Submitted 23 April 2009

Travel Behavior of the Aging Boomers:
Evidence from Naturally Occurring Retirement Communities

Phase IV

Principal Investigator
P. Christopher Zegras
Massachusetts Institute of Technology
Department of Urban Studies and Planning
77 Massachusetts Avenue, Room 10-403
Cambridge, MA 02139
617 452 2433, czegras@mit.edu

Co-Principal Investigator
Eran Ben-Joseph
Massachusetts Institute of Technology
Department of Urban Studies and Planning
77 Massachusetts Avenue, Room 10-485
Cambridge, MA 02139
617 253 7305, ebj@mit.edu

Abstract:

The phase of this on-going research project will enable us to compare data previously obtained on leading edge baby boomers from suburban age-restricted communities to their counterparts in dense urban areas, particularly naturally occurring retirement communities (NORCs). Our overall aim is to show how different types of communities might affect older adult travel behavior and to thus derive lessons for the design of neighborhoods where older adults reside. This research is inserted directly into the very active research base on the influence of the built environment on travel behavior and the growing interest in promoting active living settings, including for the aging. Despite some research in this area, there is little context-specific empirical evidence on local-level influences on boomers' travel behavior and apparently none analyzing the effects of various types of age-specific communities (naturally occurring or otherwise). The proposed research aims to fill this gap.

Statement of Project Objectives

This is the proposed fourth phase of a research project examining the travel behavior and residential preferences of the aging baby boomers. The first phase of this research established the empirical base for understanding the impact of neighborhood characteristics on travel behavior of "leading edge" *baby boomers* (defined as persons aged 55-65) in the Boston Metropolitan Area, through the use of focus groups in four different urban edge communities. The second phase of this research compared the travel behavior of residents in age-restricted, active adult communities (ARAAC) with those in "traditional" suburban counterpart communities, via a mail-back survey of attitudes and preferences and travel characteristics and statistical analysis of the survey results. The third phase continued to analyze the survey results of Phase II, refining the models and urban form analysis and focusing on the implications for land use planning, urban design, and transportation systems.

This proposed Phase IV of the research builds from the previous phases with an aim to broaden our understanding from baby boomers travel behavior in suburban communities to their counterparts in urban communities, particularly naturally occurring retirement communities (NORCs). The overall objective of this research is to develop empirical evidence on the relationship between the built environment/neighborhood characteristics and older adults' travel behavior. With respect to NORCs, by answering the following questions we hope to understand the influence of (1) different types of community settings, (2) residential preference and demographic characteristics, and (3) their interactions on residents' travel patterns, including trip rates, mode choices, distances traveled, etc:

- While the majority of baby boomers (approximately 65%) live in suburbs, what factors influence their counterparts in NORCs to live in urban areas?
- Do older adults living in NORCs make different transport choices than their counterparts living in ARAACs or "traditional" suburban neighborhoods?
- How do neighborhood designs influence the different travel outcomes?
- How do residential preferences and demographic characteristics interact with neighborhood characteristics with regard to influencing older adults' transport choice?

In the United States, the baby boomer generation (born after World War II between 1946 and 1964) is a major demographic group (78.2 million in 2005) entering its late fifties and approaching retirement age.[1] As baby boomers age, their travel behavior related to public health, welfare, and safety has emerged as an important issue for planners and policy makers. Many baby boomers prefer to live in the suburbs and tend to be highly auto-dependent. However, approximately 35% of baby boomers live in city centers. These aging urban baby boomers have several different residential choices, including NORCs, that offer diverse services of interest to an aging population.

A NORC is defined as "An initiative for connecting elders to community-based eldercare services while remaining in their own homes and staying connected to neighbors and community institutions. A NORC connects elders to supportive services and to each other,

---

[1] Oldest Baby Boomers Turn 60! (2008).   Retrieved September, 2008, from: http://www.census.gov/Press-Release/www/releases/archives/facts_for_features_special_editions/006105.html.

often using computer technology as a key tool."[2] NORCs are newly defined neighborhoods where the majority of their residents are older adults who remain in their existing homes, and service organizations offer various services for old residents. In contrast to the age-restricted communities that support the elderly in suburbs, NORCs have emerged as an option for urban baby boomers. Although, in general, their built environments are not designed to meet the health and social service needs of the older generation, NORCs provide various services including concierge services, healthcare, social work, and socialization. NORCs are formed either by the aging of residents in a set place or as a result of older adults' migration from other places. NORCs' principle is to serve seniors aging in place and promote their independent living.[3]

As the baby boomers' enter late middle age, the demographic shift raises health and well-being issues related to their mobility. Aging entails inevitable physical changes. As people age, their abilities to see, hear, and move tend to diminish. With regard to baby boomers' preferences for automobiles, the decreased ability to drive may reduce their mobility and active living. By comparing urban and suburban communities, we expect that this research may shed light on the contribution of urban design elements to older adults' health and well-being by creating urban environments that support pedestrian mobility and encourage social activities.

Research Contribution

As previously summarized in our Year 20 (Phase II) and Year 21 (Phase III) proposals, researchers and policy makers have long been interested in the travel behavior of older adults, focusing on, for example: the possibility of advanced technologies in aiding older adults' travel, the contribution of transportation to the well-being of seniors, seniors' tendency of trip-chaining and public transport use, and older adults' overall trip generation rates and distances. Less research has explored older persons' travel behavior and relationships with the built environment, although a growing number of relevant studies exist (as summarized in our previous proposals), including a recent issue of the *Journal of Transport and Land Use* dedicated to the topic.[4] Through this proposed project, we contribute to the growing research base by the implementation of a purpose-specific survey instrument in a research design that enables the preferences, attitudes, and behaviors of suburban and urban baby boomers to be analyzed and compared.

The first Phase of the research included an inventory of relevant community types in the Boston Metropolitan Area (BMA) and a review of the relevant research and available data, including the 1991 BMA household travel survey and 2006 data derived from the US Census. The former enabled a general (albeit outdated) travel portrait of older adults in the area of study and the Census data provide a more detailed view of elderly community concentrations. Based on these and other data, we identified candidate communities for focus groups to explore residential choices and travel behaviors in ARAACs. We carried out focus groups among residents in four different suburban towns, attempting to match ARAACs with nearby "typical" suburban neighborhoods (TSNs). The focus groups revealed

---

[2] Bookman, Ann *The Family Caregiver Handbook : Finding Elder Care Resources in Massachusetts*. Cambridge, MA: Massachusetts Institute of Technology, 2008.
[3] NORCs: An Aging in Place Initiative. (2008). Retrieved September, 2008, from http://www.norcs.com/
[4] *Journal of Transport and Land Use*, Vol. 2, No. 1, 2009: www.jtlu.org.

a range of behaviors regarding trip making, preferences and the role of community. ARAAC residents seem to be more social, more inclined to ride-share and more locally active (strolling in the neighborhood, more socially connected to neighbors), although, in general, participants from both neighborhood types reported high levels of local walking and neighborliness. Residents from ARAACs and TSNs expressed a high level of auto-dependence, an awareness of the potential problem of auto dependence in suburbia with aging, a clear dislike for senior shuttle services, limited access to public transport, and similar regional travel patterns.[5]

Building on Phase I, in Phase II we designed and implemented a household survey of travel behavior, residential preferences and related attitudes. The survey consisted of two parts: a single household page to gather household demographic information on the type of current and previous home, age-restricted status, ownership, number of residents, number of vehicles and bicycles, and household income; and 2 travel diaries, to be completed by 55-65 year old residents of the household, and containing questions on respondent demographics, attitudes to travel, attitudes to residential location, previous neighborhood characteristics and a travel diary, to be completed on a single Tuesday, Wednesday or Thursday (and for each trip, including start time, end time, destination, mode, cost, duration and weather conditions). The sampling frame was constructed from a commercial database of the target population (55-65 year old adult households in the identified ARAACs and the TSNs sharing those ARAACs' zip codes).

All households in the sample received the same mailing. The sample size, based on resource constraints, was 7,000 households. In total, 1,752 envelopes were returned, with 1,650 containing partial or fully complete instruments. Basic descriptive statistics reveal expected characteristics: residents of the sample areas have high incomes, live mostly in single family homes, are mostly in good health, and are auto-dependent for most travel. The two types of sample neighborhoods (ARAACs and TSNs) are well matched and also match the regional demographic trends for this age group. The sample matched the travel characteristics for this age group in the region, e.g.: high auto use, little walking/cycling. In terms of differences, ARAACs are associated with more walking and more local trip activity, including more social visits to neighbors, and more ride sharing. These travel outcomes back the idea that ARAACs support activity patterns not found in TSNs. No evidence supports the hypothesis that local trips replace regional travel: trip rates, measured using daily and weekly rates, are similar between neighborhood types. ARAAC residents seem to have chosen demographically homogeneous neighborhoods. Residents of ARAACs and TSNs have similar travel attitudes: enjoying or neutral about driving, and finding public transport inconvenient.

Behavioral models were also employed to investigate the influence of neighborhood type on local activity and sociability, as measured by neighborhood walk and cycle trips (hereafter "local activity") and visits to neighbors (hereafter "neighborliness"). The data from the survey enabled various analytical approaches to attempt to control for residential self-selection, thereby isolating the effects of neighborhood type from the effects of personal

---

[5] Zegras, C., Ben-Joseph, E., Hebbert, F., Coughlin, J. "Everyday life without a car would be impossible." A Comparative Study of Baby Boomers' Travel Behavior and Residential Preferences in Age-Restricted and Typical Suburban Neighborhoods. Presented at Annual Meeting of Transportation Research Board, Washington, DC, January 2008.

preferences. Three different model specifications were used. The first model employed straightforward statistical controls for attitudes, that is, attitudes were included directly into the models of local activity and neighborliness. For both behaviors, the neighborhood type exhibited an influence after controlling for attitudes/preferences. A second model used an instrumental variable approach, in which the community type was instrumented via a neighborhood choice model. These models produced mixed results for the two behaviors, suggesting a weak instrument in this case. The third model utilized a nested logit approach, which in some sense offers a more sophisticated understanding of the relationship between travel and location choice. For local activity, the nested logit model suggested that walking and biking are conditional on location – the ARAACs apparently produce more such activity. For neighborliness, however, the opposite finding holds: residential location is conditional on neighborliness – residents of ARAACs seem to choose these places because they have a desire to be "neighborly." All models indicate an association between neighborhood type and travel outcomes, even after controlling for endogeneity and including other control variables for individual, household and neighborhood characteristics.

The results have several implications. ARAACs have slightly higher walking, meaning local activity and neighborliness may be increased by copying ARAAC design features elsewhere. There may also be opportunities to replicate ARAAC community structure in other communities; facilitating a neighborly atmosphere in existing places might 'retain' older people in their original communities and have positive social and aging benefits. Ultimately these questions indicate an overarching question about enabling healthy aging in the suburbs. Is it better to bring the beneficial features to existing neighborhoods (assuming that the 'features' are discrete and replicable), potentially at great cost and complexity, or is it better to facilitate moves by older people into supportive locations? For service providers, having older people clustered could be efficient, implying affordable aging support and health services that might typically be found in an urban center. Alternatively, clustering older adults might make it harder for community-led initiatives and informal support, both of which will rely on a diversity of ages living together. For transportation service providers, ARAACs create clusters of potential passengers or customers who seem to be more amenable to ride sharing, suggesting an under-tapped market.[6]

Building on this analysis, in Phase III[7] we worked to improve the measurements of the built environment represented in our models, developing detailed physical characteristics for a reduced number of neighborhoods. We selected 35 neighborhoods (15 ARAACs and 20 non-ARAACs) for in depth spatial analysis using GIS. First, we collected basic spatial data including dwelling unit density, intersection density, destinations, presence of public transit, etc. Then, the 35 neighborhoods were categorized into three types based on street characteristics – linear, loop, and grid type (Figure 1) – based on the premise that people tend to like walking along circular routes and dislike duplicating their routes. The linear type does not provide circular routes, while the loop type provides single or multiple circular routes and the grid type additionally allows multiple accesses to the neighborhoods. The analysis revealed that, on average, the residents in grid and loop type neighborhoods tend

---

[6] Details of the analysis can be found in: Hebbert, F. Local travel habits of baby boomers in suburban age-restricted communities. Thesis submitted to the Dept. of Urban Studies and Planning, MIT, in partial fulfillment of the requirements for the Masters in City Planning degree, September, 2008.
[7] Due to delays in award notification for UTC Y21 and, thus, lack of necessary resources, we were unable to pursue our originally proposed Phase III research agenda.

to walk or bike more than those in linear type neighborhoods, all else equal. In addition, the results suggest that older adults' demographic characteristics, such as employment status and health status, also affect walking behavior. This implies that the effect of neighborhood characteristics is not constant for all older adults, but varies depending on their social and demographic status. We have identified a related idea that vulnerable people (unhealthy, poor, or old) tend to be more influenced by their physical environment, whereas non-vulnerable people are able to overcome the constraint of the physical environment.[8] This interaction between the neighborhood characteristics and demographic status suggests further analysis to gain more sophisticated understanding of the association of the built environment with older adults' walking behavior. We are currently preparing two journal articles for publication consideration based on the analysis carried out under Phases II-III.

Figure 1. Three categories of neighborhood characteristics, descriptive diagrams, and prototypical examples of the categorization
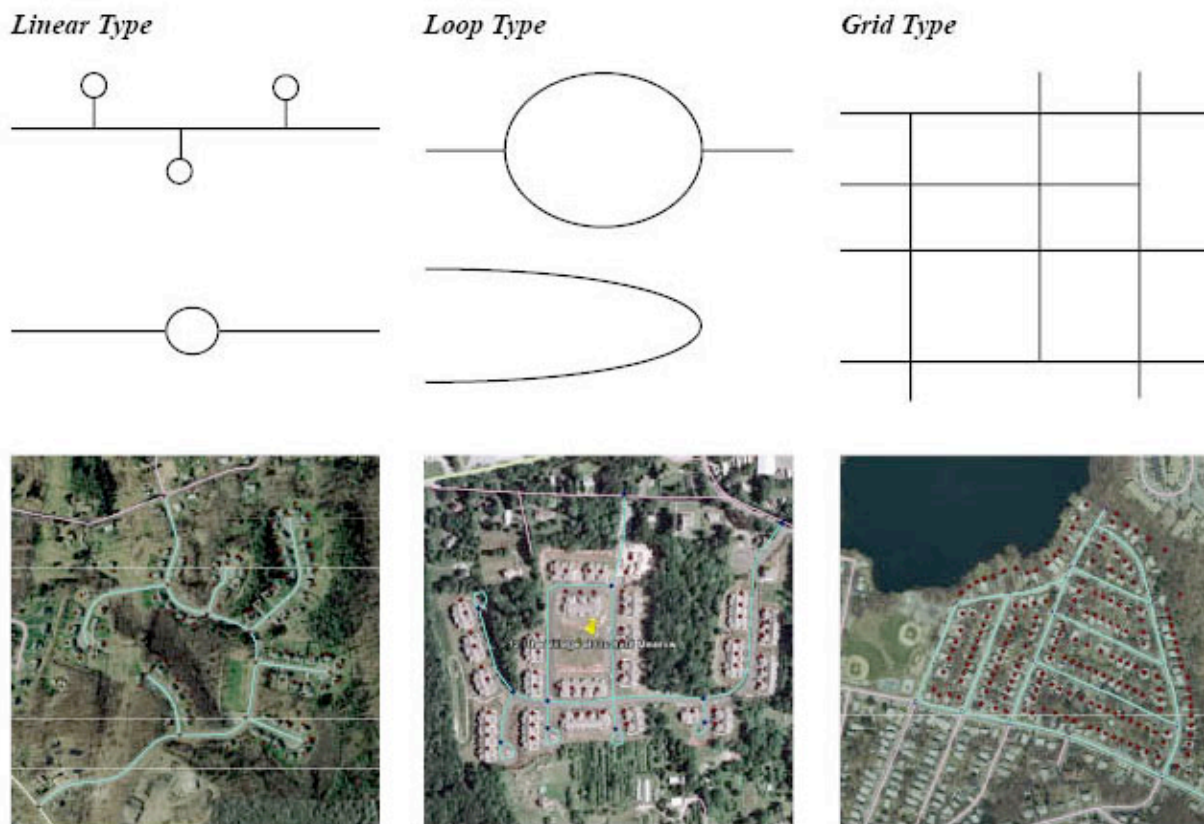
In Phase IV of the research project, we aim to make three important contributions. First, we will shed light on specific age cohort (baby boomers) who live in a particular development type – the NORC. While previous research explored the relationship between the built environment and travel behavior in general, little research has been done on NORCs, which is an emerging option for aging people's housing choice. Analysis of the travel behavior of

[8] Berke, Ethan M., Thomas D. Koepsell, Anne Vernez Moudon, Richard E. Hoskins, and Eric B. Larson. 2007. Association of the built environment with physical activity and obesity in older persons. American Journal of Public Health 97 (3).

residents in NORCs will provide additional insights to understand older adults' travel behavior in this specific setting as compared to the suburban settings studies in Phases I-III. Second, we will develop objective measures to characterize neighborhoods with regard to travel behavior. While a considerable number of measures of the built environment have already been developed in previous research, it is still necessary to construct reasonable measures of quality of design and characteristics of neighborhoods. Our research will continue to analyze the design characteristics, related to transportation and travel behavior. Third, we will refine our analytical models, improving the self-selection controls and including interaction terms to examine the variance of the built environment's effect according to the change of demographic status. The interaction term will provide a more complex understanding of the built environment-travel behavior association, for example, how the built environment has different effects on employed and retired older adults. Furthermore, we will particularly focus on deriving substantial policy, planning and design implications from our statistical models and the rich comparative analyses that will be possible based on the results from Phase II and 3.

In Phase IV, we will expand our context-specific knowledge of "leading edge" baby boomers' residential preferences and travel behavior, via the examination of a particular urban development type (NORC). By comparing NORCs, ARAACs and typical suburban neighborhoods, we expect our research to make contributions to the ongoing search for developing "livable communities" that provide adequate transportation options and a walkable environment for the aging population, not only in the Boston metropolitan area or the US, but also in much of the rest of the world.

Technical Approach or Methodology

Building on the previous phases of this research, Phase IV will expand our target population and neighborhoods into urban areas and entail a more sophisticated statistical analysis to reveal causality. We will carry on the analysis through four steps: (1) identifying NORCs and preliminary qualitative analysis, (2) developing and implementing a mail-back household survey, (3) spatial analysis and neighborhood characterization, and (4) finally, quantitative analysis to shed light on the neighborhood characteristics, travel behavior, and transportation and compare the results with the suburban communities previously analyzed.

First, we will identify naturally occurring retirement communities (NORC) in the Boston metropolitan area, for example Beacon Hill Village and Jamaica Plain. To gain preliminary understanding of NORCs and the residents' travel behavior, we will carry out interviews and focus groups by contacting NORCs' organizations. NORCs usually offer regular meetings and various social programs. Therefore, we may conduct relatively effective initial interviews or focus groups through the organizations. The results of the preliminary study will be qualitatively analyzed to detect remarkable factors or variables and refine the research questions.

Second, a mail-back household survey for NORCs will be conducted in a similar way to Phase II. The data to be collected in the household survey include:
1. Socioeconomic and Demographic Characteristics: including household size, ages, household income levels, tenure status, education levels, physical capabilities, etc.

2. Travel and Activity Characteristics: including trip purpose, origin and destination, mode(s), cost and distances.
3. Attitudinal Characteristics: including variables – such as attitudes towards residential spaces and personal security – aiming to explain neighborhood choice.

Third, the built environment characteristics of the communities and their surroundings will be continued to be analyzed by site visits, satellite imagery, GIS resources, community plans, and interviews with planners and developers. In this phase, we will specifically focus on characterizing the communities and measuring relevant design elements.[9]

Fourth, the quantitative analysis will include basic descriptive statistics from older adult households in the community types, as well as econometric models of travel behavior as a function of neighborhood characteristics, individual level control predictors including residential preferences and demographic characteristics, interaction terms between neighborhood and demographic characteristics, and other neighborhood level covariates, such as location, density, diversity, and destination.

We recognize several important analytical challenges and opportunities. First, related to self-selection mentioned above, older adults' residential preferences imply an analytical challenge to reveal unbiased association of the built environment with travel behavior. Second, the multi-layered nature of our data with both neighborhood level and individual level may violate the statistical assumption of independent observations. In other words, people in a certain neighborhood are likely to be influenced by their common experience in the neighborhood, so they may act differently from residents in other neighborhoods. To address this non-independent observation issue, we may have to consider multi-level modeling or clustering to adjust standard errors. Third, given the constraints of survey sample size and cross-sectional structure of the data, it may be difficult to account for demographic variance, such as aging, retirement, decreasing heath status, with related to effect of the built environment. Although longitudinal data may be ideal to investigate this issue, we will include interaction terms and observe the marginal effect of the neighborhood characteristics to deal with this issue.

Anticipated Results

This phase of the research should offer a new understanding of the relationship between neighborhood types and older adult travel. We expect the results to provide implications for community development and transportation policies that can be adapted to accommodate older adults in both urban and suburban communities. Derived from the approach described above, we anticipate that the analysis will produce:

- an assessment of the relationship between community types and older adult travel behavior,
- identification of the difference between urban and suburban neighborhoods with regard to variations in travel outcomes,
- characterization of specific neighborhood-level designs associated with travel outcomes.

---

[9] Lee, Chanam, and Anne Vernez Moudon. 2006. The 3Ds+R: Quantifying land use and urban form correlates of walking. *Transportation Research Part D 11*:204-215.

Ultimately, we expect the results to have important urban design, transportation and social policy implications that municipalities, service organizations, real estate developers, and others can use to adequately respond to the challenges and opportunities offered by the baby boom generation.

Technology Transfer

A range of educational, professional, and scholarly dissemination mechanisms will be used for this research. In terms of education, one of the PIs teaches a course on Land Use & Transportation Planning and the other PI teaches a course on Land Use & Community Development and a course on Site & Urban Systems Planning. They have incorporated the implications and insights obtained from previous phases of the research into these courses, educating future practitioners and scholars in the issues. In addition, a current Ph.D. student in City Planning has been a fundamental contributor to Phases II and III of this research and will be completing his first year paper at the end of the summer, analyzing the Phase II survey results. The student will continue to work on this project in Fall 2009, to carry out the survey and quantitative research described above. We expect this to potentially lead to a doctoral dissertation.

In terms of research and practice, results from Phase IV will be disseminated to scholars, researchers, developers/practitioners, and residents of NORCs through presentations and publishing. The PIs will present at transportation conferences (e.g., Annual Meeting of the Transportation Research Board), planning conferences (e.g., Annual Meeting of the American Planning Association), and real estate development conferences (e.g., Annual Meeting of the Urban Land Institute). We aim to publish *at least* one peer-reviewed journal article and one piece in the related popular press (e.g., Urban Land Magazine, AARP-The Magazine). Finally, through NORCs organizations, we will present the result of the research to the residents, in order to provide insight into NORCs' older adults as well as their organizations.