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Mobility and out-of-home activities of older people living in suburban environments: *Because I'm a driver, I don't have a problem*

Abstract

Background: Governments are challenged by the need to ensure that ageing populations stay active and engaged as they age. Therefore, it is critical to investigate the role of mobility in older people's engagement in out-of-home activities, and to identify the experiences they have within their communities. *Objective:* This research investigates the use of transportation by older people and its implications for their out-of-home activities within suburban environments. *Methods:* The qualitative, mixed method approach employs data collection methods which include a daily travel diary (including a questionnaire), GPS tracking and semi-structured interviews with older people living in suburban environments in Brisbane, Australia. *Results:* Results show that older people are mobile throughout the city, and their car provides them with that opportunity to access desired destinations. This ability to drive allows older people to live independently and to assist others who do not drive, particularly where transport alternatives are not as accessible. The ability to transport goods and other people is a significant advantage of the private car over other transport options. *Conclusion:* People with no access to private transportation who live in low-density environments are disadvantaged when it comes to participation within the community. Further research is needed to better understand the relationship between transportation and participation within the community environment, to assist policy makers and city and transportation planners to develop strategies for age-friendly environments within the community.

KEYWORDS: mobility, older people, out-of-home activity, participation, Global Positioning System (GPS)

Introduction

One of the key issues of the 21st century is how best to manage the challenges and opportunities associated with rapidly ageing populations. In Australia, for example, the proportion of people aged 65 years and older will more than double from 2004 (13%) to 2051 (26-28%) (Australian Bureau of Statistics 2006).

The majority of Australia's older population live in urban settings (Commonwealth of Australia 2010), characterised by a predominance of suburban areas (Randolph 2006); these low-density environments can create mobility issues in older age, and can lead to a decline in participation in out-of-home activities (Lord, Després and Ramadier 2011; Lord, Joerin and Thériault 2009). This engagement in out-of-home activities is critical for active ageing; indeed, the World Health Organization (2002) includes participation (along with health and security) as one of three key contributors to good quality of life in older age.

Since older Australians want to be able to 'age in place' (Olsberg and Winters 2005), it is significant that policy makers and transportation planners make informed decisions about more age-friendly environments to enable older people to stay engaged and active in their communities (World Health Organization 2007). Consequently, this paper specifically investigates the travel behaviour and out-of-home participation of older people, and their experiences within their suburban environments.

Mobility, defined as *the ability to move* (Mollenkopf, Hieber and Wahl 2011, p. 782) is crucial to enabling older people's independence and everyday participation in the community, and remains crucial throughout their later life (Mollenkopf, Hieber and Wahl 2011).

As mobility is a multifaceted concept, Webber, Porter and Menec (2010) propose a framework that visualises determinants for mobility in older age within different life-spaces relevant to older people. Mobility within those life-spaces depends on a complex relationship of individual determinants (cognitive, physical, psychosocial and financial), cultural determinants (gender, culture and

biographical influences) and environmental determinants. Together, these determinants create increasing requirements for independent mobility, the further a person moves from home.

Mobility is a common human experience that impacts on quality of life (Metz 2000; Musselwhite and Haddad 2010). Metz (Metz 2000) argues that the benefits of mobility in older age are not taken into account in transportation research, and that there is still a need to further establish this relationship between mobility and quality of life. Therefore, five key elements are proposed to articulate the quality of mobility as a human experience: travel to achieve access to desired people and places, psychological benefits of movement, exercise benefits, involvement in local community, and potential travel (Metz 2000).

Musselwhite and Haddad (2010) similarly developed a hierarchy of mobility needs based on a qualitative study of travel needs and quality of life of older people and their association with giving up driving. They found that mobility is essential to access shops and services, and that mobility needs can be categorized as utilitarian needs (primary needs derived from demand and accessibility); affective needs (secondary needs related to control and independence); and aesthetic needs (tertiary needs such as the need to enjoy the journey).

Low mobility might be an undesired effect of ageing, which reduces participation in out-of-home activities which, in turn, might also decrease quality of life. Banister and Bowling (2004) describe a British survey which focused on three aspects of the travel patterns of older people in relation to quality of life: mobility pattern (ability to get out and about), locality of participation (accessibility and proximity), and social networks (relatives and friends, and neighbourhood networks). While the engagement in out-of-home activities and the availability of a car varied widely, the authors established the clear links between the quality of the local area and quality of life in older age. These links are: availability, safety, trust, engagement and vulnerability, and isolation. Transportation, which is increasingly provided by the private car, is an important factor in mobility as it provides access to local services, facilities and social engagement. Older people have generally a positive view of their locality. Walkability of a local area was found to be essential to access destinations of activity and

public transportation. Perceptions of safety and risk at night time can lead to less activity and a higher risk of loneliness and isolation after dark. Activity and travel patterns of different groups of older people living in Scandinavia were investigated with a focus on the development of travel and activity patterns during a lifetime (Hjorthol, Levin and Sirén 2010). This investigation found that the number of driver's licence-holders and car availability increased (especially for women), and that these factors affected the choice of travel mode and distance travelled.

Older people today travel greater distances compared to older people 25 years ago; this results in a higher possibility of engaging in activities outside the home and maintaining shopping and leisure trips until an older age (Hjorthol, Levin and Sirén 2010); however, to date, research on car use in older age is primarily focused on driving experience (Peel, Westmoreland and Steinberg 2002); license guidelines (Langford *et al.* 2004); and the predictors, process and impact of driving cessation (Adler and Rottunda 2006; McCray and Brais 2007).

While the vast majority of older adults rely predominantly on their own private vehicles for transportation (Rosenbloom 2001), it was found that older age and being female is related to the higher possibility of being a non-driver (Ross *et al.* 2009). Driving becomes more physically and mentally challenging as people age; this may explain why many older drivers choose to stop or restrict their driving (by driving only in the daytime, and avoiding busy traffic or rain) (Charlton *et al.* 2006). Thus, changes to mobility behaviours might be a process of selection, optimisation, and compensation adaption, which results in withdrawal of activities and mobility habits such as driving (Rush, Watts and Stanbury 2011). However, these adaption processes in mobility behaviours can have a negative impact on the quality of life of older people.

The meaning and implications of reduced mobility because of driving cessation in terms of out-of-home activities has been the subject of some studies; for example, in the USA, driving cessation not only had a negative impact on engagement in out-of-home mobility (Marottoli *et al.* 2000), but was also linked to an increased risk of depressive symptoms (Marottoli *et al.* 1997; Ragland, Satariano and MacLeod 2005).

The transition to life as a non-driver can be particularly difficult for older adults residing in *car-dependent* rural and low-density suburban areas, where alternative transportation options (such as public transport services) are less available or inaccessible. Research also shows that only a few older people actually prepare for a stage in their life when they can no longer drive (Charlton *et al.* 2006).

A Canadian study in suburban environments found that the desire to ‘age in place’ leads to coping strategies which include a decrease in mobility and participation in out-of-home activities (Lord, Joerin and Thériault 2009). Immobility was also found to be inevitable for older people living in suburban environments, and can lead to dependency on others in order to stay active within their community (Lord, Després and Ramadier 2011).

Several key individual and structural factors which impede community participation and the use of alternative transport options for non-drivers are identified. Individual barriers include limited income (McCray and Brais 2007), declining health (Broome *et al.* 2009), and the psychological difficulty associated with changing lifelong travel habits (Rosenbloom 2009). Structural barriers, on the other hand, include neighbourhood characteristics that constrain active transport (such as walking), as well as inadequacies of the public transportation system itself. The latter is frequently criticised for not being affordable, flexible, convenient or accessible for users of all ages, but especially for older people (Broome *et al.* 2009).

A growing number of studies have explored the extent to which mobility facilitates social participation and active ageing; however, few have used global positioning system (GPS) and Geographic Information System (GIS) technologies to track and map older adult travel patterns and social activities. GIS has been used to model neighbourhood characteristics (Li *et al.* 2005) and travel demand (Maoh *et al.* 2009), while data yielded from portable GPS devices worn by older people is in its infancy (Frignani *et al.* 2010; Jones, Drury and McBeath 2011).

A collaborative project ‘Senior Tracking’ (SenTra) involving researchers from Germany and Israel (Oswald *et al.* 2010; Shoval *et al.* 2010; Shoval *et al.* 2008) used person-based GPS to investigate differences in distances of home to outdoor activities between older people with and without cognitive

impairment. A sample of 41 people, 64 years and older, was used for this purpose; the sample comprised individuals with mild cognitive impairment (n=21), mild dementia (n=7), and those with no cognitive impairment (n=13). Participants were tracked day and night over 28 days. The results show that those with mild dementia and those with mild cognitive impairment spent less time in out-of-home activities and more time close to their residences than the healthy control group (Shoval *et al.* 2011).

Person-based GPS provides a new frontier for researching older people's spatial activity, destinations, and travel patterns. It is for this reason that the study presented in this paper used daily travel diaries (and a questionnaire), person-based GPS units and in-depth interviews to explore the mobility and engagement of older people living in suburban environments within Brisbane, Australian. The key aim of the study is to identify how transportation choices and practices influence social participation and the daily lives of older suburban residents.

Methodology

Investigating the travel behaviour of older people and its relationship to community participation, experiences and activities is a complex undertaking. This research, therefore, uses qualitative design methods that incorporate a range of data collection methods – such as travel diaries (with a questionnaire), GPS tracking, and in-depth interviews – to explore travel behaviour and perceptions of community liveability and active ageing. Ethical approval for this research was provided by the Queensland University of Technology (QUT) Human Research Ethics Committee.

Location

Brisbane and South East Queensland are the fastest growing regions in Australia. In 2011 the local government area (LGA) of Brisbane was home to 1 089 743 residents living on 1326 square kilometres, with a population density of 6.76 people per hectare (The population experts 2012). About 21.7 per cent of Brisbane's population is older than 55 years (Australian Bureau of Statistics 2010).

Brisbane can be described as a dispersed city, where suburbs are typified by low-density single-standing family homes with yards. Typically also, the suburbs contain pockets of business areas, shopping centers, or street strips with shops and facilities. The central business district (CBD) and its surrounding suburbs are of higher density.

Participants

Participants (55 years and older) were either participants from a previous study who had agreed to be contacted for further research, or were provided by senior organisations which were industry partners in this research. This research focuses on a sample (n=13) of five women and eight men (see Table 1 for demographic characteristics), living in 11 different low-density suburbs within Brisbane (Capital city of Queensland, Australia), with a range of 5.05 to 27.74 people per hectare (The population experts 2012). This study used convenience sampling and therefore does not represent all older people living in suburban environments in Brisbane.

<Insert Table 1 about here>

Participants ranged in age between 57 years (P10) and 87 years (P9) (see Table 1). The annual income of participants varied considerably: n = 4, under \$20 000; n = 4, \$20-40 000; n = 2, \$40-50 000; and n = 3, \$70-100 000. Participants lived either with their partner, family members, other people, or alone: n = 7, married or living with a partner; n = 2, living with family members or other people; and n = 4, living alone. All participants but one (P12) were retired.

Data collection

Data collection took place from March to April 2010 and was organised in two phases. Firstly, participant out-of-home movement was tracked using GPS in combination with daily travel diaries. Participants received a package with an information sheet and consent form, travel diary (including a brief questionnaire), a lightweight portable GPS device (Blue747A+ and recharger), and a manual explaining how to use the device.

Participants were asked to complete a questionnaire on demographic characteristics, housing, transportation use and community living. They were also asked to complete the travel diary at a time of their convenience, describing details of their travel: the location, time of departure and arrival, transport option used, and activity undertaken. They were asked to carry the GPS device for seven consecutive days whenever they left the home.

Interviews were conducted in the second phase, about 14 days after the tracking period. Prior to the interviews, GPS data was converted into Google Earth (Google 2010) maps and an interview guide was developed for each participant. The travel diaries identified the transport options used, and the out-of-home activities undertaken by the participants. These were then mapped to produce individual participant maps (see Figure 1). The individual Google earth maps displayed the transport methods used in different colours, and the destinations were represented by place marks. The individual Google earth maps were used in discussions with participants about their own travel behaviour and their perceptions of mobility within the community. They were also used to verify the data.

<Insert Figure 1 about here>

The Age Friendly City Guide (World Health Organization 2007) provided the basis for the research interviews. Its main themes are: safety, affordability, availability, accessibility and walkability. Three community domains were addressed including: people, facilities/activities, and the built environment.

Data analysis

A phenomenological approach was used to gain insight into participant's lived experiences. The interviews were audio-taped and transcribed verbatim, with the transcripts being read and reread as an initial step before commencing rigorous thematic analyses. Data were coded into categories and concepts, with the results reported according to the emerging themes. Reliability and validity within qualitative research is addressed from a different but equally relevant approach than in quantitative

research. Quality, rigor and trustworthiness are terms used to conceptualize reliability and validity which can be established through a number of processes, including triangulation. Triangulation is a process of working towards the convergence of data from a variety of sources to identify themes and categories (Creswell & Miller, 2000). Data in this study were gathered using a variety of approaches, including GPS, travel diaries and interviews. Our approach used a documented process of cross checking multiple data sources from multiple participant perspective thus establishing quality, rigor and trustworthiness of the outcomes.

Specifically, participant GPS data was coded individually and referenced to the travel diaries and interview responses. Data from the travel diaries was used to develop categories for mode of transportation and activity type. Participant GPS data was coded individually, with time spent outside home categorised according to activity type. Subcategories were also developed. These included: average daily kilometres travelled by *car* (total average kilometres, percentage as driver, percentage as passenger, percentage unspecified); *public transport* (bus, ferry, taxi, train); and *active transport* (commuting by walking and cycling). The GPS data was also analysed for average daily kilometres travelled for various activities, including: *social* (socialising, assisting, volunteering, worship, education, and leisure); *daily life* (shopping, services, and health); *recreational* (commuting to recreational activities, and kilometres spent in recreational walking/cycling); *work*; and *unspecified* activities.

Analysis of time spent for activities, included the categories of: *social* (socialising, assisting, volunteering, worship, education, and leisure); *daily life* (shopping, services, and health); *recreational* (recreational activities, and recreational walking/cycling); *work*; *unspecified* activities; and *commuting*. Time spent *commuting* (by driving a car or being a passenger in a car; travelling by bus, ferry, taxi, train; and waiting for public transport) included all time spent commuting by all transport options, for all activities.

The number of trips made and destinations reached were determined. Trips were defined as any travelling with *leaving home* as the starting point and *getting home* as the end point of the trip. When participants accessed more than one destination, this was defined as a 'trip chain'. Trip chains

commonly involved multiple destinations of different activity categories (for example, social and daily life) and sometimes also the use of different transport modes (for example, walking to bus stop; taking bus to city; passenger with a neighbour to return home). Kilometres and minutes travelled to each destination within the trip chain were assigned to the activity category in which the participant engaged. Data was sorted into four groups for comparison to represent the percentage of kilometres travelled by car: 100%, 90-99%, 70-75% and 0%. All interview audiotapes were transcribed verbatim, with the text imported into NVivo 9 (QSR 2010), and thematically analysed for relevance to out-of-home activities and transportation.

Results

Exploring the ways in which transportation choices and practices influence social participation and the daily lives of older suburban residents will be undertaken by firstly presenting the quantitative data outlining the trips made and destinations reached and secondly through the meaning of and qualitative interpretation of those trips.

Driving status and use of transportation

The data show that participants were very dependent on the car as their main transport option (Table 2). All but two participants (P12 and P13) travelled most of their kilometres by car, either as a driver or passenger (Table 2). Three participants (P9, P10, and P12) did not own a car; two for financial reasons (P10, P12), and one had never driven (P9). One participant had a licence and owned a car, but was restricted from driving due to health conditions (P13).

The average kilometres travelled per day varied widely; however, participants who used their car for 100 per cent of the kilometres travelled were more likely to travel more kilometres than the other participants. Public transportation was the second most used transport option for four participants (P7, P9, P11, P12), and was only used by these to travel into the inner city. Only two of these participants used public transportation for a larger portion of their kilometres travelled (P11 – 24%, P12 – 59%). Active transportation was used mostly for small distances only; however, P10, P12 and P13 were

exceptions to this general trend: P10 walked for 15 per cent of her kilometres travelled; P13 walked for 100 per cent of his kilometres travelled; and P12 combined cycling and public transportation for 41 per cent of his kilometres travelled.

< Insert Table 2 about here >

All participants engaged in trip chaining, which means they stopped at a number of locations during one trip. For example, some participants travelled to two or three locations before returning to home. The effect of trip chaining accounts for the higher number of non-recreational trips made, compared to the number of destinations reached (Table 2). All but two participants (P4 and P11) made at least one non-recreational trip per day. All but four participants (P3, P6, P9 and P12) visited more destinations for daily life activities than for social activities. Eight participants (P2, P4, P5, P6, P9, P10, P11 and P12) reached destinations in the unspecified categories (such as a shopping mall); however, the reason for this destination was not specified in the diary. Four participants engaged in recreational activities such as walking (P2), cycling (P3), walking the dog (P10), and playing golf (P11).

Distance travelled for activities

The distances participants travelled to reach out-of-home activities varied widely (Table 3). While five participants travelled most of their kilometres to reach social activities (P2 – 44%, P5 – 58%, P10 – 59%, P9 – 93%, P3 – 94%), five other participants travelled most of their kilometres for daily life activities (P4 – 51%, P7 – 54%, P8 – 75%, P13 – 57%, P1 – 79%). One participant travelled most kilometres to engage in recreational activities (P11 – 39%), while two others travelled mostly for unspecified activities (P6 – 51%) or work (P12 – 89%).

The reasons participants travelled more kilometres to reach social or daily life activities varied. Those who drove more kilometres for social activities reported travelling to see family and friends who lived long distances away (P2, P3); to engage in family functions or other social events (P9 and P10); or to

visit and help friends or family who were ill (P5). Participants who travelled longer distances for daily life activities did so as a personal preference. Participants stated that they shopped at particular locations because they preferred their selection of goods (P4, P8), and because they could shop and combine other activities there, such as going to the library (P7) or visiting speciality stores (P1).

<Insert Table 3 about here>

Time spent in out-of-home activities: The role of transportation

Participants spent between 2.2 (P8) and 5.9 (P3) hours per day in activities outside of their homes (Table 3), with the group median being 3.6 hours. All participants spent time in social (10%-73%) and daily life activities (2%-27%), and in commuting (9%-52%). Two participants spent a larger percentage of time on recreational activities (P10 – 24%, P11 – 36 %), while one participant (P12) spent most of his time working (60%). Another participant (P6) spent 37 per cent of their time outside of their home in unspecified activities.

Time spent for social out-of-home activities

The two social activities most participants spent time in were socialising with family members and friends, and leisure (Figure 2). Nine participants spent most of their out-of-home time on social activities (P4 – 33%, P10 – 33%, P11 – 41%, P5 – 43%, P1 – 43%, P2 – 47%, P8 – 62%, P9 – 66%, P3 – 73%); all but one of these (P1) spent most time socialising. Seven participants (P1, P3, P4, P5, P6, P7, and P10) spent time in leisure activities; for one of these participants (P1) leisure activities accounted for 81 per cent of the social time spent outside home. Four participants (P3, P4, P6, and P7) spent time assisting family members or friends. One of these participants (P6) spent 80 per cent of her social activity time in this way. One participant (P2) spent about 32 per cent of the time spent outside home on volunteering activities.

<Insert Figure 2 about here>

The role of transportation in facilitating social activities

Spending time with family and friends was a highly valued activity for the participants. Being mobile through the use their car, meant they were able to connect with individuals and groups who were located in a wide variety of locations across the city: *[If I could not drive] I wouldn't be able to go to my friends' places so easily or my sister's place or things like that (P1)*. An inability to drive made participants dependent on visits from family and friends and on receiving rides from family and friends. For some, conflicts or changes within their social networks (such as conflicts between their children or relocation of friends) had a significant impact, not only, on the nature and amount of social contact, but also the availability of transport to connect with social networks: *Well, it's like a gate goes up. They don't visit. Therefore, it becomes more isolating (P4)*.

Being able to engage and participate in leisure activities adds to quality of life in older age. All participants used their car to reach their leisure activities as they valued the flexibility and freedom this gave them take advantage of 'in moment' activities: *[The car] gives us the opportunity that, from time to time, we might go down to Colleges Crossing just down here, the Brisbane River. Take a book. Go and have a sandwich at the little cafe that's there, watch the kids play, and come home (P4)*. Many leisure activities such as visiting the beaches, bush walking and holiday events, are located in destinations outside the city limits, which were only easily accessible by car. : *Whether it goes to Coolum or the beaches up there or anything like that; if you want to go to those places, you do still need a vehicle (P6)*.

Having a car was essential for participants who volunteered or provided assistance or support to family and friends as many times they were asked to transport goods or people to places. Participants organised shopping, transportation to events or activities, or health appointments, which they felt was an reciprocal activity acting like money in the bank, which helps to ensure that assistance is available when they need it: *We all try to be very supportive of each other (P7)*. Many of the volunteering roles available to participants were dependent on car ownership, such as community based transportation: *I*

use my own car, or I'd use [my wife's] car, actually, to go and pick them up and take them to their appointments, and wait for them, and then take them back home (P2). Therefore, the cessation of driving or car ownership can end a volunteering activity; for example, one participant (P10) had to stop her volunteer work for the *Meals on Wheels* program, when she could no longer afford her own car.

Time spent for daily life activities

Only one participant spent most time outside the home for daily life activities (P7 – 36%). All participants went shopping during the week (Figure 3). Four spent all of their time within the daily life categories on shopping (P6, P7, P10 and P12). Eight participants (P1, P2, P4 P5, P8, P9, P11 and P13) also visited destinations for health, and six participants (P2, P3, P4, P7, P8 and P13) visited destinations for services. Four participants (P4, P5, P8 and P11) spent most of their time within the daily life categories in health-related activities.

<Insert Figure 3 about here>

The role of transportation in facilitating daily life activities

Shopping was one of the key activities that required the use of a car in order to easily transport their purchases to their home. Most participants liked to visit shopping centres that provided a range of shopping and leisure opportunities, such as shopping malls and shopping districts. While some participants were aware they could use online shopping options, they still preferred to travel to a shopping centre or local store. As P2 describes *Each day we get in the car and drive to the shop.*

Travelling to attend health and medical appointments was almost a daily activity for some participants. Due to ill health or disability, these participants felt the only safe and reliable way of travelling to their appointments was by car. They described a range of issues with public transport, from difficulties getting on and off buses to being able to get to the health centres on the bus route: *As my wife needs a walker, if the bus can't drop you out close to where you want to go, it's still not practical. (P4).* As they have grown older participants still wanted to remain in contact with their family doctors and other familiar service providers. Losing the ability to drive impacted their ability

to reach their familiar health service and constrained their access to health treatment: *Well, I used to drive there [to see my doctor] but now I'm grounded (P13).*

Anxiety or difficulty in giving up driving

The tension between access needs and the lack of alternatives to the car prompted a number of responses to considering life without a car. For some there was resolution needed the participants to make a residential change as P7 illustrated, *[If we can't drive anymore] I think we'd be at the stage of thinking about moving. It's a very car dependent area,* whereas for others the problem needed a solution. *There will come a time where I can't drive any more. How do I get to the shopping centre? (P5)* As this participant illustrates the ability to remain living independently in the family home and continue with daily life activities could only be visualized with the car, thus the future without a car is a daunting prospect. The alternative options to sustain life in the current home setting without a car appeared limited in the minds of the participants. Some participants said they would use public transportation if they could not drive but most felt it was not a convenient or accessible option for them. Interestingly, at the same time many of them said they were not aware of range of public transport options that were currently available in their neighbourhoods. As P7 says *I've never taken any notice...I haven't needed to.*

Walkability, vehicle accessibility, and the ability to understand the transportation system can be more problematic than using the private car (Scharlach 2009). Participants found it very difficult to consider alternative forms of transport as using a car, either as a driver or passenger, allowed them to reach destinations using their regular routes and time schedules. Most were reluctant to use transportation that not only challenged their everyday routines while at the same time was difficult to use in reaching their desired destinations. Most expressed the view that they would continue driving or being a passenger rather than use public transport: *I wouldn't go out there by public transport, see if the kids are around [to drive me] (P6).*

Being part of a social network

The nature and make up of the social network influenced older people's travel behaviour. Participants (P3, P4, P6 and P7) contributed to the mobility and organisation of daily and social activities for others within their social networks, providing transportation for grandchildren to or from school (P6), and driving their spouse (P3, P4) or friends in need (P7) to health appointments. The ability to drive can be critical for daily life and social activities of friends and family members: *[I'm going quite around] to support friends who need me (P7)*. Participants who did not drive themselves but had a strong social network relied on family and friends to travel to most destinations (P9 and P10). Being part of a transport and social network created both a sense of being cared for (P9), but also created the feeling that they needed to be grateful for the mobility and social contact: *They are terribly good to me. Very, very good to me... (P9)*. Participants who did not drive (P12 and P13) and lacked a social network which provided access to a car did not travel by car at all.

Discussion

This qualitative study provides insights into older people's travel behaviour, their participation in out-of-home activities, and the role of transportation in facilitating this participation. A set of data collection methods – including travel diaries (and a questionnaire), GPS tracking, and an in-depth interview – provides a snapshot of older people's engagement within the community. The findings have implications for the planning of age-friendly environments and transportation which enable older people to stay active and engaged within their communities.

Participants within this study live in suburban environments which are likely to create car dependency (Zeitler *et al.* 2012). Three key findings warrant specific attention: firstly, older people need to reach a variety of locations across the city to engage in their daily activities, and prefer flexible transportation options; secondly, access to a car might not only benefit the driver, but also other people within a social network; and, thirdly, the ability to transport goods and other people is an advantage of car

transportation, enabling independent living within suburban environments. These three findings are discussed in detail below.

The first finding – that older people need to reach a variety of locations across the city to engage in their daily activities, and prefer flexible transportation options – has implications for community and transportation planning, especially for a sprawling city such as Brisbane. This is particularly pertinent in light of the fact that older people living in suburban environments are likely to adjust their lifestyle to stay within their environment (Lord, Joerin and Thériault 2009). Cities with a predominance of suburban environments need to develop strategies that promote car-independent transportation to and from all areas of the city, and to provide access to services and facilities that are accessible for non-drivers. The withdrawal of older people from community activities could be caused by inadequate transportation systems or the lack of proximity of local amenities. As public transportation is planned to accommodate work-related trips, it might not meet older people's travel needs which are more related to social and daily life activities (Burkhardt 2003). Other issues that might prohibit older people's use of public transportation include affordability, flexibility, convenience and accessibility (Broome *et al.* 2009). Rosenbloom (2009) also argues there is little evidence to support the assertion that public transport will meet older adult mobility needs in lieu of their cars; this means that the policy direction of transportation planning might have to change to accommodate older people's travel requirements, not only by accommodating diverse travel needs in older age, but also by considering and incorporating suitable transport design and pricing.

Banister and Bowling (2004) found that access to a car can improve perceptions of quality of life in older age. Town and transportation planners need to learn from the mobility perspectives a car provides and integrate these into new approaches to public transportation and the distribution of services and facilities; for example, suburban areas could be retrofitted to provide: closer services and shopping areas; a higher frequency public transportation service during the day; and para-transit services which are available within and outside of normal service hours, and which are also accessible to a wide range of older people.

The second finding – that access to a car might not only benefit the driver, but also other people within a social network – also has significant implications. Musselwhite and Haddad (2010) describe *utilitarian needs* as the travel needs related to basic needs of social and daily life. In relation to these needs, this research found that older people who are mobile might serve not only their own needs, but also the needs of dependent others who cannot drive. Drivers also help others who are less mobile by assisting, volunteering, and providing social contact by visiting. Older people who drive can, therefore, play an important role in other people's independent living and quality of life, especially when living in suburban environments.

The possibility of becoming a non-driver rises with older age (Ross *et al.* 2009), making it vital to understand how this affects mobility of the ageing baby-boomer generation. Assisting and volunteering to help others is only *money in the bank* if it is a reciprocal arrangement, and might also depend on relationships within different age groups. Overall, while car driving can have positive benefits for drivers and those whom they help, car dependency is a negative circumstance for those who have no access to this form of transport (Páez *et al.* 2009).

The third finding is the fact that the ability to transport goods and other people is an advantage of car transportation, enabling independent living within suburban environments. As living in low-density environments creates the need to travel further distances to reach desired destinations, older people might tend to *trip chain*, and to organise their activities so that they reduce the number of trips they have to make during the week. This is only possible in a timely and practical manner when a car is used as the main transport option. Its space and transport capacity might, therefore, be an advantage which is not yet fully included in perceptions of older people's travel needs.

Metz (2000) and Mussewhite and Haddad (2010) describe qualities of mobility and its possible impact on quality of life; however, their findings also highlight that an understanding of mobility needs to include the functions transportation provides for older people, beyond simply providing individual transportation from point A to B. The ability to transport goods and people, for example,

can influence social participation within the community environment, and is an aspect of older people's mobility that still needs to be examined in relation to their independent and engaged living.

Finally, this study is significant in providing Australia-specific information within the specific geographical characteristics of the subtropical city of Brisbane, Australia, which may be relevant to other developed cities. Australian cities have similar growth patterns to those of Northern American cities, where most of the research in the field has been conducted to date, and both have, at some time, experienced an increase in urban sprawl and inner-city decay. Currently most Australian cities, like many cities internationally, have a strong focus on revitalisation and gentrification of inner city environments (Randolph 2004) and subsequently, face significant changes as a result of densification (Randolph 2006). However, these Australian cities are also growing outwards and their citizens are dependent on the car as the main transport option (Dodson and Sipe 2007). This growth pattern leaves the ageing middleclass suburbs at risk of becoming locations of disadvantage, while new suburbs are developed for high-end customers on the outer fringes (Randolph 2004). It is clear, therefore, that this context-specific research not only makes a necessary and significant contribution to our local understanding of this important issue, but adds to the body of knowledge contributing to the development of age friendly cities.

The mixed methods approach adopted for the study allowed for real-time-measurement of time and distance travelled, as well as for time spent on various activities within the community environment. It combined this data with accounts of the participants' experiences with mobility and activity engagement within their community environment, to create a detailed picture of older people's use of transport in relation to out-of-home activities, and of the quality of transportation they require.

Conventional household travel surveys might not be suitable for capturing the specifics of older people's activity-related travel behaviour and its relation to accessibility (Alsnih and Hensher 2003). GPS tracking, however, provides more accurate and more objective records of older people's travel behaviour over a longer period of time (Shoval *et al.* 2010). While it does not seem feasible to use GPS measures for national travel surveys at this point of time, this could change with the development

of automated analytical approaches, and the incorporation of mobility telecommunication devices (such as mobile and smart phones) for data collection. The use of this tracking methodology could help to develop an understanding of out-of-home activity and health behaviour in older age. Individual GPS-generated maps can be used to discuss the participation and activity of individuals within their communities. Data gathered could then be used for health planning and/or health education purposes.

Finally, this qualitative study is limited by its small number of participants and the specific geographical characteristics of its context – the subtropical city of Brisbane, Australia. While this small sample size and specific site location preclude the findings from being generalised for older people living in other environments, the study does, nevertheless, provide a detailed picture of the travel behaviour and community engagement of older people living in low density suburban environments, and contributes to a growing body of literature in this specific area.

Conclusion

Population ageing creates the need for societies around the world to develop strategies which allow older people to stay engaged and participating within their communities as they age (World Health Organization 2002). Given that ageing in place is what most older people wish for their future (Olsberg and Winters 2005), it is essential to understand the specific, contextual factors which contribute to age-friendly communities (Plouffe and Kalache 2010).

Low-density environments, the predominant urban form in Australia, discourage participation in the community, especially for older people who do not have the mobility that a car provides (Lord, Després and Ramadier 2011; Lord, Joerin and Thériault 2009). The findings from this study suggest that it is critical to establish age-friendly means of transportation to enhance older people's engagement in all types of activities within their community. The findings also suggest the need for further research into this relationship between transportation and participation within the community environment. This further research, in turn, will enable policy makers, and city and transportation planners to employ informed strategies to encourage and facilitate active ageing for all citizens.

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Table 1: Demographic characteristics of suburban participants

		Participants per car use (percentage of distance travelled)												
		100%					90-99%				75-77%		0%	
		P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13
<i>Demographics</i>														
Age		65	71	75	80	84	63	63	80	87	57	72	67	69
Gender	<i>Male</i>		x	x	x	x			x			x	x	x
	<i>Female</i>	x					x	x		x	x			
Marital status	<i>Married</i>		x	x	x	x	x	x	x					
	<i>Widowed</i>								x					
	<i>Not married</i>	x								x	x	x	x	
Living arrangements	<i>Living with spouse</i>		x	x	x	x	x	x	x					
	<i>Living alone</i>	x							x		x			x
	<i>Living with family</i>									x				
	<i>Living with friends/other people</i>												x	
Paid work	<i>None</i>	x	x	x	x	x	x	x	x	x	x	x		x
	<i>Part-time</i>												x	
Annual income	<i>Under \$20k</i>					x				x	x		x	
	<i>\$20k-\$40k</i>	x	x		x									x
	<i>\$40k-\$50k</i>						x	x						
	<i>≥ \$70K-\$100k</i>			x					x		x			

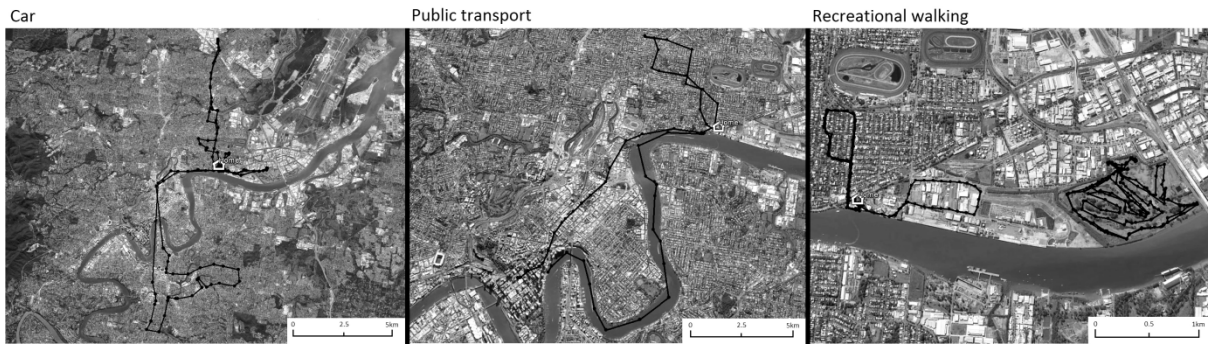


Figure 1 Maps of transportation usage

Table 2 Driving status, use of transportation, and numbers of trips and destinations

% of kilometres travelled by car	100%					90-99%				75-77%		0%	
Participants	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13
<i>Driving licence and car ownership</i>													
<i>Driving licence holder</i>													
<i>yes</i>	x	x	x	x	x	x	x	x		x	x	x	x
<i>no</i>									x				
<i>Owns private car</i>													
<i>yes</i>	x	x	x	x	x	x	x	x			x		x
<i>no</i>									x	x		x	
<i>Average daily kilometres travelled by transport option</i>													
<i>Car</i>	37.3	41.1	66.8	33.7	16.1	24.1	18.4	7.8	13.6	8.7	9.5	0	0
<i>Percentage as driver</i>	95%	82%	100%	87%	100%	100%	100%	87%	0%	0%	100%	0%	0%
<i>Percentage as passenger</i>	5%	13%	0%	3%	0%	0%	0%	13%	100%	100%	0%	0%	0%
<i>Percentage unspecified</i>	0%	5%	0%	10%	0%	0%	0%	0%	0%	0%	0%	0%	0%
<i>Public Transport</i>	0	0	0	0	0	0	1.2	0	0.8	0.8	3	36.4	0
<i>Active</i>	0	0	0	0	0	0.1	0.2	0.3	0.2	1.6	0.2	24.8	6.3
<i>SUM daily average kilometres travelled by transport option</i>	37.3	41.1	66.8	33.7	16.1	24.2	19.8	8.1	14.6	11.1	12.7	61.2	6.3
<i>Daily average number of trips</i>													
<i>Non recreational trips</i>	1.4	1.6	1.1	0.7	1.5	2	1.6	1.5	1.2	1.4	0.8	1	1.7
<i>Recreational trips (e.g. walking dog)</i>		0.1	0.9							1.7	1.1		
<i>Daily average number of destinations reached</i>													
<i>Social activities</i>	0.6	1	1.3	1.1	0.5	2	1.6	0.7	0.8	0.7	0.1	0.3	0.4
<i>Daily life activities</i>	1.4	1.3	0.6	1.9	0.9	1.7	2.3	1.7	0.5	1	1.1	0.2	1.6
<i>Work</i>												0.8	
<i>Unspecified activities</i>		0.4		0.3	0.3	0.5			0.2	0.1	0.1		0.1
<i>SUM daily average number of destinations reached</i>	2	2.7	1.9	3.3	1.7	4.2	3.9	2.4	1.5	1.8	1.3	1.3	2.1

Table 3 Kilometres travelled and time spent in activities

<i>% kilometres travelled by car</i>	100%					90-99%				75-77%		0%	
<i>Participant</i>	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13
<i>Daily average kilometres travelled for activity</i>													
<i>Social</i>	7.8	18.1	65.8	16.6	9.3	5.1	9.2	2	13.6	7.6	1	4.7	2.2
<i>Daily life</i>	29.5	15.2	1	17	5.7	6.7	10.6	6.1	0.5	3	4.7	1.8	3.6
<i>Recreational</i>													
<i>Commuting to</i>											2.7		
<i>Walking/Cycling</i>		0.4	2.9							1.8	3.7		
<i>Work</i>												54.7	
<i>Unspecified activities</i>		7.8		0.1	1.1	12.4			0.5	0.5	4.3		0.5
<i>SUM kilometres travelled</i>	37.3	41.5	69.7	33.7	16.1	24.2	19.8	8.1	14.6	12.9	16.4	61.2	6.3
<i>Daily average time spent for activity in hours</i>													
<i>Social</i>	1.6	1.6	4.3	1.4	1.0	0.4	1.3	1.4	1.7	1.1	1.5	0.4	1.1
<i>Daily life</i>	1.0	0.3	0.1	1.1	0.4	0.6	1.4	0.5	0.1	0.3	0.2	0.1	0.4
<i>Recreational</i>	0.0	0.0*	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.8	1.3	0.0	0.0
<i>Work</i>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.6	0.0
<i>Unspecified activities</i>	0.0	0.2	0.0*	0.4	0.5	1.2	0.0	0.0	0.3	0.8	0.0*	0.0	0.2
<i>Commuting</i>	1.1	1.2	1.2	1.3	0.5	1.1	1.1	0.4	0.5	0.3	0.6	1.2	1.9
<i>SUM daily average time spent for activity in hours</i>	3.7	3.4	5.9	4.2	2.4	3.4	3.8	2.2	2.6	3.3	3.6	4.3	3.6

*Amount of time spent: P2 recreational activities 0.035 hours, P3 unspecified activities 0.015 hours, P11 unspecified activities 0.012 hours

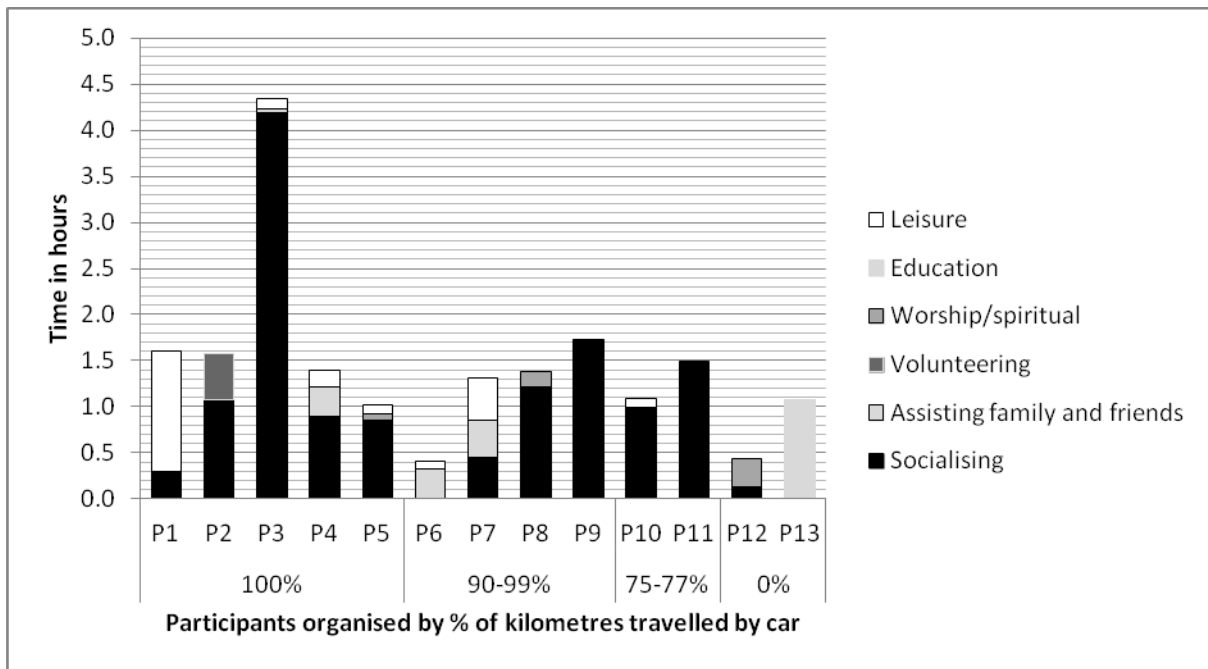


Figure 2 Time spent in social activities

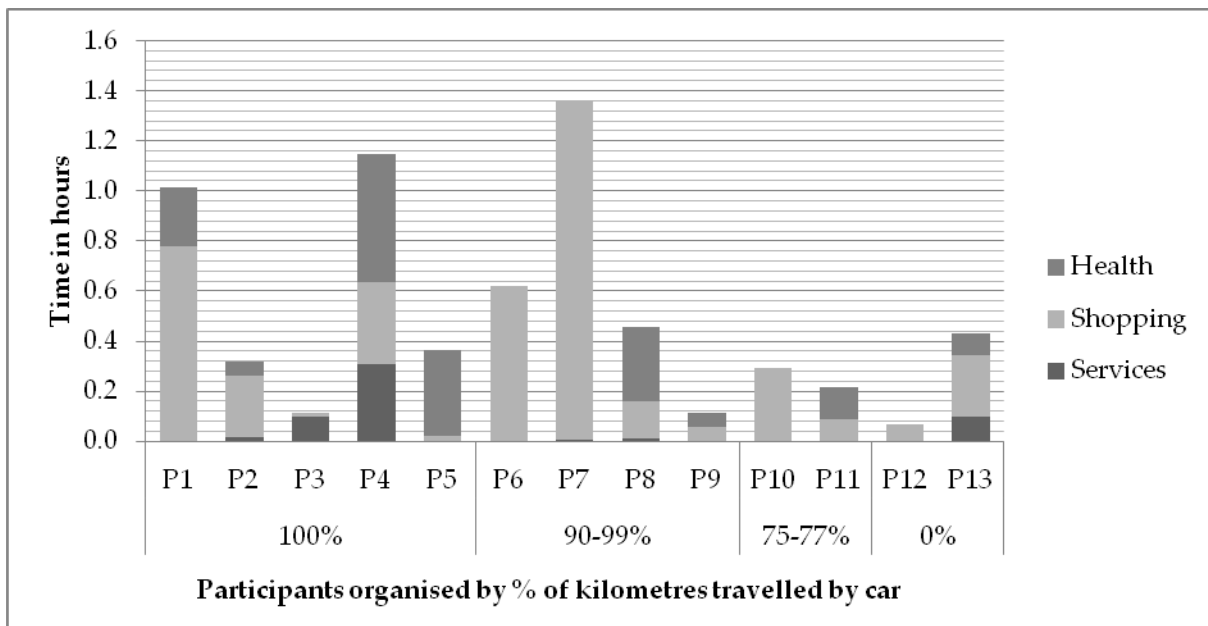


Figure 3 Time spent in daily life activities