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Public transport and pedestrian access, the impact of suburban planning on adolescence.

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ABSTRACT: The following paper discusses the impact of suburban life for adolescents in relation to public transport and pedestrian access. The research compares the morphology and level of connectivity of two planning models, cul-de-sac and regular grid, with respect to two suburbs which share a similar socio-economic profile, Rowville and Caulfield. These are subsequently evaluated in terms of ABS statistics, in particular year 12 or equivalent levels of education, and transport statistics. The results of the investigation are discussed in reference to the four key tasks of adolescence (Carr-Gregg & Shale 2002), in order to establish the degree to which morphology and access levels of suburbs impact on adolescent development.


Conference Theme: Human issues: social, cultural, economic, thermal comfort.
Key words: suburban life, public transport, education

INTRODUCTION
While the concept of sustainable residential development is often associated with optimal building performance, both with respect to their procurement and post occupancy evaluation, it would seem that these issues have little relevance if the context or neighbourhood plan structure are unable to sustain the social well being of its user groups. The need for public transport improvement in the outer suburbs of Melbourne has been well established. The dominant trend is for families to compromise on services for the sake of more affordable, larger housing. While larger housing may be considered by many to better suit the needs of adolescents, there appear to be a number of disadvantages that result from compromising access to both services and public transport. These include the following: 1) Parents must travel further to work and are therefore less available to their children for monitoring and support; 2) Adolescents reliant on their parents for transportation, due to poor public transport, are potentially isolated during this phase in their development when making connections outside the family home. The dependence on parental transport to access community services may, in some instances, undermine the ability of adolescents to establish their social and emotional independence from their parents - a central task of adolescence (Carr-Gregg & Shale, 2002:72).

Potential isolation may affect the ability of adolescents to: perform well in their studies; develop safe and selective social connections; and have access to, and participate in, a range of diverse activities.

In contrast, this potential isolation, with all its related disadvantages, may be less prevalent for adolescents who reside in inner Melbourne grid suburbs, where there is a far greater level of access to higher levels of public transport and services.

This study presents a methodology for comparing the level of use and access to public transport and how that may impact on the social well being of adolescents living in large scale cul-de-sac suburbs with regular grid planned developments in relation to the key tasks of adolescence according to Carr-Gregg & Shale. The research is based on the different levels of connectivity and permeability presented by the two plan types with respect to: pedestrian and public transport accessibility; and access to community based services and facilities. The central hypothesis is that adolescents who live in outer cul-de-sac developments are disadvantaged in terms of accessibility in comparison to adolescents living in regular grided neighbourhoods which offer greater levels of permeability. For the purposes of this study, adolescents are defined as young people aged between 15 and 16 years.

1. BACKGROUND
Typically, parents residing in the outer suburbs work at significant distances from the family home (HALCS, NHS, 1991) and hence are often unavailable to support the transport needs of their children. In some cases, this translates to their social-emotional needs as well. Whilst access may not be the only factor which contributes to the
development of social and emotional independence, indicators such as the percentage of people 15 yrs and older with Year 12 or equivalent education, and youth crime statistics, appear to correlate with the level of connectivity of a suburban plan arrangement and the provision of public transport.

'Until about 1950, residential development more or less followed the major bus, rail and ferry systems. However, since then much of the growth has continued beyond ready access to public transport, a development which has been made possible by the increasing use of the private car'. (NHS, 1991: 64)

It has been demonstrated that throughout post war suburban development, adolescents are a demographic that can be described as the 'transport poor' (Morris, 1981) due to the reliance on the private car as a suburban mode of transport and their inability to gain access to independent car travel before the age of 18 years in Victoria. This is compounded by the extended distance from employment commonly found for those living in suburban areas and the low public transport usage for the trip to work. Therefore adolescents during the working week are, for the majority of the day, dependent on how far their legs or bike can carry them, public transport, or a stay-at-home parent who may or may not have access to a second car. This dependence on a parent or guardian old enough to drive a motor vehicle hinders adolescents from achieving the key tasks of development according to Carr-Gregg & Shale, these are: to form a secure and positive identity, to achieve independence from adult carers and parents, to establish love objects outside the family and to find a place in the world by establishing career direction and economic independence.

The importance of the pedestrian walking distance has been a focus of many post-war suburban design strategies. This has been a response to the need to improve mobility in isolated suburbs suffering from the picturesque, yet indirect curving road and cul-de-sac layout reflecting the Garden City Movement ideals during the time influenced by Frank Lloyd Wright (Freestone, 1989) through the development of the motor vehicle. These suburbs were designed around the cul-de-sac to shelter children from traffic. The issue of reducing traffic and the reliance of our society on the motor vehicle has been a well discussed issue in the media and by many environmental groups and seen as a need for our development into the future by such proposals as Melbourne 2030.

Correlations between family management and community factors in terms of predictors of juvenile delinquency have indicated that a lack of child monitoring is correlated with juvenile delinquency. The 'need to belong' and the importance of connectedness and the peer group for the adolescent is well-established in the literature (Carr-Gregg & Shale, 2002:72). It would seem reasonable to suggest that the lack accessibility to others (friends, community groups, sporting and other activities) may result in boredom and antisocial behaviours. However, there is little research that investigates how the improvement of accessibility for youth may impact on delinquency levels. Crime statistics in Victoria point to an alarming trend in youth crime. Those in the 15-19 year age group are the largest demographic in terms of alleged crimes processed throughout Victoria. Whether there is any correlation between this high level of crime in this age group and the lack of accessibility to public transport linked with suburban living is yet to be investigated.

This study attempts to explore this deficiency in the existing body of research by evaluating and comparing different areas of suburban development with respect to public transport and pedestrian accessibility. The research focuses on two case studies, Rowville and Caulfield, which were evaluated on the premise, that outer suburban areas with cul-de-sac planning create poor public transport access and therefore disadvantage adolescents relative to those living in grid-style inner suburban areas with significantly higher levels of access to services and support networks.

2. METHODOLOGY

The methodology used in this study involved four different types of analysis which were applied to both of the case studies used in the research. These are the following: Visual analysis, Statistical analysis, Access analysis and Comparative analysis.

Each case study, one an outer-suburban area, Rowville, and the other an inner suburban area, Caulfield, are considered separately with respect to:

- Street forms and shopping centre designs
- Aesthetics
- Implications of different zoning patterns
- Significance of location of civic buildings
- Demographic data
- Education and employment data
- Crime data
- Transport use data
- Suburban growth unsupported by infrastructure
- Implications for use of public spaces and recreational centres
- Access to schooling and choice
- Travel distance from work and implications of lack of parental supervision
- Overall access and frequency of access to public transport

The study concludes that there is evidence to support the hypothesis that adolescents living in large scale cul-de-sac suburbs are disadvantaged relative to those living in inner, regular grid suburbs due to inadequate access to public transport and services.
2.1. Visual Analysis
The visual analysis is informed by photographic analysis of both residential and commercial building typologies and the analysis of public spaces in terms of their use by the community.

2.1.1. Visual Analysis of Public Space
The visual analysis of public spaces is based on an aspect of a previously tried and tested methodology "Public spaces and public life: City of Adelaide: 2002" (Gehl, 2002: 10). This identifies categories of user groups and activities in public spaces.

This allows observation of public places in terms of different user groups at different times of day and also the ability to analyse the type of activity partaken by user groups allowing the level of social interaction and recreation to be observed. To create particular relevance to adolescents time periods of observation are categorised by school hours, after-school hours and weekends. The areas chosen for comparison in the two suburbs have been chosen for their similar characteristics. Stud park and Caulfield shopping centres are both commercial centres for the surrounding residential areas. Arcadia Reserve and Glen Huntly Park both exhibit play equipment for children, open green space and a community group occupation, i.e. Archadia Scout Hall and Glen Huntly Football Club. Finally, Caulfield Park and Rowville Community Centre both provide organised sporting club facilities and green spaces.

2.1.2. Analysis of Building Typology
Through site visits and photographic documentation of built form a photographic analysis of the built environment was carried out to be compared with research regarding the time of development of the suburb. This allows for an analysis of the built form from simple observation and relationships to the possible motivators for design at the time of development.

2.2. Statistical Analysis
The aim of the statistical analysis is to establish the demographics, socio-economic status, crime rates and the level of use of public transport in terms of travel to work for both suburbs.

2.2.1. ABS Statistics Community Profile
ABS statistics community profiles are available to a suburban level and provide statistics in the following categories used:

Demographics and socio-economic statistics
- Total population.
- Median age of population.
- Median weekly family income.
- Median monthly housing loan repayments.
- Mean household size.
- Number of people 15 years and over.
- Number of people between 15-19 years of age.

Education and Employment Statistics
- Number of people attending secondary schooling.
- Number of people 15 yrs and over with a year 12 or equivalent level of academic achievement.
- Unemployment.

Transport Use Statistics
- Total trips to work.
- Number of trips to work by different forms of transport.
- Number of motor vehicles per household.

With the exception of the overall mean and median statistics, other statistics can be used to calculate percentage values when compared with the population so that results can be directly compared with those of another suburb whose population may be different in size.

2.2.2. Crime Statistics
The Victorian Police Statistical Division publishes basic crime rates per post code allowing a simple comparison of crime rates between suburbs.

The statistical results can then be compared between the two suburbs, and similarities and differences identified.

2.3. Access Analysis
The analysis of access to services is related to the following factors:
1) Frequency of public transport, in terms of number of departures;
2) Pedestrian access to public transport, in terms of 400m walking distance;
3) Efficiency of public transport, in terms of the types of public transport;
4) Mapping of public spaces, in terms of their relationship with location and size; and
5) Mapping of educational facilities, in terms of their relationship with location and size.
2.3.1. Pedestrian Access to Public Transport
Public transport connectivity is more difficult to determine, as previous detailed research into the level of connectivity of the suburbs of Melbourne is not available. As part of the course of this research maps reflecting the areas accessible by pedestrians within Caulfield and Rowville are to be produced to determine the level of accessibility. The mapping of actual stops where possible, rather than routes, allows for an accurate walking distance from public transport to be established. A 400m walking distance is to be used as this has been well established as a reasonable walking distance by Melbourne 2030 as well as the Pedestrian Pocket Strategy.

This study is relating directly to adolescents, who do not have access to a car. For this reason transport maps will reflect school hours, non-school hours and weekends.

2.3.2. Efficiency of Public Transport
Different modes of public transport have different levels of efficiency as a result of the level to which they are traffic dependent. This is a factor to be related to the types of transport used in the case study areas.

2.4. Choice of Study Area
The aim of this research is to investigate the different levels of access to services and public transport in relation to morphology of suburban planning. For this reason the study area was chosen following a visual analysis of a wedge of Metropolitan Melbourne where a clear transition from grid to cul-de-sac development is evident. The suburbs of Caulfield and Rowville were chosen for their comparable population, income and housing repayments suggesting similar socio-economic status. Caulfield, a suburb closer to the city was developed on a grid system and Rowville a much later development takes on the curving cul-de-sac style of the Garden City Movement.

3. RESULTS

3.1. Visual Analysis

3.1.1. Visual Analysis of Public Space

South Caulfield Shopping Centre and Stud Park Shopping Centre
During all time periods observed (weekend, weekday during school, weekday after-school, evenings), both locations exhibited everyday and necessary user activity. Caulfield also exhibited recreational activity and users not present in Stud Park. This could be due to design, Caulfield Shopping Centre is a thoroughfare, whereas Stud Park Shopping centre is an activity centre which is driven to specifically.

Caulfield Park and Rowville Community Centre
During weekend and school hours, Rowville and Caulfield exhibited necessary and everyday users whilst Caulfield also exhibited recreational users not present at Rowville. During after-school hours, Rowville and Caulfield have similar levels of activity and use with everyday, necessary and recreational users present at both locations. However, during evenings while Caulfield continued to display everyday, necessary and recreational activity, Rowville shows no activities or users. This could be due to poor lighting conditions prevalent in Rowville and the use of the centre for pre-organised after-school activities.

Arcadia Res and Glen Huntly Park
Arcadia Res remained unused during all times of observation while Glen Huntly Park was utilised by recreational users during all times other than weekends. This suggests that perhaps the Scout Hall at Arcadia Reserve is underutilized.

3.1.2. Photographic Analysis of Building Typology
The major difference between typologies is the amount of room dedicated to the motor-vehicle. Rowville residential and commercial typology is influenced heavily by the motor vehicle and large areas of the built environment are dedicated to servicing this transport. Caulfield has significantly lower levels of parking space with on street parking and one car garages/carports being the predominate form of vehicle storage.

3.2. Statistical Analysis

3.2.1 Community Profile Statistical Comparison
Housing repayments and weekly family income is comparable suggesting similar socio-economic status, however, Rowville is populated by slightly larger households. Median age in Caulfield is older than Rowville and there more people in the 15 years and over age group in Caulfield than in Rowville which could be due to an aging population in the Caulfield area. Both Caulfield and Rowville have around 30,000 people residing within the suburb yet the total number of dwellings in Caulfield is much higher than Rowville suggesting a higher density of housing. Rowville is much more car dependent than Caulfield with only a fraction of households without a motor vehicle. More Rowville households own 2 or 3 cars than those in Caulfield. However, the unemployment rate is slightly higher in Caulfield than in Rowville.

There are more 15-19 year olds in Rowville than in Caulfield and a larger percentage of the population in Rowville attend Secondary School than in Caulfield. Despite this the percentage of people over 15 years with a year 12 or equivalent qualification is significantly higher in Caulfield than it is Rowville. This could be an
indication that the disadvantage experienced by adolescents in Rowville due to lack of public transport access may have an affect on academic achievement. Whilst this is not a conclusive link it is an area that warrants further research.

<table>
<thead>
<tr>
<th>STATISTIC TYPE</th>
<th>CAULFIELD</th>
<th>ROWVILLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median Age</td>
<td>32-43</td>
<td>31</td>
</tr>
<tr>
<td>Median monthly housing loan repayments</td>
<td>$1,200-$1,399</td>
<td>$1,000-$1,199</td>
</tr>
<tr>
<td>Median weekly family income</td>
<td>$1,200-$1,499</td>
<td>$1,200-$1,499</td>
</tr>
<tr>
<td>Mean household size</td>
<td>2.4</td>
<td>3.3</td>
</tr>
<tr>
<td>Total persons</td>
<td>30,041</td>
<td>29,621</td>
</tr>
<tr>
<td>Percentage 15 years and over</td>
<td>84%</td>
<td>71.2%</td>
</tr>
<tr>
<td>Percentage 15-19 year olds</td>
<td>5.9%</td>
<td>7%</td>
</tr>
<tr>
<td>Percentage trips to work by public transport</td>
<td>16.3%</td>
<td>5.3%</td>
</tr>
<tr>
<td>Percentage trips to work by motor vehicle / truck / motorcycle / taxi</td>
<td>65.3%</td>
<td>79%</td>
</tr>
<tr>
<td>Total trips to work</td>
<td>14,373</td>
<td>14,676</td>
</tr>
<tr>
<td>Percentage number of households with no motor vehicle</td>
<td>10.9%</td>
<td>2.1%</td>
</tr>
<tr>
<td>Percentage number of households with 1 motor vehicle</td>
<td>36%</td>
<td>21.9%</td>
</tr>
<tr>
<td>Percentage number of households with 2 motor vehicle</td>
<td>34.4%</td>
<td>54.2%</td>
</tr>
<tr>
<td>Percentage number of households with 3 motor vehicle</td>
<td>11.1%</td>
<td>18.5%</td>
</tr>
<tr>
<td>Total dwellings</td>
<td>12,115</td>
<td>9,128</td>
</tr>
<tr>
<td>Percentage Secondary School attendees</td>
<td>6.2%</td>
<td>8.9%</td>
</tr>
<tr>
<td>Percentage 15 years and over with Yr 12 equivalent</td>
<td>60.6%</td>
<td>42.9%</td>
</tr>
<tr>
<td>Unemployment rate</td>
<td>5.1%</td>
<td>4.5%</td>
</tr>
</tbody>
</table>

Source: (ABS Community Profiles, 2001)

3.2.2 Schooling Choice Statistics
Rowville and Caulfield have directly contrasting results in terms of secondary school attendees as the majority of Rowville attendees receive government education whilst the majority of Caulfield attendees receive non-government education. This could also be a factor in the significant difference between levels of yr 12 or equivalent education levels. Income does not appear to be a factor as both suburbs have similar income and repayment levels, however, access to schooling choice in terms of transport may be a factor.

<table>
<thead>
<tr>
<th>Number of Students</th>
<th>Caulfield</th>
<th>Rowville</th>
</tr>
</thead>
<tbody>
<tr>
<td>Secondary</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Government</td>
<td>1,774</td>
<td>322</td>
</tr>
<tr>
<td>Catholic</td>
<td>596</td>
<td>216</td>
</tr>
<tr>
<td>Other Non Government</td>
<td>272</td>
<td>1,335</td>
</tr>
<tr>
<td>Total</td>
<td>2,632</td>
<td>1,873</td>
</tr>
<tr>
<td>Total</td>
<td>29,618</td>
<td>30,049</td>
</tr>
</tbody>
</table>

Source: (ABS Community Profiles, 2001)
3.2.3 Crime Statistics
The number of offences processed in Caulfield and Rowville appear to be at similar levels with Caulfield exhibiting a slightly higher crime rate. This slightly higher rate may be related to population density as Caulfield has a much higher number of dwellings than Rowville.

Table 3: Crime Statistics

<table>
<thead>
<tr>
<th>Statistic type</th>
<th>Caulfield</th>
<th>Rowville</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of offences</td>
<td>1,876</td>
<td>1,528</td>
</tr>
</tbody>
</table>

Source: (Victoria Police Statistical Division, 2001)

3.3. Access Analysis

3.3.1. Frequency of Public Transport
Figure 2 below shows a comparison between the number of public transport departures at different times of the week for Caulfield and Rowville areas. This clearly shows a much higher level of number of departures at all time periods for Caulfield.

![Frequency of public transport - Monday to Sunday](image)

Figure 2: Frequency of public transport – Monday to Sunday

Figure 3 below compares the level of departure of the types of transport utilized in Rowville and Caulfield. Whilst trains and trains are not located within the suburb of Rowville the number of departures for buses in Rowville is much lower than that of Caulfield’s number of bus departures despite having two other additional forms of transport, both of which have rates of departure higher than buses in either suburb.

![Frequency of Public Transport Types: Out of School Hours, Caulfield vs Rowville](image)

Figure 3: Frequency of public transport types – Out of school hours
3.3.3. Efficiency of Public Transport
As Caulfield has both train tram and bus options of public transport in comparison with Rowville which relies solely on buses it is reasonable to assume Caulfield has a better level of public transport efficiency. The fact that Rowville is also a major traffic through way also adds to the traffic problems which therefore cause public transport problems when dealing with bus travel and its traffic dependency.

3.3.2. Pedestrian Access to Public Transport
Figure 4 below shows that comparatively, during the Monday to Saturday time period, Caulfield has significantly higher levels of pedestrian access than Rowville. During the Sunday period Caulfield has similar levels of pedestrian accessibility to Rowville, however the number of departures in the Caulfield area still exceeds those in Rowville.

Figure 4: Rowville and Caulfield Pedestrian Connectivity

4. DISCUSSION AND CONCLUSION
Despite similarities between the two case study areas in terms of income, crime rates and population levels, the study found marked differences in relation to access to public transport (both overall levels and frequency of service) in the Rowville area when compared to that of the Caulfield area. Perhaps the most revealing finding is the fact that the bus system in Caulfield (already well-serviced by both trains and trams) alone runs more departures than the bus system which is responsible for all of Rowville's transport. This gives a strong indication that there is considerable room for improvement. This clearly shows that those living in Caulfield enjoy a much higher level of service and access to public transport than that of Rowville.

Hence, lack of access may perhaps suggest that adolescents in the outer-suburban case study, in having to rely more on parents for transport, might have limited opportunities in establishing independent connections within the community, which could impact on their self-esteem and social well being. These correlations, when related to the key tasks of adolescent development (Carr-Gregg & Shale 2002) appear to indicate that some adolescents in Rowville may be disadvantaged in terms of achieving these tasks when compared with their peers in Caulfield who are able to take advantage of the access and connectivity opportunities offered by a more regular suburban plan arrangement, which appears to facilitate a more comprehensive and integrated public transport service.

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REFERENCES