Développement Humain, Handicap et Changement Social
Human Development, Disability, and Social Change

DHHCS
Développement humain,
handicap et changement social

Developing Guidelines for Age-Friendly Buses: a Survey of Older Peoples' Preferences Regarding Headways, Distance to the Bus Stop and Destinations

Kieran Broome, Linda Worrall, Jennifer Fleming and Duncan Boldy

Article abstract

Background: Transport providers and policy makers should be guided by research evidence when developing age-friendly transportation services. There are significant gaps in the literature regarding older peoples' preferences for bus headways, distance to the bus stop and destinations. Therefore, the aims of this study are to 1) quantify the preferred headways for older people, 2) quantify the preferred distance to the bus stop for older people, and 3) list and rank the preferred destinations of older people. **Methods:** A survey of community-dwelling older people in Hervey Bay and Brisbane (both in Australia) was conducted to quantify the preferences of older people regarding headways, distance to the bus stop and destinations. **Results:** One hundred participants completed the survey. The majority of older people preferred headways of a maximum of 30 minutes during the day and hourly at other times. The preferred distance to the bus stop was 200m or less. Preferred destinations included cross-suburban travel, leisure destinations, shops, central business district, medical services and other towns. **Conclusion:** These results contrast with usual practice and industry conventions. Transport providers and policy makers who are interested in providing age-friendly services should attempt to meet these guidelines. They may need to consider innovative approaches in order to meet these requirements.

Developing Guidelines for Age-Friendly Buses : a Survey of Older Peoples' Preferences Regarding Headways, Distance to the Bus Stop and Destinations

KIERAN BROOME[1, 2], LINDA WORRALL[2], JENNIFER FLEMING[2, 3] and DUNCAN BOLDY[4]

[1] School of Health & Sport Sciences, University of the Sunshine Coast, Queensland, Australia
[2] School of Health & Rehabilitation Sciences, The University of Queensland, Queensland, Australia
[3] Princess Alexandra Hospital, Queensland, Australia
[4] Centre for Research on Ageing, Curtin Health Innovation Research Institute, Curtin University of Technology, Western Australia, Australia

Article original • Original Article

Abstract

Background : Transport providers and policy makers should be guided by research evidence when developing age-friendly transportation services. There are significant gaps in the literature regarding older peoples' preferences for bus headways, distance to the bus stop and destinations. Therefore, the aims of this study are to 1) quantify the preferred headways for older people, 2) quantify the preferred distance to the bus stop for older people, and 3) list and rank the preferred destinations of older people. **Methods :** A survey of community-dwelling older people in Hervey Bay and Brisbane (both in Australia) was conducted to quantify the preferences of older people regarding headways, distance to the bus stop and destinations. **Results :** One hundred participants completed the survey. The majority of older people preferred headways of a maximum of 30 minutes during the day and hourly at other times. The preferred distance to the bus stop was 200m or less. Preferred destinations included cross-suburban travel, leisure destinations, shops, central business district, medical services and other towns. **Conclusion :** These results contrast with usual practice and industry conventions. Transport providers and policy makers who are interested in providing age-friendly services should attempt to meet these guidelines. They may need to consider innovative approaches in order to meet these requirements.

Keywords : age-friendly, public transportation, buses

Résumé

Contexte : Les fournisseurs de transport et les conseillers politiques devraient être guidés par la recherche lorsqu'ils développent des services de transport destinés aux personnes âgées. Il existe des lacunes considérables dans la littérature en ce qui concerne la préférence des personnes âgées pour l'intervalle de temps entre deux départs d'autobus, la distance jusqu'à l'arrêt d'autobus et les destinations. Ainsi, les objectifs de cette étude sont 1) quantifier les intervalles préférées de temps entre deux départs d'autobus parmi les personnes âgées, 2) quantifier la distance préférée jusqu'à l'arrêt d'autobus parmi les personnes âgées, et 3) prendre note et classer les destinations préférées des personnes âgées. **Méthodes :** Un sondage a été conduit parmi des personnes âgées à la maison à Hervey Bay et à Brisbane (tous les deux en Australie) afin de quantifier leurs préférences concernant l'intervalle de temps entre deux départs d'autobus, la distance jusqu'à l'arrêt d'autobus et les destinations. **Résultats :** Cent participants ont participé à ce sondage. La majorité des personnes âgées préférait un intervalle de trente minutes entre deux départs d'autobus pendant la journée et une fois par heure pour le reste du temps. La distance préférée jusqu'à l'arrêt d'autobus était de maximum 200 mètres. Parmi les destinations préférées : d'autres quartiers, divertissements, magasins, centre-ville, services de soins médicaux et d'autres villes. **Conclusion :** Ces résultats contredisent la pratique habituelle et les conventions de l'industrie. Les fournisseurs de transport et les conseillers politiques qui s'intéressent à la mise à disposition des services destinés aux personnes âgées devraient tenter de répondre à ces directives. Ils devraient considérer les approches novatrices afin de répondre à ces conditions.

Mots-clés : favorable aux personnes âgées, les transports en commun, les autobus

Introduction

The development of "age-friendly" systems aims to create accessible and useable living environments for older people. These environments should facilitate the participation of older people in valued life situations, and ultimately improve quality of life (World Health Organization, 2007). Transport is a key area of concern for older people (Metz, 2003 & Rosenbloom, 2009), and is a fundamental aspect of age-friendly cities (World Health Organization, 2007). Availability of accessible transport for older people is often a prerequisite for participating in community activities such as socialising, recreation and shopping (Stahl, 1987), and has been linked to quality of life (Gabriel & Bowling, 2004). The accessibility of transport is especially important for those who have difficulty with both public and private transport, and have no transport support available (Dent et al., 1999). This study focuses on buses as a widespread form of public transport which may benefit from improved accessibility.

Transport providers and policy makers should be guided by research evidence when developing and providing age-friendly transportation services. In a previous study which aimed to identify the priorities for an age-friendly bus system, nominal group technique focus groups (n=227), as well as participant observations with stimulated recall interviews (n=40), were used to identify and rank barriers and facilitators to using buses for older people in Queensland, Australia (Broome, Worrall, McKenna & Boldy, 2010). The findings suggest that accessible vehicles, friendly and helpful bus drivers, appropriate timetabling and scheduling, distance to the bus stop, pedestrian accessibility, information and training, and relevant destinations, are all important considerations when developing an age-friendly bus system. Accessible vehicles, pedestrian accessibility and concession fares have received the greatest attention in the research literature (Metz, 2003 & Mitchell, 2004), with other aspects of the bus system being relatively neglected. Timetables and scheduling, distance to the bus stop, and age-friendly destinations, are three areas with minimal evidence exploring specific requirements or possible interventions.

The current recommendations in the literature are that headways (the amount of time between each bus service on a particular route) should be frequent, distance to the bus stop should be minimised and destinations should match the needs and preferences of older people (Broome, Worrall, McKenna & Boldy, 2010; World Health Organization, 2007). Despite these recommendations, transport providers require more detailed recommendations in order to enact change. There are specific gaps in the literature regarding older peoples' quantified preferences.

Existing practice is commonly based on industry conventions, non-evidence-based recommendations, and economic and pragmatic factors. In the literature, recommendations for maximum distance to the bus stop are generally 400-500m (Murray, 2003). This recommendation is not linked to evidence, and most likely does not explicitly incorporate the needs and preferences of older people. Limited evidence exists for recommended age-friendly destinations. The Global Age-friendly Cities : A Guide (World Health Organization, 2007), through focus group research, recommends that age-friendly destinations might include hospitals, health centres, public parks, shopping centres, banks and seniors' centres. These recommendations provide some guidance, but do not systematically uncover and rank the most valued destinations of older people. The preference of destinations should be quantified, so that the most important destinations can be routinely included in route planning.

The present study aims to explore the bus system preferences of older people, incorporating both metropolitan and non-metropolitan perspectives, using two sample sites (Hervey Bay and Brisbane, in Queensland, Australia). To contextualise the present study, current practice in the two geographic locations targeted in this study should be described. Both locations generally aim for half hourly buses during the day and hourly in the evening. A limited number of services in Brisbane have smaller head-

ways, for example 10-15 minutes during the day and 30 minutes in the evening, although these more frequent services are becoming more common. A guideline of 400m to a public transport stop is recommended as an accessibility standard in Brisbane. An analysis of the Brisbane transport system (Murray, 2001) indicates that 86 % of the population lives within 400m of public transport. Only 53.04 % of the population have a public transport stop within 200m of their residence. Similar information for Hervey Bay is not available. The range of destinations available in Brisbane and Hervey Bay has been frequently raised as a concern for older people in previous research (Broome, Worrall, McKenna & Boldy, 2010).

In order to provide more detailed recommendations, the aims of this study are to :

▪ quantify the preferred headways for older people;

▪ quantify the preferred distance to the bus stop for older people;

▪ list and rank the preferred destinations of older people.

Methodology

A postal survey of community-dwelling older people was conducted to quantify the preferences of older people regarding headways, distance to the bus stop and destinations.

- Sampling

One hundred and ninety-six participants from a previous nominal group technique research study (Broome, Worrall, McKenna & Boldy, 2010) were invited to take part in a brief postal survey. The previous study used volunteer convenience sampling through advertising, newsletters and radio to recruit participants. Participation in the present study was voluntary. As the participants were drawn from a previous sample, all participants met the eligibility criteria of being community-dwelling older people, aged 60 or over, with sufficient cognitive and language abilities to take part in the survey. Participants were sampled from two geographic locations in Queensland Australia (north

Brisbane and Hervey Bay) to increase geographic diversity and enhance generalisability.

- Survey design

A survey was posted to the participants with stamped, return addressed envelopes. Participants were invited to complete and return the survey, with the option of alternatively completing the survey over the phone with a researcher. This survey was completed approximately three years after the initial nominal group technique research study.

Demographic information from the original nominal group technique study was accessed to provide a context for the survey results. These data included age, gender and length of time residing in their current suburb. Additional demographic information that may have changed since participation in the nominal group technique was collected in the postal survey, including changes in ease of bus use, frequency of bus use (frequently, occasionally or never use buses), driving status (current driver, retired driver or never driven) and self-rated ease of bus use (on a 10cm visual analogue scale).

Following the brief demographic questionnaire, the survey consisted of five questions regarding bus system preferences. Ordinal data regarding preferences for headways and distance to the bus stop were collected using the questions, "What is the furthest distance to the bus stop that you would be very satisfied with?", "How often do you think buses should be scheduled during the day?", "How often do you think buses should be scheduled in the evenings and at night?" and "How often do you think buses should be scheduled on weekends and public holidays?". Response options were designed based on common headways and distances in the literature. Options for headways ranged from every 10 minutes to every 2 hours (10, 15, 30, 60 and 120 minutes). Options for distance to the bus stop ranged from 200m to 2km (200m, 400m, 500m, 1km, 2km). "Other" was an additional option. Participants were also asked to list and rank three destinations in the local area they would most like to

be able to get to by bus using the question, "If buses could take you anywhere in your local area (with 30km from your house), what are the three places you would most like to be able to get to?".

- Data analysis

Frequencies regarding preferences for headways and distance to the bus stop were computed using SPSS statistical software. Nonparametric inferential statistics (Mann-Whitney U, Kruskal-Wallis and Spearman rank correlation coefficient) were used to analyse associations between demographic data (e.g., sample site) and preferences. Categorical analysis was conducted on the three preferred destinations of participants in order to group similar responses (e.g. "shops", "shopping centre" and "Centro" [a local shopping centre] were coded as "shops"). Peer review with a second researcher was used to increase the rigour of categorical analysis. Each response was weighted, with the first preference afforded a score of 3, and the second and third preferences given a weighting of 2 and 1 respectively. Cumulative totals for each category were calculated to indicate preferred destinations.

Results

One hundred participants (51 % response rate) completed the survey. The majority of participants returned the completed survey by post, with a small number of telephone interviews conducted.

- Demographics

The sample was predominantly female (79 %) with a mean age of 75.4 years (SD = 7.4 years). There were almost equal proportions of participants from Hervey Bay (48 %) and Brisbane (52 %). Most participants had been living in the same suburb for at least 3 years (95 %). There was a diversity of transport use with 47 % current drivers, 35 % retired drivers and 18 % who had never driven. Forty percent (40 %) of participants were frequent bus users, 42 % occasional users and 18 % who never used buses. Self-rated ease of bus use had a mean score of 5.6 (*SD*=3.4) on a 10-pt scale, with a higher score indicating greater ease of bus use.

**FIGURE 1: PREFERRED DISTANCE TO THE BUS STOP**
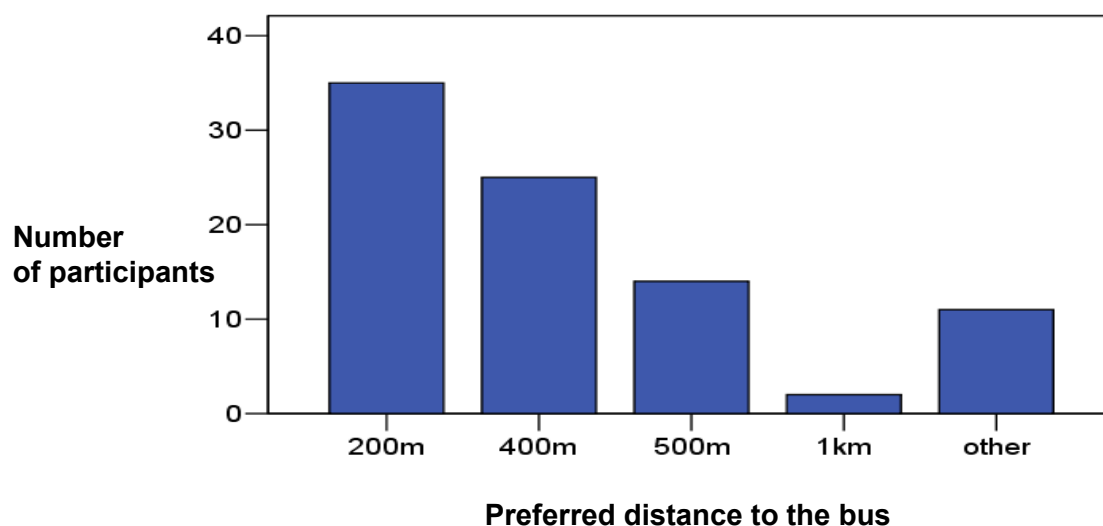
- Survey responses

The preferred distance to the bus stop was 200m. Eleven participants indicated "other", with 10 of those participants specifying that they thought that buses should pick them up less the 200m from their door, for example "outside my door" or "outside the [retirement] village". Aggregating these two scores indicated that the majority (52.8 %) of older people preferred a distance of 200m or less. The proportion of participants with each response is represented in figure 1. There were few associations between preferred distance to the bus stop and demographic variables. There was a significant relationship with living in the same suburb for the past three years ($p=0.024$) and a weak association with driving status ($p=0.057$). Those who had lived in the same suburb for more than three years were more likely to prefer a closer bus stop. Those who were currently driving were also more likely to prefer a closer bus stop closer.

The preferred headway during the day was every half hour. For both evening and nights, and weekends and public holidays, the most popular preference was for half hourly buses, with a close second preference for hourly buses. The proportion of participants with each response is represented in figures 2 and 3 for days, and evening and nights, respectively. Responses for evening and nights, and weekends and public holidays, were very similar. There were strong correlations between preferences for scheduling for each time period ($p<0.001$, correlation coefficient ranged from 0.646 to 0.757), with those who preferred more frequent scheduling during the day, also preferring more frequent scheduling during evening, nights, weekends and public holidays. The only significant associations ($p<0.001$) between demographic variables and preferred headways was for geographic location. Brisbane participants were more likely to want buses more frequently at all times.

FIGURE 2: PREFERRED FREQUENCY OF SCHEDULING DURING THE DAY
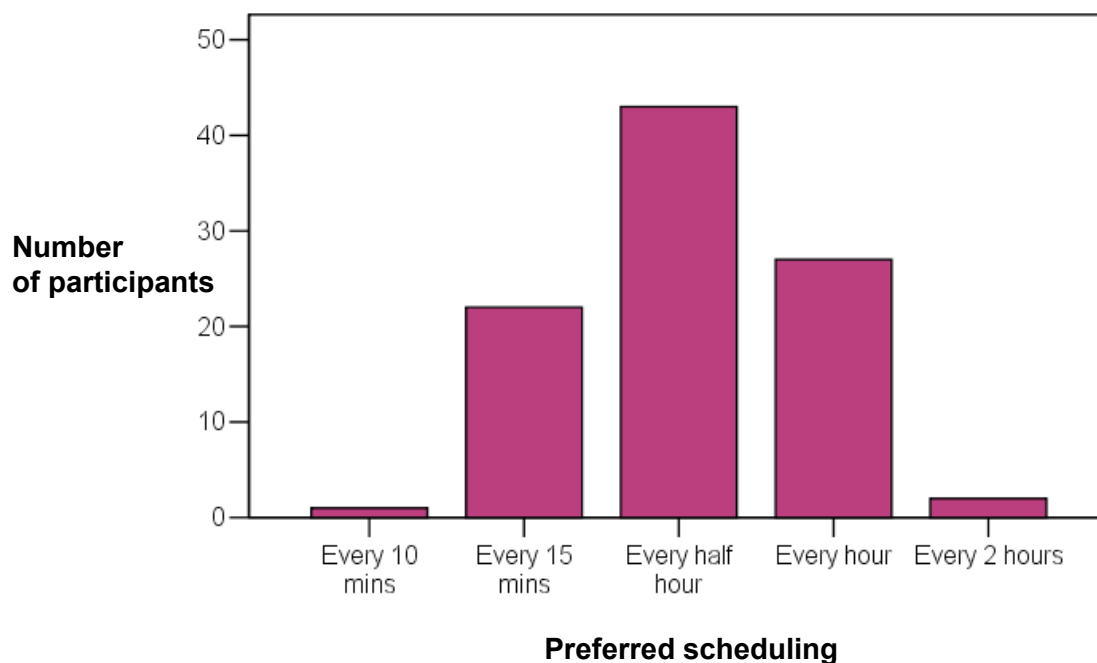
FIGURE 3: PREFERRED FREQUENCY OF SCHEDULING DURING EVENINGS AND NIGHTS
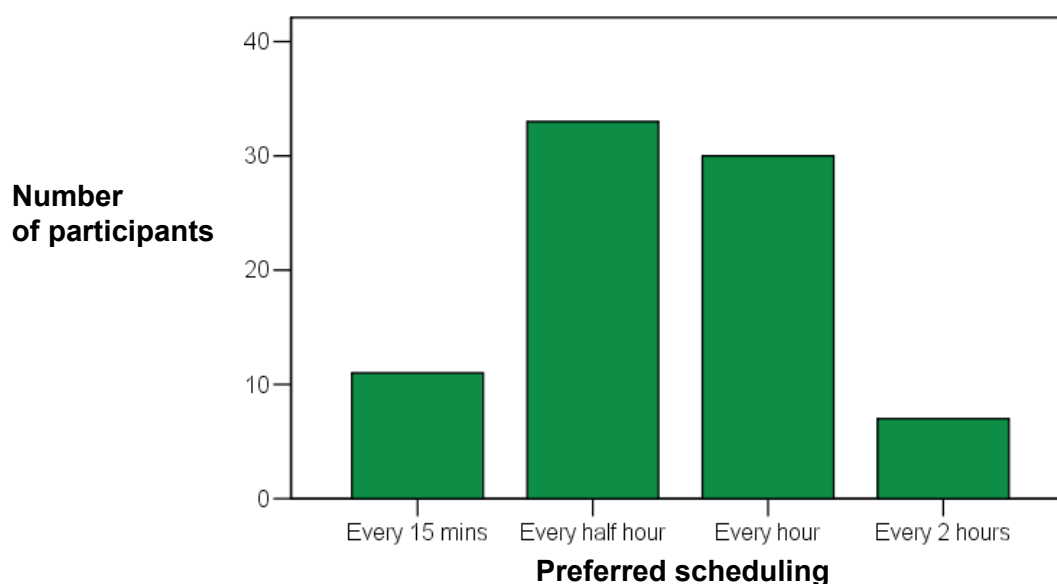
Preferred destinations included geographical areas (e.g., to nearby suburbs, central business district, other towns), services (e.g., doctors, hospital, shops), and specific destinations (e.g., hobbies, the beach, aquatic centres). The ranking of each destination category is shown in table 1.

If leisure destinations (including the beach, hobbies, theatres, cinemas, parks, gardens, library, pool, aquatic centre and entertainment districts) are considered together, the cumulative score is 76, placing leisure destinations in the second highest ranking above shops, medical services and the central business district.

Discussion

The survey results provided more detailed information on the preferences of older people regarding headways, distance to the bus stop and destinations. The majority of older people preferred headways to be at least half-hourly during the day and at least hourly during the evening, at night, on weekends and on public holidays. Those in Brisbane, a metropolitan region, preferred more frequent scheduling than non-metropolitan Hervey Bay participants. The preferences of older people correlate

TABLE 1 : PREFERRED DESTINATIONS

Rank	Category	Cumulative Score
1	Cross-suburb (i.e., nearby suburbs)	127
2	Shops	60
3	Central business district	47
4	Doctors / hospital	42
5	Other town	41
6	Beach	20
7	Hobbies (e.g., bowls club, craft group)	14
8	Theatre / cinema	12
9	Parks or gardens	10
10	Airport	9
11	Library	8
12	Pool / aquatic center	8
13	Entertainment district	4
14	Church	3
15	Markets	3
16	Transit centre / interchange	3
17	Friends	2
18	Other health professional	2
19	Public buildings	2
20	Retirement village	1

strongly with existing practice in these two locations (Brisbane participants were more likely to prefer 15 minute headways during the day and 30 minutes on the weekend when compared with Hervey Bay participants), which may suggest that older people's preferences may be contextualised within existing systems or expectations of living in a metropolitan or non-metropolitan setting. If services are to be designed to meet the preference of most older people (e.g 90 %) as in universal design and similar approaches, the recommended headways are stringent, requiring 15 minute headways at all times. Very few services in Brisbane, and no services in Hervey Bay, meet these expectations. Although little research explores how to increase the frequency of buses in an economically viable way, the replacement of larger buses with higher frequency minibuses may have potential (White, Turner & Mbara, 1992).

A distance to the bus stop of 200m or less was the most popular preference. This contrasts strongly with existing recommendations and standards that tend to target a distance of 400-500m to the bus stop or less. A distance to the bus stop of 200m or less, combined with frequent buses, would be difficult to achieve economically and pragmatically with existing services. As per a geographic analysis (Murray, 2001), about half of the population in Brisbane has services to this extent. Typically, bus services tend towards a central business district-centric "hub and spoke" model, where distance to the bus stop increases further out from the central business district. This is especially problematic in "hub and spoke" services covering wide geographic areas, which are more common in less densely populated areas such as non-metropolitan settings and typical Australian towns and cities. Innovative services, such as service route transport and flexible route transport have significant potential to meet these objectives and require further research to establish their efficacy and validity in the Australian context. Service route transport and flexible route transport are two forms of demand responsive transport supported by evidence (Brake, Nelson & Wright, 2004; Enoch, Stephen, Laws & Zhang, 2006) that use

non-traditional models to better meet users' needs. For example, with service route transport, smaller minibuses are used to wind through suburban streets before connecting to larger main lines. Flexible route transport typically involves buses travelling through zones, with the route redirected to pick up and drop off passengers according to passenger bookings. The success or failure of demand responsive transport is dependent on a wide range of factors (Ferreira, Charlers & Tether, 2007), including the fit between the model chosen and the local geographic and demographic characteristics.

There was an unexpected association between length of residence in the same suburb and preferred distance to the bus stop. This may be a result of the small number of participants (5) who had moved suburb in the last three years, which may have distorted the results. Further research could confirm this finding.

Preferred destinations included cross-suburban travel, leisure destinations, shops, central business district, medical services and other towns. A preference for cross-suburban travel was a dominant feature of participants' responses. Again, this contrasts with a "hub and spoke" model typically used by transport services, which feature the central business district (ranked third in this study) as the primary destination. There is some overlap between the results of the World Health Organization (2007) study and the results of this study. This study, however, provides further details on a range of leisure destinations that older people would like to be able to access, especially the beach, hobby destinations (e.g., bowls club, craft group), the theatre, cinemas, parks, gardens, the library and pools / aquatic centres.

An overall appraisal of the results suggests that a typical "hub and spoke" model, while ideally suited towards peak time business traveller, does not match the needs or preferences of the majority of older people. This may be challenging for transport policy makers and providers who frequently have economic imperatives that drive route and timetable planning. In order to make positive changes towards more age-

friendly bus systems, it is recommended that transport policy makers and providers :

- review their current practices in the context of the preferences of older people described above, including whether routes are scheduled at least half hourly, go within 200m of all homes and destinations, and provide cross-suburban routes as well as access to shops and leisure destinations;

- incorporate older people amongst stakeholders in route planning and schedule design;

- consider whether current service provision model is appropriate or whether alternative service provision models may be a feasible in the service planning long-term.

Conclusion

The preferences of older people should be explicitly incorporated into age-friendly guidelines which should influence the practice of transport providers and policy makers. In order to enact these recommendations transport providers and policy makers may need to consider innovative methods of service provision, such as flexible route transport and incorporating older people in the transport system design process.

Acknowledgements

References

BRAKE, J., NELSON, J. D., & WRIGHT, S. (2004). Demand responsive transport : towards the emergence of a new market segment. *Journal of Transport Geography*, *12*(4), 323-337.

BROOME, K., WORRALL, L., MCKENNA, K., & BOLDY, D. (2010). Priorities for an age-friendly bus system. Canadian Journal on Aging, 29, 435-444.

DENT, O. F., BROE, G. A., CREASEY, H., WAITE, L. M., CULLEN, J. S., & GRAYSON, G. A. (1999). Transportation needs of community-living older people in Sydney. *Australasian Journal on Ageing*, *18*(4), 186-190.

ENOCH, M., STEPHEN, I., LAWS, R., & ZHANG, L. (2006). *Evaluation study of demand responsive transport services in Wiltshire* (p. 1-99). Leicestershire : Loughborough University.

FERREIRA, L., CHARLERS, P., & TETHER, C. (2007). Evaluating flexible transport solutions. *Transportation Planning and Technology*, *30*(2), 249-269.

GABRIEL, Z., & BOWLING, A. (2004). Quality of life from the perspectives of older people. *Ageing & Society*, *24*, 675-91.

METZ, D. (2003). Transport policy for an ageing population. *Transport Reviews, 23*(4), 375-386.

MITCHELL, C. (2004, 26 May 2004). *Standards and guidelines for accessibility.* Paper presented at the TRANSED 2004 Conference, Hamamatsu, Japan.

MURRAY, A. T. (2001). Strategic analysis of public transport coverage. *Socio-Economic Planning Sciences, 35*, 175-188.

MURRAY, A. T. (2003). A coverage model for improving public transit system accessibility and expanding access. *Annals of Operations Research, 123*, 143-156.

ROSENBLOOM, S. (2009). Meeting transportation needs in an aging-friendly community. *Generations, 33*(2), 33-43.

STAHL, A. (1987). Changing mobility patterns and the aging population in Sweden. *Transportation Research Record*, *1135*, 37-41.

WHITE, P. R., TURNER, R. P., & MBARA, T. C. (1992). Cost benefit analysis of urban minibus operations. *Transportation, 19*(1), 59-74.

WORLD HEALTH ORGANIZATION. (2007). *Global age-friendly cities : a guide*. Geneva : World Health Organization.