New Perspectives and Methods in Transport and Social Exclusion Research

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Introduction
Motivation
Method
Needs Gap
Fringe Car Ownership on Low Income
Spatial Perspectives
Decomposing Transport Disadvantage
The Value of Mobility
Structural Equation Modelling
This is an overview of research findings on a major international program exploring links between social exclusion, well being & transport disadvantage

- The research is part of an Australian Research Council funded project

- Key aims were to:
  - Measure transport disadvantage, social exclusion and well being
  - Measure links between each factor
  - Explore how this varies (spatially, by group)
  - Explore quantification and how new open defensible tools might be developed

It overviews lots of published outputs (2 books; 20 plus journal papers)

**Journal Papers**

It is structured as follows

- Motivations
- Method
- Needs Gap
- Fringe Car Ownership on Low Income
- Spatial Perspectives
- Decomposing Transport Disadvantage
- The Value of Mobility
- Structural Equation Modelling

Prof G Currie - Background

Researcher National Advisory Unit of Community Transport, UK
Msc Transport Graduate Cranfield University UK
Planner – London Buses
Planner – Midland Metro Light Rail Project (VIPS)
Planning Consultant – Travers Morgan Australia
Planning Consultant – Booz Allen Hamilton Australia
Professor of Public Transport, Monash University,
PhD Monash University
Chair – Light Rail Transit Systems Committee US Transportation Research Board, Washington DC

Projects / Interests
- Metropolitan Public Transport Network Planning
- Olympic Games Public Transport Networks (Atlanta, Sydney, Athens, Beijing, London, Rio)
- Transit Demand Forecasting
- Public Transport Priority and Traffic Simulation Modelling

Transport Needs Planning
- Economic Appraisal of public transit projects
Public Transport Research Group

World Review of Public Transport Research (2009-2013)
Journal of Public Transportation Vol 18 No 2
Top 3 world universities in Public Transport Research
• Uni of Toronto, UCal Berkeley, MONASH UNIVERSITY

Operate the ‘World Transit Research’ Database
- aim: improve industry access to quality research
- Collaboration – journal publishers & Monash Uni
- All published research in the field
- 250,000 users in 170 countries

Recent Successes

Best policy paper prize
14th World Conference on Transport Research in Shanghai, June 2016

Best Research Paper – 2017
Transportation Research Board Annual Meeting Washington DC

Rahaman M Currie G Muir C (2016) Development and Application of a Scale to Measure Station Design Quality for Personal Safety’ TRANSPORTATION RESEARCH RECORD No. 2540 pp 1-12
PTRG run the world’s largest PT PhD Program - Sustainable and Effective Public Transport – Graduate Research Industry Program (SEPT-GRIP)

1. Land Use & PT
2. Big Data & Visualisation
3. Network Synchronisation
4. Shared Mobility
5. Changing Travel Behaviour
6. Tourisms & Public Transport
7. Reliability Engineering Approaches in Best Practice Railways
8. Improving Gender Diversity in the Public Transport Workforce
9. Future Train
10. Designing Urban Rail to Reduce Vandalism
11. Bus & Tram Priority Implementation
12. Simulating Bus & Tram Priority
13. Placemaking & Street Redesign
14. Passenger Falls in Trams
15. Transit Network Design
16. Future Bus
17. The New Bus Rider
18. Road Safety Impacts of Bus Safety Inspections

Largest GRIP in the world; $3M funding; 18 Scholarships; 7 Faculties; 6 Industry Partners

Linking Australia with Mexico

Comparisons Australia; Mexico

- **Population**
  - Mexico: 122.3M, Australia: 23.1M
- **Land Area**
  - Mexico: 1.97M km², Australia: 7.7M km²
- **Cities above 1M**
  - Mexico: 10, Australia: 5
- **Population in Urban Areas**
  - Mexico: 50%, Australia: 89%
- **Largest Cities**
  - Mexico: Mexico City 8.9M, Australia: Sydney 4.9M
- **Home Cities**
  - Guadalajara: 1.5M
  - Melbourne: 4.5M
It is widely acknowledged that TRANSPORT PROBLEMS much like lack of education, can fundamentally limit life opportunities [but by how much?]

(Source: Based on Wheels to Work in Shropshire UK sourced from “Transport for Young People in Rural Areas” Community Transport Association UK March 2002)
TRANSPORT PROBLEMS are also widely documented [but which are more important? Which should be tackled first? What's the priority?]

Transport Issues and Older Australians

1. Communication and Information
   - Information not accessible to people with visual impairments and other barriers (language etc)
   - Lack of promotion of new services
   - Lack of promotion of transport service options
   - Lack of communication and information about available transport options for people with different needs
   - Educating transport users to be more vocal about their needs
   - Difficulties in using timetables and ticketing procedures

2. Security
   - Concerns about safety

3. Responsive to Changing Needs
   - Replacement of Bus Fleet with accessible buses
   - Impact of fuel price rises (and future rises)
   - Transport not responsive to needs of active healthy seniors
   - Lack of door to door services

4. Lack of Fringe/Rural Services
   - Inadequate relative to the city

5. Physical Accessibility to Transport
   - Need to improve walking environment

6. Physical Accessibility onto Transport
   - Vehicle and stop infrastructure

7. Timetabling/Connectivity
   - Lack of integration between walk, cycle, community transport, public transport and taxis

8. Staffing and Human Assistance
   - Lack of staff training
   - Lack of staff to support users

9. Community Perceptions
   - Lack of understanding of the importance of accessible transport

10. Policy Planning
    - Lack of integration between agencies/Govt
    - Land use not coordinated
    - Current solutions don't maintain independence

The transport disadvantaged are widely known as are types of transport exclusion [But who and what should get priority?]

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>No/limited car access</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>Low income</td>
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<td>✓</td>
<td>✓</td>
<td>✓</td>
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<td>Elderly</td>
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<td>Single parents</td>
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<td>✓</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Youth</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<td></td>
</tr>
<tr>
<td>Disabled</td>
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<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unemployed</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beneficiaries</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outer-urban dwellers</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shift workers</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parents travelling with children</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Students</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Categories of transport exclusion (Wixey et al, 2005):
  - Spatial
  - Temporal
  - Personal
  - Financial
  - Environmental
  - Infrastructural
  - Institutional
[Is TRANSPORT DISADVANTAGE more or less important than TRANSPORT POVERTY?]

- **Transport Disadvantage Definition:**
  - People who face frequent access constraints due to lack of suitable mobility and locational disadvantage [Lack of transport]

- **Definition of Transport Poverty:**
  - “Transport poverty occurs when a household is forced to consume more travel costs than it can reasonably afford, especially costs relating to motor car ownership and usage” (Gleeson and Randolph, 2002, p.102). [Too expensive transport]
    - Voluntary and forced car ownership (Banister, 1994) –
      - FCO = no alternatives and ownership at low income (rural areas)
    - Forced car ownership - in these circumstances theorised an inverse relationship between car ownership and well being (Jones, 1987)
    - Forced ownership implies no access to pt.

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**A major barrier to understanding is weak, unclear and undefendable policy because we cannot measure transport need**

<table>
<thead>
<tr>
<th>Type of Transport Need</th>
<th>Description</th>
<th>Measurement Issues</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FELT NEED</strong></td>
<td>People who need transport and don’t have access to private alternatives</td>
<td>Who? Where? When? Cannot Systematically Measure Its Anecdotal, Most Don’t Express Need What are the Priorities?</td>
</tr>
<tr>
<td><strong>EXPRESSED NEED</strong></td>
<td>People who say they need transport</td>
<td>What are the Priorities? Its all anecdotal They Who Shout Loudest are Herd What About People Who Don’t Shout at All</td>
</tr>
<tr>
<td><strong>NORMATIVE NEED</strong></td>
<td>Define a ‘standard’ for transport provision and identify areas below this standard e.g. access to a bus within 400M of home</td>
<td>What should the standards be? Can we have standards for all travel needs? What are the priorities?</td>
</tr>
<tr>
<td><strong>COMPARATIVE NEED</strong></td>
<td>Measure the quality of travel in one area and compare it to others</td>
<td>Useful approach in that it identifies inequity. But it doesn’t gage overall service quality</td>
</tr>
</tbody>
</table>

New methods to (quantitatively) measure and understand needs are needed to make policy clear, open and defensible.
New measures might enable TD to be related to SE - the next generation in a progression of concepts relating to poverty & disadvantage...

<table>
<thead>
<tr>
<th>Definitions of Poverty/Disadvantage in History</th>
<th>Critique</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Absolute Poverty</strong></td>
<td>Poor = not enough money to buy food, warmth and shelter necessary for subsistence</td>
</tr>
<tr>
<td><strong>Relative Poverty</strong></td>
<td>Poor = not enough money to maintain a standard of living enjoyed by the rest of society</td>
</tr>
<tr>
<td><strong>Social Exclusion</strong></td>
<td>Cause of Disadvantage = more than just money – can have non-material causes and consequences. Focus is barriers to participation in a productive life</td>
</tr>
</tbody>
</table>

Disadvantage is More Than Subsistence
Disadvantage is More Than Money

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**Source:** Kenyon S (2003) ‘Understanding social exclusion and social inclusion’ Municipal Engineer156 Issue ME 2 pp97-104

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...SE is deliberately multi-dimensional to encapsulate barriers to participation and which might better relate transport problems to human life barriers

<table>
<thead>
<tr>
<th>Economic Access to Money</th>
<th>Living Space Local Environment Factors</th>
<th>Mobilty Access to the Car</th>
<th>Temporal Time pressures</th>
<th>Societal Social factors at the society level</th>
<th>Organised Political Ability to influence organised decisions</th>
<th>Social Networks Access to/relations with people</th>
</tr>
</thead>
<tbody>
<tr>
<td>Income poverty, unemployment, access to credit</td>
<td>Crime, safety, pollution, availability of services, disunity of community</td>
<td>Access to mobility, poor public transport, barrier to activities, social networks</td>
<td>Lack of time to participate in social, political, economic activities</td>
<td>Crime, education, family dynamics, health &amp; social care, inequality</td>
<td>Denial of rights, disenfranchisement, low participation in voting, poor representation,</td>
<td>Isolation, loneliness</td>
</tr>
</tbody>
</table>

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**Source:** Kenyon S (2003) ‘Understanding social exclusion and social inclusion’ Municipal Engineer156 Issue ME 2 pp97-104
We were also inspired by EU research on aging and how it related to QoL – could this framework be adopted in TD/SE/WB research?

This was the rationale for the international program exploring links between social exclusion, well being & transport disadvantage

- The research is part of an Australian Research Council funded project
- Key aims were to:
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Structural Equation Modelling

Key components are needs quantification & field surveys

<table>
<thead>
<tr>
<th>Preliminary Quantification</th>
<th>Field Surveys</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Needs-Gap</td>
<td>Social Exclusion</td>
</tr>
<tr>
<td>• Measure public</td>
<td>• Well Being</td>
</tr>
<tr>
<td>transport supply</td>
<td>• Transport</td>
</tr>
<tr>
<td>and access across</td>
<td>• Difficulties</td>
</tr>
<tr>
<td>Melbourne</td>
<td>• Impact of Fuel</td>
</tr>
<tr>
<td>• Compare to social</td>
<td>• Home Location</td>
</tr>
<tr>
<td>needs quantification</td>
<td>• Decisions</td>
</tr>
<tr>
<td>measures</td>
<td>• Forced car</td>
</tr>
<tr>
<td>2. Fringe Car Ownership on</td>
<td>• Zero Car ownership</td>
</tr>
<tr>
<td>Low Income</td>
<td></td>
</tr>
</tbody>
</table>

Main Metro Complete

Regional Complete

Special In progress
TD, SE and WB were measured using scales developed as part of the research.

**Transport Disadvantage**

- Self reported disadvantage using scales on 18 separate indicators of 'problems' with transport including:
  - Covering the costs of your transport
  - Getting to places quickly
  - Finding transport so you can travel
  - Being able to travel when you want to
  - Having to rely on others for transport
  - Etc etc
- Also examined self reported difficulties accessing activities due to transport related problems

**Social Exclusion**

- A multi-dimensional construct using the following indicators:
  - Income
  - Unemployment
  - Political engagement
  - Participation
  - Social support
- Last 3 measures derived from survey questions on social/community engagement
- Score 0/1 on each criteria
- Can be excluded on 0 to all 5 factors i.e. a range

**Well Being**

- Mature topic in social psychology
- Many measures used including:
  - Satisfaction with Life Scale (SWLS): Participants indicate how much they agree with five statements about their life conditions and how close their life is to their ideal (Diener, Emmons, Larsen, & Griffin, 1985)
  - Personal Well Being Index (PWI)
  - Positive Affect Schedule (PA): Participants rate how much they generally feel a range of positive emotions (Watson, Clark, & Tellegen, 1988)
  - Negative Affect Schedule (NA): Participants rate how much they generally feel a range of negative emotions (Watson, et al., 1988).

Sample size is 1,019 with selected demographic characteristics

<table>
<thead>
<tr>
<th></th>
<th>Metro overall</th>
<th>Inner Melb</th>
<th>Outer Melb</th>
<th>Peri-Urban</th>
<th>Regional</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number completed interviews</td>
<td>784</td>
<td>195</td>
<td>589</td>
<td>79</td>
<td>235</td>
</tr>
<tr>
<td>Percent from “special survey” sample</td>
<td>32%</td>
<td>35%</td>
<td>31%</td>
<td>41%</td>
<td>37%</td>
</tr>
<tr>
<td>Adults in HH</td>
<td>2.1</td>
<td>2.0</td>
<td>2.1</td>
<td>1.9</td>
<td>1.9</td>
</tr>
<tr>
<td>Proportion who have children in HH</td>
<td>43%</td>
<td>37%</td>
<td>45%</td>
<td>51%</td>
<td>66%</td>
</tr>
<tr>
<td>Average age</td>
<td>44</td>
<td>43</td>
<td>45</td>
<td>46</td>
<td>45</td>
</tr>
<tr>
<td>Retired</td>
<td>20%</td>
<td>16%</td>
<td>22%</td>
<td>23%</td>
<td>26%</td>
</tr>
<tr>
<td>Proportion with income below $Aust 1,100pw</td>
<td>58%</td>
<td>56%</td>
<td>59%</td>
<td>58%</td>
<td>70%</td>
</tr>
</tbody>
</table>
NEEDS-GAP measured spatial gaps between public transport (PT) supply & social needs

- Social needs
  - ABS Index of Relative Socio-Economic Advantage/Disadvantage (IRSAD)
    > e.g. Unemployment level, low educational qualifications, low income
  - Transport needs index
    > e.g. Adults without cars, persons aged over 60, low income, students, young children

- Transport disadvantage
  - Access to bus, tram and rail stops
  - Service level at these stops

PT supply is concentrated centrally

Note: Supply = Public transport services per week factored by walk access distances

While Social Needs have a fringe spread

Social Needs Index
- Very high
- High
- Above average
- Below average
- Low
- Very low
- No data

Suburban rail line
The “Gap” (very high social need/ below average PT supply) is a fringe issue.

Note: These 677 CCDs house 397,673 residents.

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**Needs Gap**

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**The Value of Mobility**

**Structural Equation Modelling**
High car ownership on low income is concentrated in outer suburbs......

....remote from public transport.....and...
...remote from local activity centres

There is a link between lack of PT & high car ownership on low income

Source: Based on Currie and Senbergs (2007)
Note: PT Supply Index score is based on number of services per week factored by the spatial coverage of the areas by public transport.
Higher values imply greater supply and coverage of areas by public transport.

Research suggests fringe car ownership may be a bigger problem than zero car ownership – Transport Poverty is a bigger issue than Transport Disadvantage

Not having a car on the fringe (transport disadvantage) could be an advantage compared to car ownership on low income (transport poverty)

**High Car Ownership on Low Income**
- 20,831 HH - low income and high car ownership
- Zero/very low walk access to local activities and limited public transport

**Zero Car Ownership on Low Income**
- 16,357 HH without a car
- Better off?:
  - Live close to activity centres
  - Walk and use public transport
  - do not have to spend a high share (over 50%) of income on running a car
  - can walk to activities
  - can access public transport


Analysis contrasts fringe low income groups with high and zero car ownership

- **Key research question:**
  - Is low or high car ownership and on the Urban Fringe a Benefit or Hindrance?
- **Examining**
  - LINCO – Low Income No Car Ownership; and
  - LIHCO - Low Income High Car Ownership
- **Areas explored:**
  - Realised travel rates
  - Difficulties with travel
  - Home location decision making and its relation to transport
  - Transport coping strategies
  - Perceived impacts on travel and activities
  - Links with measures of social exclusion and well being

LIHCO make more travel & report less travel difficulties....

![Transport Difficulties Graph](chart.png)

*How often do you have difficulty accessing activities because of transport problems?*

- **Total Sample**
  - Never: 52%
  - Rarely (few/year): 26%
  - Occasionally (monthly): 16%
  - Often (weekly): 6%
  - Very Often (daily): 1%

- **LINCO Group**
  - Never: 17%
  - Rarely (few/year): 33%
  - Occasionally (monthly): 29%
  - Often (weekly): 17%
  - Very Often (daily): 6%

- **LIHCO**
  - Never: 71%
  - Rarely (few/year): 24%
  - Occasionally (monthly): 6%
  - Often (weekly): 0%
  - Very Often (daily): 0%
Figure 2: Factors Affecting Home Location Decisions

<table>
<thead>
<tr>
<th>Factor</th>
<th>Total</th>
<th>LINCO</th>
<th>LIHCO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of dwellings you can afford</td>
<td>31%</td>
<td>35%</td>
<td>31%</td>
</tr>
<tr>
<td>Close to public transport</td>
<td>46%</td>
<td>46%</td>
<td>38%</td>
</tr>
<tr>
<td>Close to relatives</td>
<td>22%</td>
<td>21%</td>
<td>19%</td>
</tr>
<tr>
<td>Close to workplace</td>
<td>19%</td>
<td>19%</td>
<td>19%</td>
</tr>
<tr>
<td>Close to suitable schools</td>
<td>29%</td>
<td>29%</td>
<td>29%</td>
</tr>
<tr>
<td>Lots of trees, shrubs and grass</td>
<td>29%</td>
<td>29%</td>
<td>29%</td>
</tr>
<tr>
<td>Close to suitable shops</td>
<td>16%</td>
<td>17%</td>
<td>17%</td>
</tr>
<tr>
<td>Close to parks/open country</td>
<td>14%</td>
<td>17%</td>
<td>17%</td>
</tr>
</tbody>
</table>

Share Identifying as Top 3 Reason

Source: Main Metropolitan Survey, Monash University

LIHCO cope by trip reduction, LINCO say PT/Walk meet needs – they prefer cost saving

Coping - LIHCO

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Share of Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Make more trips using only 1 vehicle</td>
<td>60%</td>
</tr>
<tr>
<td>Combine lots of activities into one vehicle trip</td>
<td>50%</td>
</tr>
<tr>
<td>Vehicle maintenance is done at home</td>
<td>45%</td>
</tr>
<tr>
<td>Use a fuel other than petrol if it’s cheaper</td>
<td>40%</td>
</tr>
<tr>
<td>Buy older/second hand cars because they’re cheap</td>
<td>35%</td>
</tr>
<tr>
<td>Drive a smaller car because it’s cheaper</td>
<td>35%</td>
</tr>
<tr>
<td>Limit travel to places further away</td>
<td>30%</td>
</tr>
<tr>
<td>Drive a motorbike/moped because it’s cheaper</td>
<td>20%</td>
</tr>
<tr>
<td>Barter goods/services to pay for running the vehicle</td>
<td>10%</td>
</tr>
<tr>
<td>A friend/relative helps car maintenance</td>
<td>5%</td>
</tr>
<tr>
<td>Don’t pay for registration/insurance</td>
<td>5%</td>
</tr>
<tr>
<td>Give lots of lifts to make most use of the vehicle</td>
<td>5%</td>
</tr>
</tbody>
</table>

Coping - LINCO

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Share of Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Don’t need a car – can walk/use PT get lifts/other to meet needs</td>
<td>68%</td>
</tr>
<tr>
<td>Prefer to save money by not owning a car and to limit travel</td>
<td>44%</td>
</tr>
<tr>
<td>I can’t drive</td>
<td>42%</td>
</tr>
<tr>
<td>I don’t have a car because we don’t like driving/parking</td>
<td>32%</td>
</tr>
<tr>
<td>I don’t have a car because we think cars are bad for the environment/community</td>
<td>20%</td>
</tr>
<tr>
<td>I can’t afford a car*</td>
<td>27%</td>
</tr>
</tbody>
</table>

Note: LIHCO - 65% said they did not use all of vehicles more than twice a week. LIHCO - 35% of respondents agreed that transport costs were a substantial portion of their income.
LIHCO like mobility/access impacts but 65% say they have little choice

**IMPACTS ON LIFE - High Car Ownership on Low Income (LIHCO)**

- It's really great to have the car/s and although its expensive I/we are happy to pay this for such good mobility: 80%
- The benefits of living here outweigh the high costs of travel: 65%
- I/we have no choice but to pay these costs otherwise I/we couldn't get around: 65%
- I wish we could walk and cycle more and use the car less: 55%
- My/our transport and living costs are high but things will improve for me/us over time: 25%
- I/we didn't realize transport costs were going to be so high when I/we decided to move here: 20%
- I/we wish there was more public transport near here so that I/we wouldn't have to use the car/s so much: 20%
- I/we wish there were more activities close to home so that I/we wouldn't have to use the car/s so much: 15%
- I/we would like to move to an area nearer to activities so that I/we wouldn't have to pay for so much transport: 0%
- It was a mistake in deciding to live here because transport costs are too high: 0%

LINCO travel locally but 68% said they did more activities due to saving in car costs

**LIFE IMPACTS - No Car Ownership on Low Income (LINCO)**

- I tend to travel more locally because I don't have a car: 73%
- I get to do more activities I want to because I save money by not having a car: 68%
- Not having a car has no impact on travel options since travel alternatives are available which meet my needs: 59%
- I tend to combine several activities into a single trip because I don't have a car: 56%
- Not having a car slightly limits my travel options/activities: 49%
- I tend to get lifts more because I don't have a car: 46%
- I tend to travel less because I don't have a car: 39%
- Not having a car significantly limits my travel options: 37%
- Not having a car significantly limits the activities I undertake: 20%
- I get other people to get shopping for me and visit me because I don't have a car: 7%
LINCO are more socially excluded than LIHCO.

Table 1: Car Ownership Groups and Social Exclusion Measures

<table>
<thead>
<tr>
<th>Social Exclusion Measures</th>
<th>LINCO</th>
<th>LIHCO</th>
<th>Total sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average number of dimensions excluded</td>
<td>1.67</td>
<td>.71</td>
<td>.77</td>
</tr>
</tbody>
</table>

Component Dimensions

- Lowest income** (67% in LINCO, 12% in LIHCO) 23% in total sample
- Unemployed* (17% in LINCO, 6% in LIHCO) 5% in total sample
- No political engagement (29% in LINCO, 29% in LIHCO) 27% in total sample
- No regular activities** (25% in LINCO, 6% in LIHCO) 6% in total sample
- Low social support (29% in LINCO, 18% in LIHCO) 17% in total sample

*Chi-square significant to p < .05
**Chi-square significant to p < .01

Source: Main Metropolitan Survey, Monash University

....but is this due to person type or mobility and access?

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*Chi-square significant to p < .05
**Chi-square significant to p < .01

Source: Main Metropolitan Survey, Monash University

Typology:
- Young families
- New Mortgagees
- Home Maker & Child
- Single HH Worker

Note: No statistically significant well-being differences
Spatial research contrasts social exclusion (SE), well being (WB) & transport disadvantage (TD) by area...
Fringe/regional residents have a bigger transport task but far less Public Transport...

![Graphs showing average trips per day, travel distance, public transport services index, and average distance to local shops by region.]

Source: Monash University Australian Research Council Project LP0669046 (2008-9)

...car reliance results

![Share of trips by car driver and passenger for different regions.]

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48
Fringe/Regional report more problems – regional most activity barriers

**Often/Often Transport Problems**
- Inner: 9%
- Outer: 13%
- Peri-Urban: 13%
- Regional: 13%

**Activities Restricted by Transport**
- Inner: 18%
- Outer: 14%
- Peri-Urban: 20%
- Regional: 24%

Peri-urban are most likely to be affected by fuel price increases

**Is Your Travel Affected by Higher Fuel Prices? - Yes**
- Inner: 35%
- Outer: 46%
- Peri-Urban: 56%
- Regional: 47%
Major coping strategies varied by location

Coping Response to Higher Fuel Prices

Make fewer trips by driving
Do multiple activities in a single trip
Walk/cycle more
Travel the same but pay more
Travel to places which are closer
Travel less overall
Use the train/tram more
Share car with others more
Participate in activities less
Use the bus more
Get more lifts
Get lifts less often

Social exclusion and well-being were the same across locations
SE/TD correlations were small or not-significant

<table>
<thead>
<tr>
<th>Correlation between SE and...</th>
<th>Metro overall</th>
<th>Inner Melb</th>
<th>Outer Melb</th>
<th>Peri-Urban</th>
<th>Regional</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Frequency of difficulties accessing activities due to transport problems”</td>
<td>.10**</td>
<td>.18**</td>
<td>.07</td>
<td>.12</td>
<td>.20**</td>
</tr>
<tr>
<td>“Number of activities cannot do due to transport problems”</td>
<td>.02</td>
<td>.13</td>
<td>-.02</td>
<td>.11</td>
<td>.12</td>
</tr>
</tbody>
</table>

WB/TD correlations were strongest in regional and peri-urban sample

<table>
<thead>
<tr>
<th>Correlation between “frequency of difficulties” and...</th>
<th>Metro overall</th>
<th>Inner Melb</th>
<th>Outer Melb</th>
<th>Peri-Urban</th>
<th>Regional</th>
</tr>
</thead>
<tbody>
<tr>
<td>SWLS</td>
<td>-.19**</td>
<td>-.28**</td>
<td>-.15**</td>
<td>-.20</td>
<td>-.41**</td>
</tr>
<tr>
<td>PWI</td>
<td>-.21**</td>
<td>-.29**</td>
<td>-.18**</td>
<td>-.33**</td>
<td>-.44**</td>
</tr>
<tr>
<td>PA</td>
<td>-.02</td>
<td>-.10</td>
<td>.00</td>
<td>-.10</td>
<td>-.08</td>
</tr>
<tr>
<td>NA</td>
<td>.21**</td>
<td>.15*</td>
<td>.23**</td>
<td>.18</td>
<td>.34**</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Correlation between “activities cannot do” and...</th>
<th>Metro overall</th>
<th>Inner Melb</th>
<th>Outer Melb</th>
<th>Peri-Urban</th>
<th>Regional</th>
</tr>
</thead>
<tbody>
<tr>
<td>SWLS</td>
<td>-.14**</td>
<td>-.10</td>
<td>-.15**</td>
<td>-.32**</td>
<td>-.30**</td>
</tr>
<tr>
<td>PWI</td>
<td>-.07*</td>
<td>-.08</td>
<td>-.07</td>
<td>-.24*</td>
<td>-.33**</td>
</tr>
<tr>
<td>PA</td>
<td>.05</td>
<td>-.01</td>
<td>.06</td>
<td>-.08</td>
<td>.06</td>
</tr>
<tr>
<td>NA</td>
<td>.07</td>
<td>-.06</td>
<td>.10*</td>
<td>.19</td>
<td>.22**</td>
</tr>
</tbody>
</table>
Spatial Analysis - Conclusions

- Distance from CBD decreases PT, increases trip rates and car dependence, increases fuel price sensitivity but...
- Peri-urban (not regional) experiences highest car dependence and transport disadvantage
- Regional area used more car-sharing to cope
- Correlation between TD and WB highest in peri-urban and regional areas
  - E.g., if someone in regional area suffered TD, they were more likely to have low WB

Introduction
Motivation
Method
Needs Gap
Fringe Car Ownership on Low Income
Spatial Perspectives
**Decomposing Transport Disadvantage**
The Value of Mobility
Structural Equation Modelling
Is transport disadvantage one thing, or several different things? What are the more important elements of TD?

- Looked at the set of 18 questions about transport difficulties in survey
  - Conducted a Principal Component Analysis with a Varimax rotation
    - Statistical calculation that looks at how groups of questions “hang together”
    - PCA is an “exploratory” test; there’s no statistical significance test

The analysis came up with 4 factors...

<table>
<thead>
<tr>
<th>Factor</th>
<th>% of variance (rotated)</th>
<th>Cumulative %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>18%</td>
<td>18%</td>
</tr>
<tr>
<td>2</td>
<td>17%</td>
<td>36%</td>
</tr>
<tr>
<td>3</td>
<td>11%</td>
<td>47%</td>
</tr>
<tr>
<td>4</td>
<td>10%</td>
<td><strong>57%</strong></td>
</tr>
</tbody>
</table>

57% of variance is explained by these four factors

Modelled Factors for Degree of Difficulty with Transport

<table>
<thead>
<tr>
<th>Degree of difficulty with travel attribute</th>
<th>Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transit Disadvantage</td>
<td>Vulnerable / Impaired</td>
</tr>
<tr>
<td>Buses/trains/trams being available at night</td>
<td>.788</td>
</tr>
<tr>
<td>Buses/trains/trams being available at weekends</td>
<td>.787</td>
</tr>
<tr>
<td>Buses/trains/trams operating frequently</td>
<td>.687</td>
</tr>
<tr>
<td>Being able to make bus/train/tram connections</td>
<td>.617</td>
</tr>
<tr>
<td>Being able to get to bus/train/tram stops/stations</td>
<td>.428</td>
</tr>
<tr>
<td>Being able to travel when you want to</td>
<td>.439</td>
</tr>
<tr>
<td>Finding transport so you can travel</td>
<td>.688</td>
</tr>
<tr>
<td>Being able to get around reliably</td>
<td>.685</td>
</tr>
<tr>
<td>Getting to places quickly</td>
<td>.634</td>
</tr>
<tr>
<td>Finding the time to travel when you need to</td>
<td>.585</td>
</tr>
<tr>
<td>Being able to physically get on/off buses/trains/trams</td>
<td></td>
</tr>
<tr>
<td>Needing help to get around on your own</td>
<td></td>
</tr>
<tr>
<td>Being able to understand where to go</td>
<td>.439</td>
</tr>
<tr>
<td>Feeling safe from theft/attack when travelling on your own</td>
<td></td>
</tr>
<tr>
<td>Having to rely on others for transport</td>
<td></td>
</tr>
<tr>
<td>Finding someone to provide assistance when transport is available</td>
<td></td>
</tr>
<tr>
<td>Covering the costs of your transport</td>
<td></td>
</tr>
</tbody>
</table>

Note: Bold variables were used to formulate that factor for further analyses


All relate to fringe areas but only one relates to Social Exclusion & Poor Well Being

Modelled Degree of Difficulty Factors – Access, Segment Type and SE/WB

<table>
<thead>
<tr>
<th>Transit Disadvantage</th>
<th>Transport Disadvantage</th>
<th>Vulnerable / Impaired</th>
<th>Rely on Others</th>
</tr>
</thead>
<tbody>
<tr>
<td>38% of sample</td>
<td>18% of overall sample</td>
<td>10% of sample</td>
<td>25% of sample</td>
</tr>
<tr>
<td>Working adults</td>
<td>Busy working adults</td>
<td>Older females</td>
<td>Av. age and household</td>
</tr>
<tr>
<td>Mid age, income</td>
<td>Lowest public transport supply but highest use</td>
<td>Low income</td>
<td>Unemployed</td>
</tr>
<tr>
<td>Av. public transport use</td>
<td></td>
<td>Poor health, disability pension</td>
<td>Lower income</td>
</tr>
<tr>
<td>Access</td>
<td>Access</td>
<td>Feel unsafe on transit and in home</td>
<td>Poor health, disability pension</td>
</tr>
<tr>
<td>Outer/remote</td>
<td>Outer/remote</td>
<td>Access</td>
<td>Feels unsafe</td>
</tr>
<tr>
<td>Low PT Supply</td>
<td>Low PT Supply</td>
<td>Av. Permanent Transport Supply</td>
<td>Lack of trust</td>
</tr>
<tr>
<td>Self Reported Difficulties</td>
<td>Self Reported Difficulties</td>
<td>Low Travel Difficulties</td>
<td>Outer/remote</td>
</tr>
<tr>
<td>Lack of Time</td>
<td>Lack of Time</td>
<td>Very High Activity Barriers</td>
<td>Average PT Supply</td>
</tr>
<tr>
<td>Moderate Travel Difficulties</td>
<td></td>
<td>High Travel Difficulties</td>
<td>Self Reported Difficulties</td>
</tr>
<tr>
<td>High Activity Barriers</td>
<td>High Activity Barriers</td>
<td>Very High Activity Barriers</td>
<td>Lack of time</td>
</tr>
<tr>
<td>High Fuel Price Impact</td>
<td>High Fuel Price Impact</td>
<td></td>
<td>Moderate Travel Difficulties</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>High Activity Barriers</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>V. High Fuel Price Impact</td>
</tr>
</tbody>
</table>
Economics values travel using a Value of Time which is based on income – new trips are typically worth $ Aust 4-5 in most analysis.

- Wage rates are used to value travel time in all economic appraisals world wide
- For low income groups this is particularly problematic since it means their travel is valued less than higher income groups
- Using economic rule of a half in transport appraisals values a new trip at between $A3.54 and $A4.78

A new method was developed in the research to value new trips that otherwise would not have been made with an average value of $19.30/trip.

**Approach**

1. A logit model associates social exclusion with explanatory factors:
   - well being, distance travelled and age were key output factors
   - Includes a non-linear link between income and the marginal willingness to pay for trips
2. The marginal rate of substitution is higher for those that have less travel
3. Substituting factors in the equation it is possible to estimate the value of additional trips


This is a very powerful new tool; EXAMPLE: cost to Government of buses in Tasmania is $53.8M for 18M trips (2005/6)

### Public Transport Travel and Government Subsidy (2005/6)

<table>
<thead>
<tr>
<th>Service Type</th>
<th>Passenger Trips p.a.</th>
<th>Government Subsidy p.a. ($M)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban Bus</td>
<td>9.21</td>
<td>$26.20</td>
</tr>
<tr>
<td>Fringe Urban</td>
<td>2.98</td>
<td>$ 9.72</td>
</tr>
<tr>
<td>Rural Bus</td>
<td>5.10</td>
<td>$14.86</td>
</tr>
<tr>
<td>Regional Town</td>
<td>0.47</td>
<td>$ 0.49</td>
</tr>
<tr>
<td>Long Distance</td>
<td>0.39</td>
<td>$ 2.54</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>18.15</strong></td>
<td><strong>$53.81</strong></td>
</tr>
</tbody>
</table>

Value for Money is a Function of the benefits resulting for this investment

### Benefit to Tasmania

- **Addressing Traffic Congestion** (Hobart cost is $59-$69M p.a.)
- **Reducing Environmental Emissions** for Tasmania (Bus more efficient per passenger trip)
- **Providing Alternatives** to the transport disadvantaged (Remote Communities, Young, Ageing Tasmanians)

**Cost to Tasmania** $54M p.a.

---

Adopting results values social benefit at $120M p.a. a 200%+ return on investment

### Benefit to Tasmania

- **Say a (conservative) THIRD** would not be made if services not supplied (6M p.a.)
- **Value per trip** is a (conservative) $20 (2009)
- **TOTAL BENEFIT** = $120M

**Cost to Tasmania** $54M p.a.
A SEM was theorised using the 4-factor transport disadvantage split

Transport disadvantage
- Transit disadvantage
- Transport disadvantage
- Vulnerable / impaired
- Rely on others

Social exclusion
- Low income
- Unemployed
- Political disengagement
- Lack of participation
- Lack of social support

Subjective well-being
- High Positive affect
- Low negative affect
- High satisfaction with life

Results of SEM model showed strong SE-SWB links but poor TD/Well-being links; SWB is more indirectly links to transport disadvantage via SE.

Model fit
\( \chi^2 = 320.96; \text{df} = 51; p < .001 \)
GFI = 945
AGFI = 915
RMSEA = .074
www.worldtransitresearch.info