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The spatial context of transport disadvantage, social exclusion and well-being

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ABSTRACT

This paper explores the spatial differences in measures of transport disadvantage, social exclusion and well-being in a survey of inner metropolitan, outer suburban, urban fringe and regional areas of Victoria, Australia. Its aim is to understand how geographic context may influence transport disadvantage which may in turn influence social exclusion and well-being. There were very clear differences in mobility and car reliance between geographic locations. Car reliance peaked in fringe Melbourne with regional areas showing slightly less car reliance. Mobility and kilometres travelled also increased with distance from central Melbourne, which in turn resulted in greater sensitivity to fuel price increases. Again these factors were greatest in fringe Melbourne. Links between transport disadvantage and social exclusion were small and inconsistent in this paper although they have been demonstrated in other research. Links between transport disadvantage and well-being were strongest in the regional sample. The implications of these findings and their connection to the transport literature are discussed.

1. Introduction

A wide range of research has now demonstrated that transport disadvantage can act to limit access to social and economic activities and that this can both lower the quality of life and exacerbate social exclusion (Social Exclusion Unit, 2003; Lucas, 2004a; Currie et al., 2007; Hine, 2007). In general research in this field has either focussed on specific socially disadvantaged groups or focussed on geographical locations facing disadvantage. Studies with a geographic focus have examined the situation in a range of locations. Several studies have focussed on inner city areas of North American cities where low income groups are concentrated (Cervero and Tsai, 2003; Cervero, 2004). Much Australian research has focussed on the urban fringe areas of cities where walk access and public transport service is poor (Dodson and Sipe, 2006; Hurni, 2007; Currie, 2010). Rural and regional contexts, where distances are large and car reliance dominant, is a situation of international interest (Gray, 2004; Beecham, 2005; Currie et al., 2005).

Each of these locations creates unique barriers to access which, in turn, can influence the well-being or social exclusion of the people living there. An understandable limitation of these studies is that most of them concentrate on understanding a single geographic area in some depth. Fewer studies have used the same survey or dataset to examine differences across geographic contexts.

Analyses of national travel survey datasets compare trip rates and car ownership between urban and rural contexts (Pucher and Renne, 2005; Abley et al., 2008; Department for Transport, 2010) but transport disadvantage can only be inferred from these results. Some analyses use spatial tools to measure transport disadvantage in different areas around a city and compare them to indices of deprivation or exclusion, contrasting inner-urban with urban fringe situations (Church et al., 2000; Hurni, 2007; Currie, 2010). However these analyses are generally at the aggregate geographic level; they do not measure the impacts on individuals living in these locations.

Without this disaggregate level of analysis it is difficult to isolate the specific impacts that geographic location can have individual outcomes. Pucher and Renne (2005) in their analysis of rural mobility acknowledge that households in sprawling, congested cities may have less accessibility than households rural communities. They also highlight the shortcomings of measuring realised mobility as a proxy for accessibility because it does not indicate the extent to which desired destinations can be reached (Pucher and Renne, 2005).

This paper fills these gaps in the literature by comparing, at the disaggregate level, realised mobility, transport disadvantage, social exclusion and well-being between metropolitan (Inner, Outer and Fringe) and Regional areas in Victoria, Australia. Its aim is to understand how differences in geographic location influences transport disadvantage which may in turn influence social exclusion and well-being. It is part of a greater research project investigating

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and quantifying links between transport disadvantage, well-being and social exclusion.[2]

This paper is structured as follows. Section 2 presents some of the research background to the study. Section 3 details the methodology for the survey and the approach to exploring results for different geographical regions. Section 4 details the results which are discussed in Section 5. The paper closes with a brief summary of key findings and a review of implications for future research.

2. Background

Transport disadvantage and its links to social exclusion has been a theme of much recent work. Social exclusion as a concept has emerged from French social policy (Lenoir, 1989) but more recently the UK has focussed policy and research attention on social exclusion and its links to transport (Hodgson and Turner, 2003; Social Exclusion Unit, 2003; Clifton and Lucas, 2004; Lucas, 2004b; Department for Transport, 2006).

Research literature on the topic sometimes focuses on geographic areas with are seen to be problematic in terms of transport needs. Studies that have focussed on transport disadvantage for inner city residents have been dominated by US research exploring unemployment and racial disadvantage of ghetto type developments (Cervero and Tsai, 2003; Cervero, 2004). Low car ownership and a lack of reverse-commute public transport services are major areas of this research.

The urban fringe of metropolitan areas is a major focus of a range of research, especially within Australian cities (Dodson and Sipe, 2006; Hurni, 2007; Currie, 2010). This research suggests that fringe areas are characterized by poor walk accessibility, little or no public transport and travel distances which are much longer than inner-urban areas. Importantly housing affordability can attract low income housing to the urban fringe where a lack of alternative transport "forces" households into investing a large portion of their limited income on car ownership (Banister, 1994).

"Forced car ownership" was originally a term coined in the UK related to rural contexts where similar issues of car reliance on low income were identified (Jones, 1987; Banister, 1994). Rural contexts tend to exacerbate the need to travel over longer distances and hence generate a higher degree of car reliance. In these areas car ownership is not considered a sign of affluence but of deprivation and necessity (Gray, 2004). In this context, transport disadvantage may be minimal for households with car access but the small proportion of households without a car are likely to suffer much greater deprivation than their urban counterparts (Pucher and Renne, 2005).

Much of this research focuses on understanding the issues faced in specific geographic locations. Fewer studies use the same instrument to compare the situation across different areas. Spatial analyses sometimes compare travel characteristics across urban and rural contexts (Pucher and Renne, 2005; Abley et al., 2008; Department for Transport, 2010) or compare geographic measures of transport disadvantage with measures of deprivation or exclusion (Church et al., 2000; Hurni, 2007; Currie, 2010). However estimations of transport disadvantage from these surveys must be inferred from car ownership levels, trip rates or access distances whereas deprivation is measured at an aggregate level. These methods measure realised or potential accessibility but do not directly measure the extent to which desired destinations can be reached (Pucher and Renne, 2005). Previous work has suggested that people in congested, urban areas may have just as much difficulty reaching destinations as residents of rural areas (Pucher and Renne, 2005).

The major aim of this paper is to use disaggregate, self-reported measures of transport disadvantage to compare its prevalence across geographic areas. This disaggregated dataset will also be used to compare the impacts of transport disadvantage on social exclusion and well-being across geographic contexts. It is likely that transport disadvantage will have a greater impact on social exclusion and well-being in remote areas than it will in accessible urban areas. Exploring this hypothesis is a second contribution of this paper.

The literature on the impact of transport disadvantage on well-being is in early stages. The first studies were restricted to elderly cohorts where increased mobility was shown to have a small but important impact on quality of life (Banister and Bowling, 2004; Mollenkopf et al., 2005; Spinney et al., 2009). More recent work by the authors has demonstrated stronger links between transport disadvantage and well-being in a broader demographic group (Currie and Delbosc, 2010; Delbosc and Currie, 2011). But this relationship has not been explored across different geographic contexts.

3. Methodology

The data for this research was collected using a household interview survey lasting between 60 and 90 min.[3] Respondents were selected from two sources. The first was a pool generated by a previous household travel survey called VISTA (Victorian Integrated Survey of Travel and Activity, Department of Transport, 2009); some households who completed VISTA were later approached to complete this survey. This approach enabled access to existing travel diary records and also provided a suitable sample frame for targeting of respondents. The survey covered advantaged as well as disadvantaged households but purposefully over-sampled outer urban areas. This sample was made up of two major sub-samples, one of 535 interviews from the greater Melbourne area and another 148 interviews from the Latrobe region of Eastern Victoria. These sampling areas are displayed in Fig. 1. Both surveys were conducted in the latter part of 2008.

The second survey sample specifically targeted disadvantaged individuals who may have avoided the VISTA survey. They were recruited from government and non-government support service providers such as Centrelink welfare distribution centres, churches and youth support centres. This sample of 336 contained a high proportion of single parents, unemployed persons, the disabled and carers. These respondents completed a travel survey of their previous day's travel to compensate for not having completed the VISTA survey.

For this analysis the total sample of 1019 was divided into geographic regions. The 'inner Melbourne' sample of 229 generally lived within 20 km of the central business district. The 'outer Melbourne' sample of 476 came from the remainder of the outer suburban areas[4] between 20 km and 110 km of Melbourne's centre. In addition a 'fringe' sample made up 79 interviews. These areas were

[2] Australian Research Council Industry Linkage Program Project LP0669046, "Investigating Transport Disadvantage, Social Exclusion and Well-being in Metropolitan, Regional and Rural Victoria", Monash University, in association with the University of Westminster (UK), University of Ulster (UK), Department of Infrastructure, Victoria, the Bus Association of Victoria and the Brotherhood of St. Laurence. The principal chief investigator is Prof. G. Currie, the chief investigators are Prof. T. Richardson, Prof. P. Smyth and Dr. D. Vella-Brodrick. The partner investigators are Prof. J. Hine, Dr. K. Lucas, Mr. J. Stanley, Dr. J. Morris, Mr. R. Kinnear and Dr. J. Stanley. The study Research Fellow is Ms Alexa Delbosc.

[3] The development of the survey and the wider analysis in this project are fully described in Currie et al. (2009).

[4] Outer suburban areas include the local government areas of: Cardinia, Casey, Frankston, Hume, Knox, Mornington Peninsula, Maroondah, Melton, Nillumbik, Whittlesea, Wyndham, Yarra Ranges. At their closest these areas lay some 20 kms from Melbourne CBD and at their furthest they are some 110 kms from the CBD.

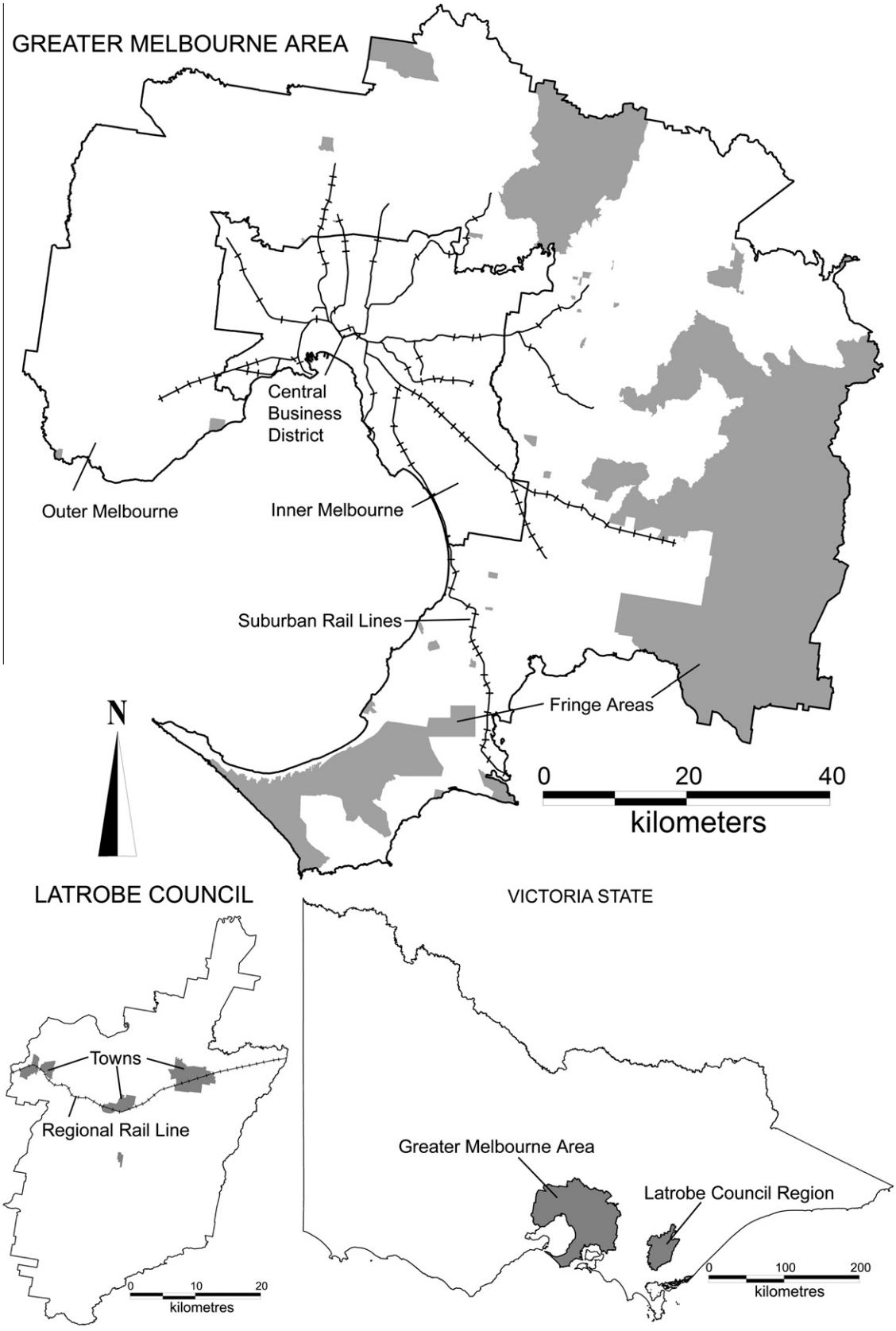

Fig. 1. Metropolitan Melbourne and Latrobe Council survey sample areas.

defined as regions in the outer ring of local government areas that had little or no public transport services.

The regional sample came from the Latrobe region of Eastern Victoria between 120 and 150 kms east of Melbourne's central

business district. The region includes the towns of Moe, Morwell, Traralgon and Churchill, which range in population from 4500 to 22,000, as well as smaller villages and areas of isolated housing.

The study of transport disadvantage is sometimes reduced to realised mobility or car ownership (e.g. Pucher and Renne, 2005). More often it is focussed on activity-based impacts, such as access to jobs, education, leisure and services (Social Exclusion Unit, 2003). Sometimes this is measured using objective measures of potential access (such as travel time to hospitals by car or transit), other times using self-reported subjective measures of difficulty (such as the percent of young people who say a lack of transport is a barrier to getting a job, Social Exclusion Unit, 2003).

In this survey transport disadvantage was measured using several subjective, self-reported measurements. Respondents were asked how often they had difficulty accessing activities due to a lack of transport and whether there were any activities they could not access at all because of transport.

In addition to the above a number of other transport related issues were explored in the survey. Travel trip rates and mode of travel for a survey day was available via the link to the previous VISTA survey. The survey also explored the impact of rising fuel prices.

Social exclusion is a complex, multi-faceted construct. It is more than just poverty and encompasses issues with social participation and civic engagement. Although the approach taken by different authors broadly overlaps, there is no single definition of social exclusion. Furthermore many conceptualisations of social exclusion make it difficult, if not impossible, to empirically measure. Burchardt (2000) was one of the first to propose an empirically defined, measurable definition of social exclusion. It is measured on five dimensions:

- Income: Participants were classified into four categories of non-equivalised gross household income.
- Unemployment: This included both those who were looking for work and those who were unemployed due to disability or illness.
- Political engagement: This was measured by recording recent participation in political or community groups.
- Participation: Participants were asked if they have been excluded from a range of activities such as hobbies, sport and visiting libraries.
- Social support: This was measured by asking how easily people could get help from others if they needed it.

People were categorised as excluded using cut-off criteria from the above variables. Those with an income below $500 per week (the 'poverty line') were considered excluded on one dimension as were people who were unemployed. Those who participated in no political or social activities were considered excluded and so were people with very low scores on the social support scale. Finally, these exclusion scores were summed, giving participants a total social exclusion score ranging from 0 (not excluded on any dimensions) to a possible 5 (excluded on all five dimensions, although the highest score in this sample was 4).

The measurement of well-being at the individual level is a mature research topic in social psychology (Kahn and Juster, 2002). For this study three measures of well-being are adopted:

- Satisfaction With Life Scale: Participants indicate how much they agree with five statements about their life conditions and how close their life is to their ideal (Diener et al., 1985).
- Personal Well-being Index (PWI): Participants indicate how satisfied they are with nine different aspects of their life (International Wellbeing Group, 2005).
- Positive and Negative Affect Schedule: Participants rate how much they generally feel a range of positive and negative emotions (Watson et al., 1988).

The 'Satisfaction With Life Scale' (SWLS), 'Personal Well-being Index' (PWI) and 'Positive Affect' (PA) and 'Negative Affect' (NA) Schedule are standard measures for measuring subjective well-being in the psychology literature (Diener, 1984; Lucas and Diener, 1996). Taken together these scales measure subjective well-being or quality of life.

4. Results

Results are examined from a number of perspectives by geographic region. This includes general sample characteristics, transport and travel, self-reported transport difficulties and links between transport difficulties, social exclusion and well-being.

4.1. Sample characteristics

Table 1 shows the sample size by geographic region and some descriptive features of the sample in each region. The sample was not chosen to be representative of the population as the disadvantaged and people living in outer areas were deliberately oversampled. For example the income profile of the sample was lower than the Melbourne average; 68% of the sample was below the Melbourne median income of $AU1,040 per week (Australian Bureau of Statistics, 2007). This will artificially increase the number of socially excluded in the sample however it should not significantly bias the correlational relationships between variables.

The proportion of each geographic sample taken from the special survey of disadvantaged individuals ranges between 31% of the Inner and Outer Melbourne samples to 41% of the Fringe sample. However this does not appear to have greatly influenced the

Table 1
Sample characteristics by region.

	Metro overall	Inner Melb	Outer Melb	Fringe	Regional
Sample size					
Number completed interviews	784	229	476	79	235
Percent from "special survey" sample (%)	32	31	31	41	37
Key descriptive statistics					
Adults in HH	2.1	2.0	2.1	1.9	1.9
Proportion who have children in HH (%)	43	37	45	51	34
Average age	44	44	45	46	45
Retired (%)	20	17	21	23	26
Proportion with income below $Aust 1,100pw (%)	61	61	61	60	71
Proportion who are unemployed (%)	16	20	14	13	25
Proportion with post-secondary education (%)	40	46	39	37	35
Proportion born overseas (%)	23	29	20	20	13
Proportion who are female (%)	57	56	59	52	48

difference in demographics between these samples although the demographics of the geographic groups differed in a few notable ways. As the samples moved from inner Melbourne to Regional areas, people were more likely to be retired, were less likely to have a post-secondary education, were less likely to be born overseas and were less likely to be female. Within Melbourne incomes did not vary by region but people were more likely to have children the farther they were from Inner Melbourne. Incomes were lower in the Regional sample and they were less likely to have children. Household size and age did not appear to vary greatly between geographic areas. The unemployed were most likely to be in Inner Melbourne and Regional areas.

These differences should be kept in mind as they may influence other variables in the survey.

4.2. Transport and travel

Table 2 details some of the transport and travel characteristics of the study areas. Average walk distance to business zones (local shops/activities) increases greatly with distance from the centre of Melbourne. A walk distance of 500 m is considered accessible; using this cut-off most of those in inner Melbourne could walk to local shops whilst those in all other areas could not.

The quantity of public transport was measured using an index of quantity of service per week and walk access to service (described fully in Currie, 2010; Delbosc and Currie, in press). This service level declines inversely with distance from central Melbourne in the Metropolitan area (fringe areas have less service than regional areas due to the definition of fringe used in this paper).

There are strong links between car ownership, mode share and lack of public transport. Regions with the highest car ownership and highest mode share by car also have the lowest public transport usage. Car ownership increases with distance from the city centre except for regional areas. Interestingly, car ownership is lower in the Regional sample than it is in the Outer Melbourne sample. Walk/cycling is also high in the Regional sample and public transport mode share is almost as high even though service levels are a third of the level in Outer Melbourne.

Interestingly the volume of travel made also generally increases with distance from the centre of Melbourne. The Fringe sample has the highest trip rates and longest distances travelled. Regional trip rates are the second-highest though their average trip distances are just as long as the Fringe sample. Compared to inner Melbourne average daily passenger kilometres are 1.5 times higher for regional areas and twice as high for fringe areas. These patterns are similar to those found in the literature, although the overall travel distances are smaller than those found in comparable American studies (e.g. Pucher and Renne, 2005).

4.3. Transport disadvantage

Table 3 details survey results regarding self reported difficulties with transport and access to activities. This includes some responses to increasing fuel prices which were occurring during the survey period.

There were no significant differences between regions in the self-reported frequency of having difficulty accessing activities due to lack of transport. In general there were many similarities in the particular activities associated with transport difficulties in each of the sample areas. Visiting friends and relatives was the most common activity associated with transport difficulties, especially in the fringe sample. This was followed by general recreation and sporting/leisure. Shopping, personal business and work access issues were highlighted by a higher share of the fringe sample.

When people were asked if there were activities they *could not do* because of transport problems there were significant differences between groups. The Fringe and Regional areas were the most likely to identify these activity barriers. Again, leisure, enjoyment and visiting others were the most commonly cited activities that could not be done. Significantly, 6% of fringe and 7% of regional respondents said they could not find work and 4% said they could not interview for jobs because of transport difficulties.

There was a strong association between car reliance, travel quantity and fuel price impacts across regions. Fringe areas were the most affected by fuel price increases followed by regional and outer areas. Although making fewer trips by car and doing multiple activities on a single trip were the most common responses in all geographic areas, there were significant differences in coping responses by location. People in inner areas were more likely to walk/cycle and less likely to participate in activities less. Outer areas were the least likely to walk/cycle and most likely to use the bus more (buses in Melbourne tend to run in middle and outer suburbs). People in fringe areas were the most likely to travel to places which are closer but with lower train/tram and bus use, they were also the most likely to participate in activities less and travel less overall. Regional areas were by far the most likely to share their car with others and were also more likely to change the number of lifts they gave.

Table 2
Transport and travel characteristics by region.

	Metro overall	Inner Melb	Outer Melb	Fringe	Regional
Walkability					
Distance from business zone (m)[a]	690	479	690	1283	2061
Public transport availability					
Public transport service level index[a]	1719	3821	1002	36	292
Car ownership					
Proportion without cars[b] (%)	12	21	8	6	15
Average number of vehicles per HH[a]	1.7	1.5	1.8	1.9	1.6
Average realised daily travel per person					
Trips per day[a]	3.7	3.5	3.6	4.4	3.9
Distance travelled per day (km)[a]	36	28	36	56	47
Distance per trip (km)[a]	10.0	7.8	10.4	13.6	13.6
Mode split					
Car driver[a] (%)	45	36	44	52	46
Car passenger (%)	16	12	18	16	17
Public transport[a] (%)	17	25	14	8	12
Walk/cycle (%)	21	25	19	21	23

[a] One-way ANOVA between inner, outer, fringe and regional values is statistically significant, $p < .05$.
[b] Chi-square between inner, outer, fringe and regional values is statistically significant, $p < .05$.

Table 3
Transport difficulties by region.

	Metro overall	Inner Melb	Outer Melb	Fringe	Regional
Difficulty accessing activities due to lack of transport					
Never (%)	45	41	48	38	44
Rarely or occasionally (%)	43	50	39	49	43
Often or very often (%)	12	9	13	13	13
Activities difficulty accessing					
Visiting friends and relatives (%)	29	34	25	37	31
Enjoyment (getting out and about) (%)	23	25	21	23	23
Sporting/leisure (%)	18	20	17	22	17
Shops (%)	15	13	14	25	17
Work (%)	14	14	13	19	17
Person business (medical/banking) (%)	12	12	12	15	14
School/university/TAFE (%)	12	10	12	15	15
Interview for jobs (%)	10	11	10	10	11
Accompanying a child/elderly etc. (%)	6	5	7	3	7
Other (%)	3	4	3	3	2
Activities cannot do because of transport problems					
Percent who said there were activities they could not do because of transport problems[a] (%)	15	18	14	20	24
Activities cannot do					
Sporting/leisure (%)	6	5	8	9	5
Enjoyment (getting out and about) (%)	4	4	5	10	4
Visiting friends and relatives (%)	3	3	4	9	3
Work (%)	1	2	6	7	2
Interview for jobs (%)	2	2	4	4	2
Person business (medical/banking) (%)	2	1	1	2	2
School/university/TAFE (%)	0	1	1	3	1
Shops (%)	2	1	3	0	1
Accompanying a child/elderly etc. (%)	0	1	0	2	1
Travel affected by increasing fuel prices[a]					
Yes (%)	44	35	46	56	47
No (%)	56	65	54	44	53
Response to increasing fuel prices (only includes those affected by increasing fuel prices)					
Make fewer trips by driving (%)	86	86	86	84	95
Do multiple activities in a single trip (%)	86	84	87	89	83
Travel less overall (%)	80	72	82	89	87
Travel the same but pay more (%)	78	78	78	73	79
Travel to places which are closer (%)	78	79	77	84	76
Walk/cycle more (%)	67	75	63	68	65
Use the train/tram more (%)	56	57	58	43	59
Participate in activities less (%)	55	46	56	66	58
Share car with others more (%)	45	48	44	41	54
Use the bus more (%)	37	32	41	27	32
Get more lifts (%)	32	32	33	32	38
Get lifts less often (%)	29	30	28	32	37

[a] Chi-square between inner, outer, fringe and regional values is statistically significant, $p < .05$.

4.4. Links between transport difficulties, social exclusion and well-being

Table 4 shows the average social exclusion and well-being scores by geographic area. Respondents could be socially excluded on anywhere from one to five dimensions and the metropolitan groups had very similar social exclusion scores. The regional sample was, on average, slightly more socially excluded. Well-being scores, measured on four different scales, were very similar across geographic regions. Taken together this shows that whilst people in regional Victoria were slightly more likely to be socially excluded, geographic location alone did not make people more or less satisfied with their life.

Table 5 explores the results of the correlation analysis between subjective transport disadvantage, social exclusion and well-being measures. Even using two different measures of transport disad-

Table 4
Social exclusion and well-being.

	Metro overall	Inner Melb	Outer Melb	Fringe	Regional
Average dimensions socially excluded[a]	1.1	1.2	1.0	1.0	1.4
Well-being average scores					
Satisfaction with Life Scale (SWLS)	5.0	4.9	4.9	5.0	4.8
Personal Well-being Index (PWI)	7.1	7.1	7.1	7.3	7.0
Positive Affect (PA)	3.6	3.6	3.6	3.6	3.5
Negative Affect (NA)	1.8	1.8	1.8	1.8	1.9

[a] One-way ANOVA between inner, outer, fringe and regional values is statistically significant, $p < .05$.

Table 5
Links between social exclusion, well-being and transport disadvantage by region.

	Metro overall	Inner Melb	Outer Melb	Fringe	Regional
Correlation between "Frequency of difficulties accessing activities due to lack of transport" and social exclusion score					
Social exclusion score	.10[b]	.15[a]	.07	.12	.20[b]
Correlation between "Number of activities cannot do because of transport problems" and social exclusion score					
Social exclusion score	.02	.09	−.03	.11	.12
Correlation between "Frequency of difficulties accessing activities due to lack of transport" and well-being					
SWLS	−.19[b]	−.24[b]	−.16[b]	−.20	−.41[b]
PWI	−.21[b]	−.27[b]	−.17[b]	−.33[b]	−.44[b]
PA	−.02	−.11	.02	−.10	−.08
NA	.21[b]	.15[a]	.24[b]	.18	.34[b]
Correlation between "Number of activities cannot do because of transport problems" and well-being					
SWLS	−.14[b]	−.09	−.13[b]	−.32[b]	−.30[b]
PWI	−.07[a]	−.07	−.05	−.24[a]	−.33[b]
PA	.05	−.02	.08	−.08	.06
NA	.07	.00	.07	.19	.22[b]

[a] $p < .05$.
[b] $p < .01$.

vantage, most of the correlations with social exclusion were low or not statistically significant. These simple correlations should be interpreted with caution.

A stronger set of links were found between transport disadvantage and well-being measures. The strongest relationships using both measures of transport disadvantage were found in the regional sample where correlations ranged between −.22 and −.44. Correlations in other geographic areas were smaller and inconsistent; they depended more on which measure of well-being or transport disadvantage was used.

5. Discussion

The central aim of this paper was to use disaggregate, self-reported measures of transport disadvantage, social exclusion and well-being to compare their prevalence and interactions across geographic areas. It was hypothesised that transport disadvantage would have a greater impact on social exclusion and well-being in remote areas than it would in accessible urban areas.

There were very clear differences in mobility and car reliance between geographic locations. Trips per day and distanced travelled per day peaked in fringe locations. Household car ownership ranged from 79% in inner Melbourne to 94% in fringe Melbourne, dropping again to 85% in regional areas. This levels is slightly higher than in the UK where 68% of residents in built-up areas and 84% in "small urban" areas have a car (Department for Transport, 2010); however this level is lower than in the US where 92% of urban and 97% of rural households have at least one car (Pucher and Renne, 2005).

However these sorts of differences have been well documented in travel surveys. The first new contribution of this paper is in the series of self-reported transport difficulties compared by region (Table 3). Interestingly there was no significant difference in transport difficulties measured as "difficulty getting to activities because of a lack of transport." However people in fringe and regional areas were significantly more likely to say they could not do some activities they wanted because of transport problems (20% of fringe respondents and 24% of regional respondents). This is exceptionally high considering that 94% of fringe and 85% of regional households have at least one car in the houshold. Most of the missed opportunities are social and leisure activities including a small but significant number of missed opportunities for work. This may have a downstream influence on well-being or social exclusion. Recent research in the field of social capital has found that people lacking "bonding" social capital (close ties to family and friends) tend to experience lower satisfaction with life whereas "bridging" social capital (ties to the greater community including work colleagues) promotes social inclusion (Stanley et al., 2010).

This paper hypothesised that transport disadvantage would have a greater influence on social exclusion and well-being in remote areas than in accessible urban areas. This relationship has been theorised and discussed in the literature (e.g. Pucher and Renne, 2005). For example an examination of 20 transport initiatives in rural areas of the UK identified a range of quality of life benefits including increased independence, social contacts and friendships and reduced stress and isolation (Beecham, 2005). The rural transport typography theorised by Gray (2004) suggests that transport's contribution to social exclusion is substantial in isolated villages and rural areas and less important in areas close to urban centres.

The correlation analysis in Table 5 provides some support for this hypothesis. Correlations between transport disadvantage and well-being were fairly consistent and were highest amongst the regional sample (and to a lesser extent the fringe sample). The strongest correlations were between the frequency of difficulties accessing activities and subjective well-being (−.41 and −.44 in the regional sample). This means that even though regional residents did not always report higher levels of transport disadvantage, those residents who *do* experience it are likely to experience worse well-being outcomes than people in urban areas. Conversely, if residents of urban areas experience transport disadvantage this is less likely to have a major impact on their well-being. Although this relationship has been theorised in the literature, this one of the first empirical demonstrations of this effect.

Correlations between transport disadvantage and social exclusion are small and inconsistent so few conclusions can be drawn there. It may be that the socially excluded have lower base expectations for travel; recent work has suggested that the socially excluded may not report as many transport problems because they do not get out as much (Stanley et al., 2010). Considering the wealth of research demonstrating the impacts of transport on social exclusion (e.g. Hodgson and Turner, 2003; Social Exclusion Unit, 2003; Cervero, 2004; Clifton and Lucas, 2004; Hine, 2004; Lucas, 2004b) it is unlikely that the two are unrelated. Moreover, a more sophisticated statistical technique (structural equation modelling) did find a significant relationship between these constructs using this same survey sample (Currie and Delbosc, 2010).

These findings confirm the policy implications highlighted in past literature: that transport disadvantage should be carefully addressed in regional areas where alternatives to private transport are scarce. Well-scoped, targeted transport solutions such as demand-responsive transit, local and long distance buses, subsidised

taxis or shuttle buses will not only increase mobility but may also increase the quality of life of service users.

Fringe areas also warrant further discussion. Car reliance, vehicle kilometres and fuel price sensitivity were highest in fringe urban areas with little public transport. Yet despite high car ownership levels in this group (an average of 1.9 cars per household), 20% reported they could not do activities because of transport problems. They were also the most likely to report that high fuel prices forces them to participate in activities less. Correlations between transport disadvantage and well-being were not always significant in this group but this may be due to the smaller sample size. These findings suggest the need for targeted policy responses in fringe urban areas, such as expanded transit networks or transit-oriented development to counteract the large travel distances in fringe locations.

It is likely that these results are dependent on the land use patterns and transport characteristics of the urban and regional areas under consideration. For example car ownership in the UK is lower than in Australia (Department for Transport, 2010) so the number of transport disadvantaged households is likely to be higher in areas with poor transit. Conversely in the United States as many as 97% of rural households have a car, including 89% of low income rural households (Pucher and Renne, 2005). This may result in lower levels of transport disadvantage overall but the extremely car-oriented transport system may result in even larger negative impacts for those who do experience problems with transport. Furthermore the relatively positive results from inner city areas in this study would not only apply to cities with employment-dense, transit-rich centres. Many American cities, for example, are so decentralised that jobs and middle-class housing have both dispersed through the suburbs resulting in a unique form of transport disadvantage for inner-city poor (Cervero and Tsai, 2003). Only further research can fully scope these likely differences.

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