

Senior Victorians and walking: obstacles and opportunities

Summary Report

Victoria
walks



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This report was prepared by Dr Jan Garrard, Active Transport Consultant, for Victoria Walks and Council on the Ageing (COTA) Victoria, November 2013.

Victoria Walks Inc is a walking health promotion charity working to get more Victorians walking every day. Our vision is for vibrant, supportive and strong neighbourhoods and communities where people can and do choose to walk wherever possible. Victoria Walks is supported by VicHealth.

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1 Key findings at a glance

Walking is particularly important for seniors, who are less likely than younger adults to participate in more vigorous forms of physical activity, more likely to experience social isolation and less likely to drive a car. Walking is highly valued by seniors for a range of reasons including improved health, wellbeing, independence, personal mobility and social connectedness.

Although overall physical activity declines with age, and 58% of senior Victorians do not achieve recommended levels of physical activity, walking is an increasingly important source of physical activity as the population ages. For people aged 75 years and over, walking comprises 77% of the total time spent on physical activity (see Figure 3).

The health benefits of walking for transport are similar to those associated with walking for recreation; however, walking for transport has a number of co-benefits associated with reduced motor vehicle use (eg improved air quality, reduced greenhouse gas emissions, less traffic congestion and increased community liveability). Walking for transport is also a more socially inclusive form of physical activity than leisure-time physical activity. While socioeconomically disadvantaged population groups are substantially less likely than advantaged groups to participate in recreational exercise, walking for transport is evenly distributed across the socioeconomic spectrum (see Figure 5).

The literature review suggests elements that make an environment more walkable, both for seniors and the general population (although perhaps to varying degrees), include:

- residential density, with good pedestrian access to shops, services, and public transport,
- street connectivity,
- an aesthetically pleasant environment,
- quality walking infrastructure,
- proximity to the CBD (which is likely to be an indicator of other elements of a walkable environment),
- perceptions of safety,

- well-positioned and well-designed road crossings that allow sufficient time for older pedestrians to cross safely and comfortably,
- traffic calming in residential areas and activity centres and limitations on car parking.

The most important perceived barriers to walking, in the survey of 1128 senior Victorians were, by order of concern:

1. Dogs that are off leash or not under control
2. Poorly maintained footpaths
3. Poorly lit footpaths
4. Drivers failing to give way
5. Bicycle riders on shared walking and cycling paths
6. Not enough public toilets.

When asked what measures might improve feelings of safety when walking, the top rating suggestions were:

1. Better cyclist behaviour on shared paths
2. Reduce cycling speed on shared paths
3. More emphasis on pedestrian safety in driver education
4. More policing of drivers' yielding rules
5. 40km/h speed zones in local shopping centres
6. Traffic calming in residential areas.

Traffic concerns were more important for seniors who walk for transport or live in central Melbourne. One in six residents of central Melbourne stated that they would walk more if local streets were designed so that traffic travels under 30 km/h.

Pedestrians are at greater risk of traffic-related injury than motor vehicle occupants, and older adults experience higher severity pedestrian injuries than younger adults. In the period 2003-2012, 148 Victorian pedestrians aged 70+ were killed, compared to 67 pedestrians aged 0-20.

Safety for older pedestrians can be improved through a safe system approach involving safer road environments, reduced traffic speed, improved vehicle design (as required in Europe), and more pedestrian-focused driver education, including increasing motorists' duty of care to vulnerable road users such as older pedestrians.

An additional injury risk for older adults is the risk of falling (due to slips, trips and stumbles) while using the road network, with fall injuries likely to outnumber traffic-related injuries. Fear of falling and consequent attention to the road surface may result in seniors being distracted from traffic hazards when crossing roads, or walking along roads without footpaths. Narrow, uneven, sloping, or slippery footpaths, obstacles such as tables, chairs and advertising signs on footpaths present a greater hazard to older pedestrians. In general, older adults require higher standards of both design and maintenance of pedestrian infrastructure.

Sudden, unexpected incidents such as cyclists passing at high speed without warning or uncontrolled dogs can sometimes cause as much, or possibly more concern than the more predictable hazards associated with motor vehicles.

Analysis of data from the Victorian Integrated Survey of Travel and Activity (VISTA) indicates that utilitarian trip purposes (eg shopping and personal business) become increasingly important for older seniors, increasing from 53% of trips for 60-69 year olds to 81% of trips for those aged 80+ (Figure 9). This confirms the important contribution that walking makes to older adults' mobility.

Shops were clearly the most common destination for transport walking amongst survey respondents (62%), followed by public transport (40%) and services such as library, health care, leisure facilities (31%). The survey results suggest health and wellbeing factors are also important motivators for walking more generally, especially amongst younger seniors (Figure 12).

Seniors can and will walk a reasonable distance to access shops and services and conduct personal business – about 1km on average. The VISTA analysis and survey results suggest there is little variation in walking trip distance across all adult age groups, including older adults.

Both the VISTA analysis and survey results confirm that, consistent with the general population, seniors walk much more in inner Melbourne suburbs than outer Melbourne or regional Victoria. About twice as many survey respondents in inner Melbourne (62%) walked more than an hour per week for transport, compared to outer Melbourne residents

(33%). Correspondingly fewer seniors in inner Melbourne (47%) drove a car on most days compared to seniors living in middle and outer suburbs (61-62%).

In Victoria, about 14% of household trips by older adults are walking trips, while in Germany, for example, 39% of all trips undertaken by people aged 65-74 years are walking trips; rising to nearly half of all trips (48%) for those aged 75 years or older.

The substantial differences in walking rates for older adults between countries and between different parts of Victoria challenge the widely-held perception that low rates of walking for transport among older adults are largely due to increasing ill-health and functional limitations. The walkability of the environment appears to be a more important determinant of walking by seniors.

2 Introduction

“Walking is a natural thing to be doing.”

“I can’t imagine not doing it – it’s part and parcel of my life.”

“I’m known by my neighbours. It’s the village – it’s a sense of security.”

“It would be terrible – stuck all day at home.”

“You get to meet interesting people, fresh air, and an easy form of transport, and it’s free.”

“I won’t walk at night any more, only because of the uneven surfaces. You can’t see where you’re walking so you’ve got to be very, very careful. When the sun goes down, I don’t walk, and that’s a bit of a pity.

“You’ve just got to watch for them [cars]. Wait for a gap, then zip across - wish me luck!”

The above comments from participants in focus group discussions in the Seniors Walking Study are apt illustrations of current research evidence which demonstrates that walking is:

- a valuable form of health-enhancing physical activity;
- an important means of social participation and community engagement; and
- a convenient, cheap and sustainable form of transport.

(Giles-Corti et al 2010)

Walking is particularly important for older adults, who are less likely than younger adults to participate in more vigorous forms of physical activity; more likely to experience social isolation; and less likely to have access to other forms of transport such as driving a car.

Increasing recognition of the value of walking has led to a growing body of research into what supports and constrains everyday walking. However, much of this research and policy interest in ‘walkable’ neighbourhoods has focused on young and middle-aged population groups, and relatively little is known about what supports and constrains walking for older adults.

This study addresses this knowledge gap through a unique and comprehensive investigation into:

- the meaning of walking for senior Victorians (aged 60 years and over);
- seniors’ walking behaviour: and
- supports and constraints on walking for seniors.

The study comprises four components:

- a literature review of supports and constraints on seniors’ walking;

- analysis of seniors’ walking data from the Victorian Integrated Survey of Travel and Activity (VISTA);
- eight focus group discussions with a total of 32 senior Victorians; and
- a survey of 1128 senior Victorians.

In this study, walking includes leisure-related walking (for recreation, exercise, fitness or sport) and utilitarian walking (ie walking as a mode of transport to get to places such as shops, services and public transport). The main focus, however, is on walking for transport. Walking for transport has several benefits in addition to health benefits, and international comparative data indicate that there is considerable potential to increase utilitarian walking among older adults in Victoria.

The study also focuses on supportive environments for walking, rather than educational/promotional programs aimed at encouraging seniors’ walking, as environmental change that leads to an increase in the proportion of trips undertaken by walking has the potential to impact on substantially more people at the population level than specific walking programs. For example, in the current study, analysis of VISTA data indicated that mean distance walked per senior per day was about two and a half times greater for seniors living in central/inner local government areas (LGAs) than for seniors living in outer suburban LGAs (see Section 5). When applied to the total population of seniors in each LGA, these differences in walking rates represent a large number of people.

Key findings from the four components of the study are described below, together with conclusions and recommendations for creating supportive environments to enable more senior Victorians to walk more often.

This report is a summary of the study – the full study report is available at www.victoriawalks.org.au/seniors/ and provides substantially more detail.

3 Background to the study and overview of seniors' walking

Older adults are the fastest growing segment of the Victorian population, with the current proportion of Victorians aged 65 years and over (14.0%) (Australian Bureau of Statistics 2013a) predicted to increase to nearly a quarter of the population (23.1%) in 2056 (Australian Bureau of Statistics 2010).

Physical inactivity is a risk factor for a range of chronic diseases such as cardiovascular disease, type 2 diabetes and some forms of cancer that increase markedly with age (see Figure 1). Physical activity tends to decline with age, and most Victorians aged 65 years and over (58%) do not achieve the levels of physical activity recommended to reduce the risk of these and other health conditions¹ (see Figure 2).

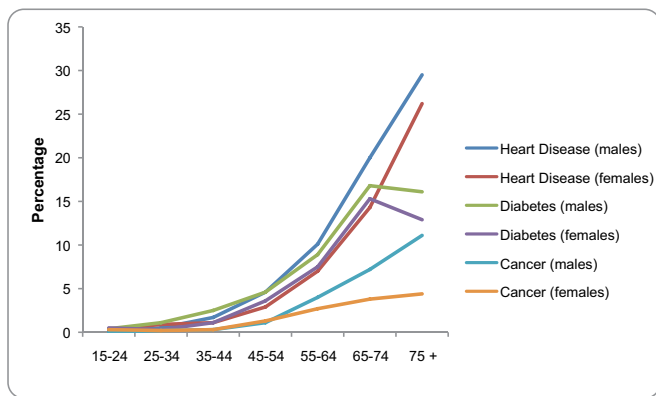


Figure 1: Proportions of persons with heart disease, diabetes and cancer

(Source: Australian Bureau of Statistics 2012a)

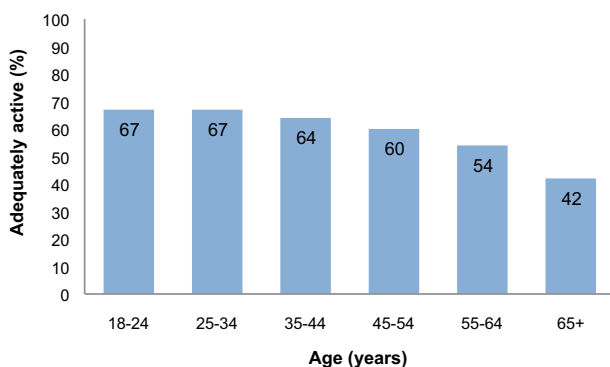


Figure 2: Physical activity levels (adequately active) by age, Victoria, 2010

(Source: Victorian Population Health Survey)

¹ At least 30 minutes of moderate intensity physical activity on most days of the week, in bouts of at least 10 minutes duration (Department of Health and Aged Care (1999). *National physical activity guidelines for Australians*. Canberra, Department of Health and Aged Care).

Walking among older adults in Victoria and Australia

The 2011-12 Australian Bureau of Statistics *Australian Health Survey* provides data on physical activity, including walking for fitness and walking for transport (Australian Bureau of Statistics 2013b). Total physical activity² declined with age, particularly in the 75+ age group, and most markedly for vigorous activity. Walking for fitness increased with age up to 65-74, and then declined in the 75+ age group. Walking for transport showed less variation with age, but also declined in the 75+ age group.

While time spent walking for fitness and transport declined for those aged 75+, walking for fitness and walking for transport were relatively more important sources of physical activity for older adults than for young and middle-aged adults. Crucially, for people aged 75 years and over, walking for fitness and transport comprised 77% of the total time spent on physical activity (see Figure 3).

The data outlined above suggest that walking is an increasingly important source of recreational physical activity and personal mobility as the population ages.

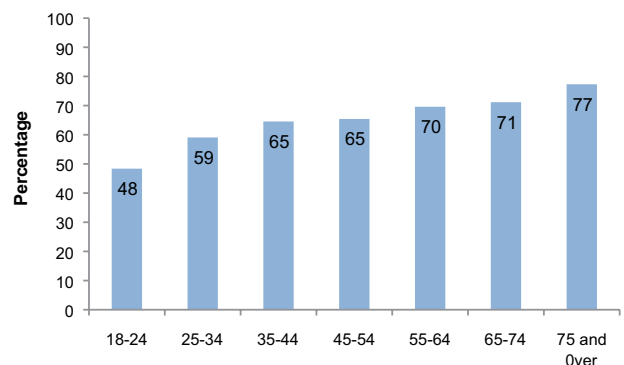


Figure 3: Proportion of total physical activity undertaken by walking for fitness and transport

(Source: ABS 2013b)

Walking for recreation

Walking, which is the most popular form of leisure-related physical activity in the Victorian population in terms of both participation rates and frequency, increases markedly with age up to 65 years (see Figure 4). The increasing popularity of walking with age suggests that the decline in walking that occurs in the 65 years and over age group is likely to be due to increased barriers to walking in this age group, rather than an inherent dislike of walking. These barriers are likely

² Across the four areas of vigorous and moderate physical activity, and walking for fitness and transport.

3 Background to the study and overview of seniors' walking (cont.)

to include both personal and environmental factors, with the focus of the current study being on potentially modifiable environmental barriers. Reducing these barriers to walking is likely to assist older Victorians to maintain or increase walking levels.

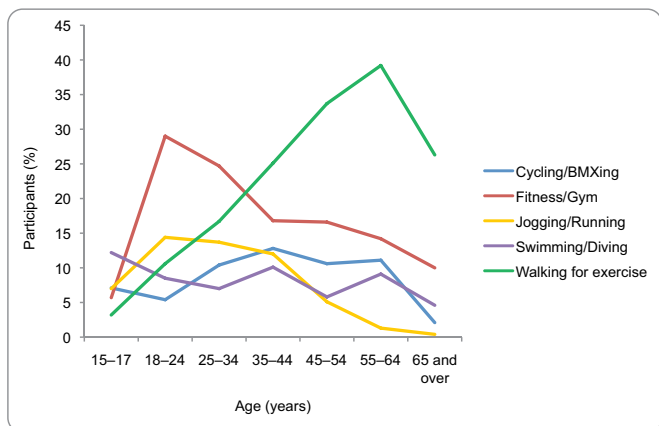


Figure 4: Participation in the top five forms of sport and physical recreation, Victoria

(Source: ABS 2012b)

Walking for transport

The health benefits of walking have been established for both recreational and utility walking (Hamer and Chida 2008a; Hamer and Chida 2008b). In addition to the health benefits of physical activity, walking for transport has a number of health, well-being and community benefits associated with reduced car use. These benefits include improved air quality; reduced traffic congestion; improved social connectedness and community liveability; and improved mobility for people who do not drive cars (Litman 2013).

Another important benefit of walking for transport is that it is a more socially inclusive form of physical activity than leisure-time physical activity. Socioeconomically advantaged population groups in Australia are substantially more likely than disadvantaged population groups to participate in recreational walking and other forms of moderate and vigorous physical activity (based on the ABS Socio-Economic Index for Areas [SEIFA]) (Australian Bureau of Statistics 2013b). However, walking for transport is fairly evenly distributed across the socioeconomic spectrum (see Figure 5). This unique feature of utility walking is important because disadvantaged population groups experience poorer health than more advantaged groups (Turrell et al 2006). Consequently, creating supportive environments for (more) transport walking may contribute to reducing health inequalities in Victoria by reducing disparities in physical activity participation.

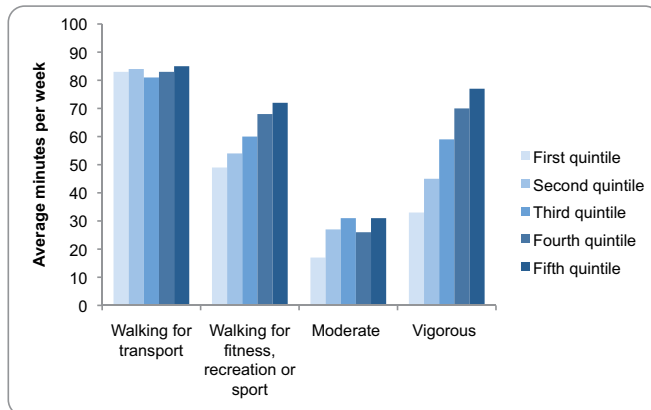


Figure 5: Average minutes per week spent on physical activity, by SEIFA Index

(The first quintile refers to the most disadvantaged 20% of areas in Australia, and the fifth quintile refers to the most advantaged 20% of areas in Australia based on the ABS SEIFA Index)

(Source: Australian Bureau of Statistics 2013a)

While recreational walking is popular in Australia (Australian Bureau of Statistics 2012b), rates of walking for transport are low compared to many other developed countries (Bassett et al 2008) (see Figure 6). Countries with high population rates of walking for transport also have relatively high rates of transport walking among older adults. In Victoria, about 14% of household trips by older adults are walking trips, while in a number of other industrialised countries, up to 48% of daily trips undertaken by older adults are walking trips (Pucher and Dijkstra 2003; Buehler and Pucher 2012).

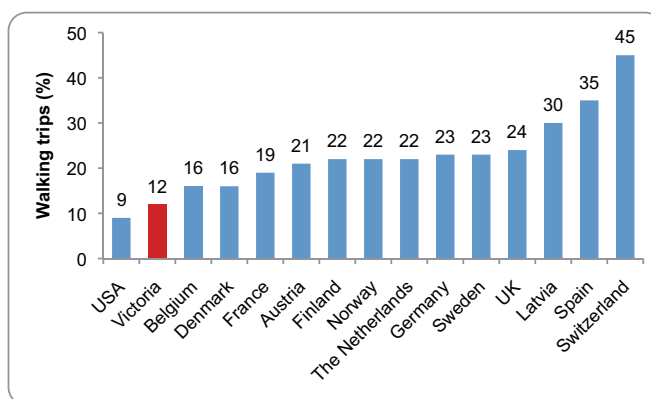


Figure 6: Walking share of trips by country (and state of Victoria)

(Source: Bassett et al 2008)

Although the overall level of utility walking in Victoria is relatively low, walking as a proportion of all trips tends to increase with age; nearly doubling between 45-49 years (8%) and 85+ years (14%³) (see Figure 7). This increase in walking trips is associated with a marked decline in car driving trips.

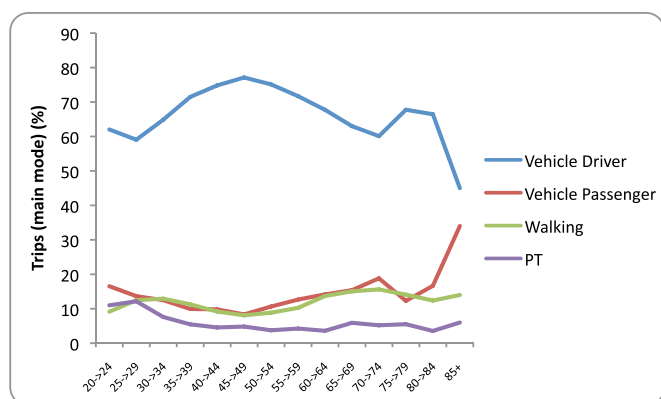


Figure 7: Main method of travel (trips) by age, Victoria 2009-2010

(Source: VISTA online)

People who use walking as a means of getting around, frequently achieve adequate levels of physical activity 'incidentally' as part of daily life, at low cost, without having to find the time and money to participate in organised sports, exercise or fitness programs. As described above, as people age, walking for transport becomes an

increasingly important source of physical activity as other forms of vigorous and moderate intensity physical activity decline. Australians aged 65-74, on average, achieve nearly half (49%) of the recommended 150 minutes per week of moderate to vigorous physical activity through walking for transport (see Table 1).

International comparative data indicate that there is considerable potential to increase levels of walking for transport in Victoria, including among older adults. For example, 39% of all trips undertaken by people aged 65-74 years in Germany are walking trips; rising to nearly half (48%) for those aged 75 years or older. In the Netherlands, where cycling is more prevalent than walking, walking trips are still high (relative to Australia): 19% for the 65-74 years age group, and 24% for those aged 75 years or older (Pucher and Dijkstra 2003).

Substantial international differences in walking rates for older adults challenge the widely-held perception that low rates of walking for transport among older adults in countries like Australia are largely due to increasing ill-health and functional limitations among older adults. In fact, large geographical differences in walking rates among older adult populations, including within Victoria (see Section 5), raise the important question of what constrains walking among older adults in some settings.

This is the focus of the current study, which comprises a comprehensive investigation of seniors' walking as outlined in the Introduction above. Key findings from the literature review are described in the following section.

Table 1: Average minutes per week spent on physical activity in Australia

(Source: Australian Bureau of Statistics 2013b)

Type of physical activity	18-24	25-34	35-44	45-54	55-64	65-74	75 and over
Vigorous	114	75	59	60	32	21	7
Moderate	29	22	19	23	37	41	25
Walking for fitness	40	47	58	75	75	80	56
Walking for transport	94	93	84	82	83	73	53
Total	277	237	220	240	227	215	141

³ This figure needs to be interpreted cautiously due to the large relative standard error for this age group.

4 Literature review of supports and constraints on seniors' walking

The literature review covers the health benefits (and risks) of physical activity and walking for older adults, the meaning of walking for older adults, and supports and constraints on seniors' walking.

4.1 Health benefits of physical activity for older adults: overview

The Commonwealth Department of Health and Ageing report "*Recommendations on physical activity for health for older Australians*", summarises the benefits of regular physical activity for older adults as including:

- reducing the risk of heart disease, stroke, high blood pressure, type 2 diabetes, and some cancers;
- building and maintaining healthy bones, muscles and joints, thereby reducing the risk of injuries from falls;
- maintaining or improving physical function and independent living; and
- improving social interactions, quality of life, and reducing depression.

(Department of Health and Ageing nd)

These benefits occur at all ages, and are more strongly correlated with recent activity than past activity (Sherman et al 1999). Consequently, it is recommended that people who are already active should maintain a physically active lifestyle into older age; and previously inactive older adults will achieve a health benefit if they commence physical activity (Department of Health and Ageing nd).

The three broad categories of physical activities for older adults are: (i) aerobic fitness/endurance; (ii) resistance/strength training; and (iii) mobility/flexibility/balance (Department of Health and Ageing nd). The health benefits of physical activity for older adults are maximised by engaging in activities across these three areas. Walking, as a form of moderate intensity physical activity, contributes to aerobic fitness/endurance and mobility/flexibility/balance.

The British Heart Foundation lists five "top line messages" for providing public advice on physical activity for frailer, older people. Under the umbrella message of "*Moving more often every day*" the five key messages are:

1. Something is better than nothing.
2. Build up your physical activity gradually.
3. Be sure to add activities that will help you be strong and steady.
4. Limit and break up the amount of time you spend sitting still.
5. The health benefits of physical activity outweigh the risk.

(British Heart Foundation 2012a)

4.2 Health benefits of physical activity and walking: specific health conditions

The health benefits of walking have been established for a number of health conditions, as summarised below. Not all findings are specifically for older adults, but these are included where possible.

The health benefits of walking include:

- Reduced risk of **cardiovascular disease** (31% risk reduction) and lower **all-cause mortality**⁴ (32% reduction) (Hamer and Chida 2008a).
- **Weight control**: a number of studies have reported that higher rates of active travel (walking and cycling) are associated with lower rates of overweight/obesity (Bassett et al 2008; Wen and Rissel 2008; Pucher et al 2010); and greater time spent driving is associated with increased obesity (Wen et al 2006; Frank et al 2004; Bell et al 2002).
- **Type 2 diabetes**: 36% reduction in the risk of type 2 diabetes for more than 30 minutes per day of walking or cycling to and from work (Hu et al 2003). For adults with diabetes, walking more than two hours a week is associated with 39% lower all-cause mortality and 34% lower CVD mortality (Gregg et al 2003).
- **Falls and fractures**: walking for leisure or transport associated with a reduced risk of 36% for any fracture, and 43% for hip fracture (Moayyeri et al 2010).
- **Mental health**: older adults (55-89 years, mean age 65.2 years) who were either moderately (150-420 minutes per week) or highly active (>420 minutes per week) had significantly higher mental health status than those who were inactive (< 150 minutes per week) after controlling for physical health status (Mummery et al 2004).
- **Cognitive functioning**: long-term regular physical activity, including walking, was associated with significantly better cognitive function and less cognitive decline in older women (Weuve et al 2004). Another study reported a 33% reduced risk for Alzheimer's disease for 'much' physical activity compared with 'no' physical activity (Scarmeas et al 2009).
- **Maintaining mobility and independent living**: cardio-respiratory exercise such as walking can improve declines in endurance and reduce breathlessness and fatigue in older adults (British Heart Foundation 2012b). Regular physical activity reduces functional limitations and assists older adults to maintain functional independence which is important as loss of mobility is associated with higher rates of morbidity, mortality, and hospitalisations; poorer quality of life; and reduced likelihood of remaining in the community (Fielding et al 2011).

⁴ All-cause mortality refers to death rates from all causes; that is, including, but not restricted to deaths due to cardiovascular disease.

- **All-cause mortality:** a systematic review and meta-analysis⁵ reported that people who walk briskly for 2.5 hours a week have an 11% reduced risk of mortality compared with people who do not walk (Woodcock et al 2010).

These findings reported above for all-cause mortality are particularly important because they demonstrate that, overall, the benefits of walking outweigh the risks; the main ones being traffic-related injuries, fall injuries and the harmful effects of air pollutants (see Section 4).

4.3 Supports and constraints on seniors' walking

Supports for walking

Environmental supports for seniors' walking have largely focused on what makes neighbourhoods 'walkable'. Factors that have been investigated include residential density, land use diversity, street connectivity, access to services, access to public transport, access to recreational facilities, walking infrastructure, traffic-related safety, crime-related safety, aesthetics, and urbanisation (Cauwenberg et al 2011). Associations with seniors' walking are broadly similar to findings for general adult populations, although not all of these factors have been as consistently related to seniors' walking rates as for adults generally, possibly due to fewer studies involving older adults.

A recent USA study examined the relationships between neighbourhood walkability, physical activity (including utility walking and cycling), obesity and lower-extremity mobility impairment among community dwelling older adults (King et al 2011). The authors reported that "Across regions, time and neighbourhood income, older adults living in more walkable neighbourhoods had more transport activity and moderate-to-vigorous physical activity and lower body mass relative to those living in less walkable neighbourhoods."

A survey of 323 residents in 32 retirement villages in Western Australia found that walking was the most popular form of physical activity, though objectively-measured activity was low (Nathan 2012). Built and social environmental factors significantly associated with walking included: closer distance to public transport; higher perceived proximity to destinations; higher perceived aesthetics score; and more physical activity support from family.

One of the few studies to comprehensively examine the use of active transport modes by older adults investigated socio-demographic and environmental factors that influenced travel by car, public transport and walking among older adults in Montréal, Canada (Moniruzzaman et al

2013). The study found that the environmental factors of higher density urban structure, street density and land-use mix were all associated with more walking trips. Living in the 'downtown core' (compared to the suburbs) resulted in more walking trips and greater walking trip distance (after controlling for density and built environment factors).

It is likely that the suburban/CBD differences (independent of density and built environment factors) are partly due to walking being more appealing than driving a car in inner city areas where traffic congestion is higher, and car parking more difficult and/or expensive. It is important to bear in mind that walking to get to places is frequently a travel mode choice (rather than a 'physical activity' choice) that is influenced by competition from alternative travel modes. In Australia, this is predominantly car travel. Thus, a more walkable environment is also one where car travel is less appealing, over and above the more commonly studied 'walkability' factors. In many of the high-walking OECD countries, the prioritisation of walking and cycling over car travel in built-up areas involves an integrated package of measures that makes walking and cycling for local short-to-medium distance trips faster, cheaper, more convenient and more pleasant than car travel (Pucher and Buehler 2010; ITF/OECD 2011).

The ITF/OECD (2011) report *'Pedestrian safety, urban space and health'* summed up the current findings on supports for older adults' utilitarian walking as follows:

"... to promote walking for transportation a neighborhood should provide good access to shops and services, well-maintained walking facilities, aesthetically appealing places, streets with little traffic and places for social interaction. In addition, the neighborhood environment should evoke feelings of familiarity and safety from crime." (p.69)

Constraints on walking

Research into constraints on physical activity and walking for older adults focuses mainly on restrictions due to health problems and reduced functional capabilities. As people age, health factors become an increasingly important barrier to physical activity, including walking (Jerome et al 2006). Older adults may have reduced motor, sensory and cognitive abilities which, together with increased frailty, can increase the risk of pedestrian injury, and also discourage older adults from walking (GOAL Consortium 2012). In addition to changing physical capabilities, changes in employment status, household composition, car ownership and use, and income also impact on walking among older adults (ITF/OECD 2011).

While changing health and lifestyle factors can constrain walking among older adults, there are also a number of potentially modifiable factors that can assist older adults

⁵ That is, a study that estimates an overall result from combining the findings from several studies.

4 Literature review of supports and constraints on seniors' walking (cont.)

to maintain or adopt more physically active lifestyles. It is also important to bear in mind that physical activity at all ages can help prevent many of the health conditions that subsequently constrain physical activity among older adults.

Because the main focus of this study is on supportive environments for older adults' walking, this section focuses on research into potentially modifiable individual and environmental constraints on seniors' walking rather than on constraints due to specific health conditions.

A baseline survey of middle-aged and older people in the UK who attended two national walking programs⁶ (N = 680, mean age 64.4 years) reported a range of perceived barriers to walking in the neighbourhood. Key barriers included:

- **intra-personal factors:** "health problems" (20%);
- **social/cultural factors:** "no one to walk with" (25%), "worry about personal safety" (29%);
- **built environment:** "worry about tripping over broken paving stones" (18%), "too much traffic" (17%), "worry about being knocked down by a cyclist riding on the pavement" (11%).

(Dawson et al 2007)

The baseline survey found that both health problems and environmental barriers to walking were associated with lower levels of walking.

A significant positive association was reported between health barriers and external barriers, suggesting that people with poorer health may require higher quality walking infrastructure than those with better health. However, change in health status over the 12-month period did not appear to impact on walking or total physical activity, suggesting that poorer health does not necessarily lead to reduced walking and other forms of physical activity.

In contrast to the limited research into general supports and barriers for seniors walking, there is a large body of research into barriers in the form of risk of traffic-related injury for older pedestrians. The following section summarises the key findings from this research.

Traffic-related and fall injuries among older pedestrians

One area of constraints on older adults' walking that has been more comprehensively investigated is that of traffic-related injury risks. Most of this research focuses on injury prevention rather than walking behaviour, though the two are inter-related,

⁶ The study sample was recruited from two walking schemes: the majority via "Walking the Way to Health" initiative (WHI) (n=601), with additional participants (n=149) recruited from the "Paths to Health" (PTH) project, based in Scotland. These schemes aim to encourage sedentary adults to become more active by attending local-led "Health Walks" (approx. 60) which generally have trained walk leaders, assisted by volunteers.

with both actual and perceived risks impacting on walking behaviour (Garrard 2008). Actual and perceived risk of assault is also likely to impact on walking behaviour, though research in this area is inconclusive. Another injury risk that arises for older adults (that is largely absent for younger adults) is the risk and fear of falling while using the road network. In contrast to traffic-related injuries, little is known about the incidence, causes and prevention of fall injuries among older pedestrians using the public road network, though it appears that fall injuries may outnumber traffic-related injuries (ITF/OECD 2011; The Swedish Transport Administration 2012).

Pedestrians are at greater risk of traffic-related injury than motor vehicle occupants, and older pedestrians experience more, and higher severity injuries than younger age groups (see Figure 8) (TAC Online Crash Database 2012). Over the last decade, pedestrian fatalities in Victoria have declined more slowly than motor vehicle occupant fatalities, and also more slowly than in Australia as a whole (Bureau of Infrastructure, Transport and Regional Economics 2012). Victoria's rate of pedestrian fatalities is also higher than in several other industrialised countries, and declining more slowly, indicating potential for substantial improvement (World Health Organisation 2009; Bureau of Infrastructure, Transport and Regional Economics 2012).

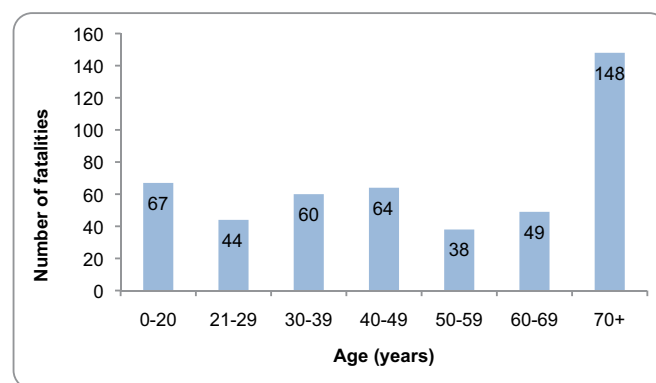


Figure 8: Pedestrian fatalities by age, Victoria, 2003-2012

(Source: TAC Online Crash Database 2012)

Countries with the lowest rates of pedestrian fatalities also have relatively high rates of walking, including among older adults, indicating that it is possible (as well as desirable) to improve both the prevalence and the safety of walking among older adults. As described below, features within each of the four components of the **Safe System** framework⁷ can make the road system more or less usable and safe for older adults.

⁷ Victoria's road safety strategy is based on the Safe System approach which comprises: safer roads and road environments; safer vehicles; safer speeds; and safer people [ie road user behaviour].

Safer roads and road environments for pedestrians include the provision of well-designed and well-maintained footpaths and road crossings. Pedestrian safety, and possibly walking behaviour, are compromised when footpaths are missing or poorly maintained, and when pedestrian crossings are absent, poorly designed or misused by drivers. Safer roads and road environments are also important for reducing non-collision fall injuries among older adults that result from slips, trips and stumbles. Older pedestrians are cautious, law-abiding road users (Harrell 1996) who are generally aware of, and attempt to compensate for personal deficiencies that increase their risk of injury (Galna et al 2009). However, they are at risk for unexpected events in complex traffic conditions or in unforgiving road environments.

Research into falls by older adults while walking focuses mainly on how older people's functional limitations impact on their ability to successfully negotiate hazards such as obstacles on footpaths and roadways, dual-tasking (eg talking while walking), and level changes (Beauchet et al 2009; Galna et al 2009; Barrett et al 2010). In most cases, these conditions are more hazardous for older compared with younger pedestrians, and are associated with increased risk of falls. A systematic review of obstacle crossing deficits in older adults found that, while older adults used a slower, more cautious obstacle crossing strategy, they were more likely to contact obstacles when less time was available to adjust their foot placement (Galna et al 2009). These findings indicate that unexpected or sudden changes on footpaths and roads increase the likelihood of a fall, as do time-constrained (eg crossing roads) or distracting conditions.

Vehicle design features that increase or reduce the risk of injury to pedestrians include vehicle front design; bull-bars; window-tinting; energy-absorbing bonnets, windscreens and pillars; blind spot mitigation; and various forms of ISA (Intelligent Speed Assistance). Australian road safety authorities promote the purchase of '5-star' rated vehicles (based on the Australasian New Car Assessment Program [ANCAP] rating) that provide high levels of protection for vehicle occupants. However, in contrast to the European system (Euro NCAP), ANCAP ratings do not require best practice pedestrian protection measures to achieve a 5-star vehicle safety rating.

Safer speeds are those that enable drivers to avoid colliding with a pedestrian, or, if a collision is unavoidable, to make contact at a more survivable speed. Speed limits in Australia are high by international standards, and frequently, pedestrian safety is traded off for small improvements in vehicle travel time (Fildes et al 2005). There is consistent evidence that slower speeds reduce pedestrian injuries, and some evidence that slower speeds increase walking rates (World Health Organisation 2013). Area-wide traffic calming

appears to be more effective for increasing walking than site-specific road treatments (eg short 40 km/h zones in shopping strips)⁸.

Safer road users include drivers, cyclists and pedestrians themselves. However, the greatest threat to pedestrian safety comes from motorists (Boufous et al 2010). In Australia, where the road system is largely seen as 'belonging' to motor vehicles, the educative, regulatory and legal systems that govern and shape road use place considerable emphasis and responsibility on vulnerable road users (such as older pedestrians) to avoid collisions with motor vehicles. In contrast, in several European countries, drivers are required to exercise a high 'duty-of-care' to avoid collisions with pedestrians.

In Australia, older pedestrians are largely held responsible for traffic-related collisions and injuries, and regularly exhorted to "take more care on the roads" (refer to Garrard [2008] and www.victoriawalks.org.au/walking_law/). In fact, observational studies of pedestrian behaviour indicate that older adults are more careful, cautious and law-abiding pedestrians than younger adults (Harrell 1996). Consistent with these research findings is evidence that educational/training programs for older pedestrians have not been shown to be effective in reducing injuries (Rivara et al 1997; Duperrex et al 2002). Rather than being 'risk-taking' road users, older pedestrians are 'at-risk' due to what Wegman (2012) refers to as 'system failure' across the four components of the 'Safe System' as described above.

Consistent with older adults' generally cautious use of the road system, 'unexpected' events, such as bicycles passing at high speed and uncontrolled dogs on shared pedestrian-bicycle paths, are a source of considerable concern for older adults. Injury data and observational studies suggest that these incidents cause relatively little injury harm to pedestrians, compared to vehicle crashes (Boufous et al 2010; Haworth and Schramm 2011), though older adults may be at increased risk. These concerns are also an important reminder that, while actual risks need to be addressed to reduce injuries, perceived risks also need to be addressed to make walking safer, less stressful and more pleasurable; and possibly more prevalent.

In conclusion, walking for recreation and transport is important for the health, well-being and mobility of older adults, with multiple benefits for seniors of all ages. There is room for further improvement in terms of creating supportive environments for seniors' walking and reducing the actual and perceived risks of walking while using the public road and path network.

⁸ See full report for details.

5 Analysis of VISTA data for senior Victorians

Data from the Victorian Integrated Survey of Travel and Activity (VISTA) were used to describe senior Victorians⁹ walking behaviour. The analysis included the socio-demographic characteristics of walkers aged 60 years and over; together with walking trip frequency, distance, duration, location and purpose.

5.1 Methods

The Victorian Integrated Survey of Travel and Activity (VISTA) is an ongoing survey of householders' travel and activity conducted for the Department of Transport, Planning and Local Infrastructure. The survey is conducted with approximately 11,000 households across greater Melbourne, and about 6000 additional households in Geelong, Ballarat, Bendigo, Shepparton and Latrobe. A 24-hour travel diary is completed for each person over five years old in the household on the specified day.

Data used in the analysis are for the 2009-10 financial year. Data included in the analysis are for walking-only trips, and therefore exclude walking associated with travel to and from public transport or motor vehicles. They therefore underestimate total daily walking.

5.2 Results

Consistent with data from a number of European countries (Pucher and Dijkstra 2003), walking becomes an increasingly important form of mobility as people age, and driving a motor vehicle declines. Utilitarian trip purposes (eg shopping and personal business) become increasingly important for older seniors, confirming the contribution that walking makes to older adults' mobility (see Figure 9).

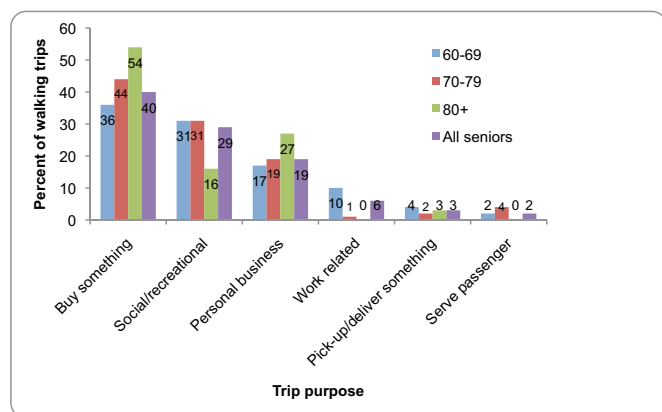


Figure 9: Walking trip purpose by age

9 Based on the regions covered by the VISTA survey (ie the greater Melbourne metropolitan area and selected regional centres).

An interesting finding from the VISTA analysis is that walking trip distance shows little variation across all adult age groups (about 1 km for all adult age groups, including older adults). This suggests that utilitarian walking has some unique¹⁰ characteristics as a form of moderate intensity physical activity, as most other forms of vigorous and moderate intensity physical activity decline with age (Australian Bureau of Statistics 2013b). It also indicates that if common trip destinations are within about 1 km of home, many seniors will walk to these destinations, including older seniors.

The other key finding from the VISTA analysis is the geographical variation in seniors' walking trip frequency and distance. The mode share of walking for seniors in inner suburban Melbourne Local Government Areas (LGAs) is several times greater than in some outer suburban LGAs, and is positively correlated with walking mode share for all adults (aged 20+ years) (see Figure 10). This finding is consistent with a similar analysis conducted in Montréal, which found that distance from central Montréal was the main determinant of seniors' utilitarian walking (Moniruzzaman et al 2013). These findings indicate that when the conditions are established that support walking in general, more seniors will also walk.

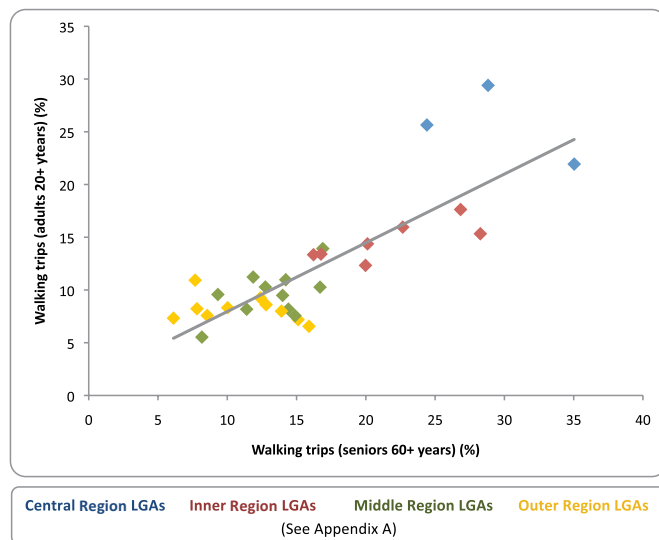


Figure 10: Proportion of trips by walking for seniors and the overall adult population by metropolitan Melbourne LGA¹¹

10 Possibly shared with utilitarian cycling in countries with high rates of cycling for transport.

11 Note that many data points have relatively high standard errors, so individual LGAs should not be compared.

This analysis also found that, in addition to walking mode share, the number of walking trips per senior per day, and the walking distance per senior per day increased with proximity to central Melbourne. Distance walked per trip tended to increase with distance *from* central Melbourne, but, overall, inner Melbourne seniors walked more because they undertook more walking trips (see Figure 11).

These findings challenge the notion that poorer health and functional decline largely explain low physical activity levels

older adults. This may be the case for the more discretionary forms of leisure-time physical activity, but appears to be less important for utilitarian walking, which is undertaken for a wider range of purposes than leisure-time physical activity. Consequently, environmental conditions play an important role in seniors' walking, as they appear to support or discourage continued utilitarian walking when the ability and/or desire to participate in leisure-time physical activity declines.

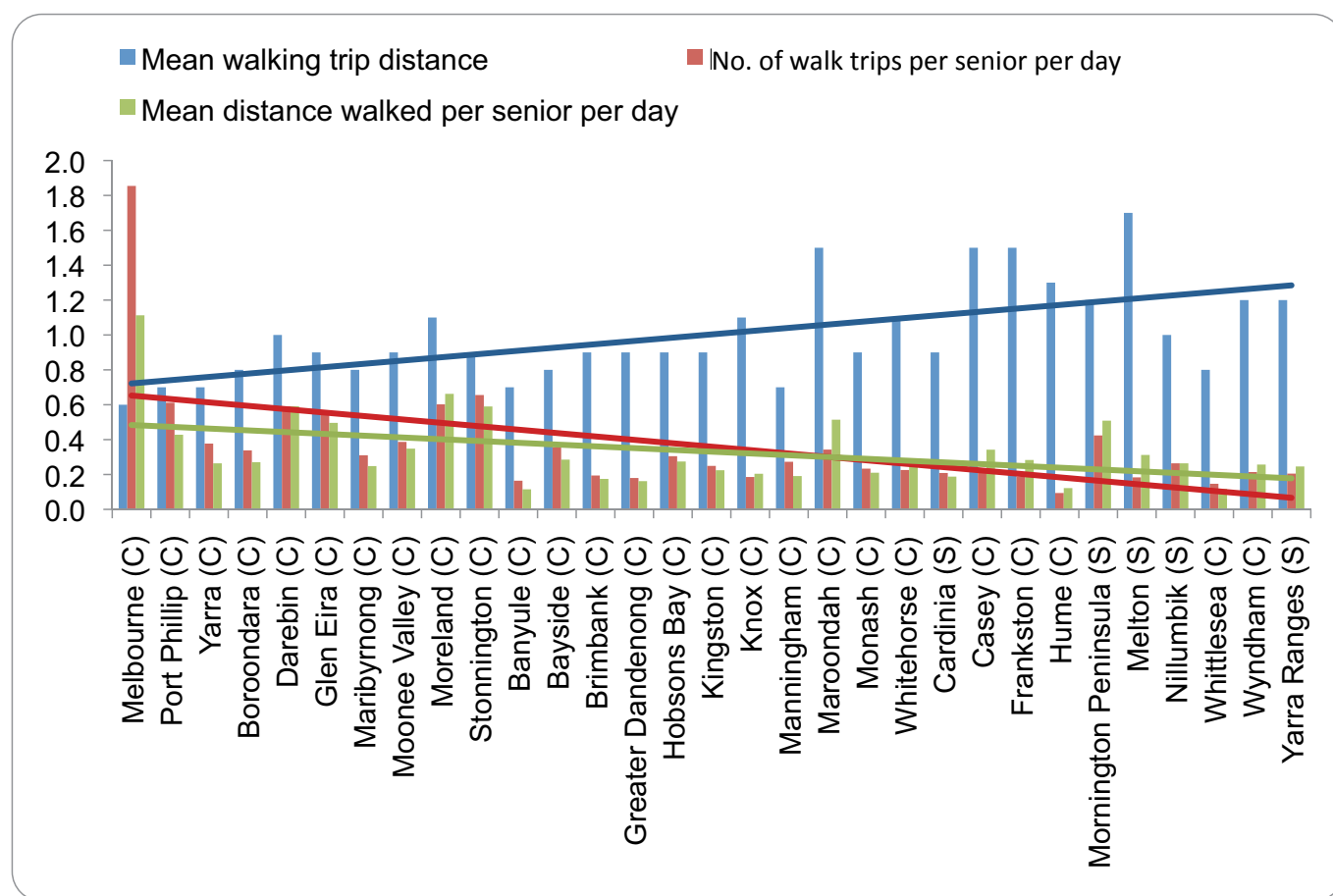


Figure 11: Mean walk trips (number of trips) and walk distances (km) by Melbourne LGA, seniors aged 60+ years¹²

12 Note that many data points have relatively high standard errors, so individual LGAs should not be compared.

6 Focus group discussions

6.1 Introduction

The aim of this component of the study was to explore barriers and enablers for walking among senior Victorians in some depth and detail using the qualitative data collection method of focus group discussions. Qualitative data assist in explaining and understanding quantitative data associated with barriers and enablers for walking, thereby providing insights into older adults' walking behaviours that cannot be obtained from numerical data alone. Findings from the focus group discussions were also used in the development of the questionnaire that was used in the survey component of the study.

Invitations for senior Victorians to participate in focus group discussions about neighbourhood walking were distributed through the Council on the Ageing (COTA). A total of 32 senior Victorians (23 females and 9 males) participated in eight focus group discussions.

6.2 Results

A key finding from the focus group discussions is the importance of walking in the lives of these senior Victorians. Walking is valued highly for a range of reasons including improved health, wellbeing, independence, mobility, social connectedness and community engagement.

"As you get older, it's something you can still do."

"It's a good pace to actually see things, experiencing things."

"I always walk down to the shops, just because it's beautiful, there's a lot of birds, it's peaceful, and not too much traffic."

"It's their social information exchange time as well as their morning exercise time." (Referring to a walking group for older adults associated with a housing estate.)

While it can be argued that seniors who self-selected to participate in the focus group discussions have a particular interest in walking that might have influenced their responses, relatively high rates of walking for both exercise and transport among older adults in Victoria and Australia also point to the importance of walking for a high proportion of senior Victorians and Australians (see Section 3).

In addition to confirming the importance of walking for older adults, this qualitative study assists in understanding both the depth of feelings that older adults hold about walking, and some of the implications of these highly positive beliefs and attitudes. For example, while adverse walking conditions can cause considerable concern to older adults, the impact of these concerns on levels of walking is unclear as, for some seniors, they appear to be countered

by a strong desire to continue to walk. Adverse walking conditions do, however, cause fear, anxiety and annoyance, thereby detracting from their enjoyment of walking. Hazardous walking conditions are also likely to contribute to traffic-related and fall injuries, even though many seniors attempt to deal with these conditions, as described below.

Older walkers' adaptive behaviours in response to adverse walking conditions include:

- being selective about when, where, how and with whom they walk:
 - » *"I avoid walking at school start and finish times – it's a bit chaotic, and that's an understatement! The parents dropping off – parking where they feel like it, doesn't matter if it's in the middle of the road!"*
 - » *"If you're slow at walking you have to avoid roundabouts."*
 - » *"It [cyclists on sections of Yarra Trail] puts me off walking there, but it doesn't stop me walking."*
 - » *"I won't walk at night any more, only because of the uneven surfaces. You can't see where you're walking so you've got to be very, very careful. When the sun goes down, I don't walk, and that's a bit of a pity."*
- taking extra care in potentially hazardous environments and situations (eg walking at night or in isolated areas, crossing roads, using roads without footpaths, using poorly maintained footpaths, and using shared paths):
 - » *"I'm very aware of what's going on around me when I'm walking on my own."*
 - » *"... unevenness of some of the footpaths, mainly in the residential streets. If I'm walking at night, I expect the footpath to be uneven and accommodate that."*
- generally walking defensively in circumstances where drivers and other road users such as cyclists are required to, but cannot be relied upon, to interact safely with pedestrians (eg at intersections and pedestrian crossings and on paths shared with bicycles).
 - » *"I give way to everyone. I just wait, wait, until it's safe. You can't trust any of them. It's just common sense. It's hard to argue the point when you're lying on the road under the car!"*
 - » *"You've just got to watch for them. Wait for a gap, then zip across – wish me luck!"*

Consistent with these adaptive behaviours was the commonly expressed view that seniors themselves are responsible for avoiding injury while walking. This perspective may help to explain why it is 'sudden, unexpected' incidents such as cyclists passing at high speed without warning or uncontrolled dogs that can sometimes cause as much, or

possibly more concern than the more predictable hazards associated with motor vehicles:

“When you walk anywhere you’ve got to be very careful of dogs and cyclists and skateboarders, and gophers¹³ – they travel on footpaths very fast. You get startled as they come screaming up behind you.”

“Dogs need to be on leads. Dogs can trip you up if they’re not under control.”

“Cyclists on shared paths that go like a bat out of hell.”

“Cyclists are really bad...and I ride a bike myself, but they scare me [on the Koonung trail at the weekend]. They do not ring their bell, and I don’t like the lycra people coming past.”

Safety concerns raised by study participants included safety related to personal assault, traffic and falls, but the main focus of the discussions was fall injuries. In all likelihood, this was because several participants (or their family members or friends) had experienced falls while walking, while there were no reports of assaults, or collisions with motor vehicles:

“Some surfaces are very difficult. The other week I went for a beautiful swan dive because I tripped over the edge of a manhole cover that was up just that little bit. Fortunately, I didn’t do any lasting damage, but I certainly got a fright.”

“I have fallen over twice, because of the rough surfaces”.

The fall hazards described by the study participants were predominantly those associated with absent or poorly designed and/or maintained walking facilities. Participants pointed out that narrow, uneven, sloping, or slippery footpaths, or obstacles such as tables, chairs and advertising signs on footpaths present a greater hazard to older pedestrians than to young or middle-aged pedestrians. This is also documented in the pedestrian safety literature (WHO 2013; ITF/OECD 2011).

So while fall injuries can result from the combination of what are seemingly minor hazards (for the majority of younger pedestrians), and reduced sensory, visual, perceptual, motor and cognitive abilities among some older adults, the *solution* is largely an environmental one. In order to support walking that is both healthy and safe, it is important to recognise that, in general, older adults require higher standards of walking infrastructure than younger population groups. This applies to both the design and maintenance of pedestrian infrastructure, though maintenance appears to be particularly important.

13 Motorised scooters.

The other key theme that emerged in the focus group discussions was road/path user behaviour. Just as older adults can be more vulnerable to environmental hazards while walking, they also express high levels of concern about the behaviours of other road/path users. These concerns may be heightened for older adults because of their reduced ability to avoid a collision in the event of the sudden, unexpected movement of another road/path user, and increased likelihood that a collision (or the avoidance manoeuvre) will result in a fall and/or injury.

Participants discussed potential methods for improving path/road user behaviour, including the traditional ‘three Es’ of engineering (ie good infrastructure design and maintenance), enforcement (of road rules) and education. However, their primary focus was on awareness-raising and education. There were concerns about road and path users’ lack of knowledge of the road rules that apply to interactions with pedestrians, as well as their failure to consistently obey the road rules (that they are aware of). There were also some concerns that the rules themselves lacked clarity – a reflection that is supported in the road safety research literature (Hatfield et al 2007).

While education was seen as crucial to sharing travel space, the concept of ‘education’ was used in the broad sense of establishing a community norm of safe, courteous road/path users, rather than just ‘education’ to increase awareness of the correct road rules. Cooperation, respect and general ‘good manners’ were also seen to *partially* compensate for potentially hazardous infrastructure (eg narrow paths or poor sight distances), and to reduce the need for costly infrastructure (eg separate, wide paths for pedestrians and cyclists). Other conditions that were mentioned that were considered to require ‘good manners’ to work effectively included footpath narrowing due to tables and chairs on footpaths, whereby cooperative rather than ‘selfish’ behaviour would allow pedestrians, people with prams and shopping jeeps, motorised scooters, and the like, to use the limited space safely and amicably.

In summary, findings from the focus group discussions indicate that walking is an important and highly valued activity for a number of older Victorians, many of whom are highly motivated to keep walking for as long as possible. A number of factors associated with the built environment can support or constrain seniors’ walking. Addressing barriers within the built environment is likely to contribute to a number of desirable outcomes including: more walking; maintaining walking into older age; making walking more appealing and enjoyable; and reducing traffic-related and fall injuries. Senior Victorians can assist in identifying and addressing these barriers as they are experienced and well-informed users of walking spaces (and potential walking spaces) in their neighbourhoods.

7 Seniors walking survey

7.1 Survey methods

The overall aim of the survey was to investigate senior Victorians' perceptions and behaviours related to walking; and supports and barriers to walking for seniors. The survey also aimed to explore differences in perceptions, behaviours, supports and barriers based on seniors' age, residential location, and type of walking (ie walking for recreation/exercise or walking for transport).

Data were collected using a 23-item questionnaire that was administered online and in paper format. A total of 1128 questionnaires were completed, comprising 851 online questionnaires, and 277 paper questionnaires.

7.2 Results

7.2.1 Characteristics of survey participants

The 1128 senior Victorians who participated in the survey came from widely dispersed locations across metropolitan Melbourne and rural and regional Victoria; however, the respondents do not comprise a representative sample of Victorian seniors. Women were over-represented (74%), as were younger seniors (60% were aged 60-69 years; 30% were aged 70-79; and 10% were aged 80+), and seniors who walk for recreation (74%) compared to transport (40%). Data from the Australian Health Survey (Australian Bureau of Statistics 2013b) and VISTA (see Section 5) indicate that transport walking is comparable to (or in the case of VISTA data, greater than) recreational walking. The fact that the survey attracted relatively more recreational than transport walkers could be due to people who walk for utilitarian purposes not necessarily identifying as 'walkers'.

The over-representation of recreational walkers is likely to have impacted on the findings, as there are some important differences between recreational and transport walking. In particular, utilitarian walkers are more likely to require a direct route to their destinations, and might therefore be more constrained by adverse path, road and traffic conditions than recreational walkers. In the focus group discussions, recreational walkers talked about choosing their walking routes and times to avoid hazardous conditions (see Section 6). These options may be less available to

utilitarian walkers. Where appropriate, survey data have been analysed separately for recreational and transport walkers, but it is important to bear in mind that nearly all 'transport walkers' were also 'recreational walkers', whereas only 6% of respondents walked for transport only.

7.2.2 Reasons for walking

The focus group discussions (see Section 6) identified the important role that walking plays in the lives of older adults. The importance of walking is also reflected in the survey findings, with just over half of the study sample (51%) reporting that walking is their only or main form of physical activity. This is consistent with population data indicating that walking is the most common form of physical activity for middle-aged and older adults in Victoria and Australia (Australian Bureau of Statistics 2012b; Australian Bureau of Statistics 2013b).

Health, fitness and getting around independently were important reasons for walking, as were factors associated with psychological well-being ('getting out in the fresh air' and 'feeling good'), and to a lesser extent, aesthetic and social factors (see Figure 12). The more utilitarian reasons for walking (eg walking associated with public transport use, or not driving a car) were least important for the sample as a whole, but relatively more important for older seniors. This finding reflects a fairly consistent pattern in the survey findings of older seniors' walking tending to be more about 'getting to places to do other things', compared with younger seniors' more recreationally-oriented walking to improve health and wellbeing.

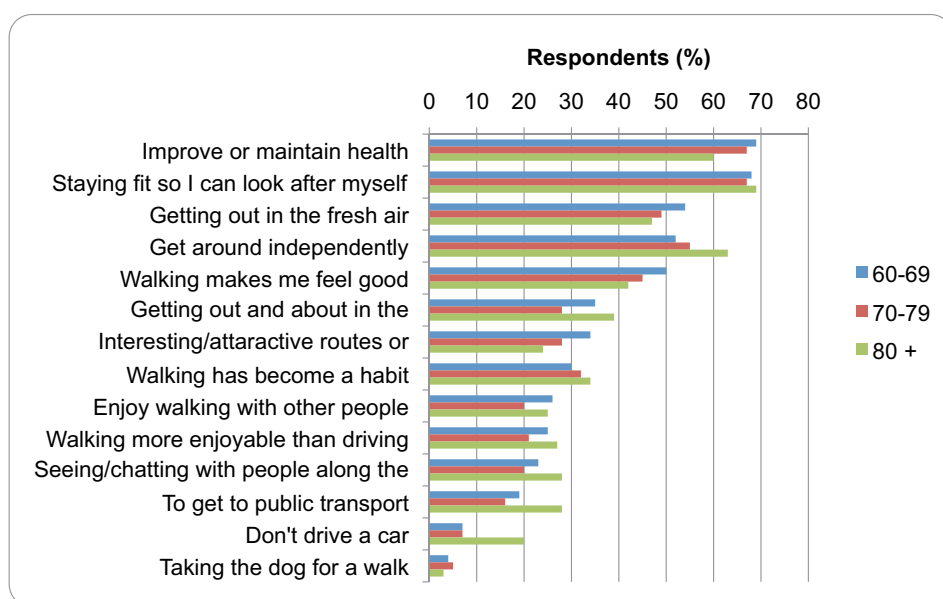


Figure 12: Reasons for walking by age (% "Very important")

Relatively higher rates of transport walking among seniors aged 80+ (see Figure 13) are consistent with older seniors being less likely than younger seniors to drive a motor vehicle on most days of the week. These findings are also consistent with VISTA data which indicate a decrease in car driving trips for people aged 85+ (45% of trips) compared with those aged 65-69 (63%); and a trend towards increased walking with age (see Section 5).

7.2.3 Walking rates

Consistent with the importance of walking for seniors, survey respondents reported spending a considerable amount of time walking, with 42% of respondents walking for recreation for more than two and a half hours a week, and 9% walking for transport for more than two and a half hours a week. Thus, a sizable proportion of the sample meet recommended levels of moderate intensity physical activity based on the 'adequate time' recommendation of at least 150 minutes (2.5 hrs) a week of moderate to vigorous physical activity (Department of Health and Aged Care 1999).

Seniors in their 60s and 70s had similar patterns of walking for both transport and recreation, with both age groups nearly twice as likely to walk (> 1hr/week) for recreation than for transport (see Figure 13). However, seniors aged 80+ were less likely than other age groups to walk for recreation, and more likely than other age groups to walk for transport, although recreational walking is still more common than transport walking for seniors aged 80+. The differences between seniors aged 80+ and younger seniors are significant for both recreational walking ($p = 0.02$) and transport walking ($p = 0.03$).

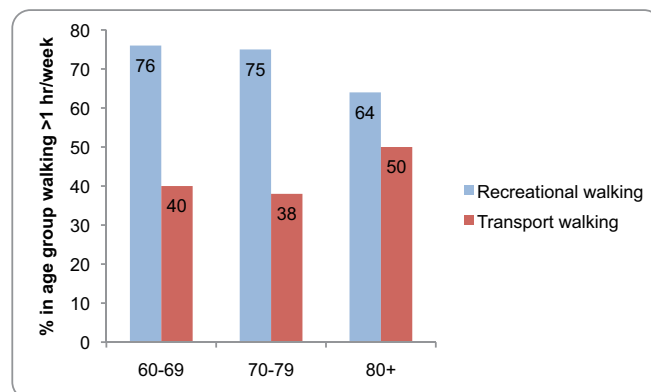


Figure 13: Recreational and transport walking by age

Walking for both transport and recreation varied by place of residence. Seniors who live in inner Melbourne LGAs¹⁴ were more likely than seniors living in middle and outer metropolitan Melbourne and rural Victorian LGAs to walk for both recreation and transport, though the association was much stronger for transport walking (see Tables 2 and 3). These findings, which are consistent with findings from the analysis of VISTA data (see Section 5), indicate that, while health conditions and functional constraints may restrict some seniors' walking, environmental factors appear to be important determinants. The relationship between some aspects of urban form and walking that has been established for adults in general (Frank et al 2008), is also likely to apply to seniors, including older seniors.

Table 2: Transport walking by region

Transport walking	Inner Melbourne	Middle Melbourne	Outer Melbourne	Rural/Regional	Total
<1 hr	85 (38%)	163 (69%)	129 (67%)	257 (62%)	634
>1hr	138 (62%)	74 (31%)	63 (33%)	158 (38%)	433
Total	223	237	192	415	1067

Table 3: Recreational walking by region

Recreational walking	Inner Melbourne	Middle Melbourne	Outer Melbourne	Rural/Regional	Total
<1 hr	38 (17%)	57 (24%)	61 (31%)	112 (26%)	268
>1 hr	188 (83%)	181 (76%)	128 (69%)	297 (74%)	794
Total	226	238	189	409	1062

¹⁴ See Appendix A – 'Inner Melbourne' includes 'Central' and 'Inner' regions.

7 Seniors walking survey (cont.)

7.2.4 Walking destinations and distances

The main destinations for transport-related walking trips were shops (62%), public transport (40%) and access to services (31%); with few age differences in transport walking destinations (see Figure 14). Most seniors (73%) reported that they were able or prepared to walk at least 500 metres to get to places. The preferred walking distance did not vary substantially with age; with 500 – 1 km being the most frequently-reported distance, including for seniors aged 80+ (see Figure 15). These findings, which are consistent with findings from the analysis of VISTA data (see Section 5), suggest that if common destinations such as shops, services and public transport are located within 500m - 1km of homes, these destinations will be accessible by walking for most seniors, including older seniors.

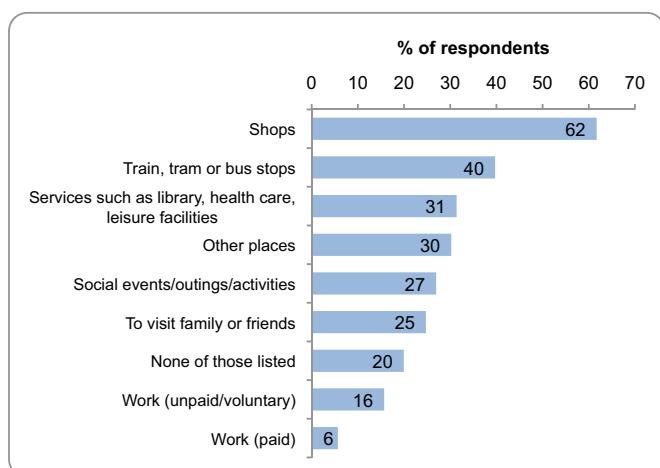


Figure 14: Transport walking destinations

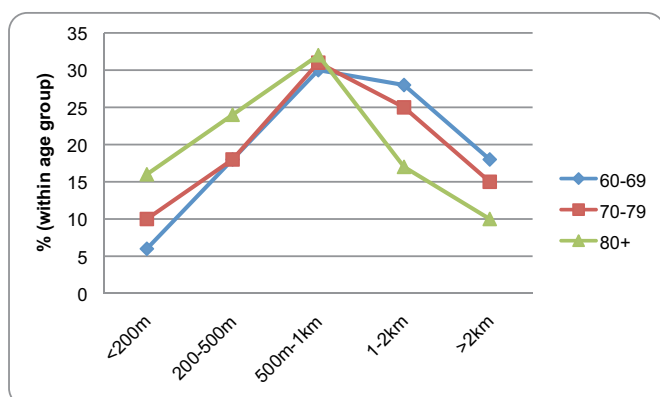


Figure 15: Distance prepared to walk to get to places by age

7.2.5 Preferred walking surfaces

Most seniors prefer to walk on sealed footpaths (83%), with these facilities nearly twice as popular as the next most popular option (shared walking and cycling paths, 45%). Streets and roads in built-up areas with no made footpaths were the least popular option (11%). Nearly one third of seniors expressed a preference for indoor walking (30%).

Seniors who walk for transport were more likely to prefer sealed footpaths (88%) than those who do not walk for transport (80%) ($p = 0.001$). Recreational walkers are prepared to use a wider range of walking surfaces, possibly because interesting or attractive routes may be more important than using the most direct route. Open-ended responses to survey items, as well as comments in the focus group discussions indicated that lack of sealed footpaths was a particular problem in some outer Melbourne suburbs and in Victorian rural areas; possibly contributing to the regional differences in seniors' walking found in this survey and in the VISTA analysis (see Section 5).

7.2.6 Use of motorised travel

The majority of study participants (56%) drive a motor vehicle on most days of the week, and few use public transport on a regular basis (14% use public transport a few times a week or more). Driving a motor vehicle on 'most days' was associated with less transport walking, but there was no association between frequency of driving and recreational walking. Older seniors were less likely to drive 'most days' than younger seniors, and more likely to walk for transport. Seniors who live in inner Melbourne areas were less likely than those who live in other regions to drive a motor vehicle on 'most days' and more likely to walk for transport than those living in other regions (see Figure 16). It therefore appears that the more walkable environment of inner Melbourne may enable an easier transition away from driving (see Figure 7) as the primary form of mobility.

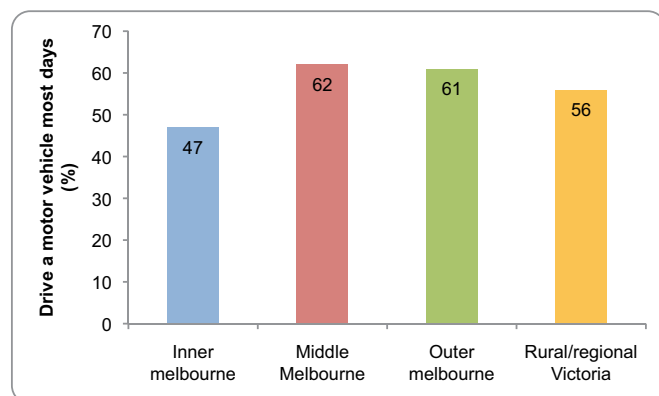


Figure 16: Drive a motor vehicle by region

The association between car use and transport walking highlights that while walking for recreation is predominantly a *physical activity* choice, walking for transport is more of a *travel mode* choice. It is therefore likely that transport walking increases when the main alternative to walking (in Australia – driving a car) is less appealing or no longer possible.

7.2.7 Factors supportive of more walking

When asked about factors that would assist them to walk more, seniors identified a mix of personal (more time and better health) and environmental factors (better weather and more places to walk to). Traffic concerns were less important, though qualitative data (see Section 6) indicate that seniors frequently deal with potential traffic hazards by avoiding them if possible. They achieve this by being selective about where and when they walk. ‘Hazard avoidance’ can be more problematic for transport walking than recreational walking, as walking to destinations generally requires a more direct route to a specific destination.

Consistent with this difference between recreational and transport walking, traffic concerns (feeling safer from traffic, less traffic, and lower speeds) were more important for seniors who walk for transport compared to seniors who do not. These findings indicate that supports for recreational walking can differ from those for transport walking. Speed reduction as a support for walking was also more important for seniors who live in central Melbourne than in other regions, possibly reflecting more transport walking in central Melbourne and more traffic (see Figure 17). One in six residents of central Melbourne stated that they would walk more if local streets were designed so that traffic travels under 30 km/h, about twice as many as in other regions.

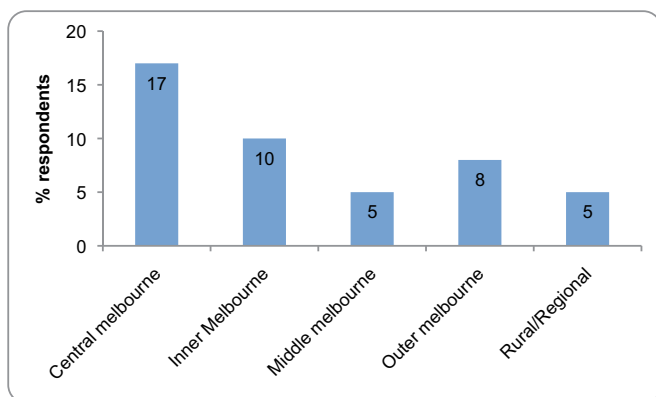


Figure 17: Lower traffic speed as a support for walking by region

7.2.8 Barriers to walking

Barriers to walking were explored in two questions; one asking about factors that constrain walking, and another asking about factors that impacted on feelings of safety while walking. The most important perceived barriers to walking were related to walking infrastructure (ie poorly maintained or poorly lit footpaths) and the behaviour of other path/road users (ie dogs not under control, drivers failing to give way to pedestrians when required, and bicycle riders on shared paths) (see Figure 18). The lower ranking of “No footpaths on streets or roads” as a barrier may be due to many respondents actually having sealed footpaths to walk on; in which case the *condition* of the footpaths and the behaviour of other path users become important.

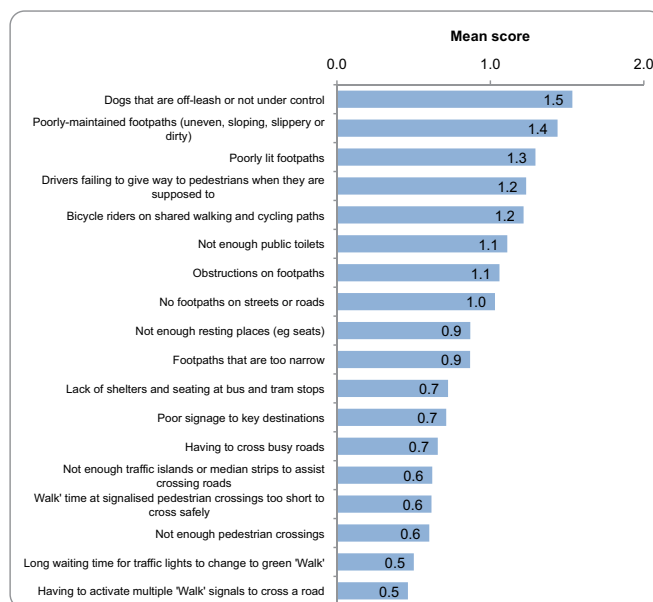


Figure 18: Barriers to walking

(0 = No, doesn't put me off walking; 1 = Yes, a minor constraint; 2 = Yes, a moderate constraint; 3 = Yes, a major constraint)

(Note: the lengths of some bars with apparently equal values [eg 0.7] vary because the bar lengths are based on unrounded values)

The behaviour of other path/road users (bicycle riders and car drivers) as a constraint on walking also emerged strongly when seniors were asked about *feelings of safety* when walking (see Figure 19). Findings from the focus group discussions and responses to open-ended survey questions suggest that these behaviours may rate as more important than structural factors such as traffic calming and lower speed limits because they are more unpredictable hazards

7 Seniors walking survey (cont.)

that are largely beyond the control of the walker. Traffic speed, and absent or poorly designed pedestrian crossings on the other hand, are more predictable 'constant' hazards that senior walkers deal with on a daily basis.

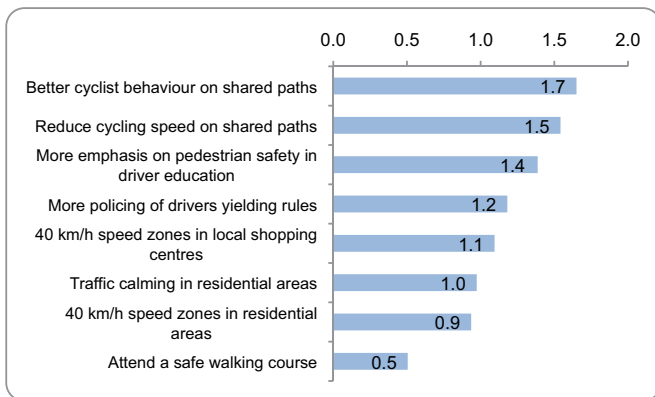


Figure 19: Measures impacting on feelings of safety while walking (mean score)

(0 = No, wouldn't make me feel any safer; 1 = Yes, a bit safer; 2 = Yes, moderately safer; 3 = Yes, much safer)

Nevertheless, seniors largely rejected the need for them to attend an education/skills course on safe walking, possibly because most seniors believe that they already have the knowledge and skills required to walk safely (including by avoiding known hazards if possible). It is largely factors beyond their individual control (eg slips, trips and stumbles due to poorly maintained footpaths, cyclists passing too close or too quickly without warning, off-leash dogs rushing at them, and drivers failing to yield) that create perceived and actual hazards for seniors.

These perceptions of the effectiveness of walking training for older adults are consistent with findings from pedestrian injury prevention research (see Section 4).

Lack of consistent, high-level support for lower traffic speeds may be partly due to the factors described above; namely, existing traffic speeds are a predictable 'constant' that individual walkers are largely deemed responsible for dealing with. The fact that the majority of respondents regularly drive a motor vehicle is also likely to influence attitudes to lower traffic speeds.

7.2.9 Perceptions of walking-friendly neighbourhoods

The majority of seniors (78%) rated their neighbourhood as moderately or very walking-friendly, with seniors in the inner Melbourne region most likely to rate their neighbourhood as 'Very walking-friendly' (43%), and seniors in the outer Melbourne region least likely to rate their neighbourhood as 'Very walking-friendly' (31%). The main reason for not rating their neighbourhood as 'Very walking-friendly' appeared to be lack of footpaths, which may be more likely to be the case in some outer Melbourne suburbs.

About a third of respondents (36%) had ever notified their local council or the state government (eg VicRoads) about a pedestrian hazard. Notifications were fairly evenly distributed across the four regions, and satisfaction with the response was mixed. The lack of significant differences in levels of satisfaction/dissatisfaction across the four regions, suggest variation by LGA rather than region.

In conclusion, this large, comprehensive survey of senior Victorians provides useful findings regarding the meaning of walking for older adults, and factors that support and constrain walking behaviour. While survey participants did not comprise a representative sample of the population of senior Victorians, several of the survey findings are consistent with findings in the international research literature, and also with findings from the analysis of VISTA data for senior Victorians (Section 5). These combined research findings provide a reasonably robust basis for conclusions and recommendations for assisting more senior Victorians to walk more often, more safely and more enjoyably.

Conclusions and recommendations that draw on the four components of the study are presented in the following section.

8 Study conclusions

Walking is a healthy, accessible and appealing form of moderate intensity physical activity for older adults. It is also an increasingly important form of mobility as people age, and are less likely to drive a motor vehicle.

Many seniors are highly motivated to walk for recreation and/or transport, and international data indicate that, when environments are supportive of seniors' walking, high proportions of older adults will continue to walk. This study also found large differences in seniors' walking rates across localities in Victoria. These findings indicate that, while poorer health and functional limitations may constrain some older adults' walking, at a population level, seniors' walking rates are shaped more by environmental factors than functional limitations.

Strong evidence for environmental determinants of walking, together with evidence that many seniors have very positive attitudes to walking, indicates that environmental measures to increase seniors' walking rates are likely to be more effective than awareness-raising or educational interventions. Many seniors already know that walking is a healthy, accessible and enjoyable form of physical activity, and are predisposed to walk. It is therefore important to create supportive environments for seniors' walking and remove barriers to walking.

Supports and barriers to seniors' walking have some similarities to supports and barriers for adult populations in general, but there are also some important differences. An important, perhaps surprising similarity is that many older adults are able and prepared to walk similar distances to destinations such as shops and services as younger adults (about 1km). This has important implications for neighbourhood design, as local shops and services are likely to be more accessible to older adults than large shopping centres that require longer travel distances, are designed to be accessed by car, and can be difficult to access by foot or by public transport.

The design and maintenance of footpaths and road crossings are important for all pedestrians, but especially so for older pedestrians. Unsignalised crossings such as at roundabouts, left-turn slip lanes, and mid-block crossings are particularly hazardous for older adults as they can experience greater difficulty judging vehicle speeds and safe crossing conditions. Signalised crossings pose risks when drivers fail to yield (eg when undertaking left and right-hand turns at signalised intersections) or when older adults are unable to cross the road in the allocated time.

Sealed and well-maintained walking surfaces are particularly important for older adults as there are indications that fall injuries may outnumber collision injuries for older pedestrians. Older adults are very aware of the risk of fall injuries and the injury consequences of falls, both of which are higher for older adults than younger adults. Consequently, older adults attempt to optimise their safety from both sources of injury risk, a form of dual-tasking not required by younger adult pedestrians.

For these, and other reasons, older adults' walking environments should be as 'forgiving of mistakes' as possible – a key principle of Victoria's Safe System road safety framework. While older adults are cautious and law-abiding pedestrians, the physical, cognitive and environmental demands of safe road use can lead to user errors. The Safe System approach requires the minimisation of harm associated with such errors. An important harm minimisation measure is lower vehicle speed, which has substantial, well-established benefits, particularly for vulnerable road users such as older pedestrians. There is also some evidence that lower vehicle speeds may contribute to more walking.

Findings from this study also point to the inappropriateness of 'blaming' older pedestrians for injuries they experience using the road system, because they 'fail to take sufficient care'. Older pedestrians are not risk-taking road users; rather, they are at-risk from a potentially hazardous environment. This is more widely recognised in European countries with high rates of relatively safe walking among older adults. Not only have these countries established safer and more convenient walking environments for older adults, they also place a higher duty of care on drivers to avoid harming more vulnerable road users such as older pedestrians (and children). This requires somewhat of a paradigm shift in countries like Australia where motor vehicle flow is frequently prioritised over pedestrian flow and safety.

Older adults also express high levels of concern about the behaviour of other footpath and shared path users such as cyclists and unleashed dogs. Because older adults are very aware of, and attempt to prevent, collision and fall injuries by walking cautiously, unexpected threats such as a bicycle approaching quietly from behind and passing closely at high speed, or a dog suddenly crossing their path, cause considerable anxiety. Separate paths for cyclists and pedestrians is the ideal, though not always possible solution to these conflicts. Education and awareness-raising among other path users of the concerns and needs of older pedestrians may improve

8 Study conclusions (cont.)

interactions among multiple users on shared paths and enable more seniors to walk more often, more safely and more confidently.

In conclusion, this large, comprehensive study of supports and constraints on seniors' walking provides important findings for a population group who, more than most, need to feel safe and confident being outside and participating in community life. Walking for recreation and transport is important for the health and mobility of older adults, with multiple benefits for seniors of all ages. Seniors themselves, and society in general have much to gain by creating physical, social/cultural and policy/regulatory environments that support rather than constrain more walking by more senior adults in Victoria.

Factors that support and constrain walking among older adults are numerous and wide-ranging, and, in some instances, not well understood. The evidence does suggest, however, that creating living spaces that support rather than constrain walking requires an integrated package of measures based on the over-arching principle that walking is an important form of mobility that, in neighbourhood settings, should be prioritised rather than simply tolerated (Jacobsen et al 2009). The precise content of such a package of measures is likely to vary somewhat by location, but broad guidance is available in the form of a growing number of countries, cities and towns that have successfully created the conditions that assist older adults to remain healthy, mobile, socially connected, and engaged in community life through walking as a regular part of daily life (GOAL Consortium 2012; ITF/OECD 2012; World Health Organisation 2013).

9 Recommendations for increasing walking by senior Victorians

Based on the combined findings from the four components of this study, the following recommendations are proposed to assist more senior Victorians to walk more often.

It is recommended that:

1. The Government of Victoria develop a cross-sectoral Victorian walking strategy that:
 - a. acknowledges that walking is an important and legitimate form of personal mobility, especially for older adults;
 - b. sets targets for increased walking among all population groups, including older adults;
 - c. includes macro-level measures associated with urban form and transport planning, and micro-level measures such as the consistent provision of well-designed and maintained footpaths and road crossings; and
 - d. includes a range of measures (as described above in Section 8) that address the needs of senior Victorians who walk for recreation and transport.
2. Planning for walkability recognises that the majority of seniors are prepared to walk up to 1km to reach destinations. Land use planning policies and agencies ensure that housing intended for seniors is located within 1km of activity centres.
3. The Government of Victoria develop a road safety strategy aimed at increasing the safety and perceived safety of walking for older adults that includes safety from traffic and safety from falls, based on creating a *Safe System* for older pedestrians that includes:
 - a. **safer roads and road environments**, including separated walking and cycling facilities, particularly in high pedestrian or cycling areas;
 - b. **safer vehicles**, including adopting the stricter Euro NCAP criteria for pedestrian safety in order to achieve a 5-star vehicle safety rating;
 - c. **safer speeds**, including lowering speed limits in residential and high-pedestrian areas; and
 - d. **safer road/path users**, including regulation, road rule enforcement and education of drivers, cyclists, and dog-walkers.
4. The Government of Victoria establish a walking infrastructure funding program to provide for ongoing investment in walking infrastructure at state and local government levels.
5. Separated walking and cycling paths are provided where high volumes of pedestrians, particularly seniors, or high numbers of cyclists, are present or anticipated.
6. Federal, state and local government policies and programs aimed at increasing active and sustainable transport include senior pedestrians as a specific target group.
7. Support for advocacy for older pedestrians is provided at state and local levels, in recognition of the fact that pedestrians, especially older pedestrians, have specific requirements that need to be represented in urban and transport planning decisions that impact on their health, wellbeing, independence and mobility.
8. Local councils establish a rolling program of auditing the walkability of key areas such as activity centres, retirement villages, aged care facilities and their surrounds and provide follow up maintenance and/or infrastructure improvement.
9. The council audit program includes assessment of the surface quality of footpaths and road crossing points (formal and informal), and adequacy of lighting, to avoid trip hazards for pedestrians.
10. Regular formal crossing opportunities are provided on roads with high traffic volumes or speeds, and areas where seniors are likely to be walking for transport.
11. Longer crossing times are provided at signalised intersections, either generally at intersections that are likely to be used by high numbers of seniors, or with pedestrian responsive signals (eg PUFFIN signals).
12. Council animal control officers are aware of the high importance for senior pedestrians of dog control on footpaths and shared paths.
13. Authorities responsible for shared paths raise awareness among dog walkers of the importance of dog control, particularly for older pedestrians.
14. Relevant government agencies explore options for managing cyclist speed on shared paths, including education and adaption of 'traffic calming' measures.
15. Responsible authorities place greater emphasis on policing issues impacting on older pedestrians such as car drivers who block pedestrian crossings and footpaths; and bicycle riders who ride on footpaths.
16. Road management authorities avoid installing slip-lanes and roundabouts in residential and pedestrian areas unless they include pedestrian crossings.

References

- Australian Bureau of Statistics (2010). *State and Regional Indicators, Victoria*, Cat. No. 1367.2. Canberra, ABS.
- Australian Bureau of Statistics (2012a). *Australian Health Survey: First Results, 2011-12*. Cat No. 4364.0.55.001. Canberra, ABS.
- Australian Bureau of Statistics (2012b). *Participation in Sport and Physical Recreation, Australia, 2011-12*, Cat No. 4177.0. Canberra, ABS.
- Australian Bureau of Statistics (2013a). *Population by age and sex, regions of Australia, 2012*, Cat. No. 3235.0. Canberra, ABS.
- Australian Bureau of Statistics (2013b). *Australian Health Survey: Physical Activity, 2011-12*. Cat No. 4364.0.55.004. Canberra, ABS.
- Barrett, RS, Mills, PM, Begg, RK (2010). A systematic review of the effect of ageing and falls history on minimum foot clearance characteristics during level walking. *Gait Posture* 32(4): 429-35.
- Bassett, DR, Pucher, J, Buehler, R, Thompson, DL, Crouter, SE (2008). Walking, cycling, and obesity rates in Europe, North America, and Australia. *Journal of Physical Activity and Health* 5(6).
- Beauchet, O, Annweiler, C, Dubost, V, Allali, G, Kressig, RW, Bridenbaugh, S, Berrut, G, Assal, F, Herrmann, FR (2009). Stops walking when talking: a predictor of falls in older adults? *Eur J Neurol* 16(7): 786-95.
- Bell, C, Ge, K, Popkin, B (2002). The road to obesity or the path to prevention: motorized transportation and obesity in China. *Obesity Research* 10: 277-83.
- Boufous, S, Senserrick, T, de Rome, L, Ivers, R, Stevenson, M, Hinchcliff, R, Ali, M (2010). *Factors in pedestrian crashes in Victoria 2004-2008*. Sydney, The George Institute for International Health.
- British Heart Foundation (2012a). *Interpreting the UK physical activity guidelines for older adults (65+): Guidance for those who work with frailer, older people*, Loughborough University.
- British Heart Foundation (2012b). *Physical activity for older adults (65+ years): Evidence briefing*, Loughborough University.
- Buehler, R, Pucher, J (2012). Walking and cycling in Western Europe and the United States: trends, policies and lessons. *TR News* 280(May-June).
- Bureau of Infrastructure Transport and Regional Economics (2012). *Road Deaths Australia - 2011 Statistical Summary*. Canberra, Department of Infrastructure and Transport.
- Cauwenberg, JV, Bourdeaudhuij, ID, Meester, FD, Dyck, DV, Salmon, J, Clarys, P, Deforche, B (2011). Relationship between the physical environment and physical activity in older adults: A systematic review. *Health & Place* 17(458-69).
- Dawson, J, Hillsdon, M, Boller, I, Foster, C (2007). Perceived Barriers to Walking in the Neighborhood Environment: A Survey of Middle-Aged and Older Adults. *Journal of Aging and Physical Activity* 15(3): 318.
- Department of Health and Aged Care (1999). *National physical activity guidelines for adults*. Canberra, Department of Health and Aged Care.
- Department of Health and Ageing (nd). *Recommendations on physical activity for health for older Australians*. Canberra, Department of Health and Ageing.
- Duperrex, O, Bunn, F, Roberts, I (2002). Safety education of pedestrians for injury prevention: a systematic review of randomised controlled trials. *BMJ (Clinical Research Ed.)* 324(7346): 1129-1129.
- Fielding, R, Rejeski, W, Blair, S, Church, T, et al (2011). The Lifestyle Interventions and Independence for Elders Study: design and methods. *The Journals of Gerontology. Series A, Biological Sciences and Medical Sciences* 66(11): 1226-37.
- Fildes, B, Langford, J, Dale, A, Scully, J (2005). *Balance between harm reduction and mobility in setting speed limits: a feasibility study*. Sydney, Austroads Inc.
- Frank, LD, Andresen, MA, Schmid, TL (2004). Obesity relationships with community design, physical activity, and time spent in cars. *American Journal of Preventive Medicine* 27(2): 87-96.
- Frank, LD, Kerr, J, Sallis, JF, Miles, R, Chapman, J (2008). A hierarchy of sociodemographic and environmental correlates of walking and obesity. *Preventive Medicine* 47(2): 172-178.
- Galna, B, Peters, A, Murphy, AT, Morris, ME (2009). Obstacle crossing deficits in older adults: a systematic review. *Gait Posture* 30(3): 270-5.
- Garrard, J (2008). *Safe speed: promoting safe walking and cycling by reducing traffic speed*. Melbourne, National Heart Foundation.

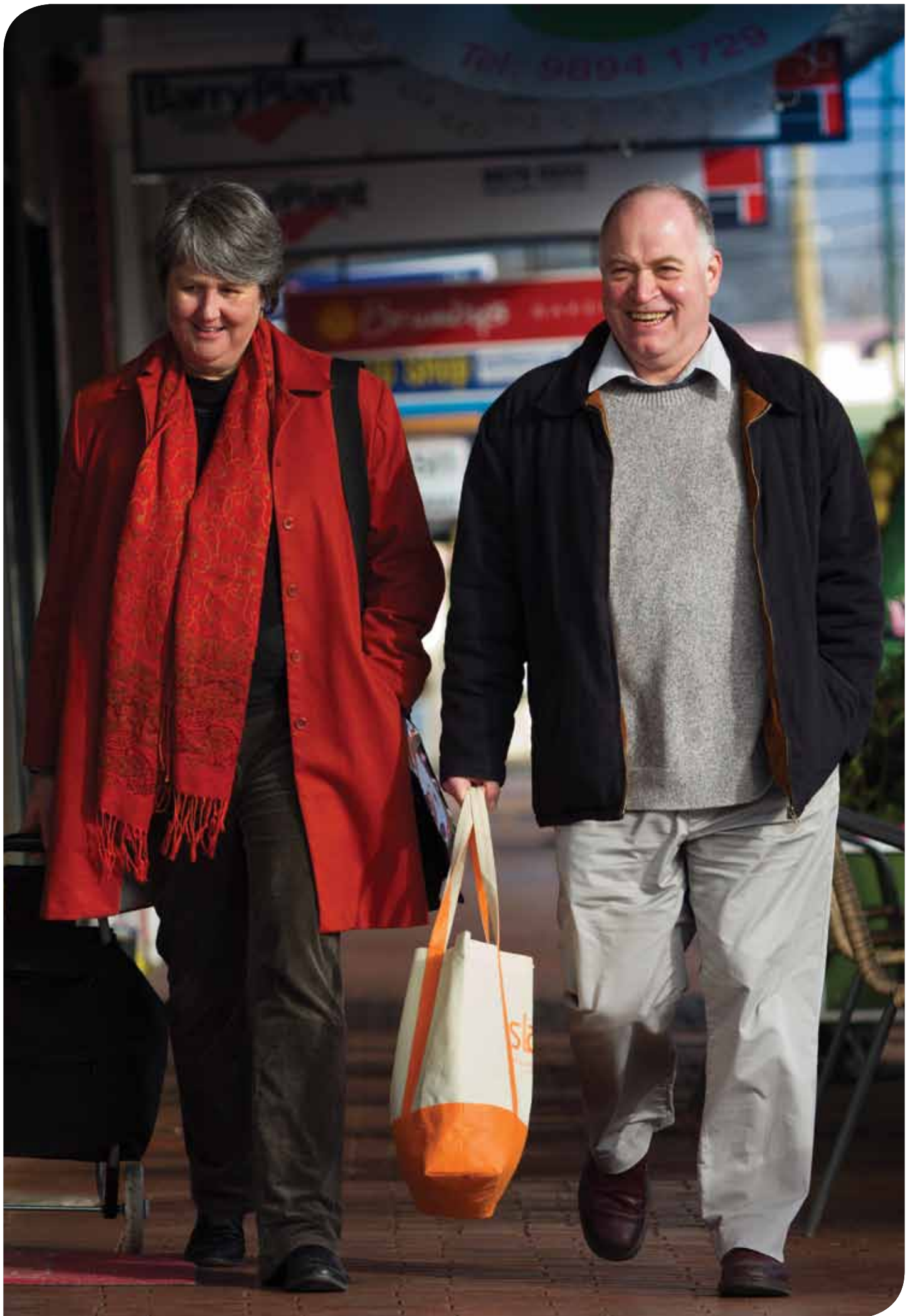
- Giles-Corti, B, Foster, S, Shilton, T, Falconer, R (2010). The co-benefits for health of investing in active transportation. *NSW Public Health Bulletin* 21(5-6): 122-127.
- GOAL Consortium (2012). *GOAL: Growing older, staying mobile - transport needs for an ageing society. Older people walking and cycling*. Vienna, Austrian Institute of Technology.
- Gregg, EW, Gerzoff, RB, Caspersen, CJ, Williamson, DF, Narayan, KMV (2003). Relationship of Walking to Mortality Among US Adults With Diabetes. *Arch Intern Med* 163(12): 1440-1447.
- Hamer, M, Chida, Y (2008a). Walking and primary prevention: a meta-analysis of prospective cohort studies. *British Journal of Sports Medicine* 42(4): 238-43.
- Hamer, M, Chida, Y (2008b). Active commuting and cardiovascular risk: a meta-analytic review. *Preventive Medicine* 46(1): 9-13.
- Harrell, W (1996). The safety of older pedestrians at signal-controlled crossings. *International Journal of Aging and Human Development* 42(1): 65-79.
- Hatfield, J, Fernandes, R, Job, R, Smith, K (2007). Misunderstanding of right-of-way rules at various pedestrian crossing types: observational study and survey. *Accident Analysis and Prevention* 39(4): 833-42.
- Haworth, N, Schramm, A (2011). Interactions between pedestrians and cyclists in the city centre. *Paper presented at the Asia-Pacific Cycling Congress, Brisbane, 18-21 September, 2011*.
- Hu, G, Qiao, Q, Silventoinen, K, Eriksson, J, Jousilahti, P, Lindstrom, J, Valle, TT, Nissinen, A, Tuomilehto, J (2003). Occupational, commuting, and leisure-time physical activity in relation to risk for Type 2 diabetes in middle-aged Finnish men and women. *Diabetologia* 46(3): 322-29.
- ITF/OECD (2011). *Pedestrian safety, urban space and health: research report*. Paris, OECD.
- Jacobsen, PL, Racioppi, F, Rutter, H (2009). Who owns the roads? How motorised traffic discourages walking and cycling. *Injury Prevention* 15(6): 369-73.
- Jerome, G, Glass, T, Mielke, M, Xue, Q, Andersen, R, Fried, L (2006). Physical activity participation by presence and type of functional deficits in older women: the Women's Health and Aging Studies. *The Journals of Gerontology. Series A, Biological Sciences and Medical Sciences* 61(11): 1171-6.
- King, A, Sallis, J, Frank, L, Saelens, B, Cain, K, Conway, T, et al (2011). Aging in neighbourhoods differing in walkability and income: associations with physical activity and obesity in older adults. *Social Science and Medicine* 73(10): 1525-1533.
- Litman, T (2013). Transportation and public health. *Annual Review of Public Health* 34.
- Moayyeri, A, Besson, H, Luben, RN, Wareham, NJ, Khaw, KT (2010). The association between physical activity in different domains of life and risk of osteoporotic fractures. *Bone* 47(3): 693-700.
- Moniruzzaman, M, Paez, A, Habib, K, Morency, C (2013). Mode use and trip length of seniors in Montreal. *Journal of Transport Geography* 30: 89-99.
- Mummery, K, Schofield, G, Caperchione, C (2004). Physical activity: Physical activity dose-response effects on mental health status in older adults. *Australian and New Zealand Journal of Public Health* 28(2): 188-92.
- Nathan, A (2012). *Active living in retirement village residents: exploring built and social environmental correlates using mixed methods*, PhD Thesis Perth, University of Western Australia.
- Pucher, J, Buehler, R (2010). Walking and cycling for healthy cities. *Built Environment* 36(4): 391-414.
- Pucher, J, Buehler, R, Bassett, DR, Dannenberg, AL (2010). Walking and cycling to health: a comparative analysis of city, state, and international data. *American Journal of Public Health* 100(10): 1986-92.
- Pucher, J, Dijkstra, L (2003). Promoting safe walking and cycling to improve public health: lessons from The Netherlands and Germany. *American Journal Of Public Health* 93(9): 1509-1516.
- Rivara, FP, Grossman, DC, Cummings, P (1997). Injury prevention. First of two parts. *The New England Journal Of Medicine* 337(8): 543-548.
- Scarmeas, N, Luchsinger, J, Schupf, N, Brickman, A, Cosentino, S, Tang, M, Stern, Y (2009). Physical activity, diet, and risk of Alzheimer disease. *Journal of the American Medical Association* 302(6): 627-37.
- Sherman, SE, D'Agostino, RB, Silbershatz, H, Kannel, WB (1999). Comparison of past versus recent physical activity in the prevention of premature death and coronary artery disease. *Am Heart J* 138(5 Pt 1): 900-7.

References (cont.)

- The Swedish Transport Administration (2012). *Analysis of road safety trends 2011, management by objectives for road safety work, towards the 2020 interim targets*. Borlange, The Swedish Transport Administration.
- Turrell, G, Stanley, L, de Looper, M, Oldenburg, B (2006). *Health Inequalities in Australia: Morbidity, health behaviours, risk factors and health service use. Health Inequalities Monitoring Series, Cat. No. PHE 72*. . Canberra, Queensland University of Technology and the Australian Institute of Health and Welfare.
- Wegman, F (2012). *Driving down the road toll by building a safe system*. Adelaide, Government of South Australia.
- Wen, L, Rissel, C (2008). Inverse associations between cycling to work, public transport, and overweight and obesity: findings from a population based study in Australia. *Preventive Medicine* 46(1): 29-32.
- Wen, LM, Orr, N, Millett, C, Rissel, C (2006). Driving to work and overweight and obesity: findings from the 2003 New South Wales Health Survey, Australia. *International Journal Of Obesity* 30(5): 782-786.
- Weuve, J, Kang, J, Manson, J, Breteler, M, Ware, J, Grodstein, F (2004). Physical activity, including walking, and cognitive function in older women. *Journal of the American Medical Association* 292(12): 1454-61.
- Woodcock, J, Franco, O, Orsini, N, Roberts, I (2010). Non-vigorous physical activity and all-cause mortality: systematic review and meta-analysis of cohort studies. *International Journal of Epidemiology* 40(1): 121-38.
- World Health Organisation (2009). *Global status report on road safety*. Geneva, World Health Organisation.
- World Health Organisation (2013). *Pedestrian safety: a road safety manual for decision-makers and practitioners*. Geneva, WHO.

Appendix A: Melbourne metropolitan regions and LGAs

Central Region	Inner Region	Middle Region	Outer Region
Melbourne	Maribyrnong	Hobson's Bay	Wyndham
Port Philip	Moonee Valley	Brimbank	Melton
Yarra	Moreland	Banyule	Hume
	Darebin	Manningham	Whittlesea
	Boroondara	Maroondah	Nillumbik
	Stonnington	Whitehorse	Yarra Ranges
	Glen Eira	Knox	Cardinia
		Monash	Casey
		Dandenong	Frankston
		Kingston	Mornington Peninsula
		Bayside	





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