



Do aging populations have differential accessibility to activities? Analyzing the spatial structure of social, professional, and business opportunities



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ABSTRACT

Accessibility is facilitated by well-organized transportation systems that move people efficiently, and it is improved as more activities are reachable to people given the means of available travel. As the current population ages, it will ultimately challenge those who manage transportation systems in their attempts to satisfy the older population's basic needs. Scanning the literature, accessibility has not been fully explored in relation to aging and older populations. We construct a systematic quantitative analysis of the older population's accessibility to potential activities. Given their residential patterns and the prevailing transportation system, we ask whether they have as much potential accessibility to activities as their younger counterparts. Our study area is a smaller metropolitan area in the state of Florida. Using highly disaggregate spatial data containing the locations of populations and possible activities, we implement accessibility models in a Geographic Information Systems (GIS) environment, accounting for mode of transportation. Scenarios and activities analyzed are informed by a review of the broader literature as well as our own analysis of the 2009 National Household Travel Survey. We find that the potential accessibility of the aging population varies by activity type and differs with other age group cohorts. When we look in detail at subgroups within the aging population, the oldest group (those 85+) tends to have higher levels of accessibility.

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1. Introduction

As the current population ages, it is expected to double in size by the year 2025, and one in three individuals in the Western world will be 65 years of age or older (Rosenbloom, 2003). These changes in population distribution will ultimately challenge those who manage transportation systems in their attempts to satisfy the older population's basic needs. There has been recent research involving the aging and transport mobility issues (DeGood et al., 2011; Mercado et al., 2010; Boschmann and Brady, 2013) touching upon key themes including the older population's accessibility to goods and services, the psychological benefits of travel, the benefits of physical movement, and maintaining social networks (Alsnih and Hensher, 2003).

Scanning the literature, *accessibility*, a term describing how effectively populations can reach goods and services, has not been

adequately explored in relation to older populations. Accessibility is facilitated by well-organized transportation systems that move people efficiently, and it is improved as more activities are reachable to people given the means of available travel modes (Hansen, 1959; McAllister, 1976; Kwan et al., 2003; Horner and Downs, 2014). Research dealing with aging populations should not conflate mobility with accessibility, as these are fundamentally different concepts. Essentially, mobility is concerned with gaining movement across the transportation system, while accessibility examines one's ability to reach opportunities via the system. Along these lines, studies of older populations have utilized surveys to investigate people's perceived lack of access to various goods and services (Alsnih and Hensher, 2003; Nemet and Bailey, 2000; Wilson et al., 2004). For example, health care utilization has been examined by correlating the number of doctor's visits people make to their travel patterns, access to private transportation, and living arrangements (Nemet and Bailey, 2000). Another survey probed older adults about their ability to reach food locations and their dietary variety (Wilson et al., 2004).

Missing from the literature is a systematic quantitative analysis of the aging population's accessibility to potential activities. Given

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their residential patterns and the prevailing transportation system, do they have as much potential accessibility to activities as their younger counterparts? And what about the potential accessibility for those near retirement? These questions are especially important for aging populations who live independently and have not relocated to retirement homes or assisted living facilities, where transportation is often regularly arranged and supplied by the facility itself.

We explore the older population's accessibility to activities for a smaller metropolitan area in the state of Florida. Using highly disaggregate spatial data containing the locations of populations and possible activities, we implement accessibility models in a Geographic Information Systems (GIS) environment to assess potential disparities between older and younger populations. Mode of transportation is taken into account, and the scenarios and activities analyzed are informed by review of the broader literature as well as our own analysis of the 2009 National Household Travel Survey. The population age 65+ is contrasted against its younger counterparts, and within the 65+ population category, this group is further broken down into finer population subgroups to explore possible disparities. We find that the potential accessibility of the aging population varies by activity type and differs with other age group cohorts, as well as differs among the older subgroups.

2. Background and literature review

This section is organized into two main components. First we review the literature dealing with the traveler behavior of the aging population with an emphasis on identifying broad trends and themes that inform our work. From there we shift to focus on the concept of accessibility and some of the key research aims surrounding its measurement.

2.1. Travel behavior and the aging population

Over the past several years, the share of total travel made by the older, or aging population, (defined here as those age 65 and up), in both miles and trips, has increased significantly (Lynott and Figueiredo, 2011). However compared with the rest of the US driving population, they tend to travel less and reduce driving as they age (Rosenbloom, 2000; Giuliano et al., 2003; Bauer et al., 2003). Those 65 and older travel far fewer miles per year than their younger counterparts (Mattson, 2012). Also, when compared to younger travelers, the older population is much less likely to travel on a given day and much more likely to stay in the same place all day (Heaslip, 2007; Mattson, 2012). Whether by choice or not, the aging population tends to travel less.

When the older population does travel, they mostly do so by personal automobile; much like the rest of the population (Lynott and Figueiredo, 2011; Rosenbloom, 2000, 2003). Over the past couple of decades, there has been an increasing propensity for older adults to maintain a driver's license, continue to own a car, and use their personal vehicles to make trips (Alsnih and Hensher, 2003; Buehler and Nobis, 2010; Rosenbloom, 2001). The dependence, culture, and familiarity of driving an automobile, along with a lack of other transportation options in some locations, may serve as a barrier for aging populations in the future (Giuliano et al., 2003; Samus, 2013). This is especially true as the aging begin to experience health problems that prevent or prohibit them from operating an automobile independently. Even without owning a car, many older Americans still find a way to make their trips in an automobile, whether this is through ride-sharing or other special services (Kostyniuk and Shope, 2003; Newbold et al., 2005).

Aside from driving, walking remains the most popular form of transportation compared to other modes of travel such as transit or taxi. Adults 65 and over take a relatively high percentage of trips (9%) by walking (Farber et al., 2011; Rosenbloom, 2009). Unfortunately, older Americans seem to be underserved when it comes to pedestrian infrastructure, which may deter some from walking (Farber et al., 2011). Another limiting factor might be that destinations that are too far and too dangerous to be reached by foot (Ritter et al., 2002). Also, at some point, walking may become an unrealistic form of travel, particularly those 85 and older (Arentze et al., 2008; Ritter et al., 2002). The share of trips made by walking, as well as the share of trips made by bicycle, has increased in recent years (Lynott and Figueiredo, 2011; Mattson, 2012).

Research suggests the older population tends to travel shorter distances (Giuliano et al., 2003; Rosenbloom, 2000). A recent study from Canada showed that travel distances decrease as age increases (Mercado and Páez, 2009). The average older person (those 65 and older) can be expected to make trips that average about 5 km less than younger adults. Interestingly, this was found to be true only for when the older adult was driving. When an older person was a car or bus passenger, travel distances changed very little. Another study has found that almost half of the trips taken by those 65 and older are less than two miles (Farber et al., 2011). However, compared to past populations, the aging today seem to be taking longer trips (Heaslip, 2007; Samus, 2013).

In terms of our present work, among the most important consideration is the purpose of the trips that the aging make. As we know, perhaps the biggest difference among older adults' travel behavior is that they do not make as many work-based trips as the rest of the population (Newbold et al., 2005; Rosenbloom, 2001). Trips for shopping, family visits, recreation, and social activities make up a much larger share of the older population's trips than do work-related ones (Collia et al., 2003; Mattson, 2012). The percentage of the older population's trips that are for medical purposes is also significantly higher than the rest of the population despite being a relatively small percentage of their travel overall (Collia et al., 2003; Mattson, 2012). However, we note that recently the age of retirement is being pushed back and that more adults are working later into their lives, which in turn results in more work-based travel by the aging population (McGuckin et al., 2013).

To summarize, we know from the literature that older adults tend to travel shorter distances, travel less frequently, and engage in a larger share of non-work travel than their younger counterparts. Like the rest of the population, they favor auto-based travel, but do tend to utilize walk modes for some trips. With these trends and preferences in mind, we now turn our attention to defining accessibility.

2.2. Accessibility concepts

The concept of accessibility deals with people reaching their desired activities via the transportation system (Handy and Niemeier, 1997; Kwan et al., 2003). On the transportation side, systems that are efficient and allow people to reach a larger amount of locations per unit of time are viewed positively (Handy and Niemeier, 1997). On the land use or destinations side, the more activities that can be reached in a given area, the greater the degree of accessibility that exists (Scott and Horner, 2008). Over the years, researchers have developed numerous perspectives on measuring accessibility, many of which expanded upon accessibility measures developed decades ago (Kwan et al., 2003; Chen et al., 2011).

At an elemental level, measures of accessibility involve an assessment of the costs involved in traveling to desired destinations and the attractiveness of the activities at these destinations

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