Older Adult Perceptions of Transit Security and Their Utilization of Public
Transportation: Ridership Strategies for the Elderly on Tren Urbano

by

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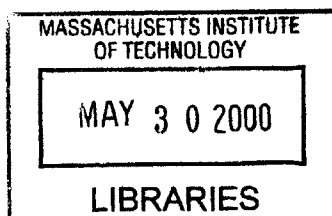
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ABSTRACT

One of the common consequences of aging is a reduction in the skills needed to drive safely. The best hope for successfully maintaining the mobility of older adults is to focus on expanding their travel options. However, past research has indicated that fear of crime is a major impediment to the use of public transportation by older adults.

This study surveys 182 seniors age 60 and over at eleven transit-accessible senior centers in the Boston Metropolitan Area. The centers were chosen for their diversity in terms of income, proximity to public transit, and level of transit use in the community. The objectives of the survey were to find out the frequency with which seniors take public transit; what they use it for; how they make mode choice decisions; the extent and cause of their public transit fear; and if their fear impacts their ridership patterns. The data was analyzed by using various statistical techniques: counts, averages, cross-tabulation, correlation coefficients, regression, and hypothesis testing.

The study shows that the vast majority of seniors have regular access to a private automobile either as a driver or a passenger. Nonetheless, many of the seniors take transit at least a few times a week, using the bus with greater frequency than the train. The elderly appear to value the convenience aspects of public transportation, including the schedule and service destinations over security. Overall, the seniors are not very afraid of crime in general or on public transportation, however they are more fearful of the train than the bus. They are most afraid of quality of life crimes, particularly pushing and shoving and teenager rowdiness.

The results from this survey are applied to Tren Urbano, the new urban heavy rail system in San Juan, Puerto Rico. While the seniors surveyed are familiar with the train, whereas those in San Juan are not, this study provides a general sense of the fears and motivations of the elderly with regard to public transportation.

Thesis Supervisor: Joseph F. Coughlin
Title: Acting Director, Center for Transportation Studies

This thesis is dedicated to the seniors who I met while conducting this research. They taught me more about life in a few months than I had learned in all my previous years.

The lessons I learned from the seniors have helped me to develop a relationship with my grandfather that I never would have known could exist.

Acknowledgements

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Chapter 1: Introduction

Background
Changing Needs of the Elderly

Our society depends largely on the automobile for personal mobility. Unfortunately, one of the common consequences of aging is a reduction in the skills needed to drive safely. The best hope for successfully maintaining the mobility of older adults is to focus on expanding their travel options. There are currently 8.4 million senior citizens 65 years old and older without drivers' licenses and many more who either feel uncomfortable driving or do not own a vehicle. [1] For elderly citizens who used to drive, parting with this freedom is seen as a major life crisis and a loss of independence.

The American Association of Retired Persons (AARP) believes that all levels of government should plan local and regional transit with the needs of the elderly in mind. The AARP estimates that more than half of the people over the age of 80 do not drive and further say that there are now five million older people whose transportation choices are limited and who rely more and more on public transportation. [2] As the elderly population grows, the number of people over age 80 will also continue to grow, increasing the number of older adults who are dependent on public transportation. Research has shown that the elderly use public transportation less than any other segment of our society with the exception of the very young. [3] In addition to lack of knowledge about public transportation, fear, and fewer places that they need to go, 21% of the elderly are handicapped which makes the physical barriers to transit even greater. [4] Mobility, however, plays an essential role in the lives of older people by providing links to services, opportunities, and facilities.

According to a 1999 study by the AARP, the percentage of Americans over the age of 65 has tripled in the last century, from 4.1% in 1900 to 12.7% in 1998. This is an increase from 3.1 million to 34.4 million people over the age of 65. Additionally, in 1998 there were many more people in the 85 and over age group than ever before (33 times the number in 1900). The number of elderly is expected to continue to increase, as seen in Figure 1.

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[1] Burkhardt. "Mobility and Independence: Changes and Challenges for Older Drivers," July 1998.
[2] AARP Website, www.aarp.org/ontheissues/issuetransport.htm, November 8, 1999.
[3] Patterson. "Fear of Crime and Other Barriers to Use of Public Transportation by the Elderly," December 1985.
[4] Ibid.

Figure 1: Number of Persons 65+: 1900-2030[5]
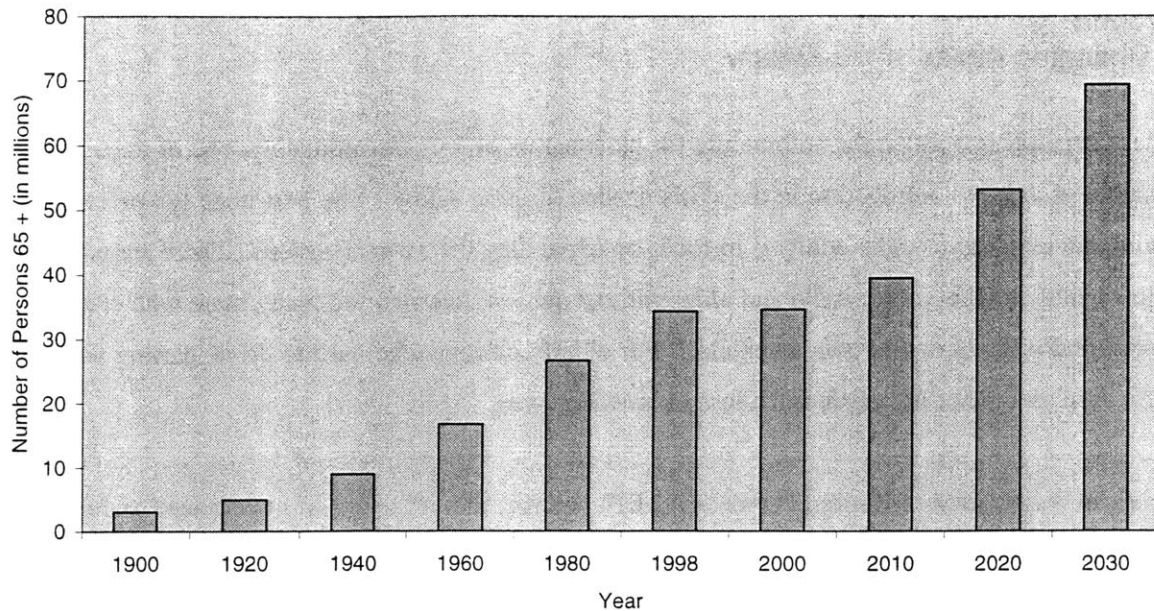
The rapid growth of the oldest segment of the population is creating special transportation challenges that were not designed for when our current transportation network was developed. A more critical look at how public transportation can be improved to better meet the needs of the nation's elderly population is necessary in order to better serve their mobility needs. Two ways that public transportation can become a viable option for seniors is by becoming (and appearing) more secure and by becoming more convenient for the elderly. It is therefore necessary to take a more critical look at how transit agencies can better accommodate the needs of older adults.

Security on Public Transit

According to the Federal Transit Administration's (FTA) Security Audit Program, the majority of U.S. transit agencies do not have existing formal evaluation programs to ensure that security procedures are current and that security systems are operable[6]. Audits showed that emergency phones, personal duress/panic and intrusion alarms are often inoperable or have not been tested. Additionally, it was found that security related procedures such as access (to the stations and to emergency exits within the stations), circulation control, and emergency evacuation procedures are often outdated and have never been evaluated by transit security personnel. The audit program recommends evaluating and testing these

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[5] Data for years 2000 – 2030 are forecasts.
[6] Aegir Systems. "Federal Transit Administration Security Audit Program: Lessons Learned," February 2000.

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security related procedures as well as recommending the implementation of formal crime prevention programs.

Security on public transit systems is a critical factor in ensuring the success of a public transportation system in terms of ridership, image, and long-term sustainability. Many riders and potential riders of transit systems include security as an important variable in their decision of whether or not to use transit. This fear of security issues, whether real or perceived, extends to all sectors of the population. To many, the transit environment is unfamiliar or uncomfortable, which can produce feelings of confinement, vulnerability, and intimidation. These feelings must be addressed by each transit system in order to reduce patron fear and to increase passenger confidence in public transportation.

Research has shown that security concerns have the most impact on the patronage of public transit by women, the elderly, blacks, and people of lower income and education.[7] The discrepancy between risk and fear in the elderly is commonly referred to as the "fear-victimization paradox," which has become a common theory because of high fear levels despite the lower victimization rates of the elderly.[8] One of the main reasons why considerable attention has been paid to crimes against the elderly is that their physical and financial losses from crimes tend to be higher than for other sectors of the population.[9] Additionally, because the elderly are one of the most transit dependent segments of the population, anything, including fear, that leads to the lack of patronage of public transportation, can have a major impact on their quality of life.

Objectives and Goals

Do seniors fear crime and does this affect their patronage of public transit? This is the central question around which this research is focused. For the purposes of this research, patronage is looked at in terms of frequency of use, mode, and trip purpose. Many studies have been conducted as to which socioeconomic and demographic characteristics cause the most fear of crime, but few studies relate that fear specifically to the use or lack of use of public transit. Additionally, most of the studies relating to public transportation focus on bus transit. This research aims to include more analysis on fear of crime specifically on rail rapid transit while also looking at the bus side of public transportation.

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[7] Levine and Wachs, "Bus Crime in Lost Angeles II- Victims and Public Impact," 1986.
[8] Zevitz and Gurnack, "Factors Related to Elderly Crime Victims' Satisfaction with Police Service," 1991.
[9] Clarke, "Victimization Among Elderly People," 1984.

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Previous research about crime and the elderly has many shortcomings : "...that age merely indexes those who have serious personal concern about crime and that neighborhood risk predicts concern, unfortunately bring us no closer to understanding the effect of fear on avoidance behavior among the old."[10] This effect on avoidance behavior, or what makes people avoid using what they fear, is what the survey conducted in this research seeks to determine.

One important outcome of this research will be recommendations to Tren Urbano, a new heavy rail system in San Juan, Puerto Rico, on how to make the system feel secure to elderly patrons. As in the U.S., Puerto Rico also has a large and increasing number of elderly citizens, with 9.2% of the population aged 65 and over, about the same as in the fifty states.[11] In order to accurately predict the impact and ameliorate the effects of fear of crime on patronage of Tren Urbano, it is very important to study the effect of fear on rail transit ridership. Fortunately for the rail system itself, police data and other studies indicate that the majority of reported transit crime happens on buses and at bus stops.[12] However, safety on the feeder network to Tren Urbano is as important as on the rapid transit part of the system, because in order to feel safe riding the train, passengers must feel safe getting to the train. Additionally, where transit crime occurs and where passengers are afraid are not necessarily the same place. Tren Urbano is a unique case because of the fact that Puerto Rico is an island, which means that many residents have never been to a city that has a rail system. This will greatly influence and most likely intensify the fear surrounding rail public transportation.

The ultimate objective of this research is to make justified recommendations to public transit agencies on how to better accommodate elderly passengers in terms of ensuring their comfort and security. This study does not look at the accessibility issues that are common to studies of the elderly and their public transport needs, but rather identifies issues that concern the personal security and convenience requirements of older adults. The results and recommendations of this research, much of which is based on Boston area data, are applicable to all transit agencies that want to make their service more amenable to the elderly population. While the elderly population in each city varies, the results obtained give a good idea of how seniors in any major metropolitan area may think and act.

[10] Janson and Ryder, "Crime and the Elderly: the Relationship Between Risk and Fear," April 1983.
[11] U.S. Bureau of the Census, 1990.

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The Survey

While much research has been done about the elderly and their fear in general, much of the specific transit fear data is limited to bus fear. While it looks at both train and bus fear, this study was aimed specifically at train fear and how fear impacts ridership. It also looks at how often seniors utilize public transit, what are their motivations for doing so, what their general fears are, and what their fears are of the transit system. It further looks into how their fear and demographic characteristics help determine their transit fear and identifies security measures that are most likely to make the older adult population feel secure and comfortable while using public transportation.

In order to obtain survey results from a wide range of seniors, surveys were conducted at ten senior centers that resulted in 182 usable surveys. While not every question on each survey was answered, there are a sufficient number of responses to each question to give accurate, statistically significant results. The survey respondents come from many towns in the Boston metropolitan area, representing seniors of various ethnicities, incomes, ages, and levels of education.

Use of Survey Results

The survey answers are analyzed by using various statistical techniques: counts, cross-tabulation, correlation coefficients, regression, and hypothesis testing. The answers are used to analyze seniors' motivations for using public transportation, how often they use transit, what their fears are in general and in relation to transit, and what measures can be implemented by transit agencies to increase their feeling of security. Using the analysis of the survey results and the findings from previous studies, recommendations are made as to how transit properties should address the needs and concerns of senior passengers.

Necessity of This Study

With the number of Americans over the age of 65 expected to double by the year 2030, managing their mobility is critical to the future of U.S. cities. The addition of new rail systems in many parts of the U.S. and the increasing number of elderly citizens dictates a new look at how rail transit can cater to seniors in terms of maintaining their security and making sure that the service is convenient to their needs. This study takes a new look at the impacts of fear on senior transit use, the mode choice decisions made by seniors, and the trip generation patterns for the ever growing part of our population over the age of 60.

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[12] Loukaitou-Sideris, "Hot Spots of Bus Crime," Autumn 1999.

Chapter 2: Literature Review

Background

Safety versus Security

Safety is a common performance measure for transit agencies, including the ubiquitous measure of mean miles between accidents. However, safety and security are not synonymous: safety implies freedom from accidental harm whereas security means freedom from intentional harm.[13] Security is often overlooked as a critical component of a successful transit system. In the case of New York City, lax security measures and poor measurements of security levels prior to the 1980s gave the New York City Transit Authority an infamous worldwide image of a dangerous system. One reason for the low level of security in New York was the use of "state of good repair" as a proxy for a safe and secure system.[14] This inappropriate basis upon which to gauge security led to a false sense of security by transit management.

Fear of Crime

The term "fear of victimization" is often used instead of the more conventional "fear of crime" because "an individual may fear 'crime' (or its consequences) without fearing personal victimization." According to some, the argument is not simply a "terminological quibble; the phrase 'fear of crime' has acquired so many divergent meanings in the literature that it is in danger of losing any specificity whatsoever.[15]"

As defined by Fattah and his colleagues, there are a number of experiential variables (significant encounters or experiences) that help define the extent of concern about victimization.[16] These experiential variables should be investigated when conducting studies on fear of crime in order to be able to truly assess concerns about crime. These encounters that help define fear of victimization are:

Victimization: Direct experience with crime may result in several emotional and psychological consequences, including the fear of crime.

Social Support and Social Integration: Individuals who are able to integrate themselves into social networks and derive support from their relationships with others reduce their fears of criminal victimization.

[13] Hathaway, "New York Metropolitan Transportation Authority Safety Investigation," June 1993.
[14] Ibid.
[15] Warr, "Fear of Victimization: Why are Women and the Elderly More Afraid?," September 1984.

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<u>Patterns of Exposure to Crime Information</u>: Mass media has a role in shaping the fear of crime. Since most people do not have direct exposure to crime, their fears are shaped through vicarious encounters through media, which are usually more sensationalist than what actually exists.

Fattah also defines perceptual variables that link the way people think about other things to the way they think about crime. These variables thus have an impact on an individual's fear:

<u>Beliefs about Crime</u>: Levels of fear about various types of crime.

<u>Psychological Malaise</u>: There are documented empirical relationships between fear of crime and uneasiness about personal or social conditions.

<u>Physical Efficacy</u>: Positive perceptions of physical health reduce anxieties about criminal danger.

Actual Crime and Public Transportation
Introduction

In the Federal Transit Administrations' National Transit Database, crimes are commonly categorized in three groups: (1) quality of life crimes (small crimes that degrade the overall quality of life and degrade the level of service of the transit system, including public drunkenness, vandalism, and disorderly conduct); (2) property crimes (including burglary, larceny, and fare evasion); and (3) violent crimes (including homicide, robbery, assault, and rape). [17] The majority of transit-related crime (64%) consists of quality of life crimes, with property crimes at 22% (80% of these are fare violations) and violent crimes at 14%.[18] However, the FTA's "Transit Security Handbook" from one year earlier than Reed's report indicates that on rail systems the violent crimes total only 7% of all crimes. It is unclear where this discrepancy comes from, especially given that rail systems experience more crime than transit systems overall.

According to the Federal Transit Association's 1998 "Transit Security Handbook," rail systems (heavy, light, and commuter) generally experience higher crime rates than bus systems, although crime reporting for bus operations tends to be less reliable than that for rail services. Because they provide shelter and in

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[16] Fattah and Sacco, "Crime and Victimization of the Elderly," 1989.

[17] Reed, "Transit Passenger Perceptions Regarding Transit-Related Crime Reduction Measures," January 2000.

some cities 24-hour availability, transit systems are a favored location for the homeless, panhandlers, and with increasing frequency, low-level drug dealers. The crimes committed by these groups within the transit system impact patron perceptions. Research also reveals that crime against passengers is much more likely to occur in a transit station or bus stop, rather than on a moving train or bus. The 1998 "Transit Security Handbook" points out that when comparing and contrasting crime level data between rail and bus systems, it is important to recognize that in many instances, it is difficult to employ security methods that address crime in just one particular mode. Because there are so many intermodal terminals, the FTA encourages agencies to implement the security from a "systems perspective," with the entire transit system in mind, thus increasing security levels within both modes of transportation.

One of the lessons learned about transit security from the FTA security audit program is that transit security managers lack accurate and timely information on transit crimes. This limits their ability to effectively allocate and assign their security personnel and other resources to reduce the occurrence of crime and to enhance the public's perception of transit safety[19]. The lesson learned is that accurate crime data is a critical tool for management's deployment of transit police resources. Therefore, the audit concluded that transit agencies should establish and maintain liaisons with local law enforcement agencies to obtain data and ensure uniform collecting and reporting procedures.

Quality of Life Crimes

There is further information on the types of quality of life crimes, which are the most common type and also the most likely to engender fear due to their prevalence. The FTA describes the following aspects of quality of life crimes and how they affect transit systems:

- The most common quality of life crimes are disorderly conduct and drunkenness, which account for nearly 80% of quality of life crimes on rail systems.
- Trespassing and loitering account for 9.5% of quality of life crimes.
- Most quality of life crime arrests occur on trains (62.2%) with a smaller percentage in transit stations (31.1%).
- Heavy rail systems have the largest number of disorderly conduct crimes, significantly higher than the rate experienced on other rail modes (mainly light rail and commuter rail.).

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[18] Ibid.
[19] Aegir Systems, "Federal Transit Administration Security Audit Program: Lessons Learned," February 2000.

- The rates of drunkenness and drug abuse violation were higher on light rail systems than on other rail systems.[20]

In interviews with transit riders and transit agency management, the FTA security audit team found that quality of life crimes were often ranked at the top of the list of personal concerns[21]. According to the audit team, every agency visited has implemented a "zero tolerance" policy, as success in controlling minor crimes often lies with the immediate and vigorous enforcement of quality of life crimes. When these small crimes are not enforced, the perception of crime by passengers can be exacerbated.

Property Crimes

The FTA also discusses property crimes in the "Transit Security Handbook." These crimes, which include pick-pocketing and purse snatching, have a direct effect on public transit patrons. Other property crimes, such as fare evasion, have indirect impacts on patrons, with higher fares in the long run if fare evasion is not controlled. Particular aspects of property crime as reported by the FTA include:

- Fare evasion accounts for over 80% of property crimes on rail systems.
- Theft and burglary account for less than 20% of reported property crime offenses
- Heavy rail systems experience a relatively high rate of fare evasion (180 per 10 million passenger trips).
- 80% of property crimes occur in stations (most of which is fare evasion).
- Only 11.4% of property crimes occur in rail vehicles.[22]

Violent Crimes

While many people avoid public transit due to fear of violent crime, there is generally very little violent crime in most transit systems. However, those violent crimes that are committed take significant time and resources away from transit police and security departments. Interestingly, while people tend to fear the enclosed spaces of heavy rail stations, there are actually more robberies and assaults on light rail than on heavy rail[23]. Particular aspects of property crime as reported by the FTA include:

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[20] Federal Transit Administration, "Transit Security Handbook." 1998.
[21] Aegir Systems "Federal Transit Administration Security Audit: Lessons Learned," February 2000.
[22] Federal Transit Administration, "Transit Security Handbook." 1998.
[23] Ibid.

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- The most serious violent crimes (homicide and forcible rape) comprise less than 1% of the total incidents of violent crime occurring on rail system property.

- Incidents of assault on operators and passengers account for almost 43% of the violent crime reported.

- Robberies, the taking of items and money from victims using violence or the threat of violence, are a significant problem on rail systems, accounting for 56.8% of violent crimes.

- Light rail and other rail systems [i.e. commuter rail] experience a higher rate of robbery and assaults than heavy rail systems.

- 65 percent of violent crimes occur in stations.

- 27.7 percent of violent crimes occur in vehicles.[24]

Perceptions of Crime on Public Transit

While studies say that the public transit system itself is more dangerous than the streets used to access the system[25], the same studies contend that most transit crimes go uncounted because of the recording practices for crime data, thereby making it nearly impossible to ascertain which aspect of the transit trip truly is more dangerous.[26] Additionally, different studies yield different results about whether citizens perceive the streets[27] or the actual transit system as being safer.[28] However, the significance of citizens' perception of transit crime as it relates to their ridership is extremely difficult to pinpoint as a result of lack of data, conflicts among existing data, and the extreme complexity of the motivations of human actions. There is also a lack of research as to what activities patrons perceive as criminal.

Despite the many ways that people think about crime, the jury is still out on whether the perception of safety affects actual ridership of transit. A Carnegie-Mellon University study done in 1975 stated that "it is readily evident even from the limited knowledge that exists that patrons' perception of transit crime significantly affects their daily ridership patterns." [29] After convenience and frequency, survey respondents ranked safety as their most important criteria in mode choice. The study by Levine and

[24] Ibid.
[25] Halloran, "When a Bus Ride Turns to Fear," Fall 1985.
[26] Ibid.
[27] Patterson, "Fear of Crime and Other Barriers to Use of Public Transportation by the Elderly," December 1985. Research for this study showed that elderly respondents found walking to and from the bus less fearful than waiting at the bus stop, though more fearful than riding the bus.
[28] Ibid. Citing another study by the Transportation Research Institute (1975).
[29] Carnegie Mellon University, "Security of Patrons on Urban Public Transportation Systems." 1975.

Wachs about bus crime in Los Angeles sites a number of other studies that showed varying results about how security factors in mode choice. For example, one study found that non-users were more concerned with personal security as a decision factor than were transit users. Yet more surveys showed high levels of fear about using public transportation among the elderly. One report showed that fear about personal security was the highest rated bus problem among a sample of Detroit riders and was the most important factor affecting the frequency of ridership.[30] A study in Los Angeles inner-city corridors cited "lack of safety" as the most important deterrent to using public buses[31]. In a Chicago Transit Security Study, 64% of the bus only riders, 75% of the rapid transit only riders, and 62% of those who ride both modes stated that there was a time when they would not ride the system due to security concerns.[32] Finally, a study of Michigan bus riders showed that although most people do not skip trips due to a concern for safety, "they regularly took more inconvenient routes in order to avoid what they perceived as unsafe areas or unseemly riders."[33] The study concludes that improved safety and perception of safety would improve the quality of the transit experience for these customers.

On the other hand, a study comparing Milwaukee, Washington, DC, Baltimore, and Chicago showed that patronage was unaffected by concern with crime, though 53% of the respondents had no other means of transportation.[34] A study in Milwaukee reported that respondents ranked crime as sixth out of eight variables influencing bus usage. This could, of course, be the reason for non-use, but there is not enough data to draw that conclusion.[35]

According to the Carnegie Mellon study, the clearest demonstration of the impact of perception of crime on a transit patron's riding behavior is the patron's decision of which mode to ride. Although there are no firm statistics on this, the Chicago study indicated that the rapid transit system was perceived as less safe than the bus system. This is an ironic finding in that other studies have found that the buses and bus stops actually experience more crime than do trains and train stations.[36] Altogether, most studies show that a patron's perception of crime depends upon their socioeconomic characteristics and when and where the patron uses public transportation.

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[30] Austin and Buzawa, "Citizen Perceptions o Mass Transit Crime and its Deterrence: A Case Study," January 1984.
[31] Loukaito-Sideris, "Hot Spots of Bus Crime," Autumn 1999.
[32] Carnegie-Mellon University, "Security of Patrons on Urban Public Transportation Systems," 1975.
[33] Reed, "Transit Passenger Perceptions Regarding Transit-Related Crime Reduction Measures," January 2000.
[34] Levine and Wachs, "Bus Crime in Los Angeles: II- Victims and Public Impact," 1986.
[35] Ibid.
[36] Loukaitou-Sideris, "Host Spots of Bus Stop Crime," Autumn 1999.

According to the Carnegie Mellon study there are three steps that should be taken in studying the relationship between the perception of crime and ridership: (1) know the relationship between actual crime on the system and the public's awareness of crime; (2) the public's attitude toward their perception of crime must be determined; and (3) it must be determined if the public's attitude toward crime affects its patronage of mass transit, and if so, in what way.

A comprehensive framework for classifying transit related crime was prepared in 1996.[37] The framework looks at violent incidents in and around transit vehicles and differentiates incidents by level of interaction between actor and target and by severity of outcome (damage or injury). This framework enables a full understanding of crime on transit in order to be able to implement good prevention and intervention strategies for dealing with transit related violence.

Crime and the Elderly

Because elderly people go out less and put themselves in fewer vulnerable situations, most studies claim that they are in fact victimized much less than younger people. However, elderly people tend to live in old neighborhoods that have deteriorated greatly over the years and now have a high rate of crime.[38] Many studies indicate that the risk of victimization decreases with age. However, partly because elderly victims are somewhat more likely to be alone, they do have high rates of crime that involve personal theft with contact (i.e., purse snatching and pick-pocketing).[39] There are studies that indicate a higher rate of criminal offenses against the elderly than against the population as a whole.

In reality, most studies agree that criminal victimization is relatively low in the older population, mainly because lifestyles present fewer opportunities for victimization[40]. In fact, one study states that the victimization rate for the elderly was lower than that of the rest of the population for all crime types (other than housebreaking).[41] Elderly women were least at risk, though they are the group most concerned by crime.

However, yet another study contends that of moderate to heavy bus riders, the elderly, along with women. Hispanics, and low-income persons, were more likely to be victimized than other demographic

[37] Hundenski, "A Typology and Analytical Model of Violent Incidents in Public Transit," January 1996.
[38] Brillon. "Victimization and Fear of Crime Among the Elderly." 1987.
[39] Fattah and Sacco, "Crime and Victimization of the Elderly," 1989.
[40] Ward. LaGory, Sherman, "Fear of Crime Among the Elderly as Person/Environment Interaction," 1986.
[41] Mawby. "Fear of Crime and Concern Over the Crime Problem Among the Elderly," July 1986.

groups.[42] In Los Angeles, the elderly appear to be more vulnerable to bus crime than other age groups.[43] For those elderly (age 65+) taking the bus daily, 29% were victimized between 1982 and 1984. Although the sample sizes are small, the consistency of change across all four age groups (18-29, 30-44, 45-64, 65+) strongly suggests that vulnerability increases with age. Women are also more likely to be victims than are men, totaling 69% of the victimized survey respondents. It should be noted, however, that women are also more likely to take buses. Even controlling for bus use, however, women were still more likely to be victimized more often. The most important factor in predicting actual bus crime victimization is frequency of use, followed by age. Elderly women and elderly Hispanics (of both sexes) were more likely to have been victimized. In a Philadelphia survey of the elderly, the majority of survey respondents ride the bus every day (39.5%) or several times a week (36.6%).[44] One in five respondents has been a victim of a crime, which is twice the national rate for the elderly. The primary place where the crimes occurred was on the street, followed by crimes at home, on a bus, and at a bus stop.

To explain the difference between their study and the majority of other studies that indicate the lower levels of crime against the elderly, Levine and Wachs contend that most transit crimes go uncounted because of the way information is recorded. They found that crime is much higher than previously documented, which skews crime statistics, especially for the elderly population. Their definition of transit crime included crimes that occur at bus stops, at the entry to a train station, or en route to or from a transit point (since all of these places are associated by the riders as part of the transit trip). When Levine and Wachs' study was first published, it was revolutionary in the field in that "it looked at bus crime from a new perspective- the rider's instead of the provider." [45] However, it is the general belief among researchers that the problem of crime and the elderly is primarily a problem involving fear of or concern with victimization rather than victimization itself[46]. This is still considered a large problem due to the fact that one's quality of life is still affected by the fear of victimization, whether or not the crimes actually occur.

According to a DOT-UMTA study in 1978, there is a latent demand for transit among the elderly. In fact, according to Cutler (1975), of those elderly with transportation, two-thirds had either stable or increasing life satisfaction, while of those without transportation, one-half experienced decreasing life satisfaction. These results were controlled for the effects of health, age, income, and gender. These results indicate

[42] Levine and Wachs, "Bus Crime in Los Angeles: II- Victims and Public Impact," 1986.
[43] Ibid.
[44] Patterson, "Fear of Crime and Other Barriers to Use of Public Transportation by the Elderly," December 1985.
[45] Halloran, "When a Bus Ride Turns to Fear," Fall 1985.

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that transportation, and in many cases public transportation, is partially responsible for ensuring a higher quality of life for senior citizens.

Main Fears about Transit by the Elderly Population

In a Philadelphia survey of elderly respondents, four main fear items exhibited weak but significant relationships as causes of decreased frequency of bus use.[47] These fears were seeing teenagers on the bus, walking streets in the respondent's own neighborhood, walking to or from the bus stop in the respondent's own neighborhood, and waiting at a bus stop in the respondent's own neighborhood. The survey did not ask about fear in other neighborhoods.

Another survey, conducted by the Southampton City Council in England, asked respondents why they feel unsafe walking in Southampton. Each of the following points represent a reason for fear on a different one of the footpaths and alleyways in Southampton:

- Drunks; poor lighting; few pedestrians; quiet; fear of attack;
- Closed in; no escape; poor visibility; narrow and unlit; fear of attack;
- Isolated; narrow, dark; 'seedy' area encourages loiterers; hiding places; bend prevents seeing either end;
- Too many bushes; no lights; lots of corners; kids hanging about;
- No lights; youths gather; hedges too high;
- Lights often out of order/vandalized: 'as soon as engineers get them mended they are broken again';
- Very large car park; poor lighting; too quiet;
- Badly lit; not maintained properly; young hooligans smash phone box; and
- Path obscured, out of sight; shrubbery.[48]

These points show some of the main causes of fear in walking, which is a large part of the transit experience. Based on these comments, some of the more common environmental aspects that caused fear include poor lighting, corners, bushes, and youths. Stephen Atkins, one of the proponents of designing for secure travel, summarizes that there are six general aspects that make places scary: activity, surveillance, visibility, environmental quality and design, graffiti and vandalism, and maintenance.

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[46] Janson and Ryder, "Crime and the Elderly: The Relationship Between Risk and Fear," April 1983.
[47] Patterson, "Fear of Crime and Other Barriers to Use of Public Transportation by the Elderly," December 1985.
[48] Atkins, "Critical Paths: Designing for Secure Travel," 1989.

Another study, conducted on the Philadelphia bus system, revealed the following general trends regarding elderly fears:[49]

- Buses are not frequent enough during the day and on the weekends;
- Buses are very dirty (unable to see out the windows);
- Buses are so crowded that elderly persons are afraid of being robbed or assaulted;
- Drivers are not sympathetic and patient;
- Elderly passengers are most fearful of crime in the afternoons (linked to the fear of teenagers).

It is interesting to note that the more frequent riders were more afraid of crime than the less frequent riders.

A 1979 study by Godbey et. al. surveyed over 2,000 elderly persons in northeastern cities in the U.S. to determine their fear of crime and the effect of this fear on the use of public recreation facilities. The study found that there was a lot of fear, particularly about: going out at night (feared by 51% of the respondents); groups of teenagers (33%); being robbed while away from home (25%); and being careful to avoid unsafe places (88%). Overall, more than 66% of the respondents said that they were afraid of crime.[50] Although the research was not designed to study the effects of fear of crime on transit ridership, the respondents' fears, when combined with their lack of use of public transit, appear to indicate that fear is a problem for the elderly transportation users.

Psychologists, such as Seligman (1975), have begun to recognize the importance of "perceived control" of the environment to people's sense of life satisfaction. This finding has been shown to be especially true among the elderly where aging contributes to both a real and perceived loss of control of their environment. By listening to the security concerns of the elderly that have been expressed in numerous surveys, transit agencies can make the systems friendlier to this important segment of the population.

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[49] Patterson. "Fear of Crime and Other Barriers to Use of Public Transportation by the Elderly," December 1985.
[50] Ibid.

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Unique Characteristics of the Elderly

Social Vulnerability

The elderly are socially vulnerable, particularly in the United States, in part because of the devaluation of aged roles in contemporary society[51]. The elderly are relegated to the margins of social life, leading to social isolation and perpetuating ageist attitudes and practices. This reinforces perceptions of the elderly as "culturally legitimate victims" of crime since for many in society, the elderly are viewed as "intellectually unfit, narrow-minded, ineffective, and ready to die momentarily[52]."

Crime engenders fear and has many personal implications, especially for the elderly who most often show a fear of crime. "Aging is a complex process that is as evident socially as it is individually, and the fear of crime seems to be connected with certain elements of this process."[53] The Canadian Urban Victimization Survey (1985) shows that the fact of being retired, of having lost one's mate, or being alone are factors that contribute to the sense of vulnerability felt by the elderly.

Fear of Crime

One research study concludes that the amount of fear experienced in the everyday lives of older persons has been overstated.[54] It says that when fear of crime is measured from specific types of crime rather than from a single indicator, it is often the younger persons who report being most fearful. A 1982 *ABC News* poll found that of seven crime situations (car or property vandalized, home burglarized, robbed on street, injured by robber, injured by burglar, being raped, being murdered) only two showed a reasonable linear relationship between age and fear of crime, and this relationship is a negative one. These two crimes which were more feared by younger people were car or property vandalization and rape. All other types of crime showed no statistically significant relationship between age and fear. Yet another study sums up the results of many other analyses by saying that age *per se* does not affect fear of crime. It is really the intermediate variables, such as social status, social interaction, and well-being that impact fear of crime.[55]

According to one study, among women, 60% of those 60 and over are fearful versus 48% of younger women; 17% of the elderly men are fearful as opposed to 7% of younger men.[56] Additionally, poorer

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[51] Fattah and Sacco, "Crime and Victimization of the Elderly," 1989.

[52] Ibid.

[53] Brillon, "Victimization and Fear of Crime Among the Elderly," 1987.

[54] LaGrange, "The Elderly's Fear of Crime," 1987.

[55] Baldassare, "The Elderly and Fear of Crime," 1986.

[56] Brillon, "Victimization and Fear of Crime Among the Elderly," 1987

people are more afraid of attack, as are those who live in large cities as opposed to the suburbs. Thus, older, poorer women who live in cities are the sector of the population that is most fearful.

Barriers to the use of public transportation by the elderly are both psychological (i.e., fear of crime) and physical (i.e., lack of shelter or benches at bus stops, steps are too high), but in general the elderly are not satisfied with public transportation.[57] Although the elderly are generally thought to be victimized less than those in other age groups, when they are victimized they may experience greater trauma, harm, and relative financial loss. These risks (both real and perceived) exacerbate their fear of crime. Low morale, which is common among the elderly, is also related to fear of crime. Of all the variables controlled for in one study (gender, homeownership, education, income, crime victimization, health, mental health, social life, housing circumstances, and community conditions), income was the only variable that negated what the researcher found to be a significant effect of age on fear.[58] In other words, controlling for income, the elderly have no more fear than others. However when controlling for all other variables, older age has a significant direct relationship with increased fear.

Fear of Crime and Activity Patterns

Some research indicates that although fear reduces the well being of the elderly, it has little relation to activity patterns. One survey of people over the age of 60 (sample size=1,185; average age 70.6; 61% female) in the Albany-Schenectady-Troy, NY, SMSA, only 4% of those surveyed cited fear of crime as a factor that limited their social activities.[59] Additionally, a survey by Peter Yin in a 1979 study of Ramsey County, Minnesota (St. Paul area), showed that fear of crime is not as big of a problem for the elderly as was once thought, and that recent studies as of 1982 do not show any relationship between fear of crime and social activities. In fact, only 4% of the 1,228 survey respondents also mentioned fear of crime as a conscious factor that deterred them from participating in social events.[60] Another book also supports this idea, based on the author's own surveys, saying that although the elderly are the age group most concerned about crime, crime is not one of their top concerns.[61] Instead, physical, psychological, financial, and family problems are all cited as more important problems. This does not necessarily mean that older adults do not change their modes of travel due to fear of crime.

[57] Patterson, "Fear of Crime and Other Barriers to Use of Public Transportation by the Elderly," December 1985.
[58] Baldassare, "The Elderly and Fear of Crime," 1986.
[59] Ward, LaGory, Sherman, "Fear of Crime Among the Elderly as Person/Environment Interaction," 1986.
[60] Yin, "Fear of Crime as a Problem for the Elderly," December 1982.
[61] Brillon, "Victimization and Fear of Crime Among the Elderly," 1987.

On the other hand, some observers say that in some American cities the situation of fear of crime by the elderly has reached "crisis proportions."[62] They say that elderly restrict their daily activities, particularly in high crime areas, a response that increases feelings of isolation and alienation.

Elderly Women and Crime/Fear of Crime

Due to the longer life expectancy of women than men (currently six years longer[63]), the majority of the elderly population is comprised of women. For this reason, it is particularly important and useful for this research to investigate fear of crime specifically related to women. "The Influence of Personal Security Fears on Women's Travel Patterns" is a paper based on two British surveys on security fears (British Crime Survey, BCS, and the Women's Committee of the Greater London Council, GLC) and another British survey done in Southampton that focused directly on transport facilities and particular modes of travel. The paper looks at the influence that women's fears of attack and harassment have on their use of transport facilities. The authors researched women's fears for a number of reasons: women's travel patterns are often different than men's due to the diversity of their roles in society; women have a "lower economic power"; fewer women have driver's licenses and access to cars; and women are more vulnerable to physical assaults and attacks.

According to "Women's Travel Patterns", more than 48% of females as compared to only 13% of males felt either a bit unsafe or very unsafe about walking alone in the dark. This is important because riding transit requires walking to and from stations and stops. Overall, travel in darkness was perceived as much more dangerous than daytime travel. In addition, 40% of women and 12% of men aged 70 and over felt unsafe, regardless of the area (inner city or elsewhere). However, the issue of walking alone in the dark rarely effects older adults, as they tend not to go out at night. The respondents of another survey of elderly people showed that the majority of the sample rode the bus mainly between 9:00 a.m. and 3:30 p.m.[64] Therefore, the responses by the age 70 and older respondents in the British surveys may not be based on actual experience of riding public transportation after dark but may be based more on perceived risk. In summary, both surveys used in the paper "Women's Travel Patterns" indicated higher levels of fear among young and elderly women. This seems to be related to perceived vulnerability, particularly for the elderly who are less able to counter attack and are more fearful in general.

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[62] Clarke, "Perceptions of Crime and Fear of Victimisation Among Elderly People," 1984.
[63] Seattle Times Website, www.seattletimes.com/news/health-science/html98/altheal_073098.html, October 21, 1999.

Actual Crime Around Rapid Transit Stations and Bus Stops
Introduction

Police data and other studies indicate that the majority of reported transit crime happens on buses and at bus stops.[65] In 1979, the Southeast Michigan Council of Governments (SEMCOG) conducted a study of fifty-seven U.S. transit systems. The findings of this study suggest that crime on transit systems, while generally lower than in the neighborhoods surrounding the system, "is a national problem of major proportion that cannot be ignored in terms of the seriousness and/or frequency with which offenses are committed."[66] Clearly, fear of crime at rapid transit stations is still a critical issue that affects people and may have an effect on their transit ridership.

Research has shown that fear of criminal victimization does not necessarily decline with a reduction in crime, though it does increase with a rise in crime[67]. This indicates a need to keep actual crime low in order to reduce fear and maintain and increase transit ridership. It is commonly believed that transit crime is quite persistent but is underreported in large urban centers. A study by Levine and Wachs ("Bus Crime in Los Angeles I: Measuring the Incidence") found that actual incidence of transit crime was 20 to 30 times greater than listed in the official reports. Other researchers agree with this argument because it is commonly believed that victims do not think that the police can find the perpetrators or recover stolen property. Thus, it is critical that the authorities do not ignore transit crime even if it appears on the surface to be at low levels. In fact, if the previous studies are correct, crime is higher than the police may think, which is of course dangerous and also discourages ridership.

There have been some studies of crime specific to neighborhoods adjacent to transit stations, and these studies will be discussed in the following sections. Table 1 summarizes the studies consulted.

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[64] Patterson and Ralston, "Fear of Crime and Fear of Public Transportation Among the Elderly," April 1983.
[65] Loukaito-Sideris, "Hot Spots of Bus Crime," Autumn 1999.
[66] Federal Transit Administration, "Transit Security Handbook," 1998.
[67] Henig and Maxfield, "Reducing Fear of Crime: Strategies for Intervention," 1978.

Table 1 : Studies of Crime near Transit Stops

City	Study Focus	Conclusions
Baltimore	Crime near stop before and after opening of the Metro system	Upward trend in crime, but inconclusive cause
Los Angeles	Types of land-use around high-crime bus stops	Negative land-uses were prevalent
Chicago	Crime near transit stops in high-crime and low-crime districts	Crime was more concentrated around transit stops in low-crime districts
Boston	Crime near transit stops in one high-crime district	Crime was more concentrated around transit stops

Baltimore

A study about the Baltimore Metro includes a review of crime statistics gathered for three years before the opening of Metro Section B and for three years after the opening.[68] The study indicates that reported crime is on an upward, though erratic, trend near these stations for most crime types. However, similar upward trends are true for the county in general, so the data does not indicate for certain that the increases in crime around the transit stations have to do with the transit stations.

Los Angeles

A study of high crime bus stops in Los Angeles looked into the land uses within 300 feet of the stops and found that there were many "negative" land uses, including: liquor stores, bars, check cashing establishments, "hot sheet" motels, single-room occupancy hotels, adult bookstores/movie theaters, parking lots, vacant storefronts or lots, and abandoned buildings.[69] The relationship of the last few of these land uses to crime is often referred to as the "broken window" thesis: when a broken window is left unrepaired, abandoned buildings dominate the landscape, or there is excessive loitering. This example sends a signal that social control is lacking in the area.

Chicago

A study of crime in four Chicago police districts showed that in the two low crime-rate districts, street robbery was concentrated near rapid transit stations, whereas crime was more dispersed in the high-crime

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[68] Plano. "Transit-Generated Crime: Perception Versus Reality-A Sociogeographic Study of Neighborhoods Adjacent to Section B of Baltimore Metro," 1993.

districts. [70] In the low-crime districts, all of the rapid transit stations were in "hot-spot" areas, or a 125-square meter area with the most concentrated occurrence of incidents (street robberies). In 2993 and 1994, while most of these crimes did not occur immediately outside rapid transit stations (due to too many potential observers), 39% of street robberies in the low-crime districts occurred within 1,000 feet of a rapid transit station. In addition, the volume of robberies was greatest during periods when fewer targets and observers were likely to be present. The authors of the study argue for problem-oriented policing of the areas near transit stations at all hours of operation of the transit system. They are also proponents of looking into allowing patrons to flag a bus or request a mid-block stop. Additionally, they say that the savings generated by eliminating late-night ticket-takers should be carefully weighed against the risks created.

Boston

Another study was conducted regarding crime levels around the T-stops that are within the Boston Police Department District 2, the Roxbury section of Boston. [71] Overall a high-crime area, these stops are: Mission Park, Fenwood Road, Brigham Circle, and Longwood Medical on the Green Line (light rail, street level stations); and Roxbury Crossing on the Orange Line (heavy rail, below-grade station). The number of crimes per acre around each transit stop was calculated and compared to the crimes per acre in the entire district. Overall, Brigham Circle has the highest level of crimes; its huge number of larcenies makes it much more crime ridden than the other stops. Mission Park also has a high level of crime, particularly in terms of assaults. The most intriguing point of the analysis, shown in Figure 2, is that around each stop the number of crimes per acre is greater than the average number per acre in District 2. The study also looked at the transit stops with relation to a smoothed map [72] of crimes per population. Although the stops are not located directly in the center of the areas with the densest crimes per person, they certainly are near to these areas of high crime. Of course, this exploratory research can not tell us if the stops are actually a cause of this high density of crimes per resident or if the stops are simply affected by this level of crime that is caused by some other risk factor.

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[69] Loukaitou-Sideris, "Hot Spots of Bus Crime," Autumn 1999.
[70] Block, "The Environs of Rapid Transit Stations: A Focus for Street Crime or Just Another Risky Place?," 1996.
[71] Blackman,. et. al., "Environmental Crime Analysis of the Boston Police Department District 2," May 1999.
[72] A smoothed map reduces the sharpness of change between areas of the map by making each data point an average of itself and the surrounding areas.

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Figure 2 : Crimes Within 100 meters of Transit Stops in Boston Police District 2
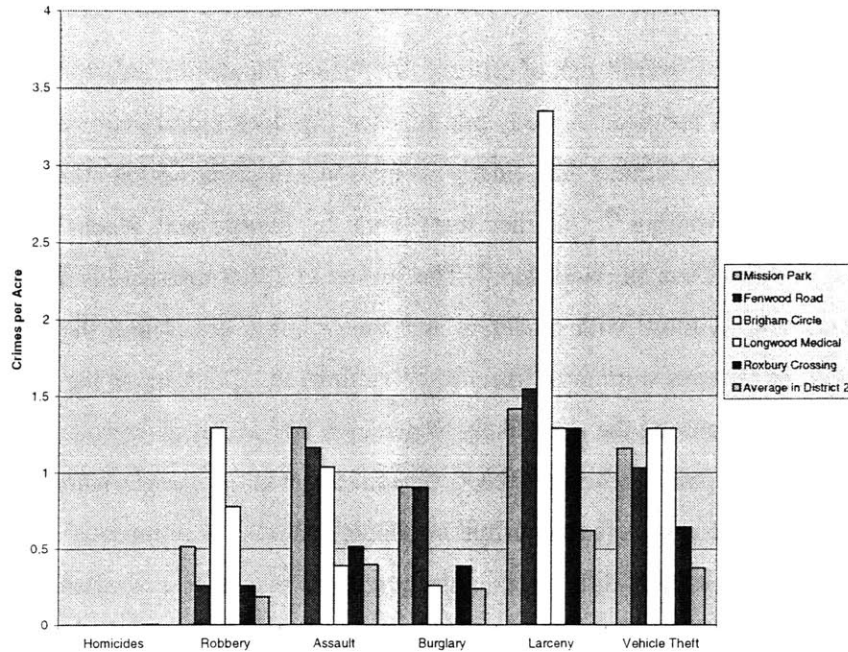
Effects of Fear on Ridership

A survey of passengers in Detroit that asked about ridership patterns and the perception of safety and victimization showed that there was substantial evidence that security concerns did adversely effect patronage[73]. Twenty percent of the respondents said they had not taken a bus because of safety worries. Also, women were somewhat more likely to view crime as the most important variable in determining transit use.

Another survey on the effects of fear on transit ridership was conducted in Philadelphia.[74] The respondents were all elderly, and the survey was focused on buses rather than the transit system as a whole (Philadelphia also has two rapid transit lines and eight trolley lines). The riders desired greater police protection and more dependable services in order to enhance their use of the transit system. It was found that fear variables could be used to predict bus usage, but the relationship was not strong enough to predict future ridership.

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[73] Austin and Buzawa, "Citizen Perceptions on Mass Transit Crime and Its Deterrence: A Case Study," January 1984.
[74] Patterson, and Ralston, "Fear of Crime and Fear of Public Transportation Among the Elderly," April 1983.

Demographic Explanations for Fear
Introduction

According to Fattah, the greatest overall risk of crime is for males, minorities, urban dwellers, the poor, and those who have never been married. A study that focused on black elderly concurred, showing that elderly men are more likely to be victims than elderly women for all crimes other than personal larceny with contact, such as purse snatching.[75] Another study done by Levine and Wachs looks at how the concern for personal security affects bus ridership.[76] The survey of 1,088 households in west-central Los Angeles, which looked only at those with moderate and heavy bus users, found that elderly, women, Hispanics, and low-income persons were most likely to be victimized. Contrary to the other two studies, this one found that women are among the most likely to perceive bus use as dangerous, as are Hispanics, persons of low education, and people who have been victimized or know people who were victims. In addition to demographic differences in fearing crime in general, there is a differential sensitivity to risk that is a function of age and sex-related differences in the perceived seriousness of offenses.[77]

In a study of Chicago cited by the Carnegie-Mellon study, the black, older, and lower income citizens had greater fears of crime but were "captives" of the system because they had no other transportation alternatives. The higher income white population cited security more often as the reason that they do not ride public transit. In a study exclusively of blacks, there were seven variables that showed a statistically significant relationship with fear of crime outside the home gender, loneliness, type of housing, length of residency, direct and indirect experience of victimization, and viewing news on television.[78]

Gender

Women and the elderly may be more fearful because they are less able to defend themselves and/or replace losses. While women and the elderly have lower victimization rates albeit lower exposure to risk, their victimization rates may actually be higher per unit of exposure.[79] There are theories, however, that men are victimized more often than women because of their "more active and dangerous social lives."[80]

[75] Joseph, "Fear of Crime Among Black Elderly," 1997.
[76] Levine and Wachs, "Bus Crime in Los Angeles: II- Victims and Public Impact," 1986.
[77] Warr, "Fear of Victimization: Why are Women and the Elderly More Afraid?," September 1984.
[78] Bazargan, "The Effects of Health, Environmental, and Socio-Psychological Variables on Fear of Crime and its Consequences Among Urban Black Elderly Individuals," 1994.
[79] Warr, "Fear of Victimization: Why are Women and the Elderly More Afraid?," September 1984.
[80] Killias and Kuhn, "Crime et Sentiment d'Insécurité au Troisième Âge," April/June 1990.

In fact, in 1998, males were victimized at significantly higher rates than females (43.1 victimizations per 1,000 persons age 12 and older for males versus 30.4 for females: a 30% greater rate).[81]

Of all modes of public transportation, women avoid using subways when they travel alone (30% did not use subways during the day and 70% avoided them at night).[82] Some suggestions for improvements included good sight lines, absence of hiding places and "dog-legged" passages, see-through subways and better lighting. Women felt particularly vulnerable while waiting for transport services as opposed to riding them. It is important to reduce fear about any aspect of the public transportation, however, because fear of any part of the process will lead to the lack of use of the mode as a way to travel.

It is important to note that the study of women's travel patterns advises that the actual frequency of crime is irrelevant to the survey, because it is the fear or apprehension of crime that actually influences travel behavior. Certainly, actual crime on a system affects the fear of crime as a result of the portrayal of the system by the media and word-of-mouth effects. However, if the actual levels of crime on transit systems are statistically controlled, it is the fear of victimization that is perceived by patrons that has the greatest effect on ridership.

Age

For certain crimes, such as begging, older adults (66+ in this study) had a much greater fear of begging than other age groups because they saw begging as a serious offense, perhaps as a precursor to a more serious crime.[83] In terms of walking alone at night, studies vary on how age affects fear. Brillon's study of adults in the United States and Canada indicates that fear increases with age, particularly between the middle-aged and elderly age groups. On the other hand, Killias and Kuhn's work concerning adults in Switzerland shows that for women (not men), fear decreases between the middle-aged and elderly age groups. Despite the inconclusiveness of the evidence on whether age is positively correlated with fear of crime, two trends have emerged. First, where a significantly high level of fear is expressed, this has almost always been characterized by more fear being expressed by older people. Secondly, even where age has not been a major predictor of fearfulness, a sufficiently large proportion of elderly respondents have expressed fear.[84]

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[81] Rennison, "Criminal Victimization 1998," July 1999.
[82] Lynch and Atkins, "The Influence of Personal Security Fears on Women's Travel Patterns," 1988.
[83] Warr, "Fear of Victimization: Why are Women and the Elderly More Afraid?," September 1984.

Despite the fear expressed by older adults, younger people are generally more often victims of crime as a result of their lifestyles.[85] In fact, violent victimization rates declined between 1997 and 1998 for individuals age 65 and older, from 4.4 incidents per 1,000 persons to 2.8 incidents, with the vast majority of those being "simple assaults."[86] Although persons age 65 and older comprise about 15% of persons age 12 and older, they report less than 7% of all victimizations[87]. As seen in Figure 3, the overall trend in violent crimes toward older adults has been decreasing since at least 1973. Unlike victims from the younger age groups, crime victims age 65 and older were more likely to be near their homes when the crime occurred. Additionally, they are more likely to be victimized during the day, since most elderly people stay home at night.

Figure 3: Violent Crimes Victimization Rate of Persons Age 65+[88]
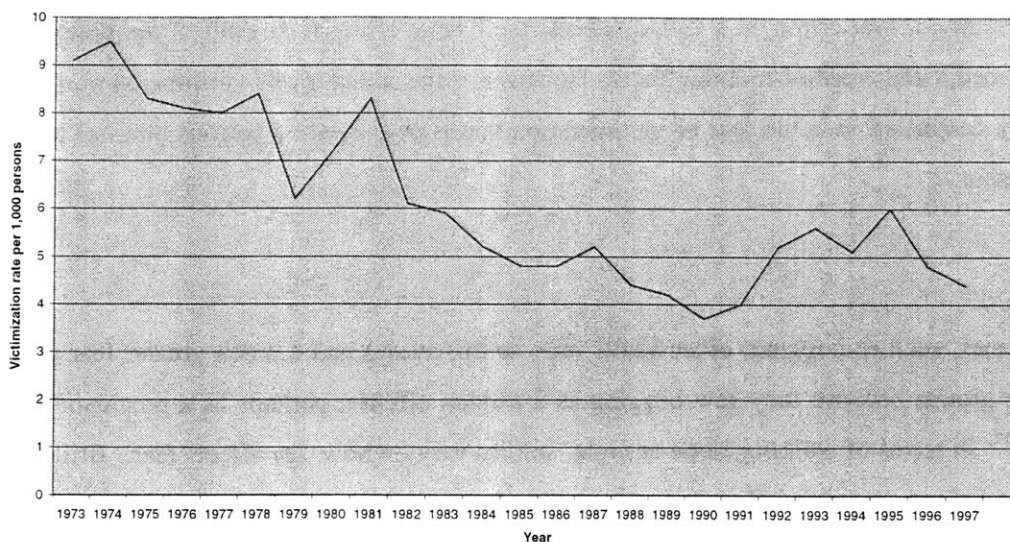
Marital Status

A study by Akers et. al. showed that elderly persons who had never married were the most fearful of all age/marital status groups. However, previous research implies there is no relationship between fear of crime and the elderly living alone, many of whom are the same people who have never been married.[89] The Bureau of Justice Statistics shows that in 1998, those who had never been married were the most

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[84] Clarke, "Perceptions of Crime and Fear of Victimization Among Elderly People," 1984.

[85] Killias and Kuhn, "Crime et Sentiment d'Insécurité au Troisième Âge." April/June 1990.

[86] Rennison, "Criminal Victimization 1998," July 1999.

[87] Klaus, "Crimes Against Persons Age 65 or Older, 1992-1997," January 2000.

[88] Perkins. "Age Patterns of Victims of Serious Violent Crime" for 1973-1994. 1995-1997 from Klaus, "Crimes Against Persons Age 65 or Older, 1992-1997," January 2000.

likely to be victims of violent crimes. After that, the rate of violent crimes decreased for the following groups respectively: those who were divorced or separated, married individuals, and widowed persons.[90]

Urbanization of Living Location

Fear of crime for elderly is lowest in rural areas and increases from suburbs to medium-sized cities to large cities[91]. This fear is consistent with the actual victimization patterns of rural residents having the lowest victimization rate, while urban residents have the highest victimization rate of these categories of urbanization.

Housing

There are varying beliefs on whether segregated or integrated housing makes public housing residents less fearful of crime. Lawton and his associates claim that older tenants who are segregated from younger tenants have less fear of crime than did those who are not housed apart.[92] Another study was done that focused on retirement communities rather than public housing.[93] This survey studied the effect that community setting has on victimization and fear of crime among the elderly. Interviews were conducted in four retirement communities, two age-homogenous and two age-heterogeneous. Although almost half of the respondents have some fear of crime, very few have a significant fear of crime. Additionally, the greater the concentration of elderly in a respondent's community, the lower the actual crime and fear of crime. This is counter to the commonly held view that age-heterogeneity in public housing results in lower levels of fear.

On the other hand, Normoyle says that once the elderly's relative group size is statistically controlled, segregation from younger generations is linked to higher fear.[94] The study shows that segregation is related to higher fear, lower satisfaction, and more extreme ratings of the severity of the local crime problem, regardless of the actual prevalence of on-site crime or whether respondents had any recent experience with victimization. It is this theory of increased fear with segregation of the elderly that is the most commonly accepted on the effects of segregation on fear.

[89] Akers. et. al., "Fear of Crime and Victimization Among the Elderly in Different Types of Communities," 1987.
[90] Rennison, "Criminal Victimization 1998," July 1999.
[91] Akers. et. al., "Fear of Crime and Victimization Among the Elderly in Different Types of Communities," 1987.
[92] Normoyle, "Fear of Crime and Satisfaction Among Elderly Public Housing Residents: The Impact of Residential Segregation," 1987.
[93] Akers. et. al., "Fear of Crime and Victimization Among the Elderly in Different Types of Communities," 1987.
[94] Normoyle, "Fear of Crime and Satisfaction Among Elderly Public Housing Residents: The Impact of Residential Segregation," 1987.

Competency

In one sociological study of the elderly, 62% of those in the high competence subgroup felt safe all the time as opposed to 50% of those in the low competence subgroup.[95] "High competence" was defined as those with no functional health limitations and with average or greater psychological resources. Other studies also indicate that poor health has been related to fear of crime.[96] Additionally, social resources (i.e., friends and neighbors) have little bearing on perceived safety. Finally, environmental characteristics (i.e., housing, urbanization) exhibit stronger associations with fear of crime than do personal characteristics (i.e. race, age), though this is more pronounced in the lower competence subgroup.

Race/Ethnicity

According to a study by Janice Joseph, elderly blacks have a particularly high fear of crime. Between 1997 and 2000, the elderly black population is expected to have increased by 46%, compared with an increase of 23% for whites. Elderly blacks are more fearful of crimes than whites because they are poorer and have less education.[97] Elderly blacks are also more likely than elderly whites to be victims of crime, which leads to a greater fear that is based on experience. These reasons lead to the conclusion that fear is based on a combination of environmental and personal factors that are characteristic of elderly blacks.

Joseph's study interviewed 119 Black seniors in Atlantic City, New Jersey. It is interesting that the males expressed higher perceptions of vulnerability. This is inconsistent with earlier research, perhaps indicating that for lower income groups, such as the participants in this study, men are more fearful of crime. Additionally, 83% of the males and 70% of the females had a high fear of crime- these percentages are much greater than those found in other research.

In 1998, blacks experienced marginally higher rates of violent crime than whites and significantly higher rates than persons of other races. Non-Hispanics and Hispanics experienced similar rates of overall violent crime in 1998, though non-Hispanics had a higher simple assault rate and Hispanics had a higher robbery rate[98]. These statistics indicate that blacks, including the elderly, are more likely to be victims of violent crimes and that Hispanics and non-Hispanics are vulnerable to different types of crimes.

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[95] Ward, LaGory, Sherman, "Fear of Crime Among the Elderly as Person/Environment Interaction," 1986.
[96] Akers, et. al., "Fear of Crime and Victimization Among the Elderly in Different Types of Communities," 1987.
[97] Joseph, " Fear of Crime Among the Black Elderly," 1997.
[98] Rennison, "Criminal Vicimization 1998," July 1999.
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Income

Violent crime rates vary inversely with income: as income decreases, violent crime rates increase. The same is true of fear: as income decreases, fear of crime increases. According to one study, only when income was statistically controlled did the elderly have no more fear than those of other age groups.[99] Because a greater percentage of the elderly than younger people have financial difficulties, the effect that income has on fear is exacerbated in the older population.[100]

Reducing Actual Crime
Introduction

Some studies have discussed measures to prevent transit crime. Four broad categories of crime countermeasures are: (1) more security and patrols; (2) use of technology (e.g., surveillance cameras, radio contact, emergency systems on vehicles); (3) better information (e.g., media campaigns, posters, help-line instructions, anti-drug messages); and (4) design actions (e.g., better lighting, recessed walls, platform layouts that increase visibility).[101] In addition to these four categories as defined by Loukaitou-Sideris, there is another category of crime prevention that utilizes community intervention and neighborhood programs to prevent crime. Transit authorities typically focus on the deployment of transit police and the use of emergency systems more than they use the other crime prevention measures.

Police and Security Officers

Most research regarding police and security officers looks at the impact that they have on reducing actual crime and making arrests. There is little research on the effects of police and security officers on passengers fear of crime, and almost no research specifically about how the presence of officers impacts fear of crime by the elderly. One item researched in a Detroit survey was the attitudes toward the plainclothes officers who rode buses in teams with a trailing car.[102] In the late 1970s, the Michigan Department of Transportation allocated $1 million for a one-year transit security program that emphasized teams of undercover officers in order to deter crime. The goals of the officers were to apprehend offenders and deter future crimes. In the long-term, they hoped to increase the perception of security on the system.

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[99] Baldassare, "The Elderly and Fear of Crime," 1986.
[100] Clarke, "Perceptions of Crime and Fear of Victimisation Among Elderly People," 1984.
[101] Loukaitou-Sideris, "Hot Spots of Bus Crime," Autumn 1999.

The operation included twelve teams of four plainclothes officers on the buses. The normal plan was to have three of the officers on the bus or at a bus stop with the fourth officer following in a trail car. The officers were in radio contact with each other and the trail car had communication with the police network. In most cases, the offenders were arrested upon alighting at a bus stop in order to maintain the hidden identity of the officers. Of those surveyed, 82% of those aware that the undercover operation existed believed that it was worthwhile. This is contrary to the hypothesis that the use of undercover police cause dramatic decreases in the use of public transit.[103] The Detroit survey also revealed the public's disapproval of private security officers. They were frequently rejected as being "unprofessional" or "not respected."

Another security plan was developed in Inglewood California by city management that assigned ten city police officers full-time to an anti-bus crime project.[104] Plainclothes officers as well as uniformed officers were used and have since made hundreds of arrests on buses and at bus stops in the three years following the development of the plan. It is unclear from the literature the impact of this program on the fear of the transit patrons.

Perhaps as a follow up to the security program in Detroit in the late 1970s, a special program was developed in Wayne County, Michigan, for giving gerontology training to law enforcement professionals[105]. The fifteen-hour course was given at the Detroit Metropolitan Police Academy in 1984 and 1985 and was run by the Gerontology Director at Wayne County Community College. The course covered five major units: overview of the needs of the older population; health and mental health of the elderly; communicating with older persons; supportive services for the elderly; and legal issues of the elderly. The project has become a model that is easily replicated by other law enforcement agencies. The participants of the Detroit program attributed an increased sensitivity to older people that hopefully will "encourage [the officers] to be more responsive to older people, thereby better meeting their specific needs," according to Esther Howell director of the Gerontology Program at the college.

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[102] Austin and Buzawa, "Citizen Perceptions on Mass Transit Crime and Its Deterrence: A Case Study," January 1984.
[103] Ibid.
[104] Halloran, "When a Bus Ride Turns to Fear," 1985.
[105] Wayne County Community College, "Gerontology Training for Volunteers and Professionals in Law Enforcement Agencies," 1985.

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It should be noted that a Canadian survey showed that the size of the local police force had no effect on the average fear of crime (correlation coefficient = 0.01).[106] While this is a statistic for the regular police force and not transit police, it gives an idea about the effect of the presence of police officers on peoples' fear of crime.

A final note about the use of different types and numbers of police officers in transit agencies is that the FTA security audit program suggests that for agencies that employ non-sworn law enforcement personnel, requiring prior law enforcement experience has resulted in the selection of more qualified candidates[107]. This improves the level of professionalism shown and the level of respect afforded to the transit police by local police departments.

Use of Technology

One type of technology based crime intervention technique is the use of emergency telephones. In a Michigan study the installation of emergency phones at bus stops is the most highly rated safety option for respondents in metro areas and large urban areas (other safety choices were more police, video cameras, driver alarm, increased lighting, driver training, and bus shelters).[108] The application of technology to crime prevention also has an impact on passengers' feelings of fear. If passengers do indeed feel unsafe taking public transit, safety options like emergency telephones and video cameras can make them feel more secure. Many passengers feel safer knowing that options exist for contacting authorities in the event of an incident. On the other hand, there are those who feel more worried when they observe many crime prevention measures because they see these as indications of a high level of crime. This research tries to address which of these two feelings is more prevalent, at least in the elderly population.

Information

The use of information to prevent crime includes things such as media campaigns, posters, and anti-drug messages. One example is a program involving school children and teenagers informing them of proper behavior while riding public transportation.

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[106] Krahn and Kennedy, "Producing Personal Safety: The Effects of Crime Rates, Police Force Size, and Fear of Crime." 1985.
[107] Aegir Systems "Federal Transit Administration Security Audit Program: Lessons Learned," February 2000.
[108] Reed, "Transit Passenger Perceptions Regarding Transit-Related Crime Reduction Measures," January 2000.

Better information would also be helpful in reducing anxiety among passengers, both by real-time information that lets passengers know of the vehicle location and also allows them to stay in their home or office until closer to the arrival time of the vehicle.

Environmental Design

There are a number of frameworks that can be used to reduce the opportunity for crime to occur. These aim to reduce actual crime and also reduce fears by making the environment seem safer. One such framework, Situational Crime Prevention (SCP), aims to reduce the opportunities for crime by changing the environment or context in which criminal activity takes place. Some examples include using public transport operating staff, installing surveillance and communication devices, designing for better visibility, promoting activity close to transport systems, and ensuring adequate maintenance.[109] According to Stephen Atkins, since the general public has no detailed knowledge of crime rates, "for those concerned with planning and design of transport facilities, it is public opinion and public perceptions of insecurity that are of greatest importance." This clearly is not the best way to approach design, as public opinions and perceptions are to some extent based upon the reality of crime rates in and around the transportation facilities.

Atkins proposes four general categories of solutions to the six threatening areas that he defined (activity, surveillance, visibility, environmental quality and design, graffiti and vandalism, and maintenance). The types of solutions he suggests are surveillance, environmental design and management, improved level and quality of service provided, and social-crime-prevention techniques. He says that if possible, activity generators should be located within or close to spaces that might otherwise be isolated in order to increase natural surveillance and discourage criminal acts. Activities can also be concentrated by reducing the number of cars on trains at night and closing off less frequented passageways into the stations. It is also important to ensure that travelers can both see and be seen. The environmental design should encourage respect from users so that people using the place will be satisfied and less likely to require formal policing. In addition, an environment that is respected by users will have less trash and graffiti, leading to a safer feeling of the system. Of course, one way to reduce the anxiety of being assaulted and harassed is to improve both the level and quality of service provided by public transport (by reducing waiting times, often the scariest part of the transit experience). Naturally there are limitations to situational crime prevention, including the feeling that increased formal security measures can create a "more closed and

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[109] Atkins, "Designing for Secure Travel," 1989.

hostile environment." Even worse, crimes may not be prevented but merely move in time, location, and nature.

Another way to achieve the objectives of crime prevention is through "Crime Prevention Through Environmental Design" (CPTED). This method, very similar to those in the SCP approach, suggests designing streets and buildings [and transit stations and facilities] in order to take the problem of crime into account. This should be enable the construction of a community setting in which people feel safer and are safer.[110] One of the basic ideas of CPTED is "defensible space," which describes an environment that exhibits physical characteristics allowing residents to assume primary authority for ensuring their own safety. One researcher argues that defensible space displays three characteristics: territoriality, surveillance, and proper location.[111] Territoriality is defined as "the capacity of the physical environment to create perceived zones of territorial influence." The sense of ownership will make groups more likely to protect "their" space against criminals. Natural surveillance is "the capacity of the physical environment to provide surveillance opportunities for residents and their agents." Proper location involves being near "safe zones," or clean and well maintained areas.

Some examples of CPTED are the installation of streetlights and the removal of obstructing hedges and other barriers. CPTED initiatives require that physical space be designed in particular ways and also that it is used in certain ways by residents. According to Fattah, age-segregated housing for the elderly is an example of CPTED that reduces crime through the creation of defensible space, though as was discussed earlier, age-segregated housing is not unanimously thought of as a fear reducer. Despite all of the positive outcomes of CPTED, not all studies indicate that this tactic is always successful. For example, planners in the 1950s and 1960s found that new buildings, extra police, and improved street lighting did not deter crime from problem areas and did not reduce fear. In fact, people were more afraid than before the changes were made.[112] However, a study in Michigan revealed that the second most desirable option for improved safety would be increased lighting at bus stops.

Neighborhood and Citizen Intervention

DuBow and Emmons characterize the general principles of crime prevention strategies as follows:

[110] Fattah and Sacco, "Crime and Victimization of the Elderly," 1989.
[111] Loukaitou-Sideris, "Hot Spots of Bus Crime," Autumn 1999.
[112] Krupat, and Kubzansky, "Designing to Deter Crime," October 1987.

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- Neighborhood residents can be mobilized by community organizations to participate in collective crime prevention projects.

- Involvement in these activities creates a stronger community because people will take greater responsibility for their own protection and local problems, and , interactions among neighbors will be increased, both formally through the activities of the crime prevention projects, and informally, as by-products of these activities.

- A stronger sense of community and increased social interaction leads to more effective informal social control.

- Aside from the direct effects of community crime prevention activities in reducing crime or the fear of crime, these activities may also reduce crime or the fear of crime by rebuilding local social control in the neighborhood. [113]

Some of the crime prevention strategies include neighborhood watch and other "block programs" initiated by the police. Studies suggest that efforts should be made in neighborhoods and communities to integrate senior citizens in crime prevention programs. The studies say that by being involved and having a sense of being capable to prevent crime, seniors' fear of crime will lessen. Further, seniors should be made aware of the considerable role they can play in the surveillance of their neighborhood, as they are often home and can serve as additional watch for the police. In the United States, "seniors are often given identification cards, window stickers and even portable radios to enhance their willingness to protect themselves and become ubiquitous witnesses."[114] It is unclear, however, of the extent to which these programs are effective.

Government Sponsored Security Programs
Mandated Security Allocation

Despite the inconclusive evidence as to whether fear of crime affects transit riders, it is fortunate that in 1991, ISTEA Section 3013 required that transit operators expend not less than one-percent of funds received for transit for security projects. There is also a provision in the Federal Transit Act which states that recipients of Section 5309 urbanized formula grants must certify that they will expend for transit security projects for each fiscal year not less than one-percent of the funds received, or they must certify

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[113] Fattah and Sacco, "Crime and Victimization of the Elderly," 1989.
[114] Ibid.

that such expenditures for security projects are not necessary.[115] Examples of such transit security projects include, but are not limited to:

- Better lighting within or adjacent to a transit system, at bus stops, subway stations, parking lots, and garages;

- Camera surveillance of an area within or adjacent to the transit system;

- Emergency telephone lines and radio communication links to contact law enforcement or security personnel in areas within or adjacent to transit systems;

- Contracts for security training;

- Security analysis studies;

- Staff salaries for personnel exclusively involved in security;

- Contracts for security services; and

- Any other project intended to enhance the security and safety of an existing or planned transit system.[116]

Additionally, the *1995 Report and Recommendations* of the National Leadership Conference on Transit Security, sponsored by the FTA Office of Safety and Security, recommended that transit operators upgrade and redesign their facilities and equipment to enhance safety[117].

Voluntary Transit Security Audit

In February 1997, the FTA's Office of Safety and Security in conjunction with Aegir Systems, Inc., initiated a voluntary, cost-free transit security audit program. This audit program is designed to enable an objective third party assessment of security shortcomings for transit agencies of all sizes and types. The objectives of the audits include:

- Provide assistance to transit agencies in developing and initiating system security program plans;

- Evaluate the level of preparedness of each system for implementing FTA's requirements for State Safety Oversight (49 CFR Part 659);

- Share best practices used by other transit police/security and operations personnel to enhance security for passengers and employees; and

- Evaluate the quality of security provided by transit systems for passengers, employees, and system facilities.[118]

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[115] Federal Transit Administration, "Transit Security Newsletter," May 1999.
[116] Ibid.
[117] Loukaito-Sideris, "Hot Spots of Bus Crime," Autumn 1999.

Participation in the program as well as compliance with suggestions are completely voluntary. Pilot audits were first conducted at San Diego Transit, WMATA (Washington, D.C.), SEPTA (Philadelphia), Metro-Dade, Denver/Boulder, and BART (San Francisco). Once a transit agency has volunteered for this program, the audit process begins with a pilot audit followed in six months by the first audit, with the second and third audits each being done after 12-month intervals.[119] As of March, 2000, audits of 42 transit properties have been conducted, though they are currently focused on the bus aspect of the agencies.[120]

Some of the best practices discovered while conducting the transit security audit program include:

- A direct line of responsibility and accountability from the security manager to the general manager;
- The presence of police officers riding the buses and trains (uniformed and off-duty)
- Involving security in all training areas (i.e., new operator training, refresher courses, supervisor training, employee security awareness training);
- Using cell phones as back-up system to other means of emergency communication;
- Establishing Memoranda of Understanding (MOUs) with local law enforcement agencies to aid in accurate data collection and reporting;
- Requiring a security review and sign-off on long range plans of new facilities;
- Using an employee and visitor badge and photo identification system;
- Having an emergency backup communications center; and
- Using of physical security measures (i.e., Closed-Circuit TV, lighting).[121]

The audits also found some trends in what agencies have been doing with regard to security, for better (+), for worse (-), and for an ambiguous effect (+/-). These include:

- + Increased usage of CCTV on buses;
- - Reduction of safety and security training due to budget constraints;
- +/- Utilization of contract security to patrol transit facilities;
- + Utilization of automated vehicle location (AVL) systems on buses and paratransit vans;
- + Using rail System Security Program Plan (SSPP) guidelines for bus operations; and
- - Most agencies have minimum contact with State Safety Oversight Office.[122]

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[118] Federal Transit Administration, "Transit Security Newsletter," March 1999.
[119] Federal Transit Administration, "Transit Security Newsletter," May 1999.
[120] Aegir Systems, "Federal Transit Administration Oversight Conference Briefing," February 2000.

Finally, the audits revealed a number of important issues that must be addressed if agencies are to improve their security and the perception of security by the patrons. These problems include:

- Incomplete or inconsistent reporting for the National Transit Database;
- Agencies are not reporting all felony crimes;
- Agencies are not implementing security policies and procedures;
- Agencies are unaware of the benefits of having a SSPP;
- Lack of maintenance and test schedules for security systems;
- Lack of formal communication between transit agencies and local law enforcement; and
- Need of assistance in marketing the audit program.[123]

Overall, the security audits have identified a number of good practices that agencies have been using as well as some common mistakes that transit agencies make in relation to system security. If the audit program is to be successful, these best practices and areas for improvement need to be actively incorporated into the security programs at transit agencies. The recommendations from the audits and the lessons learned from other transit agencies need to be used at each transit property for the FTA Security Audit Program to succeed in improving security on public transportation.

Creating Secure Travel Case Studies
Washington Metro

WMATA has used a situational approach to preventing subway crime on its network.[124] Since the subway system began operation in 1976, it has experienced crime rates much lower than were anticipated and are also a fraction of those experienced by subway systems in other major cities.[125] The safety record may be attributable to a combination of design characteristics, management practices, and maintenance policies that incorporate principles of situational crime prevention through environmental design. One example of CPTED that Metro employs is a highly uniform design from station to station so that riders will feel comfortable throughout the system and would recognize the system with ease. Additionally, the

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[121] Ibid.
[122] Ibid.
[123] Ibid.
[124] LaVigne, "Visibility and Vigilance: Metro's Situational Approach to Preventing Subway Crime," November 1997.
[125] Ibid. On page 8, the author states that some may argue that "Metro has such low crime rates because riders do not represent a cross-section of Washington D.C.'s population; rather they are predominantly white, middle- to upper-middle-class working people."

open design of the stations allows for natural surveillance, which is supplemented by video and employee surveillance. Maintenance is used as another way to ensure the safety of the passengers by quick removal of graffiti and litter and prompt replacement of broken lights. Even Metro's police officers have been trained to report any maintenance problems, such as burned-out lights, to the maintenance department. One final policy that Metro uses to prevent crime is not a design feature but a change in operating policy. After 8:00 at night, passengers can flag a bus rather than wait at a stop and can get off the bus mid-block to avoid waiting alone and to decrease the walk from the bus to a safe place. Metro believes that all of the CPTED techniques that they use increase the perceived consequences of committing a crime and decrease the perceived risk of being a crime victim.[126]

New York MTA (NYCTA)

In the late 1980s, there had been increasing concern generated by life threatening incidents and other serious accidents in New York City's mass transit system. A paper written in 1993 reviewed some of the security measures that were taken in response to the increase in crime.[127] For the rapid transit part of the system, capital programs from 1982-1991 involving security included:

- Creating off-hour waiting areas;
- Installing security mirrors in stations;
- Eliminating cul-de-sacs in stations; and
- Closing unused station entrances and exits.

The following results were reported:

- Felony crime complaints began to decline in late 1990, with a decrease of approximately 15% in 1991;
- Enforcement of misdemeanor offenses, particularly fare evasion, almost doubled from late 1990 through the end of 1991; and
- NYCTA was the first police department in New York City to receive national accreditation.[128]

Bus Specific Solutions for Secure Travel

Clearly, intensive police deployment would decrease the incidence of crime at bus stops, but the sheer number of bus stops in urban areas prevents this from being a viable solution. Another approach is what criminologists call "opportunity blocking," which involves carefully siting and designing bus stops to

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[126] Ibid.

[127] Hathaway, et. al. "New York Metropolitan Transportation Authority Safety Investigation," June 1993.

help make crime more difficult to perpetrate. The land uses that surround bus stops seem to be critical to its safety. Negative land uses promote antisocial behavior and attract potential criminals. Placing a bus stop in front of barren land uses such as vacant lots, abandoned buildings, and parking lots isolates the passengers waiting for the bus and thus invites crime. As the Los Angeles bus stop study by Levine and Wachs shows, crime tends to occur in locations with low levels of activity. Good bus stop sites provide opportunity for surveillance from surrounding businesses. It is difficult to design for the protection from all types of crime because while serious crimes tend to happen in more isolated locations, pickpockets and purse-snatchers commit their crimes in crowds. Some ways to decrease opportunities for crimes that occur in crowds is to widen the sidewalks at the bus stop locations in order to separate the waiting passengers from passerby who can rob and then keep on walking.

Reducing Fear of Crime

Fear reduction is another strategy that transit agencies can use in addition to actual reduction of crime. In general, three strategies of fear reduction have been proposed:[129]

1. Confidence-Building Strategies:
    -   "Tell the truth" campaigns might be undertaken in which mass media are used to provide people with more realistic information about the threat of criminal harm. The elderly could be given information that would tell them that they are not special targets of crime. Crime reporting in mass media must be monitored in order to ensure a less sensationalist picture of crime in the community.
    -   Deployment of "role models" and law enforcement personnel should be utilized. Role models include uniformed government employees who are perceived as having ties to the local area.
    -   Policing resources can also be utilized to reduce loitering and other forms of uncivil behavior that are related to fear of crime.
2. Community-Building Strategies:
    -   Cohesive communities can take actions against things that may incite fear, such as abandoned buildings.

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[129] Ibid.

3. Physical Rebuilding Strategies:

      - CPTED strategies may be effective not only in reducing crime but also in reducing the fear of crime. For example, efforts can be made to facilitate the increase or redistribution of pedestrian traffic that would improve the natural surveillance and the general appearance of the neighborhood setting.

It is important to note that public policy toward the reduction of fear may produce "boomerang effects" such that the feelings of fear increase instead of the desired effect of a decrease in fear. Additionally, the objective of fear reduction programs is unclear; reduction of fear is not an end in and of itself. Fear should really be mitigated by reducing the number of actual crimes.

Specific Solutions to Crime Prevention and Fear Reduction for the Elderly

There is division within the criminological and gerontological communities regarding the use of policy approaches that separate out elderly crime problems for special consideration. The question arises of whether resources should be allocated to design programs to prevent elderly crime or whether a more general crime prevention effort should be approached. Some argue that categorical interventions are preferred because they take into account the specific needs of the group, whereas others argue that the benefits of such programs should be general so that the benefits are more widely distributed. Still others say that crime problems that affect the elderly would be most effectively dealt with through broad structural changes intended to affect the socioeconomic status of the elderly, rather than using crime prevention or victim service programs.[130]

There are four types of programs intended to reduce elderly crime problems: victimization prevention, crime prevention, cost reduction, and criminal justice responsiveness. Victimization prevention are those actions that individuals take to protect themselves from criminal harm. Crime prevention policies seek to protect the community through a reduction in environmental sources of crime. Cost reduction aims to lessen the physical, economic, and psychological effects of criminal victimization. Finally, justice responsiveness involves attempts to make the criminal justice agencies more sensitive to the concerns of elderly citizens.

Victimization prevention often consists of police-sponsored seminars or public information campaigns to provide information that allows people to reduce personal risk:

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[129] Henig and Maxfield, "Reducing Fear of Crime: Strategies for Intervention," 1978.

- Tips to avoid merchandising fraud;

- Home security techniques;

- Precautions to take while walking in the neighborhood;

- Self-defense techniques; and

- Instruction in the use of crime prevention hardware (such as deadbolt locks) or property marking techniques (such as Operation Identification).[131]

Unfortunately, according to Fattah, informational seminars have drawbacks.[132] First, although they help to reduce the risk to the individual, they will not reduce the risk to the community— the crime will merely get displaced. Second, this information may increase the feelings of fear and isolation on the part of the elderly. It is the Fattah's observation that suspicion is the main lesson from these programs that many elderly walk away with. He feels as a result of these programd, the elderly may be increasingly likely to avoid contact with others and further decrease their involvement in community life. Additionally, people must be convinced to adopt the crime prevention measures that are presented, without taking them so seriously it exacerbates public fear. Although some safety seminars, such as self-defense training, have positive outcomes, Fattah believes victimization prevention programs work to achieve short-term personal objectives at the expense of longer-term social goals.

Criminal justice responsiveness to the elderly was studied in depth in a 1991 study by the Gerontological Society of America.[133] The study tested and confirmed the hypothesis that older victims who were dealt with by elderly victimization specialists were more satisfied with the efforts of local police than crime victims who did not receive specialized services. Police agencies have created specialized units designed to handle the crime-related problems of senior citizens. These units have received praise and are very popular. The elderly who have had dealings with the police that are not part of a specialized unit tended to have a low evaluation of the quality of police service. The study by the Gerontological Society of America looks specifically at the Senior Citizen Unit of the Milwaukee Police Department. This unit, which consists of 15 officers and detectives, receive specialized sensitivity training and is primarily responsible for the investigation and prevention of "contact crimes" against seniors. These crimes are defined as assaults, robberies, personal larcenies (including purse snatching and pick pocketing) as well as

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[130] Fattah and Sacco, "Crime and Victimization of the Elderly," 1989.
[131] Ibid.
[132] Ibid.
[133] Zevitz, "Factors Related to Elderly Crime Victims' Satisfaction with Police Service: The Impact of Milwaukee's 'Gray Squad'," 1991.

fraud and swindling. The study, which interviewed a sample of elderly crime victims for 1986 and 1987 (224 subjects), found that recipients of the special service reported that police personnel expended greater effort to help them, reporting that these officers were more sensitive to their needs and more concerned with their welfare. By having a police force that is concerned with the needs of the elderly, this sector of the population may feel more confident in riding public transit if they know that, should something happen to them, they will be dealt with in a sensitive manner. Additionally, actual victims may be less traumatized by the victimization experience and will be more likely to continue riding transit even after an incident.

Victim Support

There are five major categories of victim support:

1. Services that deal with the crisis of victimization;
2. Services that assist victims and witnesses to participate effectively in the criminal justice system while protecting their rights;
3. Services aimed at compensating the victim for personal damage incurred as a result of crime;
4. Services aimed at achieving restitution, reconciliation or both, between the offender and the victim; and
5. Services that assist the victim to locate and use appropriate existing services.[134]

Fattah argues that the needs of elderly victims are neglected by many victim support services. This is because the elderly tend to experience economic crimes rather than crimes of violence, which victim support programs are usually geared toward.

Many observers have noted the need to sensitize law enforcement personnel to the special needs of the elderly. Some police departments have developed more effective systems of referral which allow police services to be better integrated with those of other community agencies. In this way, elderly concerns which fall beyond the mandate of the police (but for which the police are frequently called) can be dealt with in routine fashion.

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[134] Fattah and Sacco. "Crime and Victimization of the Elderly," 1989.

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Other programs that can be used by police agencies include incorporating gerontological training into police training and the formation of special crime units devoted to the elderly. As discussed earlier, gerontological training is used extensively in the Detroit area and the subject matter of the training classes has been made available to other police departments throughout the country. Although such programs do have advantages, Fattah says that it is unclear whether the investment is warranted. He claims that the elderly already have a generally good impression of law enforcement personnel and feel more comfortable using their services than do young people.

The Role of the Transit Agency

According to a safety and security report written by the New York City Transit Authority, the bureaucracy of transit agencies make it difficult to make sure that security issues are addressed. [135] The study says that in New York, the inconsistent application of criteria in setting capital program priorities does not ensure that the most important safety and security issues are being addressed for the rapid transit division. The study says that top management's ability to comprehensively address safety and security issues is limited because the priority setting for specific projects occurs at the department, division, and subdivision level rather than at higher levels where upper management can have more impact. If upper management made safety and security a priority and imbued that idea into the department employees, it is more likely that they would base more decisions on these priorities.

Another report that discusses the transit agency's role in providing for a secure system was written for a workshop on transit security that was funded by the FTA. [136] The workshop explored topics including ethnic and intergenerational conflicts on transit, the need to work with the community to provide a safe and drug-free environment, the impact of homelessness on transit systems, and how order and cleanliness contribute to a safe and civil transit environment. A major theme of the workshop was that there is no such thing as a "transit crime" or a "transit social problem." According to the author, these problems have their roots in the communities the transit systems serve. Therefore, if transit systems want to be proactive and prevent incidents, they must become involved in the communities that the systems serve.

Part of the reason why transit agencies do not get involved in keeping the community safe is that top transit management often does not realize the ridership impact of social problems. Transit systems should

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[135] Hathaway et. al. "New York Metropolitan Transportation Authority Safety Investigation," June 1993.
[136] Rumford and Cooper, "Transit Security: Exploring New Concepts in Managing Social Problems," 1992.

establish partnerships with school systems, major employers, other public agencies, and community groups (such as elderly groups) to confront shared problems. Transit systems also need to market themselves effectively and collect and disseminate data about the safety and convenience of transit systems. Rumford reiterates that transit systems need to refocus their attention on the rights of the user, and every employee needs to send the message to passengers that misbehavior on the system will not be tolerated.

According to a report by Carnegie-Mellon University, there are two basic approaches to improve the public image of mass transit.[137] One is a reliance on standard public relations techniques that emphasize the attractiveness of the system, its convenience, and presently employed security measures. However, this type of campaign should not be left unattended because it runs the risk of improving police image but causing more distrust among those citizens continually exposed to crime. The second approach to improving the image of mass transit begins with actually reducing about crime and, if favorable results are obtained, giving those figures high visibility through the public relations process. According to the study, this type of campaign has a better chance of improving the image of the system over the long term. This type of campaign gives the public an accurate impression that the transit system is confronting its security problems and that it cares about its patrons. The problem with both of these public relations approaches is that they rely on the media that thrives on crime to write good stories. Therefore, a solid, positive, relationship must be cultivated between the transit agency and the local media to ensure that this good information gets a significant amount of press.

Examples of Elderly Security on Public Transit Systems

On the websites of five major U.S. transit agencies, none had safety tips specifically geared toward seniors. Nonetheless, they are an important constituency that should be considered when making provisions for safety and security on transit systems. On their websites, all of the transit agencies emphasize ways to avoid pick pocketing as the main way to stay secure on the public transit system. Table 2 shows a summary of the different tactics that agencies have taken and tips that they give to try to prevent crime and fear of crime.

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[137] Carnegie-Mellon University, "Security of Patrons on Urban Public Transportation Systems," 1975.

Table 2 : Transit Agency Crime Prevention[138]

Agency	Prevention of Crime	Select Prevention Tips	Mode of Tip Distribution
Metropolitan Bay Transportation Authority (MBTA), Boston	- Police - Personnel training	- Do not show wallet or cash - Keep firm grip on handbag with flap next to body - Beware of commotion or loud arguments	Victim awareness programs
Bay Area Rapid Transit (BART), San Francisco	- Police - Courtesy phones in station that connect to station attendant	- Stay in central location while waiting for a train	Safety tips via website
Washington Metropolitan Area Transportation Authority (WMATA), Washington, DC	- Police - Situational crime prevention: surveillance, wide-open stations - Call boxes in each rail car		
New York City Transit (MTA)	- District transit police and a special bus crimes unit	- Appear confident - Do not display money	Safety tips via website
Chicago Transit Authority (CTA)	- Police - Cameras on buses - UPass program to make system less isolated in midday		

[138] Categories without information is not an indication that no tips are provided, simply that none are reported in this

Metropolitan Bay Transportation Authority (MBTA), Boston, MA

According to an MBTA police officer, expanding the police force makes the elderly feel safe. [139] He notes that seniors always smile when they see an officer, and believes that the elderly are generally happy with MBTA police. The community relations officer from the MBTA also conducts victim awareness programs, conveying tips for avoiding crime and flimflam operations at senior centers. The programs include a lecture and a question and answer session. At these sessions, the officer hands out bookmarks with general crime prevention tips and a flier containing safety tips for the elderly (shown in Figures A and B in the Appendix).

The MBTA police officer believes that aside from increased police presence, improved lighting and "crackdowns" on graffiti help make seniors feel safe while riding the system. The MBTA website maintains that the "T train[s] our personnel thoroughly in a detailed program of strict safety standards and procedures. Clean, dry, well-lit conditions in stations promote safety." [140] The MBTA police has officers patrolling the system and targeting areas to maximize police visibility and prevent criminal activity. In addition to investigating and prosecuting crime, the MBTA police offer educational crime prevention programs to schools and other organizations, such as senior centers.

In addition to the victim awareness programs, the MBTA has silent alarms on all buses and emergency call boxes in many rail stations, similar to many other transit agencies.

Bay Area Rapid Transit (BART), San Francisco, CA

BART police offer safety tips to the public via their website. [141] They suggest staying in a central location that is occupied by others when waiting for a train, riding near the operator during off-peak hours, avoiding isolated bus stops, and standing near others in well-lit areas. The stations are all equipped with courtesy phones that go directly to the station attendant, who can then telephone the BART Police Department. As with the train stations, the bus driver can radio to the dispatcher when there is trouble, who can then notify police. However, there is no formal emergency system at the bus stops themselves.

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paper.
[139] MBTA police officer telephone interview, November 16, 1999
[140] MBTA Website, www.mbta.com/info/tips/safety/body/safety.htm, October 28, 1999.
[141] Bay Area Rapid Transit Website, www.bart.org/inside/bpolice/crimprev.htm, October 28, 1999.

Washington Metropolitan Area Transportation Authority (WMATA), Washington, D.C.

As previously mentioned, WMATA uses a situational approach to crime prevention by using many forms of surveillance and open station designs to help deter crime. In addition, call boxes at the end of each rail car enable riders to report an emergency to the operator, who contacts the central control center. All buses are equipped with a silent alarm that can be activated by the driver that goes through central control to the police. In addition to these emergency measures, uniformed and plainclothes Metro Transit Police officers patrol trains, stations, and parking lots.

New York City Transit (MTA), New York, NY

The MTA suggests that passengers appear confident and refrain from displaying money in public as precautionary measures.[142] The MTA deploys officers in twelve "Transportation Bureau Police Districts" that are responsible for keeping subway stations safe. Additionally, a special police unit responds to bus crimes throughout New York City.

Chicago Transit Authority (CTA), Chicago, IL

CTA has a few programs that benefit seniors directly or indirectly. It encourages elderly ridership by reducing fares, and has implemented two new security measures that help make older riders more comfortable riding public transportation. The CTA has installed cameras in buses to allow monitoring of the inside of the inside of the vehicles, a comfort to many older adults. Another development, which has made a very large impact on the feeling of safety for seniors is the UPass program.[143] UPass is a reduced fare program for students from the colleges and universities in the Chicago area. Its goal is to increase ridership among the college-age demographic, which nets two main benefits: (1) capture these riders at a young enough age to encourage future transit patronage; and (2) increase the number of college-aged students on the system during the midday period. This is the period when elderly ridership and school ridership is high, and the older riders are often harassed by teenaged school children. The presence of older college students serves as a comfort to the seniors as well as a deterrent to the sometimes harassing and rowdy behavior of the younger children.

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[142] New York Metropolitan Transportation Authority Website, www.mta.nyc.ny.us/nyct/safety/index.htm, October 28, 1999.
[143] Frank Kreusi, Presentation at MIT, December 3, 1999.

Teenagers and Transit Use

According to the literature, the elderly have a significant fear of teenagers when using public transit.[144] Older adults see teenagers as loud and threatening, a combination that often makes elderly passengers hesitant to use public transportation. Teenagers and pre-teenagers use transit systems regularly. They often do not realize that their boisterous behavior may be unacceptable or even frightening to other passengers, particularly the elderly. Additionally, according to the 1998 "Transit Security Handbook," juveniles and young adults commit the majority of crimes on public transportation.[145]

One suggestion is for schools and parents to educate young people about appropriate transit behavior. However, participants in a security workshop (a session that brought together social practitioners, community representatives, academics, and transit security administrators) agreed that it would be difficult to develop partnerships with the educational system. [146] This is because, particularly in urban areas, the problem of misbehavior on buses and trains will pale in comparison to much more serious issues that the educators must deal with. However, the workshop participants agreed that the effort to establish school/transit partnerships can lead to better interactions between young and old transit users and thus improved transit service.

School/transit partnerships are most likely to succeed if transit officials educate school system leaders about the inconvenience and danger to other passengers of inappropriate behavior. School policy makers are often unaware of the high economic and social costs of this type of behavior, which can be a contributing factor to higher fares. Transit officials should seek opportunities to make presentations to school boards, administrative sessions, and teachers' unions informing them of the importance of school children behavior on the public transit system so that this information can then be disseminated to the students.

The security workshop participants claim that parents are unaware that boisterous behavior, fare evasion, graffiti, and vandalism are problems on transit systems. Presentations to Parent Teacher Associations (PTAs) and other community organizations can help educate parents. Unfortunately, many children who

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[144] Patterson, "Fear of Crime and Other Barriers to Use of Public Transportation by the Elderly," December 1985 and Mawby, "Fear of Crime and Concern Over the Crime Problem Among the Elderly," July 1986.
[145] Federal Transit Administration, "Transit Security Handbook," 1998.
[146] Rumford and Cooper, "Transit Security: Exploring New Concepts in Managing Social Problems," 1992.

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misbehave have parents who are uninvolved in their lives and whose teachers have difficulty reaching out to them.

According to workshop participants "schools generally welcome transit system personnel to explain the rules and operation of the system. Transit employees who participate in these programs should, be of the same ethnicity and race as the majority of students in the school. In addition to explaining the operation of the system and standards for appropriate behavior, transit officials should focus on the transit system as a community resource. They should also involve other respected members of the community in these presentations."[147] The paper suggests that these outreach programs should include alternative schools, such as vocational schools, special schools for young mothers, and schools for students who have been convicted of crimes, as many students in these schools are heavy transit users. Additionally, since some teenagers in large metropolitan areas are school dropouts, the transit system should investigate partnerships with other community organizations such as job training programs and YMCAs.

The workshop participants had another idea that seems unrealistic. They propose is to recruit teenagers to work with the transit system to serve as bus monitors and to help educate others about the importance of behavioral standards. The program would include incentive programs for participation and for their successful efforts to encourage high behavioral standards. However, this program has many drawbacks, including the safety and well being of the volunteers and the issue of choosing appropriate teenagers that will help the transit system rather than allow their friends to continue rowdy behavior. Teenagers can be cruel to their peers, and it seems unfair to put any teenager in a position that would inevitably incite ridicule from their classmates.

The National Crime Prevention Council (NCPC) strongly suggests involving teens in crime prevention programs.[148] Their suggestions are more feasible, including organizing neighborhoods against crime, mentoring younger children, and working with older residents. The NCPC maintains that experience in communities throughout the nation has proven that young people can actually design and lead crime prevention programs.

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[147] Ibid.
[148] National Council on Crime Prevention, www.ncpc.org. October 28, 1999.

WMATA used an interesting and successful tactic to improve the security of one station by focusing on the nearby high school, many of whose students caused a lot of disruptive behavior at the station. [149] One WMATA officer, an alumnus of the high school, helped formulate an art program whereby students could display their creations in the train station. This served as a bond between WMATA and the students who now have a proprietary interest in the transit facility. The senior art class at the school developed three murals in the station, and the program will continue by allowing each subsequent senior art class the opportunity to replace the three murals, thereby developing a continuous vested student interest in the station. Since the inception of this program, there has been a noticeable decline in juvenile and student problems at this station.

There are many examples of how community-based programs have helped to reduce teenage violence, and these programs can have effects on all aspects of a community, including the public transit system. Some examples include the location of Boys & Girls Clubs right in public housing developments; gang prevention coalitions; use of schools as a neighborhood institution for activities during after school hours; education programs for elementary-age children; and Big Brothers/Big Sisters. While no single program by itself is the answer to teen violence, these community programs can form a base for comprehensive local action that can prevent crime on public transit and, as a result, make other riders feel more secure.

Younger Children

Although teenagers are the most problematic age group impacting transit system safety, the security workshop participants discussed the importance of educating younger children on behavioral standards. They recommend that transit systems consider developing age-appropriate programs for elementary, junior high, and high school students. [150]

One approach to working with young people (younger than 13) is to develop peer-led programs, where teenagers explain to their peers and younger children why it is imperative to behave on public transit. Senior citizens can also be used to educate students about how much they rely on public transit and how important it is to them to have a peaceful ride. It is critical to teach both younger children and teenagers to respect older people riding transit as "a lot like their grandmother" instead of "that slow old lady."

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[149] Federal Transit Administration, "Transit Security Newsletter," September 1999.
[150] Rumford and Cooper, "Transit Security: Exploring New Concepts in Managing Social Problems," 1992.

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Several transit systems that participated in the workshop have already established outreach programs for the younger students in schools. Those that have targeted schools with students who have previously caused problems on the transit system proved to be more successful. These programs that have already been implemented include presentations in the schools by transit employees from the same community and coloring books explaining why the transit is a community resource and must be treated with respect. The workshop participants stressed that occasional, informal presentations in the classrooms will not have a significant effect on young people's behavior on the transit system. Instead, there must be regular, coordinated and on-going efforts with teachers, parents, and students to make a difference in the behavior.

Safety Tips for Seniors

A portion of the National Crime Prevention Council (NCPC) website is devoted to senior safety. As most crime data maintains,[151] the NCPC also asserts that, as people grow older, their chance of being victims of crime decreases dramatically. However, their vast experience and their decreased physical capabilities make them more fearful. The NCPC says that older Americans are on the lookout for physical attack and burglary, but in fact they are more susceptible to fraud and con games. The NCPC website cautions seniors to take the following measures to avoid crime:

- Go with friends or family, not alone;

- Carry your purse close to your body, not dangling by the straps. Put a wallet in an inside coat or front pants pocket;

- Do not carry credit cards you do not need or large amounts of cash;

- Use direct deposit for Social Security and other regular checks;

- Whether you're a passenger or driver, keep car doors locked. Be particularly alert in parking lots and garages. Park near an entrance;

- Sit close to the driver or near the exit while riding the bus, train, or subway; and

- If someone or something makes you uneasy, trust your instincts and leave.[152]

There is also an extensive list of tips for seniors to avoid purse-snatching, including ideas from keeping a firm grip on the purse to not carrying a purse at all, to traveling with companions.[153] There are also lists

[151] Rennison, "Criminal Victimization 1998," July 1999.

of tips from other sources, such as transit agencies. The MBTA provides a special list of safety tips for seniors to those who attend their security workshops at senior centers throughout the Boston area. As many older adults do not use the Internet or would not specifically seek out crime prevention tips, it is critical that transit agencies and other community groups reach out to the elderly to actively help them to prevent victimization.

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[152] National Council on Crime Prevention Website, www.ncpc.org/1pro7dc.htm, October 28, 1999.
[153] Fattah. and Sacco, "Crime and Victimization of the Elderly," 1989.

Chapter 3: Methodology

General Surveying Methodology

Yin suggests that open-ended questions are more desirable because they avoid the issue of overly sensitized respondents. [154] This enables the respondents to rely on their own frame of reference rather than that of the researcher. Additionally, the Carnegie-Mellon study points out that when multiple choice questions are used there is an inherent bias of the topic because the questionnaire is usually identifiable to the respondents as dealing with crime.[155] The only real way to get around this is to have a very long questionnaire that is subtler. Unfortunately, this is not possible in the case of the research at hand given the constraints of giving surveys to uncompensated respondents in senior centers. Open-ended questions can also prove more difficult to respondents, particularly seniors who may have more trouble comprehending questions. Finally, the questions asked in this survey had easily defined categories for choices, making structured questions sensible in this situation.

Surveys and Older Adults

Answers to survey questions are subject to three types of influences: interpretation (the way the respondent reacts to the method or format used for obtaining the data); motivation (the way the respondent feels about the concept); and memory (everything else that may produce variation in a recorded answer). [156] These influences are of course present in a survey of any population, though they come to bear more heavily in surveys of the elderly.

The accuracy of data obtained from older respondents may be lower than that of younger respondents. Errors made by older adults may be a result of misinterpretation of the questions asked, motivations related to participation and reporting of information, and changes in memory[157]. In addition, complex and difficult questions are likely to increase respondent burden and may contribute to poorer quality data in those older adults who are experiencing sensory deficits, decreased attention span, and inability to concentrate. This was definitely apparent in this survey, as many of the seniors were easily frustrated by questions that they did not immediately understand. Additionally, it became clear both from working

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[154] Yin, "Fear of Crime as a Problem for the Elderly," December 1982.
[155] Carnegie-Mellon University, "Security of Patrons on Urban Public Transportation Systems," 1975.
[156] Taylor-Davis and Smiciklas-Wright, "The Quality of Survey Data Obtained from Elderly Adults," 1993.
[157] Ibid.

with the seniors and analyzing the results that some of the respondents misunderstood some questions, therefore answering them incorrectly.

These problems were most apparent in the two questions that asked the participants to rank items in order. One question asked the respondents to rank five situations in order of how safe they feel in those situations. Only 18% of the seniors who participated in the survey were able to answer this question accurately by ordering the situations from one to five, using each number only once. The other ranking question that the participants had great difficulty with asked them to rank three security measures from one to three, in order of their importance to making the respondent feel secure in a train station. While 61% were able to identify the one they think is most important, only 75% of those were able to continue and rank their second and third choices. Overall, ranking questions do not yield particularly fruitful results when surveying seniors, particularly if there is not enough supervision to check each survey as they are completed.

Previous Surveying Techniques Reviewed

Twenty of the articles that were used as background for this study were based on their own surveys. These previously completed studies were referenced for the purpose of the study, the survey methodology, and the sample size obtained (Table A in the Appendix is a summary of this information). The average sample size of these studies is 1,451, ranging from 119 respondents to 11,061. Of the twenty surveys, nine interviewed only elderly people (either 60+, 62+, or 65+, depending on the study) and the average number of respondents for these studies was 656 and the median was 372. The twenty surveys were conducted in a few different ways: eight by individual interview (either at the participants' home or at a central location); four by telephone; three by mail (two to individual homes and one to organizations); two at senior centers; and one each of a written survey on bus, an oral survey on bus, and a survey whose administration was unclear.

Arthur Patterson conducted the two surveys whose purposes were most similar to the survey conducted for this research.[158] Patterson's studies looked at assessing how fear of crime and other fears are related to the use of public transportation by the elderly and how to remove the barriers to public transportation that these fears may cause. Both studies were conducted in senior citizens centers where samples of 194 and 225 were obtained. This is an average of 19.4 and 20.5 responses per senior center, which was

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[158] Patterson and Ralston "Fear of Crime and Fear of Public Transportation Among the Elderly," April 1983 and Patterson, "Fear of Crime and Other Barriers to Use of Public Transportation by the Elderly," December 1985.
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approximately the goal of this study—the actual number of surveys obtained averaged 18.2 per senior center. Because Patterson's studies were looking at similar questions as the survey for this study, it further validated the decision of going to senior centers to conduct the survey.

Survey Procedure

A sample of respondents can be selected by random (or probability) sampling or by non-random sampling. In random sampling researchers try to select a sample that is representative of the population, whereas in non-random sampling the selection is based primarily on the researcher's judgement. This study used a combination of these two methods. A non-random sampling plan was used in that the surveys were all conducted in senior citizens centers, thus removing a degree of randomness as only people who attend activities at senior centers are surveyed. On the other hand, by selecting senior centers whose attendees had various demographic characteristics, the sample was randomized to some extent.

Finding a large sample of seniors to interview can be very difficult, as it requires obtaining demographic information on all residents of an area, determining who qualifies, and then contacting the individuals. Due to time and money constraints, this method was not possible, so the surveys were conducted in large groups at seniors citizen centers in order to obtain the maximum number of respondents in the short time available. Senior centers are places where senior citizens who live in private homes, apartments, or senior communities can go during the day to participate in various activities. Many of the centers provide lunch for a small fee and also offer activities such as bingo, mah jong, and dancing. Working with the activity coordinator for each center, a time was arranged to conduct the survey that was either before or after one of these activities in order to attract a larger audience. Some of the programs that were conducted were done in conjunction with a regular group meeting, such as the Golden Age Club (for older seniors) in Belmont.

To obtain cooperation from the senior centers to allow distribution of the surveys, the surveys were given in conjunction with a safety seminar given by the community outreach officer from the MBTA police department. This tactic, which provided immediate benefits for the participants, made it possible to secure programming space that otherwise would have been extremely difficult, if not impossible, to obtain. Some senior centers asked to see the survey and an abstract of the research before agreeing to let

the research be conducted there in order to make sure that the survey would not be too intrusive.[159] Almost all of the senior centers contacted allowed the research to be conducted. In most cases this would not have been allowed without the addition of the security speech by the MBTA community outreach officer, as the activity coordinators at the senior centers understandably wanted some immediate benefit for their customers.

Once the date and time at each senior center was determined, a package of fliers was sent to the center for use in advertising the program (a sample of the flier and a letter that accompanied it is shown in Figures C and D in the Appendix). Most centers also advertised the program in their monthly newsletter and some also advertised the program in local newspapers. A few days before each program, the center was contacted to confirm the appointment. Following each program a thank you letter was promptly sent to the coordinator who helped set up the program at the senior center (a sample is shown in Figure E in the Appendix).

Bias in Sample

One previous study used mail surveys because fear of victimization appears to be a primary source of non-response in urban surveys using personal interviews.[160] That study claims that using personal interviews tend to under-sample fearful individuals, a finding that was confirmed by the fact that 18% of the respondents to the mail survey claimed to have refused to answer their doors due to fear of victimization.

Although the research at hand uses group meetings as opposed to individual interviews, it is very likely that this methodology will also under-sample fearful individuals who do not often leave their homes to participate in senior center activities. On the other hand, maybe those ultra fearful individuals are not the population that public transit agencies are trying to reach. In addition to under-sampling overly fearful individuals, the survey also reached out to more single people rather than those still married, as those who are single and live alone are more likely to participate in senior center activities. This is a shortcoming of the survey procedure as married seniors have a travelling companion with whom they may feel more comfortable taking public transportation whereas those seniors who live alone do not have a "default" travel partner, and thus may be more hesitant to take public transportation.

[159] The Newton Senior Center required that the survey and project be authorized by the Massachusetts Executive Office of Elder Affairs. A copy of the approval and of the participant agreement form used in Newton are in Figures F and G in the Appendix.

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Additional bias in this survey may stem from the fact that just prior to completing the survey the participants listened to a talk from an MBTA officer who discussed how seniors can stay safe from crime while walking in their neighborhoods and when waiting for and riding public transportation. However, in their surveys most of the respondents did not indicate much fear while walking or while waiting for or riding public transportation. It can therefore be deduced that the talk prior to the survey had little immediate impact on their fear. Hopefully some of the tips given by the officer, however, had an impact on the seniors' practices, so that they would remain safer. The decision to conduct the talk prior to giving the survey was a logistical one stemming from the fact that the time it takes to complete the survey varies greatly from person to person. For example, those respondents who were highly educated (had attended or graduated from college) could complete the survey in as little as ten minutes. However, some of the seniors took as long as thirty minutes to complete the survey and some needed help reading the survey either due to blindness or illiteracy. Thus, if the survey were filled out prior to the presentation, much of the audience would have been left waiting for the presentation while the others finished filling out the survey. The way that the program was conducted enabled the participants to listen to the speech, ask questions, and then leave once they had completed their survey.

At some senior centers, particularly the ones in the lower income neighborhoods, many of the seniors suffered from illiteracy, a problem that was overcome by reading the surveys question by question to those seniors who could not read it for themselves. At most seniors centers there was only one surveyor who was available to help the seniors with reading or understanding the questions, but in a few instances there was some assistance.

Choosing Survey Locations

In order to obtain a diverse sample of older adults, it is necessary to choose senior centers that are located in a variety of areas in terms of demographics, specifically mode to work, automobile ownership, median income, and number of elderly residents. The first set of data looked at is from the Census Transportation Planning Package (CTPP) data for Boston.[161] This data was viewed at the block group level so that all of the differences between the smaller neighborhoods could be seen. The program that comes with the data CD-ROM is a modified version of TransCAD and describes the block groups by FIPS identifiers (Federal

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[160] Warr, "Fear of Victimization: Why are Women and the Elderly More Afraid?," September 1984.
[161] Bureau of Transportation Statistics, "Census Transportation Planning Package," 1990.

Information Processing Standard). The FIPS numbers for block groups are 24 digits long and include the codes for region, state, city, MCD, place, tract, and block group number.

The version of TransCAD that was provided with the data enabled simple mapping of various variables. This program was used to map automobile ownership and the primary mode of transportation to work. Automobile ownership, particularly the map of households with no cars, gives an idea of which people are transit dependent. The primary mode of transportation to work, although not applicable to the elderly, shows the general use of public transit versus automobile in the communities. Although the CTPP data produces maps that contain many block groups west of the Boston area, only those in the area east of route 128/95, south of and including Lynn, and north of and including Quincy were considered for survey locations. This focused the study on cities and towns that are well served by public transportation and are close enough to downtown Boston where frequent travel by public transportation is more common. "Well-served" by public transportation indicates that there are at least a few, fairly frequent bus lines in the area that connect with rapid transit stations. Three measures of accessibility were developed: high transit accessibility means that there are rapid transit stations in the town and frequent bus service to them; medium transit accessibility means that there are rapid transit stations outside of the town but frequent bus service exists to those stations; and low transit accessibility indicates a town where only bus service exists that does connect with rapid transit, but is not particularly frequent. Table 3 shows the level of transit accessibility of the towns where the surveys were conducted.

Table 3: Transit Accessibility of Towns Where Surveys Were Conducted

Location	Accessibility
Dorchester (Boston)	High
Chelsea	Medium
Newton	Low
Somerville	High
Medford	High
Brookline	High
Cambridge	High
Quincy	Medium
Everett	Medium
Belmont	Medium

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Observations

Mode to Work

Although seniors do not usually make a daily journey to work, it is still important to choose towns with different methods of commuting to work, as this indicates the extent to which transit is used in that area. Many older adults lived in the same area while they were working, so choosing a variety of locations will yield some respondents who are accustomed to taking public transportation on a daily basis and some who are not. Not surprisingly, the CTPP data revealed that the residents of the neighborhoods closer to the center city walked or took the trolley, streetcar, or subway more than those further from the center city. Additionally, those further out from the center city also took the commuter railroad much more frequently and drove alone in more cases. It is, however, very interesting to note that the mode that had the least distinction between those neighborhoods close to the center city and those further out is driving alone. This shows the omnipresence of the private automobile and also the common practice of "reverse commuting." While most people who live and work in the city take public transportation, it appears those that live in the city and work in the suburbs drive alone. Table 4 shows communities that have high usage, relative to other cities and towns in the Boston Metropolitan area, of certain modes of transportation. In contacting senior centers in different towns, this information was useful in trying to obtain a random sample.

Table 4: High Use of Particular Modes for Journey to Work Trips

Mode	Towns with High Use for Work Trips
Commuter Railroad	Roslindale, Hyde Park, Milton
Walking	Cambridge, Brookline
Subway	S. Dorchester, Quincy, Winthrop
Streetcar or Trolley Car	Brookline, Newton
Bus or Trolley Bus	Roxbury, Somerville
Drove Alone	Brookline, Newton

Automobile Ownership

The CTPP data also gives information on car ownership. The most useful variable is the number of households with no automobiles. Not surprisingly, these households tend to be closer to the city and the rapid transit and frequent bus lines. In most towns where many households do not own automobiles, there is a high level of transit accessibility. Some towns and neighborhoods that stand out as having high levels of households with no vehicles include Roxbury, Dorchester, Cambridge, Everett, and central

Boston. Although some seniors decide to give up their cars as they get older, knowing the level of automobile ownership in survey areas helps to give an idea of the level of car ownership at some time earlier in life.

Median Income

Areas close to downtown, such as Back Bay/Beacon Hill, Fenway/Kenmore, and Charlestown have high incomes. On the other hand, Roxbury, parts of Cambridge (potentially due to student bias), and parts of North Dorchester have lower median income. On the outskirts of Boston, Brookline and Newton have relatively high incomes, while Revere and Lynn are on the lower end.

Elderly Population

U.S. Census data provided information about the location of the elderly population.[162] Neighborhoods close to the center of Boston, such as Back Bay/Beacon Hill, South End, Central Boston, and Roxbury, have lower percentages of elderly people. Looking closely at the maps, there appears to be a "C" shaped band of greater concentrations of elderly persons from just outside of the central city area out to Route 128/95. Areas northeast of the city, including East Boston, Winthrop, and Revere, have large concentrations of elderly adults. Additionally, Lexington and Belmont, towns northwest of Boston, have large concentrations.

Conclusions about Survey Locations

It is necessary to focus on a variety of towns that have different income levels, automobile ownership rates, standard mode to work, and elderly population in order to survey a wide variety of senior citizens. It makes sense to survey only in communities where some transit is available so that the respondents can answer based on their experience with using public transportation. Based on the demographics of the block groups, four main locations were identified where surveys should be conducted: Cambridge/Somerville, Newton/Brookline, East Boston/Revere/Chelsea, and Dorchester/Roxbury. After contacting a number of senior centers, surveys were in fact conducted in Cambridge, Somerville, Newton, Brookline, Chelsea, Dorchester, Medford, Quincy, Everett, and Belmont. Table B in the Appendix shows the senior centers selected with the activity around which the survey was coordinated and how many surveys were obtained in each location.

Specific Questionnaire Design

The questionnaire used in this research is divided into six main sections:

(1) Questions about transportation choices and frequency of use;

(2) Physical and mental health questions;

(3) General fear questions;

(4) Questions on fear in relation to transit;

(5) Questions on how to make transit more secure; and

(6) Demographics questions.

The questionnaire was printed on single-sided paper in 14-point Times New Roman font in order to make the survey easy to navigate and easy to read. A copy of the survey in its entirety is located at the end of the Appendix in Figure I.

The survey was designed primarily to obtain a solid understanding of the transit habits of the elderly, how mode choice is made, and how ridership is affected by fear. Many of the background questions asked of the respondents have been asked before but are necessary in order to form a basis for comparison with previous work. Additionally, questions about personality and fear in general are needed to benchmark the type of person that is answering the survey. Each question posed to the seniors had a particular purpose. Table 5 is a list of the questions and the motivation for asking each one.

Survey Changes

The questions listed in Table 5 are those that were used on the final survey (the one used for all but 33 responses). Some changes (listed in Figure H in the Appendix) were made to the survey instrument after the first two survey sessions were conducted in order to clarify some of the questions that the respondents seemed to have the most difficulty with. Although the surveys conducted at the first two senior centers can theoretically be considered pilot surveys, the data obtained was used in the final analysis. It should be noted that a real pilot test of the survey was attempted. Unfortunately, because of the high education level of the pilot testers, they did not encounter any difficulty with the survey that the actual respondents later experienced. Therefore, the survey required some minor wording changes after being administered at the first two locations.

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[162] U.S. Bureau of the Census, 1998.

Table 5 : Survey Questions and Motivations

Number	Question	Motivation
1	What is your zip code?	• To be able to map the locations of respondents as well as get a proxy for their income. • This question was asked first as a kind of "warm-up" question.
2	What are the three most important factors that help you decide whether or not you use public transit?	• To gauge what factors affect elderly ridership, particularly to see if security has an effect. • To see the extent to which the availability of no alternate mode of transportation affects their decisions.
3	What type(s) of public transportation is/are within walking distance of your home?	• To determine if the person can realistically take transit on a regular basis. • To see if the respondent's transit use or lack thereof can be predicted by their proximity to public transportation.
4	How far do you consider a reasonable walking distance to access a public transportation service?	• To see what the respondent was using as the determinant to the answer of question three. • This question gives a sense as to whether the respondent will walk further for public transportation or whether they will use it only if it is very close to their home.
5	How often do you use these types of public transportation (bus, train/trolley, The Ride)?	• To determine the frequency of use of the modes mainly to compare to fear.
6	How often do you walk to do your errands?	• To assess the level of activity and also a sense of automobile reliance.

Number	Question	Motivation
7	How often did you use public transportation during the years you were working/taking care of your family?	• To assess whether the respondents have been long time users of the public transportation system • To see whether the individuals' transit usage when younger is a predictor of transit usage as an older adult • To see whether the individuals' transit usage when younger is a predictor of fear of public transportation as an older adult.
8	Which activities do you get to using public transportation?	• To see what the main uses of public transportation are for the elderly.
9	How often did you drive during the years that you were working/taking care of your family?	• To find out if the respondents are former drivers (even if they no longer drive) to get a sense as to whether former driving habits affect transit ridership and fear of security on transit.
10	Do you drive regularly now?	• To determine the level of choice that the respondent has in terms of alternatives to public transit.
11	How often do you ride in a car as a passenger?	• Another measurement of the level of choice that the respondent has in terms of alternatives to public transit. This intends to capture those that are not drivers but are also not transit dependent because of a spouse or child who drives them regularly.
12	In general, how would you say your health is?	• A way to measure the ability to travel. • Also a control when looking at fear, as there have been studies done showing that persons in worse physical health tend to be more fearful.
13	Do you have difficulty walking or climbing stairs?	• To determine if lack of ridership may be a result of physical limitations.
14	How have your spirits been lately?	• A way to measure desire to travel. • Also a control when looking at fear, as there have been studies done showing that persons in worse mental health tend to be more fearful.

Number	Question	Motivation
15	With who do you currently live?	• To look at how living arrangements relate to fear. • To determine if the person has a regular travel partner that might make taking transit less frightening and actually safer.
16	What type of home do you live in?	• To measure against previous studies, many of which show that fear is lessened in age homogenous environments. • Also as a proxy for income- those in private homes tend to be less fearful and less likely to be a victim of an attack (likely because they are more likely to live in a suburban environment).
17	How long have you lived in your current neighborhood?	• A proxy for comfort level in the neighborhood which can be measured against fear.[163]
18-21	How afraid do you feel when you are at home alone during the day/night; and when you walk near your home during the day/night?	• Used as a proxy for general fear so that fear can be controlled for when looking specifically at transit fear.
22	Have you or anyone you know been a victim of a crime against your person?	• As previous victims tend to be more fearful, this information can be used to determine one possible reason for level of fear. • This is also a common question asked in other studies so it allows for comparison with earlier work.
23	How fearful are you for your personal safety in the following situations: waiting for a bus, waiting for a train, riding the bus, riding the train, walking to/from the bus or train?	• To determine specific transit related fear, broken down by mode.
24	Rank the above five situations in order from most frightening to least frightening?	• To get a more refined order of fear in those situations since some of the situations will have been given the same level of fear in question 23, this question attempts to make a further gradation.

[163] Yin, "Fear of Crime as a Problem for the Elderly," December 1982.

Number	Question	Motivation
25	Which mode, bus or train/trolley, do you consider to be safer from crime?	• To get an idea as to which mode needs more work in terms of improving its security image for the elderly. • Also as a validity check against the feelings of fear reported for bus situations versus train situations.
26	When you ride public transportation, how frightened are you when you see the following things (obscene language, teenager rowdiness, vandalism of transit property, begging/panhandling, pushing and shoving)?	• To determine the types of "crimes" that most frighten older adults when they ride public transportation so that transit agencies can try to make the transit experience feel safer.
27	Which mode, bus or train/trolley, do you take more?	• To measure how fear on bus versus train/trolley is affected by frequency of use. • Also as a validity check against the frequency of use response to question five.
28	Why do you take the mode chosen in question 27 more often?	• To determine if the mode decision is made based on personal safety, and if not, what i is based on.
29-30	Do you ever decide not to take the train/trolley or bus because of personal safety concerns?	• To see if fear consciously affects seniors' travel behavior.
31	Do the following types of people frighten you (groups of teenagers, drunks, homeless people)?	• To determine which groups of offenders should be focused on when trying to make a transit system seem safer to the elderly.
32	Rank in order of importance to you for feeling secure at a train station (police officer or security guard, bright lighting, emergency telephones).	• To determine the importance of various safety measures to making older adults feel secure, so that a transit agency can prioritize among these measures.
	What type of guard, if any, would make you feel most secure at a train station?	• To determine the type of guard or officer that the elderly would prefer to make them feel most secure so that transit agencies can take this under advisement.
33-34	Demographic questions (gender, age, race/ethnicity, education, spending habits).	• To be able to compare this sample of respondents to other samples. • Also to determine if certain types of people have different fears so that specific fear reduction strategies can be employed with different groups.

Sparse Data

Most of the surveys received were not complete, either due to the respondents skipping questions or answering in a way that made the answer invalid. For example, on the question that asks the respondent to rank five situations from the least frightening to the most frightening, an answer of all 5's or all 1's made the response useless. In some cases, numerous questions went unanswered. Overall, however, there were enough answers to most questions to enable statistically significant conclusions to be drawn. Table C in the Appendix shows the sample size by question given the overall sample size of 182.

Analysis Methodology

The analysis for this study was conducted mainly by using various statistical techniques: counts and averages, cross-tabulations, correlation coefficients, regression, and hypothesis testing. Many of the questions that the study seeks to answer involve looking at how different personal qualities and lifestyles affect transit usage and fear, and how these personal qualities and lifestyles affect reaction to fear reduction measures. These types of question are best answered by doing bivariate analysis, typically cross-tabulations, to gauge if there exists any relationship at all. If a relationship does seem to exist, the next step is to determine the extent of that relationship by determining the correlation coefficient and conducting a regression analysis. Finally, hypothesis testing was employed as a way to test hypotheses within a specified level of significance.

In analyzing the survey data, cross-tabulation is used first as a way to determine the relationships between specific variables. After cross-tabulations are developed, correlation coefficients are calculated to further quantify the extent of the relationship. The correlation coefficients estimate the predictive validity of the independent variables. For the variables that appear to have relationships, regression, using the criterion of least squares, is then used. Regression is used as a way of predicting values for the dependent variable based on the values of the independent variable. Here, regression enabled the determination, within a specified level of significance (0.05), of the strength of the relationship between the two variables. The least squares method of regression is used because it is applicable in very general situations.[164] Either linear, exponential, or polynomial trend lines are used to approximate each relationship, depending on the which best line has the best reduction in error (R^2), indicating the best line for predicting the dependent variable based on the independent variable.

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[164] Miller and Wichern, "Intermediate Business Statistics," 1977.

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In order to validate bivariate relationships and rule out any variables that might explain the association, the concept of control is often used in statistical analysis. For this analysis, cross-tabulation was used because of the limited meaning of the values of the numbers. For example, a cross-tabulation of the respondent's more frequently used mode with their transit fear was controlled for the respondents' general fear. Because there is no numerical value for which mode they use more frequently, any mathematical process would yield useless results.

Finally, hypothesis tests were utilized to determine the validity of hypotheses developed before the surveys were conducted. The hypothesis tests were conducted using the difference between means parametric test and also by comparing the means to particular values. In all cases, a normal curve between the variables was used, as most sample sizes were larger than 30, indicating that the curves should approach normality.

Chapter 4: Data

National and State Demographics and Demographics of Survey Participants

Age

The ages of seniors nationally and in Massachusetts are relatively the same, although a higher percentage of Massachusetts seniors are in the older age brackets. The age distribution among older adults nationally and in Massachusetts is shown in Figure 4. This also shows the age distribution of the seniors who took the survey. In the survey sample, there is a significant overrepresentation of seniors between the ages of 75 and 84 and a large underrepresentation of seniors between the ages of 60 and 64. The excess of seniors between 75 and 84 is a direct result of the dearth of those aged 60 to 64. Due to the fact that the surveys were conducted in senior centers, there were few people under the age of 65, as the majority of those people have yet to retire from full-time employment. Most Boston area senior centers allow people over the age of 60 to participate in their programs, so this study included seniors age 60 and over to ensure that all attendees at the senior centers were eligible to participate in the study.

Figure 4 : Age Distribution of Seniors[165]
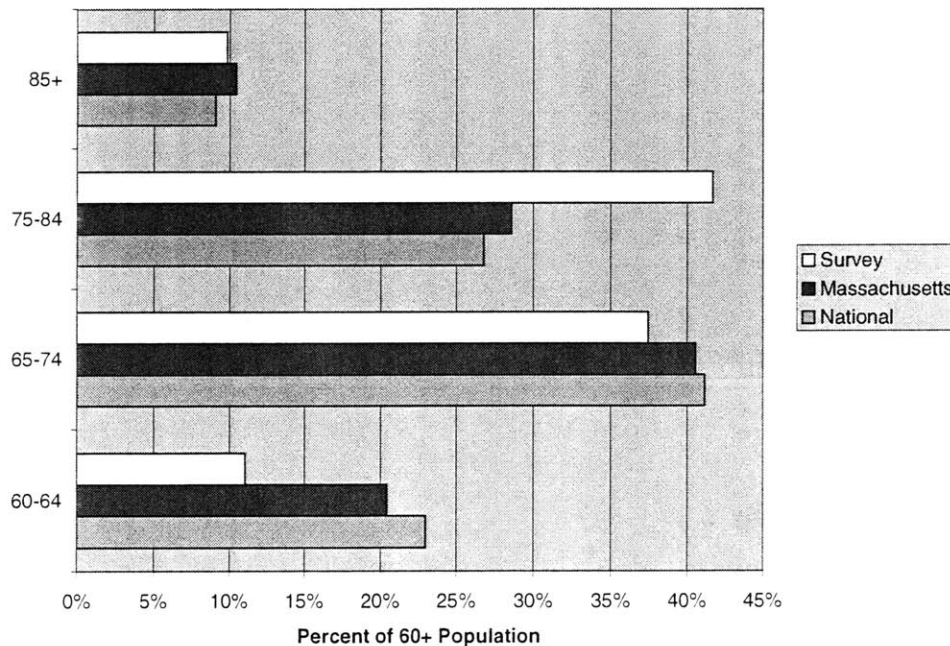
[165] July 1, 1998 Census Data from www.census.gov/population/estimates/nation/intfile2-1.txt and www.census.gov/population/estimates/state/5age9890.txt, February 21, 2000.

Gender

In 1998 there were 20.2 million older women (65 years and older) and 14.2 million men (41% men and 59% women) in the United States. The gender gap increases with age, ranging from 54% women for the 65-69 age group to 71% for persons 85 years and older.[166] The gender distribution of seniors nationally and among the survey respondents is shown in Figure 5. This study under-sampled the male population, an unfortunate result of conducting the surveys in senior centers, where more women tend to socialize. However, it was useful to obtain a significant amount of survey information from women as they take public transportation more frequently.

Figure 5: Gender of Seniors[167]
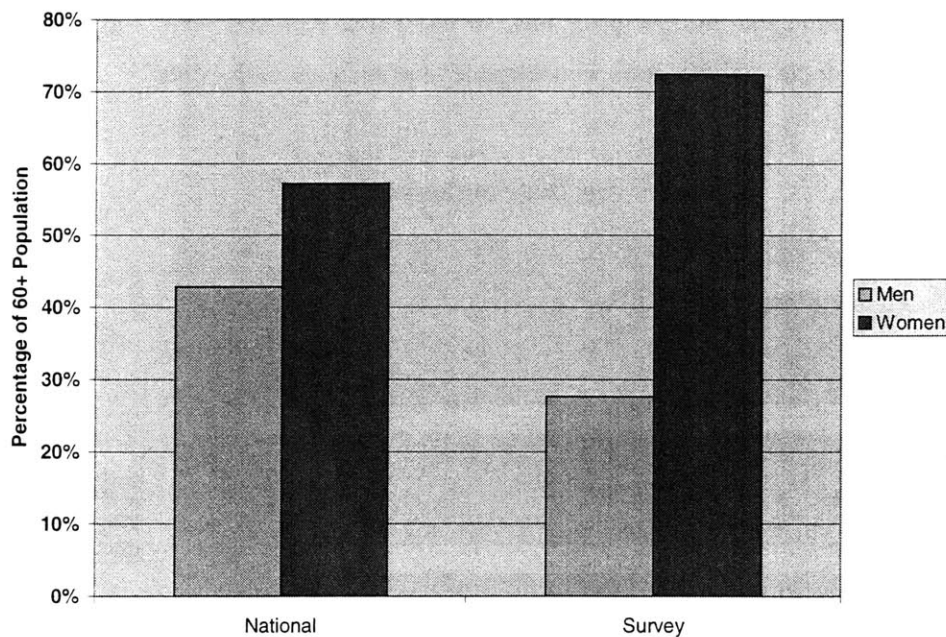
Race and Ethnicity

The majority of people in the U.S. are white, non-Hispanics, making up 72% of the national population and 84% of Massachusetts' population. Blacks and Hispanics are the next largest groups on both the national and Massachusetts level, followed by Asians and Native Americans. The racial makeups of the U.S. and Massachusetts populations are shown in Figure 6. The races of the survey respondents were

[166] Administration on Aging, "A Profile of Older Americans" 1999.

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slightly different than the Massachusetts and national averages. The percentage of survey respondents that are white is very close to the white percentage of the Massachusetts population. Additionally, the percentage of black survey respondents is very close to the percentage of blacks nationally. The survey lacks enough respondents of Hispanic origin and Asian origin to fit well with either the Massachusetts or national levels of these people in the population.

Figure 6: National, Massachusetts, and Survey Respondents' Race[168]
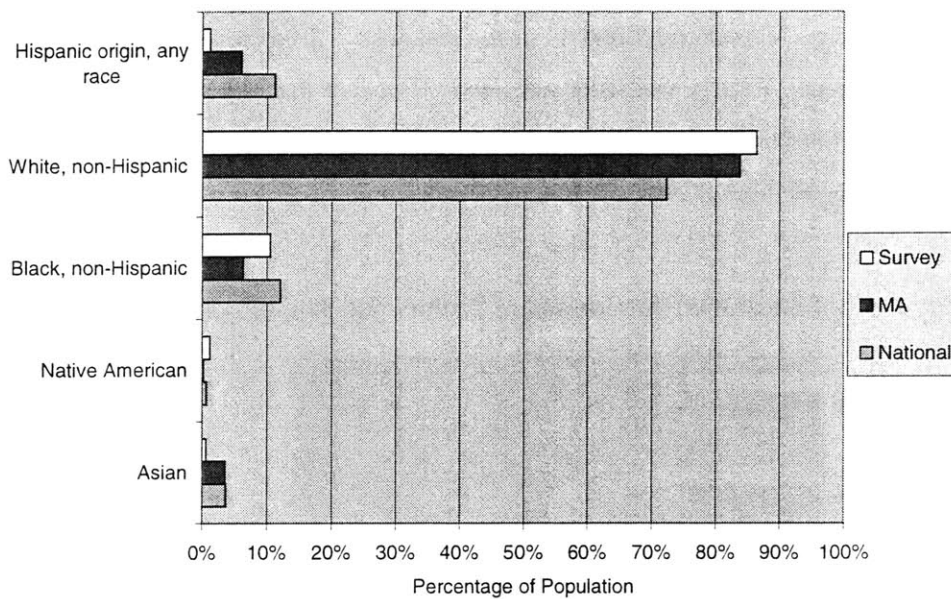
Education

According to the Administration on Aging, the educational level of the older population (65+) is increasing. [169] The administration states that between 1970 and 1998, the percentage of the elderly who had completed high school rose from 28% to 67%. This percentage, however, did vary by race and ethnic origin: 69% of whites, 43% of blacks, and 30% of Hispanics over the age of 65 had completed high school. According to data from the U.S. Census, persons aged 60 and over had a rate lower than that of the national average for completing college and advanced degrees and had a higher rate than the national

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[167] U.S. Bureau of the Census , 1999 Data.
[168] U.S. Bureau of the Census, July 1998 Data. www.census.gov/population/estimates/nation/intfile3-1.txt and www.census.gov/population/estimates/state/srh/srhus98.txt, February 21, 2000.
[169] Administration on Aging, "A Profile of Older Americans," 1999.

average for people whose highest level of education was completing high school.[170] Additionally, the percent of those 60 and over who never even attended high school was more than double that of the population as a whole. However, as the current population ages, if the past trends continue the education level of the nation's elderly will continue to increase. The educational attainment of seniors nationally, seniors from the survey respondents, and the education of the entire population is shown in Figure 7.

On average, the elderly survey respondents had higher levels of education than the average American and much higher levels of education than typical Americans over the age of 60. This is true partially because the respondents live in a large metropolitan area, but also may be due to over-sampling in a wealthy community, namely Newton. Newton provided 43 of the responses, 29 of which were from the Newton Retired Men's Club, a group of fairly well-educated men. The fact that the survey respondents had a higher ratio of holding advanced degrees, college degrees, and some college work made the percentage of survey respondents with a only high school diploma relatively low.

Figure 7: Educational Attainment of Seniors and Total Population[171]
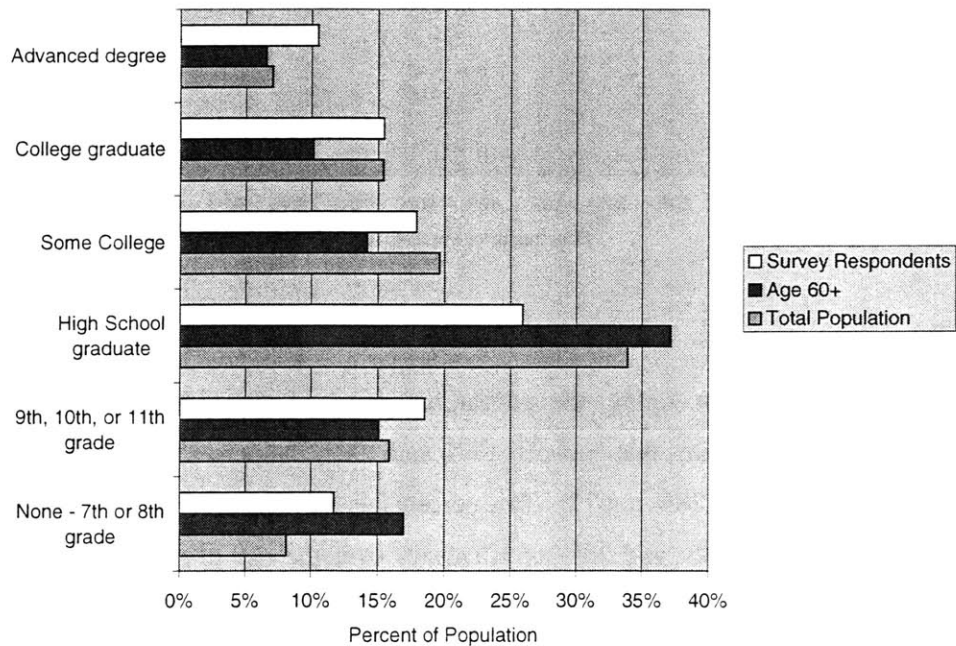
[170] U.S. Bureau of the Census, March 1998 Data, www.census.gov/prod/3/98pubs/p20-513u.pdf, February 21, 2000.
[171] Ibid.

Income

The median income of older persons (age 65 and over) in the U.S. in 1998 was $18,166 for males and $10,054 for females. [172] Household income for families headed by persons aged 65 and over had a median income of $31,568 ($32,398 for whites, $22,102 for blacks, and $21,935 for Hispanics). As reported by the Social Security Administration, the major sources of income for older persons in 1996 were Social Security, income from assets, public and private pensions, and public assistance.

Asking the elderly about income in a survey would not necessarily yield accurate results for level of wealth because not all of their money is considered income. Many siphon off portions of their savings each year to pay for their expenses and this money would not be reported as income, particularly if the asset was sold at an earlier date and the proceeds placed into a savings account. Additionally, many people are wary to report their income in surveys. Therefore, rather than ask the participants for their income, the survey asked them for their average monthly spending, the results of which are shown in Figure 8. This turned out to be only semi-successful, as many of the participants had a great deal of trouble figuring out what they spend each month. In the first batch of surveys, the responses were almost exclusively "Less than $500 per month" because the respondents forgot to include rent and insurance. Once the question was reworded to explicitly state what should be included, the answers became more accurate. However, because many of the participants have their finances managed (and often paid for) by their children, many still had no idea of their average monthly spending. Overall, 60% of the survey participants report spending less than $1,000 per month. As this is an extremely unrealistic number given the cost of living in the Boston area, it is unlikely that the spending results are valid enough to use, making it necessary to utilize an income proxy.

The median income for the city location of each senior center was used as a proxy for the income of the respondents who took the survey at that center. [173] Although zip code specific income for each respondent would have been more accurate, this data was not available for all zip codes, so the cities were used in order to maintain consistency. The median household income that was used as a proxy for income is shown in Figure 8. The correlation coefficient of the median income of the town where each survey was taken and the answers to the spending question is 0.46, indicating that median income is a decent proxy for spending, given that the answers received about spending are somewhat representative of the seniors population at large.

[172] Administration on Aging, "A Profile of Older Americans," 1999.

[173] U.S. Bureau of the Census, 1990 Data, http://venus.census.gov/cdrom/lookup/957812115 March 14, 2000.

For purposes of analysis, town income (Figure 9) was used rather than spending habits. The respondents were divided into three income brackets of approximately even numbers of people, where low-income was classified as less than $33,000 per year, middle-income from $33,000 to $46,000, and high-income were those towns with a median household income of greater than $46,000 per annum.

Figure 8: Spending Level of Respondents
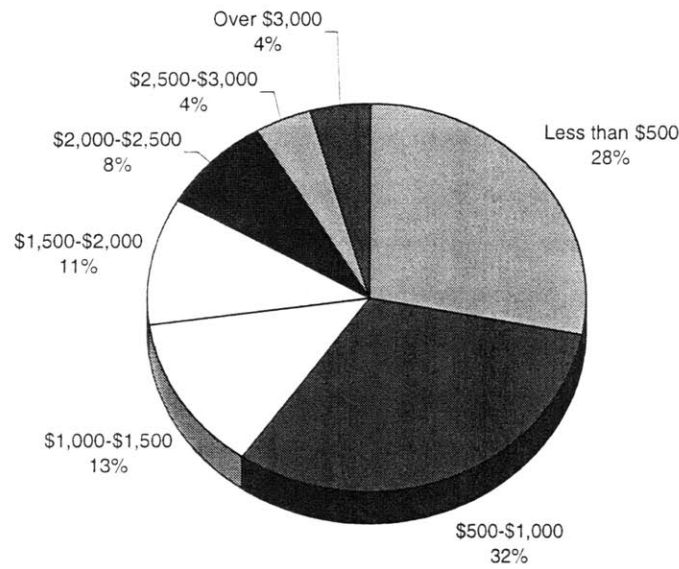
Figure 9: Income of Towns/Cities Where Surveys Were Conducted
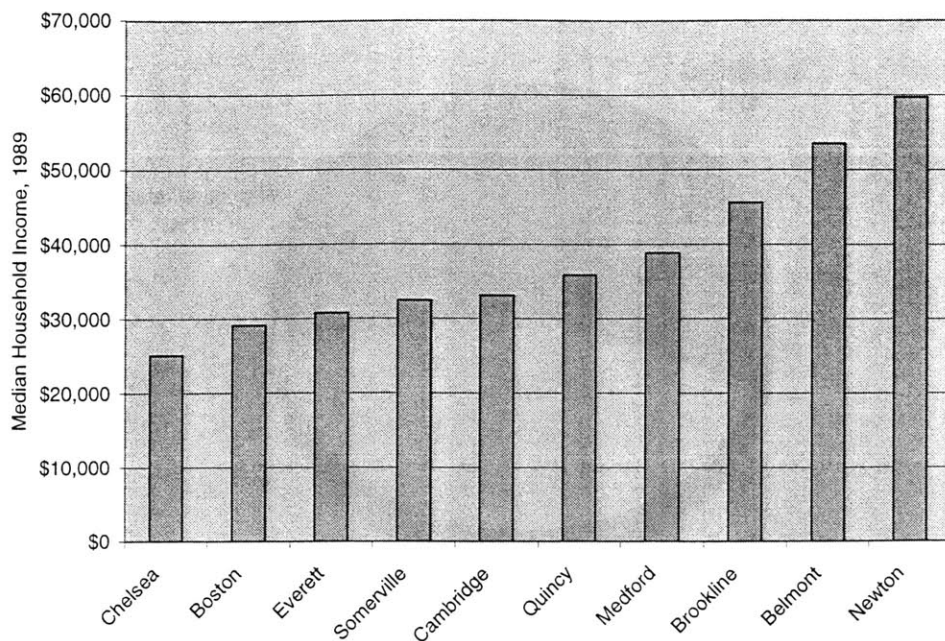
Living Arrangements

Figures 10 and 11 show the living arrangements of persons age 65 and older in 1998. The data is based on information from the U.S. Bureau of the Census which classifies living arrangements into three categories: living with spouse, living with other relatives, and living alone or with non-relatives. The results show that while the majority of men live with their spouse, more women live alone or with other relatives than live with their spouse. This is most likely a result of the longer life expectancy of women, thereby leaving women to live on their own when they are widowed.

Although the U.S. Census uses three living arrangement categories, the survey for this study uses only two: whether the respondent lives alone or not. The reason for this is to get an idea of whether the respondent is likely to be alone a lot, which can have an impact on fear. The living arrangements for all of the survey respondents are shown in Figure 12. Separated by gender, 39% of the men live alone, versus 61% of the women. Overall, more survey respondents live alone than do seniors on a national level. This could be a result of a survey bias, that people who live alone are more likely to attend events at senior centers in order to maintain a social life outside of the home. It is also a result of the fact that many more men than women live with others, and the proportion of male survey respondents was low relative to the national average.

Figure 10: Living Arrangements of Women Age 65+

With spouse
41%

With other relative
17%

Alone, or with non-
relative
42%
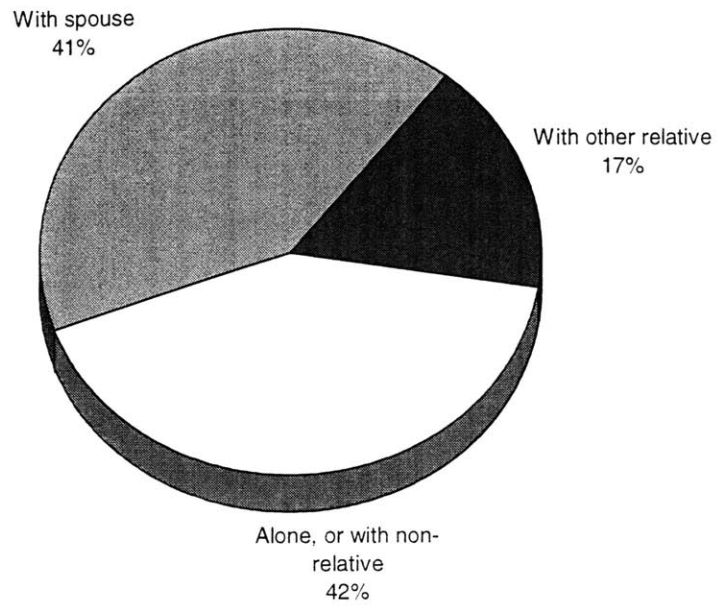
Figure 11: Living Arrangements of Men Age 65+

With spouse
73%

With other relative
7%

Alone, or with non-
relative
20%
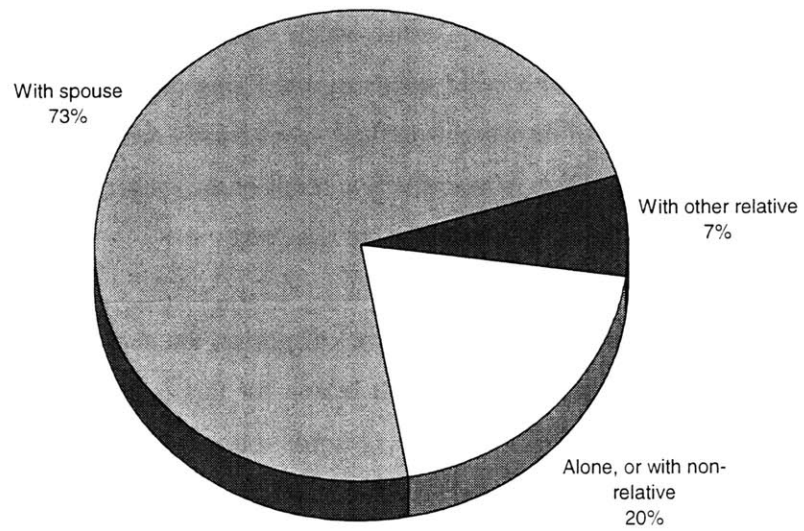
Figure 12: Living Arrangements of Survey Respondents

Living with spouse or other 62%

Living Alone 38%
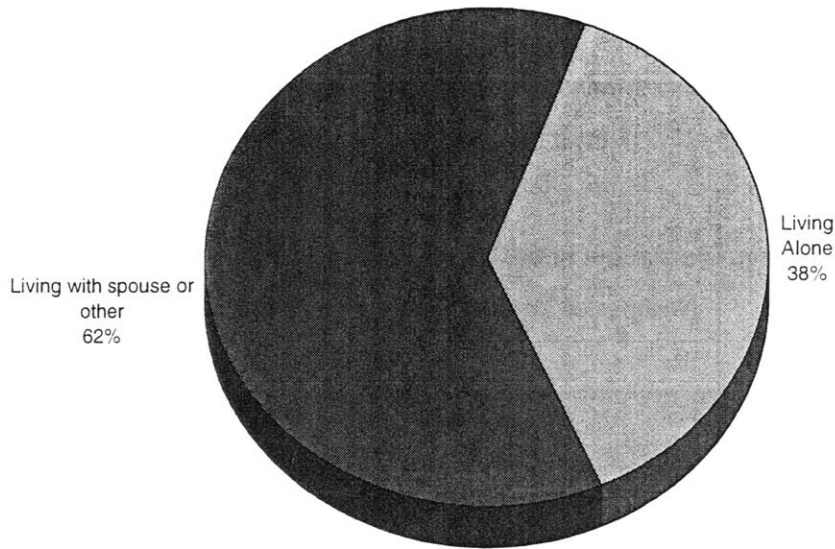
Data Counts

The following sections show the responses to the survey questions by individual question. Only those surveys which had appropriate answers for the particular question being examined were used. In other words, if only 175 respondents answered a question correctly, only 175 surveys were used. The percentage of respondents for each choice is then based on a total number of 175 responses.

Zip Code

Although most (92.31%) of the respondents were able to identify the zip code that they live in, many had difficulty. Some left the question blank and some entered zip codes that are not valid U.S. Postal Service zip codes. The zip codes and their associated towns (as reported by the U.S. Postal Service) represented by the respondents are shown in Table D in the Appendix.

Transit Ridership Decision Factors

The respondents were directed to select three of the six possible choices for this question indicating why they ride public transportation. Of the 182 respondents, 111 selected three responses, while 46 chose only

one or two choices, 20 did not select any choices, and five selected more than three choices. Although the responses certainly have more meaning when three are chosen, all responses were used to determine what the most important factors were for seniors when deciding whether or not to take public transportation. The number of total answers should theoretically be 546, or three times 182, the total number of surveys completed. In fact, due to some people choosing fewer than three choices and some choosing none at all, the total number of responses is only 419. The responses received are shown in Table 6.

Table 6 : Factors Considered in the Decision to Take Public Transit

Factor	Number of Times Chosen	Percent of Choices
Schedule	104	24.82%
Where it goes	119	28.40%
Cost	58	13.84%
Comfort	26	6.21%
Safe and secure	77	18.38%
No other alternative	35	8.35%

It appears that the convenience aspects of public transportation, such as the schedule and where it goes, are what attracts most seniors to ride public transportation. In fact, these are not much different than the decision factors that persons under age 60 use in mode choice decisions. Of all decision variables that the elderly might consider in deciding whether or not to use public transportation, comfort was least considered. This is a bit surprising, as there was much anecdotal evidence gleaned during the survey process that implied that comfort factors, such as high steps to the bus, were a major impediment from riding for the seniors. The fact that safety/security was the third most important factor is interesting, and it is unclear as to whether this response is a bias of the fact that a security discussion took place prior to taking the survey.

Types of Public Transit Within Walking Distance

Most of the respondents answered this question in what appears to be an accurate manner. Of the 103 respondents who live near train stations, 73, or 71%, also live near bus lines, which is approximately the percentage of MBTA rapid transit stops that are served by buses. Table 7 shows how many respondents live near the bus and train services of the MTBA.

Table 7: Respondents in Close Proximity to Public Transit Services

	Bus	Green Line	Orange Line	Red Line	Blue Line	No Transit Nearby
Live within walking distance	148	43	22	30	8	6
Percent of Respondents	81.32%	23.63%	12.09%	16.48%	4.40%	3.30%

Rapid transit (green, orange, red, and blue lines) is within walking distance of 58% of the respondents, a high enough number to be able to get accurate data about frequency of rapid transit use and rapid transit fear.

Walking Distance

Certainly, a reasonable walking distance to a transit service is not equal for everyone. Some seniors are only willing to walk for five minutes to access public transportation, while others are willing to walk for fifteen or more. Table 8 shows the walking distance distributions.

Table 8: "Reasonable" Walking Distance to Public Transportation

Walking Time	Number of Respondents	Percentage of Respondents
Less than 5 minutes	74	43.27%
5-10 minutes	70	40.94%
10-15 minutes	18	10.53%
More than 15 minutes	9	5.26%

Frequency of Public Transit Use

It was very important to determine the frequency with which each individual respondent uses public transportation. This frequency helps calibrate the reported fears, as there tend to be different levels of fear portrayed by frequent transit riders and infrequent patrons. Table 9 shows the frequency with which the respondents take the bus, train, and Boston's demand responsive paratransit service, The Ride.

Table 9: Frequency of Public Transit Use

		Mode					
		Bus		Train/Trolley		The Ride	
Frequency	At least a few times a week	69	39.66%	44	27.16%	7	4.79%
	Once a week to a few times a month	20	11.49%	27	16.67%	6	4.11%
	Once a month	22	12.64%	16	9.88%	9	6.16%
	A few times a year	39	22.41%	52	32.10%	14	9.59%
	Never	24	13.79%	23	14.20%	110	75.34%

It is clear that the respondents have a wide range of habits in terms of transit usage. While the majority of respondents are not customers of The Ride, the vast majority of the survey respondents take the train or the bus at least a few times a year. This enabled them to give educated opinions on their feelings with regard to security on public transportation in the Boston area.

Walking Frequency

The frequency with which each respondent walks is necessary to gauge the level of activity of each respondent and also the level of reliance on the automobile. Not unlike the average American, most seniors either walk at least a few times a week, or they rarely walk. It was surprising, however, that many seniors who live in dense areas do not often walk to their errands. The frequency with which the seniors surveyed walk is shown in Table 10.

Table 10: Frequency of Walking to Errands

	Number	Percentage	
At least a few times a week	65	44.83%	
Once a month to a few times a month	18	12.41%	
A few times a year	18	12.41%	
I rarely walk	39	26.90%	

Public Transit Use When Younger

It is important to find out the relative rate of transit use when the respondents were younger in order to be able to check for feelings toward and use of transit based on the respondents lifelong public transportation habits. Of the respondents who answered this question, 27% (43) take public transportation about the same amount as when they were younger; 22% (34) take it more now than they used to; and 51% (81)

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used to take public transportation more than they do now. The number of seniors who used to take transit more than they do now is not surprising, given that many of them probably took public transportation to work before they retired.

Activities Accessed by Transit

One objective of the study is to identify for what the seniors are using public transportation, both to obtain more insight into why they use public transit and also to identify new markets that can be explored in order to help seniors become more mobile. As Figure 13 shows, health destinations are the most popular for seniors when they make use of public transit. Shopping, social, and entertainment are the next favored destinations of choice, followed by work/volunteering. However, if the social and entertainment categories are combined, they account for 33% of the choices for transit destinations, more than health destinations. This shows that seniors look to public transit not only to go to the doctor and the grocery store, but also to have fun and maintain a good quality of life. Finally, some respondents used public transportation for other purposes, such as going to classes, meetings, or to get somewhere so that they can take a long walk home for exercise.

Figure 13 : Public Transportation Destinations
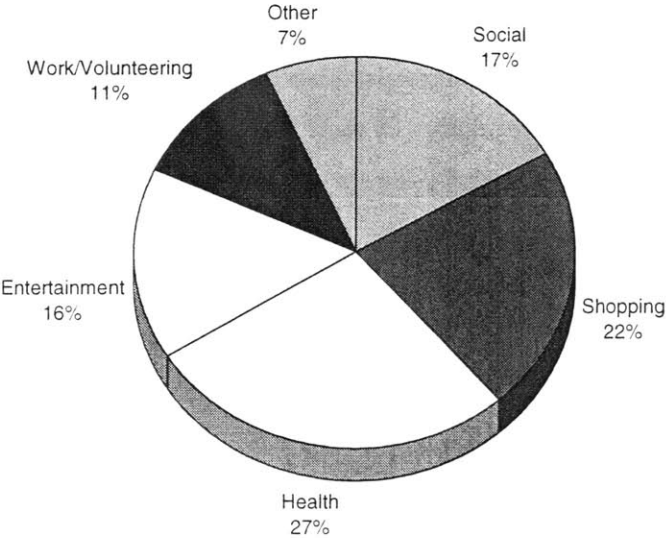
Drive when Younger

It is important to know whether or not the respondents drove when they were working or taking care of their families as this is often the key to whether elderly citizens will take public transportation, regardless of whether they are still able to operate an automobile. This question was not asked in the first two survey locations, Chelsea and Boston (Kit Clark Senior Center). Of those who were able to answer this question, their driving frequency when they were working or taking care of their family is shown in Table 11. The majority of those surveyed used to drive regularly, whereas the next highest frequency of drivers were those who never drove. It is believed that the percentage of respondents who drove at least a few times a week would have been lower if this question had been asked at the first two senior centers, as the income level in those areas is lower, which generally indicates a lower level of frequent drivers.

Table 11 : Frequency of Driving When Respondents Were Younger

Frequency	Number of Respondents	Percentage of Respondents
At least a few times a week	86	61.87%
Once a month to a few times a month	7	5.04%
A few times a year	5	3.60%
Never drove	41	29.50%

Current Driving Status

Overall, 56% (99) of the respondents do not currently drive on a regular basis (at least once a week), while the remaining 44% (79), still drive regularly. Of those who do not drive now, 57.35% never drove. The cross-tabulation of the current and former driving statuses of the respondents is shown in Table E in the Appendix.

Ride as a Passenger

It was important to determine the rate at which the seniors ride in a car as a passenger in order to account for those that do not drive but also do not take transit, getting around mainly as a passenger in a private vehicle. Table 12 shows the number of respondents who ride as a passenger at various frequencies.

Table 12: Frequency as a Passenger in a Private Car

Passenger Frequency	Number of Respondents	Percentage of Respondents
At least a few times a week	57	32.76%
Once a week to a few times a month	45	25.86%
Once a month	12	6.90%
A few times a year	41	23.56%
Never	19	10.92%

It is also important to look at each individual to see how often they either drive or ride as a passenger, as access to a car is often the determining factor in whether or not people use public transportation. Of the 182 survey respondents 56% (102) ride in a car as a passenger at least a few times a month. Of these, 69% (70) do not drive. Therefore, 70 (frequent passengers, non-drivers) plus 79 (regular drivers), or 149 (81.87%) have regular access to an automobile.

Health

Despite its obvious shortcomings, self-reported health is the only feasible way to ascertain the physical well-being of the respondents. The health of the respondents was used to see if health has an impact on transit use, again as a way to hone in on potential passengers from the elderly population. The health of the respondents is shown in Figure 14. The majority (74%) feel that their health is at least "good." This average level of health be higher than the senior population as a whole, as those who are in poor health are less likely to attend programs at senior centers. On the other hand, the survey over-sampled older seniors and under-sampled younger seniors which could serve as a balance to the health bias stemming from surveying at senior centers.

Figure 14 : Respondents' Self-Reported Health Status
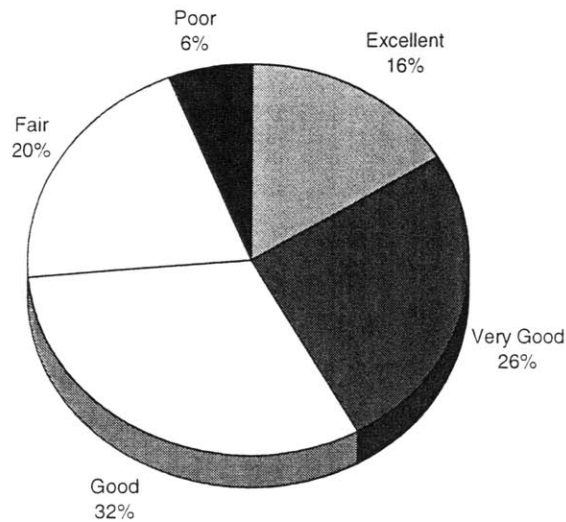
Difficulty Walking or Climbing Stairs

The majority of the respondents claimed to have no difficulty with either walking or climbing stairs. 70% had no difficulty walking and 64% had no difficulty climbing stairs. These questions were asked specifically to determine if these two handicaps yield any relationship with the frequency of transit ridership.

Spirits

Previous studies show that asking respondents about their mental well being is important for finding out if there exists a relationship between spirits and mobility and also for determining if their happiness has an effect on their fear. Overall, the respondents in this survey seem content, with 80% having either "excellent" or "very good" spirits and only 4 respondents, or 2%, saying that they are generally in poor spirits, as shown in Figure 15.

Figure 15: Respondents' Happiness

Fair-I'm happy a bit less than half of the time 18%

Poor-I'm rarely happy 2%

Excellent-I'm very happy 29%

Good- I'm usually happy 51%
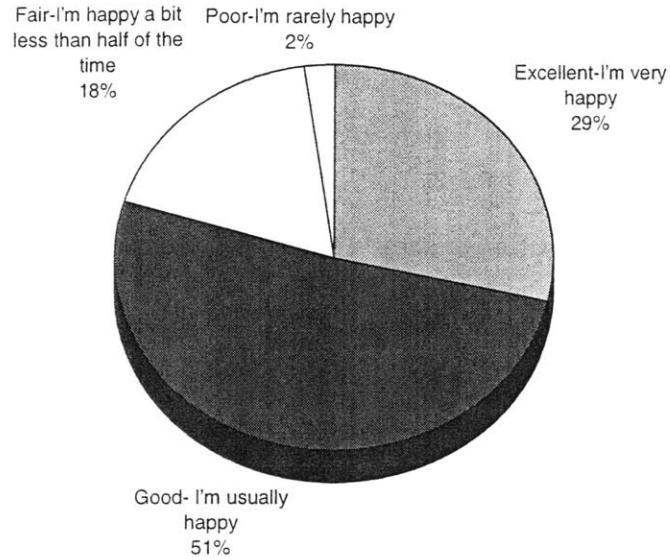
Type of Home

As shown in Table 13, seniors who live in all types of homes are represented in the sample. Some of the "other" types of homes include public housing, both for seniors and for all age groups. The type of home is important to know in order to determine if there are different levels of fear for seniors who live in different types of dwellings. The most popular types of dwellings for the respondents in this study are private homes, followed by rental apartments. There is also a significant number of respondents who live in senior communities or care facilities, which is helpful for determining whether this type of community has an effect on fear.

Table 13 : Respondents' Types of Homes

Type of Home	Number of Respondents	Percentage of Respondents
Private Home	86	48.31%
Rent an apartment	45	25.28%
Own a condo	13	7.30%
Older adult care facility or senior community	28	15.73%
Other	6	3.37%

Length of Residence in Neighborhood

The length that a respondent has stayed in their neighborhood may be used as a proxy for comfort level and can be compared with fear.[174] As it turns out, the majority of respondents are not at all fearful, so the length of time in their neighborhoods does not indicate fear or lack thereof. The length that the seniors have lived in their respective neighborhoods is shown in Figure 16.

Figure 16 : Survey Respondents' Length in Their Current Neighborhood
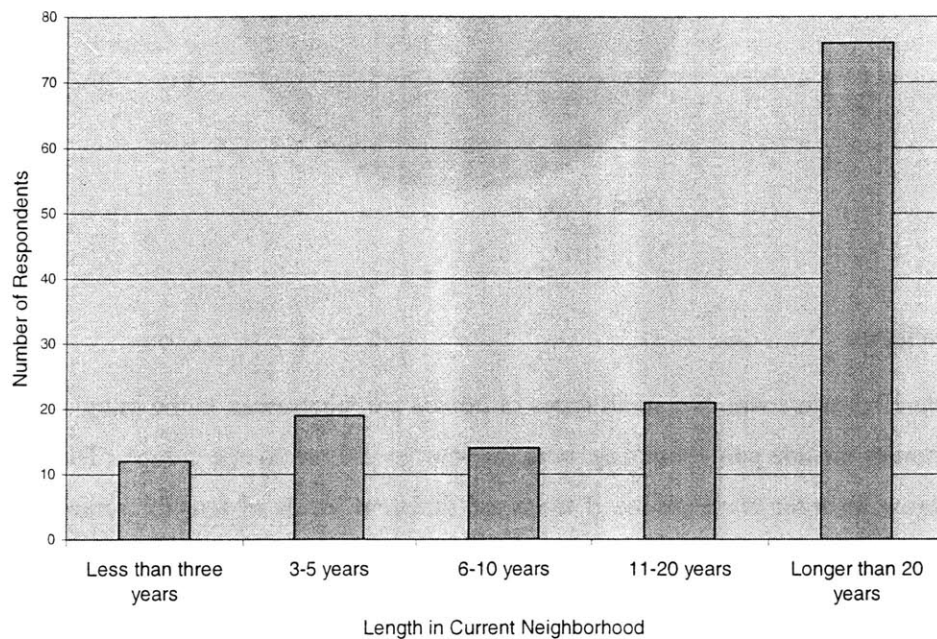
Fear

Using a suggestion from a study by Ferraro and LaGrange, a survey should tap the emotional state of fear and be stated that in a non-hypothetical format. Four questions should be asked to determine the respondents' general fear:

(1) How afraid do you feel when at home during the day?

(2) How afraid do you feel when at home during the night?

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[174] Bazargan, "The Effects of Health, Environmental, and Socio-Psychological Variables on Fear of Crime and its Consequences Among Urban Black Elderly Individuals," 1994.

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(3) How afraid do you feel to walk along right around your home during the day, that is between your home and bank, church, grocery, pharmacy, or other places that you do your shopping or other errands?

(4) How afraid do you feel to walk along right around your home at night, that is between your home and any places in your neighborhood that you might visit during the night?[175]

The choices given for these questions are not at all afraid, somewhat afraid, and very afraid. This general state of fear of the respondents was used in the data analysis to control for general fear when looking at relationships such as transit related fear and ridership frequency.

Figure 17 shows the general fear by the elderly respondents for being at home alone and for walking in their neighborhood. It is clear that most of the respondents are generally not fearful. The fears that seniors do have tend to be more prevalent at night, particularly when it comes to walking in their neighborhoods.

Figure 17: Survey Respondents' General Fear
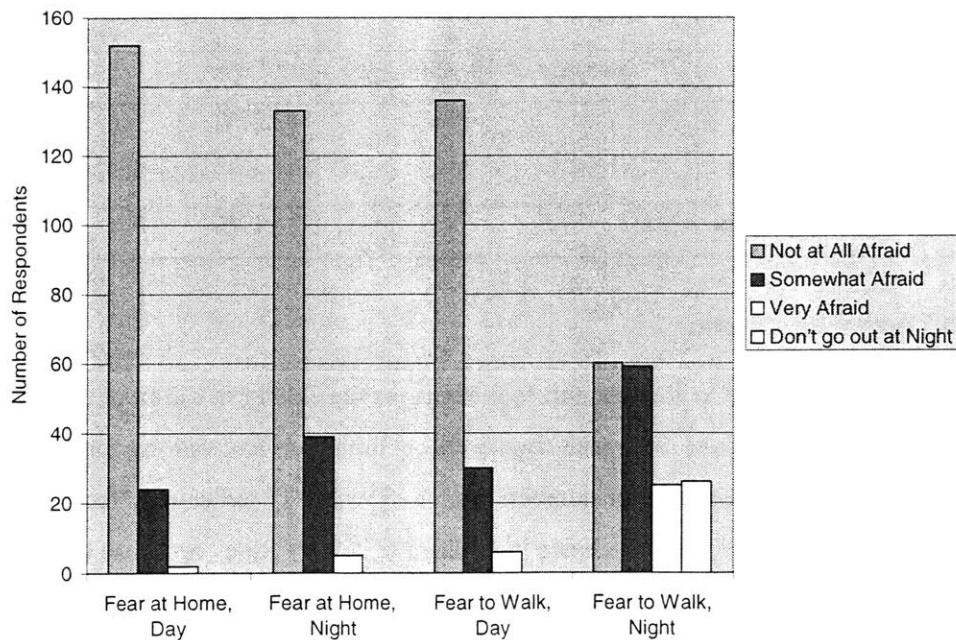
[175] Ibid.

Victimization History

There are theories that people who have been victimized in the past are more likely to fear the possibility of being a victim of a crime in the future. This is also said to be true for those who know people who were victims. In order to determine if this is true for this sample of seniors, the participants were asked if they or anyone they know has been a victim of a crime. For personal experience, the victimization experience was separated into two categories: been a victim within the last year and been a victim before this year. As a victim themselves, it is likely that personal experience would have a long-lasting effect on levels of fear. For knowing a victim, the participants were asked if they knew someone who was a victim within the past year, as after that period of time it is likely that the fear that this knowledge might induce would have worn off. The history of victimization of the respondents is displayed in Table 14. It appears that the majority of respondents have no history of victimization nor do they know anyone who was recently victimized. This is of course fortunate for the respondents, but makes it difficult to draw statistically valid conclusions about the effect of victimization on fear.

Table 14 : Victimization History of the Survey Respondents

Victimization History	Number of Respondents	Percentage of Respondents
Victim with in the last year	5	3.07%
Victim before this year	22 (Average of 10 years ago)	13.50%
Know a victim within the last year	20	12.27%
Not a victim nor know a victim	116	71.17%

Fear in Transit Situations

The survey sought to gauge if (and to what extent) fear exists for the elderly in different transit situations, in terms of mode and also the stage of the transit trip: walking to the service, waiting for the service, and riding the service. A Lickert scale with four numbers was used, with "1" indicating "feel very safe" and "4" meaning "feel very frightened." A fifth choice was added of "Don't Ride" for those that do not know how they feel because they do not ride that particular mode of public transportation. Unfortunately, a few respondents who do ride at least a few times a year circled "Don't Ride" for some of their choices. The level of fear that was reported by the respondents is displayed in Table 15.

It appears that the train evokes more fear for the elderly than does the bus. Riding the bus has the lowest fear of all the transit situations. This is not surprising, as the seniors are able to sit near the driver in a protected environment that makes them feel safe. On the other hand, riding a train is more anonymous, with the driver in a separated booth (for heavy rail), giving the feeling that there is no one watching to make sure crimes do not occur. For both bus and train, the average fear waiting for the respective mode is greater than actually riding. This has important implications for where security measures should be focused. Perhaps coincidentally, the seniors' fear of train stations is in line with actual crime on the MBTA, where the most crimes of all types occurred. Aside from that, however, the seniors fears diverged from reality, with the next most dangerous place being on the bus, followed by bus stops and finally on the train.[176]

Table 15: Respondents' Fear in Transit Situations

	Fear for Personal Safety									Average Fear[177]
	Feel very safe (1)		(2)		(3)		Feel very frightened (4)		Don't Ride	
Waiting at a bus stop for a bus	76	47.80%	48	30.19%	12	7.55%	5	3.14%	18	11.32%	2.26
Waiting on a platform for a train/trolley	47	31.33%	47	31.33%	23	15.33%	10	6.67%	23	15.33%	2.87
Riding the bus	81	54.36%	40	26.85%	9	6.04%	1	0.67%	18	12.08%	2.15
Riding the train	62	42.18%	46	31.29%	11	7.48%	4	2.72%	24	16.33%	2.63
Walking to/from the bus stop or train station	67	46.21%	37	25.52%	19	13.10%	6	4.14%	16	11.03%	2.34

After choosing their fear level in each of the five transit situations, the participants were asked to rank the five situations in order of where they feel most fearful to least fearful. This question proved to be extremely tricky for the seniors, and only 33 of the 182 participants were able to answer it accurately.

[176] Federal Transit Administration, National Transit Database, 1997.

Many of them did not understand the difference between this question and the question asking them to circle a number for their fear. For example, if they circled "2" for fear when riding the bus, then they entered a "2" next to riding the bus in the ranking question. They therefore did not use each of the five numbers only once, which was the desired result. Another aspect of this question that caused confusion was a mistake in the design of the survey. The Lickert scale for each situation had "1" described as feeling the safest, but the ranking question asked the participants to rank the situations from 1 to 5, where "1" indicated most frightening. This caused some additional confusion. Table 16 shows the results from the 33 respondents who did rank the situations. The numbers have been reversed from how the answers were entered so that the results can be compared to the fear in each situation from the previous question.

Table 16: Results of Fear Ranking of Transit Situations[178]

	Waiting at a bus stop for a bus	Waiting on a platform for a train/trolley	Riding the bus	Riding the train	Walking to/from the bus stop or train station
Average level of fear	1.62	1.97	1.47	1.65	1.72
Median level of fear	1	2	1	1	1
Mode level of fear	1	1	1	1	1

Table 17 shows a comparison between the average fear reported on the Lickert scale and in the ranking question. A negative difference in the fears indicates that the situation was reported as safer on the Lickert scale than in the ranking. A positive difference indicates that the situation was reported as more frightening on the Lickert scale than in the ranking.

When the respondents were forced to rank the five situations, the average fear is slightly different than when they simply choose between four choices. Both bus related situations were considered safer on the Lickert scale than in the ranking. A possible explanation for this is that the average education level of the

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[177] Average fear does not include the responses of "Don't Ride."

[178] Data in this table are based on choices of numbers 1-4; Blank responses and responses of "Don't Ride" were not included.

ranking respondents was higher (a significantly greater percentage of college graduates than the respondents as a whole). The respondent's level of education actually does have an impact on their fear of buses versus trains, with a higher correlation between train fear and level of education than bus fear and level of education. Therefore, the average fear displayed by the results of the ranking question may be skewed by the higher education of the respondents.

Table 17: Comparison of Average Fear by Type of Question: Lickert Scale and Ranking

	Average Fear (Lickert Scale)	Average Fear[179] (Ranking)	Difference
Waiting at a bus stop for a bus	2.26	2.69	(0.43)
Waiting on a platform for a train/trolley	2.87	2.79	0.08
Riding the bus	2.15	2.50	(0.35)
Riding the train	2.63	2.25	0.38
Walking to/from the bus stop or train station	2.34	1.77	0.57

Mode Considered Safer

The survey also asked the participants straight out which mode they consider to be safer from crime: the bus or the train/trolley. Although many expressed the feeling to the surveyors that they believe they are equally safe (or unsafe), this was not given as a choice in order to force a decision that could be of use for planning security measures and allocating security funding. Of the 146 respondents to this question, 123 consider the bus safer and only 23 consider the train safer.

Fearful of Types of Crime

Many of the fears that the elderly population has regarding transit crime are not about the typical reported crimes, such as mugging, rape, homicide, etc. The crimes that the elderly are more likely to think about when making mode choices are mainly quality of life crimes. The first two "pilot" asked about the seniors' fear of crimes such as mugging, rape, and homicide, and they were all very fearful. However, the

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[179] Average fears from the ranking question have been converted to a 1-4 scale for sake of comparison with the answers to the average fear from the Lickert scale.

respondents were only fearful of the concepts of these crimes, as they are very scary situations. However, these were not, for the most part, crimes that people could relate to. The question was therefore changed to ask the respondents how fearful they are when they witness particular crimes. The level of fear that they expressed is shown in Table 18 and Figure 18.

Table 18: Fears Expressed When Witness to "Crimes"

	Not at all Frightened (1)		(2)		(3)		Feel very Frightened (4)		Never Seen It	
Obscene Language	32	21.77%	44	29.93%	37	25.17%	26	17.69%	8	5.44%
Teenager Rowdiness	21	13.91%	33	21.85%	58	38.41%	32	21.20%	7	4.64%
Vandalism of Transit Property	22	15.83%	24	1.27%	46	33.09%	34	24.46%	13	9.35%
Begging/ Panhandling	26	18.71%	52	37.41%	31	22.30%	23	16.55%	7	5.04%
Pushing and Shoving	22	15.17%	37	25.52%	33	22.76%	46	31.72%	7	4.83%

The chart in Figure 18 shows which fear level was most popular for a given type of crime. For example, the teenager rowdiness line shows that the highest percentage of seniors rated this crime a three out of four, indicating a high level of fear.

As shown in Table 19, the elderly are most frightened by pushing and shoving, followed by vandalism of transit property, teenager rowdiness, obscene language, and begging/panhandling. In fact, the number that was cited most often for pushing and shoving is four, indicating that the respondents feel very frightened by this. Teenager rowdiness and vandalism have medians and averages over the midpoint of the scale (1-4), indicating that the elderly lean toward being very frightened when witnessing either of these two crimes. On the other hand, obscene language and begging/panhandling are not as frightening to the seniors, as average and median fear is below the midpoint.

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Figure 18 : Fears Expressed When Witness to "Crimes"
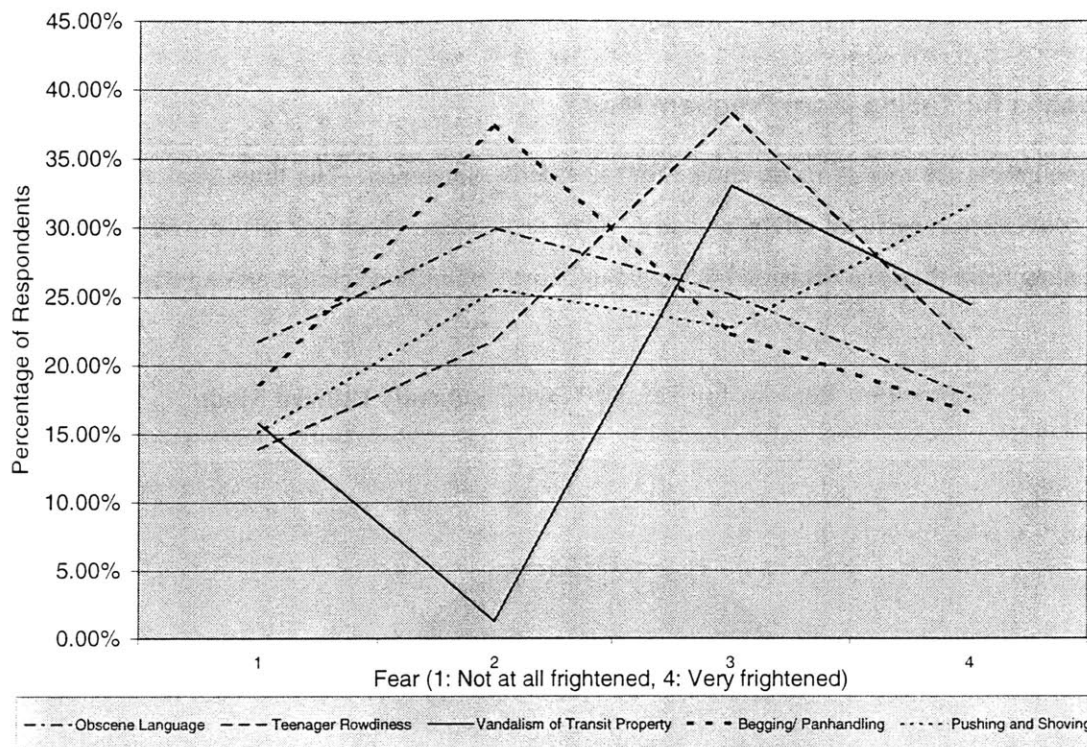
Table 19 : Average Fear When Witness to "Crimes"

	Obscene Language	Teenager Rowdiness	Vandalism of Transit Property	Begging/ Panhandling	Pushing and Shoving
Average	2.41	2.70	2.73	2.39	2.75
Median	2	3	3	2	3
Mode	2	3	3	2	4

Mode More Often

Although the seniors responded earlier in the survey about the frequency with which they take buses and trains, this question still has a dual purpose. First, it validates the answers to the frequency questions, and second, it further specifies the more frequently used mode for those respondents who chose the same frequency level for bus and train. 48% (77) respondents claim to take the bus more often than the train,

21% (34) take the train/trolley more often than the bus, and 31% (50) maintain that they take both modes with equal frequency.

Reason for Taking More Frequent Mode

This question gets at the root of mode choice for the elderly population. The three choices given on the survey are convenience, personal safety, and cost. Most respondents chose one answer, while a few chose more, indicating more than one decision factor that influences their mode choice among transit options.

Figure 19 : Reasons for Taking More Frequently Utilized Mode
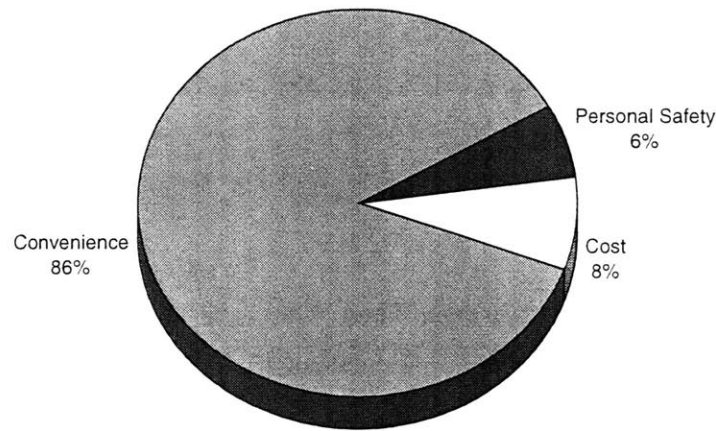
As Figure 19 indicates, the overwhelming majority of the respondents take the mode that they use more often because of convenience. A small percentage consider personal safety and a few consider cost. Most likely, those that consider cost are mainly comparing the public transportation mode to an alternative (car or taxi), as the cost differential between bus and train for a senior citizen (with proper identification) is only five cents.

Travel Decision Based on Personal Security Concerns

One aspect of the transit decision that is important to know about the elderly was whether they ever decide not to take the bus or the train because of personal safety concerns. The results yield an interesting conclusion: very few of the seniors choose not to ride transit due to personal security concerns. Only 9%

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of the respondents sometimes decided not to take the bus due to security concerns, and 14% sometimes choose not to take the train. These results are consistent with the fact that very few seniors cited personal safety as the decision factor in which mode to take. Additionally, more seniors find the bus to be the safer mode, therefore validating the fact that a greater percentage of the seniors choose not to take the train due to security concerns.

Frightening Types of People

There are a few types of people that tend to frequent public transit that can make other patrons of the system uncomfortable. In order to correctly address problems that the elderly in particular face with regard to these people, the respondents were asked how frightened they are by groups of teenagers, drunks, and homeless people. The results, displayed in Table 20, show that the majority (at least 70%) of seniors are at least sometimes afraid of these three types of people. Of the three types, drunks seem to pose the biggest threat, with the lowest percentage of seniors never being afraid and the highest percentage always being afraid.

Table 20 :   Fear of Frightening Types of People

	Almost Never		Sometimes		Almost Always	
Groups of Teenagers	42	27.81%	82	54.30%	27	17.88%
Drunks	31	22.46%	71	51.45%	36	26.09%
Homeless People	39	29.10%	70	52.24%	25	18.66%

Security Measures in Train Stations

This question seeks to find which security features make the elderly most comfortable when in a train station. The question was asked in regard to a train station as opposed to a bus stop for two reasons. First, to see what features should be focused on in the station design for Tren Urbano, and second, it is more realistic to implement security measures at train stations, as there are many fewer than there are bus stops. Originally, during the pilot surveys, the question had five choices that the participants were asked to rank, but this proved to be cumbersome for the seniors. From their answers, it appeared that three was the maximum number that the majority of respondents could rank in an order that made sense. Thus, after the pilot surveys at the first two senior centers, only three security features were asked about: a police officer or security guard; bright lighting; and emergency telephones. It is also important to note the reason why this is a ranking question. If the question had simply asked which of these are important, the

respondents would have said that they are all important. Given the limited resources of transit agencies, it is important to be able to prioritize, and the ranking procedure enables that.

As seen in Table 21, the older adult population clearly feels most comforted by the presence of a person in charge, namely a police officer or security guard. Their second most coveted safety feature is bright lighting, followed by emergency telephones.

Table 21: Desired Safety Features in a Train Station

	Most Important Safety Feature (1)			(2)	Least Important Safety Feature (3)	
Police Officer or Security Guard	85	76.58%	15	18.07%	6	7.23%
Bright Lighting	19	17.12%	51	61.45%	16	19.28%
Emergency Telephones	7	6.31%	17	20.48%	61	73.49%
Total	111	100.00%	83	100.00%	83	100.00%

Type of Guard

Knowing beforehand that it was likely that the elderly would lean toward a security officer as the preferred safety measure, a follow-up question asked what type of guard they would prefer. The vast majority, 82%, chose a uniformed and armed police officer. An unarmed security guard and a policy to employ undercover guards or officers received the same number of votes, at 8% each, with the remaining 2% claiming that no guard or officer is necessary. This question is a bit skewed, however, because given a choice with no constraints (i.e., money), most everyone will choose the safest and "best" option. However, there is no real way to control for consumer preference other than to start giving constraints, which would have been too complicated for the participants to understand. Therefore, this question has limited utility other than to tell us that, given a perfect scenario, seniors feel most comfortable with a uniformed and armed police officer.

Mobility

There was no one specific question asking about mobility— this is a derived measurement based on the answers to other questions in the survey. One of the main goals of this study is to propose ways to make

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older adults more mobile. The answers provided in the survey can be used to create a measure of mobility, or how often the seniors travel out of their homes. A measure was created that combines auto-related and non-auto-related mobility. Auto-related mobility includes the frequency of riding in a car as a passenger and whether or not the respondent drives. Non-auto related mobility includes the frequency of taking the train, bus, and The Ride as well as walking. To obtain a numeric measure, the totals in both categories (auto-related and non-auto-related) were averaged. The numbers that were used to calculate the mobility measures are shown in Table 22.

Table 22: Numeric Mobility Values

Mode	Numeric Values
Riding in a car, bus, train, and The Ride frequencies	1= At least a few times a week; 2 = Once a week to a few times a month; 3 = Once a month; 4 = A few times a year; 5 = Never
Walking	1 = At least a few times a week; 2 = Once a month to a few times a month; 4 = A few times a year; 5 = Rarely walk
Driving	1 = Drive; 5 = Do not drive

The lower the number, the more mobile the respondent is, as the lower numbers correspond to higher frequency of use of the various modes. Each type of mobility and the overall mobility are shown in Tables 23 and 24. The first table includes The Ride frequency in the non-auto mobility calculation and the second does not.

Table 23: Mobility (Including The Ride)

(Lower Number = More Mobility)

	Non-Auto Mobility	Auto Mobility	Total Mobility
Mean	3.25	3.00	6.02
Median	3.25	3.00	6.00
Standard Deviation	1.02	1.05	1.19
Variance	1.05	1.11	1.43

Table 24: Mobility (Not Including The Ride)

(Lower Number = More Mobility)

	Non-Auto Mobility	Auto Mobility[180]	Total Mobility
Mean	2.74	3.25	5.55
Median	2.67	3.25	5.50
Standard Deviation	1.30	1.02	1.37
Variance	1.69	1.05	1.88

One clear result that Tables 23 and 24 show is that seniors have greater auto mobility than non-auto mobility when use of The Ride is accounted for, whereas non-auto mobility is the higher of the two when The Ride is not included. This is not surprising most respondents never take The Ride (paratransit service), thereby lessening their average non-auto mobility when this is included. Once the non-auto mobility is calculated without The Ride, as in Table 24, the average mobility of the respondents shows that seniors are in fact more mobile by non-car modes than by their cars. This is definitely an unexpected result, as only 36% of the seniors take either the bus or train or both at least a few times a week but 44% drive regularly (at least once a week).

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[180] The values for auto mobility are different in Tables 23 and 24 because there are nine respondents who are not included in the first table's calculations since they did not answer the question about The Ride frequency.

Chapter 5: Data Analysis

Cross-Tabulations

The first step in conducting the data analysis was to create cross-tabulations of the data. Data that were believed to display a relationship were cross-tabulated to determine the extent of their connection. Most cross-tabulations are between two variables, though a few have been controlled for a third variable in order to determine if the relationship between the first two is real or spurious. In addition to the cross-tabulations in this section, the correlation coefficients were obtained for most of the relationships investigated. The correlation coefficients show the degree to which a relationship exists between the two variables: a coefficient of 1 or −1 indicates a perfect linear relationship, and a coefficient of 0 indicates two independent random variables.

As mentioned, some of the questions were not answered by all 182 respondents. This has an important effect on the data analysis when the answers to more than one question are analyzed together as only the data for those respondents who answered both questions correctly can be used. Respondents who missed either one or both questions can not be included in the sample.

Assessment of Data Consistency

Some questions in the survey asked for similar information in different ways. An assessment of data consistency and accuracy can be made by comparing respondents' answers to these similar questions.

Mode Considered Safer by Safety at Transit Situations

The respondents' average fear for each mode was developed by calculating the average fear of waiting for the mode and riding the mode. The fear of bus and train were then compared to determine which mode the respondent is more fearful of. This was then compared to the answer to the question of "Which do you think is safer: bus or train/trolley?"

Many seniors feel that the bus and the train are equally safe (or unsafe). Those respondents' accuracy level could not be assessed because the choice of "the same" was not given on the question of which mode the respondent considers safer.[181] Of the 122 respondents who answered all of the questions

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[181] The choice of "the same" was purposely omitted in order to force the seniors to choose between the two modes.

involved. 63 had equal average fears of buses and trains. Of the remaining 59, 46 had consistent responses, meaning that the mode they claimed was safer was supported by a lower average fear of that mode (for 78% of the respondents).

Mode Taken More Often by Frequency of Bus and Train Use

The answer to the question of which mode the respondent takes more often is compared with the answer to how frequently the respondent takes the bus and the train. The answers were not extremely accurate, with only 55% of the respondents answering the two questions consistently.

Teenagers

This cross-tabulation is to assess answer accuracy regarding the respondents' fear of teenagers, a fear that is commonly referred to in the literature. To determine the true extent of this fear among this sample, two questions were asked. One asked for the respondents' feeling of fear when they witness particular "crimes," among them teenager rowdiness. The second question asked the respondent whether certain types of people frighten them, one of the types of people being teenagers. To assess the consistency of the answers, the two questions were compared and determined consistent if they fit in the "Yes" categories as in Table 25.

Table 25: Assessment of Accuracy for Teenager Fear

		Answer to Teenager Rowdiness as a Crime			
		Not at all frightened (1)	(2)	(3)	Feel very frightened (4)
Answer to Fear of Teenagers	Almost Always	No	No	Yes	Yes
	Sometimes	No	Yes	Yes	No
	Never	Yes	Yes	No	No

Using this methodology, 87 (67%) answered consistently and 43 (33%) answered inconsistently. This could be a result of the fact that in general people are not very afraid of teenagers but they are afraid of their rowdiness. Of the 43 respondents who answered "inconsistently," 14 answered "4" for fear of teenager rowdiness and "sometimes" for fear of teenagers. These answers could be considered consistent, given that these people are not fearful of teenagers in general, but are fearful when teenagers are rowdy.

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Monthly Spending by Median Household Income

This cross-tabulation was conducted simply to determine the accuracy of the proxy of median household income of the town where the survey was conducted for the respondents' spending habits. The correlation coefficient is 0.46, indicating a decent, though not perfect, proxy. Since a proxy was necessary because of the belief of invalid answers to the spending question in the survey, it is not surprising that a better correlation does not exist.

Important Factors in Transit Decision

The survey asked the seniors for the three most important factors that go into their decision of whether or not to take public transit. The choices given were the schedule, where it goes (service destinations), cost, comfort, safety/security, and no alternative existed. In order to determine what personal characteristics affect decision making, cross-tabulations were created between the factors chosen by each respondent and various personal characteristics, including driving status and income. The purpose of doing such cross-tabulations is to determine where to focus transit marketing and education efforts.

Driving Status

It can be expected that seniors who drive will value different aspects of public transportation than do seniors who do not drive. As shown in Table 26, seniors who drive value schedule, the service destinations, comfort, and safety/security more than their non-driving counterparts. Both the drivers and non-drivers, however, place the highest value on where the service goes.

Table 26: Transit Decision Factors by Driving Status[182]

		Drive		Do not Drive	
		N	%	N	%
Transit Decision Factors	**Schedule**	50	26.74%	53	23.35%
	Where it goes	57	30.48%	61	26.87%
	Cost	25	13.37%	33	14.54%
	Comfortable	10	5.35%	15	6.61%
	Safe and secure	40	21.39%	36	15.86%
	No other alternative	5	2.67%	29	12.78%

Income

To some extent, income can be expected to have some effect on how transportation decisions are made. The income used here is the median household income of the town in which the senior center is located where the respondent took the survey. Looking at the cross-tabulation of driving status to income, less than 40% of the low- and middle-income respondents drive, so it is not coincidental that the answers for the low- and middle-income respondents are somewhat similar to the responses of the non-drivers.

Table 27 shows the percentage of respondents within an income category who chose a particular decision factor, and also the percentage of respondents who chose a particular factor by income brackets. Schedule and where the service goes appear to be valued relatively equally among the income groups. Cost was more important to the lower income seniors, though this is ostensibly the cost differential between transit and driving, as the cost for seniors to take public transportation in the Boston area is minimal (15 cents for buses and 20 cents for rapid transit). Although comfort was not a frequent choice, it is interesting that the lower income respondents chose this more frequently than did the wealthier seniors. Finally, safety/security and "no other alternative" were favored most by the respondents in the middle-income bracket.

Seniors in all three income brackets placed the highest value on the transit schedule and where the service goes. Safety/security was the third most important variable for medium and high-income seniors whereas cost was the third choice for the seniors with low income.

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Table 27: Transit Decision Factors by Income[183]

		Median Household Income					
		Low (<$33,000)		Medium ($33,000-$46,000)		High (>$46,000)	
Transit Decision Factors	Schedule	34	25.95%	37	24.83%	33	24.26%
			32.69%		35.58%		31.73%
	Where it goes	32	24.43%	44	29.53%	42	30.88%
			27.12%		37.29%		35.59%
	Cost	26	19.85%	13	8.72%	18	13.24%
			45.61%		22.81%		31.58%
	Comfortable	11	8.40%	6	4.03%	9	6.62%
			42.31%		23.08%		34.62%
	Safe and secure	18	13.74%	32	21.48%	27	19.85%
			23.38%		41.56%		35.06%
	No other alternative	10	7.63%	17	11.41%	7	5.15%
			29.41%		50.00%		20.59%

Walking Distance

The walking distance is what each respondent considers to be a "reasonable walking distance to access a public transportation service." The answers to this question were cross-tabulated with a number of factors in order to determine what causes the elasticity of walking distance.

Walking Distance and Driving Status

As shown in Table 28, while only 9% of the seniors who drive are willing to walk more than 5-10 minutes to access public transportation, 21% of the non-drivers are willing to make the longer walk. This confirms the trend that is prevalent in all age groups that dependent transit users are willing to make greater sacrifices to ride public transportation.

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[183] The top percentages total to 100% by column and the bottom by row. In other words, the top percentages show the percentage of seniors in each income bracket who value each factor, and the bottom percentages show what

Table 28: "Reasonable" Walking Distance to Transit by Driving Status

		Do Not Drive		Drive	
		N	%	N	%
Walking Time	Less than 5 minutes	39	42.86%	34	44.16%
	5-10 minutes	33	36.26%	36	46.75%
	10-15 minutes	12	13.19%	6	7.79%
	More than 15 minutes	7	7.70%	1	1.30%

In order to determine a correlation coefficient between these two factors, a binary value was assigned for whether or not the respondent drives, with a "0" for drives and a "1" for does not drive, and ascending numbers were assigned for increasing walking distances. The correlation coefficient between walking time and driving time is 0.12, indicating that, though small, there is some indication that those respondents who do not drive are willing to walk farther distances to access public transportation.

Walking Distance and Health

A common sense assumption about seniors is that the healthier they are, the longer they would be willing to walk to access a public transit service. This is shown to some extent in Table 29, as higher percentages of the seniors in fair or poor health are only willing to walk fewer than five minutes. In fact, 60% of seniors in fair or poor health are only willing to walk five minutes, as opposed to 37% of seniors in excellent, very good, or good health.

Again assigning ascending numbers for increasing walking distance, and assigning increasing numbers for declining health status, a correlation coefficient of –0.11 is obtained, indicating a slight relationship showing that the better the health status of the respondent, the farther they will be willing to walk.

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percentage of the people who value the factor are in each income bracket.

Table 29: "Reasonable" Walking Distance to Transit by Health

		Self-Reported Health								
		Excellent		Very Good		Good		Fair		Poor	
		N	%	N	%	N	%	N	%	N	%
Walking Time	Less than 5 minutes	10	35.71%	16	37.21%	20	36.36%	19	55.88%	7	77.78%
	5-10 minutes	14	50.00%	20	46.51%	27	49.09%	8	23.53%	1	11.11%
	10-15 minutes	2	7.14%	5	11.63%	5	9.09%	5	14.71%	1	11.11%
	More than 15 minutes	2	7.14%	2	4.65%	3	5.45%	2	5.88%	0	0.00%

Driving Status

Current and Former Driving Status

A comparison was made between seniors' former driving habits and whether or not they drive now. It is clear that driving as a senior cannot be taken for granted, as 41% of the respondents who used to drive at least once a month no longer drive at all. This is an important consideration when looking at the mobility of seniors, because those who used to drive but no longer drive make up a significant part of the senior population which transit must target. The former drivers may be less likely to want to use transit and more likely to fear transit, thus having a major impact on their mobility and quality of life.

Driving Status (Current and Former) by Median Town Income[184]

To get an idea of the incomes of the drivers, driving status was cross-tabulated with the median household income, and the results are shown graphically in Figure 20. It is clear that while the majority of those in the high-income bracket are drivers, fewer than 40% of the seniors in the medium- and low-income brackets drive. As for driving when younger, the majority of seniors in each income category used to drive, though the highest proportion of former drivers was in the high-income bracket, where 82% used to drive, compared to about 60% of the low- and middle-income seniors who used to drive.

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[184] Two of the four senior centers in the low-income bracket were surveyed before the question about driving when younger was asked.

Figure 20 : Drivers and Median Household Income
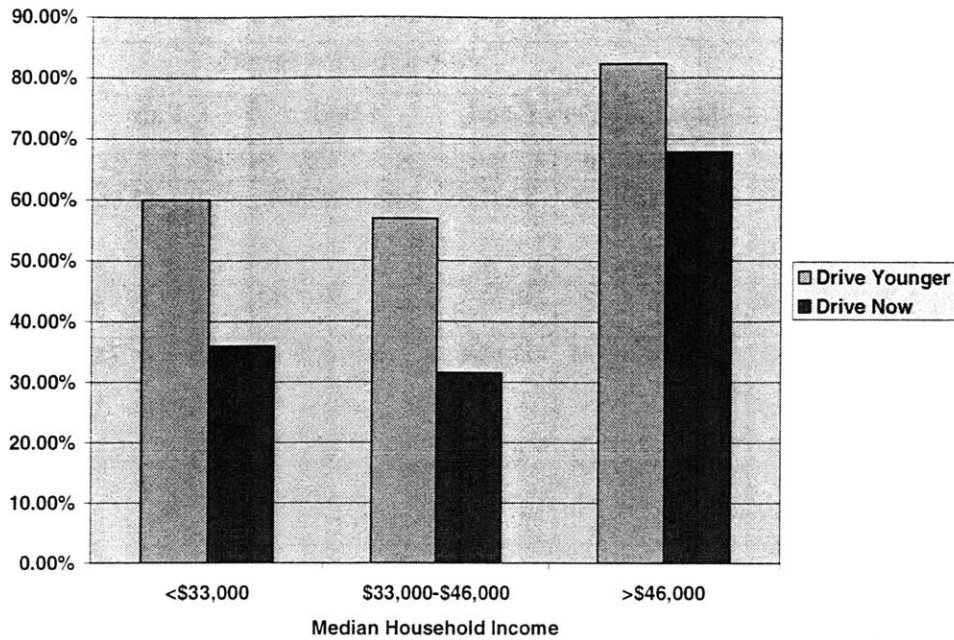
Frequency of Public Transit Use
Current and Former Public Transit Use

A cross-tabulation (Table F in the Appendix) was made of the relative use of public transportation when the respondents were younger (i.e., still working or taking care of their children) and the frequency of use of public transportation (an average of bus and train use) now. The correlation coefficient between relative former transit use and current public transit use is 0.04. In other words, whether the respondent uses transit more or less than they used to has no correlation with the frequency with which they use public transit now.

Health and Frequency of Public Transit Ridership

It is interesting to see if health has an effect on the frequency with which older adults ride public transit. Table 30 shows a cross-tabulation of health and transit utilization, broken down by bus and train use. Seniors in "excellent" health status have the highest percentage of regular transit users (at least a few times a week), and seniors in "poor" health have the highest percentage of seniors who never use transit. Other than those two trends, there appears to be little correlation between health status and frequency of transit use. Looking at the relationship the other way, the highest percentage of seniors who use transit

with a given frequency are, for the most part, in good health, as seniors in good health make up 32% of all seniors interviewed, a much greater proportion than any of the other health statuses.

Table 30 : Health and Frequency of Transit Utilization[185]

		Self-Reported Health Status								
		Excellent		Very Good		Good		Fair		Poor	
		N	%	N	%	N	%	N	%	N	%
Bus Frequency	At least a few times a week	13	46.43%	17	40.48%	20	35.09%	13	37.14%	4	40.00%
			19.40%		25.37%		29.85%		19.40%		5.97%
	Once a week - a few times a month	4	14.29%	4	9.52%	5	8.77%	6	17.14%	1	10.00%
			20.00%		20.00%		25.00%		30.00%		5.00%
	Once a month	1	3.57%	5	11.90%	10	17.54%	6	17.14%	0	0.00%
			4.55%		22.73%		45.45%		27.27%		0.00%
	A few times a year	10	35.71%	9	21.43%	13	22.81%	5	14.29%	2	20.00%
			25.64%		23.08%		33.33%		12.82%		5.13%
	Never	0	0.00%	7	16.67%	9	15.79%	5	14.29%	3	30.00%
			0.00%		29.17%		37.50%		20.83%		12.50%
Train/ Trolley Frequency	At least a few times a week	11	42.31%	8	20.00%	11	21.57%	9	30.00%	2	20.00%
			27.91%		20.93%		25.58%		20.93%		4.65%
	Once a week - few times a month	3	11.54%	8	20.00%	11	21.57%	3	10.00%	1	10.00%
			11.11%		33.33%		40.74%		11.11%		3.70%
	Once a month	2	7.69%	5	12.50%	5	9.80%	4	13.33%	0	0.00%
			12.50%		31.25%		31.25%		25.00%		0.00%
	A few times a year	9	34.62%	15	37.50%	17	33.33%	9	30.00%	2	20.00%
			17.31%		28.85%		32.69%		17.31%		3.85%
	Never	1	3.85%	4	10.00%	7	13.73%	5	16.67%	5	50.00%
			4.55%		18.18%		31.82%		22.73%		22.73%

[185] The top percentages total to 100% vertically and the bottom percentages total to 100% horizontally. The top percentages indicate the percentage of seniors in a particular health bracket who take transit with particular frequency. The bottom percentages indicate what percentage of seniors who take transit with a particular frequency are of what health status.

The correlation coefficients between health and frequency of bus and train ridership are 0.07 and 0.16, respectively. Thus, there is little correlation between health and frequency of ridership, though the correlation is slightly larger between health and train ridership. For both modes, the relationship, though weak, shows that as health declines, so does transit patronage.

Difficulty Walking/Climbing Stairs and Frequency of Transit Utilization

Table 31 shows the cross-tabulation between the frequency of bus and train ridership with these two difficulties. Respondents who had difficulty walking were much less likely to take the bus or train at least a few times a week and much more likely to never take the bus or train. A significant percentage of those who have difficulty walking still take the bus at least a few times a week, while a very small percentage take the train that often. This could be a result of the fact that only about 57% of the respondents live within walking distance of a train station, a hindrance for someone who experiences difficulty walking. Thus, it appears that difficulty walking affects seniors' use of the train more so than it affects use of the bus.

Those who had difficulty climbing stairs also were more likely to never take the bus or train but only slightly less likely than those without difficulty to take the bus or train a few times a week. However, those with difficulty on stairs were less likely to take the bus and train occasionally (either once a week to a few times a month, once a month, or a few times a year). Of those with difficulty climbing stairs, 41% take the bus occasionally, compared with 50% of those without difficulty. For occasional train use, 47% of those with stair climbing difficulty take the train occasionally, compared with 65% of those without difficulty. Overall, it appears that difficulty in climbing stairs has a greater effect on bus ridership than it does on utilization of the train.

Correlation coefficients were created by assigning a "0" for no difficulty with the activity and a "1" for difficulty. The only relationship with any significant correlation showed that those with difficulty walking take the train less frequently, with a correlation coefficient of 0.23.

Upon further analysis (Table 32), for those with stair climbing difficulty, the average frequency of use of heavy rail (Red, Orange, and Blue lines) is slightly higher than for light rail (Green Line), though the difference is small. This slight difference could be a result of elevator access to the platforms on heavy rail and a required set of steps to climb on the light rail line.

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Table 31: Frequency of Transit Use by Difficulty Walking/Climbing Stairs

		Difficulty Walking		No Difficulty Walking		Difficulty Climbing Stairs		No Difficulty Climbing Stairs	
		N	%	N	%	N	%	N	%
Bus Frequency	At least a few times a week	19	38.00%	49	40.16%	25	40.98%	43	38.74%
	Once a week - few times a month	7	14.00%	13	10.66%	9	14.75%	11	9.91%
	Once a month	5	10.00%	17	13.93%	10	16.39%	12	10.81%
	A few times a year	8	16.00%	30	24.59%	6	9.84%	32	28.83%
	Never	11	22.00%	13	10.66%	11	18.03%	13	11.71%
Train/ Trolley Frequency	At least a few times a week	7	15.56%	36	31.30	17	30.91%	26	24.76%
	Once a week - few times a month	7	15.56%	20	17.39	7	12.73%	20	19.05%
	Once a month	3	6.67%	13	11.30%	7	12.73%	9	8.57%
	A few times a year	15	33.33%	36	31.30%	12	21.82%	39	37.14%
	Never	13	28.89%	10	8.70%	12	21.82%	11	10.48%

Table 32: Average Ridership Frequency: Respondents with Difficulty Climbing Stairs

(Lower Number = Higher Frequency)

	Number of Respondents[186]	Average Train Ridership Frequency
Red Line	13	1.92
Orange Line	7	1.71
Blue Line	3	3.00
Heavy Rail Average	7.67	2.04
Green Line (Light Rail)	10	2.50

Proximity to Modes and Frequency of Transit Use

It is important to determine if seniors take the mode that is near their home more frequently than the other mode and to see if they do indeed access modes that aren't near their homes. It is clear from looking at the average frequencies in Table 33 that those near the bus or train use them more frequently than do those who do not live near those services. Seniors who live near to both modes or near to neither mode take the bus more frequently than the train. The only combination of mode proximity where seniors take the train more than the bus are those locations where the train is near but not the bus. Finally, the respondents who live near the bus but not the train take the train with an average frequency of 3.36, compared with 2.50 for those who live near the train but not the bus. This further supports the theory that bus feeder service to rail is not commonly used by the senior population.

Table 33: Frequency of Transit Use by Proximity to Transit Service

(Lower Number = Higher Frequency)

	Modes Live Near			
	Near Bus, Not Near Train	Near Train, Not Near Bus	Near Bus, Near Train	Not Near Bus, Not Near Train
Average Bus Frequency	2.74	3.11	2.15	3.86
Average Train Frequency	3.36	2.50	2.42	4.17

[186] This is the number of respondents who live within walking distance of the specified subway line and have difficulty walking.

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Driving Habits (Former and Current) by Current Transit Use

It is important to compare the transit habits of seniors who used to drive frequently with those who used to drive rarely. Table 34 shows the average score for bus and train frequency of use (1= At least a few times a week...5=Never) cross- tabulated with current driving habits, Table 35 shows the average bus and train frequency of use cross-tabulated with former driving habits, and Table 36 shows frequency and former driving habits controlled for current driving status. Current driving status is simply classified as yes or no, whereas former driving status was divided into two categories based on the four possible responses to the question of whether or not the participant used to drive. If the response to that question was either "I never drove" or "I drove a few times a year," these were grouped together as not driving when the respondent was younger. If the respondent drove either "once a month to a few times a month" or "at least a few times a week," the respondent was classified as having drove when they were younger. Without control, as in Table 35, the results show that the frequency of transit ridership is significantly higher for those respondents who did not drive when they were younger, with an even greater distinction for the bus mode. Not surprisingly, seniors who still drive have a lower frequency of transit use than the non-drivers. Once statistically controlled for current driving status, the results show that the frequency of transit ridership for current non-drivers is significantly higher for the respondents who never drove than those that used to drive, with no difference between the two transit modes.

Table 34: Average Transit Use by Current Driving Status
(Lower Number = Higher Frequency)

		Average Bus Frequency	Average Train Frequency
Drive	Yes	3.47	3.51
	No	1.93	2.39
	Difference	1.54	1.12

Table 35: Average Transit Use by Former Driving Habits

(Lower Number = Higher Frequency)

		Average Bus Frequency	Average Train Frequency
Drove when Younger	Yes	3.03	3.20
	No	1.91	2.30
	Difference	1.12	0.90

Table 36: Average Transit Use by Former Driving Habits (Controlled for Current Driving Status)

(Lower Number = Higher Frequency)

		Drive Now			
		Yes		No	
		Average Bus Frequency	Average Train Frequency	Average Bus Frequency	Average Train Frequency
Drove when Younger	Yes	3.52	3.57	2.07	2.48
	No	3.33[187]	3.50	1.69	2.11
	Difference	0.19	0.07	0.38	0.37

Using ascending numbers for decreasing frequency of use for both driving and taking transit, the correlation coefficients between bus and train frequency of ridership now and how often the respondents drove when they were younger are –0.35 and –0.29, respectively. In other words, as seen in Tables 35 and 36, seniors who drove more frequently when they were younger take transit less, with a more significant correlation between driving habits and use of the bus than between driving habits and use of the train.

Frequency of Transit Use by Age

Like gender, age is another demographic characteristic that needs to be investigated for determining appropriate security measures, convenience factors, and marketing tactics. It is clear that as seniors age they are much less likely to be regular transit users and more likely to use transit just a few times a year or not at all. The correlation coefficients of age to frequency of bus and train usage are 0.20 and 0.33

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[187] There are only six respondents who drive now but did not when they were younger.

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respectively. This shows that age has a greater impact on train usage than on bus usage. In other words, as a person ages, they are more likely to take the train less than before, but their bus usage will be impacted to a lesser extent. Table G in the Appendix shows the frequency of transit use by age.

Frequency of Transit Use by Education

For the most part, seniors who are frequent bus users have completed less education. 36% of the seniors who use the bus at least a few times a week did not graduate high school, and an additional 33% of the frequent bus users have a high school diploma as their highest level of educational attainment. These are significant numbers, especially considering the fact that only 30% of the respondents did not graduate high school and 26% of the respondents have only a high school diploma. Looking at this relationship with education as the independent variable, those seniors who graduated college or completed advanced degrees were much less likely to take the bus at least a few times a week and much more likely to take the bus a few times a year.

Seniors who are frequent train users have similar educational characteristics to those of frequent bus users, with 36% of the frequent train users without a high school diploma and 28% whose highest level of educational attainment is a high school diploma. For those in the elderly population with college and advanced degrees, many of them use the train a few times a year, presumably for the purpose of going into downtown Boston for personal business or entertainment. Table H in the Appendix shows the frequency of transit use by educational attainment.

The correlation coefficients for education versus bus frequency and train frequency are 0.23 and 0.15 respectively, showing that the level of education has more of an impact on the frequency of bus usage than of train ridership. This is not a surprising result as bus usage is generally higher among the transit dependent population, many of whom have attained lower levels of education.

Transit Frequency by Median Household Income

As with increases in education, the higher the income of the respondent, the less they utilize public transportation. As their income increases, the number of seniors taking the bus or train at least a few times a week decreases. Also as their income increases, the number of seniors who never take the bus or train increases. As shown in Table 37, 63% of low-income seniors take the bus at least a few times a month, as do 65% of middle-income seniors. In comparison, only 25% of high-income seniors take the bus that frequently.

The middle-income seniors take the train the most, with 61% taking the train at least a few times a month as compared to 46% of the lower income seniors. This difference is not likely due to the fact that a greater percentage of middle-income seniors live within walking distance of the train than do low-income seniors, as the difference is only 3%. Perhaps it is due to greater mobility due to more disposable income for shopping and entertainment. Finally, only 25% of the high-income seniors take the train at least a few times a month.

The correlation coefficients between income and frequency of transit ridership is 0.38 for bus and 0.28 for train, a fairly strong indication that seniors with higher incomes are less likely to take transit frequently, with income having a greater effect on bus ridership than train.

It is of course possible that frequency of transit ridership has more to do with whether or not the seniors drive than it has to do with their median income. The income and ridership frequency relationship was therefore statistically controlled for the driving status of each respondent. The bivariate table that was created to explain the controlled relationship is in the Appendix (Table I). While controlling for a third variable theoretically shows whether or not the original relationship was spurious, in this case, where real data was used, the result is not completely clear. There are certain relationships within the bivariate tables that are shown to be spurious or non-spurious, as indicated in Table 38 below. The spurious relationships are those where two or three income levels within the same driving status have the same percentage of respondents for a level transit frequency. The non-spurious relationships are those where an income level and transit frequency has the same percentage of respondents within different driving statuses.

The relationships not mentioned in the table are not shown to be clearly one way or the other. In addition to the relationships that are shown to be either spurious or non-spurious, there are changes in the percent of respondents who fit into each category. For example, for those respondents in the middle-income category, 49% take the bus at least a few times a week. However, income and transit use are statistically controlled for driving, the percentage of middle-income seniors who take the bus at least a few times a week increases to 62% for non-drivers and decreases to 17% seniors for the drivers. This shows that the majority of those seniors in the middle-income bracket are not frequent bus riders due to their income, but rather due to their driving status.

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Table 37: Transit Frequency by Median Household Income[188]

		Median Household Income					
		Low (<$33,000)		Medium ($33,000-$46,000)		High (>$46,000)	
		N	%	N	%	N	%
Bus Frequency	**At least a few times a week**	32	53.33%	28	49.12%	9	16.07%
			46.38%		40.58%		13.04%
	Once a week to a few times a month	6	10.00%	9	15.79%	5	8.93%
			35.00%		45.00%		25.00%
	Once a month	9	15.00%	3	5.26%	10	17.86%
			40.91%		13.64%		45.45%
	A few times a year	10	16.67%	11	19.30%	18	32.14%
			25.64%		28.21%		46.15%
	Never	3	5.00%	6	10.53%	14	25.00%
			13.04%		26.09%		60.87%
Train Frequency	**At least a few times a week**	20	38.46%	19	35.71%	4	7.55%
			45.45%		45.45%		9.09%
	Once a week to a few times a month	4	7.69%	12	25.00%	9	16.98%
			14.81%		51.85%		33.33%
	Once a month	5	9.62%	5	8.93%	6	11.32%
			31.25%		31.25%		37.50%
	A few times a year	18	34.62%	12	21.43%	21	39.62%
			35.29%		23.53%		41.18%
	Never	5	9.62%	5	8.93%	13	24.53%
			21.74%		21.74%		56.52%

Table 38: List of Spurious and Non-Spurious Relationships Between Income and Transit Frequency Controlled for Driving Status

Spurious: Driving completely accounts for...	Non-Spurious: Driving has nothing to do with...
The relationship between income (low and medium only) and taking the bus at least a few times a week, for non-drivers.	The relationship between income (low and medium only) and taking the bus once a week to a few times a month.
The relationship between income and taking the bus a few time a year, for drivers.	The relationship between income (medium only) and taking the bus once a month.

[188] The top percentages total to 100% vertically and the bottom percentages total to 100% horizontally. The top percentages indicate the percentage of seniors in a particular income bracket who take transit with particular frequency. The bottom percentages indicate what percentage of seniors who take transit with a particular frequency have what level of income.

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Spurious: Driving completely accounts for...		Non-Spurious: Driving has nothing to do with...
The relationship between income (low and medium only) and taking the train at least a few times a week, for non-drivers.		The relationship between income (high only) and never taking the bus.
The relationship between income (medium and high only) and taking the train a few times a year, for non-drivers.		The relationship between income (high only) and never taking the train.
The relationship between income and taking the train a few times a year, for drivers.		

Spirits and Mobility

It is important to see if the spirits, or happiness, of the respondents has an effect on their mobility, a measure previously described as how often the respondent travels using public (bus, train, or walk) or private transportation (drive or ride in a car). Spirits do not seem to have a large effect on the total mobility of older adults (correlation coefficient = 0.11). Those with the most mobility are those with "good" spirits, and those with the least mobility are those with "fair spirits. The two extremes- excellent and poor spirits, fall in the middle when it comes to the respondent's average mobility. Table J in the Appendix shows the respondents' average mobility by their spirits.

Incidentally, analysis was also conducted to see if spirits had anything to do with whether or not the respondent lived alone (Table K in the Appendix shows the respondents' spirits by their living situation). A higher percentage of those who lived with others (36% versus 22%) reported being in excellent spirits. However, most of this difference is made up for in the good spirits category, where the majority of the seniors who live alone classified themselves. The bottom line is, there is not too much correlation between happiness and living with others, at least in this sample of older adults.

General Fear
Fear by Length of Residence in Neighborhood

Other surveys have suggested using the length that respondents have lived in their neighborhoods as a way to measure comfort level.[189] The length of residency can then be used to determine if the

[189] Bazargan, "The Effects of Health, Environmental, and Socio-Psychological Variables on Fear of Crime and its Consequences Among Urban Black Elderly Individuals," 1994.

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respondents' general fears at home and in their neighborhoods are true fears or if they are simply a function of comfort level. The respondents' average fear by their length of residency in their neighborhoods is shown in Table 39 (a cross-tabulation of fear by length of residency is shown in Table L in the Appendix). In this survey, a very small percentage of seniors felt afraid at home and in their neighborhoods. Seniors living in their neighborhoods longer than ten years felt slightly more safe at home during the day and night and walking during the day than those living in their neighborhoods for ten years or less. The long-time residents only felt less safe than the shorter-term residents when walking alone at night. Only 36% of the seniors who have lived in their neighborhoods for longer than ten years feel very safe walking at night as opposed to 53% of those who have lived in their neighborhoods for ten years or less. Other than the walking at night fear, these results are not in line with the results of previous studies, which report that the duration of residence is positively correlated with fear of crime among older individuals.[190] Overall, however, the length of time that seniors have spent living in their neighborhoods has a fairly insignificant effect on their level of fear: the correlation coefficient of general fear to the length that seniors have lived in their neighborhoods is 0.00, further proof that these two variables are almost completely independent of each other.

Table 39: Average Overall Fear by Respondents' Length of Residence in Neighborhood

Length in Neighborhood	Average Overall Fear
Less than 3 years	4.83
3-5 years	5.35
6-10 years	5.71
11-20 years	6.32
Longer than 20 years	5.17

Fear by Type of Home

This comparison is yet another measure in an attempt to determine what personal characteristics have an effect on seniors' fear level. Again, this relationship does not reveal much, as shown in Table 40. The only lesson to be learned here is that seniors who rent in an apartment building tend to have more fear than seniors in other types of dwellings, though not significantly more.

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[190] Ibid.

Table 40: Respondents' Type of Home by General Fear

Type of Home	Average Overall Fear
Private home	5.22
Rent in apartment building	5.81
Own a condo	5.11
Older adult care facility or senior community	5.13
Other	6.13

Fear by Victimization History

Previous studies of the elderly have shown that seniors with a history of victimization are more fearful than their counterparts without experience as a victim or as an acquaintance of one.[191] As shown in Table 41, this study yielded similar results, with the average fear highest among seniors who were victims within the last year and next highest among people who were victims before this year. The average fear of those seniors who had no experience with victimization or who were merely acquaintances of a victim was about 16% lower than the fear of the victims. These results emphasize the importance of keeping seniors secure, as their experience as a victim is likely to make them more fearful for a long time, thus decreasing their quality of life.

Table 41: Victimization History by General Fear

Victimization History	Average Overall Fear
Victim within the last year	6.20
Victim before this year	6.13
Know someone who was a victim within the last year	5.16
None	5.27

Fear of Types of People by General Fear

There are certain types of people who tend to frequent public transportation systems who many people, seniors included, consider unsavory and a detriment to their comfort on public transportation. Three

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[191] Ibid.

types of people are asked about on this survey: groups of teenagers, drunks, and homeless people. While the majority of respondents were "sometimes" afraid of these types of people, drunks elicited the highest number of seniors who are "always frightened." The respondents' general fears and fear of these types of people were cross-tabulated (Table 42) in order to determine if a relationship exists. Fear of all three types of people have strong correlation with general fear, with the coefficients of 0.25 between general fear and fear of groups of teenagers; 0.20 for drunks; and 0.32 for homeless people. As the coefficients increase, it is an indication that the fear is more a result of general fear and less a result of a specific fear. Thus, fear of homeless people is more related to fearful individuals, whereas fear of drunks is more common to the senior population at large, with fear of teenagers falling in between.

Table 42: Fear of Types of People by General Fear

| | | General Fear | | | | | | | | | |
| | | 4 | | 5 | | 6 | | 7 | | 8-10 | |
		N	%	N	%	N	%	N	%	N	%
Fear of Groups of Teenagers	**Almost Never**	15	36.59%	2	8.00%	8	28.57%	3	30.00%	3	21.43%
	Sometimes	25	60.98%	22	88.00%	14	50.00%	3	30.00%	6	42.86%
	Almost Always	1	2.44%	1	4.00%	6	21.43%	4	40.00%	5	35.71%
Fear of Drunks	**Almost Never**	14	35.00%	0	0.00%	9	32.14%	1	11.11%	1	9.09%
	Sometimes	22	55.00%	17	68.00%	11	39.29%	4	44.44%	7	63.64%
	Almost Always	4	10.00%	8	32.00%	8	28.57%	4	44.44%	3	27.27%
Fear of Homeless People	**Almost Never**	18	46.15%	5	21.74%	3	11.11%	1	11.11%	1	8.33%
	Sometimes	18	46.15%	13	56.52%	18	66.67%	4	44.44%	8	66.67%
	Almost Always	3	7.69%	5	21.74%	6	22.22%	4	44.44%	3	25.00%

Fear in General by Fear in Transit Situations

This cross-tabulation, shown in Table 43, determines to what extent seniors' fear of public transportation is associated with their fear in general. The extent of the relationship is easier to determine when looking at the seniors' fear of trains, as many more of them have some apprehension to this mode. The percentage of respondents with bus fear of 3, 4 or 5 generally increases as overall fear increases from 4 through 7. Additionally, the percentage of seniors who reported a bus fear of 2, the lowest possible fear rating, decreases as the general fear increases. The correlation coefficient of bus fear and general fear is 0.32, indicating a decent positive relationship between the two.

For train fear, the relationship is even stronger, with a correlation coefficient of 0.51. As with bus fear, the percentage of seniors who have low train fear of 2 decreases as the general fear increases. The percentage of the elderly sample population who have high train fear, namely 4 or 5, increases as general fear increases.

Overall, this cross-tabulation shows that making seniors who feel unsafe feel more secure when using public transit may require more than creating a safe environment on the transit system. It appears that the transit fear that does exist, though not as common as once thought, may be more than simply a fear of public transportation.

Table 43: Bus and Train Fear by General Fear

| | | General Fear | | | | | | | | |
| | | 4 | | 5 | | 6 | | 7 | | 8-10 | |
		N	%	N	%	N	%	N	%	N	%
Bus Fear	2	26	76.47%	12	54.55%	8	36.36%	1	14.29%	1	10.00%
	3	3	8.82%	6	27.27%	4	18.18%	2	28.57%	4	40.00%
	4	2	5.88%	3	13.64%	8	36.36%	2	28.57%	2	20.00%
	5	1	2.94%	1	4.55%	2	9.09%	1	14.29%	1	10.00%
	6	2	5.88%	0	0.00%	0	0.00%	1	14.29%	2	20.00%
Train Fear	2	23	67.65%	6	27.27%	4	18.18%	0	0.00%	1	10.00%
	3	1	2.94%	6	27.27%	4	18.18%	1	14.29%	0	0.00%
	4	6	17.65%	9	40.91%	9	40.91%	2	28.57%	3	30.00%
	5	2	5.88%	1	4.55%	3	13.64%	1	14.29%	2	20.00%
	6, 8	2	5.88%	0	0.00%	2	9.09%	3	42.86%	4	40.00%

Transit Fear
Feeling of Safety in Transit Situations by Mode Used More Often

Table 44 shows the feeling of safety in four transit situations cross-tabulated with the mode that the respondent claimed to use more often.[192] It is interesting to note that the seniors who ride the bus more frequently have the lowest percentage who feel very safe at a bus stop. This could be for a few reasons: one, perhaps bus riders are more fearful in general; or two, perhaps bus stops are scary places that only frequent bus riders would know to be afraid of. When this data is controlled for general fear, it shows that seniors with low fear (4) or medium fear (6) the difference in feeling very safe at a bus stop between the bus riders and the train riders is a spurious relationship. In other words, the fact that the bus riders appear more frightened (at least for those with fear of 4 or 6) can be ignored. However, for seniors with low fear (4 and 5), the relationship is shown to be non-spurious, indicating that the original relationship may indeed have meaning. Given these results it is nearly impossible to tell the true cause of the apparent relationship between the mode used more often and which mode feels safer to the seniors.

Seniors who frequently use the bus and/or train have very similar feelings of safety while riding the bus. Essentially the same proportion of bus riders and train riders feel very safe (1) or fairly safe (2) while riding the bus. A small proportion of bus riders (as opposed to no train riders) find riding the bus frightening (fear rating of 3 or 4).

Train fear, both waiting for the train and riding the train, shows a much clearer discrepancy between those who take the bus more and those who take the train more. Seniors who use the train more often than the bus are more likely to feel very safe waiting for the train and riding the train than do those seniors who ride the bus more frequently. For waiting at the platform, the relationship between mode used more often and feeling safe is spurious for those with medium general fear (6). For riding the train, the relationship is spurious for those with fear levels of 5 and 6. However, at the same time as the relationships are shown to be spurious, there is evidence that they are non-spurious, so it may indeed be accurate that seniors who ride the bus more than the train are more fearful of the train than are frequent train riders.

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[192] Only 55% of the respondents answered consistently between the question of which mode they use more often and how often they use the bus and train. However, it is believed that the direct question of which mode is used more often more accurately reflects their actual habits.

Table 44: Transit Fears by Mode Used More Frequently

		Mode Used More Often					
		Same		Bus		Train/Trolley	
		N	%	N	%	N	%
Bus Stop	Feel very safe (1)	23	60.53%	27	45.76%	12	54.55%
	(2)	10	26.32%	19	32.20%	7	31.82%
	(3)	4	10.53%	6	10.17%	0	0.00%
	Feel very frightened (4)	0	0.00%	4	6.78%	0	0.00%
	Don't Ride	1	2.63%	3	5.08%	3	13.64%
Riding Bus	Feel very safe (1)	24	63.16%	32	58.18%	12	57.14%
	(2)	8	21.05%	16	29.09%	6	28.57%
	(3)	5	13.16%	3	5.45%	0	0.00%
	Feel very frightened (4)	0	0.00%	1	1.82%	0	0.00%
	Don't Ride	1	2.63%	3	5.45%	3	14.29%
Train Station	Feel very safe (1)	15	39.47%	12	22.64%	11	50.00%
	(2)	13	34.21%	18	33.96%	6	27.27%
	(3)	9	23.68%	10	18.87%	3	13.64%
	Feel very frightened (4)	0	0.00%	5	9.43%	1	4.55%
	Don't Ride	1	2.63%	8	15.09%	1	4.55%
Riding Train	Feel very safe (1)	16	43.24%	22	42.31%	13	59.09%
	(2)	15	40.54%	17	32.69%	8	36.36%
	(3)	5	13.51%	2	3.85%	1	4.55%
	Feel very frightened (4)	0	0.00%	2	3.85%	0	0.00%
	Don't Ride	1	2.70%	9	17.31%	0	0.00%

In order to apply some check to the validity of the relationship between the mode used more often and the senior's fears, this relationship was controlled for the respondent's general fears. This was done to determine if the relationship between fear and ridership is real or if it is mostly a result of the respondents' overall fearfulness. Table M in the Appendix shows the mode used more often cross-tabulated with fear in transit situations controlled for general fear. The results of the statistical control, in

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terms of spurious and non-spurious relationships, are shown in Table 45. The spurious relationships are those where two or three modes within the same general fear bracket have the same percentage of respondents for a level of transit fear. The non-spurious relationships are those where a mode and transit fear has the same percentage of respondents within different general fear brackets. In some cases, as denoted by an "*" in the middle column of Table 45, some aspects of the relationships were shown to be both spurious and non-spurious, resulting in inconclusive results.

The relationships not mentioned in the table are not shown to be clearly one way or the other. In addition to the relationships that are shown to be either spurious or non-spurious, there are changes in the percent of respondents who fit into each category. For example, 61% of the respondents who use the bus and train about the same amount feel very safe when waiting at a bus stop. When this relationship is controlled for general fear, the percentage of respondents (who ride the bus and train the same amount and feel very safe at a bus stop) who have with low general fears increases but decreases for those with higher general fear.

Table 45: List of Spurious and Non-Spurious Relationships Between Mode Used More Often and Transit Fear when Controlled for General Fear

Spurious: General Fear Completely Accounts For...		Non-Spurious: General Fear has Nothing to do With...
The relationship between feeling very safe at a bus stop and which mode is taken more often (bus or train); for those with low general fear (4).	*	The relationship between feeling very safe at a bus stop and which mode is taken more (bus); for those with low general fear (4 and 5).
The relationship between feeling very safe at a bus stop and which mode is taken more often (bus, train, or same); for those with somewhat low general fear (6).	*	The relationship between feeling very safe at a bus stop and which mode is taken more often (same); for those with somewhat low and medium general fear (6 and 7).
The relationship between feeling very safe on the bus and which mode is taken more often (same or bus); for those with low general fear (5).	*	The relationship between feeling very safe on the bus and which mode is taken more often (same or bus); for those with somewhat low general fear (4, 5, and 6).
The relationship between feeling very safe at a train station and which mode is taken more often (same or train); for those with low general fear (4).	*	The relationship between feeling very safe at a train station and which mode is taken more often (train); for those with low general fear (4 and 5).

Spurious: General Fear Completely Accounts For...		Non-Spurious: General Fear has Nothing to do With...
The relationship between feeling very safe at a train station and which mode is taken more often (bus or train); for those with somewhat low fear (6).	*	The relationship between feeling very safe at a train station and which mode is taken more often (bus); for those with somewhat low fear (5 and 6).
The relationship between feeling very safe on a train and which mode is taken more often (bus, train, or same); for those with low general fear (5).	*	The relationship between feeling very safe on a train and which mode is taken more often (bus); for those with low general fear (4 or 5).
	*	The relationship between feeling very safe on a train and which mode is taken more often (same); for those with low and medium general fear (5 and 7).
The relationship between feeling very safe on a train and which mode is taken more often (bus or train); for those with somewhat low general fear (6).	*	The relationship between feeling very safe on a train and which mode is taken more often (train); for those with somewhat low general fear (5 and 6).
		The relationship between feeling very safe at a bus stop and which mode is taken more often (same); for those with low general fear (4 and 5).
		The relationship between feeling very safe on the bus and which mode is taken more often (train); for those with medium and high fear (5 and 7).
The relationship between feeling very safe on the bus and which mode is taken more (train or same); for those with medium general fear (6).		
The relationship between feeling very safe on a train and which mode is taken more often (same or train); for those with low general fear (4).		

Mode Considered Safer and Mode Used More Often

One of the primary goals of this research was to determine if seniors consider the mode of public transportation that they take more as safer. Additionally, it was critical to look at this relationship from another angle: whether a feeling of less security have any effect on which mode members of the elderly population choose to use. The relationship between the mode that is considered safer and the mode that is used more often is shown cross-tabulated in Table 46.

Table 46: Mode Considered Safer by Mode Used More Often[193]

		Mode Used More Often					
		Both about the same		Bus		Train/Trolley	
		N	%	N	%	N	%
Mode Considered Safer	Bus	39	88.64%	61	93.85%	16	57.14%
			33.62%		52.59%		13.79%
	Train/Trolley	5	11.36%	4	6.15%	12	42.86%
			23.81%		19.05%		57.14%

It is clear that the majority of the seniors consider the bus to be a safer mode, though many of the respondents who ride the train more frequently than the bus believe that the train is the safer mode. Of those that consider the train the safer mode, the majority, or 57%, ride the train more frequently than the bus. Once the respondents who use both modes equally are factored in, over 80% of those that feel the train is safer are not the bus riders. This shows that seniors who do not take the train often tend to feel that the train is a less secure mode of public transportation.

An additional way to test the significance of the relationship between the mode seniors use more often and the mode they believe to be safer is the Guttman Coefficient of Predictability, or lambda (λ)[194]. This calculation uses the equation:

$$\lambda = \frac{f_i - F_d}{N - F_d}$$

Where f_i = the modal frequency within each category of the independent variable

F_d = the modal frequency in the marginal totals of the dependent variable

N = the total number of cases

It shows that $\lambda = 0.29$, indicating the relationship between the mode that seniors use more often and the mode that they feel is safer. λ can range from 0 to 1, where 1 indicates that use of the independent

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[193] The top percentages total to 100% vertically and the bottom percentages total to 100% horizontally. The top percentages indicate the percentage of seniors who take a given mode more often who feel that a particular mode is safer. The bottom percentages indicate the percentage of seniors who feel a particular mode is safer who take which mode more often.

[194] Nachmias, "Research Methods in the Social Sciences." 1987.

variable permits the dependent variable to be predicted with no error. Therefore, λ of 0.29 shows that there is still a reasonable amount of error in the prediction of the mode seniors consider safer based on the mode they take more often. Consequently, it can be said that there is some, but not complete certainty, that the mode seniors take more often affects which mode they consider to be safer.

Fear in Transit Situations by Gender

The relationship between gender and fear was analyzed in order to define market segments at which to target transit security programs. The data in Table 47 show that for all five transit situations, women are more frightened than men, a very important finding given that 72% of the respondents were women and the majority of seniors in the U.S. are women (59% overall, ranging from 54% women for the 65-69 age group to 71% for persons 85 years and older). Fear associated with waiting for and riding the train and accessing transit are areas where women are, on average, significantly more concerned about safety than are men.

Table 47: Transit Fear by Gender

	Female		Male		
	N	Average	N	Average	% Lower Average Fear for Males
Fear at bus stop	95	1.67	35	1.49	10.78%
Fear on bus	89	1.48	34	1.41	4.73%
Fear at train station	87	2.14	36	1.56	27.10%
Fear on train	85	1.74	34	1.47	15.52%
Walking to transit	88	1.86	35	1.46	21.51%

Perception of Safety by Education

It is important to determine if level of education has an effect of seniors' fears, as this can help determine which parts of the senior population to target for educational and marketing campaigns. Table 48 shows that seniors without a high school diploma are the only ones who have extremely high bus fear (6 or 8), though high train fear is experienced by seniors with all levels of education. The bus fear is related to the fact that seniors with lower levels of education take the bus more frequently and the more frequent bus users are the seniors with greater bus fear.

Overall, however, there is not much difference between bus fear and train fear when correlated with education: the correlation coefficient of bus fear to education is -0.33 and of train fear to education is -0.29. As stated, there is somewhat of a negative relationship between transit fear and education, showing that people with a higher level of education have less fear about public transportation.

Table 48: Bus and Train Fear by Education

		Highest Level of Education Completed										
		Stopped before HS		Attended HS		Graduated HS (or GED)		Some College		Graduated College		Advanced Degrees
		N	%	N	%	N	%	N	%	N	%	N	%
Bus Fear	2	2	12.50%	6	21.43%	17	50.00%	15	62.50%	10	66.67%	8	57.14%
	3	5	31.25%	7	25.00%	6	17.65%	3	12.50%	2	13.33%	4	28.57%
	4	2	12.50%	4	14.29%	8	23.53%	5	20.83%	2	13.33%	2	14.29%
	5	1	6.25%	1	3.57%	3	8.82%	1	4.17%	1	6.67%	0	0.00%
	6,8	3	18.75%	5	17.86%	0	0.00%	0	0.00%	0	0.00%	0	0.00%
Train Fear	2	1	9.09%	6	30.00%	10	33.33%	9	37.50%	8	50.00%	6	42.86%
	3	2	18.18%	1	5.00%	4	13.33%	3	12.50%	1	6.25%	3	21.43%
	4	3	27.27%	6	30.00%	11	36.67%	10	41.67%	3	18.75%	4	28.57%
	5	1	9.09%	4	20.00%	1	3.33%	1	4.17%	3	18.75%	1	7.14%
	6,7,8	4	36.36%	3	15.00%	4	13.33%	1	4.17%	1	6.25%	0	0.00%

Fear of Types of Crime by Frequency of Transit Ridership

Analysis was conducted to determine what types of crime frighten elderly riders who use transit with various frequencies so that transit agencies can focus their crime fighting efforts. The seniors were mostly asked about quality of life crimes: obscene language, teenager rowdiness, vandalism of transit property, begging/panhandling, and pushing and shoving. These are the types of crimes that seniors can understand and relate to since they are more likely to have witnessed them. Teenager rowdiness, pushing and shoving, and vandalism of transit property are the types of crimes for which the highest percentage of respondents had high levels of fear. Tables N and O in the Appendix has all of the counts and percentages of fear of types of crime by frequency of transit use.

The correlation coefficients of fear to frequency of ridership are shown in Table 49, and the stronger relationships based on these coefficients will be discussed further. It is important to note, however, that the positive relationships indicate that higher frequency of use results in lower fear, whereas the negative relationships indicate that lower fear is a result of less use. First, there is some correlation between bus

frequency and fear of vandalism of transit property, showing that the less a senior rides the bus the less likely they are to be fearful. This makes sense, as infrequent riders might not witness this a lot and therefore are not as fearful of it. Additionally, those who rated their fear as a "2" tended to be those who took the train at least a few times a month. For the very frequent train users (a few time a week), obscene language fears rated as a "2" were much more prevalent than rated as a "1", indicating an overall slight fear by the frequent train users of obscene language.

Fear of begging and panhandling displayed the most significant correlation with frequency of use. This is not a surprising result, as the seniors who use transit less were more likely to live in towns with greater incomes, thereby having less exposure to begging. Generally people are afraid of what they are not used to, leading the infrequent users, who live in the wealthier areas, to be more afraid of this quality of life crime. While a fear of "2" was the most common response for begging and panhandling, the number of seniors who had a fear of "4" was much more common for infrequent bus riders and a fear of either "3" or "4" was more common for infrequent train users.

Table 49: Correlation Coefficients of Ridership Frequency and Fear of Transit Crime

	Obscene Language	Teenager Rowdiness	Vandalism of Transit Property	Begging/ Panhandling	Pushing and Shoving
Bus Ridership Frequency	-0.02	-0.05	-0.15	0.13	0.05
Train Ridership Frequency	0.06	-0.05	-0.07	0.18	0.03

Type of Security Measures Preferred by Mode More Often

Although many of the seniors surveyed were not able to answer this question in its entirety, 83 responses were usable. Greater than 60% of the responses yielded the same answer, with a police officer or security guard as the most important security measure, followed by bright lighting and emergency telephones. Although the number of respondents for choices other than officer-lighting-telephones are low, Table 50 was created to show how the responses varied for patrons of the different modes. The next most common response was the security measures in the order of officer, then emergency telephones, and then bright lighting. For seniors who use bus and train about the same, this popular second choice was tied with

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lighting, officer, telephones. The only real difference between bus riders and train riders that is discernable from this analysis is that emergency telephones appear to be more popular among the bus riders, with a few of them selecting them as the most important option for making them feel secure in a train station. Perhaps this is an indication that bus users would like to have a way to contact the police from a train station, a place that they find foreign and therefore somewhat frightening.

Table 50: Security Measure Responses by More Often Mode

	Both about the same		Bus		Train/Trolley	
	N	%	N	%	N	%
Officer-Lighting-Telephones	17	62.96%	18	51.43%	10	62.50%
Officer-Telephones-Lighting	4	14.81%	7	20.00%	3	18.75%
Lighting-Officer-Telephones	4	14.81%	6	17.14%	2	12.50%
Lighting-Telephones-Officer	0	0.00%	1	2.86%	1	6.25%
Telephones-Officer-Lighting	0	0.00%	2	5.71%	0	0.00%
Telephones-Lighting-Officer	2	7.41%	1	2.86%	0	0.00%

Infrequent Train Users (but Frequent Bus Riders)[195] Correlated with Fear of Train

This calculation was performed to look at how infrequent train users (but frequent bus riders) fear the train, as opposed to looking at all infrequent train users together. Overall, the average fear of the train for all respondents is 3.57 (out of a total of 8). All respondents who are infrequent train riders, regardless of their bus use, have an average train fear of 3.53. For those respondents who are frequent bus riders but infrequent train riders, the average fear of the train is 3.77. Although the differences are small, the results show that the lowest fear of trains is by infrequent train riders, regardless of their bus use, followed by all respondents, and finally, with the highest fear of the train, the infrequent train riders who ride the bus a lot. This has important policy and marketing implications for cities that are implementing a new train system and hope to obtain some senior ridership from the bus market. It appears that the frequent bus riders but infrequent train riders, who will depend on the new trains for their mobility, will need the most help to overcome their fear of the train and maximize their mobility.

[195] Frequent bus riders but infrequent train riders were classified as those respondents who rode the bus at least once a month and rode the train no more than a few times a year.

Type of Rail Riders by Fear of Train

This analysis determines if the seniors who live near light rail have the same fear as those who live near heavy rail. This determination uses the assumption that the seniors who live within walking distance of light rail take light rail more often and that those who live near heavy rail take that more. It appears that the seniors who take light rail are less frightened, with an average fear of trains of 3.03/8.00 as opposed to seniors who take heavy rail, with an average train fear of 3.93. This may be due to the fact that light rail vehicles have a drivers in each car, much like a bus. Additionally, most light rail stations on the MBTA (outside of the central city) are at grade, usually within the view of many pedestrians and drivers, thereby making patrons waiting for the service feel less isolated.

Regression

Based on the results from the cross-tabulations and correlation coefficients, specific linear regression analyses were performed. The following sections show the relationships that were thought to exist and their respective best-fit lines and R^2 coefficients (using a significance level of 0.05).

Driving versus Ridership Frequency

From initial analysis it appears that a negative relationship exists between whether or not a senior drives now and/or when they were younger and their frequency of transit use (in other words, seniors who drive and/or used to drive take public transit less). The regression analysis shows that the relationship is strongest between current drivers and bus use, but also exists between current transit use (mainly bus) and whether or not the seniors drove when they were younger (Tables P and Q in the Appendix show the regression analysis results for these relationships). Total driving habits are also analyzed to determine the combined effects of driving when younger and current driving status.[196] Table 51 shows the strongest relationship between transit frequency and driving, when driving habits during both life stages are taken into consideration. A graphic of the best-fit line for the regression of total driving habits to transit frequency is shown in Figure 21.

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[196] Calculated as the sum of points for current driving status (1= Drive, 5 = Don't Drive) and for driving habits when younger (1 = at least a few times a week, 2 = once a month to a few times a month, 3 = a few times a year, 4 = never drove).

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Table 51: Total Driving Habits Regressed with Transit Frequency

	R^2	Line equation
Bus Frequency	0.287	y = -0.271x + 4.0431
Train Frequency	0.198	y = -0.2144x + 3.9937
Total Transit Frequency	0.263	y = -0.4823x + 8.0281

Figure 21 : Best-Fit Line for Driving Habits and Frequency of Use
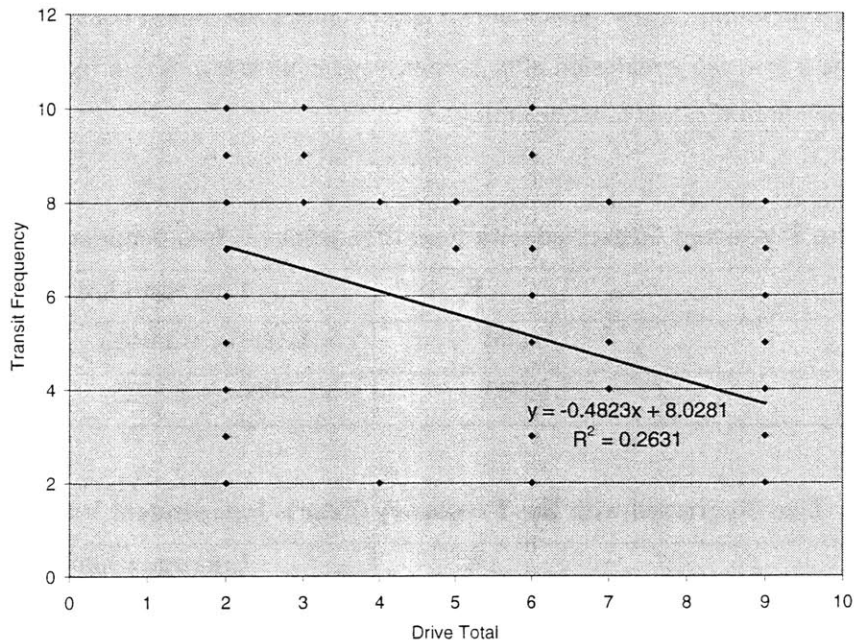
Difficulty Walking versus Train Frequency

The cross-tabulation of seniors with difficulty walking and how frequently they took the train seems to indicate that this physical impediment has a relatively large impact on the use of rapid transit. However, although the correlation coefficient between the frequency of train ridership and difficulty walking is 0.23, the regression shows that there is in fact very little relationship between difficulty walking and how often seniors ride the train. In fact, the R^2 is only 0.055. Thus, the relationship between difficulty walking and train frequency is supported by the correlation coefficient (0.23) but not by the regression analysis.

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Transit Frequency versus Bus Fear and Train Fear

The cross-tabulation for the relationship between fear and frequency of transit use was very complex, so a regression analysis was used to better determine the extent of the relationship. This relationship between transit frequency and fear was analyzed in two ways, with fear considered the independent variable and also the dependent variable. The objective was twofold: to find out whether fear affects transit ridership and also to find out whether transit ridership affects fear. These two relationships were analyzed both for bus frequency and train frequency regressed with fear of buses and fear of trains. The results are shown in Tables 52-55. The regressions clearly show that fear and frequency are almost completely independent of each other. This is a startling conclusion after so much previous research that indicates a relatively high correlation between high fear and low transit use.

Table 52 : Bus Frequency Regressed with Fear (Frequency is Independent Variable)

	R^2	Line equation
Bus Fear	0.000	y = -0.0091x + 3.0466
Train Fear	0.000	y = 0.0006x + 3.5725

Table 53: Fear Regressed with Bus Frequency (Fear is Independent Variable)

	R^2	Line equation
Bus Fear	0.000	y = -0.0127x + 2.4982
Train Fear	0.000	y = 0.0005x + 2.5111

Table 54: Train Frequency Regressed with Fear (Frequency is Independent Variable)

	R^2	Line equation
Train Fear	0.000	y = -0.0068x + 3.5494
Bus Fear	0.003	y = -0.0477x + 3.1561

Table 55: Fear Regressed with Train Frequency (Fear is Independent Variable)

	R^2	Line equation
Train Fear	0.000	y = -0.0064x + 2.7304
Bus Fear	0.003	y = -0.0664x + 2.9381

Transit Fear versus General Fear

Transit fear and general fear displayed a relationship in the cross-tabulation that was worthy of further investigation. The regression analysis confirmed there is a decent relationship between fear of transit and general fear, with $R^2 = 0.259$ and the best fit line of $y = 0.8471x + 1.9307$. This shows that seniors who are afraid in transit situations (waiting for and riding the bus and the train) are likely to be the same people who are generally fearful in their homes and in their neighborhoods.

Transit Use versus Age

Though there is a high correlation coefficient (0.20 for bus and 0.33 for train) between transit use and age, regression analysis yields an $R^2 = 0.104$ and the best fit line of $y = 1.1636x + 2.4527$. This low R^2 value indicates that only to a small extent does increased age within the elderly population lead to a lower frequency of transit ridership. This is slightly different than was displayed in the cross-tabulation, which indicated a stronger relationship between transit use and age, with correlation coefficients of 0.20 between bus frequency and transit use and 0.33 between train frequency and transit use.

Fear and Education

There is a small negative relationship between increased education and increased fear, with a stronger relationship between transit fear and education than general fear and education. In other words, with higher levels of education the level of fear is lower, particularly the level of transit fear. The regression statistics for education versus fear are as follows: Transit Fear: $R^2 = 0.116$ and equation is $y = -0.5657x + 8.5037$; and General Fear- $R^2 = 0.093$ and equation is $y = -0.2928x + 6.443$.

Transit Frequency versus Income

The regression statistics for the relationship of frequency of transit use to income show that bus ridership frequency is more affected by income than is train use. The relationship is such that seniors from higher income neighborhoods take public transit less than those from lower income neighborhoods, with bus use being the most affected. Table 56 shows the statistics for regression of income to transit frequency using the three income brackets used in previous analysis (low is <$33,000; middle is $33,000-$46,000; high is >$46,000).

Table 56: Income Regressed with Transit Frequency

	R^2	Line equation
Bus Frequency	0.124	y = 0.6498x + 1.2935
Train Frequency	0.059	y = 0.4392x + 2.0071
Total Transit Frequency	0.095	y = 1.0907x + 3.29

Hypothesis Testing

Hypothesis tests were used as a way to determine the validity of hypotheses made about the survey results. These tests yield an answer as to whether the hypothesis is true or false within a given level of significance. For this study, a 95% level of significance ($\alpha = 0.05$) was used, as this is the least specific of the levels commonly used in social sciences. The lowest specificity (of significance levels commonly used in social science research[197]) was chosen because of the relatively small amount of data and the known inaccuracies involved in collecting survey data from seniors.

Because many of the hypotheses to be tested involve a comparison between populations, many of the hypothesis tests use the difference between means parametric test. For all situations where the sample size is greater than 30 the curve can be assumed to approach normality. Almost all of the data fit this description, and those that didn't were at least n = 27. Therefore the t distribution was used to determine the significance of the difference between the means. The following equation was used to determine t:

$$t = \frac{(\overline{X}_1 - \overline{X}_2) - (\mu_1 - \mu_2)}{\hat{\sigma}_{\overline{x}1 - \overline{x}2}}$$

where $\overline{X}_1 - \overline{X}_2$ = difference between the sample means

$\mu_1 - \mu_2$ = The means of the sampling distribution of the difference between means

$\hat{\sigma}_{\overline{x}1 - \overline{x}2}$ = an estimate of the standard eror of the sampling distribution of the difference,

determined by the following equation:

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[197] Nachmias. "Research Methods in the Social Sciences." 1987.

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$$\hat{\sigma}_{\bar{x}1-\bar{x}2} = \sqrt{\frac{n_1 s_1^2 + n_2 s_2^2}{n_1 + n_2 - 2}} \sqrt{\frac{n_1 + n_2}{n_1 n_2}}$$

Under the null hypothesis $\mu_1 = \mu_2$, then the following equation for t was used:

$$t = \frac{(\bar{X}_1 - \bar{X}_2)}{\hat{\sigma}_{\bar{x}1-\bar{x}2}}$$

A few of the hypotheses did not use the difference between means parametric test and instead compared the mean to a specific value. For these tests, the following equation for t was used:

$$t = \frac{\bar{x} - \mu_o}{\bar{s} / \sqrt{n}}$$

Hypothesis 1: Seniors who are more fearful in general are more fearful in the five transit situations

μ_1 = Average transit fear for those with high general fear (6+)

μ_2 = Average transit fear for those with low general fear (4, 5)

H_a: $\mu_1 > \mu_2$

H_o: $\mu_1 = \mu_2$

Table 57: Mean General Fear

	High General Fear	Low General Fear
n	39	56
x	7.82	5.59
s	2.37	2.06
Difference between sample means = 2.23		

With a significance level of 95%, $Z_{\alpha/2} = 1.65$. Because the test is directional implying large values (looking to see if : $\mu_1 > \mu_2$), it is a right-tail t test where the critical region is >1.65.

t = 2.23/.46 = 4.85

4.85 > 1.65 ⇒ Reject the null hypothesis H_o

This test shows that it is certain within a 0.05 level of significance that seniors with high fear in general will also have high levels of fear associated with riding public transportation.

Hypothesis 2: Elderly women take transit more frequently than do elderly men

μ_1 = Average bus/train frequency for women

μ_2 = Average bus/train frequency for men

H_a: $\mu_1 < \mu_2$ (Lower number implies greater frequency)

H_o: $\mu_1 = \mu_2$

Table 58: Mean Ridership Frequencies by Gender

	Bus			Train	
	Women	**Men**		**Women**	**Men**
n	112	45		106	43
x	2.31	3.16		2.68	3.16
s	1.52	1.52		1.48	1.27
	Difference between sample means = -0.85			Difference between sample means = -0.48	

With a significance level of 95%, $Z_{\alpha/2}$ = 1.65. Because the test is directional implying small values (looking to see if : $\mu_1 < \mu_2$), it is a left-tail t test where the critical region is < -1.65.

Bus:

t = -0.85/0.2700 = -3.15

-3.15 <-1.65 ⇒ Reject the null hypothesis H_o

Train:

t = -0.48/0.260 = -1.85

-1.85 <-1.65 ⇒ Reject the null hypothesis H_o

This test shows that it is certain within a 0.05 level of significance that elderly women take public transit, both bus and train, more frequently than do older men. This is in line with younger sectors of the population. However, the result could be slightly biased, as 42% of the men surveyed are from the upper income bracket (as opposed to 24% of the total survey respondents), a group that takes less public transportation overall.

Hypothesis 3: Younger Seniors take transit more than older seniors

μ_1 = Average bus/train frequency for younger seniors (Age 60-74)

μ_2 = Average bus/train frequency for older seniors (Age 75+)

H_a: $\mu_1 < \mu_2$ (Lower number implies greater frequency)

H_o: $\mu_1 = \mu_2$

Table 59: Mean Ridership Frequencies by Age

	Bus			Train	
	Younger	**Older**		**Younger**	**Older**
n	76	81		73	73
x	2.29	2.75		2.36	3.22
s	1.45	1.56		1.33	1.41
	Difference between sample means = -0.46			Difference between sample means = -0.86	

With a significance level of 95%, $Z_{\alpha/2}$ = 1.65. Because the test is directional implying small values (looking to see if : $\mu_1 < \mu_2$), it is a left-tail t test where the critical region is < -1.65.

Bus:

t = -0.46/0.243 = -1.89

-1.89 < -1.65 ⇒ Reject the null hypothesis H_o

Train:

t = -0.86/0..2255 = -3.81

-3.81 < -1.65 ⇒ Reject the null hypothesis H_o

This test shows that it is certain within a 0.05 level of significance that younger seniors take public transit, both bus and train, more frequently than do older seniors. This is not surprising as it becomes more difficult to travel as the seniors age. This knowledge is very useful, however, as the provision of more secure, comfortable, and convenient service to the younger seniors may encourage them to continue using the system as they get older.

Hypothesis 4: Seniors who do not drive or frequently ride as passengers (either once a month, a few times a year, or never) take transit more frequently

μ_1 = Average bus/train frequency for non-drivers/non-passengers

μ_2 = Average bus/train frequency for drivers/passengers

H_a: $\mu_1 < \mu_2$ (Lower number implies greater frequency)

H_o: $\mu_1 = \mu_2$

Table 60: Mean Ridership Frequencies by Driving Status

	Bus			Train	
	Non-driver/Non-passenger	Driver/passenger		Non-driver/Non-passenger	Driver/passenger
n	22	142		19	135
x	1.82	2.80		2.05	3.04
s	1.44	1.51		1.43	1.43
	Difference between sample means = -0.98			Difference between sample means = -0.99	

With a significance level of 95%, $Z_{\alpha/2}$ = 1.65. Because the test is directional implying small values (looking to see if : $\mu_1 < \mu_2$), it is a left-tail t test where the critical region is < -1.65.

Bus:

t = -0.98/0.3458 = -2.83

-2.83 < -1.65 $\Rightarrow$ Reject the null hypothesis H_o

Train:

t = -0.99/0.3522 = -2.81

-2.81 < -1.65 $\Rightarrow$ Reject the null hypothesis H_o

This test shows that it is certain within a 0.05 level of significance that seniors who do not drive nor are frequent passengers in a private car take public transit, both bus and train, more frequently than do seniors who drive or frequently ride in a car.

Hypothesis 5: Of those seniors who do not drive, those who never drove take transit more frequently than those who used to drive.

μ_1 = Average bus/train frequency for non-drivers who never drove

μ_2 = Average bus/train frequency for non-drivers who used to drive

H_a: $\mu_1 < \mu_2$ (Lower number implies greater frequency)

H_o: $\mu_1 = \mu_2$

Table 61: Mean Ridership Frequencies by Former Driving Status

	Bus			Train	
	Never Drove	**Used to Drive**		**Never Drove**	**Used to Drive**
n	39	27		37	27
x	1.69	2.07		2.11	2.48
s	1.13	1.52		1.33	1.42
	Difference between sample means = -0.38			Difference between sample means = -0.37	

With a significance level of 95%, $Z_{\alpha/2}$ = 1.65. Because the test is directional implying small values (looking to see if : $\mu_1 < \mu_2$), it is a left-tail t test where the critical region is < -1.65.

Bus:

t = -0.38/0.3306 = -1.15

-1.15 > -1.65 $\Rightarrow$ Accept the null hypothesis H_o

Train:

t = -0.39/0.3524 = -1.11

-1.11 > -1.65 $\Rightarrow$ Accept the null hypothesis H_o

This hypothesis test shows that within a 0.05 significance level, there is no difference in the frequency of public transit use between non-drivers who used to drive and non-drivers who never drove. This is a critical finding because it indicates that even seniors who used to depend on their cars can learn to take public transportation. This result differs from the cross-tabulation analysis and regression analysis that both imply a difference in frequency of transit use between former drivers and seniors who never drove.

Hypothesis 6: Seniors who ride transit infrequently (once a month, a few times a year, or never) feel less safe in the five transit situations

μ_1 = Average total transit fear of infrequent riders

μ_2 = Average total transit fear of frequent riders

H_a: $\mu_1 > \mu_2$

H_o: $\mu_1 = \mu_2$

Table 62: Mean Fear by Frequency of Transit Use

	Bus			Train	
	Infrequent Users	**Frequent Users**		**Infrequent Users**	**Frequent Users**
n	55	55		56	52
x	6.69	6.47		6.66	6.40
s	2.42	2.54		2.38	2.52
	Difference between sample means = 0.22			Difference between sample means = 0.26	

With a significance level of 95%, $Z_{\alpha/2}$ = 1.65. Because the test is directional implying large values (looking to see if : $\mu_1 > \mu_2$), it is a right-tail t test where the critical region is < 1.65.

Bus:

t = 0.22/0.4777 = 0.46

0.46 < 1.65 ⟹ Accept the null hypothesis H_o

Train:

t = 0.26/0.4759 = 0.55

0.55 < 1.65 ⟹ Accept the null hypothesis H_o

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This hypothesis test shows that within a 0.05 significance level there is no difference in public transit fear between frequent and infrequent users of public transportation. This confirms the conclusions of the regression analysis that also shows that fear and frequency of public transit use are independent variables.

Hypothesis 7: Seniors are afraid of rowdy teenagers

μ = Average fear of rowdy teenagers

H_a: $\mu > 2.5$

H_o: $\mu = 2.5$

Table 63: Mean Fear of Rowdy Teenagers

	Fear of Rowdy Teenagers
n	144
x	2.70
s	0.97

With a significance level of 95%, $Z_{\alpha/2}$ = 1.65. Because the test is directional implying large values (looking to see if : $\mu_1 > 2.5$), it is a right-tail t test where the critical region is < 1.65.

t = 0.20/0.0808 = 2.47

2.47 > 1.65 $\Rightarrow$ Reject the null hypothesis H_o

This hypothesis test therefore shows us that it is certain with a significance level of 0.05 that the average fear of rowdy teenagers is greater than 2.5 (on a scale of 1 to 4, with 4 being the most frightened). This confirms the belief expressed in the literature that teenagers are generally a threat to the comfort of seniors riding on public transportation.

Hypothesis 8: Seniors with poor health or difficulty walking or climbing stairs take transit less frequently

Health

μ_1 = Average bus/train frequency for seniors with poor health (reported as fair or poor)

μ_2 = Average bus/train frequency for seniors with good health (reported as excellent, very good, or good)

H_a: $\mu_1 > \mu_2$ (Lower number implies greater frequency)

H_0: $\mu_1 = \mu_2$

Table 64: Mean Ridership Frequencies by Self-Reported Health

	Bus			Train	
	Poor Health	**Good Health**		**Poor Health**	**Good Health**
n	45	127		40	120
x	2.6	2.61		3.13	2.82
s	1.56	1.52		1.59	1.41
	Difference between sample means = -0.01			Difference between sample means = 0.31	

With a significance level of 95%, $Z_{\alpha/2}$ = 1.65. Because the test is directional implying large values (looking to see if : $\mu_1 > \mu_2$), it is a right-tail t test where the critical region is < 1.65.

Bus:

t = -0.01/0.2666 = -0.04

-0.04 < 1.65 ⇒ Accept the null hypothesis H_0

Train:

t = 0.31/0.2671 = 1.16

1.16 < 1.65 ⇒ Accept the null hypothesis H_0

This test shows that it is certain with a 0.05 significance level that health does not have an effect on the average transit use of seniors. Perhaps for some seniors poor health reduces their ability to make use of public transportation, but for others poor health means they can not drive, thereby increasing their use of

public transportation. Thus, the health of seniors, on average, does not affect how much they ride the bus or train.

Difficulty Walking

μ_1 = Average bus/train frequency for seniors with difficulty walking

μ_2 = Average bus/train frequency for seniors without difficulty walking

H_a: $\mu_1 > \mu_2$ (Lower number implies greater frequency)

H_o: $\mu_1 = \mu_2$

Table 65: Mean Ridership Frequencies by Difficulty Walking

	Bus			Train	
	Difficulty Walking	No Difficulty Walking		Difficulty Walking	No Difficulty Walking
n	50	122		45	115
x	2.70	2.55		3.44	2.69
s	1.63	1.48		1.46	1.42
	Difference between sample means = 0.15			Difference between sample means = 0.75	

With a significance level of 95%, $Z_{\alpha/2}$ = 1.65. Because the test is directional implying large values (looking to see if : $\mu_1 > \mu_2$), it is a right-tail t test where the critical region is < 1.65.

Bus:

t = 0.15/0.2580 = 0.58

0.58 < 1.65 ⇒ Accept the null hypothesis H_o

Train:

t = 0.75/0.2527 = 2.97

2.97 > 1.65 ⇒ Reject the null hypothesis H_o

This test shows us that it is certain with a 0.05 significance level that difficulty walking does not have an effect on the bus use of seniors, but that it does have an effect on how often they use the train. This

confirms the results from the cross-tabulation that difficulty walking affects seniors' use of the train more so than it does the bus.[198] Again, this could be a result of the fact that only about 57% of the respondents live within walking distance of a train station, a hindrance for someone who experiences difficulty walking.

Difficulty Climbing Stairs

μ_1 = Average bus/train frequency for seniors with difficulty climbing stairs

μ_2 = Average bus/train frequency for seniors without difficulty climbing stairs

H_a: $\mu_1 > \mu_2$ (Lower number implies greater frequency)

H_o: $\mu_1 = \mu_2$

Table 66: Mean Ridership Frequencies by Difficulty Climbing Stairs

	Bus			Train	
	Difficulty Climbing Stairs	No Difficulty Climbing Stairs		Difficulty Climbing Stairs	No Difficulty Climbing Stairs
n	61	111		55	105
x	2.49	2.65		2.91	2.90
s	1.55	1.52		1.58	1.41
	Difference between sample means = -0.16			Difference between sample means = 0.01	

With a significance level of 95%, $Z_{\alpha/2}$ = 1.65. Because the test is directional implying large values (looking to see if : $\mu_1 > \mu_2$), it is a right-tail t test where the critical region is < 1.65.

Bus:

t = -0.16/0.2448 = -0.65

-0.65 < 1.65 ⇒ Accept the null hypothesis H_o

Train:

t = 0.01/0.2458 = 0.041

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[198] The correlation coefficient for this relationship and the hypothesis test confirm that seniors with difficulty walking take the train with less frequency than seniors without difficulty. However, the regression analysis does not support this conclusion.

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0.04 < 1.65 ⇒ Accept the null hypothesis H_o

This test shows that it is certain with a 0.05 significance level that difficulty climbing stairs does not have an effect on the average transit use of seniors.

Hypothesis 9: Seniors with higher levels of education (at least some college) are less fearful in transit situations

μ_1 = Average transit fear for seniors with more education

μ_2 = Average transit fear for seniors with less education

H_a: $\mu_1 < \mu_2$

H_o: $\mu_1 = \mu_2$

Table 67: Mean Transit Fear by Level of Education

	Bus			Train	
	More Education	**Less Education**		**More Education**	**Less Education**
n	53	70		54	61
x	2.62	3.36		3.19	3.90
s	.91	1.41		1.20	1.66
	Difference between sample means = -0.74			Difference between sample means = -0.71	

With a significance level of 95%, $Z_{\alpha/2}$ = 1.65. Because the test is directional implying small values (looking to see if : $\mu_1 < \mu_2$), it is a left-tail t test where the critical region is < -1.65.

Bus:

t = -0.74/0.2314 = -3.20

-3.20 < -1.65 ⇒ Reject the null hypothesis H_o

Train:

t = -0.71/0.2808 = -2.53

-2.53 < -1.65 ⇒ Reject the null hypothesis H_o

This hypothesis test shows that it is certain within a 0.05 significance level that seniors with less formal education are more fearful of public transit. Fear is even higher for the bus than for the train. These results show that perhaps with special training and programs, seniors who are more fearful can be taught how to safely and comfortably use public transportation.

Hypothesis 10: Seniors who take light rail are less fearful of trains than those seniors who take heavy rail.

μ_1 = Average train fear for light rail riders (within walking distance of light rail)

μ_2 = Average train fear for heavy rail riders (within walking distance of heavy rail)

H_a: $\mu_1 < \mu_2$

H_o: $\mu_1 = \mu_2$

Table 68: Mean Transit Train Fear by Use of Type of Rail Transit

	Light Rail Users	Heavy Rail Users
n	30	41
x	3.03	3.93
s	1.22	1.71
	Difference between sample means = -0.90	

With a significance level of 95%, $Z_{a/2}$ = 1.65. Because the test is directional implying small values (looking to see if : $\mu_1 < \mu_2$), it is a left-tail t test where the critical region is < -1.65.

t = -0.90/0.3710 = -2.43

-2.43 < -1.65 ⇒ Reject the null hypothesis H_o

This hypothesis test shows that it is certain within a 0.05 significance level that seniors who take light rail tend to be less frightened of trains (both waiting on a platform for a train and riding the train) than those seniors who ride heavy rail. This could be because the light rail vehicles in Boston, much like the buses, have a driver at the front of each car. Additionally, many of the stations on the light rail lines are at grade next to the street, so the passengers are not isolated while waiting for the train.

Chapter 6: Conclusions

External Validity of Results

One of the main purposes of this study is to develop results that can be easily applied to other regions where public transit service exists or is in development. To this end, participants from all over the Boston metropolitan area of varying demographics and transit ridership patterns were surveyed so that the sample is fairly indicative of seniors across the United States. The demographics of the 182 respondents were compared to those of seniors nationally and in Massachusetts to ensure that the seniors interviewed were representative of the U.S. and the state in which the survey was conducted. Some of the demographics of the respondents correspond better with national and state averages than others.

The average age of the respondents was higher than the senior population as a whole. There was a low percentage of survey participants in the 60-64 age bracket and a high percentage in the 75-84 age group relative to the percentage of the elderly population as a whole. The other age groups, 65-74 and 85+ were representative of the senior population on the national and state level. The gender of the participants was not very indicative of the national population, with 28% men in the survey compared with 43% men on a national level. In terms of race, the survey results somewhat underrepresents Asians and Hispanics, but otherwise mirrored the racial makeup of the U.S. The average educational attainment of the survey respondents was a bit higher than seniors across the U.S. In terms of income, while this survey did not ask the income of the participants, the weighted average median income of the towns where the survey was taken is $41,117. This is a fairly accurate representation of income, as the U.S. median household income for families headed by persons aged 65 and is $31,568, just 25% lower than the median income of all families in their surveyed towns.

Overall, while the demographics of the survey participants do not exactly match those of seniors on a state or national level, the characteristics of the seniors surveyed correspond closely enough to be able to use the results of the survey as a starting point for planning services and security for the elderly in any transit system. Certainly the unique demographics of a specific region have to be taken into consideration, but the findings from this survey can be used as a place to begin.

Overall Accuracy of Data

Since it is impossible to assess whether or not the answers to certain questions were answered accurately, some questions on the survey had a validating question somewhere else in the survey. It was expected

that most of the respondents would answer the paired questions similarly, as they were essentially the same question posed differently. Overall, the results of these accuracy "tests," which are discussed at length in Chapter Five, were found to be fairly consistent between each pair of questions. One set of questions asked the respondents which mode they considered safer, bus or train, and 78% of the respondents answered consistently. For the set of questions about which mode of public transportation the respondents take more often, only 55% of the respondents were consistent. The survey participants were asked twice about their fear of teenagers, both in terms of their fear of teenager rowdiness on the transit system and their fear of teenagers in general; 67% answered consistently in this situation, but some of the inconsistency is likely due to the fact that many seniors may be afraid of teenager rowdiness, but not of teenagers in general. Finally, the answer to the question of how much the respondents spend each month was compared to the median household income of the town in which the survey was taken. The correlation coefficient of spending to income is 0.46, indicating an acceptable though not perfect, relationship.

Results of Data Counts and Averages

The following sections summarize the results found from conducting the survey, based solely on averages and counts of the answers to the questions. The results from the cross-tabulations, regression, and hypothesis testing are discussed later.

Reasons for Using Public Transportation

The answers to the survey questions show that seniors, much like the rest of the population, are drawn to the convenience aspects of public transportation, such as the schedule and where the service goes. Anecdotal evidence suggests that ease of use and comfort is another major motivator for taking public transit, as the high steps to the buses tend to deter seniors from riding them.

Likelihood of Using Public Transportation

The likelihood that seniors will use public transportation depends upon many factors. These include how far they are willing to or capable of walking to access public transit; how close they live to public transit service; whether or not they drive a car; and for what reasons they use public transportation. In terms of living near public transit service, 58% of the survey respondents claim to live within walking distance of train service and 83% within walking distance of bus service. Of the seniors interviewed, 84% are willing

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to walk only ten minutes or less to access transit service. an approximate distance of 1/3 of a mile or less. Finally, 56% of the seniors surveyed drive. These three factors all have an impact on the frequency of use of public transportation by seniors, many of whom have the flexibility to manage their travel based on what is convenient for them.

There are also many destinations to which older adults might take public transportation. Health destinations are the most popular reasons why seniors use public transportation. This is a revealing finding because it shows that seniors are most likely to utilize public transit in order to accomplish health-related errands, such as going to the doctor or pharmacist. When social and entertainment destinations are combined, however, these trips account for more than do health trips, indicating that seniors rely on transit for more than trips to the doctor and the grocery store. In order to improve the quality of life of seniors, it is essential that they feel comfortable using public transportation to access multiple activities.

Travel Frequency
Public Transit Use

The survey shows that seniors take the bus more regularly than the train or trolley. The highest percentage of seniors use the bus at least a few times a week (40%), followed by another large percentage who use the bus a few times a year (22%). On the other hand, the largest contingency of seniors use the train a few times a year (32%), followed by those who use it at least a few times a week (27%). Overall, it appears that seniors are either very frequent transit users or seldom use it— using it occasionally is not as popular as the extremes. When asked outright which mode they use more often, almost half of the seniors say that they take the bus more often, about 20% take the train more often, and approximately 30% take both the bus and train about the same amount. The overwhelming majority of seniors (86%) say that their mode choice is one of convenience, and only few cited cost (8%) and personal safety (6%) as the most important factor influencing their mode decision.

Walking

Much like public transit use, seniors appear to walk either a lot or a little, with fewer who walk occasionally; 45% walk to their errands at least a few times a week, 27% rarely walk, and only 28% walk from a few times a year to a few times a month.

Drive/Ride in Car

Another characteristic that affects the likelihood that a senior will use transit is how frequently they drive or ride in a car. As stated previously, 56% of the seniors surveyed drive on a regular basis (at least once a week). Additionally, 60% of the seniors ride in a car as a passenger at least a few times a month. Of these, 65% do not drive, thus implying that 82% of the seniors who responded to the survey either drive regularly or ride in a private car at least a few times a month.

Former Habits
Driving When Younger

The survey asked about the seniors' driving habits when they were younger and working or taking care of their families. Most of the seniors interviewed either drove at least a few times a week or they never drove. Of the seniors who no longer drive, those who never drove take transit more frequently than those that used to drive, so knowing the former driving habits of the respondents proved to be very useful.

Public Transit Use When Younger

This question asked for the respondents' relative public transit use when they were younger compared to how much they use it now. The majority of the respondents (51%) used to take public transportation more, presumably because they used it to go to work. This shows that even though the seniors' use of public transit has declined, they are familiar with the system and therefore should not be too affected by fear and security concerns.

Personal Characteristics and Living Situation
Health

Most of the respondents (74%) feel that their health is at least good, the middle of a five point scale of self-reported health. This indicates that the majority of the respondents should be in good enough health to make use of the public transportation system for whatever they might want to use it for.

Difficulty Walking or Climbing Stairs

The majority of the respondents had no difficulty with these activities, with 70% citing no difficulty with walking 64% having no difficulty with stairs. However, these levels are significant enough that transit agencies should account for these obstacles when designing transit infrastructure and service.

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Happiness

The seniors were asked to evaluate their "spirits," or happiness. Overall, the respondents are fairly happy, with 80% having either "excellent" or "very good" spirits. The seniors' high spirits indicate that they are likely to be less fearful and more likely to go out more, thus requiring transportation. This may be slightly inflated for the overall population, as senior center participants may be more outgoing and happier than seniors who stay more to themselves.

Type of Home

Many of the seniors surveyed live in private homes (48%), with the next most frequent response involving living in a rented apartment (25%). Additionally, a noteworthy number of seniors surveyed live in an older adult care facility or senior community (16%). This pattern is expected to be similar to other metropolitan areas.

Length of Residence in Neighborhood

The majority of the seniors (69%) have lived in their neighborhoods for at least ten years, another factor that may contribute to their happiness and diminished level of fear. Although research has shown that duration of residence is positively correlated with fear,[199] this survey shows that these two variables are independent of one another.

Living with Others

Of the national elderly population, 67% live with others, compared to 47% of the surveyed population. This is a likely byproduct of the fact that the survey respondents contain more than the national average percentage of women, who tend to live alone (42% versus 20% of elderly men). Another reason is simply the fact that people who frequent senior centers are more likely to live alone and thus seek company at the center.

Victimization History

The majority of seniors have never been a victim of a crime against their person nor do they know anyone who was within the past year.

Fear
General

The older adults surveyed are not very afraid, especially during the day. Those who were fearful tend to be afraid of walking around at night, and most of those people compensate for that by not going out at night.

Transit

The elderly are more fearful of the train than they are of the bus. Of the five transit situations presented (riding the train, riding the bus, waiting for the train, waiting for the bus, and walking to/from transit), the one that evokes the highest fear is waiting on a platform for a train or trolley. The next most fearful situation for the seniors is riding a train. The least fearful situation is riding the bus, presumably because passengers are under the watchful eye of the bus operator. When asked openly which mode they consider safer, most seniors (84%) believe the bus is the safer mode.

It is extremely interesting to compare the general transit fear results with those from the respondents who were able to rank the five situations in order from least frightening to most frightening. While waiting for a train is considered the most frightening activity for both methods of asking about transit fear, riding the bus is the third least frightening for the ranking question, compared to the general question where riding the bus is considered the least frightening transit activity. This difference between the ranking and the rating of safety is likely a result of several factors: a smaller sample size for the ranking question, a more educated sample, and greater answer inaccuracy due to the apparent confusing nature of the question.

Types of Crime

Many seniors are fearful of quality of life crimes that make them feel uncomfortable and thus less likely to take public transportation on a regular basis. The crimes and situations that induce the most fear in the seniors are pushing and shoving, teenager rowdiness, and vandalism of transit property. While vandalism can be reduced by proper policing, pushing and shoving and teenager rowdiness are situations that are very difficult for transit agencies to control.

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[199] Bazargan, "The Effects of Health, Environmental, and Socio-Psychological Variables on Fear of Crime and its

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Types of People

Based on previous studies and other literature, seniors tend to be afraid of groups of teenagers, drunks, and homeless people. In order to determine which of these groups cause the most fear, the survey respondents were asked to identify the level of fear they have of these three types of people. The majority are afraid of all three at least sometimes, and drunks incite the greatest fear overall.

Travel Decision Based on Security Concerns

The overwhelming majority of seniors do not consciously change their travel patterns due to personal security concerns, other than not going out at night. In general, less than 15% of the older adults surveyed chose not to take public transit because of personal security concerns. Of these people, more change their plans with regard to the train than the bus.

Security Measures in Train Stations

The survey participants were asked to define what security measures would be most successful in reducing any fear that seniors may have while in a train station. The seniors prefer having a person in the station, particularly a uniformed and armed police officer. At a much lower level of importance, the seniors' next choice for a security measure is bright lighting, followed by emergency telephones.

Mobility

A measure that shows the average auto-mobility and non-auto mobility was created to determine if seniors are more mobile with their cars (driving or riding) or via public transportation (bus and train) and walking. The average auto mobility (on a scale of 1 to 5) of seniors is 2.78 and non-auto mobility is 2.62, where the smaller number indicates a greater degree of mobility. This shows that the elderly travel more with bus, train, and walking than they do by car (either as a driver or a passenger). This indicates the potential to further increase the use of public transportation by the senior population, thereby improving the elderly's overall mobility and thus their quality of life.

Consequences Among Urban Black Elderly Individuals," 1994.

Results from Cross-Tabulation and Regression

Important Factors in Transit Decision
Driving Status

Both drivers and non-drivers place the highest value on the same factors: where the service goes, comfort, safety, and security. There is a higher percentage of drivers who chose these variables, as non-drivers chose "have no other alternative" as a decision variable. Thus, even as older adults, many of the non-drivers would use public transit a lot less if they could drive. This indicates that the transit industry has a long way to go toward attracting "choice" senior riders.

Income

Since less than 40% of the low- and middle-income respondents drive, it is not coincidental that the decision variables for these seniors are similar to the responses of non-drivers. Schedule and where the service goes are valued relatively equally among the income groups. For the low-income seniors, cost and comfort are the most important factors in choosing to use public transit. For the seniors in the middle-income bracket, "no other alternative" and safety/security are the most important decision factors. Finally, the high-income seniors value where the service goes and safety/security as their two most important factors. This information indicates that in order to appeal to seniors of all economic strata, it is necessary to focus on issues of convenience like schedules and service destinations.

Walking Distance
Walking Distance and Driving Status

Most seniors are not willing or able to walk more than ten minutes to access transit service, though the "tolerable" distance increases somewhat for those seniors who are not able to drive. These results indicate a need to either provide more comprehensive coverage to attract seniors to public transit or to implement a marketing and educational campaign that can teach seniors of the options available to them. Marketing and educational programs can help seniors who already live very near public transit but are not aware of the places where the transit can take them. For example, they might know that there is a bus within a five-minute walk, but they may not realize that it goes directly to a supermarket.

Walking Distance and Health

The worse the health of older adults, the shorter the distance they are willing or able to walk to access public transportation. Therefore, it is even more critical for transit agencies to focus on providing service to places where elderly in poor health or "older elderly" (age 75 and older) might live. Examples might be areas containing assisted living facilities or neighborhoods that have degraded over the years where many "older elderly" remained after the neighborhood changed.

Driving Status
Current and Former Driving Status

It is imperative that seniors are taught how to use transit and about the improved quality of life that being mobile can provide. Of the seniors who used to drive at least once a month, 40% no longer drive at all. These seniors may have particular difficulty adjusting to using the public transit system.

Driving Status and Income

While the majority of seniors in the highest income bracket still drive, less than 40% of the seniors in the middle and lower income brackets drive. This is due to a higher rate of driving overall for the higher income seniors when they were younger. Thus, the seniors who are much more likely to rely on public transit, to no surprise, are the lower and middle-income seniors. Ridership campaigns and transit agencies must target and address the concerns and fears of these lower income seniors.

Frequency of Public Transit Use
Former Public Transit Use

The participants were asked whether they used to use public transit more, less, or the same amount as they use it now. Their answers had no correlation with the frequency with which they utilize public transit as older adults.

Health

The group of seniors with excellent health has the highest percentage of regular transit users, both for bus and for train. The group of seniors in poor health has the highest percentage who never use transit, again both for bus and train. Overall, however, there is not a very strong relationship between transit frequency and health, though train use is more affected.

Difficulty Walking

According to the cross-tabulation, it appears that seniors who have difficulty walking are much less likely to take the bus or train on a regular basis and are much more likely to never take the bus or train. This effect is greater on the train than it is on the bus. While further regression analysis shows that there is in fact very little correlation between difficulty walking and the frequency with which the seniors take the train, hypothesis testing shows that difficulty walking does indeed affect transit use, but only use of the train, not of the bus. This is important an important factor for transit agencies to take into consideration when considering how to best to serve seniors, some of whom have difficulty walking (30%).

Difficulty Climbing Stairs

Of seniors who have difficulty climbing stairs, 18% never take the bus compared to only 12% of those without difficulty, and 22% never take the train compared to only 11% of seniors without difficulty. This indicates that seniors with trouble climbing stairs are less likely to make use of public transit services and are thus less able to participate in activities outside the home. For train use, seniors with difficulty climbing stairs ride heavy rail with slightly greater frequency than they ride light rail. This may be due to the existence of elevators in the heavy rail stations, eliminating all stairs. Overall, though difficulty climbing stairs has a small effect on frequency of transit use, agencies should still make efforts to accommodate the specific physical needs of elderly passengers.

Proximity to Transit

Seniors who live near the train take the train with greater frequency and those near the bus take that with greater frequency. Seniors who live near both the bus and the train take the bus more than the train. The only proximity combination where seniors take the train more than the bus is if they live near the train but not the bus. Since the survey shows that seniors living near the bus but not the train take the train significantly less than seniors who live near the train, it can be deduced that bus feeder service to rail is not frequently used by the senior population.

Driving Habits

It goes without saying that seniors who currently drive take public transit less than non-drivers. Frequency of transit ridership is also significantly higher for seniors who did not drive when they were younger, with an even greater distinction for bus. Additionally, the more frequently seniors drove when

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they were younger, the less frequently they take transit as older adults, with a greater correlation between former driving habits and the bus rather than the train.

The regression results show a strong negative relationship (R^2 = -0.22) between current driving status and transit frequency and a weaker negative relationship between former driving habits and transit frequency (R^2 = -0.11). The strongest relationship is between transit ridership frequency and a combination of former and current driving habits, with an R^2 of 0.287 for bus frequency of use and 0.198 for train frequency of use. This indicates that bus frequency is affected more than train frequency by former and current driving status. When the relationship between former driving status and transit frequency is controlled for current driving status, it is clear that the frequency of transit ridership for current non-drivers is significantly higher for the respondents who never drove than for those who used to drive. The difference in frequency of transit use between non-drivers who used to drive and those that never drove is more pronounced for bus than for rail.

Age

Cross-tabulation analysis indicates that as seniors age, they are more likely to use transit just a few times a year or not at all. Regression analysis confirms this relationship exists, but to a lesser extent. Finally, a hypothesis test showed that seniors use public transit less as they get older. Over time, seniors' bus usage is impacted to a lesser extent than their train usage.

Education

For the most part, seniors who frequently bus and train have completed less education, as confirmed by both cross-tabulation and regression analyses. The level of education has more of an impact on the frequency of bus usage than of train ridership (both negative relationships). This is not a surprising result as bus usage is generally higher among the transit dependent population, many of whom have attained lower levels of education.

Income

As with increases in education, the higher the income of the respondent, the less they utilize public transportation. This is confirmed by both solid correlation coefficients (0.38 for bus and 0.28 for train) and a somewhat significant R^2 (0.12 for bus and 0.06 for train), particularly between income and bus use. The number of seniors taking the bus or train at least a few times a week decreases as their income

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increases. Likewise, the number of seniors who never take the bus or train increases as their income increases. Overall, seniors with higher incomes are less likely to take transit frequently, with income having a greater effect on bus ridership than train use.

Once income and frequency are controlled for driving status, some of the relationships between income and frequency are shown to be spurious while some of the relationships are maintained. For example, driving appears to have nothing to do with the strong relationship between high-income and never taking the bus or train. However, driving status almost completely accounts for the relationship between income and taking the train at least a few times a week, at least for non-drivers.

Spirits and Mobility

The seniors' spirits, or happiness, has only a small effect on their mobility.[200] Those with "excellent" or "good" spirits are more highly mobile compared to those with "fair" or "poor" spirits. However, the difference between their degrees of mobility is only about 10%, a negligible amount which could be due to data error.

General Fear[201]

Length of Residence in Neighborhood

Seniors' feelings of safety at home and walking around their neighborhoods is completely independent of the length of time that a senior has spent living in their neighborhood.

Type of Home

Seniors' feelings of safety at home and walking around their neighborhoods is completely independent of the type of dwelling in which they reside. While previous studies have shown various results in terms of the effects of age homogeneity on fear, there were not enough seniors in this study living in senior communities (16%) to make an appropriate judgement.

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[200] The measure of mobility combines auto-related and non-auto-related mobility. Auto-related mobility includes the frequency of riding in a car as a passenger and whether or not the respondent drives. Non-auto related mobility includes the frequency of taking the train and bus, as well as walking.

[201] General fear was previously defined as the average fear when home alone during the day and night and walking near home during the day and night.

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Victimization History

Some studies have shown the elderly with a history of victimization to be more fearful. This survey concurs with that observation, showing that seniors who were victims within the past year are the most fearful, followed by seniors who were victims before this year. It appears that knowing a person who was a victim within the past year has little to no effect on making seniors feel more unsafe.

Fear of Types of People

Although the majority of seniors are sometimes or always afraid of teenagers, drunks, and homeless people, those with higher general fear tend to be even more fearful of these groups of people that often frequent public transit systems. This shows that, to some extent, these types of people need to be controlled, as their presence affects the majority of seniors. On the other hand, there is a limit to what transit agencies can do, as a lot of the fear is simply a result of seniors' general apprehension.

Fear in Transit Situations

Seniors who are more fearful in general are more fearful in transit situations, including waiting for and riding the bus and train. The relationship between general apprehension and riding the train is stronger than for riding the bus, indicating that general fear in seniors affects their fear of the train than of the bus. Regression analysis confirms these findings, with a much larger R^2 value for the relationship between general fear and train fear ($R^2 = 0.275$) than general fear and bus fear ($R^2 = 0.140$). Additionally, there is a satisfactory R^2 value ($R^2 = 0.259$) between general fear and total transit fear (both bus and train combined).

Transit Fear
Mode Used More Often

Regardless of which mode is more frequently used, seniors feel fairly safe while riding the bus. Seniors who ride the bus more often than the train tend to feel less safe at bus stops, even when controlled for general fear. On the other hand, seniors who take the train more often feel much safer than the bus riders when waiting for or riding the train. Overall, it is those seniors who ride the bus more frequently who are most frightened of transit, both at the bus stops and in all situations involving trains. Transit security programs should focus on these seniors in particular.

Transit Frequency and Transit Fear

Regression analysis shows that for the elderly, despite the indications of previous studies, frequency of transit use and fear of transit situations are almost entirely independent of one another, with R^2 values from regression analysis all equal to 0.00.

Mode Considered Safer and Mode Used More Often

The majority of the seniors (84%) feel that the bus is safer than the train. Of the seniors who feel the train is safer, more than 80% either ride the train more frequently or use the bus and the train about the same amount as the bus.

Gender

Senior men feel much safer in transit situations. The differential in fear between the genders is smallest while riding the bus and largest while waiting at a train station.

Education

Seniors with higher levels of education are generally less fearful in transit situations. Seniors with high levels of bus fear are exclusively those without a high school diploma, though high train fear is experienced by seniors with all levels of education. Overall, there is an acceptable negative correlation between fear and education (-0.33 for bus fear and -0.29 for train fear).

Fear of Types of Crimes by Frequency of Transit Use

Teenager rowdiness, pushing and shoving, and vandalism of transit property invoke the most fear in seniors. Fear of teenager rowdiness and vandalism are positively correlated with frequency of transit use— as frequency of use increases, fear increases. Fear of pushing and shoving and of begging and panhandling have a negative relationship with frequency of transit use— as frequency of use increases, fear decreases. Of all types of crime, fear of begging and panhandling has the strongest relationship with how frequently the elderly use public transportation. The relationship is negative, indicating that as ridership frequency increases, fear decreases. These relationships show that some crimes (teenager rowdiness and vandalism) are more feared by frequent transit users and some crimes (pushing and shoving and begging) are of more concern to seniors who use transit less often.

Types of Security Measures Preferred

Most seniors' first choice of security measures in a train station is a police officer, followed by bright lighting and then emergency telephones. The only difference between patrons of different modes is that seniors who ride the bus more frequently put a greater value on emergency telephones in train stations. Since seniors who ride the bus more than the train are most frightened in train stations, this is an important point to note.

Hypothesis Conclusions

A number of conclusions are drawn based on the results of the hypothesis tests. While some of these support previous conclusions based on the cross-tabulations, correlation coefficients and regression analyses, some hypothesis tests present an opposite finding. In developing the final list of lessons learned from this study, judgement had to be used as to which analysis technique made the most sense.

- Seniors with high general fear also have a high level of fear associated with riding public transportation;
- Older women take public transportation more often;
- Younger seniors take public transit more often;
- Seniors who do not drive or frequently ride in a car as a passenger take public transit, both bus and train, more frequently than seniors who drive or frequently ride in a car;
- There is no difference in public transit frequency of use between non-drivers who used to drive and non-drivers who never drove;
- There is no difference in public transit fear between frequent and infrequent users of public transportation;
- Seniors are generally fearful of groups of rowdy teenagers;
- Level of health does not have an effect on the average transit use of seniors;
- Difficulty walking does not have an effect on the bus use of seniors, but it has an effect on how often they use the train;
- Difficulty climbing stairs does not have an effect on the transit use of seniors; and
- Seniors with less formal education are more fearful of public transit, more so of the bus than of the train.

Summary of Lessons Learned

Although the demographics of the survey respondents from this study are not equivalent to those of the population at large, they are sufficiently similar to enable drawing generalizable conclusions. The respondents were taken from a wide range of communities and towns throughout the Boston metropolitan area in order to obtain a diversity of incomes, driving habits, and transit usage habits. Though many of the surveys did not have all questions answered, there was still a large enough sample on all questions to conduct analyses. Additionally, validating showed that the majority of the seniors answered the survey with relative coherence and accuracy. In some cases, different results were obtained from different statistical techniques: cross-tabulations, correlation coefficients, regression analysis, and hypothesis testing. In these cases, a judgement was made as to which result made the most sense.

Some of the most important lessons to be taken from this survey are those that teach how transit properties can manage service and security to better serve the elderly population. Table 69 summarizes the important lessons and how they can be used to improve public transportation for seniors.

Table 69: Conclusions from Survey and Their Applications

Conclusion	Application
Seniors are similar to the rest of the population in that their major reasons for taking public transit are convenience factors such as schedule service destination. They also choose which mode to take by which is more convenient.	Seniors, who often travel during off-peak hours, will not use public transportation if the schedule is inconvenient (if they have no other transportation alternative). Therefore, for an agency to attract seniors, it must make convenient midday schedules. Agencies should consider senior travel patterns when planning bus and train service. Additionally, agencies should promote service by informing the seniors of nearby public transportation and where it can take them.

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Conclusion	Application
Seniors are not willing to walk very far to access public transportation, implying that public transportation selection for most seniors is simply whatever is nearest. This is different from younger people who are often willing to walk farther if it means accessing a more convenient service. Naturally, the access distance decreases as the health of the individual declines.	Agencies should work with seniors to show them where they can go on the nearby public transportation, both the nearest service as well as service that is a bit farther. Perhaps if seniors were aware of more options they might be willing to walk farther.
Seniors mainly use public transportation to get to health-related appointments and for social/entertainment destinations.	Although seniors use public transportation for a wide variety of destinations, agencies must work with seniors to show non-users all of the different uses of public transportation. Additionally, agencies must make it easy for seniors to use public transit for these purposes, by having friendly drivers who can assist with stop location; large turnstiles in the subways so it is easy to enter with shopping bundles; and information so that seniors know the transfer opportunities from their local buses to other buses and trains.
Seniors use public transit either very frequently or very infrequently— occasional use is not popular.	Information to seniors and improved convenience are the best ways to convert infrequent transit users into occasional users.
The vast majority of seniors either drive themselves or are driven by others on a regular basis. The more they have access to private automobiles, the less they utilize public transit.	If transit service is made more convenient in terms of schedule and seniors are taught the extent of its uses, seniors might be more likely to make use of public transit rather than using private automobiles. Additionally, controlling things that make seniors uncomfortable, such as rowdy teenagers, is crucial to changing their habits.
Of seniors who used to drive regularly, 34% no longer drive. This number will likely increase as the elderly population ages.	This is a sector of the elderly population that needs information and encouragement to use public transportation. As the number of former drivers increases, additional work will be necessary to attract them to riding transit.

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Conclusion	Application
Most seniors consider themselves in good health and have no difficulty walking or climbing stairs, meaning that physical limitations should not deter them from taking public transportation.	While survey data shows that most seniors do not have difficulty climbing stairs, anecdotal evidence shows that many seniors still do not take the buses because the steps are too high. If an agency is to attract senior ridership, it is imperative that drivers of buses be courteous and kneel the buses; allow seniors to sit before the bus starts moving again; elevators and escalators in train stations are always working; and that seats are actually given up to elderly riders. One of the ways for agencies to deal better with senior riders is to provide front-line employees with sensitivity training.
Seniors' general fear is surprisingly low (e.g., fear of being home alone and walking in their neighborhood).	Fear is not as much of an issue for agencies to deal with as is convenience of service.
Seniors are more fearful of the train than the bus.	Two things must be done to encourage seniors to ride the train and not be afraid. First, the train must be safe, with visible police officers in some stations, bright lighting, and clearly marked emergency telephones. Second, an educational campaign must be launched to teach seniors about the safety of the train system.
The types of crimes that seniors fear most while using public transportation include pushing and shoving, teenager rowdiness, and vandalism of transit property.	Pushing and shoving typically only happens during rush hour, so if service is made more convenient during the midday, many seniors will be able to avoid this altogether. Teenager rowdiness must be controlled, by implementing a zero-tolerance policy and enforcing it with constant police vigilance. Another way to control teenager rowdiness is to encourage college students to use the system, which in turn discourages teens from acting up and comforts seniors.[202]

[202] Frank Kreusi, Presentation at MIT, December 3, 1999.

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Conclusion	Application
Seniors are particularly fearful of drunks and teenagers who frequent transit property.	Police must implement and enforce a zero-tolerance policy for people who do things to make riding the system unpleasant for others.
The elderly do not consciously make travel decisions based on personal security concerns.	This is important to note, however given their fear of trains, it is possible that seniors subconsciously avoid rapid transit due to security concerns.
The preferred train station security measure by seniors are police officers. Frequent bus users also cite emergency telephones as important.	Police officers should be spread throughout the system and rotate between stations to ensure constant vigilance and makes the system feel and be safer. Additionally, emergency telephones should be located in every station and must be clearly marked so they are visible from all parts of the platform. Finally, in stations where the collection booth is upstairs from the tracks, lighted signs indicating that a train is on its way can help seniors by enabling them to stay within the watchful eye of the collector until the train is nearing the station, at which time they can go down to the train platform.
Seniors with difficulty walking are less likely to use the train than those without difficulty.	Seniors need to learn about bus feeder service to access rail service. Additionally, signage in train stations must be clear so seniors avoid extra walking, while escalators and elevators need to be in working order at all times.
Seniors who live near a bus stop ride the train less frequently than those who live near the train.	Feeder bus service to rail is not commonly used by the senior population. However, with information about how to use the bus to get to the train and the many destinations that are accessible by train, this can be changed.
Of seniors who do not drive, transit use is greater for seniors who never drove than for those that used to drive.	Transit agencies need to use educational and marketing campaigns to help attract seniors who are not used to taking public transit. As the senior population ages and there are more non-drivers, making the service more comfortable for the elderly will become more important.

Conclusion	Application
Seniors who take the bus and train more frequently tend to have attained lower levels of education and have lower incomes. Education and income have an even greater impact on bus use than train use.	Educational campaigns in higher income areas are necessary to improve transit mobility there. Additionally, information should be provided to those lower education, lower income seniors so that they can make better use of the system and actually "choose" to use it rather than be forced to.
Seniors who are frequent bus users (but infrequent train users) are the most afraid of the train.	Frequent bus users (but infrequent train users) should be introduced to the benefits of the train using the tactics recommended for making seniors less afraid of the train.
Women are much more fearful of transit than are men, particularly while waiting in a train station.	Women should be educated and informed about the security of public transit and about what they can do to prevent victimization.
Seniors with high general fear have higher transit related fears.	Seniors with high general fear are less likely to be convinced that transit is safe. However, this is another group that should be targeted so that those seniors who are fearful in general do not become captives to their own fear.
There is little difference in public transit fear between frequent and infrequent users of public transportation.	Riding public transit, at least in Boston, does not change seniors' minds about the safety of public transportation. However, agencies have a long way to go in terms of making transit, particularly trains, feel safe enough for seniors to ride on a frequent basis.

Future Research

This section provides a list of future research and work that should be done to increase the knowledge in this field.

- Determine what levels of convenience would be suitable for seniors to use transit more regularly and for a wider variety of activities;

- Research and work with teenagers to determine their motivations for misbehaving and what would prevent them from doing so (types of guard, etc.);

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- Survey seniors who have senior citizen discount passes from the MBTA about their feelings of security at different stations (such as one with an officer and one without) to see if an officer really makes people feel safer; and

- Conduct a cost/benefit analysis of sensitivity training for bus and trolley operators and research the results of this type of training in transit agencies.

Chapter 7: Applications to Tren Urbano

Introduction

When Tren Urbano, a new heavy rail system in San Juan, Puerto Rico, opens in a few years, one of the biggest challenges for management will be how to attract and maintain ridership. San Juan has never before had fixed guideway, exclusive right-of-way public transportation, and while this has the potential to cause major travel pattern changes in the region, it also has the possibility of failing. When cities on the mainland of the United States build a new rapid transit system, they have the advantage that most of the residents have been to other cities in the U.S. and experienced the benefits of rail rapid transit. However, as an island, Puerto Rico does not have that benefit. Many of the residents of the San Juan metropolitan area have never utilized an urban public rail system. Anecdotally, it has been said that the older residents of San Juan picture Tren Urbano as the New York City subway that they have seen in movies, which portrays the system as full of violence and crime. This fear of crime, as well as the challenge of trying something new, might make it very difficult for Tren Urbano to attract senior riders.

Expected Fear of Tren Urbano

While the Tren Urbano management would like to eventually attract all seniors, regardless of their current public transit use, the most obvious starting point involves the current frequent bus riders. To determine how fearful of the train this segment of the population might be, survey data from this study can be used to look at how infrequent train users (but frequent bus riders) fear the train. Overall, the average fear of the train for all respondents is 3.6 (out of a total of 8). All respondents who are infrequent train riders, regardless of their bus use, have an average train fear of 3.5. For those respondents who are frequent bus riders but infrequent train riders, the average fear of the train is 3.8. Although the differences are very small, the results show that infrequent train riders but frequent bus users have the highest fear of trains. This has important policy and marketing implications for Tren Urbano. It appears that frequent bus riders (but infrequent train riders), who will depend on the train for their mobility, will need the most help to overcome their fear of the train and maximize their mobility.

Based on the survey results, seniors are not particularly fearful of public transit, though they are more afraid of the train than of the bus. This will likely be exaggerated in San Juan, where most of the seniors have never taken the train and therefore do not know that much about it. The survey results from Boston indicate that although there is very little correlation between frequency of use and transit fear, train riders

have less train fear than bus riders. However, because the rail system has been around for so long in Boston, non-riders have heard enough about it through word-of-mouth. In San Juan, seniors' fear of the train, regardless of their transit use now, is likely to be higher than seniors' fear in Boston.

Improving Convenience

Seniors in the Boston area do not frequently take bus feeder service to access rapid transit. Especially in the early stages of the Tren Urbano system, when only one line is built, very few seniors will be able to access the train without taking a bus to the train. If the seniors in San Juan have similar habits to those in Boston, this might not be a popular option. However, with the opening of Tren Urbano, bus routes will undergo major changes, thereby making seniors have to change their travel patterns anyway. This could be a catalyst for encouraging seniors to use bus service to access the train. Additionally, marketing and educational campaigns directed toward seniors will need to be employed to teach the seniors about where the train, new bus, new público, (jitney) routes can take them.

Another way that Tren Urbano can make itself convenient to seniors is by implementing senior fares. Whereas the buses in the San Juan metropolitan area currently cost only 25 cents for all passengers, the proposed rail fare is $1.00. This is a lot of money for any lower income person, but especially for seniors who are living on fixed incomes. Senior discounts, which could only be applicable during off-peak times, would encourage seniors to use the system. Tren Urbano should make it easy for seniors to obtain identification cards allowing them to obtain the senior discount. One of the biggest complaints in the Boston area is that there is only one place to obtain the senior pass and it is a big journey to unknown areas for most seniors.

Improving Tren Urbano Security and the Image of Security

Unlike in Boston, the demographics of San Juan indicate that many more seniors have lower incomes and have attained lower levels of formal education. This could lead to additional anxiety about the train, as the survey in Boston shows that seniors with less formal education and lower incomes tend to be more afraid.

Based on the results from the Boston survey, police officers are important to maintaining an image of security in the train stations. While Tren Urbano management has contracted with unarmed security guards for monitoring the stations, these guards need to be either replaced with or supplemented by armed, sworn police officers with the authority to enforce rules and make arrests. Additionally, the
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stations should be designed such that the collector's booth is in a location that gives the collector a good vantage point for keeping an eye on the entire station. Finally, lighting should be bright, signage adequate, and emergency telephones operational and in clear locations in all stations. These features will not only help the seniors to feel safer, but they will also make the other passengers feel more comfortable in this new environment. Additionally, these features will actually make the system safer, thus enabling Tren Urbano to accurately portray itself as a secure and convenient way to travel.

If Tren Urbano adopts a zero tolerance policy from the beginning, the system will be more secure from the outset. The MBTA in Boston, with few officers around to enforce good behavior, discourage littering, and impart a feeling of safety, can feel frightening. On the other hand, the Metro system in Washington, D.C. has visible police officers who enforce rules regularly; even the rule of no eating or drinking on the Metro is enforced and followed. Something as simple as clean stations and trains makes the patrons feel like they are part of something that is more upscale and therefore more secure.

Conclusions

Tren Urbano will most likely feel the effects of transit fear by the seniors much more than the MBTA does in Boston. However, Tren Urbano has the unique opportunity of attracting choice senior riders from the start by making the system feel secure and portraying a culture where the workers, from the bus drivers to the fare collectors, are helpful and friendly to seniors. Besides making Tren Urbano safe, convenience aspects must be implemented to attract senior ridership. By educating seniors as to how Tren Urbano can improve their quality of life by enabling them to get to places that they could not conveniently access before, Tren Urbano will be able to attract more of the elderly population.

Future Research

- Conduct a similar senior survey in San Juan, supplemented with focus groups;
- Investigate the convenience aspects that would convince San Juan seniors to ride;
- Analyze the costs and benefits of replacing or supplementing security guards with sworn police officers;
- Investigate how to integrate security in stations with the surrounding communities; and
- Investigate opportunities to attract teenage riders while promoting appropriate behavior.

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Appendix

List of Appendix Tables

List of Appendix Figures

Table A: Previous Studies on Fear of Crime and Seniors' Fear of Crime

Title	Author	Purpose of Study	Survey Technique	Sample Size	All Elderly?
Transit Passenger Perceptions Regarding Transit-Related Crime Reduction Measures	Reed, Wallace, Rodriguez	Examine transit passenger perceptions regarding a number of transit-related crime reduction measures, primarily patrol and security, design actions, and technological innovation.	Survey passengers on a pseudo-random sample of bus routes. Written survey to be returned to surveyor during the ride.	761	No
Factors Related to Elderly Crime Victims' Satisfaction with Police Service: The Impact of Milwaukee's "Gray Squad"	Zevitz, Gurnack	To test the hypothesis that specialized police services for the elderly affect the way the elderly view the police in general.	Letter followed by telephone survey. Used two groups: persons whose most recent interaction with the Milwaukee Police Department was with the Gray Squad and those whose dealings never included the Gray Squad.	224	Yes
Fear of Crime as a Problem for the Elderly	Yin	To determine how fear of crime affects the elderly.	Random sample of residential blocks were canvassed to locate elderly respondents. They were then interviewed individually.	1,228	Yes
Fear of Victimization: Why are Women and the Elderly More Afraid?	Warr	Examine sex and age differences in fear among a variety of offenses, with a view to the subjective causes of those differences.	Mail survey from random selection from phone book. Reminder postcard one week later, follow up letter and replacement questionnaire after 3 weeks, and, if necessary 7 weeks.	346	No

Title	Author	Purpose of Study	Survey Technique	Sample Size	All Elderly?
Fear of Crime Among the Elderly as Person/Environment Interaction	Ward, LaGory, Sherman	To look at how personal, social, and environmental characteristics are relevant to an understanding of the causes and consequences of fear of crime.	Personal interviews at residences	1,185	Yes
Fear of Crime and Fear of Public Transportation Among the Elderly	Patterson, Ralston	To assess how fear of crime and other fears are related to the use of public transportation by the elderly.	Questionnaires administered in ten senior citizens centers.	194	Yes
Fear of Crime and Other Barriers to Use of Public Transportation by the Elderly	Patterson	To assess older persons' evaluations the severity of physical and psychological barriers to public transportation and potential means of removing these barriers.	Questionnaires administered in eleven senior citizens centers.	225	Yes
Fear of Crime and Satisfaction Among Elderly Public Housing Residents: The Impact of Residential Segregation	Normoyle	To assess how residential age segregation among elderly public housing residents affects their fear of crime.	In-person interviews conducted in 42 public housing sites and adjacent neighborhoods.	945	Yes
Fear of Crime and Concern Over the Crime Problem Among the Elderly	Mawby	To determine the fear of crime by the elderly and how that relates to their concern of the crime problem in general. Also how these relate to their experience with victimization.	Questionnaire. Unclear how administered.	763	No

Title	Author	Purpose of Study	Survey Technique	Sample Size	All Elderly?
The Influence of Personal Security Fears on Women's Travel Patterns	Lynch, Atkins	To investigate the influence that women's fears and apprehension about attack and harassment have on use of transport facilities.	Letter writing and then sending questionnaires to organizations such as major retailers, large hotels, the University cleaning staff, colleges, and women's institute groups. Also a letter about the survey in the local newspaper which resulted in a few more surveys being mailed out to individuals.	249	No
Bus Crime in Los Angeles: II-Victims and Public Impact	Levine, Wachs	Examines the extent to which fear of personal security affects bus ridership.	By telephone calls to a sample drawn by using random digit dialing.	1,088	No
Fear of Crime Among the Black Elderly	Joseph	To examine the nature, extent, and causes of the fear of crime among Black seniors by focusing on the environmental factors, perceptions of vulnerability, vicarious victimization, and personal victimization.	In-person interviews.	119	Yes

Title	Author	Purpose of Study	Survey Technique	Sample Size	All Elderly?
The Effects of Health, Environmental, and Socio-Psychological Variables on Fear of Crime and its Consequences Among Urban Black Elderly Individuals	Bazargan	Identify significant predictors of fear of crime among Black urban elderly individuals.	Random selection from elderly housing complexes and mixed-age housing complexes. Individuals were sent a letter that explained the survey and offered a remuneration fee. The interviews were conducted in the homes of the participants.	372	Yes
The Elderly and Fear of Crime	Baldassare	Explores the causes of greater fear of crime among the elderly versus younger people.	By telephone calls to a sample drawn by using random digit dialing.	1,009	No
Citizen Perceptions on Mass Transit Crime and its Deterrence: A Case Study	Austin, Buzawa	To determine if citizen concerns over the level of crime against transit system patrons does in fact limit the use of mass transit. Also to determine levels of public knowledge of and acceptance of the use of undercover police officers and various alternatives.	Oral interviews of passengers on 20 of Detroit's 62 buslines (the 10 most travelled plus a random selection from the remaining lines).	512	No
Fear of Crime and Victimization Among the Elderly in Different Types of Communities	Akers, LaGreca, Sellers, Cochran	Examine the effect that community setting, relative to other factors, has on victimization and fear of crime among the elderly.	Interviews that took approximately one and one-half hours to complete. Some respondents chosen by random-digit dialing and some non-randomly	1,410	Yes

Title	Author	Purpose of Study	Survey Technique	Sample Size	All Elderly?
Elderly Women and Fear of Violent Crime: The Least Likely Victims?	Pain	Assesses existing explanations of the relationship between the risk and fear of crime amongst elderly people.	Mail questionnaires followed by some follow-up, in-depth interviews.	389	No
Crime and the Elderly: The Relationship Between Risk and Fear	Janson, Ryder	To investigate the relationship between the elderly's concern with crime and the neighborhood's crime rate.	Interviews.	449	No
Producing Personal Safety: The Effects of Crime Rates, Police Force Size, and Fear of Crime	Krahn, Kennedy	To examine the relationships among crime rates, police staffing rates, fear of crime, and citizens' crime prevention behaviors.	Interviews.	11,061	No
Crime et Sentiment d'Insécurité au Troisième Âge (Crime and the Feeling of Insecurity in Old Age)	Killias, Kuhn	To determine the truth to whether older persons are at higher risk of being a victim of a crime. Also to determine if fear of crime depends on age and if there is a relationship between age and the consequences of being a victim.	Telephone survey.	6,500	No
Hot Spots of Bus Stop Crime	Loukaitou-Sideris	To determine the importance of environmental attributes to the incidence of crime and the feeling of security at bus stops.	Random street surveys of transit passengers at six high-crime bus stops.	212	No

Figure A: MBTA General Crime Prevention Tips Bookmark

"ON YOUR SIDE"

Transit
Crime Watch

REPORT SUSPICIOUS ACTIVITY

Call the MBTA Police at (617) 222-1212 or contact an MBTA Employee

Here are some tips from the MBTA Police on how to avoid becoming a victim.

* Don t show your wallet or cash. Use exact change, a token or T pass.

* Do not leave your bags/luggage unattended.

* Keep jewelry and other valuables out of sight.

* Keep a firm grip on you handbag with the flap side next to your body.

* Carry your wallet in your front pants pocket, not in the back.

* Beware of commotion or loud arguments. Incidents can be staged to distract a pickpocket victim. If you re jostled in a crowd, beware; your pocket may have JUST been picked.

* Don t stand in train doorways; move to the center of the train.

* Stay alert. Prevention is the best course of action.

For more information on
Neighborhood Crime Watch
1-888-30-WATCH

No Smoking

As part of the MBTA s initiative to address quality of life issues, the MBTA Police Department has been asked to enforce the **NO SMOKING** law. It is a violation of law to smoke on MBTA vehicles or property. (Mass. Gen. Law CH. 161A Section 33). The greatest number of complaints received by the MBTA concern the violation of this law. Please be considerate of your fellow passengers. Violations may result in a fine or a criminal complaint. Thank your for your cooperation.

A Program Sponsored by The
Commonwealth of Massachusetts
Agreo Paul Cellucci, Governor,
Massachusetts Neighborhood
Crime Watch Commission within
the Department of Housing &
Community Development and the
Massachusetts Bay Transportation
Authority.

Figure B: MBTA Crime Prevention Tips for the Elderly

PROVIDED BY THE MBTA POLICE COMMUNITY SERVICE UNIT (617) 222-1180

CRIME PREVENTION TIPS: ELDERLY SAFETY

<u>At Home</u>:

1. Always keep your doors locked. Consider installing a peephole so you can see you is outside your door.

2. Do not open your door to strangers or unexpected servicemen unless they display full identification. If you have any doubts, do not be afraid to make them wait while you call their companies for verification.

3. If you live in a building with an elevator, be cautious about riding alone with strangers. If you are bothered by someone in an elevator, press the emergency button and as many floor buttons as possible. - this will attract attention.

4. Use only your last name and initial on your mailbox, by your doorbell and in telephone listings.

5. When planning to go out, leave lights on and a radio playing to give your home a "lived-in" appearance. This deters burglars.

<u>When Going Out</u>:

1. Avoid carrying extra money or valuables. Men should carry money and identification in some place other than a wallet. And stash your cash - never flash it!

2. Women should consider whether they really need to carry a handbag; money and identification is safest in an inside pocket. If you must, carry your handbag tightly under your arm...not dangling from your wrist or wrapped tightly around it. Never set it down on store counters, in shopping carts, or on bus seats.

3. Carry a personal alarm such as a "Screamer" or a whistle. Unexpected loud noises can scare off a trouble-maker and summon help.

4. Always try to walk with someone else if possible - especially at night. Most muggers will be discouraged by company, male or female.

5. Be alert to your surroundings! Stay in well-lighted, well-travelled areas and away from bushes, alleys, entryways or any other good hiding places.

6. If you are being followed by someone on foot, cross the street, change direction, or vary your pace. If followed by someone in a car, turn around and walk briskly in the other direction. If still followed, seek help in nearest home or business and call the police immediately.

7. If accosted by someone demanding your money, cooperate - do exactly as told. Resistance is dangerous and should be resorted to only to protect your person, never your property.

8. Get to know your neighbors and cooperate with them in making your immediate neighborhood safer. You may even want to start with a Block Watch together.

Safety Seminar:

How to Stay Secure While Riding the T
and
Help Public Transportation Better Meet Your Security Needs

Featuring:
- A presentation on staying secure on public transportation and in your community
- A survey for you to share your ideas
- Discussion, questions, and answers

Wednesday, February 23
10:00 – 11:00
Quincy Senior Center
83 Saratoga St.

Refreshments will be provided

Sponsored By:

MIT Age Lab

Many thanks to the Quincy Senior Center

Figure D: Sample Letter to Senior Centers

MIT AgeLab
77 Massachusetts Avenue, Room 1-235
Cambridge, MA 02139-4307

December 30, 1999

Ms. Jane Doe
Quincy Department of Elder Services
83 Saratoga Street
N. Quincy, MA 02171

Dear Ms. Doe:

Thank you for agreeing to host a program on public transportation safety and security on February 23 from 10:00-11:00. I have arranged to bring the MBTA Police public outreach officer with me to make a thirty minute presentation on safety and riding the T. Together with the survey for my research, this will be an hour long program that would be beneficial for the attendees as well as for the future welfare of elderly transit riders.

To give you some further background, the main objective of the study (sponsored by the U.S. Department of Transportation and the MIT Age Lab) is to look at the perception of crime by elderly citizens and determine how this perception of crime affects their transit ridership. This information will then be used to determine what programs should be implemented in order to make the transit experience more comfortable for elderly passengers. In order to provide an interesting and informative program for the seniors, I am working jointly with the MBTA.

I have enclosed copies of a flier for you to use, an abstract of my research, and a short paragraph about the program for you to use in your senior center newsletter. Please feel free to change the wording to make it sound more appealing. Let me know if you have any questions. I look forward to meeting you on February 23.

Sincerely,

Lora Blackman

Figure E: Sample Thank You Letter to Senior Centers

MIT AgeLab
77 Massachusetts Avenue, Room 1-235
Cambridge, MA 02139-4307

February 24, 2000

Ms. Jane Doe
Quincy Department of Elder Services
83 Saratoga Street
N. Quincy, MA 02171

Dear Ms. Doe:

I just wanted to thank you for having me at the Quincy Senior Center to conduct my survey on the public transportation security needs of the elderly. I appreciate the time you took to help organize the program. The survey responses that I received will enable me to formulate policies on making public transportation more secure and comfortable for seniors.

I greatly appreciate the time you allowed me with the seniors. It was very useful for my research and I hope they also benefited from the presentation and survey. Thank you again.

Sincerely,

Lora Blackman

Figure F: Study Approval from Massachusetts Executive Office of Elder Affairs

The Commonwealth of Massachusetts

Executive Office of Elder Affairs

One Ashburton Place, Boston, MA 02108

ARGEO PAUL CELLUCCI
GOVERNOR

JANE SWIFT
LIEUTENANT GOVERNOR

LILLIAN GLICKMAN
SECRETARY

Phone (617) 727-7750
Fax (617) 727-9368
TTY/TTD 1-800-872-0166

February 3, 2000

Dr. Joseph Coughlin
Director, Age Lab
Technology for Healthy Aging Laboratory
77 Massachusetts Avenue, Room 1-235
Cambridge, MA 02139-4307

Dear Dr. Coughlin:

Thank you for appearing before the Elder Rights Review Committee (ERRC) on January 7, 2000. We are in receipt of your letter dated February 2, 2000, which included revisions recommended by the ERRC.

The ERRC has recommended that I approve your research. In accordance with EOEA-00-07, I am approving your project and your revisions as submitted on February 7, 2000. I wish you success in your study to determine the perception of crime by passengers and potential passengers and how this effects ridership, particularly elderly (60+) members of the population.

If you have any questions, please call Arthur Dramin at (617) 222-7495.

Sincerely,

Lillian Glickman

Figure G: Informed Consent Form for Study Participants

Informed Consent Form

The objective of this research project is to determine the perception of crime by passengers and potential passengers and how this effects ridership, particularly among elderly (60+) members of the population.

This survey should take you about twenty minutes and consists of a series of questions regarding your lifestyle, how much you ride public transit, and your fear of crime in different situations.

You may feel uncomfortable answering some of the questions, but we can assure you that all responses will remain anonymous and will be used solely for research purposes and the production of a research report. All responses will be kept confidential according to the procedures set forth by the Privacy and Confidentiality Regulations of the Executive Office of Elder Affairs.

If you have any questions during the survey, just raise your hand and we will gladly help you out.

After completing the survey, you will be treated to an informative discussion of safety and security by officer Fran Mulhern of the MBTA Police. Following the discussion, coffee and cake will be served.

Should you so choose, you may withdraw your consent and discontinue participation in this project at any time without jeopardizing home care or other services received from an Aging Services Access Point or Senior Center.

If you wish to file a grievance regarding this survey, contact Dr. Joseph Coughlin at 77 Massachusetts Avenue, Room 1-235, Cambridge, MA 02139-4307 or at (617) 253-4978.

_____

Print your Name

_____

Sign your Name   Date

Table B: Surveys Conducted at Senior Centers

Date and Time	Location	Activity Coordinated With	Number of Respondents
12/22/99	Kit Clark Senior Center, Codman Square, Dorchester	After lunch	15
12/23/99	Salvation Army Lunch Site, Chelsea	After lunch	17
2/3/00	Newton Senior Center	Before lunch	14
2/9/00	Somerville Senior Center		10
2/10/00	Medford Senior Center	After lunch	13
2/16/00	Brookline Council on Aging, Senior Housing Community Room		16
2/17/00	Cambridge Senior Center	After lunch	24
2/23/00	Quincy Council on Aging, Senior Housing Community Room		7
3/2/00	Newton Retired Men's Club, Newton Senior Center	After bi-weekly meeting	29
3/30/00	Everett Council on Aging, Everett Armory	Before dance class	23
4/4/00	Belmont Senior Center	At Golden Age Club meeting	13

Figure H: Survey Changes After First Two Senior Centers

- A question asking the frequency of commuter rail ridership and one asking whether or not commuter rail was within walking distance of the home were eliminated due to both the misunderstanding of the term "commuter rail" and also because there are so few commuter rail riders among the senior population.

- A question was added asking "How often do you walk to errands, shopping, etc." to account for mobility other than driving, riding in a car, and taking transit

- A question was added asking if the respondent drove when they were younger to get an idea of whether they used to rely on a car.

- A question asking whether the respondent lived in an urban or suburban neighborhood was eliminated due to confusion with the terms. The zip codes provided by the respondents can give an adequate estimation of the level of urbanization around the respondents' homes.

- A low response rate was obtained for the question about fear when walking near their home at night because most of the elderly do not walk alone at night. Adding a choice of "do not go out at night" helped increase the response rate to this question and gave a more realistic answer choice to many.

- Two questions, one about fear in different situations (riding, waiting for, and walking to transit) and one about fear about certain crimes were changed from a matrix format to Lickert bars in order to clarify what we expected the respondents to do. Instead of having the choices of "Feel very safe," "Feel reasonably safe," "Feel slightly frightened," and "Feel very frightened," only the extremes of the choices were labeled- as "Feel very safe" to "Feel very frightened."

- The question about crime types was originally meant to ask how frightened the respondents are that particular types of crime will occur. However, the respondents did not seem to be able to relate to first degree crimes such as armed robbery, sexual assault, and murder, so many left the question blank. Those that did not leave the question blank, all said that they were very frightened of those types of crimes, because they did not understand that the question was asking whether or not they fear those type of crimes occurring while they are taking public transportation. To ameliorate this lack of understanding, the question was changed to "When you ride public transportation, how frightened are you when you see the following things?" The crime types were limited to obscene language, teenager rowdiness, vandalism of transit property, begging/panhandling, and pushing and shoving.

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- A question asking the participants to rank from one to five the importance of certain security measures was originally very difficult for the participants. Many ranked each choice as a "1" because they feel that they are all important. To make the question a bit easier, two of the choices, video cameras and easy exits, were eliminated. These two seemed to be the choices that the respondents had the most difficulty understanding. In order to make use of the surveys taken before this change was made, the three remaining answers were ranked from one to three based on the ranking that the respondent had entered for all five choices.

- The question asking the respondents to estimate their monthly spending posed great difficulty for the seniors. Nearly all respondents chose the lowest choice, $500 or less. There are two explanations for this: first, perhaps the participants were hesitant to reveal their spending for privacy reasons. More likely however, they did not remember to factor in large expenses such as rent, car insurance, and medicine and only thought of everyday expenses such as food. The question was made more clear by listing some items that the respondents should remember to include, such as rent, food, and entertainment.

Table C: Sample Size by Question

Number	Question Description	Sample Size
1	Zip Code	168
2	Why take transit	162
3	Nearby public transportation	179
4	Reasonable walking distance	171
5	Frequency of use of Public Transit: Bus Train The Ride	 174 162 146
6	Walk to errands[203]	140
7	Public transit when younger	158
8	Activities by transit	176
9	Drive when younger[204]	139
10	Drive now	178
11	Ride in car frequency	174
12	Health	179
13	Difficulty Walking/Stairs	180
14	Spirits	178
15	Live alone?	178
16	Type of home	178
17	Length in neighborhood	178
18	Fear at home, day	178
19	Fear at home, night	177
20	Fear to walk, day	172
21	Fear to walk, night	170
22	Victim	163
23	Bus Stop Fear Train Station Fear Riding Bus Fear Riding Train Fear Walking to Transit Fear	159 150 149 147 145
24	Rank situations	33
25	Safer mode	146
26	Fear of situations: Obscene Language Teenager Rowdiness Vandalism of Transit Property Begging/Panhandling Pushing and Shoving	 147 151 139 139 145
27	More often mode	161
28	Why more often mode	150
29	No train for safety	163
30	No bus for safety	164

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[203] The first 32 survey respondents were not asked this question
[204] The first 32 survey respondents were not asked this question

Number	Question Description	Sample Size
31	Fear of types of people:	
	Groups of teenagers	151
	Drunks	138
	Homeless	134
32	Safety feature importance:	
	Most important safety feature	111
	Middle importance safety feature	83
	Least important safety feature	83
33	Type of guard	139
34	Demographics	
	Gender	163
	Age	163
	Ethnicity	164
	Education	162
	Spending	140

Table D: Zip Codes of Survey Respondents

Zip Code	City	Responses
02021	Canton	1
02121	Boston	1
02122	Boston	2
02124	Boston	1
02125	Boston	2
02126	Mattapan	4
02130	Jamaica Plain	1
02136	Hyde Park	1
02138	Cambridge	5
02139	Cambridge	9
02140	Cambridge	2
02141	Cambridge	2
02143	Somerville	4
02144	Somerville	2
02145	Somerville	4
02149	Everett	20
02150	Chelsea	12
02151	Revere	2
02155	Medford	11
02169	Quincy	1
02170	Quincy	1
02171	Quincy	5
02176	Melrose	2
02445	Brookline	5
02446	Brookline	14
02451	Waltham	1
02453	Waltham	2
02458	Newton	4
02459	Newton Center	12
02460	Newtonville	4
02461	Newton Highlands	1
02464	Newton Upper Falls	6
02465	West Newton	5
02467	Chestnut Hill	3
02468	Waban	2
02472	Watertown	1
02478	Belmont	13

Table E: Respondents' Current and Former Driving Habits

		Driving When Younger (Working or Taking Care of Family)							
		At least a few times a week		Once a month to a few times a month		A few times a year		Never drove	
		N	%	N	%	N	%	N	%
Drive Now	No	25	29.76%	3	42.86%	1	20.00%	39	95.12%
	Yes	59	70.24%	4	57.14%	4	80.00%	2	4.88%

Table F: Current and Former Public Transit Use

		Average Public Transit Use Now								
		More								*Less*
		1	1.5	2	2.5	3	3.5	4	4.5	5
Public Transit Use When Younger	Less than now	7	5	1	1	2	4	5	2	2
	More than now	19	8	5	4	8	7	15	6	5
	About the same as now	10	4	1	1	5	3	11	2	3

Table G: Frequency of Transit Use by Age

		Age							
		60-64		65-74		75-84		85+	
		N	%	N	%	N	%	N	%
Bus Frequency	At least a few times a week	13	76.47%	24	40.68%	24	36.36%	5	33.33%
	Once a week to a few times a month	1	5.88%	7	11.86%	7	10.61%	2	13.33%
	Once a month	2	11.76%	7	11.86%	8	12.12%	2	13.33%
	A few times a year	1	5.88%	15	25.42%	15	22.73%	4	26.67%
	Never	0	0.00%	6	10.17%	12	18.18%	2	13.33%
Train Frequency	At least a few times a week	10	62.50%	18	31.58%	14	22.58%	0	0.00%
	Once a week to a few times a month	3	18.75%	13	22.81%	8	12.90%	2	18.18%
	Once a month	0	0.00%	6	10.53%	5	8.06%	3	27.27%
	A few times a year	3	18.75%	18	31.58%	22	35.48%	6	54.55%
	Never	0	0.00%	2	3.51%	13	20.97%	0	0.00%

		Highest Level of Education Completed											
		Stopped before HS		Attended HS		Graduated HS (or GED)		Some College		Graduated College		Advanced Degrees	
		N	%	N	%	N	%	N	%	N	%	N	%
Bus Frequency of Use	At least a few times a week	7	43.75% 12.73%	16	55.17% 29.09%	18	42.86% 32.73%	10	35.71% 18.18%	7	29.17% 12.73%	4	25.00% 7.27%
	Once a week to a few times a month	2	12.50% 14.29%	2	6.90% 14.29%	7	16.67% 50.00%	2	7.14% 14.29%	3	12.50% 21.43%	0	0.00% 0.00%
	Once a month	2	12.50% 10.00%	5	17.24% 25.00%	5	11.90% 25.00%	5	17.86% 25.00%	2	8.33% 10.00%	3	18.75% 15.00%
	A few times a year	3	18.75% 9.68%	3	10.34% 9.68%	9	21.43% 29.03%	6	21.43% 19.35%	10	41.67% 32.26%	3	18.75% 9.68%
	Never	2	12.50% 10.53%	3	10.34% 15.79%	3	7.14% 15.79%	5	17.86% 26.32%	2	8.33% 10.53%	6	37.50% 31.58%
Train Frequency of Use	At least a few times a week	4	33.33% 11.11%	9	31.03% 25.00%	11	28.21% 30.56%	9	33.33% 25.00%	4	17.39% 11.11%	3	17.65% 8.33%
	Once a week to a few times a month	3	25.00% 13.04%	5	17.24% 21.74%	8	20.51% 34.78%	2	7.41% 8.70%	5	21.74% 21.74%	3	17.65% 13.04%
	Once a month	1	8.33% 6.67%	4	13.79% 26.67%	5	12.82% 33.33%	4	14.81% 26.67%	1	4.35% 6.67%	1	5.88% 6.67%
	A few times a year	4	33.33% 9.30%	8	27.59% 18.60%	9	23.08% 20.93%	8	29.63% 18.60%	10	43.48% 23.26%	8	47.06% 18.60%
	Never	0	0.00% 0.00%	3	10.34% 16.67%	6	15.38% 33.33%	4	14.81% 22.22%	3	13.04% 16.67%	2	11.76% 11.11%

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[205] The top percentages total to 100% vertically and the bottom percentages total to 100% horizontally. The top percentages indicate the percentage of seniors in a particular education bracket who take transit with particular frequency. The bottom percentages indicate what percentage of seniors who take transit with a particular frequency have completed what level of education.

Table I: Ridership Frequency by Median Income Controlled for Driving Status

Drive	No		No		No			Yes		Yes		Yes	
Median Income	<$33,000		$33,000-$46,000		>$46,000			<$33,000		$33,000-$46,000		>$46,000	
Bus Frequency	N	%	N	%	N	%		N	%	N	%	N	%
At least a few times a week	28	70.00%	23	62.16%	7	38.89%		4	20.00%	3	16.67%	2	5.26%
Once a week to a few times a month	4	10.00%	6	16.22%	1	5.56%		2	10.00%	3	16.67%	4	10.53%
Once a month	4	10.00%	2	5.41%	5	27.78%		5	25.00%	1	5.56%	5	13.16%
A few times a year	3	7.50%	4	10.81%	1	5.56%		7	35.00%	7	38.89%	17	44.74%
Never	1	2.50%	2	5.41%	4	22.22%		2	10.00%	4	22.22%	10	26.32%

Drive	No		No		No			Yes		Yes		Yes	
Median Income	<$33,000		$33,000-$46,000		>$46,000			<$33,000		$33,000-$46,000		>$46,000	
Train Frequency	N	%	N	%	N	%		N	%	N	%	N	%
At least a few times a week	15	46.88%	16	44.44%	4	26.67%		5	25.00%	3	17.65%	0	0.00%
Once a week to a few times a month	3	9.38%	10	27.78%	2	13.33%		1	5.00%	2	11.76%	7	18.42%
Once a month	2	6.25%	3	8.33%	2	13.33%		3	15.00%	2	11.76%	4	10.53%
A few times a year	10	31.25%	6	16.67%	3	20.00%		8	40.00%	6	35.29%	18	47.37%
Never	2	6.25%	1	2.78%	4	26.67%		3	15.00%	4	23.53%	9	23.68%

Table J: Spirits and Average Mobility (not including The Ride)

(Lower number = greater mobility)

Spirits	Average Mobility
Excellent- I'm very happy	5.55
Good- I'm usually happy	5.29
Fair- I'm happy a bit less than half of the time	6.26
Poor- I'm rarely happy	5.61

Table K: Spirits and Living Situation

		Live Alone		Live with Others	
		N	%	N	%
Spirits	Excellent- I'm very happy	21	22.34%	29	35.80%
	Good- I'm usually happy	52	55.32%	38	46.91%
	Fair- I'm happy a bit less than half of the time	18	19.15%	13	16.05%
	Poor- I'm rarely happy	3	3.19%	1	1.23%

Table L: General Fear by Length of Residence in Neighborhood

	Length in Neighborhood									
	Less than 3 years		3-5 years		6-10 years		11-20 years		Longer than 20 years	
Fear at Home, Day										
Not at all afraid	14	100%	17	85%	11	69%	17	71%	92	90%
Somewhat afraid	0	0%	3	15%	5	31%	7	29%	9	9%
Very afraid	0	0%	0	0%	0	0%	0	0%	1	1%
Fear at Home, Night										
Not at all afraid	12	86%	17	81%	11	69%	15	63%	77	77%
Somewhat afraid	2	14%	4	19%	5	31%	7	29%	21	21%
Very afraid	0	0%	0	0%	0	0%	2	8%	2	2%
Fear to Walk, Day										
Not at all afraid	13	93%	13	65%	12	71%	14	64%	83	86%
Somewhat afraid	1	7%	4	20%	5	29%	7	32%	13	13%
Very afraid	0	0%	3	15%	0	0%	1	5%	1	1%
Fear to Walk, Night										
Not at all afraid	6	43%	11	52%	7	41%	5	23%	30	32%
Somewhat afraid	3	21%	3	14%	6	35%	10	45%	37	39%
Very afraid	3	21%	4	19%	2	12%	4	18%	11	12%
Don't go out at Night	2	14%	3	14%	2	12%	3	14%	16	17%

Table M: Mode Used More Often by Fear in Transit Situations Controlled for General Fear

General Fear / Mode More Often	4 Same		4 Bus		4 Train		5 Same		5 Bus		5 Train		6 Same		6 Bus		6 Train		7 Same		7 Bus		7 Train	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Bus Stop Fear																								
1	12	80%	10	63%	8	62%	8	73%	9	64%	2	100%	2	29%	6	38%	1	33%	1	33%	1	25%	0	0%
2	1	7%	1	6%	3	23%	2	18%	4	29%	0	0%	5	71%	9	56%	1	33%	0	0%	3	75%	1	100%
3	2	13%	1	6%	0	0%	0	0%	1	7%	0	0%	0	0%	1	6%	0	0%	2	67%	0	0%	0	0%
4	0	0%	2	13%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
5	0	0%	2	13%	2	15%	1	9%	0	0%	0	0%	0	0%	0	0%	1	33%	0	0%	0	0%	0	0%
Bus Fear																								
1	12	80%	10	63%	6	55%	8	73%	8	67%	2	100%	2	29%	10	71%	1	25%	2	67%	2	40%	1	100%
2	2	13%	2	13%	3	27%	2	18%	4	33%	0	0%	3	43%	4	29%	2	50%	0	0%	2	40%	0	0%
3	1	7%	1	6%	0	0%	0	0%	0	0%	0	0%	2	29%	0	0%	0	0%	1	33%	1	20%	0	0%
4	0	0%	1	6%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
5	0	0%	2	13%	2	18%	1	9%	0	0%	0	0%	0	0%	0	0%	1	25%	0	0%	0	0%	0	0%
Train Station Fear																								
1	10	67%	6	40%	7	64%	5	45%	3	27%	2	67%	0	0%	3	21%	1	25%	0	0%	0	0%	0	0%
2	3	20%	1	7%	4	36%	5	45%	7	64%	1	33%	3	43%	8	57%	1	25%	0	0%	1	20%	0	0%
3	2	13%	2	13%	0	0%	0	0%	0	0%	0	0%	4	57%	2	14%	1	25%	3	100%	2	40%	1	100%
4	0	0%	2	13%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	1	20%	0	0%
5	0	0%	4	27%	0	0%	1	9%	1	9%	0	0%	0	0%	1	7%	1	25%	0	0%	1	20%	0	0%
Train Fear																								
1	10	67%	6	46%	8	67%	4	36%	5	42%	1	50%	1	14%	7	50%	2	50%	1	33%	1	20%	1	100%
2	4	27%	2	15%	4	33%	5	45%	5	42%	1	50%	4	57%	6	43%	1	25%	1	33%	1	20%	0	0%
3	1	7%	0	0%	0	0%	1	9%	0	0%	0	0%	2	29%	0	0%	1	25%	1	33%	1	20%	0	0%
4	0	0%	1	8%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	1	20%	0	0%
5	0	0%	4	31%	0	0%	1	9%	2	17%	0	0%	0	0%	1	7%	0	0%	0	0%	1	20%	0	0%

Table N: Fear of Types of Crime by Frequency of Bus Use

		Bus Frequency								
		At least a few times a week		Once a week – few times a month		Once a month		A few times a year		Never	
		N	%	N	%	N	%	N	%	N	%
Obscene Language	Not at all frightened (1)	11	20.37%	1	7.69%	3	15.00%	13	35.14%	3	15.79%
	(2)	19	35.19%	6	46.15%	7	35.00%	7	18.92%	5	26.32%
	(3)	14	25.93%	5	38.46%	5	25.00%	7	18.92%	5	26.32%
	Very frightened (4)	10	18.52%	1	7.69%	4	20.00%	4	10.81%	5	26.32%
	Never seen it	0	0.00%	0	0.00%	1	5.00%	6	16.22%	1	5.26%
Teenager Rowdiness	Not at all frightened (1)	9	15.25%	0	0.00%	1	5.00%	8	22.22%	3	16.67%
	(2)	16	27.12%	1	7.14%	4	20.00%	8	22.22%	3	16.67%
	(3)	20	33.90%	11	78.57%	9	45.00%	11	30.56%	6	33.33%
	Very frightened (4)	14	23.73%	2	14.29%	5	25.00%	4	11.11%	5	27.78%
	Never seen it	0	0.00%	0	0.00%	1	5.00%	5	13.89%	1	5.56%
Vandalism of Transit Property	Not at all frightened (1)	6	11.54%	0	0.00%	1	5.00%	11	30.56%	3	16.67%
	(2)	10	19.23%	1	10.00%	6	30.00%	4	11.11%	3	16.67%
	(3)	22	42.31%	4	40.00%	4	20.00%	10	27.78%	5	27.78%

		Bus Frequency								
		At least a few times a week		Once a week – few times a month		Once a month		A few times a year		Never
		N	%	N	%	N	%	N	%	N	%
	Very frightened (4)	13	25.00%	4	40.00%	7	35.00%	4	11.11%	5	27.78%
	Never seen it	1	1.92%	1	10.00%	2	10.00%	7	19.44%	2	11.11%
Begging/ Panhandling	Not at all frightened (1)	10	19.23%	3	27.27%	3	15.79%	6	16.67%	3	16.67%
	(2)	26	50.00%	3	27.27%	8	42.11%	10	27.78%	5	27.78%
	(3)	10	19.23%	4	36.36%	4	21.05%	6	16.67%	6	33.33%
	Very frightened (4)	6	11.54%	1	9.09%	4	21.05%	9	25.00%	2	11.11%
	Never seen it	0	0.00%	0	0.00%	0	0.00%	5	13.89%	2	11.11%
Pushing and Shoving	Not at all frightened (1)	9	16.07%	0	0.00%	4	20.00%	6	16.67%	2	11.11%
	(2)	22	39.29%	1	8.33%	2	10.00%	8	22.22%	4	22.22%
	(3)	8	14.29%	3	25.00%	8	40.00%	8	22.22%	5	27.78%
	Very frightened (4)	16	28.57%	8	66.67%	6	30.00%	9	25.00%	6	33.33%
	Never seen it	1	1.79%	0	0.00%	0	0.00%	5	13.89%	1	5.56%

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Table O: Fear of Types of Crime by Frequency of Train Use

		Train Frequency								
		At least a few times a week		Once a week – few times a month		Once a month		A few times a year		Never	
		N	%	N	%	N	%	N	%	N	%
Obscene Language	Not at all frightened (1)	7	18.42%	7	31.82%	3	20.00%	13	27.66%	1	6.25%
	(2)	13	34.21%	8	36.36%	4	26.67%	10	21.28%	4	25.00%
	(3)	11	28.95%	5	22.73%	4	26.67%	13	27.66%	4	25.00%
	Very frightened (4)	7	18.42%	2	9.09%	3	20.00%	6	12.77%	5	31.25%
	Never seen it	0	0.00%	0	0.00%	1	6.67%	5	10.64%	2	12.50%
Teenager Rowdiness	Not at all frightened (1)	4	10.00%	5	20.83%	1	6.67%	8	17.02%	2	12.50%
	(2)	9	22.50%	6	25.00%	2	13.33%	9	19.15%	3	18.75%
	(3)	17	42.50%	9	37.50%	7	46.67%	19	40.43%	5	31.25%
	Very frightened (4)	10	25.00%	4	16.67%	5	33.33%	6	12.77%	4	25.00%
	Never seen it	0	0.00%	0	0.00%	0	0.00%	5	10.64%	2	12.50%
Vandalism of Transit Property	Not at all frightened (1)	6	16.67%	3	13.64%	1	6.67%	11	23.91%	1	6.67%
	(2)	6	16.67%	4	18.18%	2	13.33%	7	15.22%	3	20.00%
	(3)	10	27.78%	12	54.55%	6	40.00%	12	26.09%	4	26.67%

		Train Frequency								
		At least a few times a week		Once a week – few times a month		Once a month		A few times a year		Never	
		N	%	N	%	N	%	N	%	N	%
	Very frightened (4)	13	36.11%	3	13.64%	4	26.67%	9	19.57%	4	26.67%
	Never seen it	1	2.78%	0	0.00%	2	13.33%	7	15.22%	3	20.00%
Begging/ Panhandling	Not at all frightened (1)	8	21.62%	6	28.57%	2	14.29%	8	17.02%	2	13.33%
	(2)	17	45.95%	9	42.86%	4	28.57%	15	31.91%	3	20.00%
	(3)	8	21.62%	4	19.05%	4	28.57%	12	25.53%	3	20.00%
	Very frightened (4)	4	10.81%	2	9.52%	3	21.43%	9	19.15%	4	26.67%
	Never seen it	0	0.00%	0	0.00%	1	7.14%	3	6.38%	3	20.00%
Pushing and Shoving	Not at all frightened (1)	4	11.11%	3	13.04%	2	13.33%	9	19.15%	2	12.50%
	(2)	14	38.89%	8	34.78%	0	0.00%	10	21.28%	3	18.75%
	(3)	6	16.67%	4	17.39%	8	53.33%	12	25.53%	2	12.50%
	Very frightened (4)	12	33.33%	7	30.43%	5	33.33%	12	25.53%	7	43.75%
	Never seen it	0	0.00%	1	4.35%	0	0.00%	4	8.51%	2	12.50%

Table P: Driving Status Regressed with Transit Ridership Frequency

	R^2	Line equation
Bus Frequency	0.256	y = -0.3867x + 3.8603
Train Frequency	0.145	y = -0.2785x + 3.7851
Total Transit Frequency	0.218	y = -0.66x + 7.6735

Table Q: Drive When Younger Regressed with Transit Ridership Frequency

	R^2	Line equation
Bus Frequency	0.125	y = -0.396x + 3.4635
Train Frequency	0.084	y = -0.3091x + 3.5234
Total Transit Frequency	0.108	y = -0.685x + 6.9553

Survey of Your Public Transit Needs and Concerns

Given by:
Lora Blackman, Master's student in transportation at MIT
Dr. Joseph Coughlin, Director, Age Lab at MIT

Sponsored by:
U.S. Department of Transportation
MIT Age Lab

We are interested in your thoughts and experience about how public transportation can better serve your unique needs. Please fill out this questionnaire, which should take you about 20 minutes. It is important that you answer every question. Thank you!

1. What is your zip code?_____

2. What are the most important factors that help you decide whether or not you use public transit? Please choose the THREE most important factors.
   ❏ Schedule
   ❏ Where it goes
   ❏ Cost
   ❏ Comfortable
   ❏ Safe and secure
   ❏ No other alternative

3. What type(s) of public transportation is/are within walking distance of your home?
   ❏ Bus
        If so, which route(s):_____
   ❏ Green Line Train/Trolley
   ❏ Orange Line Train
   ❏ Red Line Train
   ❏ Blue Line Train
   ❏ None

4. How far do you consider a reasonable walking distance to access a public transportation service?
   ❏ Less than 5 minutes
   ❏ 5-10 minutes
   ❏ 10-15 minutes
   ❏ More than 15 minutes

5. How often do you use these types of public transportation?
   a. Bus
        ❏ At least a few times a week
        ❏ Once a week to a few times a month
        ❏ Once a month
        ❏ A few times a year
        ❏ Never

b. Train/Trolley
- ❏ At least a few times a week
- ❏ Once a week to a few times a month
- ❏ Once a month
- ❏ A few times a year
- ❏ Never

c. The Ride
- ❏ At least a few times a week
- ❏ Once a week to a few times a month
- ❏ Once a month
- ❏ A few times a year
- ❏ Never

6. How often do you walk to do your errands (shopping, health care, visit friends, etc.)?
- ❏ At least a few times a week
- ❏ Once a month to a few times a month
- ❏ A few times a year
- ❏ I rarely walk

7. How often did you use public transit during the years you were working/taking care of your family?
- ❏ Less than now
- ❏ More than now
- ❏ About the same as now

8. Which of these activities do you get to using public transportation?
- ❏ Social or visiting friends
- ❏ Shopping
- ❏ Health- to see a doctor or pharmacist
- ❏ Entertainment- movies or going out to eat
- ❏ Work or volunteering
- ❏ Other_____

9. How often did you drive during the years that you were working/taking care of your family?

    ❏ At least a few times a week
    ❏ Once a month to a few times a month
    ❏ A few times a year
    ❏ I never drove

10. Do you drive regularly now (at least once a week)?

    ❏ Yes
    ❏ No

11. How often do you ride in a car as a passenger (not including The Ride)?

    ❏ At least a few times a week
    ❏ Once a week to a few times a month
    ❏ Once a month
    ❏ A few times a year
    ❏ Never

12. In general, how would you say your health is?

    ❏ Excellent
    ❏ Very Good
    ❏ Good
    ❏ Fair
    ❏ Poor

13. Do you have difficulty:

    ❏ Walking?
    ❏ Climbing Stairs?
    ❏ Neither

14. How have your spirits been lately?

    ❏ Excellent- I'm very happy
    ❏ Good- I'm usually happy
    ❏ Fair- I'm happy a bit less than half of the time
    ❏ Poor- I'm rarely happy

15. With who do you currently live?

    ❏ Live with spouse or others
    ❏ Live alone

16. What type of home do you live in?
 - ❑ Live in private home
 - ❑ I rent in apartment building
 - ❑ I own a condo in an apartment building
 - ❑ Live in an older adult care facility or senior community
 - ❑ Other_____

17. How long have you lived in your current neighborhood?
 - ❑ Less than three years
 - ❑ 3-5 years
 - ❑ 6-10 years
 - ❑ 11-20 years
 - ❑ Longer than 20 years

18. How afraid do you feel when you are home alone during the day?
 - ❑ Not at all afraid
 - ❑ Somewhat afraid
 - ❑ Very afraid

19. How afraid do you feel when you are home alone at night?
 - ❑ Not at all afraid
 - ❑ Somewhat afraid
 - ❑ Very afraid

20. How afraid do you feel to walk alone near your home during the day, that is, between your home and bank, grocery store, church, pharmacy, or other places where you do your errands?
 - ❑ Not at all afraid
 - ❑ Somewhat afraid
 - ❑ Very afraid

21. How afraid do you feel to walk alone near your home at night, that is, between your home and places in your neighborhood that you might visit at night?
 - ❑ Not at all afraid
 - ❑ Somewhat afraid
 - ❑ Very afraid
 - ❑ Don't go out at night

22. Have you or anyone you know been a victim of a crime against your person (i.e. mugging, robbery, assault)?

❏ I was a victim within the last year

❏ I was a victim before this year

　　　　How many years ago?_____

❏ I know someone who was a victim within the last year

❏ No

23. How fearful are you for your personal safety in the following situations? Please circle one number for each situation.

	Feel very Safe			**Feel very Frightened**	
	1	2	3	4	
Waiting at a bus stop for a bus		—	—	—	Don't Ride
	1	2	3	4	
Waiting on a platform for a train/trolley		—	—	—	Don't Ride
	1	2	3	4	
Riding the bus		—	—	—	Don't Ride
	1	2	3	4	
Riding the train		—	—	—	Don't Ride
	1	2	3	4	
Walking to/from the bus stop or train station		—	—	—	Don't Ride

24. Please rank the above situations in the order from 1= most frightening to 5=least frightening. PLEASE USE EACH NUMBER ONLY ONCE.

__Waiting at a bus stop for a bus

__Waiting on a platform for a train/trolley

__Riding the bus

__Riding the train

__Walking to/from the bus stop or train station

25. Which do you consider to be safer from crime?
   ❑ Bus
   ❑ Train/Trolley

26. When you ride public transportation, how frightened are you when you see the following things? Please circle one number for each item.

	Not at all **Frightened**			**Feel very** **Frightened**	
Obscene Language	1	2	3	4	Never seen it
Teenager Rowdiness	1	2	3	4	Never seen it
Vandalism of Transit Property	1	2	3	4	Never seen it
Begging/Panhandling	1	2	3	4	Never seen it
Pushing and Shoving	1	2	3	4	Never seen it

27. Which do you take more often?
   ❑ Bus
   ❑ Train/Trolley
   ❑ Both about the same

28. Why do you take the above mode more often?
   ❑ Convenience
   ❑ Personal safety
   ❑ Cost

29. Do you ever decide not to take the train because of personal safety concerns?
   ❑ Yes
   ❑ No

30. Do you ever decide not to take the bus because of personal safety concerns?
    ❑ Yes
    ❑ No

31. Do the following types of people frighten you?

	Almost Never	Sometimes	Almost Always
Groups of teenagers			
Drunks			
Homeless people			

32. Please rank these in order of most importance to you for feeling secure at a train station (1=most important...3=least important). PLEASE USE EACH NUMBER ONLY ONCE.
    ___A police officer or security guard
    ___Bright lighting
    ___Emergency telephones

33. Which ONE of the following would make you feel most secure at a train station?
    ❑ Presence of a uniformed and armed police officer
    ❑ Presence of an unarmed security guard
    ❑ A policy to employ undercover guards/officers
    ❑ No guard or officer is necessary

34. Please tell us about yourself:

a. Are you
    ❑ Male?
    ❑ Female?

b. How old are you?
    ❑ 60-64
    ❑ 65-74
    ❑ 75-84
    ❑ 85+

c. What is your ethnic/cultural descent?
- ❏ Black
- ❏ Hispanic
- ❏ White
- ❏ Asian
- ❏ Native American (American Indian)
- ❏ Other

d.   How much education have you completed?
- ❏ Stopped school before high school
- ❏ Attended high school
- ❏ Graduated high school or GED equivalent
- ❏ Attended some college
- ❏ Graduated from college
- ❏ Completed advanced college degrees

e.   About how much do you spend each month for rent, food, clothing, entertainment, etc.?
- ❏ Less than $500
- ❏ $500- $1,000
- ❏ $1,000-$1,500
- ❏ $1,500-$2,000
- ❏ $2,000-$2,500
- ❏ $2,500-$3,000
- ❏ Over $3,000