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Investigating links between transport disadvantage, social exclusion and well-being in Melbourne—Preliminary results

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ABSTRACT

This paper summarises preliminary results of a study to extend knowledge associated with social exclusion and transport by quantifying social and behavioural implications of lack of public transport and the nature of the social well-being benefits associated with improving services. Metropolitan results are outlined including methodologies exploring the distribution of transport disadvantage in Melbourne, Australia and how this relates to public transport services. An exploration of high car ownership for groups on low income is also presented. Gaps in coverage of public transport are identified and future research outlined.

1. Introduction

Urban sprawl and sparse living are pervasive in Australia. Despite high levels of car ownership, many Australians do not have access to a private car for their travel needs. These people, often from marginalised groups in society such as young people, low-income earners, older people, indigenous Australians and those with disabilities, face difficulties accessing services, facilities and activities. While transport disadvantage and its association with social exclusion is now a major research and policy field in the UK, and tackling transport equity is a part of US policy, Australia lacks a similar focus.

This paper presents preliminary results from a new international research project aimed at redressing this Australian research gap. The project is investigating associations between transport disadvantage, social exclusion and well-being in Metropolitan, Regional and Rural Victoria, Australia.[1] The project is original in aiming to quantify associations between lack of transport and social exclusion, and is also unique in linking these factors to the social and psychological concept of subjective well-being.

Section 2 of this paper outlines the aims of the project and describes the methodologies that are to be employed including recent methodology development. Section 3 presents a summary of preliminary results concerning an assessment of transport disadvantage in fringe urban Melbourne. Section 4 details results concerning an assessment of the spatial distribution of public transport supply relative to the distribution of transport disadvantage in Melbourne. The final section concludes the paper with a summary of major findings and some discussion on areas of future research and development in the project.

2. Research program aims and approach

2.1. Research program aims and objectives

The overall goal of the program is to investigate well-being, social exclusion and transport disadvantage with reference to

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[1] 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 chief investigators are Prof. G. Currie, 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.

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Metropolitan, rural and regional Victoria. The project covers a 3 year program and commenced in late 2006. The initial project phase has focused on analysis of transport disadvantage in Metropolitan Melbourne. The project aims to:

1. evaluate travel and activity patterns to contrast behaviour between the transport rich, and transport poor and for social groups, which may be considered advantaged and disadvantaged in both groups;
2. investigate relationships between activity travel patterns and the ease of access to transport;
3. assess relationships between activity travel patterns and the elements of social and economic advantage/disadvantage and general social well-being measures;
4. evaluate poor access to transport as a cause of social exclusion and to understand how this relates to other causes of social exclusion;
5. develop a comprehensive understanding of the mechanisms influencing the travel and activity behaviour of transport disadvantaged people to a high level of detail and depth;
6. measure how public transport, community transport and human services transport provided to meet transport needs relate to the travel and activity behaviours of the transport disadvantaged;
7. identify the mechanisms and impacts of 'forced' car ownership for low-income families including a study of 'coping' strategies related to limited transport;
8. examine the impacts of higher fuel costs on the transport disadvantaged;
9. investigate the social and economic benefits of access to public transport for the transport disadvantaged;
10. assess residential location decision and the extent to which transport disadvantage results from a conscious home location decision.

2.2. Methodology

The methodology follows an inter-disciplinary approach and aims to quantify the strength of the relationships among the variables identified. The major element is a quantitative primary research survey, which is informed by an analysis of available background data and also through qualitative approaches (focus groups and consultations) to elaborate disadvantage in each of the regions being investigated.

The work commenced with a multi-disciplinary literature review of definitions of terms related to transport disadvantage and social disadvantage including team workshopping of the findings of these to identify an appropriate definitional basis for the project.

The Metropolitan section of the project has commenced with a review of available travel survey data, including the Victorian Activity Travel Survey (VATS, Transport Research Centre, 1996), so as to explore the travel behaviour of transport disadvantaged groups using existing data sources. In addition, preliminary research has involved an accessibility assessment of the quality of access on Melbourne's public transport system so as to relate the quality of service to the spatial location of residents who might be facing transport disadvantage. This work aims to establish transport 'rich' and 'poor' areas as appropriate research case study areas.

A series of research tasks are proposed to develop and implement the questionnaire survey including focus groups/interviews within case study areas to explore research questions and develop interview surveys from an informed perspective. Also survey instrument development will be undertaken through workshopping of questionnaire design within the research team including an analysis of previous survey approaches used.

A multi-criteria evaluation approach is proposed to examine the influence of transport and mobility variables with social exclusion and well-being measures. These will be analysed in the survey results database using a 'Structural Equation Modelling' approach (an advanced version of factor analysis). In transport the most related examples come from the 'Mobilate' project undertaken in the European Union (Mollenkopf et al., 2005). This work established statistically reliable relationships between quality of life indicators and a series of mobility variables ($R^2 = 0.76$). It also illustrated links between these factors and rural/urban contexts, social economic variables and psychological motivational factors.

2.3. Methodology development

Adjustments to the methodology have followed from preliminary research findings and also from wider survey developments in Melbourne since the study's inception.

A major adjustment to the research program concerns integration of the project surveys with the new Melbourne household travel survey commencing in May 2007 termed VISTA (Victorian Integrated Survey of Travel and Activity Survey, DoI, 2007). Integration with VISTA will assist in targeting transport 'rich' and transport 'poor' households in the project surveys as well as reducing the amount of data required from the field surveys.

The other main adjustment to the survey methodology concerns the case study approach targeting transport 'rich' and transport 'poor' areas. Preliminary results (see later) have confirmed the significance of walk accessibility to local activity centres as a critical influence on the levels of transport disadvantage in the community. These conclusions suggest that walk accessibility as well as the level of (public transport) supply must also be considered. Fig. 1 shows the revised framework being employed due to these findings.

This change considerably increased the number of case study 'cells' being examined, which has in part influenced the adjustment to a continuous sampling frame across all cells as opposed to the dichotomous rich–poor approach originally proposed.

Methodology development has also been informed through a series of separate analyses. Definitions of transport disadvantage were summarised across the transport literature (Currie et al., 2006). In addition, approaches to the measurement of well-being have been assessed and more promising measures for use in the study surveys identified (Vella-Broderick, 2006). In general, the research has found the psychological disciplines and associated measures of subjective well-being to be well defined and readily applicable to the quantitative study approaches envisaged. However, the social policy disciplines are less readily definable or quantitative and consequently the study's social policy researchers have had to invest much time in the definition and measurement of 'social exclusion'. Preliminary work in identifying measures of social exclusion have proposed adopting multiple measurement approaches due to the unsatisfactory basis of previous research (Johnson and Stanley, 2007). The feasibility of this within an already large study survey is being assessed and priorities identified.

Finally an interesting methodological development has been proposed in relation to measuring the economic and social benefits of public transport provision. It has been proposed that financial values be estimated on well-being measures using the 'Benthamite utilitarian approach' to valuation (Stanley, 2007). This approach envisages adopting satisfaction-based measures of well-being (after Bernard et al., 2004; Ferrer-i-Carbonell and

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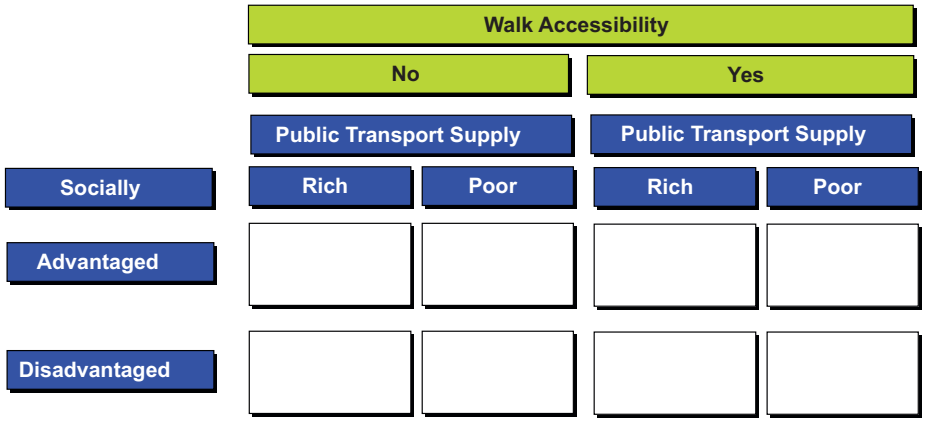

Fig. 1. Revised study framework.

Frijters, 2004) and ensuring a common financial/economic numeraire is used in the resulting equations. In this way financial/economic values of changes in component variables might be implied through modelling.

3. Preliminary results—transport disadvantage in Melbourne

The major substantive preliminary results have concerned the analysis of transport disadvantage in Metropolitan Melbourne through an analysis of VATS. This has included the assessment of 'forced car ownership' (FCO) and 'zero car ownership' (ZCO) households in the Outer urban fringe of Melbourne (findings are detailed in Currie and Senbergs, 2007a, b).

3.1. Forced car ownership

FCO is a term firstly defined in relation to UK rural areas (Banister, 1994). It concerns the involuntary choice low-income families have when owning and operating cars because no other transport options are available but they 'need' the accessibility which a car brings. In the Australian context the concept has been termed 'transport poverty' (Gleeson and Randolph, 2002) although the terminology 'forced' car ownership has never been applied in the Australian literature. The major elements of FCO are low income, lack of alternative transport options (e.g. walk or public transport) and high car ownership and hence transport costs.

To explore FCO in Melbourne a special cross tabulation of 2001 census (ABS (Australian Bureau of Statistics), 2001) results for household income and car ownership were requested. From this analysis households with a weekly income below $Aust 500/week and who lived in Outer urban Melbourne who ran more than 2 cars were selected as FCO households.

Analysis established that these households had no or very low public transport service levels and in general poor (or no) walk access to local activities. In addition, operation of 2 or more cars was found to represent as much as 50% (or more) of total income. Clearly transport costs in this group were a major issue.

Analysis established the following:

- Some 20,831 households fulfilled the identified FCO criteria. This was more than 45% larger than the number of zero car households in Outer urban Melbourne. As such it is likely that FCO is a larger issue in terms of transport disadvantage in fringe urban Australia than lack of access to a car.
- There was evidence of financial stress associated with owning and running cars in FCO households:
  - The average age of cars in FCO households (11.5 years) was higher than in other households in Outer Melbourne (10.7 years) and also for other parts of Melbourne.
  - FCO households operated smaller cars than other Outer area households. However, on average, these cars were larger than those operated by all households in Inner and Middle Melbourne.
  - These findings matched evidence on household expenditure indicating that expenditure on car purchase was lower than average.
- FCO households make 12.9% less trips than the average Outer area households with 2+ cars. However, compared to low-income households (<$500/week) in Middle Melbourne with 2+ cars, FCO households make 5.2% more trips. This is suggestive that living in Outer Melbourne requires more travel but that FCO households struggle to meet these mobility needs compared to other income groups and areas.
- FCO householders travel considerably more than Middle Melbourne low-income residents; trips (+5.2%) and distance per trip (+38%) suggest a total relative daily travel quantum difference of +45% compared to Middle suburbs. This is suggestive of a substantially higher travel financial cost compared to Inner/Middle Melbourne low-income households.

Fig. 2 illustrates the number of trips per day by mode for FCO and ZCO households. This indicates the following:

- FCO households are highly car dependent (80% of trips by car). This is a similar share to higher income households.
- Public transport share is a very small share of travel (3.3%) for low-income households compared to 4% for higher income households.
- Walking is a significant share of travel for low-income households (13.9%).
- In general, mode trip share is similar regardless of income with one exception:
  - The ratio of car passenger trips to car driver trips is 63% for low-income households.
  - This ratio is 53% for middle- and high-income households, where on average the ratio of car passengers to drivers is 55%.
  - Overall low-income households have a ratio of car passengers to drivers which is 15% larger than average for 2+ car households in Outer Melbourne.

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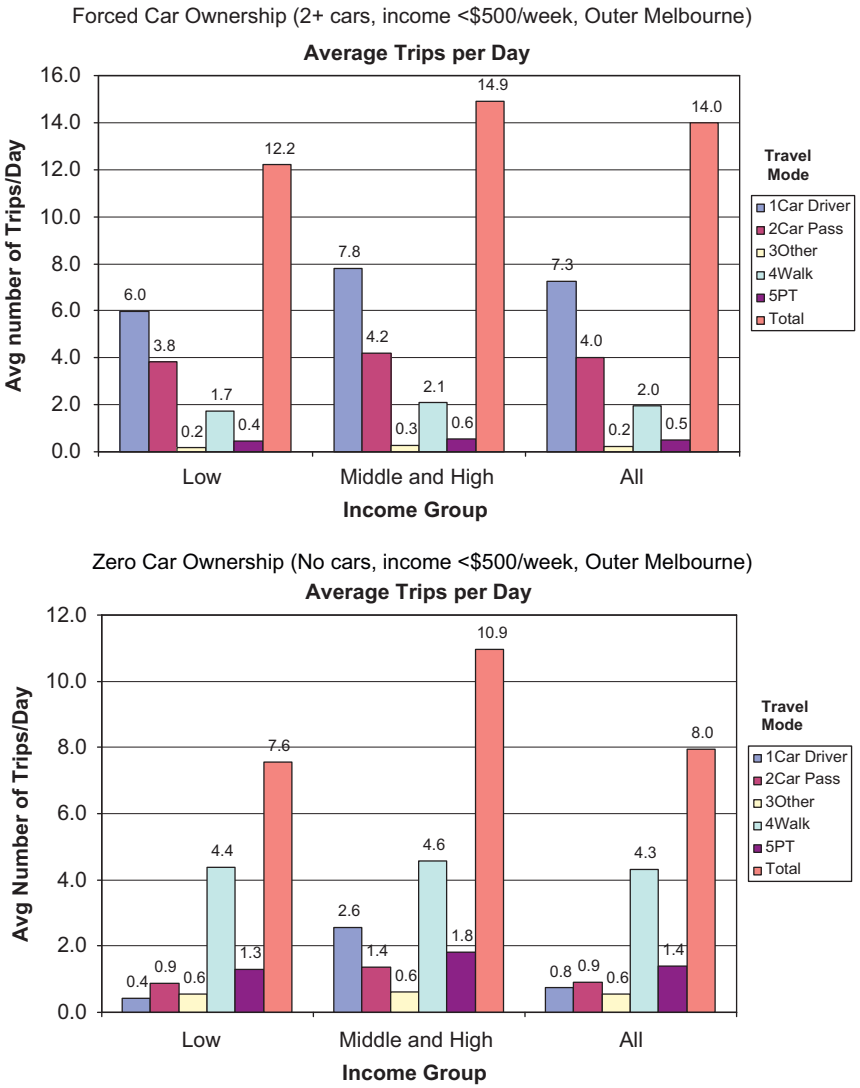

Fig. 2. Daily travel volume by mode—FCO/ZCO households.

The main contribution of this analysis to the FCO exploration is that it elaborates on how FCO households are 'coping' with low income and the high costs of car travel. In particular, evidence suggests car dependence for these groups but with a considerably higher share of car sharing. There is a 23% higher ratio of car passenger to car driver travel in FCO households compared to other households with high car ownership in Outer Melbourne.

3.2. Zero car ownership

For low-income families in Outer Melbourne (income below $Aust 500/week) the number of households without a car was 16,357, almost 4500 less than the number of 2+ car households. Travel behaviour analysis (Fig. 2) established the following:

- Walking dominates travel for ZCO households in Outer Melbourne. It represents 58% of trips made by low-income households and 54% of trips by all ZCO households.
- Public transport use is 17% of all trips by low-income ZCO households. It is about the same share for all income groups.
- Car use (driving and sharing) is 17% of trips. However, it is a 21% share of travel for all income groups together. It is interesting that car use is a significant share of travel for households without a car. Getting lifts is particularly important for low-income groups (a 12% share of their trips).
- As may be expected the trip distance analysis shows that walk trips are of a significantly shorter length than motorised travel. However, at 1.0 km in average length, walk trips for low-income households are surprisingly longer (over 60% more than the Metropolitan average of 610 m).

These results present a new and original picture of transport disadvantage in Australian cities. Because walking dominates travel in terms of frequency but not distance, the implication is that ZCO households live within walkable access to local activities. Indeed an analysis of the share of ZCO in each CCD has established that 99% of all census collector districts with over 20% share of low-income households without a car were within 1.5 km from a local activity centre.

3.3. Identifying FCO/ZCO drivers

Analysis explored the relationship between the share of ZCO and FCO in low-income households and a series of other potential

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explanatory variables using multiple regression analysis. Analysis covered all 5720 CCDs in Melbourne. The following explanatory variables were tested:

- The relative level of public transport supply—this was measured using an index relating to frequency of service during the week and also the spatial coverage of services (see later).
- Distance to nearest railway station (km).
- Distance to nearest defined major activity centre (km).
- Distance to nearest local activity centre (defined as a business zone, km).

The regression results established that public transport supply and distance to local activity centre had statistically significant relationships with FCO/ZCO but with a modest level of overall explanatory power (adjusted $R^2 = 0.15/0.17$). The other variables were not significant in 'p tests'.

Fig. 3 shows the modelled relationship between public transport supply and the share of low-income household with FCO/ZCO. These relationships suggest that the share of FCO households in Outer Melbourne is particularly sensitive to the level of public transport supply compared to Inner and Middle Melbourne. A reasonably small increase in public transport supply, from say zero to a supply index value of 1000, can reduce

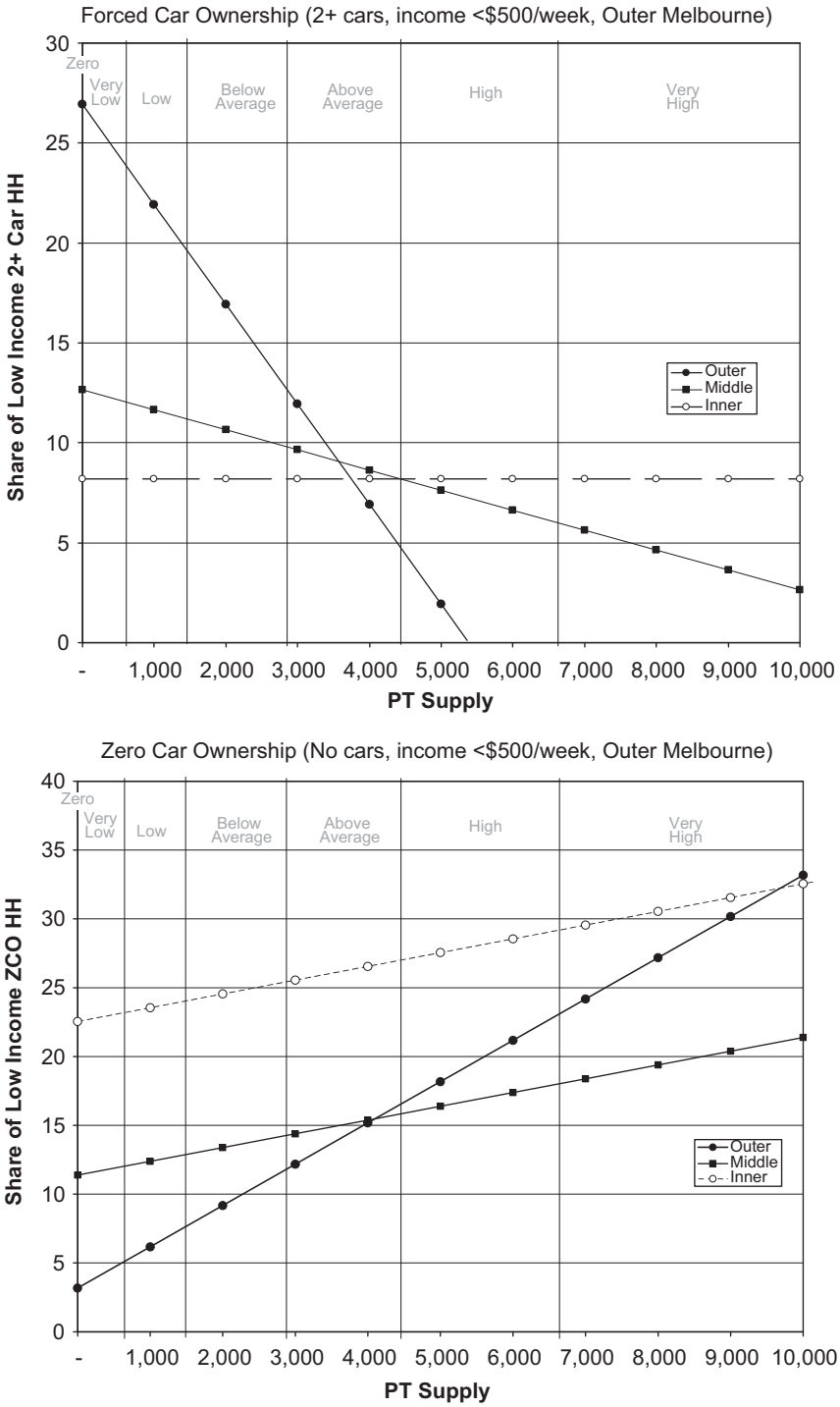

Fig. 3. Modelled relationship public transport supply and share of FCO/ZCO low-income households in outer Melbourne.

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FCO from 27% of households to 22%. This would reduce the number of Outer households with FCO by over 1000. For ZCO households, the share increases with public transport supply.

The associated analysis of walkability also showed a strong link between the ability to walk to local activity centres and zero and 2+ car ownership in households. As noted over 99% of all CCD's with 20%+ of low-income household without a car were within walkable access to an activity centre. FCO share increases with distance to activity centres (i.e. they are not walkable).

These results suggest a strong link between the quality of public transport supply and the share of low-income households facing financial burdens associated with car use. In addition, walk accessibility and inaccessibility is an equally strong driver of car ownership.

4. Preliminary results—the Melbourne needs-gap study

As part of the accessibility assessment of the Metropolitan Melbourne area, a Geographic Information System (GIS) model of public transport service level was developed. The resulting distribution of service supply was compared with the spatial distribution of transport needs measured using census-based indicators. The approach is termed 'needs gap' (i.e. gaps between public transport supply and transport needs) and has been applied in a number of Australian studies (Currie and Wallis, 1992; Travers Morgan, 1992; Currie, 2004) and are reported in detail for the Melbourne application in a recent conference paper (Currie and Senbergs, 2007a, b).

4.1. Public transport service measurement

The supply measurement aimed to create a measure of public transport supply for each CCD, which was representative of the share of the CCD that had good/bad access distance to public transport and the level of service provided by public transport to the areas where public transport was provided.

The following approach was adopted:

1. A database of bus and tram stops and train stations was obtained (current to August 2006). This included the location of each stop/station plus a listing of rail, bus and tram routes using the stops.
2. This database was integrated with a database of public transport service frequencies in Melbourne. A database of bus service levels was obtained from the Bus Association of Victoria (current to November 2005, and includes updates for new 'SmartBus' routes 700 and 900 to August 2006). Current tram and train service frequencies were extracted from local passenger information websites (current to August 2006).
3. For each stop/station a measure of service frequency was calculated, which is the 'total number of service arrivals per week'.
4. Access distance to each stop/station was then measured for each CCD assuming the following thresholds of walk access which are based on typical walk catchments (termed walk 'buffers') for public transport modes:
   access to bus stop = 400 m,
   access to tram stop = 400 m,
   access to rail station = 800 m.
5. A combined measure of service frequency (vehicle trips per week) and access distance was then computed for each CCD using GIS software and the following formula:

$$SI_{CCD} = \sum_{N} \left(\frac{Area_{Bn}}{Area_{CCD}} SL_{Bn} \right) \quad (1)$$

where SI_{CCD} is the supply index for the *CCD*; *CCD* is the *CCD* under analysis; *N* is the number of walk access buffers to stops/stations in each CCD; *Bn* is the buffer n for each stop/station in each CCD; Area is the square kilometre spatial area of the CCD; *SL* is the service level measure (number of bus/tram/train vehicle arrivals per week).

4.2. Spatial transport needs measurement

A combination of two main measures of the spatial distribution of social disadvantage or 'need' indices was adopted including the following:

1. The Australian Bureau of Statistics Index of Relative Socio-Economic Advantage/Disadvantage (IRSAD).
2. A Transport Needs Index.

Both were considered a valuable means of identifying social disadvantage in relation to transport needs. The IRSAD index is more common in social research in Australia and is described in Adhikari, 2006. In summary, it identifies census indicators associated with social advantage and disadvantage (e.g. income, unemployment, etc.). The Transport Index approach is based on Currie (2004) and Travers Morgan (1992) and is adopted because it specifically considers transport related needs using available Australian census and social indicators. Measures include the share of adults without cars, the share of groups known to experience transport disadvantage (e.g. young and older people, low-income groups, students and disabled people).

Scores for these indices were assembled for CCD's throughout Melbourne and 'standardised' to a single composite index with a value between 0 and 100 based on the scores' relationship to the highest index score in the data series. A composite set of indices considering total scores and the share of scores in each CCD was adopted.

5. Results

Table 1 shows the distribution of public transport supply and need indicator scores through Melbourne's CCD's grouped into above and below average categories (including a zero supply category). The resident populations (2001) for the CCD's in each group are also identified.

This indicates the following:

- Some 89 CCD's representing 37,699 Melbourne residents (1.1% of the population) live in areas with no public transport but have the 'very high' social/transport needs score.
- Of those with 'very high' need scores, 1,01,305 residents live in areas with 'very low' public transport supply and 1,37,735 with 'low' public transport supply. Hence overall 8.2% of Melbourne residents have 'very high' needs but 'zero', 'low' or 'very low' public transport supply.

Fig. 4 shows the spatial distribution of CCD's with 'very high' need scores and 'zero' or 'very low' public transport service levels. This indicates the following:

- Outer urban Melbourne including Mornington Peninsula, Yarra Ranges and Cardinia are highlighted as areas with large amounts of high-need low/zero supply.
- Closer to Middle Melbourne the following areas are highlighted:
  - In Melbourne's North West Parts of Deer Park, Albion/Ginifer, Keilor Plains, Meadow Heights, Dallas, Campbellfield and Laylor.

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Table 1
Relative public transport supply and transport need groups.

Supply indicator	Composite need indicator								
	Very high			High			Above average		
	CCDs	Pop.	% Pop.	CCDs	Pop.	% Pop.	CCDs	Pop.	% Pop.
Zero	89	37,699	1.1	32	14,338	0.4	16	7985	0.2
Very low	190	1,01,305	3.0	212	1,31,554	3.9	230	1,40,757	4.2
Low	209	1,37,735	4.1	214	1,41,273	4.2	256	1,69,648	5.1
Below average	189	1,20,934	3.6	205	1,19,981	3.6	191	1,13,281	3.4
Above average	74	41,702	1.2	61	33,000	1.0	81	43,622	1.3
High	53	27,702	0.8	66	33,314	1.0	62	30,694	0.9
Very high	53	24,692	0.7	39	16,563	0.5	43	20,393	0.6
Total	857	4,91,216	14.7	829	4,90,023	14.7	879	5,26,380	15.8

Supply indicator	Composite need indicator											
	Below average			Low			Very low			Total		
	CCDs	Pop.	% Pop.	CCDs	Pop.	% Pop.	CCDs	Pop.	% Pop.	CCDs	Pop.	% Pop.
Zero	18	9416	0.3	25	13,263	0.4	6	2722	0.1	186	85,423	2.6
Very low	245	1,54,876	4.6	218	1,40,874	4.2	164	1,18,926	3.6	1259	7,88,292	23.6
Low	221	1,46,209	4.4	217	1,48,078	4.4	176	1,19,906	3.6	1293	8,62,849	25.8
Below average	261	1,53,874	4.6	237	1,40,390	4.2	206	1,26,061	3.8	1289	7,74,521	23.2
Above average	121	62,783	1.9	116	60,952	1.8	147	79,117	2.4	600	3,21,176	9.6
High	92	42,802	1.3	98	48,912	1.5	161	76,597	2.3	532	2,59,468	7.8
Very high	75	35,865	1.1	146	61,719	1.8	205	90,181	2.7	561	2,49,413	7.5
Total	1033	6,05,825	18.1	1057	6,14,188	18.4	1065	6,13,510	18.4	5720	33,41,142	100.0

Fig. 4. Melbourne needs gap—very high transport need areas with zero or very low public transport supply.

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- In Melbourne's South Parts of Frankston East, Seaford, Bonbeach, Cranbourne South, Dandenong, Clayton South and Keysborough.

The study results show much consistency with the findings of previous studies indicating a concentration of transport gaps in fringe urban Australia (Currie and Wallis, 1992; Currie, 2004). Although the approaches used in these studies are different, a remarkably clear mismatch between public transport supply and social needs is apparent in Australian cities. Although this has been widely commented on in social research (e.g. Hurni, 2006), the approach adopted in this study has been quantitatively based utilising GIS techniques to objectively assess relative needs and service levels. The findings should therefore be an excellent basis for planning to address the gaps identified as well as to monitor performance in addressing these gaps.

6. Conclusions

This paper presents an update on progress of an international research project investigating links between transport disadvantage, social exclusion and well-being in Metropolitan, Regional and Rural Victoria.

Preliminary results have concerned the investigation of the transport disadvantage in fringe urban Melbourne through an analysis of existing census and travel survey data. The concept of 'forced' car ownership (FCO) as it applies to fringe urban Melbourne has been explored. Overall some 20,831 households were identified in Outer Melbourne, which may be considered to have FCO including no/low relative public transport service levels, lack of walkability to activities, an income below $500/week, who also run two or more cars. These households were found to own smaller and older cars and to spend a higher share of motor vehicle expenditure on registration and insurance and less on vehicle purchase. Analysis found that FCO households make less trips (12.9% less), travel shorter distances (−7%) and slightly shorter time (−6.8%) than average 2+ car households in Outer Melbourne. This relative propensity to less travel might be illustrative of financial pressures and a desire to reduce the costs of travel compared to other income groups in similar circumstances.

FCO groups were found to travel considerably more than Middle Melbourne low-income residents; trips (+5.2%), distance per trip (+38%) suggesting a total relative daily travel quantum difference of +45% compared to Middle suburbs. This is suggestive of a substantially higher travel financial cost compared to Inner/Middle Melbourne low-income households.

FCO households are highly car dependent and make very few trips by public transport. There is a 23% higher ratio of car passenger to car driver trips in FCO households compared with other higher car ownership households in Outer Melbourne. These habits are suggestive of a relatively high cost of car ownership and travel by car compared to others in Melbourne. It is also suggestive of the adoption of 'coping' strategies to utilise available resources within limited budgets better.

A similar travel analysis of low-income households with no car (ZCO) has highlighted that walking dominates travel. This indicates that, in general, fringe dwellers must live near to activities.

Statistical analysis of the shares of low-income households with 2+ and zero cars show a weak though significant relationship to public transport supply and walk accessibility. These findings may be used to provide an original contribution to the assessment of public transport provision benefits for 'social' reasons on the fringe of Australian cities. They are also demonstrative of the importance of locating low-income housing within activity centres, which can lessen the need to own cars and act to encourage social inclusion through both walk accessibility and public transport provision, which in general is also higher in activity centres.

The analysis in this paper has painted a new and original picture of transport disadvantage in fringe urban Australia. Forced car ownership affects a numerically larger number of fringe urban households in Melbourne than zero car ownership. Hence transport disadvantage on the fringe does not necessarily mean lack of transport. In addition, much previous social research has focussed on those without cars and the problems these people have in using a sparse and low-frequency public transport system. While these cases certainly occur this research suggest that most car-less low-income families on fringe urban Melbourne live near to activities they can walk to. Importantly these activity centres also tend to have higher quality public transport than suburbs away from activity centres. Hence the image of the socially isolated car-less community on the urban fringe represents the minority not the majority of Australia's urban transport disadvantage.

The needs/gap study has identified some 89 CCD's representing 37,699 Melbourne residents (1.1% of the population) who live in areas with no public transport but have the 'very high' social/transport needs score. In addition, of those with 'very high' need scores, 1,01,305 residents live in areas with 'very low' public transport supply and 1,37,735 with 'low' public transport supply. Overall 8.2% of Melbourne residents have 'very high' needs but 'zero', 'low' or 'very low' public transport supply.

The study results show much consistency with the findings of the Hobart 'needs-gap' study (Currie, 2004) and also earlier studies of Adelaide (Currie and Wallis, 1992). Although the approaches used in these studies are different, a remarkably clear mismatch between public transport supply and social needs is apparent in Australian cities. Although this has been widely commented on in social research (e.g. Hurni, 2006), the approach adopted in this study has been quantitatively based utilising GIS techniques to objectively assess relative needs and service levels. The findings should therefore be an excellent basis for planning to address the gaps identified as well as to monitor performance in addressing these gaps. The preliminary research findings presented represent only a very early snapshot within the wider research program. Nevertheless, findings have been interesting, original and potentially important. The analysis of transport disadvantage is now exploring other types of disadvantage using the same sources, while the main research program is gearing up towards developing and implementing the survey instrument, which is the core of the project. Despite the preliminary nature of the work to date some areas for additional exploration have been identified in future research:

- The significance of walk accessibility to local activity centres has highlighted that residential location and the integrated planning of activities/services is as much a component of transport disadvantage as the provision of transport. Both research and policy need to better understand the interactive effects of these influences.
- Although 'forced' car ownership has been one of the foci of preliminary research this has largely been based on the application of theoretical assumptions to available data. A primary behavioural study of low-income households would be a more insightful way of understanding the dynamics of car ownership in fringe urban areas. Although this will be part of the surveys in this project it seems a fruitful area for more focussed attention given the suggested scale of the problem. In addition, the emerging Australian 'sea change' and 'tree

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change' trends where aging Australians migrate to areas of car dependence and poor access are issues worth exploring further in this context.

- The research provides more evidence of gaps in public transport services relative to Australian fringe urban areas and the transport disadvantaged people who tend to live in these areas. This is a major challenge for Australian transit systems because the low density, sparse-development patterns associated with these areas are unproductive environments for cost-effective transport services. Hence while there is a social equity challenge in the Australian urban fringe there is also a technical challenge seeking to identify more viable approaches to fill the equity gap.

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