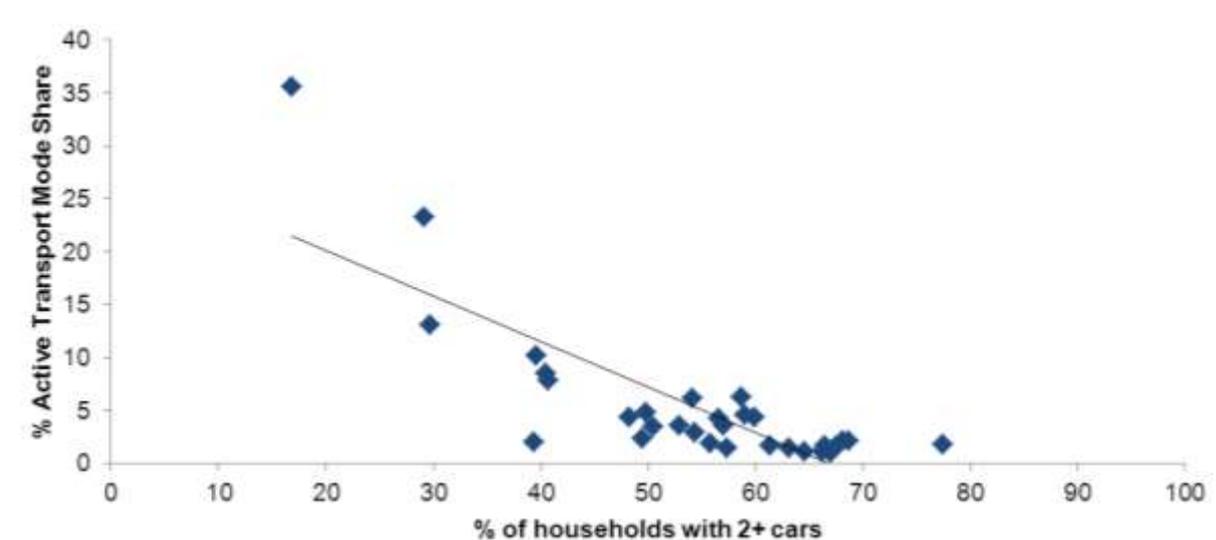
Lowest		Highest	
LGA	Average No. Vehicles per dwelling	LGA	Average No. Vehicles per dwelling
Melbourne	0.79	Nillumbik	2.20
Yarra	1.14	Yarra Ranges	2.00
Port Phillip	1.17	Cardinia	2.00
Maribyrnong	1.34	Manningham	1.95
Stonnington	1.35	Casey	1.93

Figure 11: 2011 LGA active transport mode share (%) and 0-1 car households (%)



Source: ABS Census – Basic Community Profile

Figure 12: 2011 LGA active transport mode share (%) and 2+ car households (%)



Source: ABS Census – Basic Community Profile

There is a strong relationship between active transport and the number of cars per household. This analysis demonstrates that LGAs that have a greater percentage of 0-1 car households tend to generate greater levels of active transport trips whereas LGAs with two or more cars generate fewer active transport trips. This supports the relationship between car ownership and transport choice

identified by Currie and Zenbergs (2007). In addition to the quality of walking and cycling infrastructure, the review into the factors of that influence car ownership in outer areas found that the availability of other transport modes and proximity to activity centres also correlated to multiple car ownership. It may also indicate that households that are more inclined to walk and cycle in preference to other modes are less likely to choose to invest in a car or an additional car.

5 CONCLUSIONS AND FURTHER RESEARCH

As the analysis in Section 4 shows, while there has been a noticeable increase in walking and cycling trips to work from 2001 to 2011, active transport only makes up a small percentage of Melbourne's overall daily transport task. A high proportion of those trips are generated in the Inner Core and Inner Melbourne LGAs compared to most Middle and Outer Melbourne LGAs. This suggests that different characteristics between different LGAs influence the propensity for people to commute by active transport in different ways.

Sections 4.3 and 4.4 explored two of these characteristics namely distance from the CBD and car ownership per dwelling. The analysis indicated that, the proximity of an LGA to the CBD only has a moderate relationship with active transport mode share. On the other hand, number of cars per dwelling was found to have a strong and statistically significant relationship with active transport mode share. These findings raise a number of interesting further research questions.

The results of the investigation of the correlation between the distance to the GPO and active transport mode share for work trips in Section 4.3 suggested that Melbourne, Yarra and Port Phillip LGAs may exhibit some different characteristics from the remaining metropolitan LGAs. Using ABS Census and VISTA data the relationship between active transport and distance from the CBD and other employment centres could be examined at a much smaller spatial scale to better understand the nature of active transport in the places that generate the highest shares. This could include investigations of destinations of these work trips and whether there is a relationship between the types of employment and active transport trips to work.

A potential research topic could involve further investigation of the relationships between number of cars per dwelling and active transport mode share. It could explore whether the factors that contribute to influencing a household to locate in a particular LGA or to own more or less than two cars are the same factors that influence walking and cycling mode share. Other variables to be explored could be household structure, urban form, job density, education, income and gender. These research questions could also be applied to the context of regional centres.

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