Transportation and driving in longitudinal studies on ageing

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Abstract

Background: the associations between transportation, driving and successful ageing are as yet poorly understood. As longitudinal studies are the best methodology for clarifying associations and relationships between health, ageing and environmental factors, we sought to determine how transportation is incorporated into longitudinal studies, and which aspects are assessed.

Methods: of 55 longitudinal studies on ageing on the National Institute on Aging register, online survey instruments, where available, were scrutinised for references to transport. Where unavailable, principal investigators were contacted by mail/email/phone and asked to forward questions on transportation and driving. Questions were classified into (i) systems, (ii) resources, (iii) transport satisfaction and (iv) mobility needs.

Results: of 55 studies, we could review 36 questionnaires (28 personal replies, 9 accessible online survey instruments). Sixteen had no reference to driving or transportation, 20 (61%) had public transport components and 12 (31%) included questions about driving. Questions covered systems (17), transportation needs (12), transportation resources (11) and transportation satisfaction (4).

Conclusion: transport is under-represented in ongoing longitudinal studies, with emphases on public transport, systems and resources, rather than driving and satisfaction. Future waves of studies could usefully review their survey instruments to better measure older people’s preferences on transport options and satisfaction.

Keywords: longitudinal studies, ageing, transportation, automobile driving, elderly

Introduction

Demographic trends predict significant increases in the proportion and absolute numbers of older people in both the developed and developing world. Although encouraging trends in healthy life expectancy have been described in several countries, the increasing heterogeneity that characterises later life means that services and infrastructure need to be developed that are responsive to a wider range of abilities and needs than are encountered in younger populations. One new, but relatively understudied, area of public policy is the consideration of transport policy for an ageing society [1]. Older people rate transportation as a very high priority in their lives: at the White House Conference on Ageing in 1971, transportation was rated as third in importance in older people’s lives, after health and finance [2]; this high ranking persisted in the 2005 White House Conference on Ageing, with access to transportation ranked ahead of Medicaid and Medicare [3]. This study was prompted by the hypothesis that those involved in developing longitudinal studies on ageing may not have reflected this prioritisation of older people in design and data collection.

A particular emphasis which requires study is the increasingly central role of the private car as the predominant form of transport in many countries. This has been termed ‘automobility’ of older people — the greater likelihood that they will be licenced to drive and will make more or longer trips, increasingly in a car and increasingly as the driver of that car [4]. Use of alternative modes of transport among older people has actually declined, with an American Association of Retired Persons (AARP) survey showing that walking, public transport, taxis or community vans serve as the usual mode of transportation for less than 1 in 20 over 50 year olds in the United States. Instead, driving is the preferred mode of transport for four out of five adults over 50 (http://assets.aarp.org/rgcenter /il/2002_04_ transport.)
M. Bartley and D. O’Neill

Older people will comprise a larger share of the driving population and place greater emphasis on transport requirements [5] and on the need to sustain their mobility [6].

Housing and other elements of physical and social infrastructure have been shown to be important contributors to health and well-being in later life [7]. However, there has been less emphasis on the contribution of adequate and satisfactory transportation to successful ageing, a concept which in one of the commonly used definitions includes high cognitive and physical functional capacity, a low probability of disease and disability and active engagement with life [8]. Indeed, the change in demographic trends has implications for housing and consequently on transportation needs. Increasing numbers of older people will live, often alone, in rural or suburban areas, leaving them dependent on private transport for independence.

Transportation is a complex concept, and Metz has outlined at least five important elements: (i) travel to achieve access to desired people and places, (ii) psychological benefits of movement — of ‘getting out and about’, (iii) exercise benefits, (iv) involvement in the local community and (v) potential travel — knowing that a trip could be made even if not actually undertaken [9]. Much existing research focuses on only the first of these, disregarding what might be called the destination-independent benefits.

There is a developing literature on the role of transportation, and in particular automobile, in public health [10] and successful ageing. A number of studies from the last decade have shown that lack of transportation is associated with reduced health care utilisation [11], depression [12] and increased risk of nursing home entry [13]. Conversely, increasing levels of age-related disease and disability are associated with driving cessation and transportation difficulties [14, 15]. Clarity on causality and the nature of these relationships is needed, and longitudinal studies are the best methodology for clarifying associations and relationships between health, ageing and environmental factors. They can also best determine whether or not older people suffer from transportation inequity in terms of both mobility and accessibility [5]. The challenge lies in identifying appropriate survey instruments which can adequately capture an older person’s level of mobility and transportation.

The aim of our review was to assess the emphasis placed upon transportation in the current longitudinal studies on ageing, looking at all forms of transport.

Methodology

Fifty-five longitudinal studies are listed on the National Institute on Aging database. This database was established in 2004 following input from the Longitudinal Data on Aging working group and represents an important initiative in recognising that longitudinal studies are a valuable resource for facilitating future research on ageing. Included are studies focusing on children and mid-life, as well as those explicitly on ageing. Of the 55 studies, only five did not include people over 50 in their study age ranges. For the remainder, there is a wide range of age groups studied, from 0 years to over 100 years in the case of the Berlin Study. There are three international studies included on this database — the Cross-European Longitudinal Study of Ageing, the Longitudinal Study of Ageing in Africa and the Survey on Health, Ageing and Retirement in Europe. The remainder are national longitudinal studies. We reviewed each of these studies by accessing their online survey instruments, where available, to see if there was any reference made to transport in the study. The principal investigators of each longitudinal study were also contacted by email/mail and/or phone and asked if transportation was addressed in their longitudinal study. We also asked them to forward any questions pertaining to transport.

Questions were then classified by consensual agreement by the authors into those which considered (i) transport systems: questions relating to availability or proximity of public transport, (ii) transport resources: questions relating to possession/access to a private car, possession of a driving licence, (iii) transport satisfaction: questions asking whether the older person was limited in their activities by transport access and (iv) mobility needs: whether transport was required for health, social or other needs.

We decided not to perform a separate search for cross-sectional studies on this topic as cross-sectional studies show associations rather than causation and longitudinal studies best reflect the major secular trends in transport.

Results

Of 55 studies, we were able to review 37 questionnaires or relevant sections of questionnaires (28 personal replies, 9 accessible online survey instruments, a 67% discovery rate). The remaining 18 questionnaires were inaccessible to us (no online survey instrument or no response to direct and repeated inquiry). Sixteen (43%) of the 37 studies had no reference to driving or transportation, 20 (54%) had a public transport component and 12 (32%) included questions about driving or car ownership. Examples of the nature of the questions and study age ranges are given in Table 1.

On further classification the questions we found that 17 survey instruments looked at transportation systems, 12 covered transportation needs, 11 transportation resources and only 5 asked about transportation satisfaction. Four of the survey instruments asked about driving cessation and one about car accidents.

Discussion

Our review clearly highlights a relative under-emphasis on transport as an important issue in a growing ageing population. However, the developing interest in transport and ageing has occurred largely over 10 to 15 years, and many of these studies had been designed before this. In some ways, the delay may be providential, as earlier studies of
Table 1. A sample of the transportation-related questions in the longitudinal studies survey instruments, including the age range and aim of the study

<table>
<thead>
<tr>
<th>Study</th>
<th>Study aim</th>
<th>Age range</th>
<th>Sample question</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, Gene/Environment Susceptibility Study Aging in Manitoba</td>
<td>To study genetic contribution to diseases common in old age. To address such issues as social isolation and loneliness, self-perceived health status, capacity for physical services, successful ageing, formal and informal social support and care and sample mortality.</td>
<td>68–95</td>
<td>What form of transportation would you take if you had to go a kilometre or so?</td>
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<tr>
<td></td>
<td></td>
<td>60+</td>
<td>Do you experience any problems with your usual means of transportation?</td>
</tr>
<tr>
<td>Baltimore Longitudinal Study on Aging</td>
<td>To learn what happens as people age and how to sort out changes due to ageing from those due to disease or other causes.</td>
<td>20–100</td>
<td>Have you given up your automobile or bought a cheaper car?</td>
</tr>
<tr>
<td>Bangor Longitudinal Study of Ageing</td>
<td>To provide information that would inform policy makers and improve the quality and delivery of services to the ‘rural elderly’.</td>
<td>65+</td>
<td>Do you or does a member of your household have a car?</td>
</tr>
<tr>
<td>Berlin Aging Study</td>
<td>Interdisciplinary study with these common orientations: differential ageing, continuity versus discontinuity of ageing, range and limits of plasticity and reserve capacity and old age and ageing as interdisciplinary and systemic phenomena.</td>
<td>70–105</td>
<td>Which type of transportation do you use to get to your dentist? I walk/go by car/bicycle/wheelchair/bus/subway/elevated train/telebus/ambulance/taxi/relative’s private car/other transportation/reasons: 0 = not mentioned 1 = dentist visits nursing home 2 = dentist visits home 3 = participant does not go by him/herself 4 = too expensive</td>
</tr>
<tr>
<td>English Longitudinal Study of Aging</td>
<td>To cover the broad set of topics relevant to a full understanding of the ageing process.</td>
<td>50+</td>
<td>Do you have use of a car or van when you need one (either as a passenger or driver)? How often do you use public transport?</td>
</tr>
<tr>
<td>Established Populations for Epidemiologic Studies of the Elderly</td>
<td>To investigate the association of numerous factors (including medical conditions, demographic characteristics, social and psychological factors, medication use and health behaviours) with important outcomes in ageing populations.</td>
<td>65+</td>
<td>Can you drive your own car or travel alone on buses or taxis? During the past year, have you had any accidents or injuries involving a car, truck or other motor vehicle?</td>
</tr>
<tr>
<td>Fredericton 80+ Study</td>
<td>To generate hypotheses about ageing, determine preventive effects of medical intervention and supplement quantitative assessment of ageing with qualitative information on subjective experiences of the participants.</td>
<td>80+</td>
<td>Do you have a driver’s licence? Do you still drive? (If not anymore) When did you give up your driver’s licence?</td>
</tr>
<tr>
<td>Health and Retirement Study</td>
<td>To paint an emerging portrait of an ageing America’s physical and mental health, insurance coverage, financial status, family support systems, labour market status and retirement planning.</td>
<td>70+</td>
<td>Do you own anything for transportation? How much time spent washing the car?</td>
</tr>
<tr>
<td>Health, Aging and Body Composition Study</td>
<td>The primary focus was on physical functioning and the secondary, on cognitive functioning, genetics and behaviour.</td>
<td>70–79</td>
<td>Have you ever driven a car? How much difficulty do you have driving during the daytime in familiar places?</td>
</tr>
<tr>
<td>Longitudinal Aging Study Amsterdam</td>
<td>To determine predictors and consequences of ageing, focusing on physical, emotional, cognitive and social functioning in late life, the connections between these aspects and the changes that occur in the course of time.</td>
<td>55–85</td>
<td>Can you use your own or public transportation?</td>
</tr>
<tr>
<td>Longitudinal Study of Aging I/II</td>
<td>To make data on the oldest-old and on people moving into that age group available to the research community; to describe the continuum from functionally independent living in the community through dependence, including institutionalisation, to death.</td>
<td>70+</td>
<td>In the last 12 months, did you use special transportation for the elderly? What prevents you from leaving your home as often as you would like? Transportation problem (none available, too expensive, no regular or dependable source)</td>
</tr>
<tr>
<td>Manitoba Follow-up Study</td>
<td>Longitudinal study of cardiovascular disease.</td>
<td>20–39</td>
<td>How important is safe affordable transportation for your overall quality of life?</td>
</tr>
<tr>
<td>National Long Term Care Survey</td>
<td>To collect information on Medicare recipients who are 65 years of age or older with emphasis on the aged population who are functionally impaired.</td>
<td>65+</td>
<td>How do you go places out of walking distance?</td>
</tr>
</tbody>
</table>
transportation and ageing focused largely on risk and safety issues, whereas there has been an important reorientation of studies towards mobility in the last decade, as captured by the difference in emphasis in the titles of the two key Organisation for Economic Co-operation and Development (OECD) studies on the subject [6, 16]. Current longitudinal studies also show an emphasis on public transport that is not consistent with present knowledge of transport and mobility patterns of older people. A reorientation of inquiry towards the car, whether driven by self or others, is important, not only to reflect the current reality, but also to economise on redundant questions in survey instruments where length and time taken with participants are at a premium. A potential exception to this emphasis might be made for studies in specific urban areas with both the infrastructure and the tradition of highly developed levels of public transport, such as in certain European cities, as exemplified by the current reality, but also to economise on redundant questions in survey instruments where length and time taken with participants are at a premium. A potential exception to this emphasis might be made for studies in specific urban areas with both the infrastructure and the tradition of highly developed levels of public transport, such as in certain European cities, as exemplified by the questions in the Berlin Longitudinal Study on Ageing (see Table 1).

However, the value of using longitudinal studies can already be seen in studies from the Health and Retirement Study [17] and the North Wales Bangor Study [18].

A developing and important area is the clarification of the factors associated with driving cessation, with a corresponding scrutiny of alternative personalised options of alternative transport, such as paratransit [19], innovative social models of assisted personal transport [20] and the use of new modalities such as powered scooters. Longitudinal studies have already begun to provide some important insights into driving cessation [21], as well as the impact of driving cessation on areas such as consumption spending by older people [14]. Some helpful guidance on priorities in better understanding of the mobility needs of older people and the linkages between transportation, health and well-being has been given by recent expert reviews. The OECD in 2001 outlined eight priority areas for research and development: supporting health improvements for older adults; enhancing land-use planning and sustainable communities; improving the assessment and rehabilitation of older drivers; improving older people’s ability to avoid/survive crashes; determining, demonstrating and promoting the societal benefits of providing road improvements and of providing older people with continued, safe mobility; the study of how to provide transport options in an efficient and cost-effective way; and the encouragement of cross-national co-operation in the development of data and information sources [6]. This last imperative might be partially met by the inclusion of common data queries on transport and driving in international longitudinal studies on ageing: such international comparisons have already proved helpful in cross-sectional studies demonstrating a negative impact of medical screening at licensure of older drivers [22].

In a similar vein, the European Conference of Ministers of Transport recognised that much progress was needed to meet the growing demand for travel in older people (http://www.internationaltransportforum.org/europe/ecmt/roadsafety/ pdf/CM200116e.pdf). In particular, they indicated concern that there is no indication that older people’s need for activities outside the home will drop as fast as their skill levels or mobility resources do. This implies that for many older people there will be a large gap between what they want to do and what they have the transportation resources to do and between what they need to do and the mobility options open
to them. They outlined a series of initiatives and co-operative actions that would all require a better understanding of the role of transport, driving and mobility in the lives of older people. Equally, the US Transportation Research Board has outlined an ambitious programme of areas for research and development to ensure that transportation systems are suitably configured to meet the needs of an ageing society [23].

Clearly in any longitudinal study, a constant conflict exists between time constraints on questioning older people and the desire to measure as many aspects of life as possible. Ideally, the use of a validated measure or questionnaire is preferable, and no brief validated instrument currently exists which covers all aspects of transportation. Travel and mobility are clearly contingent on social environment, land use and resources, both internal and external. Banister has proposed a careful review of both the active (travel related) and passive (locality and social networks) elements which need to be brought together so that the quality of life for older people can be better understood [24].

However, in general, most longitudinal studies include measures of health, well-being and quality of life, so the challenge is to insert measures by which transportation and mobility can be measured. A number of validated and relatively short measures currently exist. An example is the Life Space Questionnaire, a measure of mobility of older people both inside and outside their homes, which is well validated and simple in conception and execution [25]. In cross-sectional studies, a larger life space is positively correlated with self-reported measures of disability, and a larger life space was associated with less visual impairment, higher levels of lower extremity motor performance, global cognition and social involvement and with personality and purpose in life. The results suggest that the range of environmental movement in older adults is a useful indicator of health in old age and may complement measures of disability [26].

In terms of resources, while the holding of a driver’s licence does not necessarily mean continued driving, particularly in terms of its utility (for example as a proxy for an identity card) for other purposes in some jurisdictions, as well as an important symbol of social inclusion, data from Germany suggests that less than 10% of those licenced aged 70–79 did not have access to a household car [27]. Looking at the travel survey data from Norway in the 1990s for example [28], more than 90% of women aged 45–54 years had a driver’s licence but less than 80% had ready access to a car. In contrast, 93% of men in the same age group were licenced and 90% had access to a car. A more focused insight into driving can be obtained by the Driving Habits Questionnaire (www.eyes.uab.edu/tools/DHQ.pdf), which has six domains, including difficulty in driving. Individual components might be chosen, as it covers areas including driving status, exposure and avoidance.

Developments in the understanding of models of driving behaviour might also encourage linkage of driving exposure, accidents and cessation to strategic thinking, either through measures such as the de Raedt questionnaire [29] or else the Selection–Optimisation–Compensation questionnaire [30]. Driving self-efficacy is a relatively new scale which has demonstrated internal consistency and construct validity with stroke and non-stroke populations. The scale demonstrated criterion validity in its relationship with outcome of an on-road driving assessment. [31]. The concept of risky behaviour is also worth pursuing, with either the possibility of using a risk-taking profile or else by self-report of temperament and personality [32].

Finally, a key area of important inquiry is the availability of alternatives to the private car and the extent to which these facilitate social inclusion in older people who can no longer drive, as well as supporting transition from driving to not driving. These services are often quite varied, from comprehensive social economy models such as the ITNAmerica model® [33], or less uniform models such as dial-a-ride, used by about 12% of older Americans with medical conditions that affect their travel [34].

Conclusion

As the best method for understanding the complex interactions between driving/transportation and well-being, health and resources is through longitudinal studies on ageing, incorporation of measures of transportation and mobility are required. We propose that future waves of longitudinal studies should review their survey instruments to better measure older people’s resources, preferences and satisfaction with their transport options in a way that will also allow for international comparison.

Key points

- Older people will comprise a larger share of the driving population and place greater emphasis on transport requirements.
- Current longitudinal studies emphasise public transport which does not reflect mobility patterns of older people.
- We propose future studies should adapt their survey instruments to focus more on older people’s transport preferences.

Conflicts of interest

No conflicts of interest.

References

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