

Contents lists available at [ScienceDirect](#)

Journal of Transport & Health

journal homepage: www.elsevier.com/locate/jth

Active travel, public transportation use, and daily transport among older adults: The association of built environment

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ARTICLE INFO

Keywords:

Older adults
active travel
public transportation
physical activity
built environment

ABSTRACT

Objectives: To examine active travel and public transportation use among U.S. older adults and the built environment characteristics associated with them.

Methods: Total active travel, public transportation trips, travel purpose diversity, total and maximum distance traveled for older adults (> = 65 years) relative to middle age adults (45–64 years) as reported in the 2009 National Household Travel Survey (NHTS) were compared using linear regression models and logistic regression models.

Results: Overall, adults over 65 years of age had 3.3 trips and total travel distance of 20.6 miles per day. Active travel and daily transport trips declined from younger to older age groups. Among the older adults, the daily transport varied by a number of characteristics. The association of built environment on older adults' transport differed by the specific environmental characteristics and travel modes.

Discussion: Existing transportation facilities and policies need to be adjusted to meet the challenge. Our study has a potential to contribute to the design of effective interventions that enhance health and quality of life for the burgeoning aging population in the U.S.

1. Introduction

By 2030, more than 20% of U.S. residents will be aged 65 and older, compared with 13% in 2010 and 9.8% in 1970 (Ortman et al., 2014), primarily caused by increased life expectancy and the baby boom generation (U.S. Census Bureau, 2016). The aging process will bring various challenges, one of which relates to daily mobility, with significant implications for health, quality of life, and well-being (Metz, 2000; Depp and Jeste, 2006; Satariano et al., 2012). Compared with the younger adult population, older adults tend to make fewer trips, travel shorter distances, have smaller activity zones, and engage in a larger share of non-work trips. This pattern is more pronounced among women and those with medical conditions (Horner et al., 2015; Collia et al., 2003). A compromised transport ability may prevent older adults from accessing places to meet basic needs and health care providers, participating in meaningful social and cultural activities, maintaining social networks, and engaging in active travel such as walking.

Walking and bicycling, known as active travel, are important sources of physical activity and well-being for older adults (Haselwandter et al., 2015). Compelling evidence shows the engagement of physical activities could decrease the risk of cognitive declines and diseases such as Alzheimer's and dementia (Hayes et al., 2015; Sofi et al., 2011). Active travel is beneficial for

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<https://doi.org/10.1016/j.jth.2018.01.012>

Received 29 June 2017; Received in revised form 22 January 2018; Accepted 30 January 2018

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maintaining overall mobility among older adults, due to its integrated use of the musculoskeletal, cardio-respiratory, sensory and neural systems (Simonsick et al., 2005). Walking is particularly appropriate for older adults as a safe and affordable travel mode. Additionally, it is well recognized that utilitarian and recreational purposes of walking should be examined separately, because the two purposes are driven by different mechanisms (Saelens et al., 2003; Giles-Corti et al., 2005), have different prevalences (Yang and Diez-Roux, 2012), and are associated with environmental factors differently (Spinney et al., 2012; Lee and Moudon, 2006). Furthermore, utilitarian and recreational walking may have different health benefits (E, C. et al., 2009).

Older adults are far from a homogeneous group, with important generational and cohort differences in transport behavior. Both active travel and transport in general among older adults vary by demographic and other individual characteristics. In addition to differences in walking and travel behavior by gender (Horner et al., 2015; Collia et al., 2003), it is well established that travel behavior is associated with household income, driver status, and count of household vehicles (Pucher et al., 2011; Pucher and Renne, 2003). The effect of a life course stage (e.g., single, married without children, married with young children, etc) on travel behavior is also important and may influence the number of trips made (Sun et al., 2009; Waygood et al., 2015).

In addition to active travel, the use of public transportation emerges not only as a feasible alternative to serving the mobility needs of older adults but as an incidental source of physical activity (Langlois et al., 2016; Durand et al., 2016). While driving may not be a safe option for some older adults due to physiological limitations, public transportation allows users to travel longer distances than walking. Furthermore, among US adults, 35% of those who travel by public transportation meet recommended levels of physical activity solely from walking to and from public transportation (Freeland et al., 2013). However, the share of public transportation remains low among U.S. population, including older adults (Lynott and Figueiredo, 2011; Mattson, 2012). The distribution of public transportation is uneven, and public transportation service tends to be limited or unavailable in many suburban and rural areas.

The built environment can support the transport needs of older adults, particularly for those engaging in active transport. Active transport has been associated with environmental factors such as land use mix, street connectivity, traffic conditions, proximity to destinations, safety, and aesthetics (Bauman and Bull, 2007; Saelens and Handy, 2008; Rosso et al., 2011; Li et al., 2008; Van Cauwenberg et al., 2012). However, despite a growing interest (Haselwandter et al., 2015; Van Cauwenberg et al., 2012; Van Cauwenberg et al., 2011), relatively few studies have been conducted on older adults when compared to studies focusing on adults or children only (Van Cauwenberg et al., 2011). Among the limited studies on older adults, the findings on the relation between the built environment and physical activity (including active travel) among older adults are less consistent (Van Cauwenberg et al., 2011). Furthermore, knowledge from studies conducted in younger populations cannot be readily transferred to older adults (Rosso et al., 2011; Van Cauwenberg et al., 2011; Farber et al., 2011).

Furthermore, it is possible that the neighborhood environment may be more influential for older adults compared with younger groups. One possible explanation is that older adults spend more time in their neighborhoods (Glass and Balfour, 2003). Another explanation is that older adults may perceive the built environment differently than the general population (Haselwandter et al., 2015) and may be more sensitive to certain environmental factors (Van Cauwenberg et al., 2011) (e.g., poorly maintained sidewalks or lack of street crosswalks may prohibit older adults from walking) due partly to the increased prevalence of functional limitations including both cognitive and physical constraints. As a result, a focus on the environment instead of on individual-centered mobility barriers may confer special benefits for older adults.

A growing number of studies have examined how the characteristics of neighborhood environment could be associated with older adults' active travel (Cerin et al., 2017). However, most existing studies (Van Cauwenberg et al., 2012; Li et al., 2005; Michael et al., 2006; Nagel et al., 2008; Gallagher et al., 2010; Grant et al., 2010; Cerin et al., 2013) cover relatively limited areas, are for short periods of time, and are not generalizable to the US population (Pucher et al., 2011). Studies that cover a range of climatic regions, seasonal variation, and types of built environments may assist in the design of more effective active travel promotion policies. In addition, very little research has described and quantified public transportation use among older adults. It may be that the relevance of specific built environment factors for older adults may differ for active travel than for public transportation use. Thus, quantifying active travel and the use of public transportation among older adults is a first step in understanding the environmental factors that may determine its use. This is of special concern for disadvantaged groups such as older adults with lower income level, no private vehicle, no driver license, or those with medical limitations. In this study, we address gaps in the literature by first examining daily transport and active travel among U.S. older adults. Second, we examine associations between neighborhood environmental factors and active travel and public transportation use. Both goals are achieved using data from the 2009 National Household Travel Survey (NHTS), a large nationally-representative sample (NHTS, 2017).

2. Methods

2.1. Data sources

The NHTS is a survey of household transportation covering the civilian, non-institutionalized population of the U.S. aged ≥ 5 years using computer-assisted random-digit-dialing telephone interviewing technology. Data on one-way trips were obtained during a designated 24-hour period. Trip information includes travel purpose, travel mode, distance, and duration. NHTS data were weighted to adjust for the selection probabilities at the individual level and to make the sample nationally representative, and the weights were provided in the 2009 NHTS data. The large nationally representative sample provides a comprehensive picture of U.S. older adults' daily mobility patterns and serves as a baseline for various studies of specific groups and contexts. Another advantage of this database is that it provides a relatively refined geographical information of the household location, thus enabling an examination of the association of the neighborhood environment.

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