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## Measuring the transportation needs of seniors

[Mensuração das necessidades de transporte de idosos]

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### Abstract

Transportation systems are built with the intention to serve communities by providing accessibility and mobility. Yet seniors residing in these communities face different challenges compared to regular commuters. Seniors have special needs in terms of desired destinations and challenges faced due to limitations in mobility and decline of accessibility levels where they reside. In this research paper we discuss major findings from a mail-out mail-in survey conducted in Hennepin County, Minnesota to measuring met and unmet urban transportation needs of seniors. Compared to previous research this study uses primary collected data rather than relying on travel surveys, which does not measure the unmet urban transportation needs of seniors. The findings from this survey is consistent in term of measuring the existing travel behavior of seniors, which raises our confidence in the information being collected related to the unmet transportation needs of seniors. Seniors are found to be generally independent and rely mainly on auto usage to reach desired destinations at higher rates compared to the rest of the population. The majority of seniors reported although they are currently independent they do know that such independency is not permanent and they have to learn more about alternatives available to them. This study helps transportation engineers and planners in better understanding the current and future challenges that they will face with an aging population.

*Key words: seniors; accessibility; mobility; urban transportation.*

### Resumo

Os sistemas de transporte são construídos com a intenção de servir as comunidades, proporcionando acessibilidade e mobilidade. No entanto, os idosos que residem nessas comunidades enfrentam desafios diferentes em comparação com os passageiros regulares. Idosos têm necessidades especiais em termos de destinos desejados e desafios enfrentados devido a limitações em mobilidade e diminuição dos níveis de acessibilidade, onde eles residem. Na presente pesquisa discutimos as conclusões principais de uma pesquisa com questionários enviados por correio realizada em Hennepin County, Minnesota, para medir as necessidades atendidas e não atendidas de transporte urbano de idosos. Em comparação com a pesquisa anterior, este estudo utiliza dados primários coletados em vez de confiar em pesquisas com viajantes, que não medem as necessidades não atendidas de transporte urbano de idosos. Os resultados deste estudo é consistente em termos de medir o comportamento de viagem existente de idosos, o que aumenta nossa confiança na informação a ser recolhida relacionada com as necessidades não atendidas de transporte de idosos. Revelou-se que os idosos são independentes e se baseiam principalmente na utilização de automóvel para alcançar destinos desejados, em uma proporção mais elevada em comparação com o resto da população. A maioria dos idosos relatou que, embora sejam atualmente independentes, eles sabem que tal independência não é permanente e eles têm de aprender mais sobre as alternativas disponíveis a eles. Este estudo ajuda os engenheiros e planejadores de transporte para uma melhor compreensão dos desafios atuais e futuros que terão de enfrentar com uma população envelhecida.

*Palavras-Chave: idosos; acessibilidade; mobilidade; transporte urbano.*

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## 1. Introduction

Transportation systems are built with the intention to serve communities by providing accessibility (the ability to reach valued destinations) and mobility (the ability to move on the network) (Handy & Niemeier, 1997; Hansen, 1959). Limitation in mobility occurs when a person cannot move between an origin and desired destination because of external or individual factors; while limitation in accessibility is present with the absence of desired destination or limitation in reaching it using a certain mode. Limitation in mobility and accessibility may affect physical, social, and psychological well-being. Community transportation agencies aim to help special populations to overcome their limitations, increase their level of mobility, and provide them with the ability to access desired destinations.

This paper investigates the travel demands and activities (in terms of both actual behavior and unmet needs) of seniors residing or working in Hennepin County, Minnesota. A senior person is generally identified as a person of age 65 years old or older, yet in our study we kept identified seniors based on their affiliation to a senior organization and not merely based on age. In other words if a person associate himself to a senior center then to his mind he is considered senior and we should not be excluding him from our study. Hennepin County is part of the Twin Cities Metropolitan region. It includes 46 different cities, including the city of Minneapolis. Hennepin County is the largest County in the Twin Cities metropolitan region with a total population over one million residents. Hennepin County is mainly an urban region with some rural sections at the fringes. It has a mature transportation network for auto, transit, bicycle and pedestrians.

Previous research heavily depends on existing travel surveys when assessing the transportation needs for seniors. Meanwhile in this research paper we assess the transportation needs of seniors through the analysis of a mail out- mail in survey. The survey is designed especially to measure the difficulties seniors are facing in reaching desired destinations to conduct some kind of activity (work, shopping, recreation, social, education, medical, agency support, and personal business). We try to determine the unmet needs and wants of the targeted groups, e.g. what services they

want but are not presently being provided, what kind of destinations they would like to reach but are facing limitation in reaching it.

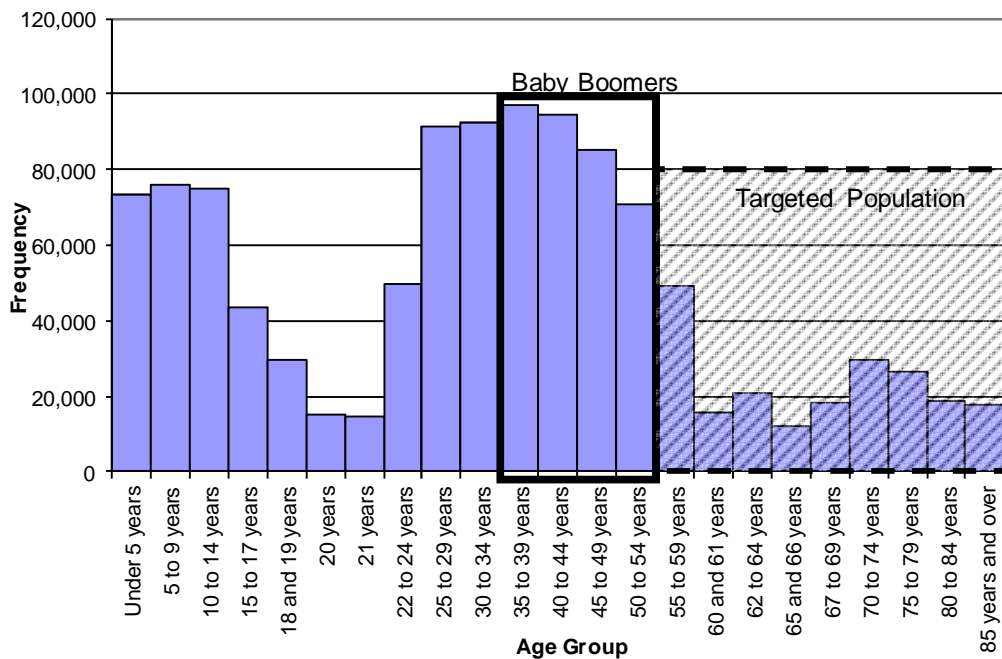
This research paper is divided into several sections, it first starts with a background section highlighting the importance of the studied research question and explains methods and findings from previous studies in this field. The second section includes definitions and the research design describing the survey instruments, methodology and data characteristics. The third section includes the analysis and discussions. Finally the paper ends with a set of conclusions derived from the analysis. The conclusion section includes several policy recommendations based on the analysis.

## **2. Background**

The baby boom began in 1946 and continued through 1964. During those 19 years, 76 million people were born in the United States. In the year 2006 the oldest cohort of baby boomers reached the age of 60. In Hennepin County baby boomers represent around 29.4% of the entire resident population. In Figure 1, a histogram shows the distribution of age groups in Hennepin County in the year 2000.

As observed from the histogram, by the year 2030 all baby boomers will fall under the most inclusive category of seniors (being 65 years or older). It is clear that a better understanding of the transportation needs of seniors is crucial before the shift in the population takes place. Hennepin County, the study area is highlighted in a context map of the Twin Cities region (Figure 2).

The majority of studies looking at the transportation needs of seniors use a subset of metropolitan travel surveys (data related to seniors) in their analyses (Alsnih & Hensher, 2003; Colli, Sharp, & Giesbrecht, 2003; Rosenbloom & Morris, 1998; Schwanen, Dijst, & Dieleman, 2001; Tacken, 1998). Travel surveys in general are not designed specifically to capture the unmet transportation needs of the surveyed population.

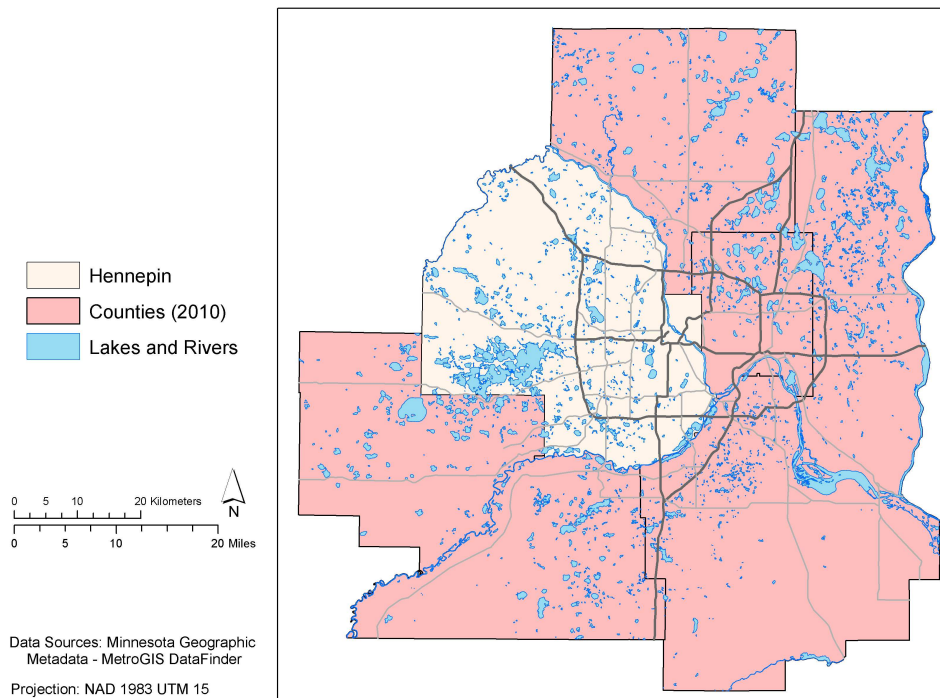


**Figure 1: Age distribution in Hennepin County, MN in 2000**

The everyday transportation system in the United States depends mainly on personal automobile, which causes a variety of problems for adults attempting to remain mobile and healthy into old age (Burkhardt, 2000). More often, seniors choose to reside in suburbs, and as they get older, both the proportion of seniors living alone and the proportion that have some kind of disability increase; hence, they are faced with the most intractable barriers to transportation (Burkhardt, McGavock, Nelson, & Mitchell, 2002).

Some of the studies using metropolitan surveys had some significant findings and many of them recommended using specialized surveys for seniors. Wachs (1979) who analyzed data from the Los Angeles Regional Transportation Study defines seven discrete seniors' lifestyle groups. Two of the mentioned groups had characteristics of a transportation disadvantaged population. A transportation disadvantaged group is a group of people who cannot fulfill all their transportation needs due to certain limitations. Hildebrand (2003) used a method similar to Wachs' to assign individuals to lifestyle groups based on socio-demographic variables and analyze how the groups differed from one another in travel behavior. Three of the six lifestyle groups can be classified as

having some kind of a transportation disadvantage. Accordingly the senior population includes both transportation advantaged and transportation disadvantaged people (Dickerson, et al., 2007).



**Figure 2: Twin Cities region map**

Schmöcker, Quddus, Noland, and Bell (2005) analyzed data collected in the London Area Travel Survey 2001. Across all models they found that increasing age results in fewer trips and shorter distances traveled. In the United States, using data from the Bureau of Transportation Statistics (BTS) *Transportation Availability and Use Survey*, Sweeney (2004) compared the travel patterns of seniors with and without disabilities to younger people with disabilities. The seniors with disabilities were found to leave their homes on average four days per week, less often than either the young people with disabilities or seniors with no disabilities. Tacken (1998) was able to analyze the Dutch National Travel Survey over time (1979-1994). A finding unique to the Netherlands was that car mode share declined steadily from age 55 onward, while bicycle mode share stayed relatively constant until age 75, then declined. Burkhardt (2000) notes that remarkable declines in driving begin around age 75. It is clear from all these studies that seniors

mobility declines with increase in age as well as their dependence on autos as a main mode of transportation.

A small percentage of seniors in general use public transit. Yet the percentage of public transit users among seniors is generally higher than the entire population, which can be related mainly to lower income and disability. Of the seniors with disabilities studied by Sweeney (2004), the number of those using public bus and paratransit service were relatively equivalent, to 5.8% and 7.2% respectively. Among the seniors with vision-impairment in Santa Barbara (Golledge, Costanzo, & Marston, 1996), half used the public bus, compared to 10% who reported using dial-a-ride service.

An Oregon Department of Transportation (ODOT) study, on the state's mobility needs, conducted a telephone survey of mobility-impaired residents (Oregon Department of Transportation, 1999). The study included both seniors and people with disabilities, across the state, with respondents stratified by size of community (large city to rural) and geographic area. To our knowledge it is a unique study in the transportation literature since it was designed for such a population and measured the unmet needs of this population. One drawback to the ODOT study is that it grouped the seniors and people with disabilities together under the unitary designation "mobility impaired" when analyzing the data. This hinders understanding that could be gained by dividing respondents into groups for analysis based on their specific travel limitations. The types of desired trip purposes reported speak to the "quality of life" aspect of mobility as described by Metz (2000). The latent demands of the respondents indicate that current transit services are not meeting their needs.

Burkhardt (2000) examined interview data from Maryland seniors residents. Participants were grouped in five-year age cohorts so that effects of age could be observed at a finer grain. This grouping method is the most comprehensive when studying seniors, since it differentiates them based on cohorts and stages in life. The US Census Bureau uses a similar cohort when studying various populations, yet when the numbers increase beyond a certain threshold they split the cohort into two groups (United States Census Bureau, 2000). A 5-year age groups are used to better explore the inherent diversity within the older population. This diversity is particularly

relevant in transportation studies because of the functional loss and increase in frailty that is a part of normal advanced age (Quadagno, 2004).

To sum up, the body of literature on seniors and transportation suggests that the aging population faces several challenges, due to their independence on car as main mode of transportation, which has a direct effect on their health. At some point in a senior life cycle he/she needs to switch modes or change their travel behavior. This switch is essential for seniors to help them in sustaining an active and healthy life. Studying seniors by age group is another important factor to consider.

### **3. Definitions**

There are many definitions of seniors in the literature. A person may be classified as a senior citizen based on one or more of the following criteria: age, retirement, and experience in life. In western society adults are typically declared to be "seniors" when they reach the ages of 60-65. In some research papers seniors are considered to be people who are retired no matter their age. Other researchers consider people who are aged 55 or older as seniors since they have a lifetime of experience that they can share with others (Tacken, 1998). This study targeted a sample of people who are affiliated to senior centers and contacted them through these centers. Accordingly the age definition is left open to capture all types of seniors mentioned in the previous literature and/or people who consider themselves as seniors due to their affiliation to these centers.

A transportation disadvantaged person cannot fulfill all his transportation needs without help either from family or society. Seniors in general includes both transportation disadvantaged and transportation advantaged people. The transportation literature concentrates on either group and rarely focuses on both. A transportation disadvantaged senior is more likely to be excluded from the society, which can affect his physical and mental well being. It is the society's responsibility to make sure a safe alternative for the every transportation disadvantaged person is present to make sure of his/her integration (Dickerson, et al., 2007). Accordingly in this research we try to measure the transportation needs of both transportation disadvantaged and transportation advantaged seniors in Hennepin County, Minnesota.

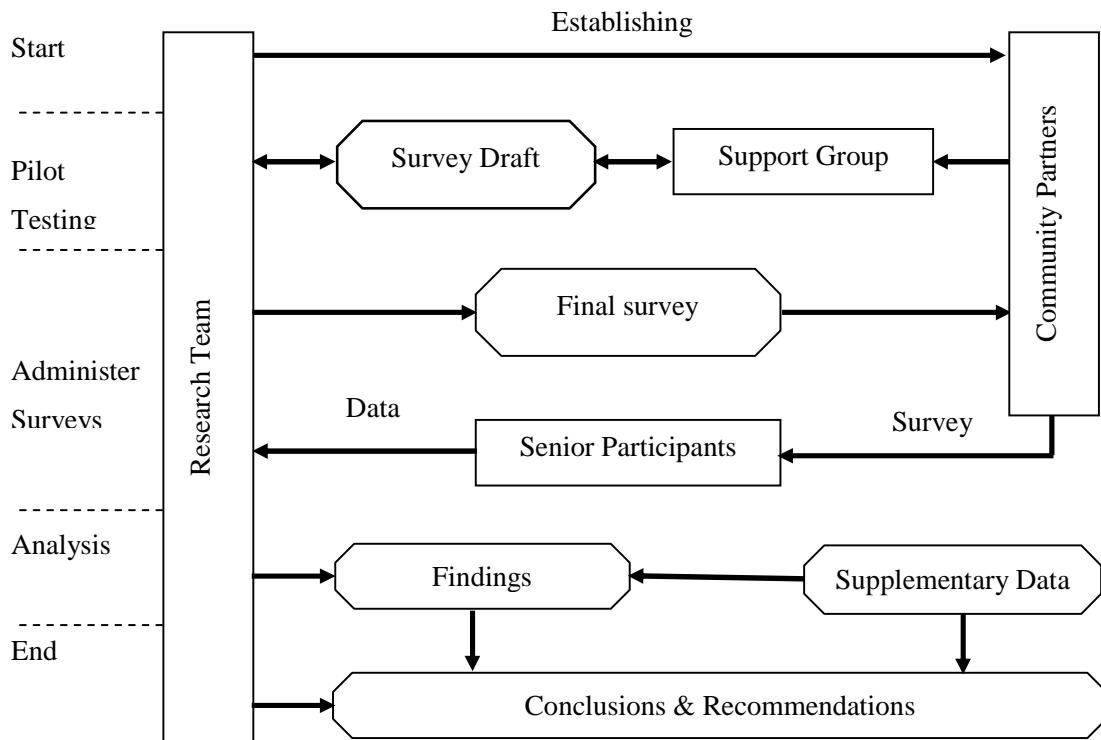
#### **4. Research design**

This research is a cross sectional study that deals with seniors as a group distinguished by their age. The available secondary datasets for example US Census data and metropolitan travel surveys are inadequate to help in reaching the goal of this research, accordingly conducting a survey and collecting primary data that measure the needs of this population is essential. The research team constructed a transportation survey to achieve the main goal of this study. Reaching only seniors to answer this questionnaire was accomplished through partnership with several senior centers (25 partners), residential communities and transportation providers serving them, where mailing lists and contact information are sustained (25 partners). These partnerships started with the early stages of the study, where several senior centers helped in reviewing the survey and organized meetings with seniors to conduct a pilot testing for the survey. The pilot testing took place at one of the senior centers during their monthly advisory committee meeting. This meeting included a group of 18 seniors and received back 12 completed survey packets. They were asked to fill the survey and return it, in addition to give comments on the design of the survey. After the return of the pilot testing surveys, the research team incorporated several changes to the survey to address the concerns and issues being raised by seniors who were part of the testing. In addition, meetings with the Technical Advisory Panel from Minnesota department of transportation and various experts in the field at various stages in the research process helped in crystallizing the ideas and polishing the survey and the research design.

The final survey was then distributed to seniors during the period from January to March of 2006, by the help of the community partners. The distribution of the survey to seniors varied based on the level of cooperation of the senior center with the research team. Some centers left the surveys at the front desk to be picked up only by visitors. On the other hand senior residential communities distributed the surveys by hand to all residents in their communities. The majority of the centers agreed to mail out the surveys directly to all seniors on their mailing lists and provided the research team with a support letter to be included in the survey packet. These centers added names and labels on each envelope by themselves and returned them to be mailed by the research team. Other centers did the labeling and the mailing by themselves. Finally all



surveys were returned by mail. Figure 3 outlines the flow of the research and the various phases that the research team passed through.



**Figure 3: Research design**

It is important to note that our sampling is biased towards the cities and areas where senior centers or community services agreed to help us, and also biased by the level of support we received from these centers in distributing the surveys. In addition the research team received several phone calls from seniors stating they do not have any transportation issues and they won't be filling and returning the survey.

## 5. Survey and response rates

The designed survey contained a set of quantitative and qualitative questions. The quantitative questions in the survey include standard information about demographic and socioeconomic characteristics (level of education, age, gender, income, housing, household information, and ethnicity). The survey also included questions trying to identify transportation modes and frequency of usage to reach various destinations. Travel/activity diary information recording every trip or activity undertaken by an individual over the course of the day is also included in the survey. This travel diary is similar to the travel diary collected as part of regular travel surveys.

The qualitative questions are directed to the travel and activities that the senior could and/or could not undertake. Meanwhile a set of supporting questions are included to help in explaining the purposes of these trips and why these trips couldn't be undertaken if this was the case. In addition, opened ended question is included at the end of the survey for seniors to report comments or concerns related to their transportation needs or limitations.

In total 8,003 survey packets were printed and distributed. This number was determined based on the number of surveys being requested by each partner for distribution. The research team received 951 returned envelopes. Only 854 surveys were completed by seniors or their guardians. The difference of 97 surveys came from seniors who either did not want to participate in the study or seniors who wrote comments related to their transportation needs but did not complete the actual survey. Some of the unfilled survey stated quotes like *"currently I do not have any transportation needs, I have my own auto and I drive, yet maybe in the near future I will have more needs."* It is also important to note that not all the filled surveys came back with completed travel diaries, indicating either no travel or a desire not to fill out the diary. The response rate of the travel diaries was lower than the filled surveys. The total number of returned and filled travel diaries was 775 surveys. In general a 10% response rate is considered acceptable due to the nature of the survey and the level of cooperation we received from senior centers. Some centers refused to send reminder cards, others rejected the idea of having incentives as part of the mailing, and finally some centers distributed the survey by hand at the front desk counters.

Also it is important to note that seniors with no transportation issues were less likely to respond to the survey, since we received notes and phone calls stating we do not have any transportation issues so we won't fill the survey. This bias is present in many surveys especially mail-in-mail-out surveys similar to the one that we have conducted. People who tend to have problems or issues are the ones who respond the most, followed by people who feel a sense of commitment to the community to give their opinion. A person facing no problems is less likely to respond or take the time to fill the survey due to time constraints.

## **6. Descriptive statistics**

The first step towards understanding the needs of this diverse population is to demonstrate the general characteristics of the sample. It is important to note that the findings of this study only represent the characteristics of the people who received the surveys and responded to it.

### ***Age and Gender***

Table 1 show the percentage of males and female in each age group, who returned the surveys (numbers are reported in parenthesis). As it is clear from Table 1 among the 854 returned surveys, 5 seniors did not report their age. Around 9% of the response came from seniors between 55 to 65 years old. Meanwhile 42% of the response came from seniors between 75 and 85 years old. Similarities in the distribution of the sample do exist between males and females in term of the response rates by age group. Around 64% of the males and 62% of females were between 70 and 84 years old. However, only 29.8% of the returned surveys came from males.

Comparing our sample to the overall population in Hennepin County Minnesota, it is clear that our sample is biased more towards females and seniors over 70 years old. Females over 60 years old represent 58% of the residents in Hennepin County, in our sample females over 60 years old represents around 70% of the sample. Also around 80% of the survey came from senior aging between 65 and 85 years old, meanwhile in Hennepin County this cohort represents only 65%. This bias in the sample can be related to the working status of seniors. The majority of surveyed population less than 65 reported work as one of their main destinations.

**Table 1: Response rate by gender and age group**

	Male	Female	No Answer	Total
< 60	5.88 (15)	2.88 (17)	0.00 (0)	3.75 (32)
60-64	3.14 (8)	6.27 (37)	0.00 (0)	5.27 (45)
65-69	14.51 (37)	14.92 (88)	11.11 (1)	14.75 (126)
70-74	18.43 (47)	19.83 (117)	11.11 (1)	19.32 (165)
75-79	23.14 (59)	21.86 (129)	0.00 (0)	22.01 (188)
80-84	22.75 (58)	19.83 (117)	33.33 (3)	20.84 (178)
85-89	9.02 (23)	10.85 (64)	22.22 (2)	10.42 (89)
90 +	2.75 (7)	3.05 (18)	11.11 (1)	3.04 (26)
No Answer	0.39 (1)	0.51 (3)	11.11 (1)	0.59 (5)

### *Education and Income*

Table 2 compares the level of education and household income, which are two factors that tend to be highly correlated. This table reports percentages, while actual numbers are reported in parentheses. Around 60% of the seniors who reported their income had a household income less than or equal to \$44,000 per year, while 12% of the seniors respond to the survey did not include their income. Meanwhile around 56% of the seniors who responded to the survey had an education level at Junior College or less. Only 19% of the respondents had attended 4 year college as their ultimate education level, while 23% of the respondents had a post graduate education. The majority of seniors with lower levels of education tend to have lower income levels.

**Table 2: Education and income**

	Less than High School	High School	Junior College	4-Year College/ University	Post Graduate	Total
Less than 25,000	81.25 (13)	46.00 (138)	40.85 (86)	18.56 (31)	15.42 (31)	33.02 (280)
From \$25,000 to \$44,999	6.25 (1)	28.67 (86)	28.66 (47)	35.33 (59)	18.41 (37)	27.12 (230)
From \$45,000 to \$74,999	6.25 (1)	10.00 (30)	12.20 (20)	23.35 (39)	30.85 (62)	17.92 (152)
From \$75,000 to \$99,999	0.00 (0)	1.33 (4)	2.44 (4)	7.19 (12)	13.43 (27)	5.54 (47)
From \$100,000 to \$199,999	0.00 (0)	0.67 (2)	2.44 (4)	6.59 (11)	5.97 (12)	3.42 (29)
\$200,000 or more	0.00 (0)	0.00 (0)	1.22 (2)	0.00 (0)	1.99 (4)	0.71 (6)
Total	1.88 (16)	35.37 (300)	19.33 (167)	19.69 (201)	23.70 (848)	

***Place of residence***

The place where seniors live can be used as an indicator to the level of independence. In the survey two questions were directed towards understanding where seniors reside and if they live with a relative or a non-relative. It is noted from the data that the majority of seniors reside in private homes or condos (70%), while 58% of people living by themselves reside in private homes. Meanwhile 57% of the surveyed population lives by themselves and 25% live with relatives. It is clear that the level of independence in living between the surveyed seniors tend to be high, yet still many live with others. The number of people responding to the survey living in group facilities is minor (1%). These findings are reported as percentages in Table 3, while the absolute numbers are reported in parentheses.

**Table 3: Where do you live and with who?**

	Yourselves	With relatives	With non-relatives	Both with relatives and non-relatives	others	Total
Private home, Condo	58.70 (280)	88.78 (182)	71.43 (5)	70.00 (7)	83.94 (115)	70.45 (589)
Apartment	32.91 (157)	5.85 (12)	14.29 (1)	20.00 (2)	4.38 (6)	21.29 (178)
Group Facility	0.84 (4)	0.98 (2)	0.00 (0)	0.00 (0)	2.92 (4)	1.20 (10)
Other	7.55 (36)	4.39 (9)	14.29 (1)	10.00 (1)	8.76 (12)	7.06 (59)
<b>Total</b>	<b>57.06 (477)</b>	<b>24.52 (205)</b>	<b>0.84 (7)</b>	<b>1.20 (10)</b>	<b>16.39 (137)</b>	

## 7. Analysis and discussion

In this section we mainly concentrate on displaying the major findings of the survey. In order to better understand the transportation needs of the surveyed sample, looking at some of the questions while controlling the age distribution. Controlling for age distribution is critical to understand the general trends and if there is a specific phenomenon associated with a certain age group of seniors. Previous research identified that senior travel market may be segmented and profiled with a combination of factors including cognitive age (Sellick, Discovery, & Nostalgia, 2004). First we concentrate on the travel diaries to obtain general trends in terms of trip purposes, and then we use this information in analyzing frequency of engaging in these trips through data obtained from the survey.

### *Trip Purpose*

Observing the purpose of a trip, in travel diaries, seniors reported shopping and social/recreational as the top two purposes for traveling. Trip chaining is noticed to be part of 35% (241 observations) of the travel pattern among the surveyed sample who answered this section of the travel diaries (674 observations). This indicates that these engage in multiple activities after leaving home. Table 4 shows the trip purpose as reported by seniors. To account for trip chaining in the survey the research team asked each senior to report up to 4 trips he made during the past day. These trips are reported in Table 4 as Trip 1 through 4, where Trip 1 is the first trip in the day that this person made and Trip 2 is the second and so on.

**Table 4: Trip Purpose**

	Trip 1	Trip 2	Trip 3	Trip 4	Total	Percent
Home	4	119	98	86	307	9.90%
Medical	85	37	16	10	148	4.77%
Work	39	7	7	3	56	1.81%
School	8	1	3	1	13	0.42%
Shopping	114	149	81	40	384	12.39%
Social/Recreational	141	107	55	30	333	10.74%
Religious	60	15	15	8	98	3.16%
Personal Business	45	33	24	19	121	3.90%
Other	178	108	92	44	422	13.61%
No Answer	101	199	384	534	1218	39.29%

It is not surprisingly that social and recreational trips contribute to around 10% of the total trips. Several studies concentrating on seniors travel behavior uses social and recreational trips (leisure) as their main point of interest when studying the transportation needs of seniors (Horneman, Carter, Wei, & Ruys, 2002; Schwanen, et al., 2001; Sellick, et al., 2004; Stamatiadis, Leinbach, & Watkins, 1996). As it is seen here leisure trips are important, yet other activities such as shopping is important as well to seniors.

### ***Frequency of Trips***

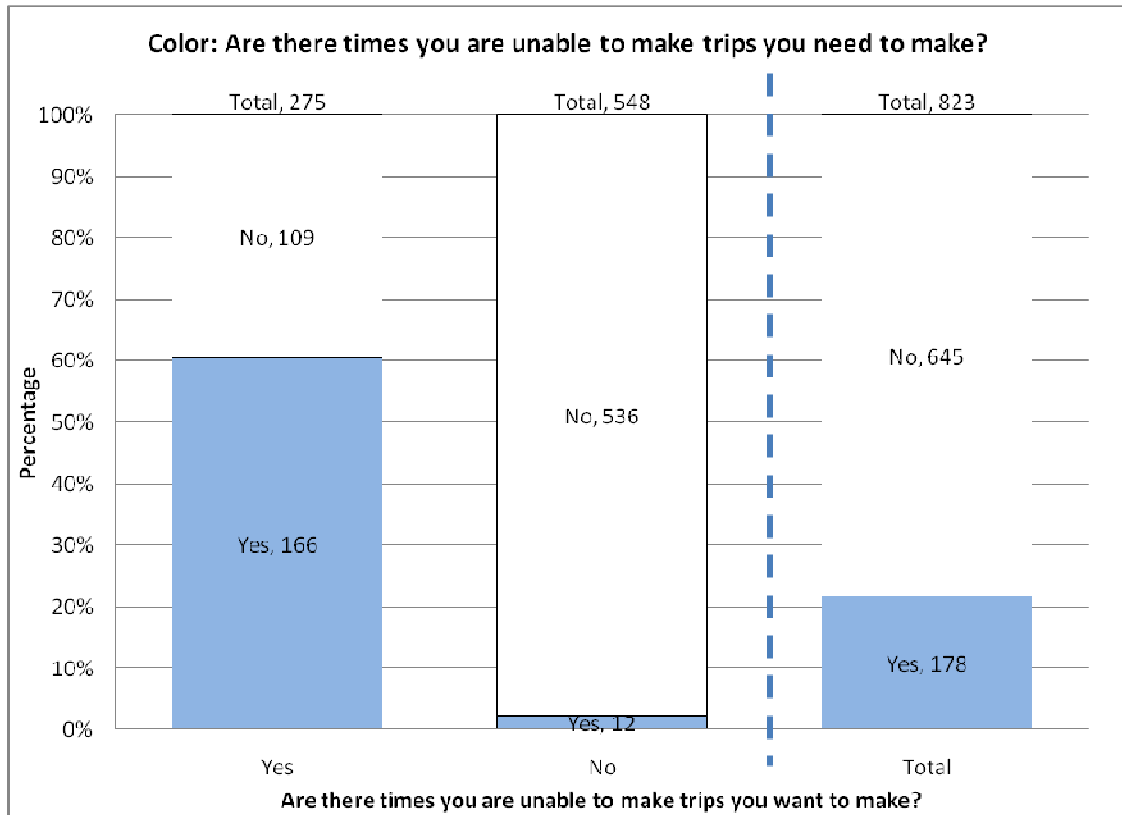
Around 390 seniors reported in the survey that they engage in shopping activity at least two to four times per week. However, seniors between the ages of 80 and 84 years old go shopping at least once a week compared to the other age groups. Other (non-shopping) activities indicated a similar pattern. Accordingly trip frequency tends to decline with increase in age.

### ***Travel Needs***

Two questions are used to measure if the transportation needs of seniors are being met. In the survey we ask seniors if there are times when they cannot make trips they need to make and asks them if there are times they cannot make trips they want to make. Figure 4 shows the relationship between these two questions. The x axis represents the answer for the question asking about the trip a senior want to make. The colors in the figure represent the answers to the question related to the trips seniors need to make. A total of 536 seniors responded “No” they can make both the trips they want to make and the trips they need to make. This number represents 62% of the surveyed sample. Meanwhile 166 seniors responded yes they are facing problems in doing both trips they need to make and trips they want to make.

The number of people responding “No” to the question asking about trips you need to make and “Yes” to the question asking about trips you want to make was 109 seniors. The overall trend in the entire population was around 35% who had trips they want to make and could not make. It is important to note that in the age group between 85 and 89 years old around 45% of seniors responded yes there are trips they want to make but they could not make. This clearly indicates a decline in the level of independence by seniors in older age groups that limits them from reaching desired destinations. While the eldest groups 90 plus had limited needs accordingly they did not have a lot of trips they want to make but could not make.





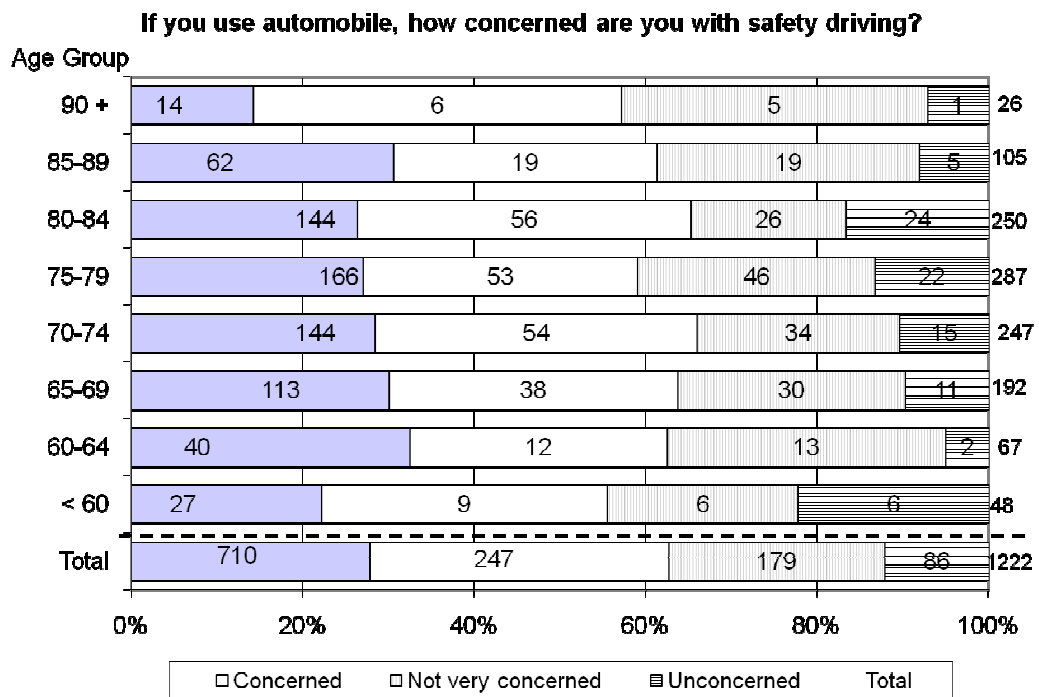
**Figure 4: Trip Needs**

***Difficulties***

Questions asking about difficulties seniors face when using public transit concentrated mainly on the physical difficulties. For example moving, standing, walking to the bus stop, climbing stairs, and reading route numbers. Around 24% of the surveyed population indicated they are facing some kind of difficulty if they use transit. Difficulties in standing were present among all age groups. Around 18% of the surveyed sample indicated having difficulties in standing. Difficulty in walking was around 10% of the surveyed sample. On the other hand, around 18% of the surveyed sample reported having difficulty in climbing stairs. Accordingly using public transit as an alternative mode for seniors is good only for 76% of the studied population.

**Concerns of Auto users**

Similar to previous studies (Alsnih & Hensher, 2003) driving an automobile was observed to be the main mode of transportation for most seniors. As shown in Figure 5 more than 60% of the seniors indicated that they are either concerned or very concerned about the safety of driving.



**Figure 5: Safety concerns of senior drivers**

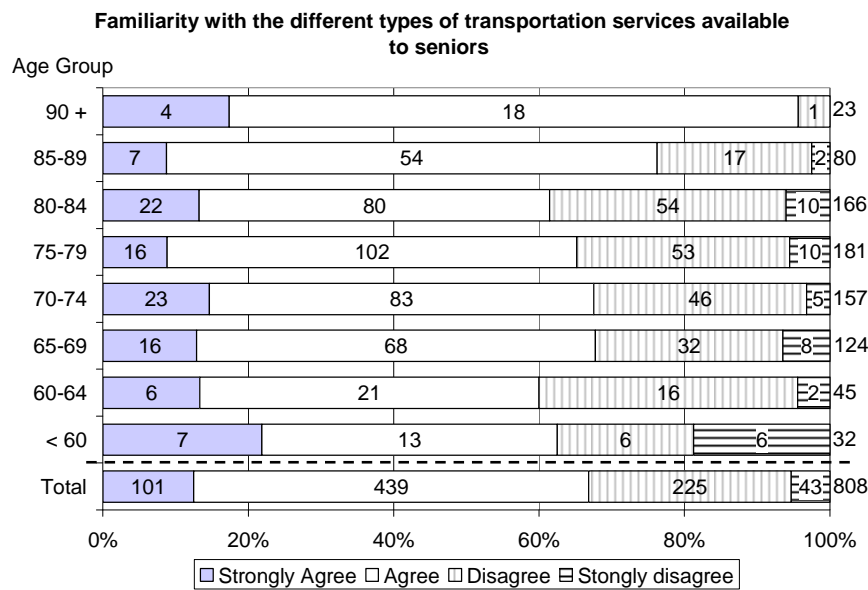
Seniors were less concerned about parking; around 55% of the total population indicated they are concerned or very concerned for finding the appropriate parking space. Meanwhile only 40% of the surveyed seniors reported being concerned or very concerned with travel time. This finding indicates the high levels of dependence on the auto among seniors as the main mode of transportation.

### *Concerns of Transit users*

Public transit was the second-most used mode of transportation for seniors. Around 51% of the surveyed population were transit users, 45% of them reported having some difficulties when using transit. Meanwhile around 49% of the transit users said that they are either concerned or very concerned about being a victim of a crime when using public transit. Around 48% of the surveyed sample reported being concerned or highly concerned with the time being spent at the bus stop. On the other hand only 33% of the surveyed seniors were concerned with travel time. This can be due to the nature of the desired activities that seniors are interested in reaching.

### *Familiarity with Services*

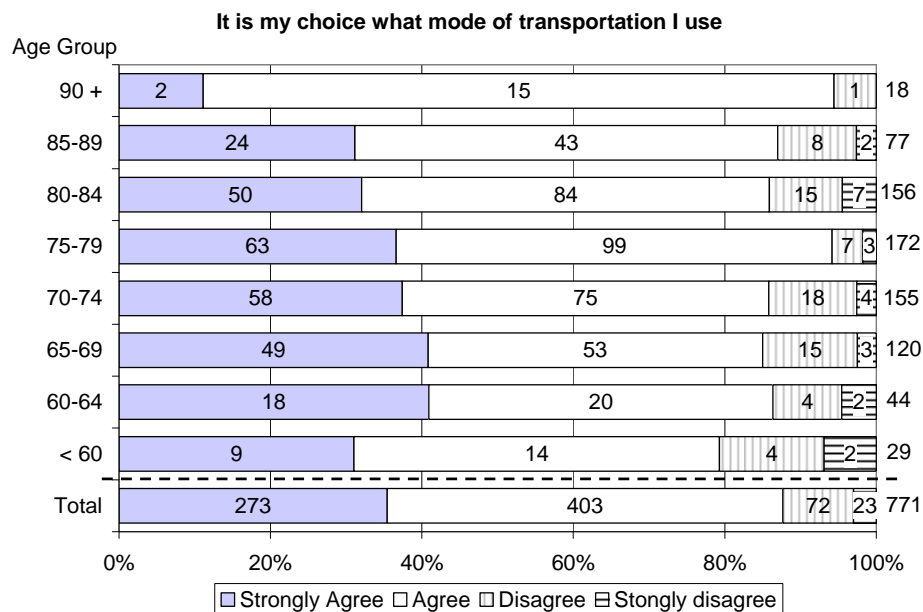
As it is clear from Figure 6 around 65% of the surveyed sample indicated being familiar with transportation services offered to seniors in the Twin Cities. Meanwhile 35% of the surveyed sample indicated that they are not familiar with these services, which indicates that more work is needed in promoting the services to seniors. It is noticed that paratransit is being used by only 15% of the surveyed sample. It is observed that more than 55% of the surveyed sample have used Metro Transit (the local transit provider in the Twin Cities region) either buses or light rail at some point in time as a mode of transportation. Looking at the older age groups 85 years old and older we notice that the percentage of people who used Metro Transit declines compared to the other age groups.



**Figure 6: Familiarity with services**

***Independence***

Independence in transportation use is measured directly through asking questions related to what extent seniors consider themselves independent travelers. More than 92% of seniors agreed that they were independent travelers. The levels of independency of each age group tend to decline with the increase in age. Survey respondents younger than 60 years old are considered as an exception to this observation. This group is younger than the typical retirement age used in the majority of previous studies. They have additional difficulties, which is why they are affiliated with senior centers. As shown in figure 7 around 88% of the surveyed sample agreed that it is their choice which mode of transportation they use. About 80% of the surveyed sample had a valid driver’s license. Only 12% of the people who considered themselves independent travelers are non-auto users. 90% of the population who filled the survey admitted not driving would limit their independence. Only 65% of the surveyed sample responded that they do agree that using public transit would increase their level of independence.



**Figure 7: Mode choice for seniors**

***Travel Barriers***

The travel diaries included a question asking seniors about the trips they want to make but they could not make. Only 17% percent reported at least one trip they wanted to make but could not make it (104 seniors compared to 605 filled diaries). This number is generally high and indicates a transportation challenge that seniors are facing and cannot overcome. Such number is expected to increase in the future with the increase in the number of seniors and amount of limited resources dedicated to them. Meanwhile 5% of seniors who filled the travel diaries had at least two trips they wanted to make but could not make, while only 3% of seniors could not make three trips they wanted to make. Finally only 2% of seniors who filled travel diaries had at four trips they wanted to make but they could not make. Medical, shopping, and social/recreational were the most trips that seniors could not make.

There were different reasons why seniors could not make these trips, summarized in Table 5. The most frequently mentioned reason was weather, and difficulties in moving associated with snow.

It is important to note that the survey was conducted from January to March of 2006, when weather is occasionally disruptive and snow lingers on the ground for the entire season. No one available to drive was the second most widely cited reason why seniors could not make their desired trips and that there was no available vehicle.

Table 5: Reasons for not making a trip

	Trip 1	Trip 2	Trip 3	Trip 4	Total	Percentage
Change in Plans	10	4	1	1	16	9.30%
Could not Afford	3	0	0	0	3	1.74%
No Vehicle available	9	2	4	2	17	9.88%
No one available to drive	12	7	1	1	21	12.21%
Couldn't make dial a ride reservation	3	3	2		8	4.65%
Weather	11	2	1	3	17	9.88%
Health	6	1	1	0	8	4.65%
Other	46	20	11	5	82	47.67%

## Conclusion

This paper summarizes an 18 months study of the transportation behavior and needs of senior citizens living in Hennepin County Minnesota. Overall, most seniors responded to the survey remain largely independent, but many recognize and stated clearly in their comments that they know that this independence is not permanent.

The private automobile was found to be the main mode of transportation seniors tend to use to meet their transportation needs, followed by public transit. This finding is similar to recommendations done by previous research. Stern, Burkhardt, and Eberhard (2003) stated in their conceptual paper, on the future of transportation for aging population, that any transportation option for seniors should go beyond driving. Social/recreational trips, shopping, and medical are the three major destinations seniors tend to commute to more frequently compared to other destinations.

Seniors in the surveyed sample showed a willingness to use public transit more and indicated that they feel that using it will increase their independence. But since that service does not exist

around their homes or near their destinations they felt using it was not possible for the time being. This finding urges the need to promote more accessible public transit for seniors. Also a regular suburb to downtown bus service does not serve the needs of these seniors except if it passes by any of their desired destinations. The majority of the surveyed seniors reside independently in suburbs. Several scholars and legislators call for more coordinated special services for seniors, such as dial-a-ride (Sundeen, 2007). These services are well known to be costly and not every senior is eligible to them. Also these services isolate the seniors and people with special needs from the communities, which is the opposite of the recommendations being made by health specialists (Marmot & Wilkinson, 2005).

Differing needs of assistance are observed among the younger and older age groups. Among the younger age group (60 years and younger) we suspect that the sample was biased towards people facing problems, perhaps including physical disability. Seniors on the other end of the age spectrum (90 years and older) showed more difficulties and problems compared to others as well. This is related to aspects of aging more than aspects of a sample bias. It is important to note that the sample is very small among these two age groups to derive a conclusion or to build a policy upon.

The following comment was common among hundreds of returned surveys and phone calls we received

*“I do not feel that I have transportation problems right now since I can still drive. However I feel I will face big problems in the near future when I stop driving.”*

Several seniors added some comments related to walking distance to and from bus stops and how far stops are either at origin or destination. One of the main findings of this research study is the need to educate seniors about available transportation options offered to them. This could be through presentations at senior centers and information included as part of newsletters to seniors telling them about alternative modes and eligibility to different types of services. Also educating seniors about points of attractions around their homes through providing maps highlighting major destinations and alternative modes to reach them is a key towards senior independence.

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