AN EXPLORATORY STUDY OF THE TRANSPORTATION REQUIREMENTS OF THE SPATIALLY DISPERSED URBAN ELDERLY

BY

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MASTER OF ARTS

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A Thesis/Practicum submitted to the Faculty of Graduate Studies of the University of Manitoba in partial fulfillment of the requirements for the degree of

MASTER OF ARTS

ABSTRACT

The principle objective of this thesis is to determine the effect of residential location, as well as the diminishing capabilities of the individual resulting from the aging process, on the transportation requirements of the spatially dispersed urban elderly. The research is guided by the conceptual framework of Lawton's ecological model of aging (Lawton & Nahemow, 1973; Lawton, 1980; Lawton, 1982; Lawton, 1985; Parmalee & Lawton, 1990). It is postulated that the transportation behaviour of older persons can be predicted by the components of the autonomy of the individual and the security afforded by the environment. Accordingly, three research questions are formulated to evaluate the effect of both (i) the socio-demographic characteristics, health and functional status, and transportation resources of the individual, and (ii) varying residential locations on the mobility of the elderly. The research questions address the influence of autonomy and security on the following transportation behaviours: the frequency of use of transportation modes; the frequency of travel to service and activity sites; and the distance travelled to service and activity sites.

Data for the study are elicited by an interview survey. Respondents for the survey were chosen based on systematic sampling of three distinct areas of Winnipeg, Manitoba. As the focus of the study is to consider whether the low density design of suburban environments impacts negatively upon the mobility of seniors, the three locations represent varying density levels. The sample areas of Fort Garry and Charleswood are outer suburbs characterized by low density development, while the sample area of St. Boniface is a higher density inner suburb.

Analyses include the use of univariate, bivariate, and multivariate methods to evaluate the effect of autonomy and security on the transportation behaviour of older persons. Results of the study provide evidence that the diminishing physical, social, and financial resources of the elderly individual result in greater mobility problems. In addition, it was found that the suburban environment does not impact upon the mobility of seniors. Rather, the findings suggest that elderly persons in the area of higher density development experience greater difficulty in accessing appropriate transportation. It is speculated that the mobility problems of the St. Boniface respondents are not caused by environmental factors, but, instead reflect the higher proportion of individuals in this area with decreasing capabilities. Therefore, the study concludes that the growing suburban elderly population will increasingly experience diminishing capabilities as they become older. Therefore, it remains imperative to continue to evaluate the effect of low density development on the mobility of older persons. Further research is essential as this study demonstrates that the analysis of both the components of autonomy and security assists in identifying appropriate transportation provision for the elderly population. Moreover, the study illustrates the ability of gerontological geography to contribute to the improved living environment of the elderly population.

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I would like to dedicate this thesis to my parents for this would not have been possible without their love and belief in me. And to Nestor, whose love, determination, and courage is an inspiration for me.

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CHAPTER 1

INTRODUCTION

The projected increase of the Canadian population over the age of 65 requires extensive evaluation of their environmental needs (Hodge, 1990). It is desirable that the investigation of the relationship between the environment and aging incorporate a variety of environmental components including the adequacy of transportation for the elderly population. In the present study, examination of the transportation requirements of the spatially dispersed urban elderly extends beyond a consideration of the adequacy of transportation systems for this population cohort. Instead, this analysis focuses on the effects of individual competency and the environmental dimension of geographic location on transportation provision for the elderly.

In this chapter, the first section discusses the importance of transportation for the maintenance of satisfaction and independence of older persons. In addition, the objective of the research is reviewed and research questions are advanced based on the conceptual model utilized in this study. To establish the background for this study, the second section of the chapter discusses the development of geographical themes within gerontology. The relevance of this study to gerontological geography is considered in the third section. This represents a preliminary discussion of the study's contribution to a greater understanding of the transportation needs of the urban elderly. Finally, the chapter concludes with a description of the organization of the thesis.

1.1 **Introduction**

1.1.1 Transportation and the Urban Elderly

The increasing proportion of the Canadian elderly population has made it imperative to study how the living environment of this age cohort affects their quality of life. Although particular attention has been given to the necessities of seniors in the spheres of health care and social services, comprehensive analysis of their transportation requirements has been limited (Witkowski & Buick, 1985). However, the inadequacies of transportation for the Canadian elderly are clearly demonstrated by the report of Canada's National Advisory Council on Aging (1993) that 25 percent of those over the age of 65 experienced problems with transportation in 1990.

Transportation for the elderly in the urban environment is particularly significant as mobility is essential to maintain satisfaction and independence (Carp, 1988). Accordingly, transportation must be evaluated on the basis of its capability to maximize social integration and assure accessibility to life-sustaining functions (Cutler & Coward, 1992). The key factors in studying effective transportation provision for seniors must identify both the physical, social, and financial decrements of the elderly person which can lead to transportation dependency, and the components of the residential environment that cause mobility problems.

One environmental dimension of particular significance to the transportation requirements of the urban elderly is the increasing suburbanization of the elderly population. The demographic process of aging-in-place has made it essential to investigate the suburban environment. The evidence of the suburbanization process of the elderly in both the United States (Golant, 1990a) and in Canada (Broadway, 1995) highlights the necessity to examine further the environmental context of the graying of the suburbs. In particular, it is important to consider the effect of the graying of the suburbs on transportation provision because the low density design of these areas creates distinctive mobility problems for the elderly. Wachs (1976), for example, demonstrates that future transportation planning must recognize that a growing proportion of the elderly population will be located in low density suburban developments, and that their dependency on the automobile will require innovative solutions if they become ex-drivers and require transportation services.

The above discussion demonstrates that an evaluation of the issues of transportation for the growing elderly population is necessary. Furthermore, it is essential to focus an analysis of the transportation requirements of the urban elderly on the needs of the individual, as well as the effects of the local environment. A fundamental consideration of the design of a transportation system is a clear understanding of the elderly who are transportation disadvantaged. In addition, the living environment of the elderly must be carefully considered to ensure that transportation provision is based on the location of the elderly person's residence in conjunction with the location of required services and activities. Therefore, the present study will focus on how individual and environmental dimensions affect the transportation requirements of the urban elderly.

1.1.2 The Research Objectives

The objective of this study is to determine the effect of residential location on the transportation requirements of the urban elderly. It is proposed that the mobility of the elderly population is dependent upon both individual factors, as well as the living environment. Specifically this research evaluates whether access to mobility resources is determined by environmental, as well as individual attributes. To accomplish this, a comparison of the use of transportation modes, trip-making activities, and distance travelled to essential service and activity sites between the outer and inner suburban elderly in Winnipeg, Manitoba, is made.

This analysis is guided by the conceptual framework of Lawton's ecological model of aging (Lawton & Nahemow, 1973; Lawton, 1980; Lawton, 1982; Lawton, 1985; Parmalee & Lawton, 1990). This model suggests that the interaction of the person and environment creates a dialectic between the demands imposed by the environment and the individual's ability to cope with those demands (Wister, 1989). The individual component of the ecological model is defined by the concept of "competency" or "autonomy", while the environment is defined by the concept of "environmental press" or "security". The present study will examine how the components of the person and environment affect the adequacy of transportation for the urban elderly population. An elaboration of the conceptual framework and its application to this study is included in Chapter 3.

In this study, the analysis will consider the effect of both individual factors and environmental dimensions on the mobility of the population over the age of 65 years.

Individual competency, or autonomy, will be examined based on the socio-demographic characteristics and health resources of the respondents of the study. The security afforded by environmental factors will be defined by residential location. Conceptually, the purpose of this study is to determine how the components of autonomy and security assist or inhibit the elderly individual's ability to access the services and activities essential for normal physical and psychological functioning.

According to Lawton (1980), transportation behaviours are responses made by the individual as a result of the autonomy-security dialectic. These include the frequency of use of transportation modes, as well as mobility patterns reflected by the frequency of travel to service and activity sites, and the distance travelled to access service and activity sites. Transportation modes are defined as driving an automobile, rides from friends and family, use of the public transit and walking. Service and activity sites include the grocery store, shopping mall, bank, medical facilities, pharmacy, facilities for recreation and entertainment, and homes of friends and family. The following three research questions are proposed in relation to the effect of the components of the person and environment on these behaviours.

The first question considers the effect of autonomy and security on the frequency of use of transportation modes:

<u>Research Question 1</u>

Part a) What is the influence of socio-demographic characteristics and health resources on the frequency of use of transportation modes for the urban elderly?; and,

Part b) Are there differences in the frequency of use of transportation modes by the urban elderly according to geographic location?

The second research question addressing the effect of autonomy and security on the frequency of travel to service and activity sites is stated:

Research Question 2

Part a) Is the frequency of trip-making to essential services and social activity sites affected by socio-demographic characteristics and health resources of the urban elderly?; and,

Part b) Is the frequency of trip-making by the urban elderly affected by geographic location?

The final research question evaluates the effect of autonomy and security on the distance travelled to service and activity sites:

Research Question 3

Part a) What is the influence of socio-demographic characteristics and health resources on the distance travelled to essential services and activity sites for the urban elderly?; and,

Part b) Are there differences in the distance travelled to essential services and activity sites by the urban elderly according to geographic location?

1.2 Gerontological Geography

The scientific inquiry of gerontology is composed of numerous dimensions which can be defined broadly as the interdisciplinary study of the elderly and the aging process. Initial attention was given primarily to the prevention or relief of the physical attributes of growing old. However, by the middle of this century the independent area of social gerontology developed as it was recognized that sociocultural, historical, and environmental factors have a great impact on the processes of individual and population aging (McPherson, 1990). The objective of social gerontology is to increase understanding of human aging processes and of society's responses to the requirements and preferences of older age groups (Warnes, 1990).

The effectiveness of social gerontology can be attributed to its ability to incorporate a wide range of disciplinary perspectives. Geography is the only discipline "...which at its core uses space as a basic organizing principle to evaluate human-environmental interaction" (Rudzitis, 1984, 541). As a result, there has been an evolving recognition that the circumstances of elderly people have spatial and locational dimensions. More specifically, the identification of the influence of environmental parameters over the life experiences of older people has led to the relevant role of geographical investigation in social gerontology since the early 1970's (Golant et al., 1989).

An evaluation of geography's objectives and contributions to social gerontology can be categorized based on the dimensions of spatial organization and person-environment relationships (Warnes, 1982). Within the realm of spatial organization, topics of geographical gerontology include the demographic processes of aging, the spatial distribution of the elderly, and the migration of older persons. Research areas which focus on the interrelationship between people and the environment include issues of housing, service implementation, and activity patterns of the elderly. This overview identifies the importance of the evolution of geographic gerontology from initial research that concentrated on a description of spatial patterns to an increasing trend to incorporate the concept of environment. The latter has ultimately led to a greater degree of conceptualization and critical interpretation of the processes that account for the contemporary geography of the elderly (Rowles, 1986).

1.2.1 The Demographic Processes of Aging

The first research area which illustrates geography's contribution within the general framework of social gerontology is the issue of demographic aging. The mechanism of growth of an aging population has been widely identified as the termination of the demographic transition when both fertility and mortality rates have stabilized at a low level. The predicted rate of demographic aging is associated with the scale of recent fertility decline (Warnes, 1982). Based on the theory of demographic transition geographers have provided a descriptive analysis of the dynamics of population aging.

Grigsby (1991) demonstrated that the proportion of elderly persons in a country is dependent upon the nation's stage in the demographic transition. Studies in the United Kingdom (Warnes, 1987) and Europe (Clarke, 1987) have indicated that some European countries have completed the demographic transition as both fertility and mortality rates are low. Canada (Stone & Fletcher, 1980) and the United States (Siegel & Davidson, 1984) are at an earlier stage of demographic aging as a result of higher fertility rates. As a result, they are experiencing greater rates of growth of their elderly populations in comparison to European countries (Warnes, 1990). In contrast, countries in the developing world are currently in the first stages of the demographic transition (Grigsby, 1991). However, as fertility declines have recently spread throughout the world, future decades will witness a rapid dissemination of demographic aging (Coale, 1983). Warnes (1990) notes that the acceleration of global population aging provides an opportunity for geographic research to identify the interplay between demographic change and social, economic, and political responses.

1.2.2 The Spatial Distribution of the Elderly

A further demographic consideration, and the second area of inquiry of gerontological geography, is the spatial distribution of the elderly population. An accurate analysis of the present and future location of the aging population is essential for the successful implementation of social policy and services for the elderly. The locational patterns of older people is highly dynamic and an analysis of national, regional, and metropolitan concentrations is essential (Rosenberg et al., 1989).

There are varying demographic processes including aging-in-place and migration, along with changing patterns of fertility and mortality, which have resulted in spatial variations in elderly population concentrations (Rowles, 1986; Golant, 1989). Golant (1972) found that in Canada, central-western, and Maritime provinces have greater percentages of elderly relative to their total population size as a result of aging-in-place and the out-migration of younger age cohorts due to economic stagnation. Similarly, studies in the United States (Wiseman, 1978; Flynn et al, 1985) and Britain (Warnes and Law, 1984) have identified the out-migration of the young, aging-in-place, and the increased migration of the elderly to retirement communities as the contributing factors to elderly concentrations.

Of particular importance to geographical research of the spatial distribution of the elderly population have been studies at the urban level. Some studies have confirmed the existence of elderly concentrations in the inner city resulting from the out-migration of younger cohorts to new suburban areas (Golant, 1972; Massey, 1980; Wiseman, 1978). However, other studies (Kennedy and De Jong, 1977; Howe, 1978) have documented the decreasing residential segregation of older persons and their increasing concentration in suburban areas as a result of the process of aging-in-place. The importance of the geographical investigation of the suburbanization of the urban elderly population will be elaborated upon further in Chapter 2.

1.2.3 Migration of the Elderly Population

As demonstrated in the previous section, the distribution of the aged is increasingly affected by the demographic process of migration. As this has important implications for policy planning and resource distribution, the third research area of gerontological geography is elderly migration. Research is now progressing beyond the description of flow patterns to analyze the characteristics of migrants, and the social and economic consequences of migration (Warnes, 1981).

Elderly migration is strongly influenced by life-course events. Litwak and Longino (1987) suggested that the nature of modern technology creates institutional pressures for older people to make three basic types of moves after retirement:

> 1) an immediate post-retirement move, primarily for amenity reasons; 2) a move to be near a primary caretaker when the person becomes moderately disabled and can no longer manage without help; and 3) a final move to an institutional setting when the caretaker can no longer handle the burden (Litwak & Longino, 1987, 270).

Typologies of elderly relocation also incorporate the distinction between local moves and long distance migration. As an increasing proportion of the elderly population participates in long distance migration, geographical studies have concentrated on this phenomena (Warnes, 1990). In addition, research has focused on amenity migration as there have been large outflows from major metropolitan centres to areas with retirement amenities such as the sunbelt of the United States, the west coast of Canada, and seaside resorts in Britain and Australia (Allon-Smith, 1982; Flynn et al., 1985; Longino, 1990; Murphy, 1981; Northcott, 1984).

Rogers (1992) has developed a model of multi-regional demography to project the interregional migration patterns of the U.S. elderly through 2020. This development in geographical research is critical for future planning of the distribution of services for the elderly. Research indicates that elderly long distance migrants tend to be younger, married, and have a higher income, thereby suggesting positive economic implications for the receiving area (Biggar, 1980; Rogers, 1988; Rowles, 1986). Conversely, as the migrants begin to age-in-place major demands are placed on local resources and services.

Local moves by elderly persons are characterized by short distances within an urban area and often reflect involuntary adjustments to changing circumstances. Local migration is reflective of the moves discussed by Litwak and Longino (1987) that are made when an older person requires assistance. The causes of local relocation include mobility limitations resulting from reduced physical competence and health deterioration, as well as decreased social supports (Rowles, 1986). Geographical research in this area is limited (Stapleton Concord, 1984). However, further geographical investigation is imperative to evaluate the extent to which local moves are indicative of the inability of elderly persons to adapt to the existing environment as a result of the aging process (Rowles, 1986).

1.2.4 Activity Patterns and the Utilization of Environments

A recent geographical trend has been to incorporate the spatial aspects of aging with a focus on how the elderly occupy, utilize, and experience environments that are distinct to the aging process (Rowles, 1986). One area of research has been the use of the physical environment as expressed in the activity patterns of older persons. Activity patterns have been conceptualized as a major mechanism of the elderly to satisfy needs and goals (Golant et al., 1989).

A number of geographical studies have evaluated the repetitive trips of elderly persons to a variety of activity sites (Carp, 1980; Meyer, 1981; Robson, 1982; Southern 1981). An important component of research on activity patterns is the diminishing life space of elderly persons (Golant et al, 1989). Peace (1982) has proposed the concept of "repressed preference" to express the degree to which the preferred activity spaces of old people are limited by their socio-economic status and physical limitations, as well as environmental barriers and constraints. For example, although Hanson (1977) found that the frequency of non-work trips of elderly persons were equal to those of younger persons, several studies have provided evidence of the reduction in the frequency, number of purposes, and spatial extent of trips of the elderly population (Basu, 1979; Peace, 1982; Smith, 1984).

The diminished activity patterns of the elderly have been attributed to a number of personal variables which can inhibit an older persons travel patterns including age, gender, health, marital status, and economic status (Golant, 1984; Moss & Lawton, 1982; Neugarten, 1975). In addition, environmental barriers and constraints exist which affect the ability of elderly persons to make trips for shopping, medical, and social purposes. Two key environmental issues that account for reduced activity patterns of the elderly are the inaccessibility of community services and the inadequacy of transportation for the elderly (Rowles, 1986). It is significant for the present study that Smith (1988) suggested that future research must focus on the identification of individual and environmental factors which affect the activity patterns of the elderly.

1.2.5 Service Distribution and Utilization by the Elderly

As the discussion of activity patterns illustrates, the unequal distribution of services contributes to the diminishing lifespace of the elderly (Rowles, 1986). Therefore, the second area of geographical inquiry that focuses on the interaction of elderly persons and the environment is the distribution and utilization of services. Meyer (1990) identifies locational analysis and questions of equity in service delivery to be the main components of research.

In the evaluation of the distribution of services, geographic research has focused on the spatial variation of the concentration of elderly persons and the location of services. Studies have found that community-dwelling elderly generally do not require the level of services required by those elderly residing in senior housing (Pfeiffer et al., 1989; Phillips & Vincent, 1988). Of particular relevance to this area of investigation are the findings that institutionalized elderly have fewer family supports within close proximity which precipitates greater need for services (Krout, 1988). In addition, studies of transportation provision have found that elderly persons who live alone, as well as community residents with functional limitations, have higher rates of service utilization (Iutcovich & Iutcovich, 1988; Smith & Hiltner, 1988).

The issue of elderly concentrations, as well as the link between personal characteristics and service utilization, illustrate the need to determine the effect of these variables on the adequacy of service provision. As Meyer (1990) notes, "spatial concentrations of different types of older people are likely to lead to spatial variation in need and utilization, and decisions about service delivery should consider such complex variation" (Meyer, 1990, 398). This demonstrates the role of geographical research in identifying the correlation between the siting of services and the unmet needs of older persons. For example, Gant and Smith (1989) concluded that reduced transportation and social services in the Cotswolds would have significant implications for service utilization.

1.2.6 Housing for the Elderly

The final area of research within gerontological geography focuses on the environmental and spatial components of the provision of housing for older people. Housing for the elderly has often been the focal point of policy measures to promote the well-being of older persons as it is considered a primary means of addressing their needs (Rudzitis, 1984). The study of housing conditions is wide-ranging because the diversity of elderly housing includes independent owner-occupied dwellings, as well as segregated independent and dependent residential environments.

Geographical research has concentrated on issues specific to segregated residential housing environments for the elderly. One area of interest is the segregated living environments of retirement communities such as Sun City in Arizona (Gober, 1985; Marans et al., 1984). In addition, geographers have considered the inequitable spatial variation of housing opportunities for seniors (Warnes, 1981). For example, Mercer (1979) has found that the location of senior citizen housing projects in Vancouver is determined by the availability of cheap land rather than on consideration of the spatial distribution of the elderly population. Other research has evaluated the proximity of elderly housing projects to services and the extent to which these environments promote or inhibit the activities of older people (Smith, 1984).

Geographical research has also focused on long-term care facilities and the environmental determinants of the quality of life of the elderly in these institutions (Peace et a., 1979). Rowles (1986) suggests that there is significant potential for geographical contribution within the sphere of the micro-environment of long-term care. Such research would demonstrate the ability of gerontological geography to determine the types of environmental modifications necessary to promote the improved well-being of the elderly in these living environments.

1.2.7 Overview of Geographical Contributions to Gerontology

This survey of geographical approaches, based on the dimensions of space and the person-environment relationship, demonstrates the extensive range of present and potential contributions to social gerontology. In terms of the present study, the principal research areas of gerontological geography are applicable to the issue of the transportation requirements of the urban elderly. The discussion of older persons' activity patterns and service utilization highlights the importance of mobility. Transportation provision is the link that enables the elderly to maintain their travel activities and access the services essential for their physical and social needs. However, limited access to transportation caused by the aging process and environmental factors can diminish the life space of the elderly. The consequences of inadequate transportation provision include the forced relocation of an older person in response to mobility limitations. Therefore, it is important to consider the effect on mobility of both the personal characteristics of seniors and the residential environment. As the discussion on housing demonstrates, the proximity of services is an essential component of the living environment of the elderly. The suburbanization of the elderly population, however, suggests that the proximity to services is decreasing. Therefore, transportation provision is a critical factor when considering the environmental implications of the evolving spatial distribution of the elderly.

1.3 Contribution of this Study to Gerontological Geography

The discussion of gerontological geography has demonstrated that approaches to research in this domain include both spatial and environmental components. Similarly, the relevance of the present study to gerontological geography is based on both the spatial and environmental implications of this research for the aging population. Therefore, two distinct contributions of this study are identified.

First, within the domain of spatial organization, the present study proposes to evaluate the implications of the suburbanization of the elderly population. Although the graying of the suburbs has been documented (Golant, 1990a; Broadway, 1995), the ramifications of aging-in-place on the ability of older persons to utilize their environment have not been considered (Warnes, 1990). Rudzitis (1984) advocated that geographers can contribute to an evaluation of the effect of suburbanization on service and housing infrastructure as it pertains to the older population. Furthermore, Golant et al. (1989) identified the need for increased research on the spatial and social barriers that limit older persons' access to services. This includes the need to evaluate the problems in providing transportation as a result of low population density and spatial dispersion (Skelton, 1982). Therefore, the first contribution of the present study is its analysis of the impact of the suburbanization of the elderly on their transportation requirements.

In addition to locational dimensions, the present study also contributes to a greater understanding within gerontological geography of the relationship between the person and environment. The objective of this study is to determine how the transportation requirements of the urban elderly are affected by both environmental parameters and the aging process of the individual. Rowles (1986) stresses that there is a need to link studies that illustrate how individual activity patterns are limited by changing physiological capability and health with studies that demonstrate how resource allocation is affected by environmental constraints. For example, there have been several studies that have considered the predisposing factors of an individual which cause transportation dependency. Schmitt (1979), Gonyea et al. (1990), and Iutcovich and Iutcovich (1988) demonstrate that there is a specific sub-population of elderly persons who must rely on alternative forms of transportation as their financial, social, and health resources diminish. In contrast, other studies have looked specifically at the significance of environment for the transportation requirements of the elderly. Both Cutler (1974) and Carp (1980) have demonstrated that access to transportation and services is dependent on whether the elderly person lives in a central city or suburban environment. However, there are few studies (eg. Cutler, 1972) that have simultaneously evaluated the significance of both individual and environmental dimensions on the transportation requirements of the elderly. Therefore, the second contribution of the present study is a greater understanding of how the need for transportation of older persons is affected by the aging process, as well as constraints caused by environmental factors.

The application of Lawton's (1973, 1980, 1982, 1990) ecological model of aging to the present study will assist in conducting the analysis of the transportation requirements of the elderly. The model provides a framework to establish the relationship between transportation behaviour and the characteristics of the elderly individual and the environment. As Golant at el. (1989) note, there have been too few studies using theoretical formulations and:

> As with many subspecialties within geography, a reluctance to frame research within a more global context exacerbates the danger of accumulating a mass of unrelated studies that provide useful information, but limited insight (1989, 462).

Therefore, it is envisioned that the present study will contribute to the conceptualization of the relationship of person and environment in gerontological geography.

It is anticipated that the results of this study will provide a foundation for considering policy issues relating to the transportation requirements of the urban elderly. The universal decrease in government funding implies that policies must be promoted that both increase accessibility to potential activities and provide effective application of municipal resources. The limited resources available to address the inadequacies of transportation for the elderly make it particularly important to consider how the interaction of person and environment create mobility problems. It is essential to identify the target population of those elderly who require transportation services in order to ensure efficient use of funds (Iuctovich & Iuctovich, 1988). Furthermore, it is crucial to define the differences in the needs and availability of mobility assistance for older persons in different residential environments (Logan & Spitze, 1988). The results of the study will assist in ascertaining the processes of aging which create transportation dependency for elderly persons, as well as the environmental factors of residential location that create barriers to the access of transportation. As Rowles (1986) has stressed, it is essential that geographic research contribute to policy development as many gerontological issues have geographical outcomes.

1.4 Organization of the Thesis

This thesis is organized into five chapters. In the second chapter a review of relevant literature for this study is presented. The importance of transportation for the elderly is first established, followed by a discussion of why certain transportation modes may be inadequate for the needs of elderly individuals as a result of the aging process. The consideration of literature concerning transportation for the elderly population focuses on the systems-oriented approach, as well as research which has examined the effect of the decrease of individual capabilities and the impact of environmental constraints on transportation provision for the elderly. Finally, the residential environment and the effect of the suburbanization of the urban elderly population is discussed in relation to their transportation requirements. The chapter concludes by proposing that a more comprehensive approach that incorporates both individual and environmental dimensions is required to adequately determine the transportation requirements of the urban elderly.

Chapter 3 involves a detailed discussion of the conceptual framework, research questions, and data sources of the study. The ecological model of aging is first defined and its application to the research questions is established. Three research questions are formulated to determine the effect of autonomy and security on the transportation behaviours of: frequency of use of transportation modes; frequency of travel to service and activity sites; and distance travelled to service and activity sites. Secondly, the data collection procedures are described. An interview survey was conducted with respondents chosen from a systematic sampling design. The respondents reside in one of three sub-areas which represent contrasting living environments. The outer suburbs are characterized by low density development and the dispersion of services. In contrast, higher density development is found in the inner suburb resulting in greater accessibility to services.

This is followed by the presentation of the data analyses in Chapter 4. The first part of the chapter offers a descriptive analysis of the data to provide an overview of the physical, social, financial, and transportation resources of the entire sample, as well as sub-groups, based on three distinct living environments. In addition, data relating the transportation behaviours are presented including the frequency of use of transportation modes, the frequency of travel to service and activity sites, and the distance travelled to service and activity sites. The final section of the chapter includes the application of statistical inferential tests to evaluate the effect of both individual resources and residential location on transportation behaviours. Finally, Chapter 5 of the thesis includes a summary and interpretation of the results. This chapter also considers the policy implications of the findings and suggests directions for future related research.

1.5 **Summary**

This introductory chapter has established the importance of investigating the issue of transportation for the elderly population. The overview of gerontological geography demonstrates that the study of the aging population includes elements of both spatial organization and person-environment relationships. The objective of this study is to determine how the transportation requirements of the urban elderly are affected by components of both the person and the environment. Based on the framework provided by Lawton's (1973, 1980, 1982, 1990) ecological model of aging, the study will:

1. Evaluate the effect of autonomy and security on the frequency of use of transportation modes;

2. Evaluate the effect of autonomy and security on the frequency of travel to service and activity sites; and

3. Evaluate the effect of autonomy and security on the distance travelled to service and activity sites.

The following chapters will present the main components of this research including the literature review, theoretical framework and methodology, and analyses. It is proposed that the results of this study will have significant policy implications and contribute to a greater understanding of the transportation requirements of the urban elderly.

CHAPTER 2

REVIEW OF THE LITERATURE

This chapter provides an overview of research that has focused on the issues of transportation for the elderly population in the urban environment. The relationship between transportation provision and an older person's quality of life is first discussed. This is followed by an evaluation of the how factors of the aging process, along with environmental barriers, may create mobility problems for the elderly. A review of transportation literature illustrates that many researchers have emphasized the systems-oriented approach to consider mobility solutions for the aging population. More recently, the trend has been to adopt a more comprehensive approach that considers individual and environmental determinants of the transportation needs of older persons. However, there are few studies that measure the effect of both individual and environmental components. The effect of environmental barriers on transportation provision is particularly relevant as a greater proportion of the elderly population now resides in suburban areas where the dispersion of services creates greater mobility constraints. Therefore, it is the objective of the present study to contribute to the literature by evaluating the effects of the residential environment, as well as the diminishing capabilities of older persons, on transportation provision for the elderly.

2.1 The Significance of Transportation for the Elderly Population

The issue of transportation for the elderly population is a relatively new area of investigation within gerontology. Martin Wachs (1979), for example, considered that prior to the 1960's transportation planning and programming did not include the elderly as an identifiable group that required special study and unique programs. Transportation was not a consideration at the first White House Conference on Aging in 1961. However, the question of transportation for the elderly was finally brought to the forefront at the 1971 White House Conference on Aging (USGPO, 1971). Although it had not been regarded as a major issue for the elderly by the planners of the conference, delegates ranked transportation third in importance preceded by income and health (Carp, 1972a). It is significant that, as a result of this initial classification, the conference identified the key research area to be the effect of transportation upon the elderly's ability to satisfy maintenance needs and its impact on their quality of life. Consequently, an underlying theme of the subsequent literature has been that barriers to transportation have far-reaching implications for the quality of life of older persons (Cutler, 1975; Rudzitis, 1984; Joseph and Fuller, 1991).

A basic determinant of the quality of life of all persons is unrestricted mobility that allows access to goods, services, jobs, education, recreational activities, and social contacts (Schmitt, 1979; Wachs, 1988). Wachs (1979) effectively asserted that mobility is critical to the physical, social, and psychological well-being of the elderly. Access to medical facilities and other social services is essential to maintain physical health. Social contact is dependent upon accessibility to family and friends, as well as recreational and cultural activities. Finally, mobility enhances the psychological health of the elderly by enabling the avoidance of isolation and allowing choice of activities. Furthermore, Wachs argued that elderly individuals "are entitled to the mobility necessary for them to maintain adequate nourishment and good health, conduct personal business, engage in social relationships, and pursue recreation" (Wachs, 1979, 213).

Logue (1987) also identified personal mobility, the ability to travel from place to place, to be an important component of independence and full participation in society thereby influencing morale and life satisfaction. In addition, she advocated that mobility represents self-sufficiency and engagement for older people. Therefore, transportation for elderly persons is a key component of their quality of life because it provides a link to other elements of their environment (Wachs, 1988). Transportation services and facilities enable the elderly to move at will, to engage in social and recreational activities when desired, and to reach business and social services when needed (Rosenbloom , 1988). Transportation is the mediator between people and the community environment. Transportation provides the linkage necessary to pull services and facilities together into a system which makes them truly available. Community resources are only a viable option when there is suitable transportation (Carp, 1980). Therefore, transportation is a key to an active and healthy old age, but inadequate transportation may be the means by which the environment isolates the elderly (Wachs, 1988).

The lack of appropriate transportation for elderly persons results in immobility and isolation that may contribute to other social and physical problems of the older individual. Carp (1971) observed that inadequate transportation services restrict the living space of any person, limit self-sufficiency, restrict activities and contacts with other people, and may contribute to disengagement and alienation from society. Therefore, accessibility to transportation is an important component of the quality of life of the elderly population. The contrasting explanations of social aging provided by the activity and disengagement theories assist in illustrating the importance of transportation in allowing elderly persons to lead healthy and independent lives (McPherson, 1990).

A considerable amount of research has focused on the social isolation of the elderly, as well as the low rates of utilization of various types of services (Carp, 1980). The disengagement theory provides one interpretation for the immobility of the elderly and refutes the importance of transportation in maintaining the quality of life of older persons. The theory, developed by Cumming and colleagues (Cumming et al., 1960; Cumming & Henry, 1961), suggests that normal aging involves a voluntary process whereby an individual gradually withdraws from social roles and decreases his or her social interaction (McPherson, 1990). According to the disengagement theory, low service-utilization rates occur because old people do not want to be involved, and social isolation results because social withdrawal is intrinsic to old age (Carp, 1980). In contrast, the activity theory, first suggested by Havighurst and Albrecht (1953), proposes that successful aging involves an active lifestyle and continuance of roles that will maintain a favourable self-concept and a high level of life satisfaction (McPherson, 1990). Transportation is an essential element of an active lifestyle for seniors. Therefore, if transportation services are inadequate, they may not be used by the older persons they are designed to serve. Similarly, social isolation occurs when family and friends are not accessible (Carp, 1980). The activity theory suggests that the loss of the work role in old age is usually accompanied by a large increase in leisure time and good transportation services are important to provide the mobility necessary to be active (Golant, 1976).

There has been only limited empirical investigation of the effect of mobility and transportation on life satisfaction despite the identification of the importance of transportation for the quality of life of the elderly population (Cutler, 1972). An important exception is the early work of Cutler (1972, 1975) which demonstrates that differentials in the availability of transportation relate to the life satisfaction of the elderly. His longitudinal study in the community of Oberlin, Ohio, is based on differentials in the availability of personal transportation (automobile use) and differentials in residential location based on distance from the centre of the city (Cutler, 1972). It is his hypothesis that:

> Given the association between social engagement and life satisfaction proposed by the activity theory, it is expected that the impediments to social interaction raised in the absence of transportation should be reflected in decreasing life satisfaction...Finally, other consequences of mobility limitations, such as restricted access to community services and facilities and heightened feelings of dependence when others must be relied upon for conveyance, are expected to have adverse effects on life satisfaction (Cutler, 1975, 155-156).

The results of both studies provide empirical confirmation that the quality of life of older persons is dependent, at least in part, upon the availability of personal transportation (Cutler, 1972, 1975). In the first study lower levels of life satisfaction characterize those older persons who do not have personal transportation and who live at greater distances to the facilities and services of the community (Cutler, 1972).

Similarly, in the longitudinal study a greater proportion of the elderly without transportation demonstrate declining life satisfaction than those with transportation (Cutler, 1975). Therefore, the research supports the proposition that mobility restrictions are related to low levels of life satisfaction, and therefore, the quality of life of the elderly population (Cutler, 1972).

Cutler (1972) proposed that the analysis of the effect of transportation on life satisfaction demonstrates the importance of considering how aspects of the environment relate to the morale of the aged. The results of a study by Berghorn et al. (1978), for example, reveal that there are three major networks of environmental factors that are related to life satisfaction. In the third network of environmental factors, the dimensions of mobility and activities are identified. Their findings demonstrate that there is a direct link among personal transportation, the environment, and morale (Berghorn et al., 1978). The significance of transportation for life satisfaction is attributed to mobility enhancement and the maintenance of independence within the community.

Cutler (1975) suggested that the importance of transportation for life satisfaction demonstrates that questions about transportation and mobility should be routinely included, along with socioeconomic, demographic, and health variables, in gerontological research. Furthermore, Carp (1980) outlined that little is known about transportation and the problems encountered by the elderly, nor how the lack of transportation limits mobility, activity, and social interaction. The importance of mobility for the quality of life of the elderly population, therefore, requires that research focus on improvements to access the community environment. Improvements in access through the provision of transport and mobility services can be a major contributor to the quality of life of individuals who are transportation disadvantaged (Schmitt, 1979). Transportation strategies that are most effective in reducing the inadequacies of mobility will improve the well-being of the elderly population (Patrick, 1992).

2.2 The Aging Process and Its Effect on Transportation Provision

In the preceding section, the importance of the provision of transportation for the quality of life of older persons was established. However, many seniors are transportation disadvantaged as a result of physical, social, financial, and environmental barriers that cause incongruities between the user and the type of transportation that is available (Golant, 1976). In this section, the barriers encountered by the elderly population are discussed to illustrate why present transportation provision may be inadequate for their mobility needs.

Researchers have considered the shortcomings of a variety of transportation modes for the elderly (Bell & Olsen, 1974; Golant, 1976; Schmitt, 1979; Skelton, 1982; Carp, 1988). Within this literature there is a consensus that inconvenient geographical location and environmental barriers, along with the increased propensity of the elderly to experience functional impairment, diminishing health, and lower income, contribute to mobility problems (Bell & Olsen, 1974; Golant, 1976; Skelton, 1982, Carp, 1988).

It is recognized by most researchers that the private automobile provides the greatest opportunities to realize the mobility needs of the elderly (Bell & Olsen, 1974; Golant, 1976; Schmitt, 1979; Skelton, 1982). In the 1970's the automobile was not the predominant form of transportation for the elderly. Bell and Olsen (1974) found that over half of the elderly in the United States did not own a car, and Golant (1976) stated that car ownership among different age groups was lowest in the United States for the population over the age of 65. However, it is significant that Skelton (1982) did recognize that increasing proportions of the future elderly population will be car drivers. As Wachs (1976) observed:

> Early transportation programs for senior citizens were based upon an image of higher density living by a fairy homogeneous group of elderly persons in central-city locations, many of whom were non-drivers. The elderly of the future, however, will be more heterogeneous, more affluent, more highly educated, dispersed in a variety of living environments, and more likely to drive (Wachs, 1979, 2).

This insight is particularly relevant to the present population of suburban seniors who have relied on the car because of the separation of residential location from services. While the use of the car does enhance mobility opportunities, it will also present new problems as a larger percentage of elderly people will eventually have to give up the use of their own car (Wachs, 1979).

With increasing age, accessibility to an automobile may decrease as the changes in sensory and perceptual processes and motor skills affect the older person's ability to maintain a drivers license. Carp (1988) found that the diminished ability of older persons to drive was the result of visual problems, the slowing of motor responses, stiffness and crippling, and difficulty adjusting to new situations. The effect of these physiological changes is demonstrated by accident statistics that indicate that in Canada people aged 60 and over are more likely than younger drivers to be involved in collisions and to suffer serious or fatal injuries as a result (NACA, 1993).

An additional factor that contributes to decreased access to automobile use is the cost of owning, maintaining, and operating a car (Golant, 1976; Schmitt, 1979; Cutler & Coward, 1992). The ownership of a car becomes prohibitive for many elderly persons as a result of their reliance on a fixed income. Automobile ownership has a strong correlation with income (Berghorn et al., 1978). For those elderly persons who are economically disadvantaged, mobility becomes an essential service and the use of a car becomes a luxury that they cannot afford (Wachs, 1976).

One issue that is not considered by most research that focuses on the adequacy of transportation for the elderly population, is the predominance of older women who have never learned to drive (McPherson, 1990). Elderly auto-owners tend to be predominantly younger, male, married, and with greater financial resources (Berghorn et al., 1978). In many cases, older women have relied upon their spouses to provide them with rides. These women are particularly vulnerable if they become widows or if their husband can no longer drive (Joseph & Fuller, 1991). They must seek transportation alternatives that do not offer the support once provided by their husbands.

Those who must give up the use of their car will present new challenges for the provision of transportation because they will expect a service that reflects the flexibility offered by the automobile (Wachs, 1979). Berghorn et al. (1978) concluded that as auto-owners report higher levels of trip frequency for all purposes, self-transportation expands the individual's life space and facilitates the attainment of many service and activity opportunities. Those elderly who have access to a car, are transportation independent. However, there are many older persons who do not have the physical, social, and financial resources to sustain mobility independence. As a result, they become increasingly transportation dependent thereby losing autonomy and self-sufficiency. As Joseph and Fuller (1991) point out:

> In this transition to transportation dependence, the elderly become "passengers" in their travel behaviour and as such have to purchase or negotiate a ride with providers. The ability to remain mobile (or active) will, over time, depend upon the quality of the personal and community support system available...as well as the particular circumstances of the individual (Joseph & Fuller, 1991, 134).

Access to alternative forms of transportation becomes particularly important for elderly persons if the private automobile is no longer available (Schmitt, 1979). Family and friends provide transportation that most closely reflects the mobility afforded by the car. The provision of rides eliminates the need to walk, and the absence of a schedule allows a higher degree of flexibility than is possible with other transportation modes. Nonetheless, researchers downplay the importance of this transportation alternative because of the loss of autonomy and self-sufficiency it may represent for the elderly (Bell & Olsen, 1974; Golant, 1976). Furthermore, Carp (1972b) stipulated that:

> Accepting rides may be distasteful because it represents a loss of autonomy and self-sufficiency. Acceptance may involve indebtedness which becomes burdensome and demeaning when reciprocation is impossible. The schedule, route, or destination of the driver may not conform to the needs of the passenger. The older person may be nervous about the driving skill of the person who offers the ride (Carp, 1972b, 66).

However, Carp (1972b) also acknowledged that rides from friends and family may provide welcome social contacts for seniors. In addition, the health and functional levels of an older person may require that door-to-door transportation service be provided. Carp (1972b) found, for example, that the incidence of riding as a passenger in an automobile were second only to driving oneself. These rides provide seniors with the level of assistance offered only at great cost by other transportation services. Without voluntary transportation of this nature many elderly persons would become isolated.

Some research has found that walking represents the most frequently used mode of transportation for seniors (Smith, 1991). However, other authors do not consider walking to be a feasible transportation option for the elderly population (Bell & Olsen 1974; Golant, 1976; Skelton, 1982). Golant (1976) referred to a "walking environment" that is not appropriate for older persons. Uneven walking surfaces, curbs, and the hazards of vehicle traffic can be major deterrents for elderly persons who must walk to obtain services and social contacts. Golant (1976) stressed that the short distance between a residence and a required facility or service may be inconsequential because of the environmental barriers associated with walking. An additional impediment to a safe walking environment for the elderly, and one that is not identified in the literature, is the effect of extreme weather conditions. The negative consequences of these environmental barriers are intensified if the elderly individual has functional and health limitations that affect his or her ability to walk. The inadequacy of walking as a transportation mode is further highlighted by the finding that elderly persons are more likely to be involved in pedestrian accidents than are younger age cohorts (NACA, 1993).

In addition to the environmental barriers discussed above, walking as a transportation mode is also inappropriate for those seniors who live great distances from required service or activity sites. Researchers have recognized the problems posed for older persons by the suburban environment. Walking may not be an alternative because the problems of low housing densities, and the resulting incongruency of services to residential location, create distance barriers for the elderly (Bell & Olsen, 1974; Skelton, 1982). Therefore, the inadequacies of walking as a form of transportation for the elderly population are the result of both the functional and health limitations of the older person, and the physical barriers encountered in the environment.

Early research focusing on the mobility needs of the elderly population typically identified public transit as the most appropriate form of transportation (Bell & Olsen, 1974). This was based on the common assumption that older persons were located in central city locations where the provision of bus service is superior to that found in the outlying areas of the city (Wachs, 1979). Nevertheless, bus systems are a poor surrogate for auto-ownership (Berghorn et al., 1978). There are numerous inadequacies of transit systems and proposed solutions centre on a transportation service that would address the specific limitations of older persons (Bell & Olsen, 1974; Golant, 1976; Schmitt, 1979; Skelton, 1982). Golant (1976) revealed that the environmental consequences of urbanization and suburbanization has been the spatial separation of facilities and services from residential locations thereby encouraging movement by automobile. Mass transit has been unable to compete with the car, and service in off-peak hours to non-work destinations is particularly inadequate. As a result, the orientation of public transportation to work trips often fails to provide reasonably direct connections between the elderly person's residence and nonwork destinations (Schmitt, 1979; Carp, 1988). For transit service to provide adequate means of mobility for the elderly, there must be bus service at suitable times and with adequate reliability near the locations of origin and destination (Skelton, 1982).

Additional deficiencies of the bus include vehicle design that does not promote easy entry and exit for those with physical limitations, service infrequency, waiting at bus stops without benches and shelters, walking or standing on a moving bus, the number of required transfers, and high fares (Golant, 1976; Berghorn et al., 1978; Schmitt, 1979; Skelton, 1982; Carp, 1988). The inadequacy of public transit was demonstrated by the recommendations of the White House Conference on Aging that the goal of improved mobility of old people could be attained by subsidies, innovative transportation systems, reduced fares, and architecturally barrier-free travel environments (Carp, 1972a).

One inadequacy of public transportation that represents an insurmountable barrier for many elderly persons is the distance between the bus stop and the individual's home. As was noted previously, the limited walking capability of some older people, in conjunction with environmental barriers, can make the bus completely inaccessible. This issue is particularly relevant in suburban areas where the bus stop can be especially inaccessible because scattered development does not allow effective coverage of the entire area by the bus.

In summary, it is important to note that work which has already focused on the adequacy of transportation modes provides direction for future research. Schmitt (1979) advocated that an appropriate transportation system should assure geographical access to all necessities and amenities. It is significant that he recognized that little is known about the effectiveness of most services for the transportation disadvantaged because of the overemphasis on transportation systems rather than on the mobility needs of those who require transportation services. Similarly, Skelton (1982) criticized the focus of transportation research on supply problems because it has resulted in a lack of knowledge about the contribution of transport schemes to the lifestyles of elderly persons. Bell and Olsen (1974) also identified the need of future research on transportation for the elderly to focus on the causes of transportation dependency. Furthermore, they suggest that the objective of mass transit should be to connect people to essential destinations and services rather than to link geographical places together. Finally, Golant (1976) provided insight into the environmental dimension of the issue when he suggested that transportation services must be centralized in areas with large concentrations of older persons. More significantly, he recommended that the location of those elderly who restrict their activities because of transportation difficulties must be identified so that mobility solutions are effectively implemented for the targeted population. Therefore, these studies demonstrate an awareness that effective transportation provision must incorporate both an understanding of the physical, social, and financial factors which create transportation dependency among the elderly, as well as the environmental barriers which cause the inaccessibility of transportation modes.

2.3 **Research on Transportation for the Elderly Population**

The 1971 White House Conference on Aging was an early recognition of the importance of transportation for the aging population. Consequently, there was an appeal for further research on the transportation requirements of the elderly. The effect of transportation upon the elderly's ability to satisfy maintenance needs and its impact on their quality of life, as well as the association between the lack of mobility and the loss of income that may occur in old age, were identified to be key research areas (Carp, 1972a).

The most notable recommendation made by the 1971 White House Conference on Aging was the prerequisite that research on a transportation system for the elderly must begin first with an investigation of the needs and capabilities of the users, rather than on the characteristics of existing systems. Of significance to the present study was the stipulation that emphasis on the physical and social environment was paramount in the development of a transportation system that would address the mobility requirements of the elderly (Carp, 1972a). This early identification of the correlation between an elderly person's physical and social surroundings and his or her needs and capabilities provides a rationale for the focus of the present study on the effect of the components of the person and environment on the transportation requirements of the elderly.

In this section, the discussion of research on transportation for the elderly is divided into two categories. The first category is characterized by research that focuses on transportation systems for the elderly. It is postulated that this systems-oriented approach is incomplete as it does not encompass the factors of the individual and the environment which cause mobility problems for the elderly. Conversely, the second category of transportation research is comprised of those studies which have adopted a more insightful approach that includes dimensions of the individual and the environment. It will be demonstrated, however, that there continues to be a lack of research which considers simultaneously the effect of individual and environmental components on the transportation needs of the elderly. It is the objective of the present study to address the absence of an integrative approach and thereby contribute to a greater understanding of the mobility requirements of older persons.

2.3.1 The Systems-Oriented Approach to Transportation Provision for the Elderly

The call for transportation research focusing on the elderly individual and the environment was not heeded by many of the early investigators. Rather, the focal point of their research was on the deficiencies of transportation systems and policies to provide adequate service to the urban elderly (Bell & Olsen, 1974; Schnell, 1974; Golant, 1976; Lichtenheld & McKelvey, 1976; Schmitt, 1979; Skelton, 1982; Wallin, 1982; Jackson, 1983). The systems-oriented approach of the literature is predominantly descriptive and excludes a comprehensive investigation of the transportation needs of the elderly based on individual capabilities and the environment. Nevertheless, the early research does illustrate a growing recognition during this period of the transportation disadvantages of the elderly (Skelton, 1982).

The emphasis on transportation systems, instead of a comprehensive approach that integrates individual and environmental components, is clearly illustrated by work which addresses the issue of mainstreaming transportation systems in the United States (Schnell, 1974; Lichtenheld & McKelvey, 1976; Wallin, 1982; Jackson, 1983). The question of modifying public transportation facilities and services to assure access by the elderly and handicapped evolved into a political issue in the 1970's. In 1970 an amendment was made to the Urban Mass Transportation Act of 1964 that declared the equal rights of elderly and handicapped persons to utilize mass transportation (Wallin, 1982). The response was an extensive discussion of the most effective and efficient means to implement this mandate. The debate centred upon a comparison of modifying fixed-route systems versus establishing specialized demand-responsive systems.

Researchers who became involved in the debate focused on an examination of the policies to implement Section 16 of the Urban Mass Transportation Act. Jackson (1983) deliberated on the implementation in Massachusetts of the sub-section 16.a which authorized grants to non-profit organizations to purchase equipment for the transportation needs of the elderly and handicapped. This review is largely descriptive and concentrated specifically on demand-responsive systems. Schnell (1974) and

Wallin (1982), however, applied a broader comparative approach to determine whether a fixed-route or demand-responsive system would provide the most effective accessibility to urban public transportation for elderly and handicapped persons. They both deliberated on the modification of the design of buses required to accommodate the elderly and handicapped. Wallin (1982) stressed the costs involved in mainstreaming transit systems. For example, the United States government's TRANSBUS program to develop a prototype of a handicapped-oriented vehicle was rescinded because of the fiscal problems involved in providing full access transportation. It is significant that both Schnell (1974) and Wallin (1982) recognized that cost is only one factor in the debate to mainstream transportation systems. The modification of regular buses would not necessarily enable the nonambulatory to effectively use transit because various environmental barriers would still have to be overcome by the elderly and handicapped to reach the transit facility. These barriers include uneven road and sidewalk surfaces, sidewalk curbs, and weather conditions. This observation demonstrates the distinction between mobility and accessibility as the mobility of the elderly and handicapped is increased only if a bus is accessible (Wallin, 1982). Schnell (1974) and Wallin (1982) reasoned that door-to-door service would overcome the physical barriers involved in getting to and from transit stops on fixed operations. Therefore, they concluded that a demand-responsive system would fulfill the obligation set out by the 1970 amendment of the Urban Mass Transportation Act (Wallin, 1982).

The advocacy for a demand-responsive system for the elderly and handicapped does suggest a recognition that present fixed-route systems do not address the mobility needs of the elderly. However, the emphasis on the environmental components which impede access to the bus illustrates that the systems-oriented approach provides only a partial interpretation of the transportation requirements of the urban elderly. It overlooks how the mobility of the elderly is affected by other environmental factors, as well as individual needs. A bus with design modifications may not be appropriate for the elderly not only because of the surrounding physical barriers, but also as a result of diminishing individual resources, the incongruency of residential location to needed services, and distinct trip purposes that are not amenable to a work-oriented transportation system.

The inadequacies of the literature that focus on a comparison of demand-responsive and fixed-route systems is demonstrated further by the work of Lichtenheld and McKelvey (1976) who examined the duplication of transportation services in Cedar Rapids, Iowa. They postulated that the problems of the demand-responsive system, including excessive demand and the cost of the service, require the measurement of trips that could be made on the existing fixed-route system. It can be argued that the finding that 30 percent of demand-responsive rides were duplicated is open to question because of the limitations of the measurement criteria. The first criterion, the need to transfer, does not adequately recognize the distinct transportation needs of the elderly. Lichtenheld and McKelvey (1976) disclosed that the elderly population is concentrated in the central business district in Cedar Rapids, whereas most services are located at the periphery of the city. However, they did not recognize that this may create difficulties for the elderly as the fixed-route system is concentrated into the work-oriented central area and not to the areas of service required by the elderly. Therefore, it is not only the need to transfer, but also the lack of reasonably direct service that must be included in an evaluation of the duplication of services. The second criterion, a walk of two blocks or less to the bus stop, does not consider that even this distance may be inaccessible for some because of the combined effects of functional limitations and environmental barriers. An application of the effects of individual and environmental components also demonstrates the inadequacy of the third criterion of a physical handicap. Lichtenheld and McKelvey's (1976) definition of only visible physical handicaps excludes less obvious handicaps such as heart disease which could diminish an individual's ability to walk to the bus stop. In addition, they did not take into account weather conditions and road and sidewalk surfaces which could also be a deterrent to walking for those with some form of functional limitation. Therefore, the authors' attempt to determine the mobility needs of the users is inconclusive. Perhaps the only significant finding of the study is that most trips on the demand-responsive system were made by females thereby demonstrating that there is a specific sub-population of elderly persons who are transportation disadvantaged.

Finally, it is useful to consider Heads' (1994) investigation of transportation for seniors because, as the present study, it is based on research conducted in Winnipeg, Manitoba. It is largely a descriptive analysis of the frequency and purpose of trip-making by seniors, as well as the types of transportation modes used. A comprehensive examination of the inadequacies of transportation services is absent as Heads (1994) merely reports the attitudes of respondents towards Winnipeg transit services. No attempt is made to interpret why the elderly may encounter problems with these services. However, he does conclude that "some transport issues relating to seniors are addressed in too narrow a context" and, in particular, the effect of extreme winter conditions on the mobility of the elderly population must be evaluated (Heads, 1994, 261). This demonstrates a recognition that future research must incorporate the environmental context of the transportation needs of the elderly.

In summary, this evaluation of systems-oriented research establishes that the emphasis on systems of transportation, rather than on a comprehensive analysis of the effects of diminishing individual capabilities and environmental dimensions, fails to provide an effective analysis of the adequacy of transportation provision for the elderly. The following sub-section will illustrate how research which focuses on individual and environmental components contributes to a greater understanding of the transportation needs of seniors.

2.3.2 The Person-Environment Approach to Transportation Provision for the Elderly

The present study proposes that it is essential to include both individual and environmental factors to analyze the transportation requirements of the urban elderly population. Older persons face a variety of personal and environmental barriers to their use of transportation (Rosenbloom, 1988). Some of the research that has adopted a more comprehensive approach to investigate transportation for seniors has focused specifically on the individual. However, other research has attempted to incorporate an analysis of the effects of both individual and environmental components. Of particular significance to the present study, is research on transportation for older persons that defines the environment in terms of residential location.

An analysis of the transportation needs of the elderly requires that the individual components which create greater mobility dependency be considered. It is essential to first identify those elderly persons who require mobility assistance, and secondly to evaluate the role of transportation in improving their circumstances. The objective of a number of studies has been to identify those elderly persons who require transportation services (Ashford & Holloway, 1972; Cutler, 1974; Schmitt, 1979; Iuctovich & Iuctovich, 1988; Smith & Hiltner, 1988; Golant, 1990; Hodge, 1990).

The research of Cutler (1974), Weaver (1974), Schmitt (1979), and Golant (1990) demonstrates that there is a specific sub-population of elderly persons who must rely upon alternative forms of transportation as their financial and health resources diminish. Weaver (1974), for example, found that there was a correlation between gender and income and the use of public transit. Elderly females and those older persons with lower incomes were more likely to use public transit.

Similarly, Iuctovich and Iuctovich (1988) considered the predisposing factors of age, sex, race, marital status, health status, economic status, and living conditions to gain an understanding of their correlation with the need for and use of transportation services for the elderly. Using data from a survey of older Pennsylvanians, the study found that transportation requirements vary according to personal characteristics. Specifically, users of public transit are more likely to have an income under $10,000, to be non-owners of cars, to live in the city, and to have poorer health. In addition, the more aged, women, those living alone, and those unmarried were more likely to be users than nonusers.

Ashford and Holloway (1972) illustrated that age has a significant effect on travel behaviour and travel demand. They found in their survey of six American urban centres that the highest percentage of trips made by public transit occurred for the 65 and over age group for all trip purposes except school trips. Although the higher dependence on transit may not be representative of the present elderly population, their conclusion that the lack of transit services appears to affect the elderly more than any other age group is significant. It demonstrates that the availability of adequate transportation services enables movement by disadvantaged groups such as the elderly who would otherwise become isolated.

Hodge's (1990) description of the demographic processes and environmental consequences of aging illustrates the need for communities to adapt to the competence level of older people. More specifically, he demonstrates that increased age, lower health status, lower income, and living alone account for the transportation dependency of the elderly thus affecting their ability to interact with the environment.

Based on these studies, it can be surmised that the socio-demographic variables of age, gender, income, health and functional status, household composition, social support, and marital status must be included in an analysis of those elderly persons who are transportation dependent. It must be noted, however, that the importance of these variables is not supported by all studies. Smith and Hiltner (1988), for example, found that in Toledo, Ohio, the profile of an aged transit user was a non-driver who lived alone, and was female with a lower income. They did not, however, find a relationship between transit usage and health and age factors that have been reported as key variables in other research. These conflicting results illustrate that further investigation is required to determine which variables should be used to identify elderly individuals dependent on transportation services.

Other investigations have demonstrated that an additional dimension that must be included when considering the transportation needs of the elderly is the effect of the environment on mobility levels (Paaswell & Recker, 1974; Wachs, 1976; Gillan & Wachs, 1976; Carp, 1980). Wachs' (1976) early research, for example, was an exception to the systems-oriented approach of transportation research. His conceptualization of the elderly population into seven lifestyle groups highlighted the fallacy of assuming that all seniors lived at high densities and were dependent on public transportation. Wachs (1976) demonstrated that future transportation planning must recognize that a growing proportion of elderly persons will be located in low density suburban environments, and that their dependency on the automobile will require innovative solutions if they become ex-drivers and require transportation services.

In another study, Gillan and Wachs (1976) suggested that mobility is significantly affected by age, income, and locational variables. They analyzed diversified transportation needs in Los Angeles County to determine the effect of advancing age on travel behaviour and the socioeconomic correlates related to the mobility of the elderly. They found that there is a latent demand for improved transportation, particularly as the individual becomes older and driving is no longer possible. They indicated that there are many elderly persons in the suburbs who do not drive. As a result, they concluded that the greatest need for improved transportation services was in the suburbs where low residential density does not allow social interaction and use of services. Therefore, they hypothesized that, without adequate transportation alternatives, the elderly population will become the most transport-deprived segment of society.

Paaswell and Recker (1974) investigated the diverse group of those without access to a car in Buffalo, New York. In their analysis, they combined the dimension of location with a framework of desired activities and available transportation. An extensive application of maps enabled the investigators to demonstrate the areas and groups who experience the greatest degree of transportation deficiency. They found that over half of those over the age of 65 were not licensed to drive. They proposed that the extent of carlessness in the suburbs demonstrates that the problem of mobility may be more severe for the suburban elderly in comparison to the inner city elderly. In addition, transportation alternatives for suburban residents are limited because public transportation is unable to service the needs of the dispersed population.

The significance of residential location was developed further by Carp (1980) who outlined that the elderly can only remain independent if a broad range of services and opportunities are provided in the community that are linked by transportation. Her comparison of transit use in San Francisco and San Antonio demonstrates that without adequate transportation, an older person's environment is limited. Moreover, environmental factors affect mobility behaviour and the improvement of transportation services could improve the elderly's access to community resources. Her findings show consistently that the elderly in San Francisco make more trips for social and service needs, and a substantially greater number use public transportation compared to their San Antonio counterparts. Carp (1980) stressed that these differences are the result of environmental considerations. In San Francisco, services are in greater proximity and the public transit system meets the needs of the elderly more adequately. In contrast, the conditions in San Antonio are more representative of typical suburban areas as services must be accessed by automobile due to greater distances and a less developed public transit system.

In summary, this survey of transportation research has demonstrated that the investigation of the transportation needs of the elderly must incorporate two key components. First, fundamental to the design of adequate transportation provision is a clear understanding of the elderly who are transportation disadvantaged. Secondly, the living environment of the elderly must be carefully considered to ensure that transportation provision is based on the location of the elderly person's residence, as well as the area of required services and social and recreational activities. Therefore, the residential environment provides a crucial dimension to the evaluation of the transportation requirements of the elderly. Moreover, the identification of the effect of the suburban environment on mobility was an important step in the evolution of a comprehensive examination of the transportation requirements of the urban elderly. In the next section, the relevance of the residential environment is discussed, and, more specifically, the suburbanization of the elderly population is described to illustrate that it has important environmental ramifications for the transportation requirements of seniors.

2.4 The Residential Environment of the Elderly Population

In Chapter 1, the application of the person-environment relationship to the study of gerontological geography was described. The primary concern of this approach is how the elderly population adjusts to its environment (Rudzitis, 1984). The elderly are a heterogeneous group and their diversity is reflected both in social as well as spatial dimensions (Wachs, 1979). From a geographical perspective, further knowledge is required to fully understand the spatial significance of the location of the elderly, and, more specifically, how the interaction of the elderly with the environment affects their quality of life.

Berghorn et al. (1978) explained that because humans interact with the environment, it can present opportunities for enhancing levels of morale or, conversely, with stressful situations and barriers to obtaining a satisfying life. According to Carp and Carp (1982), the residential environment has a profound effect on the quality of life of older persons. Furthermore, the "components of the residential environment are more subject to improvement, by public efforts, than any other situational influence upon well-being, and they are therefore worthy of study" (Carp &

Carp, 1982, 411-412). Consequently, it is important to examine the improvement of transportation provision as a means of improving the residential environment of the elderly population.

Carp (1988) specified that the quality of later life depends upon the quality of housing and environment, which is made dynamic by transportation. Mobility plays a vital role in the residential environment as it determines accessibility to community resources. The satisfaction of elderly persons within the living environment depends on their mobility into the wider community to access service and activity sites (Carp, 1979). Therefore, the transportation needs of the urban elderly must be considered within the context of the housing environment (Carp, 1988). Adequate and suitable transportation is an essential component of a good housing and living environment for the elderly.

The availability of high quality transportation is a factor that is increasingly considered by researchers and professionals in their evaluation of the suitability of residential locations occupied by the elderly (Golant, 1976). Therefore, one of the most important elements in the process of planning transportation and services is a comprehensive understanding of residential patterns. Within this domain, the effect of the suburbanization of the elderly is of particular significance to the issue of transportation provision. In this section, the demographic process of the graying of the suburbs is documented, followed by a consideration of how this residential environment affects the ability of elderly persons to access adequate transportation.

2.4.1 The Suburbanization of the Elderly Population

Environmental parameters are increasingly being recognized as a factor to identify the needs of the elderly population. Within a metropolitan area it is essential to analyze the residential location of the elderly when considering the effect of the environment on the aged. According to Golant (1990a), the motivation for research that documents the changing spatial distributions of the elderly has been the need to plan and implement services in the areas with identified concentrations of elderly persons. As discussed in Chapter 1, there is specific interest in comparative studies of the inner city and suburban regions because of increasing evidence of the "graying of the suburbs" caused by the demographic process of aging-in-place.

The earliest analysis of elderly urban distribution was documented by Golant (1972) in Toronto, Ontario. Elderly persons were concentrated mainly in the older inner city area. According to Golant (1972), this distribution was the result of the differential rate of urban spatial growth whereby younger cohorts were migrating to new suburbs while the elderly remained in older parts of the metropolitan centre. Wiseman (1978) came to a similar conclusion in his research on metropolitan areas of the United States. He found that there were high concentrations of elderly persons in older neighbourhoods near the centre of American cities. Furthermore, Graff and Wiseman (1978) postulated that just as the out-migration of younger cohorts intensified the evolution of the rural concentrations of elderly, the suburbanization of the younger population produced ghettos of the aged.

The interpretation of inner city elderly ghettos was modified by Kennedy and De Jong (1977). Their evaluation of ten cities in the United States led them to conclude that elderly concentrations were reflective of the stage of development of the urban areas. The Index of Dissimilarity was used to measure the level of residential segregation. The index values indicate the proportion of persons of either group who would have to move (from the areal unit of analysis) to attain an integrated residential area (Taeuber & Taeuber, 1965). Based on this measurement, the degree of segregation of the elderly population was higher in the newer cities that were experiencing in-migration of young adults. Similarly, Warnes and Law (1984) concluded that the simple relationship between proximity to the centre and a disproportionate number of elderly people does not exist in longer established cities. Other factors have a stronger influence on the distribution of the elderly, including differential mortality by age, occupation, and social class, and various out-migration rates.

Other research has demonstrated that a concentration of elderly persons in the central city is not conclusive. A study conducted by Smith and Hiltner (1975) illustrated that only a weak relationship existed between the location of the elderly and the variables of distance to the central city, decade of housing development, median value of housing, percentage of multiple-family units, and percentage of the city's total non-elderly population. Of significance was Smith and Hiltner's (1975) observation that aging-in-place was occurring in a Toledo suburb which suggested that with the cessation of urban sprawl, more aged would reside in peripheral tracts of an urban area.

More recently, Golant (1990a) found that older people in suburban locations now outnumber those in central areas of U.S. metropolitan areas. The need to conduct research in suburban locations is manifested by his findings that by 1977 a larger percentage of the urban elderly population in the United States lived outside the central city. He documented how the suburbanization trend has continued so that by 1988, 57.4% of the U.S. metropolitan elderly population lived in suburban areas. The decreasing segregation of the elderly population was the outcome of previous migration to the suburbs by younger cohorts and the consequent process of aging-in-place (Golant, 1990a). It is also significant that the elderly population over the age of 75 suburbanized at a slower rate than the younger elderly as these two groups became more segregated from each other between 1975 and 1984. However, this trend was reversed by 1988. While the older elderly population has traditionally been located in the urban core, the increase of their numbers in suburban locations indicates that service provision, including transportation services, must be increased in these areas as the financial, social, and health resources of these individuals diminishes.

The suburbanization of the urban elderly in Canada has also been documented by Broadway (1995). He found that during the period between 1971 and 1991 the metropolitan centres of Toronto, Vancouver, Victoria, Winnipeg, and St. Catherines-Niagra experienced successive reductions in the concentration of elderly residents within their inner cities. Although there was an increase in elderly concentration in the inner cities of the remaining Canadian Metropolitan Centres (CMA's) in the 1970's, there was a decline in all CMA's during the following decade. Broadway attributed the increase in the proportion of the elderly population in suburban areas to the general aging of the population.

The findings of Golant (1990a) and Broadway (1995) were predicted by Wachs (1979) who forecast that the suburbanization of the elderly would continue as those who moved to suburban areas after World War II reached retirement age. He also foresaw that the trend toward lower density living by seniors would present some significant difficulties for the provision of transportation services for this population cohort. In order to clearly understand the association between transportation and the suburbanization of the elderly, it is essential to consider the travel patterns of older persons and their use of services.

2.4.2 <u>The Utilization of the Environment: Activity Patterns and Service Distribution</u>

Once the predominance of older persons in suburban areas is established, it is important to consider the inadequacies of this environment for the elderly population caused by low density design and the dispersion of services. As discussed in Chapter 1, gerontological geography has focused on the spatial aspects of an older person's transactions with the physical and social environments. The older person's utilization of the environment has been considered by a number of studies that have evaluated issues pertaining to the daily travel-activity patterns of seniors, particularly in relation to their levels of service utilization. The decreasing life space of the elderly referred to by Peace (1982) is caused by diminishing activity patterns which are, in turn, the result of decreasing personal capabilities and the inaccessibility of service resources and social activity sites (Carp, 1988). This issue is particularly relevant in the suburban environment where the unequal distribution of services, along with the problem of inadequate transportation provision, contribute to the decreasing life space of the elderly population.

The changing travel activity patterns of elderly persons have been considered by a number of studies. Berghorn et al. (1978), for example, suggested that levels of activity within the general urban environment decline over the life span, particularly after retirement. They reported that there is a general decline in activity and trip frequency for older persons. In addition, the relative importance of specific activities and the resultant trips change with increased age. Upon retirement, total trip frequency declines as daily work trips are no longer undertaken, but increases are often reported for shopping and other types of trips. Hanson (1977) found, for example, that the decreased level of trip frequency for older persons was the result of the diminished importance of work trips. When all other out-of-home activities were taken into account in his study, the elderly travel as frequently as younger persons. Therefore, travel to service and activity outlets becomes increasingly important for the elderly population. Various researchers have found that travel by elderly persons for shopping purposes represents the most common repetitive trip (Hanson, 1977). Furthermore, Smith (1984) found that grocery shopping is frequently linked to other travel activities including trips to pharmacies, financial institutions, and social destinations.

The importance of travel to services and activities for the elderly population requires that the accessibility of these opportunities be considered. The work of Smith and Gauthier (1995) suggests that the well-being of older people is affected by the suitability of the local service environment. The importance of the proximity of services is demonstrated by Smith's (1984) finding that the food shopping patterns of the elderly are restricted to the home neighbourhood regardless of the type of food store available. In addition, research in Britain has demonstrated that the greatest frequency of shopping activity by elderly persons occurs in neighbourhoods with good local shopping facilities (Herbert & Peace, 1980; Peace, 1982). Problems of access to the service environment are identified by research that suggests that the activity spaces of elderly shoppers is restricted in comparison to those of other age groups (Herbert & Peace, 1980; Peace, 1982). Furthermore, despite Hanson's (1977) findings that the travel patterns of the elderly are similar to other age groups, he did conclude that the frequency of travel for recreational purposes was limited for older persons. The problem of access is also illustrated by Golant's (1984) finding that social and recreational activities were more likely to be carried out in the proximate residential environment in contrast to the distance required to travel for medical and shopping needs.

Research on the residential environment of the elderly has focused on resource utilization. The primary determinant of resource utilization is proximity (Carp & Carp, 1982). According to Lawton:

> The most basic environmental attribute that mediates how older people use the environment is physical distance from the older person to another person or to a resource (Lawton, 1980, 38).

The effect of proximity on the mobility of the elderly is demonstrated by the work of Smith and Gauthier (1995). They found that trip frequency patterns were similar for elderly persons living in two senior housing projects that varied in their proximity to service resources. It is significant, however, that they did suggest that those residents who are more disadvantaged in terms of their proximity to services experience greater difficulties in adapting their travel-activities.

The issue of proximity is particularly relevant to the urban process of suburbanization as it has resulted in the separation of nearly all urban functions and activities from the place of residence of the inhabitants of the city. The restructuring of the urban environment has increased the dispersion and reduced the density of opportunities for obtaining necessary goods and services (Berghorn et al., 1978). In suburban areas, the location and scale of shopping centres, social activities, and human services have evolved to reflect nearly universal access by means of the automobile. Therefore, the pattern of life of the elderly depends on the accessibility offered by the car and the low density delivery of public and private services (Rosenbloom, 1988). This suggests that suburban areas represent a harsh environment for people whose lives differ significantly from the norm of the auto-oriented household (Wachs, 1988).

Some research has considered the availability of transportation for the elderly to destinations used by the general population, but the possibility is often ignored that the elderly have notably different travel desires. The elimination of trips to work are replaced with an increase of trips for social, leisure, and medical purposes. The automobile is the only mode that can readily accommodate changing patterns of travel. However, as discussed previously, with increased age the car becomes increasingly less available (Schmitt, 1979).

The inadequacy of the suburban environment for seniors is analyzed by Logan (1984). He demonstrated that the suburbanization of the elderly results in challenges for the provision of basic services to older persons as these areas were originally planned for young families. His observation that increased provision of municipal services in the United States has been achieved at the cost of high property taxes and a heavy reliance on government aid is significant. It is possible that further adaptation to the suburbanization of the elderly may be more difficult because of fiscal restraints. Logan (1984) concluded that if the elderly are to remain independent in the community, resources must be introduced that address the inherent liability of suburban geography.

Fitzpatrick and Logan (1985) also examined the aging of the suburbs because there has been little attention given to the implications of suburbanization for older persons' access to services. They regarded the study of the provision of services to be crucial because in suburban areas "...governmental fragmentation imposes service inequalities among communities and the inadequate development of public transportation makes older people particularly reliant on proximate services" (Fitzpatrick & Logan, 1985, 107). Furthermore, the more affluent and mobile suburban elderly conceal those who lack financial and social support sources. They postulated that the provision of services to these disadvantaged elderly is made difficult by the spatial dispersion of residents from services and inappropriate transportation provision.

Logan and Spitze (1988) examined the effect of the suburbanization of the elderly on the provision of public services. They also indicated that the provision of services to the disadvantaged suburban elderly is made difficult by their spatial dispersion and poor transportation services. Logan and Spitze's (1988) results suggested that coefficients to predict the use of community services can be determined based on the indicators of age, functional limitations, household composition, proximity to children, poor health, and gender. They conclude that the service delivery system has adapted to the suburbanization of the elderly as few individuals reported needs for assistance. However, it is also important to note that Logan and Spitze (1988) emphasized that their analysis has only provided a broad comparison of the elderly and they recognize that services are unevenly accessible. They suggested that smaller geographic areas must be examined to determine where the needs of the elderly are unmet.

This overview of research that examines the effect of suburbanization on the distribution of services illustrates the inadequacy of the suburban environment for the elderly population. The decreasing life space of seniors is in part the result of the low density design of suburban areas. Moreover, the travel-activity patterns of the elderly may be reduced if adequate transportation is not available to overcome the dispersion of services from the place of residence. Therefore, in order to address the decreased life space of the elderly in the suburbs, it is imperative to evaluate the inadequacies of transportation provision in this environment.

2.4.3 Suburbanization and Transportation Provision for the Elderly

It is the basic premise of this analysis that the ability of transportation services to meet the needs of the aging population is directly affected by the progressively dispersed location of the elderly. According to Rosenbloom (1988), the graying of the suburbs will change the character of the suburb and the nature of the transportation needs of the elderly. Gelwicks (1973) was rather pessimistic about the prospect of increasing numbers of elderly persons in suburban areas:

> ...tomorrow's elderly will be left in declining suburbs; will suffer from too low density to maintain social interaction and widely dispersed vital services without public transportation (Gelwicks, 1973, 4).

Wachs (1979) emphasized that the trend toward lower density living by seniors causes significant difficulties for the provision of transportation. Transportation problems, and therefore solutions, vary widely from the inner city to the suburbs because accessibility depends on the geographical area. In the central areas of a city housing and facilities are generally close to services which encourages walking as a transportation mode. In addition, older persons residing in central cities are less likely to have personal transportation, however, the higher density conformation of the inner city has resulted in a more comprehensive public transportation system (Cutler & Coward, 1992). However, in the suburbs, planning has tended to assume universal car availability thereby producing land-use patterns in which housing and facilities are more widely separated (Robson, 1982). The process of suburbanization and spatial dispersion has encouraged auto-oriented travel while decreasing the mobility opportunities of those who must rely other forms of transportation. Those affected by personal mobility constraints include an increasing proportion of suburban elderly who must rely on alternative transportation services as their financial, social, and health resources diminish (Carp, 1979). As a result, many older persons do not have adequate mobility resources and thus may have to restrict the frequency or locational context of their travel (Golant, 1976).

Gonyea, Hudson, and Seltzer's (1990) comparative study of the residential satisfaction of well and vulnerable seniors in a suburban area is relevant because it suggests that there is a specific sub-population of elderly whose diminished capabilities create greater vulnerability to the barriers of the suburban environment. Specifically, the authors found that the functionally vulnerable elderly are socially isolated as they express dissatisfaction with the distance of their suburban home to friends and family. Therefore, it can be surmised that these elderly persons encounter mobility problems as a result of poor transportation services and the greater distances of suburban areas. This illustrates further that it is important to identify those attributes of the elderly that create greater dependency on transportation services.

Overall, transportation services are inadequate for the suburban elderly population. The distinct travel patterns of the elderly cause mobility deficiencies because they do not coincide with the services provided by present transportation systems (Schmitt, 1979). Public transit is generally oriented towards work trips and often fails to provide reasonably direct connections between the residences of the elderly and nonwork destinations. Most bus routes converge on the downtown area whereas many trips made by seniors are within and between suburban areas.

As Carp (1980) suggested, research on the transportation of the elderly population has been inadequate. Even fewer studies have been conducted on the effect of the suburbanization of the elderly as the general assumption is that they rely on personal transportation. However, there is a trend to allow older persons to remain in their homes as long as possible as an alternative to institutionalization (August & Russell, 1993). This suggests that increasing numbers of suburban elderly will lack the resources to drive whether it be for physical or financial reasons. Therefore, the implementation of increased transportation provision must be considered a key factor in providing an adequate living environment for the elderly who are spatially dispersed.

It is essential that planners and service providers recognize that the process of aging-in-place will be the dominant force shaping suburban communities (Gonyea, Hudson, and Seltzer, 1990). The increased presence of the older elderly has important implications for the provision of services and housing because of the higher risk of mental and physical disabilities (Golant, 1990). Gonyea, Hudson, and Seltzer (1990) have found, for example, that the vulnerability of elderly with diminished economic, physical, and social resources are causing them to relocate because of insufficient services such as transportation. Therefore, investigation of the inadequacies of transportation provision in suburban environments is essential. Moreover, the analysis of the transportation requirements of the spatially dispersed urban elderly must incorporate both the components of individual resources, as well as the effect of residential location.

2.5 Residential Location and the Transportation Requirements of the Elderly

As residential location represents a fundamental element for the investigation of the transportation requirements of the elderly, it is imperative to consider transportation research which has effectively analyzed the dimensions of both the person and the environment (Cutler 1972; Cutler, 1975; Carp, 1979; Cutler & Coward, 1992). In the studies containing the component of residential location that were mentioned in the section on transportation research, only the effect of socio-demographic characteristics are measured. The effect of suburbanization is not measured, but, rather, the possibility of mobility constraints resulting from the suburban environment are identified. In this section, studies which have operationalized both the effect of residential location and individual characteristics are considered. These studies provide a framework to consider the objective of the present study.

Carp's (1979) consideration of the inadequacy of public transportation in the suburbs is an example of research that incorporates the dimensions of both the individual and the environment. She compared the central city and suburban environments of San Antonio, Texas. Multiple regression analyses were conducted to determine whether location and lifestyle variables account for the variance in trip frequency and satisfaction. The findings indicated that the central city is a more favourable environment for the elderly due to the concentration of service and transportation options. The feasibility of walking and superior public transportation create greater accessibility to service and activity sites. Carp (1979) concluded that the inadequacy of transportation provision in suburban areas must be addressed to ensure access to essential services for those elderly identified as transportation disadvantaged. It is significant for the present study that Carp (1979) stressed that the definition of a good environment is not universal and suitable environmental attributes co-vary with the attributes of the older person. Therefore, an examination of the transportation requirements of the elderly must evaluate the effect of the individual characteristics of the elderly which make them transportation dependent, as well as the influence of residential location.

The research of Cutler (1972; 1975; & Coward, 1992) provides further support for the application of the person-environment approach to analyze the mobility needs of the elderly population. As described earlier in this chapter, Cutler (1972) investigated how residential location and the availability of transportation affect life satisfaction. He surmised that research on transportation for the elderly had concentrated on large urban areas and that little was known about the availability of transportation in smaller urban settings. For the analysis, the independent variables were the variability of the availability of personal transportation and the variability of residential location in terms of distance from the centre of the city. Cutler (1972) found that the highest proportion of older persons with low life satisfaction scores were those who did not have personal transportation, who lived at greater distances from the centre of the city, and who were of lower socio-economic status and in poor health. These findings emphasize the importance of evaluating transportation dependency in terms of the individual resources of the older person and the effect of distance in suburban locations. The lack of mobility options for the elderly are related to both environmental and individual factors.

In the follow-up study, Cutler (1975) deemed it essential to distinguish between the variables which affect transportation availability. The independent variables included subjective health, family income, sex, and the distance of residence from the centre of the city. He found that respondents who were more likely to be without personal transportation were in poorer health, with lower incomes, to be older, to be female, and to live closer to the centre of the city. Although these findings suggest that older persons in suburban location are less vulnerable to inadequate mobility, the study does support the dual consideration of personal and environmental factors. It is also significant that Cutler (1975) identified the need for comparative replications in other community settings.

In a more recent study, Cutler and Coward (1992) investigated how age, gender, and residential location affect an elderly person's access to personal transportation. They found that one out of three women over the age of 75 residing in suburban areas was without private transportation. These results illustrate that there is a specific sub-population of elderly in the suburbs who require transportation services. As the suburbanization of the elderly continues, it will be the more aged that will be affected by the lack of transportation alternatives in suburban areas. It is significant that Cutler and Coward (1992) stressed that the identification of elderly persons who cannot access services and social contacts because of the inadequacy of transportation provision requires further study. Furthermore, they concluded that transportation solutions must be flexible to reflect locational variations.

In summary, the research discussed above provides support for the person-environment framework proposed by the present study to evaluate the transportation requirements of the elderly. Furthermore, Cutler and Coward's (1992) call for additional investigation illustrates that the importance of residential location, as well as the personal characteristics of the individual, must be evaluated further to determine the most appropriate transportation services for the elderly in the urban environment. Therefore, the present study will contribute to a greater understanding of the transportation requirements of the spatially dispersed urban elderly.

2.6 **Summary and Place of the Present Study Within the Literature**

This review of literature concerning transportation for the elderly population has demonstrated that access to mobility is an important determinant of the quality of life of older persons. Mobility constraints and the lack of adequate transportation for elderly persons are the result of environmental barriers, as well as the diminishing physical, social, and financial resources of the individual. An overview of the research, however, clearly indicates that the environmental considerations of the study of the transportation requirements of seniors has not been emphasized. As a result, a major objective of the present study is to augment present knowledge of the transportation requirements of the urban elderly by evaluating the relationship between transportation provision and the dimensions of the individual and the environment.

An overview of transportation research illustrates that early studies adopted a systems-oriented approach, while more recent research has focused on the socio-demographic characteristics which contribute to the transportation problems of the elderly. In addition, some literature has considered individual attributes while employing the effects of the suburban environment to explain the mobility constraints of seniors. However, there are only a small number of studies which have specifically measured the effect of both personal characteristics and residential location on the transportation requirements of the urban elderly. The present study will contribute to this literature by comparing the transportation behaviour of older persons in one inner suburban area and two outer suburban areas. It is the supposition of this study that an inner suburban environment provides greater accessibility to service and activity sites as a result of higher density development and superior transportation provision.

The contribution of the present study is the specific focus on the suburban environment and its effect on the transportation requirements of older persons. This area of investigation is important because the suburbanization of the elderly population in all metropolitan areas will have long-term implications for the provision of services, and, concomitantly, the quality of life of the elderly population. Therefore, the factors of the suburban environment that discourage mobility, as well as the socio-demographic variables that create greater transportation dependency, must be considered.

It is the thesis of the present study that the low density design of suburban areas creates distinct mobility problems for the elderly. Consequently, an evaluation of the transportation requirements of this growing population subgroup is imperative. The dispersion of services in this environment requires the provision of adequate transportation to assure the independence of older persons in the community. Therefore, it is anticipated that the present study will contribute to a greater understanding of what constitutes adequate transportation for the elderly, particularly in the suburban environment.

CHAPTER 3

THE CONCEPTUAL FRAMEWORK, RESEARCH QUESTIONS, AND METHODOLOGY

This chapter first offers a discussion of the person-environment conceptual framework that is utilized in this study. Specifically, M.P. Lawton's ecological model of aging is presented (Lawton & Nahemow, 1973; Lawton, 1980; Lawton, 1982; Lawton, 1985; Parmalee & Lawton, 1990). This model provides the foundation for the research questions which are introduced in the second section of the chapter. Thirdly, the methodology that is used to address the research questions of the present study is presented. The methodology includes a description of the study area and an outline of the organization of the field survey.

3.1 **The Conceptual Framework: The Person-Environment Interaction**

3.1.1 Person-Environment Theoretical Constructs

As was demonstrated in Chapter 2, research on transportation for the elderly population has not adequately examined how mobility needs are affected by both the capabilities of the older individual and the constraints of the living environment. The importance of addressing person-environment transactions, and the balancing of environmental demands with age-related individual competencies, in order to better understand the significance of environment for elderly persons has been recognized in the literature (Wister, 1989). As noted by Lawton (1980), conceptualizing the person-environment interaction provides a framework to search for ways of improving the functional level of older people, and concomitantly their quality of life through environmental means.

The focus of gerontological geography is to understand the experience of aging based on the symbiotic relationship between the individual and an environmental context (Rowles, 1986). Geographical investigation attempts to determine the outcome of the transaction between the person and environment. The application of environmental determinism to the study of aging contributes to a greater understanding of how older persons interpret their local environment, and how the environment affects their quality of life (Rudzitis, 1984). However, within the discipline of geography, theory has not been developed to test the person-environment transaction (Rowles, 1986). Therefore, a theoretical framework within the broader context of gerontology must be considered for this study.

Theoretical development of the person-environment interface was the result of attempts by psychologists, geographers, and architects to specify some of the links between people and their environments (Parmalee & Lawton, 1990). Kurt Lewin, a psychologist, was the first to conceptualize person-environment relations by formulating the ecological equation B = f(P, E) signifying that behaviour is both the function of the person and the environment (Lawton, 1980). While theories of environment and aging have built on this initial formulation, they remain in the early stages of development. A greater emphasis has been placed on the application of person-environment knowledge to policy and practice rather than on the development of new theoretical concepts (Parmalee & Lawton, 1990). For example, person-environment models which create environments that "fit" objective levels of competence have been adopted to solve problems of housing and community service delivery (Wister, 1989).

Despite the slow development of a person-environment theoretical framework, the most comprehensive model relating the individual, the environment, and aging has been proposed by Lawton and his associates (Wister, 1989; McPherson, 1990). Lawton's research on person-environment interaction has had the greatest impact on research and policy issues of housing for the elderly population (Wister, 1989). Therefore, the conceptual framework of this study is based on Lawton's ecological model of aging (Lawton & Nahemow, 1973; Lawton, 1980; Lawton, 1982; Lawton, 1985; Parmalee & Lawton, 1990).

3.1.2 The Ecological Model of Aging

The formulation of the ecological model of aging resulted from Lawton's examination of how the behaviour of older persons is affected by environmental dimensions, in addition to the biological, social, and personal deficits associated with the aging process (Lawton, 1982). He considered that the adaptation of a person to the environment, and the consequent alteration of the environment, is part of the process of human adaptation. More specifically, the aging process is identified as one element of this continual adaptation, that is adaptation to both the external environment and to changes in individual capabilities and functioning which take place during the life cycle (Lawton & Nahemow, 1973). Based on these observations, Lawton identifies the need for a theoretical framework that would establish a predictive model for the behaviour of older persons based on the interaction of the two basic elements of the individual and the environment (Lawton, 1982).

The development by Lawton and Nahemow (1973) of the ecological model of aging, also known as the environmental docility model, demonstrates that the behaviour and well-being of the elderly individual are the result of the dynamic balance between the demands imposed by the environment and the individual's ability to cope with those demands (Wister, 1989). The model describes the interrelationship between individual capability (the degree of competence) and the demands of the environment (environmental press) which are the major predictive components of the model (Lawton, 1982).

Competence is a multi-dimensional concept. The degree of individual competence consists of separate processes or abilities that enable the individual to respond adaptively to environmental demands. These processes are difficult to identify because their minimum and maximum limits may vary over time and are specific to each individual (Lawton & Nahemow, 1973). Nevertheless, the processes which most clearly represent competence were identified by Lawton to be biological health, sensory-perceptual capacity, motor skills, cognitive capacity and ego strength (Lawton, 1982). These domains of competence have a theoretical upper limit and according to Lawton (1980) an older person is more subject to reductions in competence than a younger adult. In later life, individual competence may decline as a result of losses in general health, as well as decrements in cognitive and sensory-motor functions (McPherson, 1990). These losses are compounded by external processes that also produce reductions in competence for the individual. These processes include social isolation, retirement, loss of income, widowhood, and ageism (Lawton, 1980).

Environmental press is defined as forces or stimuli in the environment that evoke a particular behavioural response (Lawton & Nahemow, 1973). The positive or negative quality of an environmental press is defined by the interacting individual. Therefore, some environments create great behavioural demands while others do not (Lawton, 1980). Although a categorization of the environment has not been developed, Lawton (1970) does suggest that there are five classifications of the environment: the personal environment; the group environment; the suprapersonal environment; the social environment; and the physical environment (Lawton, 1980). Accordingly, environmental press can be found in both social and physical surroundings (Wister, 1989).

The ecological model of aging proposes that behaviour or affective response is the outcome of the ecological equation of individual competence and environmental press. The behaviour outcome "may be either outwardly observable motoric behaviour or an inner affective response" (Lawton, 1982, 43). The behavioural response is considered to be the result of a press of a given magnitude acting upon an individual of a given level of competence. In the model, the level of individual competence ranges from low to high, while the degree of environmental press varies from weak to strong. The outcome of the competence-environment interaction leads to varying degrees of adaptive behaviour (McPherson, 1990). A state of congruence occurs when competence and environmental press are in balance. Concomitantly, an individual with a high level of competence is able to tolerate a stronger magnitude of environmental press. In contrast, an individual with a low level of competence may experience a greater impact of environmental factors. As the competence of the individual decreases, the proportion of his or her behaviour controlled by environmental forces increases (Lawton & Nahemow, 1973). If the level of environmental press increases, the ecological model of aging suggests that the competence level of an elderly person can be raised by introducing change into the environment (Lawton, 1980). Therefore, the value of the model is its demonstration of the dynamic relationship between the competence of the person and the kind of environment that can optimize the outcome (Lawton, 1989a). The theory's consideration of adaptation of the elderly individual provides a basis to "...search for ways of elevating behaviour and experienced quality of life through environmental means" (Lawton, 1980, 15).

One criticism of Lawton's ecological model of aging is directed to the assumption that individuals are passive and do not attempt to fulfill their needs (McPherson, 1990). In subsequent revisions of the model, Lawton (1989a) introduced concepts of proactivity and reactivity which recognize the individual's active shaping of his or her environment. Personal resources enable an individual to intervene with proactive behaviour, whereas reactive behaviour is simply a response to environmental press (Wister, 1989). The incorporation of the concept of proactivity introduced a component of planful behaviour that had been lacking in previous person-environment models (Parmalee & Lawton, 1990).

The continuing conceptualization of the nature of the person-environment relationship led Lawton to revise his ecological model further by addressing the dependence of the model on the global concepts of competence and environmental press. He stated that the definitions of these terms were poorly conceptualized, and the model was difficult to operationalize when the exact type of competence and environmental press could not be identified (Lawton & Nahemow, 1973; Lawton, 1982). Consequently, Parmalee and Lawton's (1990) updated version of the ecological model of aging posits a dialectic relationship between the individual and his or her environment. In this revision the competence dimension is redefined as "autonomy" and the environmental press dimension is redefined as "security". According to the revised model "...autonomy and security together form a dialectic that lies at the heart of person-environment relations in later life" (Parmalee & Lawton, 1990, 465-466).

At the individual level, the focus is on autonomy and the ability of an elderly person to maintain independence within the community (Parmalee & Lawton, 1990). Autonomy is the state in which the person feels capable of effecting independent action and pursuing goals by using his or her own resources. The term implies that an individual has freedom of choice within his or her own life space (Parmalee & Lawton, 1990).

Security is the state in which the pursuit of goals is dependent on the physical, social, and interpersonal resources of the environment. The term emphasizes physical safety, psychological peace of mind, and communality (Parmalee & Lawton, 1990). A secure environment offers dependable physical and social resources. Therefore, the maintenance of autonomy is subject to the level of security afforded by the environment.

Parmalee and Lawton (1990) conceptualized autonomy and security as poles of a dialectic. In this approach, autonomy and security form a single continuum whereby the poles coexist in a dynamic equilibrium. Therefore, in old age the person-environment relationship is constantly being balanced. The aging process creates a greater need for physical security and a more manageable environment. However, the autonomy of the individual must be maintained to ensure effective adaptation. The outcome of a person-environment transaction is dependent upon whether security or autonomy aspects are maximized, and "the tension between security and autonomy operates continuously so that any period of apparent equilibrium is short lived" (Parmalee & Lawton, 1990, 469). The postulation of the person-environment congruency that adaptation or behaviour is maximized when the characteristics of the environment are in equilibrium with individual needs and preferences "...implicitly affirms the importance of both autonomy and security for normal functioning" (Parmalee & Lawton, 1990, 469).

In summary, the ecological model of aging describes the relationship between the individual and the environment (Lawton & Nahemow, 1973; Lawton, 1980; Lawton, 1982; Lawton, 1985; Parmalee & Lawton, 1990). The model predicts the behaviour resulting from the person-environment interaction through the concepts of autonomy or competence, and security or environmental press. The purpose of the present study is to gain a more comprehensive understanding of the dynamic relationship between the person and environment and its effect on the transportation requirements of the urban elderly. Reductions in competence may affect the ability of elderly persons to access the transportation required for their mobility needs. The autonomy of an older person is reflected in his or her ability to access appropriate transportation which, in turn, is contingent upon the individual's physical, social and financial resources. In addition to the competency of the individual, the focus of this study will be on the physical environment, and more specifically the security afforded by residential location and its effect on the transportation provisions for the urban elderly. Transportation provision defines the level of security provided by the environment.

3.1.3 The Application of the Ecological Model to the Present Study

The development of the ecological model of aging was the result of years of research on a variety of housing issues for older persons. Lawton and his associates developed the model to enable the identification of the most appropriate housing environments for elderly individuals (McPherson, 1990). As a result, the utilization of the ecological model of aging has been predominantly within the domain of housing and its association with environmental solutions for the elderly population (Lawton & Nahemow, 1973). In the present study, the application of the model is broadened to include the issue of transportation and how this environmental component affects the ability of seniors to maintain their independence within the community.

Lawton (1982) indicated that it was natural that the early concern of the study of environment and aging was directed towards housing and relocation because these factors may precipitate dramatic environmental changes for older persons. It was suggested that the impact of new housing is of interest because of its implications for improving the lives of older people (Lawton & Nahemow, 1973). New housing for elderly persons represents not only a physical change, but also may result in a change in social interaction. Therefore, both physical and social processes must be evaluated when considering the effect of change of residence on elderly persons (Lawton & Nahemow, 1973).

The application of the ecological model of aging to the housing environment is demonstrated by studies focusing on the effect of senior housing environments on the elderly population. Carp (1966), for example, found that satisfaction with housing and life-sustaining resources, as well as social interaction and perceived health, had improved for elderly tenants when they moved to a model residence. Rosow (1967) studied the social interaction patterns of elderly apartment dwellers and found that the amount of contact was a direct function of the age density of the structure. In a similar study, Lawton and Simon (1968) demonstrated that there was a strong proximity effect on choice of friends, and that lowered competence resulted in a smaller social space for friendship. In another study, Lawton (1969) proposed that individuals match their competencies with the resources of the environment in which they choose to live.

His hypothesis was supported by empirical data that demonstrated that less competent individuals choose housing with more services. In a later study, Lawton (1978) found that increased housing satisfaction and functional ability were associated with improvement in dwelling-unit ambiance and change to a smaller unit. It was concluded that environment was a significant element in the determination of the well-being of the elderly.

Despite the early employment of the ecological model of aging in housing research, "...there have been more applications of person-environment knowledge to policy and practice than new theoretical concepts, interesting research methodologies, or major new research findings" (Parmalee & Lawton, 1990, 464). According to Parmalee and Lawton (1990), the decrease in empirical research on the effect of environment upon aging people was the result of the cessation of federally assisted housing program development in the United States since 1980. As was demonstrated above, the tradition of person-environment research has been to study planned environments of the elderly. It is significant that although funding for community development for the elderly has slowed, researchers have not turned their attention to older persons living in ordinary communities (Parmalee & Lawton, 1990). There have been few attempts to use the ecological model of aging to predict environmental adaptation precipitated by community-living elderly (Wister, 1989). Ecological studies using the community as the unit of analysis have typically not considered the elderly as the primary focus. Therefore, there is a definite need to extend the realm of research on environment and aging to include "...exploration of the interaction of the individual with the community and other larger structures" (Lawton and Nahemow, 1973, 657).

The present study attempts to address the absence of research on the interaction of the elderly individual with the larger environment by focusing on the transportation requirements of older persons that enable them to maintain their mobility within the community. The emphasis of environmental research on aging has been on the effect of the environment of the elderly person's residence. There is very little attention given to the surrounding community where the older person lives (Lawton & Nahemow, 1973). By analyzing how transportation provision within the urban environment affects the ability of an older person to access essential resources, the study is extending research of environment and aging to incorporate the community beyond the home of the elderly person. The inclusion of the larger environment in the analysis suggests that a greater understanding of ways to maintain the independence of the elderly within the community will be gained. Furthermore, an increased understanding of the needs of the elderly within the community based on the relationship of the person and environment will contribute to Lawton's primary objective in developing the ecological model of aging:

> Knowledge about environmental cognition should clearly lead to better planning decisions for elderly individuals, a wider range of choices for them, and better community planning processes. It should also add to our general knowledge about the relationship between the personal and environmental aspects of the process of aging (Lawton, 1982, 56).

Accordingly, the purpose of the present study is to evaluate the transportation requirements of the urban elderly within the framework of the autonomy-security dialectic relationship of the person and environment. The independence within the community of an older person is contingent on his or her ability to gain access to those services and activities that are essential for normal physical and psychological functioning. Accessibility to these services and activities is conditional upon the availability of transportation within the community. It is the assertion of this study that the transportation needs of the elderly are based on the equilibrium between autonomy and security. An elderly individual's ability to access required transportation is dependent on his or her physical, social, and financial resources, as well as the transportation resources that are provided by the environment. If the resources of the individual are appropriate to access the transportation available in the environment then the autonomy of the individual and the security of the environment are in equilibrium.

This study will evaluate how security affects the autonomy of the elderly individual by assisting or inhibiting his or her ability to access the services and activities essential to normal functioning. It is proposed that the provision of transportation in the environment varies according to residential location. There are fewer transportation options in suburban areas where service and residential locations are widely dispersed. If the personal resources of an elderly individual are adequate, the lack of transportation options dictated by residential location can be overcome and the autonomy of the individual is maintained. If, however, the resources of the individual are inadequate, the mobility of the older person, and therefore his or her autonomy, are reduced as a result of the decreased environmental security created by limited transportation options specific to residential location. Based on the dialectic relationship proposed by Parmalee and Lawton (1990), if transportation provision is augmented, security afforded by the environment will be increased thereby assuring the autonomy of the elderly individual.

In addition to the present study's broader definition of environment to include the community, the focus on the effect of residential location provides a further contribution to the development of the ecological model of aging. The analysis of the effect of varying residential locations furnishes a new dimension as variation in environment has not been considered as a component of the outcome of the person-environment interaction (Lawton & Nahemow, 1973). It is the assertion of this study that the variation in residential location results in different levels of transportation provision. The emphasis on the significance of residential location is supported by the autonomy-security dialectic as Parmalee and Lawton (1990) point out that:

> The variety of environments inhabited by older people reflects the autonomy-security dialectic inasmuch as differing housing types afford differing balances between autonomy and security. A brief review of major types of residential environments will demonstrate that they vary greatly in their ability to afford person-environment congruence in people of any particular level of competence, as well as in the breadth of the autonomy-security continuum they offer. A dominant theme is that of aging-in-place - the mutual process whereby both the older person and the environment change, the only constant being geographic location. As we shall see, aging-in-place can create disequilibrium, in some cases impeding a satisfactory balance between autonomy and security needs (Parmalee & Lawton, 1990, 471).

This highlights the importance of evaluating the effect of residential location on the transportation requirements of the urban elderly. More specifically, it is crucial to evaluate the effect of suburbanization on the transportation needs of the urban elderly.

In this study the balance between the autonomy and security needs of the older individual is exemplified by the provision of transportation that addresses both the competence of the individual and the demands of the environment resulting from residential location.

In summary, the contribution of the present study to the ecological model of aging is its extension of the definition of environment to include the broader community beyond the immediate housing environment of the elderly person. In addition, the study examines the effect of locational variation on the relationship between the person and environment. Moreover, the autonomy-security dialectic of the ecological model of aging provides a conceptual framework to evaluate the transportation requirements of the urban elderly. Autonomy is defined as the personal resources which enable the individual to access transportation and thereby maintain their independence within the community. Security is defined as the transportation provided within the environment. In the urban environment the level of transportation provision varies according to residential location. The application of the dimensions of autonomy and security to the present study is developed further when the research questions are presented in the following section.

3.2 The Research Questions

As discussed in the previous section, the study of environment and aging using person-environment models has focused on housing for the elderly population. It is significant, however, that Lawton has identified transportation as an applicable research area within the domain of ecology and aging (Lawton & Nahemow, 1973; Lawton, 1980). Transportation systems have been considered the dominion of transportation engineers. However, the interest in the effect of the physical environment on behaviour has provided a humanistic orientation to the concerns of the transportation needs of the elderly (Lawton & Nahemow, 1973).

According to Lawton and Nahemow (1973), the availability of appropriate transportation becomes more critical as the aging process continues and independence in the community becomes threatened. Moreover, Lawton (1980) recognized that the existence of services and resources in the community may only be operationalized if sufficient transportation is provided within the environment. Carp (1970), for example, found that many older persons who mentioned the need for services explained that the problem was not the absence of such services but the lack of transportation in order to access them. Sufficient transportation is dependent upon a balance between the competence level of the individual and the living environment. If there is a lack of equilibrium between the autonomy of the individual and the security of the environment, the person will become transportation disadvantaged and resource deprived.

Lawton (1980) concluded that those elderly individuals who have the greatest level of mobility are those with 1) sufficient income and good health to continue to drive themselves, 2) a diverse available public transit, and 3) proximate services and social contacts. Conversely, Lawton (1980) discussed why transportation provision is often inadequate for the needs of the elderly. From an environmental perspective, factors of transportation-deprivation include the decrease of security caused by the lack of nearby public transportation. In addition, autonomy can be diminished not only if the individual experiences physical limitations that cause mobility difficulties, but also financial barriers.

The autonomy-security dialectic provides the structure for this study. Transportation behaviour is predicted by a variety of personal and environmental variables (Lawton, 1980). Autonomy, or competence, is conceptualized as the socio-demographic characteristics and health resources of the individual which either assist or inhibit access to transportation. With respect to data analysis, these resources of the person are measured using a variety of variables including age, gender, marital status, health and functional conditions, and availability of transportation resources. In addition, security is provided by the environment in the form of transportation. The provision of adequate transportation is dependent upon the resources offered by the environment where the residence is located. Therefore, the security of the environment is defined by the provision of transportation at a specific residential location.

Lawton (1980) referred to transportation behaviours that can be measured to analyze the effect of the autonomy-security dialectic on the transportation needs of the elderly. The response of the individual to both the components of autonomy and security can be observed in the frequency of use of transportation modes, as well as mobility patterns reflected by the frequency of travel to service and activity sites, and the distance an individual travels to access service and activity sites. These empirical behavioural dimensions provide elements for the conceptualization of the research questions that are developed in this section.

In summary, the present research evaluates whether access to mobility resources is determined by both individual competency and the environmental factors of residential location. The study of the varying transportation requirements of the urban elderly is based on the examination of transportation behaviours including the use of transportation modes, trip-making activities, and the distance travelled to service and activity sites. Relevant analysis is guided by the following research questions.

3.2.1 Research Question 1: Frequency of Use of Transportation Modes

Easy access to transportation is identified by Lawton (1973) as a critical link in the ability of elderly persons to remain functioning members of society. Therefore, it is important to examine the types of transportation that are used by the elderly. Based on a consideration of a national study conducted in 1969-1970, Lawton (1980) concludes that the automobile is the most frequent mode used by the elderly, followed by public transit, walking, and rides from family and friends. In addition, Carp (1974) found that among elderly city-centre residents, 50 percent walked everyday, while in the suburbs 50 percent of seniors never walked. According to Lawton (1980), this finding, together with the aging of the suburbs, "...presages increasing problems with access to resources among older suburban residents of the future" (Lawton, 1980, 153). Therefore, it is imperative to determine the importance of transportation modes as each mode affords varying advantages and problems for the elderly according to the dimensions of autonomy and security. This demonstrates the need to evaluate the frequency of use of transportation modes. On the basis of Lawton's consideration of the empirical value of the frequency of use of transportation modes, the first research question encompasses an analysis of this behaviour.

The dimensions of autonomy and their effect on the use of transportation modes is analyzed in the first part of Research Question 1:

> Part a) What is the influence of socio-demographic characteristics and health resources on the frequency of use of transportation modes for the urban elderly?

The effect of the level of security afforded by different environmental locations is the focus of the examination in the second part of Research Question 1:

> Part b) Are there differences in the frequency of use of transportation modes by the urban elderly according to geographic location?

3.2.2 Research Question 2: Frequency of Travel to Service and Activity Sites

The provision of transportation is crucial to enable seniors to access essential services and maintain social contacts. Lawton (1980) identifies trip frequency to be an important indicator of transportation behaviour because it demonstrates whether the elderly are able to access service and activity sites. The autonomy and security dimensions which affect the frequency of travel are illustrated by Carp's (1974) findings that high frequency of trips is most associated with good health, distance from the city centre, and car ownership. Therefore, the second research question analyzes the frequency of travel to service and activity sites of the respondents in the study.

Research Question 2 first examines the effect of the autonomy of the individual on the frequency of travel to service and activity sites:

> Part a) Is the frequency of trip-making to essential services and social activity sites affected by socio-demographic characteristics and health resources of the urban elderly?

The level of security provided by the three separate environments is addressed in the second part of Research Question 2:

> Part b) Is the frequency of trip-making by the urban elderly affected by geographic location?

3.2.3 Research Question 3: Distance Travelled to Service and Activity Sites

Lawton (1980) referred to transportation as a linking mechanism that bridges the distance between the consumer and the resource. The distance a person travels is dependent on the ability of the individual, as well as the requirements of the environment. In a study conducted by Schooler (1969), characteristics of the neighbourhood environment were investigated using data from a national sample of older persons which included distance travelled to services. As Lawton (1980) noted, distance will become an increasingly important factor as the aging of the suburbs results in accelerating problems of access to resources among older suburban residents. The maintenance of the individual's autonomy is dependent on the security afforded by the environment in the form of adequate transportation to travel to services and social opportunities that are located at relatively long distances from the place of residence. Therefore, the distance elderly persons travel to access service and activity sites is an important indicator of travel behaviour. The third research question considers the distance travelled by seniors to access service and activity sites.

Research Question 3 first examines whether personal variables affect the distance travelled by the individual:

> Part a) What is the influence of socio-demographic characteristics and health resources on the distance travelled to essential services and activity sites for the urban elderly?

Finally, the second part of Research Question 3 considers the effect of geographic location on the distance required to travel for service and social needs:

> Part b) Are there differences in the distance travelled to essential services and activity sites by the urban elderly according to geographic location?

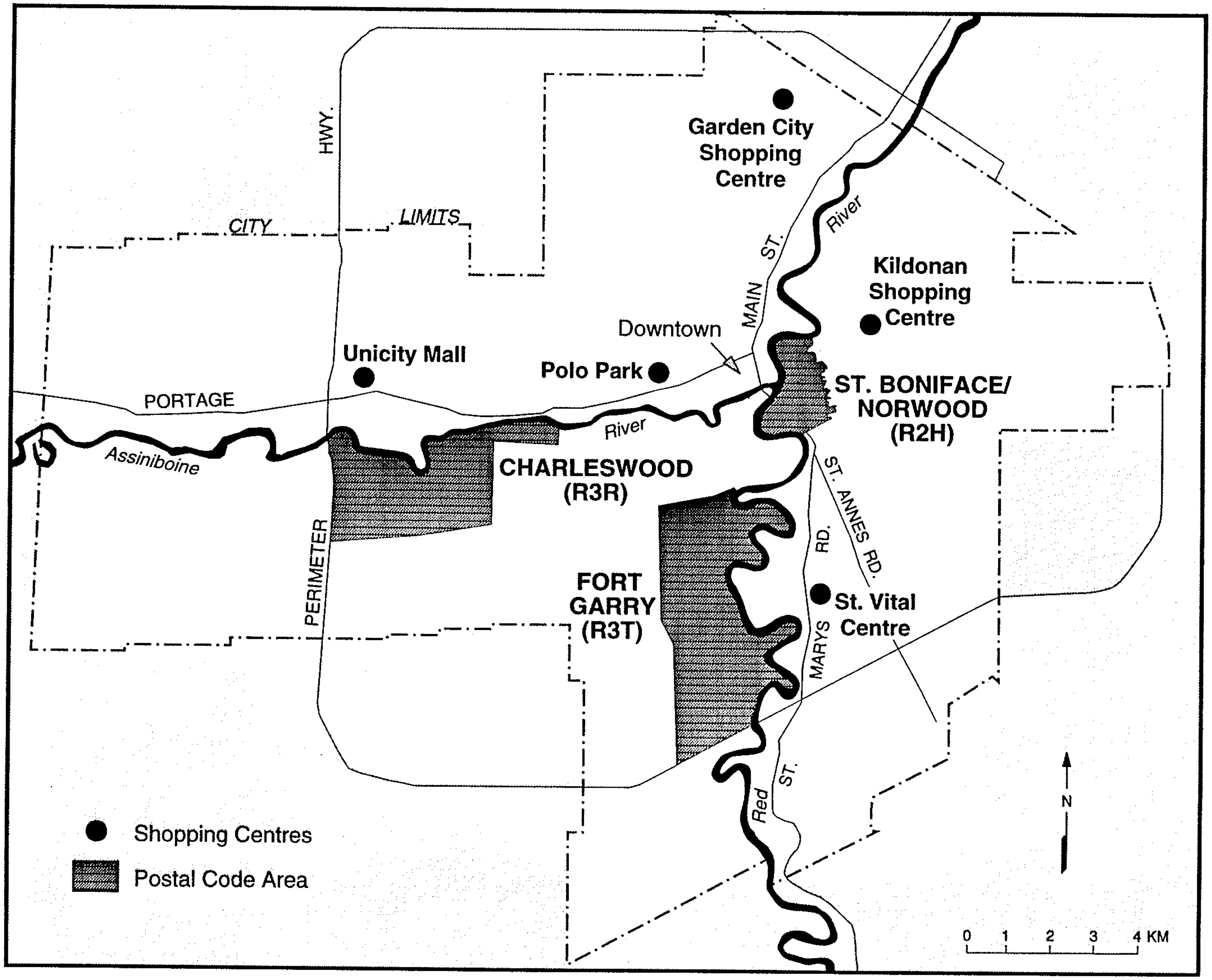
3.3 **Methodology**

3.3.1 Study Area and Sample Areas

The Sample for this study was drawn from a list provided by the Manitoba Health Services Commission consisting of the population 65 years and over for three postal code areas in Winnipeg, Manitoba. This list was originally obtained in 1993. Therefore, the Sample population was in fact 67 years and over in 1995 when the present survey was conducted.

Winnipeg is the capital and largest settlement of the province of Manitoba. The total population for the Canadian Metropolitan Area (CMA) of Winnipeg was 652,354 in 1991 (Statistics Canada, 1992). The proportion of persons 65 and over in the CMA increased from 11.5 percent to 12.9 percent during the period between 1981 and 1991.

Figure 1: Location of Study Areas in Winnipeg, Manitoba



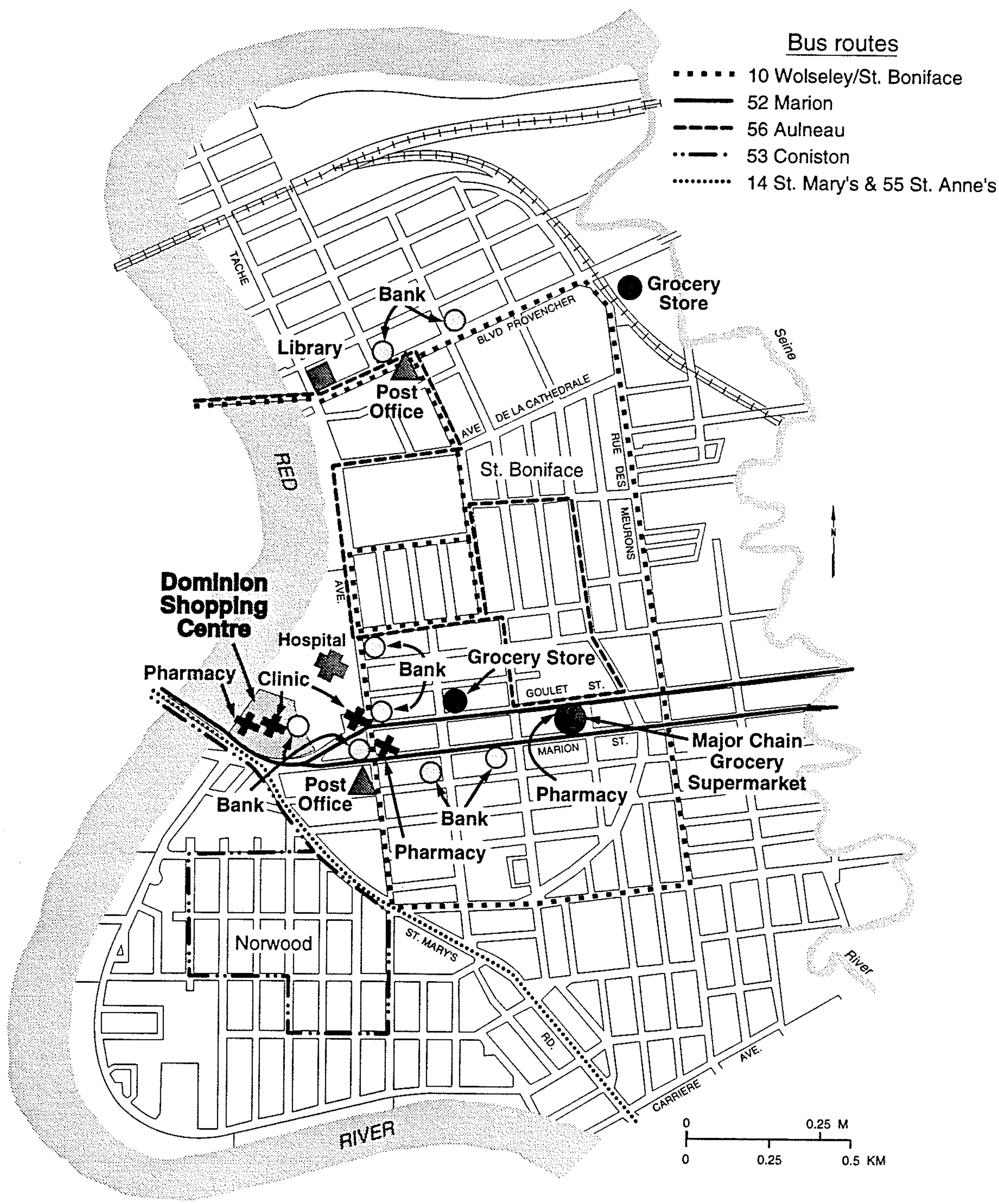
This increase is significant for two reasons. First, it demonstrates that the demographic phenomenon of population aging is occurring within the study area. Secondly, the proportion of the elderly population in Winnipeg is higher than the national average of the 25 CMA's which increased from 9.3 percent to 11.1 percent during the same period (Statistics Canada, 1981, 1991). This suggests that geographical investigation of the elderly population is imperative in this urban centre.

There are 34 designated postal code areas, or Forward Sortation Units (FSU), within Winnipeg. These areal units are defined by Canada Post Corporation for use in sorting mail. In order to make comparisons between the inner and outer suburbs of Winnipeg, three separate areas were defined including the postal code areas of R2H (St.Boniface), R3T (Fort Garry) and R3R (Charleswood). The postal code areas are highlighted in Figure 1.

3.3.1.1 St. Boniface

The postal code area of R2H includes the two sub-areas of St. Boniface and Norwood (Figure 1). In this postal code area 20.7% of the population were 65 years of age and over in 1994 (Manitoba Health, 1994). The postal code area can be categorized as an inner suburb because it is located directly across the Red River from the downtown district of Winnipeg. It is also an older suburb as the development of St. Boniface is closely tied to the early history of Winnipeg (Levin, 1993). As a result, it is not characterized by the low density development that is characteristic of the recent suburbanization of North American urban centres. Figure 1 demonstrates that

Figure 2: St. Boniface/Norwood Sub-Area: Location of Service Resources



St. Boniface/Norwood consists of a considerably smaller region in comparison to the other two areas under investigation. Therefore, services are concentrated and in close proximity to the residents of St. Boniface. The downtown services are accessible to St. Boniface and can be reached within five minutes by car, ten minutes by bus, and approximately thirty minutes by walking.

The relatively high density environment is demonstrated further by the concentration of services within a four block radius along the streets of Tache, Marion and Goulet in St. Boniface (Figure 2). These services include two grocery stores, several banks and pharmacies, hair salons, medical clinics, a hospital, a variety of restaurants and a small retail mall. Provencher Street is the second major street in St. Boniface where a smaller concentration of services including a grocery store, post office, library, and banks are located.

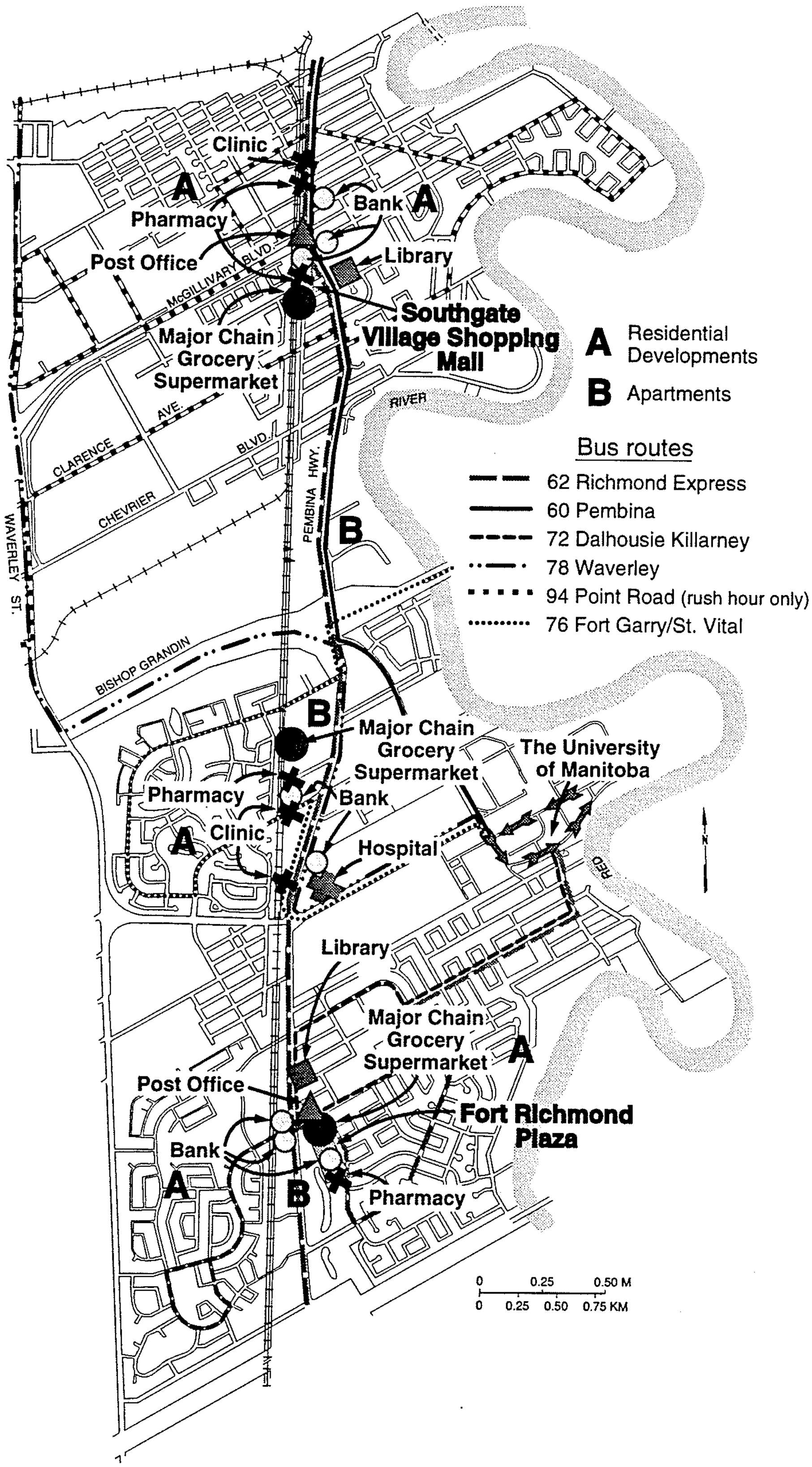
The high concentration of services within the R2H postal code implies that its residents have ready access to necessary health and retail facilities and, possibly, social contacts and recreational activities. However, it is important to distinguish the variation in access between the two sub-areas of St. Boniface and Norwood. The residential area of what is termed "old" St. Boniface borders on the concentration of services. In contrast, the boundaries of the Norwood residential area are situated approximately eight blocks from the service area. In addition, the main thoroughfare of St. Mary's Road may represent a barrier for those elderly persons living in Norwood who may encounter difficulties crossing the busy street to reach the concentration of services. Therefore, accessibility to service resources vary considerably among residents of postal code area R2H. Walking to needed services may be more feasible for residents of old St. Boniface in comparison to those living in Norwood who may be more dependent on other means of transportation.

Figure 2 illustrates that residents of St. Boniface and Norwood have similar degrees of access to public transit routes. The old section of St. Boniface has two bus routes that traverse the residential area. However, these routes are directed to the downtown area and do not provide easy access to the concentration of services within St. Boniface. Similarly, the bus route that covers the Norwood residential area affords a direct link with downtown Winnipeg without providing access to the local service concentration centred around Goulet, Tache and Marion. In addition, the Norwood residents are reasonably close to two bus routes along St. Mary's Road that provide access to the downtown area.

3.3.1.2 Fort Garry

The postal code area of R3T also encompasses two sub-areas (Figure 1). Fort Garry is a large outer suburb of Winnipeg and its boundaries extend to the southern periphery of the city. In 1994, 11.2% of the population of the postal code area were 65 years of age and older (Manitoba Health, 1994). The principle thoroughfare of the area is the north-south Pembina Highway. The majority of services within Fort Garry are located along this highway in a dispersed linear pattern. Thus, most services within this suburb are not located within easy walking distance of the place of residence.

Figure 3: Fort Garry Sub-Area: Location of Service Resources



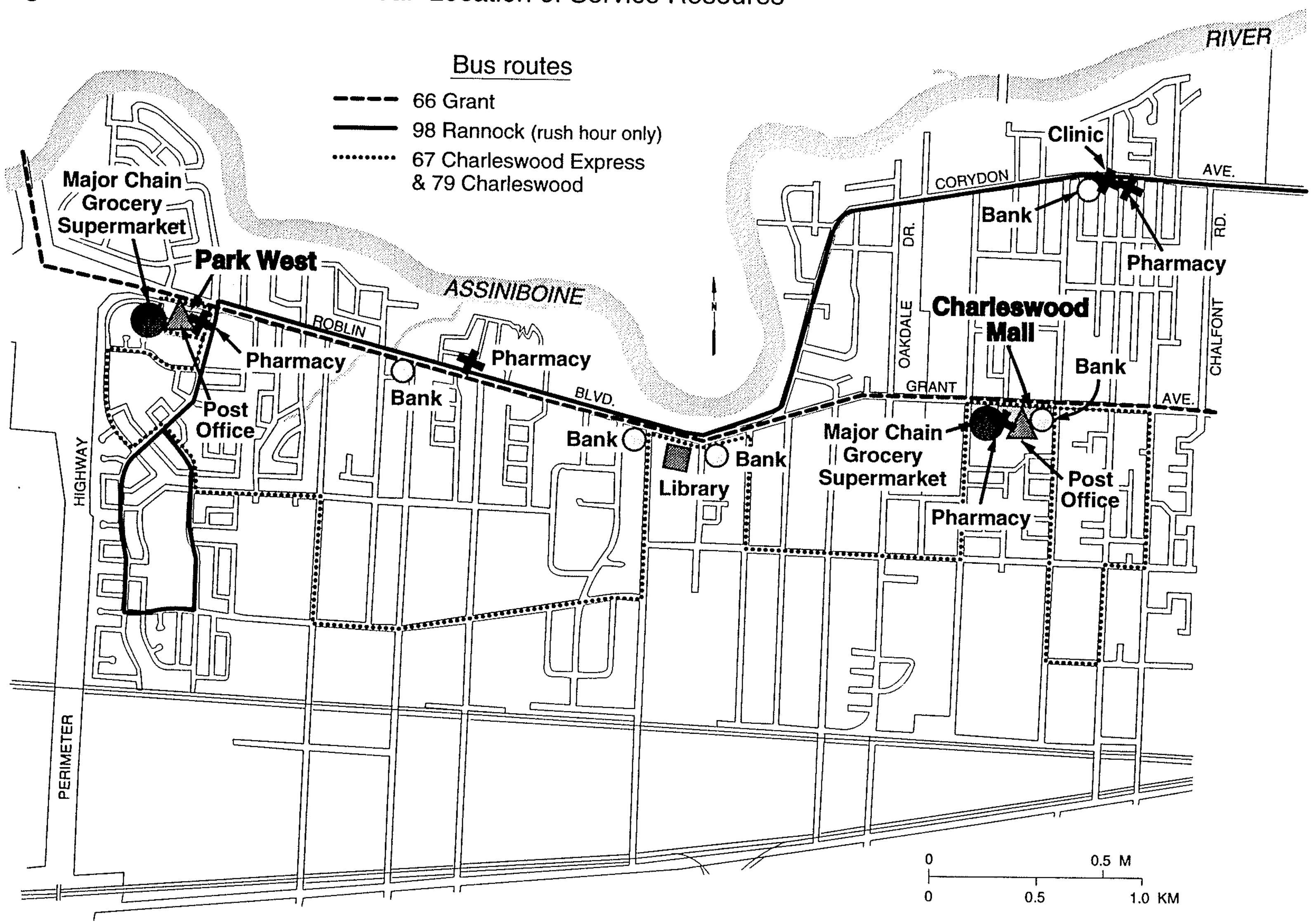
There are numerous residential districts within Fort Garry that are located within the catchment area of Pembina Highway (Figure 3). These districts are grouped as sub-area A because of the similarities of their low density development environments. They have been developed within the last thirty to forty years with the general assumption that their residents are automobile drivers. Therefore, services are located beyond easy walking distance and are dispersed along Pembina Highway so that health, social and retail needs cannot be satisfied at one location. In addition, these areas are serviced by feeder bus routes that have sporadic schedules (in some cases they operate only during rush hour), providing connections only to bus routes on Pembina Highway. As Figure 3 illustrates, these feeder routes do not cover the entire residential areas thereby creating long walking distances between the bus stop and the homes of the residents. As a result, the bus service is excluded as a viable transportation option for many seniors living in these residential areas.

Sub-area B of Fort Garry consists of the many apartment buildings located along Pembina Highway (Figure 3). Although these apartments are not classified as seniors housing, it was discovered during the study that many of the buildings are occupied mainly by persons over the age of 55. It is significant that although the apartments are located along the main thoroughfare of Fort Garry, most services are not located within walking distance because of the dispersed development. The congestion of traffic on Pembina Highway may also be a deterrent for elderly apartment dwellers to walk to service areas. Walking to services In addition, residents of these apartments However, unlike the residential districts, the residents of these apartment buildings have an excellent bus service that provides them with access to the services within the local area, in addition to downtown Winnipeg. The quality of bus service is extremely good because Pembina Highway is an important route to the University of Manitoba (Figure 3). It should also be noted that there are special transportation services available in some of the apartment buildings that have a majority of senior tenants. For instance, the local Safeway supermarket store provides free van service to their store once a week from some of the apartment buildings. In addition, there is a private van service available for the tenants in some of these apartment blocks. Therefore, although the degree of dispersal of services is similar for both sub-areas of Fort Garry, the sub-area of apartments on Pembina Highway has a greater number of transportation options. In sub-area A the automobile is the only option for many because of the incongruity between the bus service schedules and routes, and the needs of the elderly population living in the suburban environment.

3.3.1.3 Charleswood

The postal code area of R3R includes the outer suburb of Charleswood (Figure 1). Specifically, it is located in west Winnipeg and extends to the western boundary of the city. In this postal code area 9.1% of the population were 65 years of age and over in 1994 (Manitoba Health, 1994). Unlike the previous sample areas discussed, there is only one residential environment within Charleswood. Charleswood represents the lowest density development of the three sample areas included in this research. Its physical lay-out presents the greatest obstacle for seniors with mobility problems. This

Figure 4: Charleswood Sub-Area: Location of Service Resoures



residential area was developed after the Second World War when the Veterans Land Act allowed veterans to acquire large pieces of land for low prices[1]. The result of this development has been large residential lots and extremely long streets often separated by considerable distances from Roblin Boulevard and Grant Avenue, the main thoroughfares of Charleswood.

While services are dispersed along the main streets of Charleswood, three concentrations can be identified (Figure 4). The Charleswood Mall on Grant Avenue is the main service centre and includes both a grocery and department store, as well as a variety of smaller service facilities. The second concentration is found in the Charleswood "village" on Corydon Avenue where there are a variety of retail outlets and restaurants. Of particular importance in this area is the Charleswood Medical Clinic. Finally, there is a smaller grocery store and retail mall at the western periphery of the area on Roblin Boulevard.

Walking to access services is not a transportation option in Charleswood unless a person resides in close proximity to one of the three service concentrations mentioned above. However, most residents do not live in close proximity because of the long streets that are characteristic of Charleswood. As in Fort Garry, the bus service is also not an option for many of the seniors in the area. There are three bus routes in Charleswood that provide access to the local concentrations of services, as well as to the downtown area. However, access to these buses is impeded again by the long distances to the routes. There is a feeder route that covers parts of the residential area

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[1] This information was provided by the numerous Charleswood respondents who had acquired their land in this manner.

and provides access to the Charleswood Mall. However, as it does not cover all of Charleswood, the distance to the bus stop is prohibitive for many seniors who reside in the area. In addition, the feeder service is only available in rush hour when most seniors do not require transportation services. Therefore, the only transportation option feasible to most seniors in Charleswood is the automobile.

3.3.1.4 Summary: The Study Area and Sample Areas

As the description of the sample areas illustrates, St. Boniface, Fort Garry and Charleswood are representative of different residential environments. Access to services in these suburbs is dependent upon the proximity of residence to service outlets and the transportation options that are available. It is proposed that the older inner suburb of St. Boniface is characteristic of higher density development and that the spatial concentration of services and residences enhances accessibility. In contrast, the outer suburbs of Fort Garry and Charleswood are representative of low density development that hinders access for older persons because of the spatial separation of service facilities and residences.

3.3.2 Field Survey

3.3.2.1 Sampling Procedures

The first phase of the sampling procedure consisted of establishing a list of potential respondents to participate in the interview survey. The Manitoba Health Services Commission listing was used to draw names of potential respondents from the three sample sub-areas. For each sub-area, a name was randomly selected from the first five names on the list. After the selection of the first name, the remainder of the names were selected by a systematic sampling design. Every fifth name was chosen commencing with the fifth name after the first name to be selected. As the lists were previously used in other research those names that had already been selected were omitted from the sample.

One important consideration of the sample design was to ensure that only community-dwelling seniors were selected. The mobility requirements of those elderly who live in senior housing is distinct from that of community-dwelling seniors because of the variety of services that are available at many senior housing sites such as grocery trucks, bank services, and recreational facilities. The transportation requirements of the residents of senior housing are diminished because some of their service needs are met within the residence. Their mobility requirements are not comparable to the community-dwelling elderly who must travel more frequently to access services. As a result, names on the Manitoba Health Services Commission list with addresses at senior housing complexes were omitted from the sampling process. However, names from age-integrated apartment buildings were considered eligible for inclusion in the sample. It was discovered during the data collection that some of these residences do provide special transportation services for seniors.

Once potential respondents were selected, their addresses were verified in the 1995 Winnipeg telephone book to ensure that their place of residence had not changed since 1993 when the list was produced. A cover letter (Appendix A-1) was sent to the selected names to describe the research project. The letter explained that the objective of the study was to investigate the transportation needs of the elderly population in different areas of Winnipeg. It was stressed to the potential respondent that their personal experiences and ideas would be valuable to the research. It was also stressed that the questions would focus on their use of transportation, and the services accessed while using transportation. Finally, the potential respondent was told that there would be a follow-up phone call to determine whether he or she was willing to participate in the study.

A follow-up phone call was made approximately one week after the letter was sent. If the potential respondent was interested in participating in the study, an appointment time was then arranged. Data were elicited by means of face-to-face interviews during the period from July-December, 1995. Interviews were conducted by the author in the homes of the respondents, and, in a few cases, in coffee shops. The average length of the interviews was forty-two minutes, but ranged from twenty minutes to two hours.

Ethical approval to conduct this research was granted by the University of Manitoba's Faculty of Arts Ethical Review Committee. This approval was based on the committee's consideration of this study's questionnaire to be described later in this chapter. Consent by the respondents was deemed to have been obtained by their agreement to participate.

3.3.2.2 Response Rates

In total 364 potential respondents were sent a letter to request their participation in the research. Interviews were completed by a total of 105 respondents. In each sample area 35 respondents were interviewed. The overall response rate was 28.9%. The reasons for non-responses can be broken down as follows: 51.7% refused to be interviewed; 12.9% could not be contacted; and 6.7% could not speak English (Table 1).

TABLE 1:
Response Rates By Study Area

	St. Boniface **% (n)**	Fort Garry **% (n)**	Charleswood **% (n)**	Total **% (N)**
Refusals	47.14 (66)	62.28 (71)	46.36 (51)	51.65 (188)
No contact	12.14 (17)	6.14 (7)	20.9 (23)	12.91 (47)
No English	15.71 (22)	0.88 (1)	0.91 (1)	6.59 (24)
Total	74.99 (105)	69.3 (79)	68.17 (75)	71.15 (259)
RESPONSE RATE	25.0 (35)	30.7 (35)	31.82 (35)	28.85 (105)

There are variations in the response rate when the three sample areas are compared. The Charleswood rate of 31.8% was the highest of the three areas. With respect to the breakdown of non-responses in Charleswood, 46.4% of the potential respondents refused to be interviewed, 20.9% could not be contacted, and only 0.9% could not speak English (Table 1).

Fort Garry registered a response rate of 30.7%. This area had a higher rate of refusal than Charleswood with 62.3% of the potential respondents refusing to be interviewed. Only 6.14% could not be contacted, and 0.88% could not speak English (Table 1).

St. Boniface recorded the lowest response rate of 25.0%. Of particular significance in this area were the 15.7% of potential respondents who were not interviewed because they could not speak English. The refusal rate was 47.1% of potential respondents, while 12.1% could not be contacted (Table 1).

For the entire sample, refusal to be interviewed represents the greatest number of non-responses. The categorization of refusal included both those potential respondents who chose not to participate in the study, as well as those who indicated that illness prevented them from participating. With respect to the "unable to contact" category, it was found that inability to contact potential respondents was a greater problem during the summer vacation months. As already indicated, non-responses due to the inability to speak English were most prominent in St. Boniface where there is a large French-speaking population.

3.3.2.3 Administration of the Questionnaire

The questionnaire (Appendix A-2) consisted of seven sections that obtained information about the respondent's housing and service environment, transportation use, perceptions of the adequacy of bus transportation, functional level, health status, life satisfaction, and socio-demographic characteristics. The interview schedule included both structured and open-ended questions. Sources for this questionnaire included a variety of questionnaires used previously for other research projects at the Centre on Aging at the University of Manitoba, as well as questions by the author.

The first section of the questionnaire involved the examination of the housing and service environment of the respondent (Questions 1 to 6). First the characteristics of the respondents' housing environment were considered. The respondents were asked about the type of housing they live in and the range of responses consisted of "detached", "semi-detached", "apartment", "high-rise", or "boarding home". They were also asked whether they live in seniors-only housing, which the respondent indicated by a "yes" or "no" response. The tenancy of the dwelling where the respondents live was determined by the responses of "own" or "rent". In addition, the respondents were asked to indicate how long they have lived in the dwelling and whether their previous residence was located "in the same neighbourhood", "in Winnipeg", or "in a different city". Open-ended questions were included to discuss the factors which led to the move to their present residence, as well as the reasons why they would consider moving from their present address.

The composition of the respondent's household was also considered. The respondents were asked if they live with anyone else, and if the answer was affirmative, they were asked how many people live with them. In addition, they were asked about their relationship to the other resident or residents of the home.

As an introduction to subsequent discussions on transportation, the respondents were asked how many automobiles were in the household. They were then asked if they drove which they indicated by a "yes" or "no" response. If the respondent did not drive, an open-ended question was included to discuss the reasons why they do not drive.

Following the questions concerning the housing environment, the components of the service environment surrounding the place of residence were discussed (Questions 7). The respondents were asked whether they considered it important to live in close proximity to a food store, bank, medical centre, library, pharmacy, senior centre, bus stop, park, post office, and friends, family and other seniors. The choice of responses included "very important", "slightly important", and "not important". The respondents were then asked if these service and activity opportunities were located close to their place of residence which they indicated by a "yes" or "no" response. It should be noted that when the respondents were asked if the service and activity sites were in proximity to their home, the term "close by" was defined independently by each respondent. They were asked whether "close by" meant to them within "walking distance", "driving distance", or "access by bus".

The second section of the questionnaire contained questions regarding transportation use (Questions 8 to 12). First the frequency of use of different transportation modes was evaluated. The respondents were asked how often they travel by seven modes generally available to the urban elderly population: automobile; public transit; taxi; handi-transit (public transit for handicapped and elderly persons who cannot access regular bus service); private transport services (van service that is provided at rates substantially higher than public transportation); automobile rides from friends and family; and walking. The frequency with which these modes were used was determined through the use of a seven-point scale. Respondents indicated "at least once per day", "2-6 times per week", "once per week", "2-3 times per month", "once per month", "less than once per month", or "never" when asked how often they use each transportation mode.

The respondents were also asked which transportation mode or modes were used to reach ten service and activity sites. These destinations included the grocery store, shopping mall, bank, medical facilities, pharmacy, recreation and entertainment, work and volunteering, friends and family, seniors centre, and place of worship. These sites were selected to represent destinations older persons frequently travel to as the services are essential for an elderly person to obtain life-sustaining functions, and the activity opportunities are important for maintaining important social contacts. The choice of responses for transportation modes used to access the service and activity sites included the seven modes discussed above: "automobile"; "public transit"; "taxi"; "handi-transit"; "private transport services"; "rides from friends and family"; and "walking".

In addition, the frequency of use of the service and activity sites was examined. The respondents were asked how often they travel to the grocery store, shopping mall, bank, medical facilities, pharmacy, recreation and entertainment, work and volunteering, friends and family, seniors centre, and place of worship. The seven-point frequency scale described above was used to elicit their responses: "at least once per day", "2-6 times per week", "once per week", "2-3 times per month", "once per month", "less than once per month", and "never"

The increasing importance of the home delivery of services could affect the frequency with which elderly individuals travel to service sites. Therefore, the respondents were asked if they receive any services or assistance within their home to determine if their need to travel to certain services was diminished. The respondents indicated whether they receive home-delivery of services by a "yes" or "no" response. If they responded "yes", they were asked what type of services they receive in the home.

Finally, the respondents were asked to give the location of the ten service and activity sites that they travel to most frequently. The respondents provided the street address of the grocery store, shopping mall, bank, medical facilities, pharmacy, place of recreation and entertainment, homes of friend and family, place of work or volunteering, seniors centre, and place of worship. However, in certain instances the location of the residence of family and friends was indicated only by the area of the city for reasons of confidentiality. The locations of the service and activity sites were recorded so that the distance between the home of the respondent and each site could later be calculated. This information was required to determine the distance the respondent travels to access life-sustaining functions and maintain important social contacts.

The third part of the questionnaire consisted of questions concerning the usage of public transit (Questions 13 to 16). If the question on the frequency of use of the seven transportation modes indicated that public transit was utilized, the respondent was asked to provide the bus routes that he or she used when accessing any of the ten service and activity sites. If a respondent did not take the bus, he or she was asked if public transit would be an option in the future. The choice of responses included "yes" or "no", and was followed by open-ended questions to determine why the bus was or was not considered a feasible mode of transportation.

A further series of questions considered the positive and negative features of public transit (Questions 17 to 19). The respondents were asked if these features were or could be important in their decision to use the bus. The positive features of the bus included no driving, no parking, low cost, convenience in winter, and environmental concerns. The respondents indicated the level of importance of these features based on the responses of "very important", "somewhat important", or "not important". The negative or problematic points of bus usage were walking to the bus stop, bus stairs, understanding schedules, fear of falling on the bus, need for an escort on the bus, stormy winter conditions, icy roads and sidewalks, parcels, and health. The choice of responses to indicate the degree of problems associated with these features included "very problematic", "somewhat problematic", or "not problematic".

The respondents were also asked how far their home was from the closest bus stop. The scale to measure this distance was based on the number of blocks. The range of responses included: "less than one block"; "one block"; "two blocks"; "three blocks"; "four blocks"; "five blocks"; "six blocks"; or "more than six blocks".

The section on public transit in the questionnaire also included a series of open-ended questions to elicit the respondents' perceptions of the feasibility of public transit as a transportation mode. These questions (Questions 20 to 30) asked the respondents to give their opinion of the cost of using the bus, the safety of the bus, the adequacy of public transit in comparison to other transportation modes, the adequacy of bus route coverage, their ability to use the bus in winter, transportation issues affecting the elderly population, and what is considered a reasonable fare for specialized transportation services. Respondents were also asked about their satisfaction with the bus service. Satisfaction was measured using a five-point scale and the responses included: "very satisfied"; "satisfied"; "somewhat satisfied"; "dissatisfied"; or "very dissatisfied".

The fourth section of the questionnaire encompassed the realm of activities of daily living (Questions 31 to 37). Eight questions were included that measure the level of personal mobility of the respondents. The questions evaluated the respondent's ability to walk, to get about the house, to go up and down stairs, to get to places out of walking distance, to go outdoors in good weather, to go outdoors in winter, and to go shopping. The level of mobility was measured using a five-point scale. The respondents indicated their ability to do these activities based on the response format of: "without any help"; "with some help from a device only (cane, walker, crutches or a chair); "with some help using a person only"; "with some help from both a person and a device"; and "unable to do it". Furthermore, the respondents were asked how far they can walk and the choice of responses included: "1/4 to 1 mile or more"; "100 yards to 1/4 mile"; "10 to 100 yards"; "less than 10 yards".

The fifth segment of the questionnaire evaluated the health status of the respondents (Questions 38 to 40). The respondents were asked to rate their own health as either “excellent” (never prevents activities), “good” (rarely prevents activities), “fair” (occasionally prevents activities), “poor” (very often prevents activities), or “bad” (prevents most activities all the time). The respondents were also provided with a list of 17 chronic conditions and were asked to indicate by either “yes” or “no” if they experienced each of these conditions within the last year. Finally, the respondents were asked how much health troubles stand in the way of their doing things. The possible responses to this question were “not at all”, “a little” and “ a great deal”.

The sixth section of the questionnaire included questions on life satisfaction (Questions 41 and 42). Respondents were asked their satisfaction with their health, finances, family relations, paid employment, friendships, housing, recreational activity, religion, self-esteem, transportation and life as a whole. Responses were based on the seven-point Terrible-Delightful Scale and included “terrible”, “very dissatisfying”, “dissatisfying”, “mixed”, “satisfying”, “very satisfying”, or “delightful” (Andrews & Withey, 1976; Michalos, 1980; and Michalos, 1985).

In the final section of the questionnaire data for a variety of socio-demographic characteristics were elicited (Questions 43 to 45). The gender of the respondent was recorded as either “male” or “female”. Respondents were asked to indicate the year they were born in and their actual age was calculated from this information. The level of education was based on the question of the number of years of formal education that were completed by the respondent. The respondents were also asked their marital status and were provided with the response options of "single (never married), "married", "divorced/separated", or "widowed".

The final socio-demographic questions pertained to the income of the respondents (Questions 46 to 48). They were asked the average yearly income of the household and the response format included: "less than $10,000"; "$10,001 to $15,000"; "$15,001 to $20,000"; "$20,001 to $30,000"; "$30,001 to $40,000"; and "over $40,000. They were also asked if their income and assets satisfied their needs. The respondents answered this question based on the following response format: "completely adequate"; "somewhat adequate"; "somewhat inadequate"; and "totally inadequate". Finally they were asked what they would spend extra income on. The choice of responses for this question included: "better housing"; "house repairs"; "more or better food"; "more or better clothing"; "more or better furniture"; "medical needs"; "recreational equipment or activities"; "transportation or new car"; and "trips and holidays".

3.4 **Summary**

In summary, the conceptual framework of the present study is based on Parmalee and Lawton's (1990) model of the autonomy-security dialectic. For the purpose of this study, autonomy is defined to be the socio-demographic characteristics, health and functional resources, and transportation resources of the elderly individual. The security dimension is defined as transportation provision in distinct environmental locations. The ecological model of aging proposes that the components of autonomy and security can predict the transportation behaviours of elderly persons which are defined to be: frequency of use of transportation modes; frequency of travel to service and activity sites; and distance travelled to service and activity sites. Accordingly, the study formulates three research questions to determine the effect of autonomy and security on these transportation behaviours.

Using an in-person interview survey, data were collected to test the research questions. In the following chapter, the analysis will examine if the components of autonomy and security predict transportation behaviours. The effect of the components of the person and environment will assist in determining the transportation requirements of the elderly.

CHAPTER 4

THE ANALYSIS

This chapter presents the statistical analysis of the data obtained from the interview survey. The first section provides a descriptive analysis of the sample characteristics. The second section includes a consideration of the transportation usage and travel activity patterns of the respondents of the three study areas. The final part of the chapter presents the analysis of the research questions based on statistical inferential tests.

The SPSS for Windows (Version 6.1.3) software programme was used for data analyses. Analyses included univariate, bivariate, and multivariate methods. Univariate techniques consisted of frequency distributions. Bivariate analyses included cross-tabulations. Multivariate analyses was composed of both logistic regression analysis and linear multiple regression analysis.

4.1 Characteristics of the Entire Sample and Sub-Groups

In this sub-section, the characteristics of the study sample which represent the autonomy dimensions of the autonomy-security dialectic are discussed. The description of the sample is based on an overview of the respondents' socio-demographic characteristics, socio-economic status, living arrangements, health and functional level, housing environment, transportation resources, and life satisfaction. As this study focuses on residential location and its effect on the ability of the environment to provide security in the form of transportation provision, these attributes are examined for the entire sample, as well as for each of the areal sub-groups. The objective of the descriptive analysis is to consider the relationship between geographic location and the various sample characteristics.

4.1.1 Socio-Demographic Characteristics

Three socio-demographic characteristics of the sample are considered. These include age, gender, and marital status.

4.1.1.1 Age

Over one-half (55.2%) of the entire sample are between 68 and 74 years of age (Table 2). In contrast, in 1991, 60.0% of the Canadian senior population were between the ages of 65 and 74 ("younger seniors") (Norland, 1994, 11). Over one-quarter (27.6%) of the sample are between the ages of 75 and 80, while 17.1% are over 81 years of age. In comparison, 31.0% of the Canadian senior population were between 75 to 84 years of age ("intermediate seniors") in 1991, and 9.0% were 85 or older ("older seniors") (Norland, 1994).

When the three study areas are considered there are some notable differences with respect to age distribution. The largest proportion of respondents in the age category of 68 to 74 years of age is found in Fort Garry (71.4%), while only three-fifths of the respondents in Charleswood and St. Boniface are in the youngest age category. It is noteworthy that the category of 81 years and over accounts for 22.9% of the St. Boniface respondents, while there are only 11.4% of Fort Garry respondents in this category. Despite the observed variation of age distribution among the three study areas, there is no significant relationship between age and geographic location (x^2=9.05, df=6, ns) (Table 2).

TABLE 2:
Composition of Entire Sample and Sub-Groups by Age, Gender, and Marital Status

	St. Boniface (n=35) **% (n)**	Charleswood (n=35) **% (n)**	Fort Garry (n=35) **% (n)**	Total (N=105) **% (N)**
Age (years)				
68-70	14.3 (5)	25.7 (9)	37.1 (13)	25.7 (27)
71-74	34.3 (12)	20.0 (7)	34.3 (12)	29.5 (31)
75-80	28.6 (10)	37.1 (13)	17.1 (6)	27.6 (29)
81+	22.9 (8)	17.1 (6)	11.4 (4)	17.1 (18)
Gender				
Female	71.4 (25)	45.7 (16)	60.0 (21)	59.0 (62)
Male	28.6 (10)	54.3 (19)	40.0 (14)	41.0 (43)
Marital Status				
Single	42.9 (15)	37.1 (13)	25.7 (9)	35.2 (37)
Married	57.1 (20)	62.9 (22)	74.3 (26)	64.8 (68)

4.1.1.2 Gender

Almost three-fifths (59.0%) of the respondents in the sample are female (Table 2). This is consistent with the findings of the 1991 Census that 58% of the Canadian senior population were female (Norland, 1994, 14). The highest proportion of females is found in St. Boniface (71.4%). This conforms with the high proportion of "older seniors" in this area as there are typically higher proportions of older females, particularly in the older age categories, as a result of their higher life expectancy in comparison to males (Chappell *et al.* 1986, 21). Contrary to the above observations, the proportion of males in Charleswood (54.3%) slightly exceeds the proportion of females. Despite the incongruities among the three study areas, there is no statistically significant relationship between gender and geographic location (x^2=4.80, df=2, ns) (Table 2).

4.1.1.3 Marital Status

Almost two-thirds (64.8%) of the entire sample are married (Table 2). This is higher than the national average as 57.0% of the Canadian population over the age of 65 were married in 1991 (Norland, 1994, 21). For the remainder of the sample, 28.6% of the respondents are widowed, 4.8% have never married, and 1.9% are separated or divorced.

For the individual study areas, the largest percentage of married respondents is found in Fort Garry (74.3%) compared to Charleswood (62.9%) and St. Boniface (57.1%). The higher percentage of unmarried respondents[2] (42.9%) in St. Boniface again reflects the higher proportion of older females in this sub-group. Specifically, the higher life expectancy of females, combined with the tendency to marry older men, results in a greater proportion of female widows in the later stages of life. No statistically significant relationship between marital status and geographic location is found (x^2=2.34, df=2, ns) (Table 2).

In summary, the St. Boniface study area records the highest proportion of respondents who are "older seniors", are female and are single. As was previously

[2] This category includes widowed, single and divorced or separated persons.

discussed, the characteristics of these respondents suggest that they may experience greater transportation problems.

4.1.2 Socio-Economic Status

Three measures are used to evaluate the socio-economic status of the respondents. They are level of education, annual household income and satisfaction with finances.

4.1.2.1 Education

The level of formal education is based on the number of years the respondent attended school. Approximately one-quarter (25.7%) of the entire sample reported 9 years or less of formal education (Table 3). The largest proportion of the sample (40.0%) received between 10 and 12 years of education. The remaining 34.3% of the respondents obtained some level of post-secondary education as the total number of years that they attended school ranged from 13 to 25 years.

Examination of the sub-groups does indicate some variation with respect to the level of education. For example, the highest proportion of respondents with 12 years or less of education occurred in the St. Boniface study (77.1%) compared to Charleswood (65.7%) and Fort Garry (54.3%). Within the post-secondary education category Fort Garry has the largest proportion (45.7%) in comparison to Charleswood (34.3%) and St. Boniface (22.9%). Despite the divergence of education levels among the in the three study areas, there is no significant relationship between education and geographic location (x^2=5.90, df=4, ns) (Table 3).

TABLE 3:
Composition of Entire Sample and Sub-Groups by Education, Income, and Satisfaction with Finances

	St. Boniface % (n)	Charleswood % (n)	Fort Garry % (n)	Total % (N)
Education	(n=35)	(n=35)	(n=35)	(N=105)
0-9 years	37.1 (13)	20.0 (7)	20.0 (7)	25.7 (27)
10-12 years	40.0 (14)	45.7 (16)	34.3 (12)	40.0 (42)
13-25 years	22.9 (8)	34.3 (12)	45.7 (16)	34.3 (36)
Income	(n=31)	(n=34)	(n=35)	(N=100)
<$20,000	48.4 (15)	38.2 (13)	17.1 (6)	34.0 (34)
$20-30,000	22.6 (7)	17.6 (6)	22.9 (8)	21.0 (21)
>$30,000	29.0 (9)	44.1 (15)	60.0 (21)	45.0 (45)
Satisfaction - Finances*	(n=35)	(n=35)	(n=35)	(N=105)
Dissatisfying	11.4 (4)	11.4 (4)	11.4 (4)	11.4 (12)
Satisfying	74.3 (26)	80.0 (28)	68.6 (24)	74.3 (78)
Very Sat.	14.3 (5)	8.6 (3)	20.0 (7)	14.3 (15)

* "Dissatisfying" includes the categories of "Mixed", "Dissatisfying", "Very Dissatisfying" and "Terrible". "Very Satisfying" includes the categories of "Very Satisfying" and "Delightful".

4.1.2.2 Income

The yearly household income of the respondents is classified into three categories (Table 3). Over one-third (34.0%) of the entire sample report incomes of less than $20,000. This is markedly lower than the Canadian average as 71.8% of the Canadian senior population registered incomes of $20,000 or less in 1991 (Norland, 1994, 44). Twenty-one percent of the respondents have yearly household incomes between $20,000 and $30,000, while 45.0% of the entire sample reported an income greater than $30,000.

Income differences among the three study areas can be broadly considered in terms of the educational levels of the respondents. For example, in Fort Garry three-fifths (60.0%) of the respondents report an annual household income of $30,000 or more (Table 3). This is in accordance with the relatively high proportion (45.7%) of respondents with post-secondary education in this study area. In comparison, less than one-third (29.0%) of St. Boniface respondents report an income of $30,000 or more which is congruent with the low proportion (22.9%) of persons in this area with post-secondary education. Although there are observed differences among the three study areas, no significant relationship is found between income and geographic location (x^2=8.78, df=4, ns) (Table 3).

4.1.2.3 Satisfaction With Finances

Based on the seven-point Terrible-Delightful scale that ranges from "terrible" to "delightful", the respondents were asked if they were satisfied with their finances. Over four-fifths (88.6%) of the entire sample are either satisfied or very satisfied with their finances (Table 3). The remaining 11.4% are either dissatisfied or very dissatisfied with their finances. There is no statistical relationship between financial satisfaction and geographic location (x^2=1.87, df=2, ns) (Table 3).

In summary, the St. Boniface study area records the highest proportions of respondents having the lowest level of education and the lowest annual household income. This suggests that these persons may have fewer resources to address transportation needs.

4.1.3 Living Arrangements

The living arrangements of the respondents are evaluated based on the indicators of household size and household composition.

4.1.3.1 Household Size

In 1991, 38.0% of the Canadian senior population lived alone (Norland, 1994, 35). In contrast, 29.5% of the entire sample of this study live alone (Table 4). The lowest proportion of respondents who live alone is found in Fort Garry (22.9%) compared to St. Boniface (34.3%) and Charleswood (31.4%). The remainder of the entire sample (70.5%) live with one to three persons, with the three study areas again demonstrating general congruency with this value. No statistical significance is found between household size and geographic location (x^2=1.19, df=2, ns) (Table 4).

TABLE 4:
Composition of Entire Sample and Sub-Groups by Household Size and Household Composition

	St. Boniface **% (n)**	Charleswood **% (n)**	Fort Garry **% (n)**	Total **% (N)**
Household Size	(n=35)	(n=35)	(n=35)	(N=105)
Lives Alone	34.3 (12)	31.4 (11)	22.9 (8)	29.5 (31)
1-3 Residents	65.7 (23)	68.6 (24)	77.1 (27)	70.5 (74)
Household Composit'n	(n=23)	(n=24)	(n=27)	(N=74)
Spouse Only	78.3 (18)	79.2 (19)	81.5 (22)	79.7 (59)
Others	21.7 (5)	20.8 (5)	18.5 (5)	20.3 (15)

4.1.3.2 Household Composition

Of those respondents in the sample who live with others (n=74), 79.7% live with a spouse only (Table 4). Approximately one-fifth (20.3%) of the entire sample who do not live alone reside with more than one person. This category includes respondents who live with their spouse and children, siblings, or a border. The individual study areas register percentages broadly comparable with those for the entire sample. There are too few observations to conduct statistical analysis of household composition.

In summary, the majority of the sample live with at least one other person who is usually their spouse. For those who do live alone, there is a greater possibility that they may encounter problems with transportation as they do not have the assistance often available to those who live with another person.

4.1.4 Health Status

The evaluation of the health status of the sample is based on five indicators. These include self-rated health, chronic health conditions, perceived barriers due to health troubles, Activities of Daily Living, and satisfaction with health.

4.1.4.1 Self-Rated Health

Respondents were asked to rate their health based on a five-point scale ranging from "excellent" to "bad". Over two-thirds (71.4%) of the entire sample rate their health to be either "excellent" or "good" (Table 5). This is somewhat higher than for Canada as a whole as 64.0% of Canadians over the age of 65 rated their health as good, very good or excellent in 1985 (NACA, 1993) The remaining 28.6% of the sample rate their health to be "fair", "poor", or "bad" .

TABLE 5:
Composition of Entire Sample and Sub-Groups by Self-Rated Health, Chronic Conditions, Health Troubles, Activities of Daily Living, and Satisfaction with Health

	St. Boniface (n=35) **% (n)**	Charleswood (n=35) **% (n)**	Fort Garry (n=35) **% (n)**	Total (N=105) **% (n)**
Self-Rated Health				
Excellent	20.0 (7)	22.9 (8)	17.1 (6)	20.0 (21)
Good	48.6 (17)	57.1 (20)	48.6 (17)	51.4 (54)
Fair-Poor	31.4 (11)	20.0 (7)	34.3 (12)	28.6 (30)
Chronic Conditions				
0-1	17.1 (6)	28.6 (10)	28.6 (10)	24.8 (26)
2	25.7 (9)	14.3 (5)	22.9 (8)	21.0 (22)
3	11.4 (4)	31.4 (11)	28.6 (10)	23.8 (25)
4-11	45.7 (16)	25.7 (9)	20.0 (7)	30.5 (32)
Health Troubles				
Not at all	48.6 (17)	62.9 (22)	54.3 (19)	55.2 (58)
A little/A lot	51.4 (18)	37.1 (13)	45.7 (16)	44.8 (47)
ADL				
No help	34.3 (12)	57.1 (20)	42.9 (15)	44.8 (47)
Some help	28.6 (10)	17.1 (6)	25.7 (9)	23.8 (25)
With Help	37.1 (13)	25.7 (9)	31.4 (11)	31.4 (33)
Satisfaction -Health*				
Dissatisfying	20.0 (7)	20.0 (7)	20.0 (7)	20.0 (21)
Satisfying	51.4 (18)	42.9 (15)	45.7 (16)	46.7 (49)
Very Satisfying	28.6 (10)	37.1 (13)	34.3 (12)	33.3 (35)

* "Dissatisfying" includes the categories of "Mixed", "Dissatisfying", "Very Dissatisfying" and "Terrible". "Very Satisfying" includes the categories of "Very Satisfying" and "Delightful".

For the individual study areas, Charleswood records the highest proportion of respondents (80.0%) reporting "excellent" or "good" health, while Fort Garry has the lowest proportion (65.7%) of respondents in this category. As the ratings for all three sample areas closely approximate those of the entire sample, no significant relationship is found between self-rated health and geographic location (x^2=2.02, df=4, ns) (Table 5).

4.1.4.2 Chronic Conditions

Respondents were provided with a list of 17 chronic conditions and were asked to indicate which conditions, if any, they experienced (Table 5). Approximately one-quarter (24.8%) of the entire sample reported one or no chronic condition, compared to 75.3% reporting between two and eleven chronic conditions (Table 5). In comparison, approximately 80% of persons age 65 and over in Canada reported one or more chronic conditions in 1991 (NACA, 1993).

The three study areas record similar patterns of chronic conditions among the respondents. Both Charleswood and Fort Garry have a slightly higher proportion (28.6%) of respondents who report one or no chronic condition. St. Boniface has a higher proportion of respondents (82.8%) who report two to eleven chronic conditions. No statistical significance is found between chronic conditions and geographic location (x^2=10.04, df=6, ns) (Table 5).

4.1.4.3 Health Troubles

The question "How much do your health troubles stand in the way of your doing the things you want to do?" was posed to the respondents. Three possible response were provided: "not at all"; "a little"; or "a great deal". Over one-half (55.2%) of the entire sample report that health problems do not affect their activities (Table 5). The remaining 44.8% report that health problems stand in the way of their doing things "a little" or "a great deal".

The highest proportion of respondents who report that health troubles do not affect their activity level is found in Charleswood (62.9%) compared to Fort Garry (54.3%) and St. Boniface (48.6%). No significant relationship between health troubles and geographic location is found (x^2=1.46, df=2, ns) (Table 5).

4.1.4.4 Activities of Daily Living

Eight questions relating to activities of daily living were included in the questionnaire. These questions measure the level of personal mobility of the respondent. A respondent's ability to engage in an activity was indicated by five possible responses: "without any help"; "with some help from a device only"; "with some help using a person only"; "with some help from both a person and device"; and "unable to do it". Each response was designated a score and the total for the eight responses was calculated for each respondent. Based on the total score, the respondent was classified into one of three categories: "able to do all activities without any help", "able to do all activities with a little help" (this category represents respondents who require support for climbing stairs), or "able to do the activities with help from a device and/or person" (this category represents respondents who require support for walking) (Table 5). Over two-fifths (44.8%) of the entire sample are able to perform all activities without any help. Approximately one-quarter (23.8%) of the respondents require some help to perform some of the activities, while the remaining 31.4% require help from a device and/or a person to perform activities of mobility.

The highest proportion of respondents who require some assistance or require a device and/or person to perform activities is found in St. Boniface (65.7%) compared to Fort Garry (57.1%) and Charleswood (42.8%). The high proportion of respondents who require assistance in St. Boniface is consistent with the higher percentage of "older seniors" in this study area, thus reflecting the increase in functional difficulties with advancing age. Despite the noted discrepancies among the three sample areas, there is no significant relationship between problems of mobility and geographic location (x^2=3.85, df=4, ns) (Table 5).

4.1.4.5 <u>Satisfaction With Health</u>

The Terrible-Delightful Scale, a seven-point scale ranging from "terrible" to "very satisfied", was utilized to determine the health satisfaction of the respondents. Four-fifths (80.0%) of the entire sample are either satisfied or very satisfied with their health (Table 5). The remaining 20.0% of the sample indicated that satisfaction with their health is either "mixed", "dissatisfying", "very dissatisfying" or "terrible". Little variation is found among the three study areas with respect to satisfaction with health.

As a result, no statistical relationship is found between health satisfaction and geographic location (x^2=0.69, df=4, ns) (Table 5).

In summary, the majority of the respondents consider themselves to be in good health. Nevertheless, approximately three-quarters of the sample have two or more chronic conditions. Over two-fifths of the respondents report that their health problems do cause barriers to activities. Furthermore, over two-fifths of the sample require assistance to perform mobility activities. It is also significant that the highest proportion of respondents who have two or more chronic conditions, as well as identify health to be a barrier and require assistance to perform activities, are found in the St. Boniface study area. The lower health and functional status of the St. Boniface respondents suggests that they may have greater difficulty in accessing adequate transportation.

4.1.5 Housing Environment

The housing circumstances of the respondents of this study are described by examining four indicators. These indicators are (i) type of housing, (ii) length of residence at the current address, (iii) satisfaction with housing, and (iv) the service area surrounding the place of residence.

4.1.5.1 Housing Type

Almost three-quarters (74.3%) of the entire sample live in a detached house, while the remainder of the respondents live in an apartment (Table 6). An examination of the study areas does indicate differences among them in terms of the types of housing occupied by the elderly. Over four-fifths of the respondents in both St. Boniface (94.3%) and Charleswood (80.0%) live in a detached or semi-detached house, compared to only 48.6% in Fort Garry. Over one-half (51.4%) of the respondents in Fort Garry live in an apartment. The geographical concentration of apartments occupied by seniors in this study area was identified in Chapter 3. A significant statistical relationship at the 0.001 level is found between housing type and geographic location (x^2=20.02, df=2, p<0.001) (Table 6).

TABLE 6:
Composition of Entire Sample and Sub-Groups by Type of Housing, Length of Residence, and Satisfaction with Housing

	St. Boniface (n=35) **% (n)**	Charleswood (n=35) **% (n)**	Fort Garry (n=35) **% (n)**	Total (N=105) **% (N)**
Type of Housing				
Detached	94.3 (33)	80.0 (28)	48.6 (17)	74.3 (78)
Apartment	5.7 (2)	20.0 (7)	51.4 (18)	25.7 (27)
Length of Residence				
1-10 years	5.7 (2)	28.6 (10)	37.1 (13)	23.8 (25)
11-20 years	5.7 (2)	22.9 (8)	20.0 (7)	16.2 (17)
21-30 years	8.6 (3)	20.0 (7)	20.0 (7)	16.2 (17)
31-40 years	42.9 (15)	8.6 (3)	17.1 (6)	22.9 (24)
41-55 years	37.1 (13)	20.0 (7)	5.7 (2)	21.0 (22)
Satisfaction -Housing*				
Dissatisfying	2.9 (1)	5.7 (2)	8.6 (3)	5.7 (6)
Satisfying	54.3 (19)	51.4 (18)	51.4 (18)	52.4 (55)
Very Satisfying	42.9 (15)	42.8 (15)	40.0 (14)	41.9 (44)

* "Dissatisfying" includes the categories of "Mixed", "Dissatisfying", "Very Dissatisfying" and "Terrible". "Very Satisfying" includes the categories of "Very Satisfying" and "Delightful".

It is significant that the majority of respondents in St. Boniface and Charleswood live in semi-detached or detached homes whereas over one-half of the Fort Garry respondents live in apartment dwellings. This suggests that the living environments among the three study areas may be different and, correspondingly, the transportation needs of the respondents could vary.

4.1.5.2 Length of Residence

Approximately one-quarter (23.8%) of the entire sample have lived at their present address for a period of less than eleven years (Table 6). Almost one-third (32.4%) have lived in their current homes between 11 and 30 years. The remaining 43.9% of the respondents have lived at the present address for 31 or more years.

As with housing type, there is a significant difference among the three sample areas with respect to length of residence. The St. Boniface sample has a very high proportion of respondents who live in detached or semi-detached homes (94.3%). Presumably these respondents live in homes that they have occupied since the formation of their families. This proposition is supported by the high proportion of respondents (80.0%) who have lived in their homes for 31 years or more (Table 6).

In Fort Garry the high proportion of respondents living in apartments (51.4%) suggests that the length of residence will be much lower because older apartment-dwellers may include persons who have recently moved from their family homes. The increase in health problems and functional limitations which may occur with the aging process cause some elderly to move from their homes when maintenance requirements become unmanageable. This proposition is supported by the high proportion of respondents (57.1%) in Fort Garry who have lived at the present address for less than 21 years (Table 6).

However, the relationship suggested between length of residence and type of housing is not supported by the Charleswood study area. Although the proportion of apartment-dwellers is considerably lower (20.0%) in the Charleswood study area, 51.5% of the Charleswood respondents have lived in their home for less than 21 years. Overall, a significant relationship at the 0.001 level is found between length of residence and geographic location (x^2=31.31, df=8, p<0.001) (Table 6).

4.1.5.3 <u>Satisfaction With Housing</u>

The respondents were asked if they were satisfied with their housing, and responses were based on the seven-point Terrible-Delightful scale (Table 6). Over one-half (58.1%) of the entire sample indicated that their housing is either "mixed" or "satisfying". The remaining 41.9% of the sample are very satisfied with their housing circumstances. These proportions are reproduced in the three sample areas. Consequently, there is no significant relationship between housing satisfaction and geographic location (x^2=0.08, df=2, ns) (Table 6).

4.1.5.4 <u>The Service Area</u>

The analysis of the service area surrounding the place of residence is based on two indicators. The first is the question which asks the respondents if it is important to have certain services and social opportunities close by. The responses are categorized as "very important", "slightly important, or "not important". The second indicator is the question of whether the respondent lives in close proximity to the facilities and opportunities mentioned in the first question. The response option for this question is either "yes" or "no". It should be noted that "close proximity" was subjectively defined by each respondent. The services and social opportunities included in this analysis are food store, bank, medical centre, pharmacy, bus stop, post office, park, library, senior centre, friends and relatives and other seniors.

Ninety percent of the entire sample stated that it is "very important" to have a food store close by (Table 7). The majority (79.0%) of the respondents in the entire sample indicated that they live close to a food store. No significant relationship is found between proximity to a food store and geographic location (x^2=0.12, df=2, ns) (Table 7).

Three-quarters (75.2%) of the entire sample indicated that it is "very important" to have a bank close by (Table 7). Over four-fifths (81.0%) of the entire sample reported having a bank close by. No statistical relationship is found between proximity to a bank and geographic location (x^2=0.86, df=2, ns) (Table 7).

Seventy percent of the entire sample stated that it is "very important" to have a medical centre close by, and 66.7% indicated that they do have a medical centre close by (Table 7). Only 51.4% of the Fort Garry respondents reported having a medical centre close by compared to Charleswood (77.1%) and St. Boniface (71.4%). As a result, there is a significant relationship at the 0.05 level between proximity to a medical centre and geographic location (x^2=5.74, df=2, $p<0.05$) (Table 7).

TABLE 7:
Importance and Proximity to a Food Store, Bank, and Medical Centre for the Entire Sample and Sub-Groups

	St. Boniface (n=35) % (n)	Charleswood (n=35) % (n)	Fort Garry (n=35) % (n)	Total (N=105) % (N)
Food Store:				
Importance				
Not/Slightly	11.4 (4)	8.6 (3)	8.6 (3)	9.5 (10)
Very	88.6 (31)	91.4 (32)	91.4 (32)	90.5 (95)
Proximity				
No	20.0 (7)	22.9 (8)	20.0 (7)	21.0 (22)
Yes	80.0 (28)	77.1 (27)	80.0 (28)	79.0 (83)
Bank:				
Importance				
Not/Slightly	20.0 (7)	25.7 (9)	28.6 (10)	24.8 (26)
Very	80.0 (28)	74.3 (26)	71.4 (25)	75.2 (79)
Proximity				
No	22.9 (8)	14.3 (5)	20.0 (7)	19.0 (20)
Yes	77.1 (27)	85.7 (30)	80.0 (28)	81.0 (85)
Med.Ctr:				
Importance				
Not/Slightly	17.1 (6)	31.4 (11)	40.0 (14)	29.5 (31)
Very	82.9 (29)	68.6 (24)	60.0 (21)	70.5 (74)
Proximity				
No	28.6 (10)	22.9 (8)	48.6 (17)	33.3 (35)
Yes	71.4 (25)	77.1 (27)	51.4 (18)	66.7 (70)

Seventy-nine percent of the entire sample stated that it is "very important" to have a pharmacy close by (Table 8). Over four-fifths (83.8%) of the sample reported living close to a pharmacy. No significant relationship is found between proximity to a pharmacy and geographic location (x^2=0.14, df=2, ns) (Table 8).

TABLE 8:
Importance and Proximity to a Pharmacy, Bus Stop, and Post Office for the Entire Sample and Sub-Groups

	St. Boniface (n=35) **% (n)**	Charleswood (n=35) **% (n)**	Fort Garry (n=35) **% (n)**	Total (N=105) **% (N)**
Pharmacy:				
Importance				
Not/Slightly	22.9 (8)	17.1 (6)	22.9 (8)	21.0 (22)
Very	77.1 (27)	82.9 (29)	77.1 (27)	79.0 (83)
Proximity				
No	17.1 (6)	14.3 (5)	17.1 (6)	16.2 (17)
Yes	82.9 (29)	85.7 (30)	82.9 (29)	83.8 (88)
Bus Stop:				
Importance				
Not/Slightly	5.7 (2)	25.7 (9)	31.4 (11)	21.0 (22)
Very	94.3 (33)	74.3 (26)	68.6 (24)	79.0 (83)
Proximity				
No	2.9 (1)	14.3 (5)	17.1 (6)	11.4 (12)
Yes	97.1 (34)	85.7 (30)	82.9 (29)	88.6 (93)
Post Office:				
Importance				
Not/Slightly	25.7 (9)	40.0 (14)	40.0 (14)	35.2 (37)
Very	74.3 (26)	60.0 (21)	60.0 (21)	64.8 (68)
Proximity				
No	17.1 (6)	20.0 (7)	17.1 (6)	18.1 (19)
Yes	82.9 (29)	80.0 (28)	82.9 (29)	81.9 (86)

While only 79.0% of the entire sample indicated that it is "very important" to have a bus stop close by, 88.6% of the respondents did state that they live close to a bus stop (Table 8). The highest proportion of respondents who reported living near a bus stop is found in St. Boniface (97.1%) compared to Fort Garry (82.9%) and Charleswood (85.7%). Despite the apparent differences among the three study areas, there are too few observations in the "no" category of proximity to a bus stop to conduct a statistical analysis.

Almost two-thirds (64.8%) of the entire sample indicated that proximity to a post office is "very important" (Table 8). Over four-fifths (81.9%) of the sample reported that they do live close to a post office. No significant relationship is found between proximity to a post office and geographic location (x^2=0.13, df=2, ns) (Table 8).

TABLE 9:
Importance and Proximity to a Park, Library, and Senior Centre for the Entire Sample and Sub-Groups

	St. Boniface % (n)	Charleswood % (n)	Fort Garry % (n)	Total % (N)
Park:				
Importance	(n=35)	(n=34)	(n=35)	(N=104)
Not/Slightly	71.4 (25)	58.8 (20)	65.7 (23)	65.4 (68)
Very	28.6 (10)	41.2 (14)	34.3 (12)	34.6 (36)
Proximity	(n=35)	(n=34)	(n=35)	(N=104)
No	2.9 (1)	29.4 (10)	34.3 (12)	22.1 (23)
Yes	97.1 (34)	70.6 (24)	65.7 (23)	77.9 (81)
Library:				
Importance	(n=35)	(n=35)	(n=35)	(N=105)
Not/Slightly	60.0 (21)	62.9 (22)	42.9 (15)	55.2 (58)
Very	40.0 (14)	37.1 (13)	57.1 (20)	44.8 (47)
Proximity	(n=34)	(n=35)	(n=35)	(N=104)
No	47.1 (16)	11.4 (4)	20.0 (7)	26.0 (27)
Yes	52.9 (18)	88.6 (31)	80.0 (28)	74.0 (77)
Senior Ctr:				
Importance	(n=35)	(n=35)	(n=35)	(N=105)
Not/Slightly	77.1 (27)	60.0 (21)	68.6 (24)	68.6 (72)
Very	22.9 (8)	40.0 (14)	31.4 (11)	31.4 (33)
Proximity	(n=35)	(n=32)	(n=34)	(N=101)
No	25.7 (9)	3.1 (1)	32.4 (11)	20.8 (21)
Yes	74.3 (26)	96.9 (31)	67.6 (23)	79.2 (80)

Only 34.6% of the entire sample indicated that a park close to the place of residence is "very important" (Table 9) Nevertheless, over three-quarters (77.9%) of the entire sample indicated that they do live close by a park. The lowest proportion of respondents that live near a park is found in Fort Garry (65.7%) compared to Charleswood (70.6%) and St. Boniface (97.1%). There is a statistically significant relationship at the 0.01 level between proximity to a park and geographic location (x^2=11.60, df=2, p<0.01) (Table 9).

Only 44.8% of the entire sample indicated that it is "very important" to live close to a library (Table 9). Almost three-quarters (74.0%) of the sample reported living near a library. In St. Boniface only 52.9% of the respondents live close to a library compared to Fort Garry (80.0%) and Charleswood (88.6%). In St. Boniface, English-speaking residents must go to the downtown area to access library services because only a French library is located in the area. A significant relationship at the 0.01 level is found between proximity to a library and geographic location (x^2=12.37, df=2, p<0.01) (Table 9).

Over two-thirds (68.6%) of the entire sample indicated that it is "not important" or only "slightly important" to have a senior centre close by (Table 9). Despite the high proportion of respondents who do not consider a senior centre to be important, 79.2% of the entire sample report living close to a senior centre. The highest proportion of respondents who indicate that they live near a senior centre is found in Charleswood (96.9%) compared to Fort Garry (67.6%) and St. Boniface (74.3%). A significant relationship at the 0.01 level is found between proximity to a senior centre and geographic location (x^2=9.34, df=2, p<0.01) (Table 9).

Three-quarters (75.2%) of the entire sample indicated that it is "very important" to have friends or family close by (Table 10). Four-fifths (80.0%) of the sample do have friends or family close to their place of residence. No significant relationship is found between proximity to friends and family and geographic location (x^2=0.36, df=2, ns) (Table 10).

TABLE 10:
Importance and Proximity to Friends and Family, and Other Seniors for the Entire Sample and Sub-Groups

	St. Boniface (n=35) **% (n)**	Charleswood (n=35) **% (n)**	Fort Garry (n=35) **% (n)**	Total (N=105) **% (N)**
Friends /Family:				
Importance				
Not/Slightly	22.9 (8)	28.6 (10)	22.9 (8)	24.8 (26)
Very	77.1 (27)	71.4 (25)	77.1 (27)	75.2 (79)
Proximity				
No	22.9 (8)	17.1 (6)	20.0 (7)	20.0 (21)
Yes	77.1 (27)	82.9 (29)	80.0 (28)	80.0 (84)
Seniors:				
Importance				
Not/Slightly	48.6 (17)	28.6 (10)	57.1 (20)	44.8 (47)
Very	51.4 (18)	71.4 (25)	42.9 (15)	55.2 (58)
Proximity				
No	5.7 (2)	28.6 (10)	5.7 (2)	13.3 (14)
Yes	94.3 (33)	71.4 (25)	94.3 (33)	86.7 (91)

Slightly more than one-half (55.2%) of the entire sample indicated that it is "very important" to have other people their own age near by (Table 10). However, the majority (86.7%) of the sample indicate that they do have other seniors living near them. In both St. Boniface and Fort Garry, 94.3% of the respondents report living close to other seniors in comparison to Charleswood (71.4%). However, there are too few observation in the "no" category of proximity to seniors to conduct a statistical analysis.

In summary, approximately four-fifths of the entire sample live near the facilities and opportunities discussed above. This suggests that the majority of the respondents may have reasonably easy access to services and social contacts if they have adequate transportation provision. There are some notable differences among the three study areas. For example, a significantly larger proportion of respondents in St. Boniface live close to a bus stop thereby suggesting that access to bus service is better in this area than in Fort Garry and Charleswood. It is also significant that the lowest proportion of respondents who live near medical facilities is found in Fort Garry. This indicates that respondents who have inadequate transportation provision in Fort Garry will have greater difficulty in accessing medical services than their counterparts in Charleswood and Fort Garry.

4.1.6 Transportation Resources

The transportation resources available to the respondents in this study are based on an analysis of two separate sets of data. The first set is specific to personal transportation and the indicators are (i) ability to drive and (ii) car ownership. The second set addresses public transportation and the indicators include (i) distance to the bus stop, (ii) ability to walk, (iii) perceptions concerning the suitability of bus service, and (iv) satisfaction with bus service. In addition, the respondents' satisfaction with transportation in general is considered.

4.1.6.1 Ability to Drive

Respondents were asked if they could drive, which they indicated by a "yes" or "no" response. Over two-thirds (68.6%) of the entire sample report that they can drive (Table 11). The three study areas have similar yes/no distributions, and, therefore, no significant relationship is found between ability to drive and geographic location (x^2=0.27, df=2, ns) (Table 11).

TABLE 11:
Composition of Entire Sample and Sub-Groups by Ability to Drive and Car Ownership

	St. Boniface (n=35) **% (n)**	Charleswood (n=35) **% (n)**	Fort Garry (n=35) **% (n)**	Total (N=105) **% (N)**
Ability to Drive				
Yes	65.7 (23)	68.6 (24)	71.4 (25)	68.6 (72)
No	34.3 (12)	31.4 (11)	28.6 (10)	31.4 (33)
Car Ownership				
0	22.9 (8)	17.1 (6)	14.3 (5)	18.1 (19)
1 car	51.4 (18)	51.4 (18)	62.9 (22)	55.2 (58)
2-3 cars	25.7(9)	31.4 (11)	22.9 (8)	26.7 (28)

4.1.6.2 Car Ownership

Less than one-fifth (18.1%) of the overall sample do not own a car (Table 11). There is only minimal variation among the data for the three study areas, and, therefore, no significant relationship is found between car ownership and geographic location (x^2=1.79, df=4, ns) (Table 11).

In summary, the evaluation of ability to drive demonstrates that 31.4% of the entire sample do not drive. In contrast, only 18.1% of the entire sample do not have a car in the household. Therefore, it can be assumed that those respondents who do not drive, but live in a household where at least one car is available, may have greater mobility resources in the form of rides from a spouse. Nevertheless, transportation resources such as public transit are particularly important for the 18.1% of respondents who do not drive nor possess a car.

4.1.6.3 Distance to the Bus Stop

Respondents were asked how far their home is from the bus stop and were provided with responses that ranged from "less than one block" to "one mile or more". Over two-fifths (41.9%) of the entire sample live less than one block from a bus stop, while 25.7% live one block from a bus stop and 32.4% of the sample live more than one block from a bus stop (Table 12). The largest proportion of respondents who live one block or less from a bus stop is found in St. Boniface (85.8%) compared to Charleswood (60.0%) and Fort Garry (57.2%). The higher proportion of respondents in Charleswood (40.0%) and Fort Garry (42.9%) who live two blocks or more from a bus stop is indicative of the low density development of these areas. In comparison, in the relatively densely developed inner suburb of St. Boniface only 14.3% of its respondents live two blocks or more from a bus stop. Overall, there is a significant statistical relationship at the 0.01 level between distance to the bus stop and geographic location (x^2=14.22, df=4, p<0.01) (Table 12).

TABLE 12:
Composition of Entire Sample and Sub-Groups by Distance to Bus Stop, Ability to Walk, and Distance Able to Walk

	St. Boniface (n=35) **% (n)**	Charleswood (n=35) **% (n)**	Fort Garry (n=35) **% (n)**	Total (N=105) **% (N)**
Distance to Bus Stop				
< 1 block	42.9 (15)	34.3 (12)	48.6 (17)	41.9 (44)
1 block	42.9 (15)	25.7 (9)	8.6 (3)	25.7 (27)
> 1 block	14.3 (5)	40.0 (14)	42.9 (15)	32.4 (34)
Ability to Walk				
No Help	80.0 (28)	82.9 (29)	80.0 (28)	81.0 (85)
With Help	20.0 (7)	17.1 (6)	20.0 (7)	19.0 (20)
Distance Can Walk				
1/4-1 mile	54.3 (19)	71.4 (25)	62.9 (22)	62.9 (66)
100yds-1/4mi	31.4 (11)	14.3 (5)	20.0 (7)	21.9 (23)
10-100 yds	14.3 (5)	14.3 (5)	17.1 (6)	15.2 (16)

4.1.6.4 Ability to Walk

The indicator of ability to walk is based on two questions pertaining to walking that were included in the Activities of Daily Living. The first question is whether the respondent can walk. A respondent's ability to walk was indicated by five possible responses: "without any help"; "with some help from a device only"; "with some help using a person only"; "with some help from both a person and device"; and "unable to do it". Over four-fifths (81.0%) of the entire sample can walk without any help while the remainder of the respondents require some help from a device and/or person (Table 12). There is no significant relationship between ability to walk and geographic location (x^2=0.12, df=2, ns) (Table 12).

The second question considered the distance the respondent is able to walk. The respondents were provided with four possible responses that range from "less than 10 yards" to "1/4 to 1 mile or more". The majority (84.8%) of the entire sample can walk one-quarter of a mile or more (Table 12). Conversely, the remaining 15.2% of the respondents can walk only 100 yards or less which conceivably precludes bus transportation as a feasible option for them because of the walking requirements to and from the bus stop. There is no statistical relationship between walking distance and geographic location (x^2=3.38, df=4, ns) (Table 12).

Based on the indicators of ability to walk, it can be concluded that less than 20% of the total sample experience problems walking and require a device and/or person for assistance. Therefore, the large majority of the sample could potentially access bus service from their home. However, it must also be stressed that the severe winter conditions of Winnipeg were not taken into consideration when these questions were asked. Therefore, there may be a larger group who have problems walking in the winter because of the danger posed by ice and snow on walkways.

4.1.6.5 Perceptions of the Suitability of Bus Transportation

To obtain a greater understanding of the factors that motivate or impede bus usage by the elderly population, the respondents were asked a series of questions relating to the positive and negative features of public transit. The positive features include no driving, no parking, convenience in winter, low cost, and environmental concerns. They were asked if these features were "very important", "somewhat important" or "not important" in their decision to use the bus. The negative or problematic features are walking to the bus stop, bus stairs, understanding schedules, fear of falling, need for an escort, winter conditions, parcels, and the respondent's health. The respondents were asked if these features were "very problematic", "somewhat problematic" or "not problematic".

4.1.6.5.1 Positive Features of Public Transit

Over four-fifths (83.8%) of the entire sample indicated that not having to drive was a "very important" or "somewhat important" feature of bus service (Table 13). St. Boniface had the greatest percentage of respondents (97.1%) who indicated that not having to drive was "very important" or "somewhat important", in contrast to Charleswood (82.9%) and Fort Garry (71.4%). This difference in perception among the three study areas perhaps suggests that the St. Boniface respondents regard bus service to be a more feasible transportation alternative in comparison to respondents who live in the lower density suburbs. A statistically significant relationship at the 0.01

level is found between the importance of not driving and geographic location ($x^2=8.56$, df=2, $p<0.01$) (Table 13).

TABLE 13:
Importance of Public Transit: No Driving, No Parking, Convenience in Winter, Low Cost, and Concern for Environment for the Entire Sample and Sub-Groups

	St. Boniface (n=35) **% (n)**	Charleswood (n=35) **% (n)**	Fort Garry (n=35) **% (n)**	Total (N=105) **% (N)**
No Driving				
Important	97.1 (34)	82.9 (29)	71.4 (25)	83.8 (88)
Not Import.	2.9 (1)	17.1 (6)	28.6 (10)	16.2 (17)
No Parking				
Important	91.4 (32)	85.7 (30)	65.7 (23)	81.0 (85)
Not Import.	8.6 (3)	14.3 (5)	34.3 (12)	19.0 (20)
Winter				
Important	68.6 (24)	68.6 (24)	42.9 (15)	60.0 (63)
Not Import.	31.4 (11)	31.4 (11)	57.1 (20)	40.0 (42)
Low Cost				
Important	65.7 (23)	74.3 (26)	48.6 (17)	62.9 (66)
Not Import.	34.3 (12)	25.7 (9)	51.4 (18)	37.1 (39)
Environment				
Important	68.6 (24)	71.5 (25)	48.5 (17)	62.9 (66)
Not Import.	31.4 (11)	28.6 (10)	51.4 (18)	37.1 (39)

The importance of not having to park was also considered a positive feature of using the bus. Over four-fifths (81.0%) indicated that not having to park was "very important" or "somewhat important" (Table 13). In St. Boniface 91.4% of the respondents stated that it was "very important" or "somewhat important" not to have to park when using the bus in comparison to Charleswood (85.7%) and Fort Garry

(65.7%). As a result of these differences, there is a significant relationship at the 0.05 level between the importance of not parking and geographic location (x^2=8.28, df=2, $p<0.05$) (Table 13).

Three-fifths of the entire sample stated that the convenience of bus service in winter was "very important" or "somewhat important" (Table 13). In both St. Boniface and Charleswood, 68.6% of the respondents indicated that convenience was "very important" or "somewhat important", whereas only 42.9% of the Fort Garry respondents gave this response. As a result, a significant relationship at the 0.05 level is found between the importance of convenience of bus usage in winter and geographic location (x^2=6.43, df=2, $p<0.05$) (Table 13).

Over three-fifths (62.9%) of the entire sample reported that the low cost of the bus was "very important" or "somewhat important" (Table 13). No significant relationship is found between the importance of low cost and geographic location (x^2=5.14, df=2, ns) (Table 13).

Importance to the environment was considered to be a "very important" or "somewhat important" feature of the bus by 62.9% of the entire sample (Table 13). No statistically significant relationship between the importance to the environment and geographic location (x^2=7.61, df=4, ns) (Table 13).

In summary, the positive features of not driving and not parking are perceived to be important by the highest proportion of the sample. This is reflective of many comments made by respondents during the course of the interview that they did not like to drive downtown where driving was more stressful and parking was problematic.

The importance attributed to the convenience of the bus in winter highlights the need to study further the effect of extreme climatic conditions on the mobility of the elderly population.

4.1.6.5.2 Negative Features of Public Transit

When problems of the bus service are evaluated, the issue of walking to the bus stop demonstrates the effect of the different suburban environments. Almost two-thirds (64.8%) of the entire sample reported that walking to the bus stop was "not problematic" (Table 14). In St. Boniface, 88.6% of the respondents indicated that walking to the bus stop was "not problematic", in comparison to only 42.9% of the Charleswood respondents. This highlights the problems encountered by seniors in suburban areas where long distances to the bus stop may eliminate public transit as a mobility option. In Fort Garry, 62.9% of the respondents reported that walking to the bus stop was "not problematic". This higher proportion, in comparison to Charleswood, perhaps reflects the larger number of respondents who live in apartments in close proximity to major bus routes. As a result of the differences among the three study areas, a significant relationship at the 0.001 level is found between problems of walking to the bus stop and geographic location (x^2=16.11, df=2, $p<0.001$) (Table 14).

Over two-thirds (68.6%) of the entire sample reported that going up and down the stairs of the bus was "not problematic" (Table 14). There is no significant relationship between problems posed by bus stairs and geographic location (x^2=5.57, df=2, ns) (Table 14).

TABLE 14:
Problems of Public Transit: Walking to Bus Stop, Bus Stairs, Falling, Need for Escort, and Health as a Barrier for the Entire Sample and Sub-Groups

	St. Boniface (n=35) **% (n)**	Charleswood (n=35) **% (n)**	Fort Garry (n=35) **% (n)**	Total (N=105) **% (N)**
Walking to Bus Stop				
Problematic	11.4 (4)	57.1 (20)	37.1 (13)	35.2 (37)
Not Problematic	88.6 (31)	42.9 (15)	62.9 (22)	64.8 (68)
Bus Stairs				
Problematic	28.6 (10)	20.0 (7)	45.7 (16)	31.4 (33)
Not Problematic	71.4 (25)	80.0 (28)	54.3 (19)	68.6 (72)
Falling				
Problematic	37.1 (13)	28.6 (10)	31.4 (11)	32.4 (34)
Not Problematic	62.9 (22)	71.4 (25)	68.6 (24)	67.6 (71)
Escort				
Needed	2.9 (1)	11.4 (4)	11.4 (4)	8.6 (9)
Not Needed	97.1 (34)	88.6 (31)	88.6 (31)	91.4 (96)
Health				
Problematic	14.3 (5)	22.9 (8)	22.9 (8)	20.0 (21)
Not Problematic.	85.7 (30)	77.1 (27)	77.1 (27)	80.0 (84)

A similar proportion of the entire sample (67.6%) reported that fear of falling on the bus was "not problematic" (Table 14). No significant statistical relationship is found between fear of falling on the bus and geographic location (x^2=0.61, df=2, ns) (Table 14).

An escort is not required to take the bus with 91.4% of the entire sample (Table 14). There is no significant relationship between need for an escort and geographic location (x^2=2.19, df=2, ns) (Table 14).

Four-fifths of the entire sample do not consider health to be a barrier in taking the bus (Table 14). No significant relationship is found between health as a barrier and geographic location (x^2=1.07, df=2, ns) (Table 14).

TABLE 15:
Problems of Public Transit: Winter Conditions, Parcels, Waiting, and Understanding Bus Schedule for the Entire Sample and Sub-Groups

	St. Boniface (n=35) % (n)	Charleswood (n=35) % (n)	Fort Garry (n=35) % (n)	Total (N=105) % (N)
Winter				
Problematic	57.1 (20)	71.4 (25)	68.6 (24)	65.7 (69)
Not Problematic	42.9 (15)	28.6 (10)	31.4 (11)	34.3 (36)
Parcels				
Problematic	48.6 (17)	51.4 (18)	45.7 (16)	48.6 (51)
Not Problematic	51.4 (18)	48.6 (17)	54.3 (19)	51.4 (54)
Waiting				
Problematic	48.6 (17)	60.0 (21)	54.3 (19)	54.3 (57)
Not Problematic	51.4 (18)	40.0 (14)	45.7 (16)	45.7 (48)
Schedule				
Problematic	11.4 (4)	8.6 (3)	17.1 (6)	12.4 (13)
Not Problematic	88.6 (31)	91.4 (32)	82.9 (29)	87.6 (92)

Almost two-thirds (65.7%) of the entire sample reported that winter conditions and ice on walkways can be "somewhat problematic" or "very problematic" when using the bus (Table 15). There is no significant relationship between problems of winter conditions and ice and geographic location (x^2=1.78, df=2, ns) (Table 15).

Approximately one-half (51.4%) of the entire sample indicated that carrying parcels on a bus is "not problematic" (Table 15). There is no statistical relationship between "carrying parcels" and geographic location (x^2=0.23, df=2, ns) (Table 15).

Over one-half (54.3%) of the entire sample reported that waiting for the bus is "somewhat problematic" or "very problematic" (Table 15). This illustrates a common problem for elderly persons when bus shelters and benches are not provided. In Charleswood 60.0% of the respondents indicated that waiting for the bus was a problem, compared to 48.6% of the St. Boniface respondents. The discrepancy between these two areas may reflect that St. Boniface has more bus shelters and more frequent bus services than does Charleswood. Nevertheless, no significant relationship is found between the problem of waiting for a bus and geographic location (x^2=7.42, df=4, ns) (Table 15).

Understanding the bus schedule is not a problem for 87.6% of the entire sample (Table 15). There is no significant statistical relationship between understanding the bus schedule and geographic location (x^2=1.23, df=2, ns) (Table 15).

In summary, the negative features of public transportation that cause the least problems for the sample are the need for an escort, understanding schedules, and health related issues. Approximately one-third of the entire sample reported that walking to and from the bus stop, going up and down the bus stairs, and the fear of falling on the bus create problems for bus usage. The issue of walking is more problematic for the outer suburban elderly as they must walk longer distances compared to the St. Boniface respondents. Approximately one-half of the respondents consider waiting for the bus and carrying parcels to be barriers to bus usage. The issues of winter conditions and ice on walkways are of particular significance because the high proportion (65.7%) of respondents indicated that these negative features pose a problem in using public transit. This highlights the severe winter conditions experienced in Winnipeg which may diminish the feasibility of public transportation for many elderly persons regardless of how close they live to a bus stop.

4.1.6.6 Satisfaction with Bus Transportation

Respondents were asked their satisfaction with bus service based on their experience of using it or their general knowledge of the service. A five-point scale was utilized ranging from "very satisfied" to "very dissatisfied". Approximately four-fifths (81.0%) of the entire sample is either "satisfied" or "very satisfied" with bus service (Table 16). In both St. Boniface and Charleswood approximately three-fourths of the respondents are "satisfied" or "very satisfied" with bus service. In contrast, the response of no less than 91.7% of the Fort Garry respondents are in these categories. No significant relationship is found between bus satisfaction and geographic location (x^2=0.25, df=2, ns) (Table 16).

TABLE 16:
Satisfaction with Bus System and Transportation in General for the Entire Sample and Sub-Groups

	St. Boniface % (n)	Charleswood % (n)	Fort Garry % (n)	Total % (N)
Satisfaction				
Bus*	(n=30)	(n=25)	(n=24)	(N=79)
Dissatisfying	23.3 (7)	24.0 (6)	8.3 (2)	19.0 (15)
Satisfying	56.7 (17)	56.0 (14)	66.7 (16)	59.5 (47)
Very Satisfying	20.0 (6)	20.0 (5)	25.0 (6)	21.5 (17)
Satisfaction				
Transport*	(n=35)	(n=105)	(n=105)	(N=105)
Dissatisfying	14.3 (5)	11.4 (4)	5.7 (2)	10.5 (11)
Satisfying	68.6 (24)	71.4 (25)	60.0 (21)	66.7 (70)
Very Satisfying	17.1 (6)	17.1 (6)	34.3 (12)	22.9 (24)

* "Dissatisfying" includes the categories of "Mixed", "Dissatisfying", "Very Dissatisfying" and "Terrible". "Very Satisfying includes the categories of "Very Satisfying" and "Delightful".

4.1.6.7 Transportation Satisfaction

Based on the seven-point Terrible-Delightful Scale, the respondents were asked if they were satisfied with their transportation in general. Two-thirds of the entire sample stated that they were satisfied with their transportation, and 22.9% were very satisfied (Table 16). As with bus satisfaction, Fort Garry has the largest proportion (94.3%) of respondents who are satisfied or very satisfied with their transportation compared to St. Boniface (85.7%) and Charleswood (88.5%). No significant relationship is found between transportation satisfaction and geographic location (x^2=3.89, df=2, ns) (Table 16).

4.1.7 Life Satisfaction

Although some of the indicators of life satisfaction have been evaluated in the appropriate sections, satisfaction with family, friends, religion, self-esteem and life as a whole must still be considered. A further component of life satisfaction, satisfaction with work, cannot be analyzed because of too few observations (n=6). The responses for the satisfaction questions are based on the seven-point Terrible-Delightful scale.

Most respondents in the entire sample (94.2%) indicate that they are either satisfied, very satisfied, or delighted with their family relations (Table 17). Only 7.6% of the entire sample are dissatisfied or very dissatisfied with relationships with friends (Table 17). Only 5.3% of the entire sample indicated that their satisfaction with religion was either "mixed", "dissatisfying", or "very dissatisfying" (Table 17). When respondents were asked about their satisfaction with themselves, 76.9% of the entire sample indicated that they are satisfied or very satisfied (Table 17). Ninety percent of the entire sample is satisfied or very satisfied with life as a whole (Table 17).

TABLE 17:
Satisfaction with Family, Friends, Religion, Self-Esteem, and Life as Whole for the Entire Sample and Sub-Groups

	St. Boniface **% (n)**	Charleswood **% (n)**	Fort Garry **% (n)**	Total **% (N)**
Satisfaction -Family*	(n=35)	(n=35)	(n=35)	(N=105)
Dissatisfying	8.6 (3)	2.9 (1)	5.7 (2)	5.7 (6)
Satisfying	42.9 (15)	34.3 (12)	34.3 (12)	37.1 (39)
Very Satisfying	48.6 (17)	62.8 (22)	60.0 (21)	57.1 (60)
Satisfaction -Friends*	(n=35)	(n=35)	(n=35)	(N=105)
Dissatisfying	5.7 (2)	5.7 (2)	11.4 (4)	7.6 (8)
Satisfying	48.6 (17)	40.0 (14)	42.9 (15)	43.8 (46)
Very Satisfying	45.7 (16)	54.3 (19)	45.7 (16)	48.5 (51)
Satisfaction -Religion*	(n=33)	(n=33)	(n=29)	(N=95)
Dissatisfying	0 (0)	9.1 (3)	6.9 (2)	5.3 (5)
Satisfying	75.8 (25)	63.6 (21)	65.5 (19)	68.4 (65)
Very Satisfying	24.2 (8)	27.3 (9)	27.6 (8)	26.3 (25)
Satisfaction -SelfEsteem*	(n=35)	(n=34)	(n=35)	(N=104)
Dissatisfying	22.9 (8)	32.4 (11)	14.3 (5)	23.1 (24)
Satisfying	62.9 (22)	41.2 (14)	57.1 (20)	53.8 (56)
Very Satisfying	14.3 (5)	26.5 (9)	28.6 (10)	23.1 (24)
Satisfaction -Life*	(n=35)	(n=34)	(n=35)	(N=104)
Dissatisfying	8.6 (3)	11.8 (4)	8.6 (3)	9.6 (10)
Satisfying	60.0 (21)	38.2 (13)	45.7 (16)	48.1 (50)
Very Satisfying	31.4 (11)	50.0 (17)	45.7 (16)	42.3 (44)

* "Dissatisfying" includes the categories of "Mixed", "Dissatisfying", "Very Dissatisfying" and "Terrible". "Very Satisfying" includes the categories of "Very Satisfying" and "Delightful".

4.1.8 Overview of the Characteristics of the Entire Sample and Sub-Groups

This descriptive analysis has provided an overview of the characteristics of the sample for this study which represent indicators of the autonomy of an individual. An examination of the socio-demographic characteristics, socio-economic status, living arrangements, health and functional level, housing environment, transportation resources, and life satisfaction of the respondents provides an indication of their ability to access transportation that enables them to remain independent within the community. In particular, the discussion has centred on the relationship between the sample characteristics and the three individual study areas. Geographic location will also be the focus in the next section when the transportation usage and travel activity patterns of the respondents are evaluated.

4.2 Transportation Usage and Travel Activity Patterns

In this sub-section the three key dependent variables of the analysis are examined. These variables are based on Lawton's (1980) identification of the transportation behaviours that can be measured to analyze the effect of the autonomy-security dialectic on the transportation needs of the elderly. They include: (i) the frequency of use of transportation modes by the respondents; (ii) the frequency of travel to service and activity sites, and for descriptive purposes, the types of transportation utilized to access these sites; and, (iii) the distance the respondents travel from their place of residence to reach services and social contacts.

4.2.1 Transportation Modes: Frequency of Use

The respondents were asked to indicate the frequency of use of seven types of transportation. The transportation options available for most elderly persons residing in urban areas include rides from friends and family, accessibility to the automobile within the household, walking, public transit, taxi, handi-transit, and private transportation. The frequency of use of these transportation modes is based on seven possible responses: "at least once per day"; "2-6 times per week; "once per week"; "2-3 times per month"; "once per month"; "less than once per month"; and "never".

4.2.1.1 Rides From Friends and Family

Rides from friends and family (excluding rides from a spouse) represent the transportation mode used by the largest proportion of the sample (Table 18). Four-fifths of the respondents receive rides for travel to service and activity sites. In most cases, however, rides from friends and family are only an occasional form of transportation. Over two-fifths (41.9%) of the entire sample receive a ride once a month or less. Only 9.5% of the respondents receive rides more than once a week. No statistical relationship is found between frequency of rides from friends and family and geographic location (x^2=3.04, df=6, ns) (Table 18).

TABLE 18:
Frequency of Rides from Friends and Family for the Entire Sample and Sub-Groups

	St. Boniface (n=35) **% (n)**	Charleswood (n=35) **% (n)**	Fort Garry (n=35) **% (n)**	Total (N=105) **% (N)**
Trip Frequency				
1 per day	5.7 (2)	2.9 (1)	2.9 (1)	3.8 (4)
2-6 per week	8.6 (3)	5.7 (2)	2.9 (1)	5.7 (6)
1 per week	11.4 (4)	20.0 (7)	17.1 (6)	16.2 (17)
2-3 per month	11.4 (4)	14.3 (5)	11.4 (4)	12.4 (13)
1 per month	25.7 (9)	8.6 (3)	22.9 (8)	19.0 (20)
< 1 per month	22.9 (8)	22.9 (8)	22.9 (8)	22.9 (24)
Never	14.3 (5)	25.7 (9)	20.0 (7)	20.0 (21)

4.2.1.2 The Automobile

The second largest category of respondents (75.2%) indicated that access to the household automobile is their major form of transportation (Table 19). In contrast to rides from friends and family, however, those who indicated that they use the automobile, use it on a regular basis. All the respondents that use the automobile drive at least once per week. It is important to note that 8.57% of the sample who use the automobile do not drive themselves but are driven by a spouse. This highlights the dependence on their spouse for rides and suggests that they would encounter transportation difficulties if their spouse could no longer drive. There is very little variation among the three study areas with respect to degree of automobile use. There is no significant relationship between the frequency of automobile use and geographic location (x^2=1.16, df=4, ns) (Table 19).

TABLE 19:
Frequency of Automobile Use
for the Entire Sample and Sub-Groups

	St. Boniface (n=35) **% (n)**	Charleswood (n=35) **% (n)**	Fort Garry (n=35) **% (n)**	Total (N=105) **% (N)**
Trip Frequency				
1 per day	34.3 (12)	48.6 (17)	45.7 (16)	42.9 (45)
2-6 per week	37.1 (13)	22.9 (8)	31.4 (11)	30.5 (32)
1 per week	2.9 (1)	2.9 (1)	0 (0)	1.9 (2)
Never	25.7 (9)	25.7 (9)	22.9 (8)	24.8 (26)

4.2.1.3 Walking

Walking is also an important transportation mode for the entire sample (Table 20). Thirty-nine per cent of the respondents walk to a service or activity site at least once a week. In addition, 13.3% of the sample walk between one and three times per month. When the three study areas are considered, no significant relationship is found between the frequency of walking and geographic location (x^2=4.06, df=4, ns) (Table 20). Nevertheless, an important observation is that 51.4% of the Fort Garry respondents walk at least once a week compared to Charleswood (37.1%) and St. Boniface (28.6%). This suggests that walking as a form of transportation is more important for older people living in the Fort Garry study area.

TABLE 20:
Frequency of Walking
for the Entire Sample and Sub-Groups

	St. Boniface (n=35) **% (n)**	Charleswood (n=35) **% (n)**	Fort Garry (n=35) **% (n)**	Total (N=105) **% (N)**
Trip Frequency				
1 per day	11.4 (4)	11.4 (4)	17.1 (6)	13.3 (14)
2-6 per week	8.6 (3)	20.0 (7)	20.0 (7)	16.2 (17)
1 per week	8.6 (3)	5.7 (2)	14.3 (5)	9.5 (10)
2-3 per month	11.4 (4)	5.7 (2)	5.7 (2)	7.6 (8)
1 per month	2.9 (1)	8.6 (3)	5.7 (2)	5.7 (6)
< 1 per month	8.6 (3)	2.9 (1)	2.9 (1)	4.8 (5)
Never	48.6 (17)	45.7 (16)	34.3 (12)	42.9 (45)

4.2.1.4 Public Transit

Over one-half (52.4%) of the entire sample use public transit to travel to service and activity sites (Table 21). As with rides from friends and family, however, it is evident that public transit is used mainly as an occasional mode of transportation. For instance, 33.3% of the respondents take the bus less than once a week, while only 19% use public transit once per week or more. St. Boniface has the highest proportion (57.1%) of respondents who use public transit. Furthermore, the largest proportion of respondents who take the bus at least twice a month is registered by St. Boniface (37.2%) compared to Charleswood (22.9%) and Fort Garry (22.9%). Despite these differences, there is no statistically significant relationship between frequency of use of public transit and geographic location (x^2=2.54, df=4, ns) (Table 21).

TABLE 21:
Frequency of Public Transit Use for the Entire Sample and Sub-Groups

	St. Boniface (n=35) **% (n)**	Charleswood (n=35) **% (n)**	Fort Garry (n=35) **% (n)**	Total (N=105) **% (N)**
Trip Frequency				
1 per day	2.9 (1)	2.9 (1)	0 (0)	1.9 (2)
2-6 per week	14.3 (5)	8.6 (3)	5.7 (2)	9.5 (10)
1 per week	14.3 (5)	0 (0)	8.6 (3)	7.6 (8)
2-3 per month	5.7 (2)	11.4 (4)	8.6 (3)	8.6 (9)
1 per month	14.3 (5)	11.4 (4)	2.9 (1)	9.5 (10)
< 1 per month	5.7 (2)	17.1 (6)	22.9 (8)	15.2 (16)
Never	42.9 (15)	48.6 (17)	51.4 (18)	47.6 (50)

4.2.1.5 Taxi

Only one-third of the sample use taxi transportation to access service and activity sites (Table 22). In all cases, the use of taxi services is limited to once a month or less. In addition, the majority of respondents who take a taxi indicated that it is mainly for transportation to and from Winnipeg Airport. There is no significant relationship between frequency of taxi use and geographic location (x^2=2.66, df=2, ns) (Table 22).

TABLE 22:
Frequency of Taxi Use
for the Entire Sample and Sub-Groups

	St. Boniface (n=35) **% (n)**	Charleswood (n=35) **% (n)**	Fort Garry (n=35) **% (n)**	Total (N=105) **% (N)**
Trip Frequency				
2-3 per month	2.9 (1)	0 (0)	0 (0)	1.0 (1)
1 per month	2.9 (1)	2.9 (1)	2.9 (1)	2.9 (3)
< 1 per month	17.1 (6)	37.1 (13)	34.3 (12)	29.5 (31)
Never	77.1 (27)	60.0 (21)	62.9 (22)	66.7 (70)

4.2.1.6 Handi-Transit

Statistical analysis cannot be conducted when considering the frequency of use of handi-transit because there are too few observations. Only 10.5% of the entire sample reported using this form of transportation. However, there are respondents from all three study areas who use handi-transit, with frequency of use ranging from daily to less than once a month (Table 23).

TABLE 23:
Frequency of Use of Handi-Transit
for the Entire Sample and Sub-Groups

	St. Boniface (n=35) **% (n)**	Charleswood (n=35) **% (n)**	Fort Garry (n=35) **% (n)**	Total (N=105) **% (N)**
Trip Frequency				
1 per day	2.9 (1)	0 (0)	0 (0)	1.0 (1)
2-6 per week	0 (0)	2.9 (1)	0 (0)	1.0 (1)
1 per week	0 (0)	5.7 (2)	0 (0)	1.9 (2)
2-3 per month	5.7 (2)	0 (0)	0 (0)	1.9 (2)
1 per month	2.9 (1)	0 (0)	0 (0)	1.0 (1)
< 1 per month	0 (0)	5.7 (2)	5.7 (2)	3.8 (4)
Never	88.6 (31)	85.7 (30)	94.3 (33)	89.5 (94)

4.2.1.7 Private Transportation

Private transportation includes a variety of transportation companies who offer van services for the elderly at a rate substantially higher than public transportation. Little use of private transportation is reported, and, therefore statistical analysis cannot be conducted (Table 24).

TABLE 24:
Frequency of Use Private Transportation for the Entire Sample and Sub-Groups

	St. Boniface (n=35) **% (n)**	Charleswood (n=35) **% (n)**	Fort Garry (n=35) **% (n)**	Total (N=105) **% (N)**
Trip Frequency				
1 per day	2.9 (1)	0 (0)	0 (0)	1.0 (1)
2-6 per week	0 (0)	2.9 (1)	0 (0)	1.0 (1)
1 per week	0 (0)	0 (0)	2.9 (1)	1.0 (1)
2-3 per month	0 (0)	0 (0)	8.6 (3)	2.9 (3)
Never	97.1 (34)	97.1 (34)	88.6 (31)	94.3 (99)

4.2.1.8 Overview of Frequency of Use of Transportation Modes

In summary, the automobile, rides from friends and family, walking, and public transit are the principle forms of transportation used by the sample. Based on these results, it can be surmised that automobiles driven by respondents or their spouse are used as the most regular form of transportation. In contrast, automobile rides provided by friends and family, walking and public transit appear to be used only occasionally to reach service and activity sites. Based on this analysis there is no relationship between geographic location and the frequency of use of these transportation modes. However, it is apparent that the St. Boniface respondents drive less but take the bus more often than respondents in Fort Garry and Charleswood. Furthermore, the Fort Garry respondents walk more often to service and activity sites than do the respondents in the other two study areas. Finally, the use of taxis, handi-transit, and private transportation is very limited, and, therefore, will not be included in the testing of the research questions.

4.2.2 Frequency of Travel to Service and Activity Sites

There are ten service and activity sites that are defined to be of importance in maximizing social integration and assuring access to life-sustaining functions. These sites include the grocery store, shopping mall, bank, medical centre, pharmacy, facilities for recreation and entertainment, the homes of friends and relatives, church, place of work or volunteering, and senior centre. The respondents were asked how often they travel to each of these ten service and activity sites. The frequency of travel to each site is based on seven responses: "at least once per day"; "2-6 times per week; "once per week"; "2-3 times per month"; "once per month"; "less than once per month"; and "never".

4.2.2.1 Grocery Store

Over one-half (55.3%) of the entire sample travel to the grocery store more than once a week (Table 25). The highest proportion of respondents who travel to the grocery store more than once a week is found in Fort Garry (68.6%) compared to Charleswood (57.1%) and St. Boniface (40.0%). As a result of these discrepancies, a statistical relationship at the 0.05 level is found between frequency of travel to the grocery store and geographic location (x^2=5.85, df=2, $p<0.05$) (Table 25).

TABLE 25:
Frequency of Travel to a Grocery Store for the Entire Sample and Sub-Groups

	St. Boniface (n=35) **% (n)**	Charleswood (n=35) **% (n)**	Fort Garry (n=35) **% (n)**	Total (N=105) **% (N)**
Trip Frequency				
1 per day	0 (0)	11.4 (4)	8.6 (3)	6.7 (7)
2-6 per week	40.0 (14)	45.7 (16)	60.0 (21)	48.6 (51)
1 per week	45.7 (16)	40.0 (14)	28.6 (10)	38.1 (40)
2-3 per month	8.6 (3)	2.9 (1)	2.9 (1)	4.8 (5)
1 per month	2.9 (1)	0 (0)	0 (0)	1.0 (1)
Never	2.9 (1)	0 (0)	0 (0)	1.0 (1)

4.2.2.2 Shopping Mall

Respondents were asked how often they travel to the regional shopping centres located in Winnipeg (Figure 1). These shopping centres were selected because of the wide range of services offered. Almost three-fifths (58.1%) of the entire sample travel to a shopping mall at least once per week (Table 26). St. Boniface has the lowest proportion of respondents (40.0%) who travel to a shopping mall once a week or more compared to Charleswood (65.8%) and Fort Garry (68.6%). However, there is no statistically significant relationship between frequency of travel to shopping malls and geographic location (x^2=9.67, df=6, ns) (Table 26).

TABLE 26:
Frequency of Travel to a Shopping Mall for the Entire Sample and Sub-Groups

	St. Boniface (n=35) **% (n)**	Charleswood (n=35) **% (n)**	Fort Garry (n=35) **% (n)**	Total (N=105) **% (N)**
Trip Frequency				
1 per day	0 (0)	8.6 (3)	2.9 (1)	3.8 (4)
2-6 per week	22.9 (8)	22.9 (8)	34.3 (12)	26.7 (28)
1 per week	17.1 (6)	34.3 (12)	31.4 (11)	27.6 (29)
2-3 per month	17.1 (6)	14.3 (5)	17.1 (6)	16.2 (17)
1 per month	17.1 (6)	14.3 (5)	11.4 (4)	14.3 (15)
< 1 per month	22.9 (8)	5.7 (2)	2.9 (1)	10.5 (11)
Never	2.9 (1)	0 (0)	0 (0)	1.0 (1)

4.2.2.3 Bank

Over one-half (53.3%) of the entire sample travel to the bank two to three times per month (Table 27). Over two-fifths (42.9%) of the Fort Garry respondents travel to a bank once a week or more compared to only 5.7% of the St. Boniface respondents. It can be postulated that the difference of travel frequency to the bank may be the result of diverse income levels of the study areas. The lower income of the St. Boniface respondents suggests that their main source of income is the Old Age Security government pension. This pension arrives only once a month which would explain why they travel to a bank less frequently. As a result of the observed differences among the three study areas, a statistically significant relationship at the

0.001 level is found between the frequency of travel to the bank and geographic location (x^2=21.48, df=4, p<0.001) (Table 27).

TABLE 27:
Frequency of Travel to a Bank
for the Entire Sample and Sub-Groups

	St. Boniface (n=35) **% (n)**	Charleswood (n=35) **% (n)**	Fort Garry (n=35) **% (n)**	Total (N=105) **% (N)**
Trip Frequency				
2-6 per week	0 (0)	2.9 (1)	14.3 (5)	5.7 (6)
1 per week	5.7 (2)	22.9 (8)	28.6 (10)	19.0 (20)
2-3 per month	51.4 (18)	57.1 (20)	51.4 (18)	53.3 (56)
1 per month	42.9 (15)	14.3 (5)	5.7 (2)	21.0 (22)
< 1 per month	0 (0)	2.9 (1)	0 (0)	1.0 (1)

4.2.2.4 <u>Medical Centre</u>

Almost three-quarters (72.4%) of the entire sample travel to a medical facility less than once a month (Table 28). This percentage is broadly replicated in the three areal sub-groups. Therefore, no statistically significant relationship is found between the frequency of travel to a medical facility and geographic location (x^2=1.85, df=2, ns) (Table 28).

TABLE 28:
Frequency of Travel to Medical Facilities for the Entire Sample and Sub-Groups

	St. Boniface (n=35) **% (n)**	Charleswood (n=35) **% (n)**	Fort Garry (n=35) **% (n)**	Total (N=105) **% (N)**
Trip Frequency				
2-6 per week	0 (0)	2.9 (1)	0 (0)	1.0 (1)
1 per week	2.9 (1)	2.9 (1)	0 (0)	1.9 (2)
2-3 per month	8.6 (3)	5.7 (2)	8.6 (3)	7.6 (8)
1 per month	22.9 (8)	14.3 (5)	11.4 (4)	16.2 (17)
< 1 per month	62.9 (22)	74.3 (26)	80.0 (28)	72.4 (76)
Never	2.9 (1)	0 (0)	0 (0)	1.0 (1)

4.2.2.5 Pharmacy

Almost one-half (47.6%) of the entire sample travel to a pharmacy less than once a month (Table 29). The highest proportion of respondents who go to the pharmacy less than once a month is found in Charleswood (60.0%) compared to St. Boniface (42.8%) and Fort Garry (40.0%). No statistically significant relationship is found between the frequency of travel to a pharmacy and geographic location (x^2=7.72, df=4, ns) (Table 29).

TABLE 29:
Frequency of Travel to a Pharmacy
for the Entire Sample and Sub-Groups

	St. Boniface (n=35) **% (n)**	Charleswood (n=35) **% (n)**	Fort Garry (n=35) **% (n)**	Total (N=105) **% (N)**
Trip Frequency				
2-6 per week	0 (0)	0 (0)	2.9 (1)	1.0 (1)
1 per week	5.7 (2)	2.9 (1)	22.9 (8)	10.5 (11)
2-3 per month	11.4 (4)	8.6 (3)	8.6 (3)	9.5 (10)
1 per month	40.0 (14)	28.6 (10)	25.7 (9)	31.4 (33)
< 1 per month	31.4 (11)	42.9 (15)	37.1 (13)	37.1 (39)
Never	11.4 (4)	17.1 (6)	2.9 (1)	10.5 (11)

4.2.2.6 Facilities for Recreation and Entertainment

Over three-fifths (61.0%) of the entire sample travel to places of recreation and entertainment once a week or more (Table 30). When the three study areas are compared some dissimilarities are apparent. In Fort Garry 71.5% of the respondents travel to places of recreation and entertainment once a week or more compared to Charleswood (57.2%) and St. Boniface (54.3%). Despite these differences, no statistically significant relationship is found between the frequency of travel to places of recreation and entertainment and geographic location (x^2=3.93, df=6, ns) (Table 30).

TABLE 30:
Frequency of Travel to Recreation and Entertainment Facilities for the Entire Sample and Sub-Groups

	St. Boniface (n=35) % (n)	Charleswood (n=35) % (n)	Fort Garry (n=35) % (n)	Total (N=105) % (N)
Trip Frequency				
1 per day	5.7 (2)	5.7 (2)	2.9 (1)	4.8 (5)
2-6 per week	25.7 (9)	28.6 (10)	45.7 (16)	33.3 (35)
1 per week	22.9 (8)	22.9 (8)	22.9 (8)	22.9 (24)
2-3 per month	14.3 (5)	14.3 (5)	14.3 (5)	14.3 (15)
1 per month	5.7 (2)	11.4 (4)	8.6 (3)	8.6 (9)
< 1 per month	11.4 (4)	14.3 (5)	5.7 (2)	10.5 (11)
Never	14.3 (5)	2.9 (1)	0 (0)	5.7 (6)

4.2.2.7 Homes of Friends and Family

One-half of the entire sample travel to the homes of friends and family once a week or more (Table 31). The highest proportion of respondents to travel to the homes of friends and family once a week or more is found in Fort Garry (62.9%) compared to Charleswood (52.9%) and St. Boniface (34.3%). Nevertheless, no statistically significant relationship is found between the frequency of travel to the homes of friends and family and geographic location (x^2=8.28, df=6, ns) (Table 31).

TABLE 31:
Frequency of Travel to Friends and Family for the Entire Sample and Sub-Groups

	St. Boniface (n=35) % (n)	Charleswood (n=35) % (n)	Fort Garry (n=35) % (n)	Total (N=105) % (N)
Trip Frequency				
1 per day	0 (0)	5.9 (2)	2.9 (1)	2.9 (3)
2-6 per week	11.4 (4)	23.5 (8)	20.0 (7)	18.3 (19)
1 per week	22.9 (8)	23.5 (8)	40.0 (14)	28.8 (30)
2-3 per month	20.0 (7)	17.6 (6)	14.3 (5)	17.3 (18)
1 per month	22.9 (8)	17.6 (6)	14.3 (5)	18.3 (19)
< 1 per month	22.9 (8)	11.8 (4)	8.6 (3)	14.4 (15)

4.2.2.8 Church

Over two-fifths (41.9%) of the entire sample do not attend church, while 44.7% of the respondents travel to church once a week or more, and 13.4% attend less frequently (Table 32). When the three study areas are compared, there are important differences in the percentage distributions of the frequency of travel to church. In St. Boniface 65.7% of the respondents travel to church once a week or more. In contrast, only 60.0% of the Charleswood respondents and 40.0% of the Fort Garry respondents attend church at any time. As a result of this differences, there is a statistically significant relationship at the 0.01 level between the frequency of travel to church and geographic location (x^2=8.53, df=2, p<0.01) (Table 32).

TABLE 32:
Frequency of Travel to Church
for the Entire Sample and Sub-Groups

Trip Frequency	St. Boniface (n=35) **% (n)**	Charleswood (n=35) **% (n)**	Fort Garry (n=35) **% (n)**	Total (N=105) **% (N)**
1 per day	5.7 (2)	0 (0)	0 (0)	1.9 (2)
2-6 per week	11.4 (4)	11.4 (4)	0 (0)	7.6 (8)
1 per week	48.6 (17)	25.7 (9)	31.4 (11)	35.2 (37)
2-3 per month	0 (0)	2.9 (1)	0 (0)	1.0 (1)
1 per month	5.7 (2)	5.7 (2)	5.7 (2)	5.7 (6)
< 1 per month	2.9 (1)	14.3 (5)	2.9 (1)	6.7 (7)
Never	25.7 (9)	40.0 (14)	60.0 (21)	41.9 (44)

4.2.2.9 Place of Work or Volunteering

Of the 36.2% of the entire sample who travel to work or to volunteer, the majority (24.8%) make such trips at least once per week (Table 33). The percentage distribution is similar for the three study areas. However, there are too few observations to conduct a statistical analysis of the relationship between frequency of travel to work or to volunteer and geographic location.

TABLE 33:
Frequency of Travel to Work or to Volunteer for the Entire Sample and Sub-Groups

Trip Frequency	St. Boniface (n=35) **% (n)**	Charleswood (n=35) **% (n)**	Fort Garry (n=35) **% (n)**	Total (N=105) **% (N)**
1 per day	0 (0)	2.9 (1)	0 (0)	1.0 (1)
2-6 per week	8.6 (3)	11.4 (4)	14.3 (5)	11.4 (12)
1 per week	14.3 (5)	11.4 (4)	11.4 (4)	12.4 (13)
2-3 per month	5.7 (2)	2.9 (1)	5.7 (2)	4.8 (5)
1 per month	2.9 (1)	5.7 (2)	5.7 (2)	4.8 (5)
< 1 per month	2.9 (1)	2.9 (1)	0 (0)	1.9 (2)
Never	65.7 (23)	62.9 (22)	62.9 (22)	63.8 (67)

4.2.2.10 <u>Senior Centre</u>

Less than one-fifth (18.1%) of the entire sample travel to a senior centre of whom the majority make such trips at least once per week (Table 34). Interestingly, 31.4% of the Charleswood respondents travel to a senior centre compared to only 5.7% of the St. Boniface respondents. This difference in travel frequency cannot be explained by variations in proximity as the analysis of distance to senior centres will illustrate that respondents in both Charleswood and St. Boniface travel similar distances to this activity. Once again, there are too few observations to conduct a statistical analysis of the relationship between the frequency of travel to a senior centre and geographic location.

TABLE 34:
Frequency of Travel to a Senior Centre for the Entire Sample and Sub-Groups

	St. Boniface (n=35) **% (n)**	Charleswood (n=35) **% (n)**	Fort Garry (n=35) **% (n)**	Total (N=105) **% (N)**
Trip Frequency				
1 per day	0 (0)	2.9 (1)	0 (0)	1.0 (1)
2-6 per week	5.7 (2)	5.7 (2)	5.7 (2)	5.7 (6)
1 per week	0 (0)	8.6 (3)	11.4 (4)	6.7 (7)
2-3 per month	0 (0)	8.6 (3)	0 (0)	2.9 (3)
1 per month	0 (0)	2.9 (1)	0 (0)	1.0 (1)
< 1 per month	0 (0)	2.9 (1)	0 (0)	1.0 (1)
Never	94.3 (33)	68.6 (24)	82.9 (29)	81.9 (86)

4.2.2.11 Overview of Frequency of Travel to Service and Activity Sites

In summary, at least one-half of the respondents in the sample travel at least once a week to the grocery store, shopping mall, places of recreation and entertainment, the homes of friends and family, and church. In addition, statistically significant relationships were found between the respondents' geographic location and the frequency of travel to a grocery store, bank, and church. In particular, there are pronounced differences between Fort Garry and St. Boniface. Specifically, there are greater proportions of Fort Garry respondents who travel once a week or more to all destinations except to church. The variation in trip frequency between St. Boniface and Fort Garry may be the result of the greater proportion of St. Boniface respondents exhibiting declining autonomy resources which suggest that they experience mobility problems. In addition, the analysis of distance travelled to service and activity sites will demonstrate that St. Boniface respondents travel further to a grocery store. This suggests that the component of security may also contribute to the explanation of the differences in trip frequency. However, the distance travelled to a bank does not support this conclusion as St. Boniface respondents travel similar distances as those in Fort Garry to this service. As there are only a limited number of respondents who travel to church, to work or to volunteer, and to a senior centre, these sites will not be included in the analysis of the research questions.

4.2.3 Transportation Modes: Access to Service and Activity Sites

Although the types of transportation used to access the service and activity sites will not be utilized in further testing, the inclusion of this variable is for descriptive purposes to complement the data on frequency of visits to these sites. The respondents were asked to indicate which transportation modes they utilized. They were provided with seven transportation options available for most elderly persons residing in urban areas: "rides from friends and family"; "the automobile"; "walking"; "public transit"; "taxi"; "handi-transit"; and "private transportation". They were asked to indicate which transportation mode, or combination of modes, they use to access the service and activity sites mentioned above.

4.2.3.1 Grocery Store

One-half of the entire sample travel to the grocery store by automobile, while one-quarter of the sample both drive and walk to reach this service site (Table 35). The remaining 25.0% of the sample use a variety of transportation modes to access the grocery store including rides with friends and relatives, bus, taxi, and private transportation. The highest proportion of respondents who drive to the grocery store are found in St. Boniface (55.9%), while the highest proportion of respondents who both drive and walk is found in Fort Garry (22.9%). No significant relationship is found between transportation modes used to access the grocery store and geographic location (x^2=7.81, df=4, ns) (Table 35).

TABLE 35:
Transportation Modes Used to Travel to a Grocery Store for the Entire Sample and Sub-Groups

	St. Boniface (n=34) **% (n)**	Charleswood (n=35) **% (n)**	Fort Garry (n=35) **% (n)**	Total (N=104) **% (N)**
Transport Mode				
Auto	55.9 (19)	51.4 (18)	42.9 (15)	50.0 (52)
Auto/Walk	11.8 (4)	17.1 (6)	22.9 (8)	17.3 (18)
Walking	0 (0)	5.7 (2)	17.1 (6)	7.7 (8)
Rides/Walk	2.9 (1)	14.3 (5)	5.7 (2)	7.7 (8)
Rides	11.8 (4)	2.9 (1)	0 (0)	4.8 (5)
Auto/Rides	8.8 (3)	0 (0)	0(0)	2.9 (3)
Bus/Walk	5.9 (2)	2.9 (1)	0 (0)	2.9 (3)
Others*	2.9 (1)	8.6 (3)	11.4 (4)	7.7 (8)

*Represents a variety of transportation modes.

4.2.3.2 Shopping Mall

Over one-half (51.0%) of the entire sample use the automobile to access regional shopping centres (Table 36). The remainder of the entire sample utilize a variety of transportation modes that include rides from friends and family, walking, public transit, and private transportation to travel to shopping malls. In Fort Garry 65.7% of the respondents use the car to travel to shopping malls, whereas only 38.2% of the St. Boniface respondents use the automobile. Despite these differences, no statistically significant relationship is found between the type of transportation used to access shopping outlets and geographic location (x^2=6.72, df=4, ns) (Table 36).

TABLE 36:
Transportation Modes Used to Travel to a Shopping Mall for the Entire Sample and Sub-Groups

	St. Boniface (n=34) **% (n)**	Charleswood (n=35) **% (n)**	Fort Garry (n=35) **% (n)**	Total (N=104) **% (N)**
Transport Mode				
Auto	38.2 (13)	48.6 (17)	65.7 (23)	51.0 (53)
Auto/Bus	14.7 (5)	8.6 (3)	5.7 (2)	9.6 (10)
Rides/Bus	11.8 (4)	8.6 (3)	2.9 (1)	7.7 (8)
Bus	11.8 (4)	8.6 (3)	0 (0)	6.7 (7)
Rides	8.8 (3)	5.7 (2)	5.7 (2)	6.7 (7)
Auto/Rides	11.8 (4)	5.7 (2)	0 (0)	5.8 (6)
Auto/Walk	0 (0)	2.9 (1)	2.9 (1)	1.9 (2)
Walking	0 (0)	5.7 (2)	0 (0)	1.9 (2)
Private	0 (0)	2.9 (1)	2.9 (1)	1.9 (2)
Others*	2.9 (1)	2.9 (1)	14.3 (5)	6.7 (7)

*Represents a variety of transportation modes.

4.2.3.3 Bank

Over one-half (55.2%) of the entire sample also use the automobile to travel to the bank (Table 37). The remainder of the sample access the bank through a variety of transportation modes. There is no significant relationship between the type of transportation used to access the bank and geographic location (x^2=0.31, df=2, ns) (Table 37).

TABLE 37:
Transportation Modes Used to Travel to a Bank for the Entire Sample and Sub-Groups

	St. Boniface (n=35) **% (n)**	Charleswood (n=35) **% (n)**	Fort Garry (n=35) **% (n)**	Total (N=105) **% (N)**
Transport Mode				
Auto	51.4 (18)	57.1 (20)	57.1 (20)	55.2 (58)
Walking	8.6 (3)	14.3 (5)	20.0 (7)	14.3 (15)
Rides	14.3 (5)	11.4 (4)	2.9 (1)	9.5 (10)
Auto/Walk	8.6 (3)	8.6 (3)	8.6 (3)	8.6 (9)
Bus	5.7 (2)	2.9 (1)	5.7 (2)	4.8 (5)
Auto/Bus	2.9 (1)	2.9 (1)	0 (0)	1.9 (2)
Bus/Walk	5.7 (2)	0 (0)	0 (0)	1.9 (2)
Handi-Tran	2.9 (1)	0 (0)	0 (0)	1.0 (1)
Private	0 (0)	0 (0)	2.9 (1)	1.0 (1)
Others*	0 (0)	2.9 (1)	2.9 (1)	1.9 (2)

*Represents a variety of transportation modes.

4.2.3.4 Medical Centre

The automobile is used less frequently in relation to travel to medical centres (Table 38). Only 43.8% of the entire sample drive to medical facilities. Almost one-fifth (18.1%) of the sample use both the car and bus to reach medical centres. Public transit is used to travel downtown for medical appointments to avoid driving and parking in an environment that is prone to traffic congestion. The remaining 38.1% of the entire sample use a variety of transportation modes including the handi-transit, rides, and walking to access medical facilities. Only 34.3% of the St. Boniface respondents drive to medical facilities, compared to Fort Garry (51.4%) and Charleswood (45.7%). Despite these differences, there is no significant relationship between the type of transportation used to travel to medical facilities and geographic location (x^2=4.24, df=4, ns) (Table 38).

TABLE 38:
Transportation Modes Used to Travel to Medical Facilities for the Entire Sample and Sub-Groups

	St. Boniface (n=35) **% (n)**	Charleswood (n=35) **% (n)**	Fort Garry (n=35) **% (n)**	Total (N=105) **% (N)**
Transport Mode				
Auto	34.3 (12)	45.7 (16)	51.4 (18)	43.8 (46)
Auto/Bus	5.7 (2)	14.3 (5)	8.6 (3)	9.5 (10)
Bus	8.6 (3)	5.7 (2)	11.4 (4)	8.6 (9)
Auto/Walk	14.3 (5)	5.7 (2)	0 (0)	6.7 (7)
Walking	8.6 (3)	5.7 (2)	2.9 (1)	5.7 (6)
Rides	5.7 (2)	8.6 (3)	0 (0)	4.8 (5)
Auto/Rides	8.6 (3)	0 (0)	2.9 (1)	3.8 (4)
Handi-Tran	5.7 (2)	0 (0)	0 (0)	1.9 (2)
Taxi	0 (0)	0 (0)	2.9 (1)	1.0 (1)
Private	0 (0)	0 (0)	2.9 (1)	1.0 (1)
Others*	8.6 (3)	14.3 (5)	17.1 (6)	13.3 (14)

*Represents a variety of transportation modes.

4.2.3.5 Pharmacy

Of the ten service and activity sites considered, the pharmacy registers the highest proportion of respondents (63.0%) who use the automobile (Table 39). Walking is also an important transportation mode as 19.0% of the entire sample walk to the pharmacy. There is no significant relationship between the type of transportation used to access a pharmacy and geographic location (x^2=8.64, df=4, ns) (Table 39).

TABLE 39:
Transportation Modes Used to Travel to a Pharmacy for the Entire Sample and Sub-Groups

	St. Boniface (n=32) **% (n)**	Charleswood (n=34) **% (n)**	Fort Garry (n=34) **% (n)**	Total (N=100) **% (N)**
Transport Mode				
Auto	59.4 (19)	67.6 (23)	61.8 (21)	63.0 (63)
Walking	9.4 (3)	17.6 (6)	29.4 (10)	19.0 (19)
Rides	9.4 (3)	8.8 (3)	2.9 (1)	7.0 (7)
Auto/Walk	9.4 (3)	0 (0)	5.9 (2)	5.0 (5)
Bus	6.3 (2)	0 (0)	0 (0)	2.0 (2)
Private	0 (0)	2.9 (1)	0 (0)	1.0 (1)
Others*	6.3 (2)	2.9 (1)	0 (0)	3.0 (3)

*Represents a variety of transportation modes.

4.2.3.6 Facilities for Recreation and Entertainment

Almost one-half (47.1%) of the entire sample use the automobile to reach places of recreation and entertainment (Table 40). The remainder of the sample use a variety of transportation modes including rides and walking to travel to recreational facilities. No significant relationship is found between the transportation mode used to access recreational and entertainment facilities and geographic location (x^2=2.31, df=4, ns) (Table 40).

TABLE 40:
Transportation Modes Used to Travel to Recreation and Entertainment Facilities for the Entire Sample and Sub-Groups

	St. Boniface (n=35) % (n)	Charleswood (n=34) % (n)	Fort Garry (n=35) % (n)	Total (N=104) % (N)
Transport Mode				
Auto	42.9 (15)	47.1 (16)	51.4 (18)	47.1 (49)
Auto/Rides	25.7 (9)	14.7 (5)	20.0 (7)	20.2 (21)
Rides	11.4 (4)	14.7 (5)	14.3 (5)	13.5 (14)
Walking	0 (0)	8.8 (3)	0 (0)	2.9 (3)
Bus	2.9 (1)	0 (0)	2.9 (1)	1.9 (2)
Auto/Walk	0 (0)	0 (0)	5.7 (2)	1.9 (2)
Auto/Bus	0 (0)	5.9 (2)	0 (0)	1.9 (2)
Rides/Walk	2.9 (1)	0 (0)	2.9 (1)	1.9 (2)
Handi-Tran	2.9 (1)	0 (0)	0 (0)	1.0 (1)
Private	0 (0)	0 (0)	2.9 (1)	1.0 (1)
Others*	11.4 (4)	8.8 (3)	0 (0)	6.7 (7)

*Represents a variety of transportation modes.

4.2.3.7 Homes Friends and Family

Over one-half (52.4%) of the entire sample use the automobile to travel to the homes of friends and family while the remainder of the sample use a variety of transportation modes that include walking, public transit, taxi, and handi-transit (Table 41). In Fort Garry 62.9% of the respondents use the automobile compared to St. Boniface (45.7%) and Charleswood (48.6%). There is no significant relationship between the type of transportation used to travel to the home of friends and family and geographic location (x^2=4.23, df=4, ns) (Table 41).

TABLE 41:
Transportation Modes Used to Travel to Friends and Family for the Entire Sample and Sub-Groups

	St. Boniface (n=35) **% (n)**	Charleswood (n=35) **% (n)**	Fort Garry (n=35) **% (n)**	Total (N=105) **% (N)**
Transport Mode				
Auto	45.7 (16)	48.6 (17)	62.9 (22)	52.4 (55)
Rides	11.4 (4)	22.9 (8)	14.3 (5)	16.2 (17)
Auto/Rides	11.4 (4)	8.6 (3)	8.6 (3)	9.5 (10)
Auto/Walk	8.6 (3)	11.4 (4)	2.9 (1)	7.6 (8)
Walking	2.9 (1)	2.9 (1)	0 (0)	1.9 (2)
Taxi	2.9 (1)	0 (0)	0 (0)	1.0 (1)
Others*	17.1 (6)	5.7 (2)	11.4 (4)	11.4 (12)

*Represents a variety of transportation modes.

4.2.3.8 Church

Almost three-fifths (57.4%) of the entire sample use the automobile to travel to church (Table 42). The remaining 42.6% of the sample use rides, walking, and handi-transit to travel to church. No statistically significant relationship is found between the transportation modes used to travel to church and geographic location (x^2=0.67, df=2, ns) (Table 42).

TABLE 42:
Transportation Modes Used to Travel to Church for the Entire Sample and Sub-Groups

	St. Boniface (n=27) **% (n)**	Charleswood (n=20) **% (n)**	Fort Garry (n=14) **% (n)**	Total (N=61) **% (N)**
Transport Mode				
Auto	51.9 (14)	60.0 (12)	64.3 (9)	57.4 (35)
Walking	14.8 (4)	15.0 (3)	7.1 (1)	13.1 (8)
Rides	7.4 (2)	20.0 (4)	7.1 (1)	11.5 (7)
Auto/Walk	11.1 (3)	0 (0)	7.1 (1)	6.6 (4)
Auto/Ride	7.4 (2)	5.0 (1)	0 (0)	4.9 (3)
Rides/Walk	3.7 (1)	0 (0)	7.1 (1)	3.3 (2)
Others*	3.7 (1)	0 (0)	7.1 (1)	3.3 (2)

*Represents a variety of transportation modes.

4.2.3.9 Place of Work or Volunteering

Over one-half (51.3%) of the entire sample use the automobile to travel to work or to volunteer, while the remainder use public transit, rides, and walking (Table 43). No significant relationship is found between the type of transportation used to travel to work or to volunteer and geographic location (x^2=1.53, df=2, ns) (Table 43).

TABLE 43:
Transportation Modes Used to Travel to Work or Volunteer for the Entire Sample and Sub-Groups

	St. Boniface (n=12) % (n)	Charleswood (n=13) % (n)	Fort Garry (n=14) % (n)	Total (N=39) % (N)
Transport Mode				
Auto	41.7 (5)	46.2 (6)	64.3 (9)	51.3 (20)
Walking	8.3 (1)	30.8 (4)	21.4 (3)	20.5 (8)
Bus	25.0 (3)	7.7 (1)	0 (0)	10.3 (4)
Auto/Walk	8.3 (1)	7.7 (1)	7.1 (1)	7.7 (3)
Auto/Ride	16.7 (2)	0 (0)	7.1 (1)	7.7 (3)
Rides	0 (0)	7.7 (1)	0 (0)	2.6 (1)

4.2.3.10 Senior Centre

There are too few trips to senior centres in order to conduct a statistical analysis of travel modes. Of those members of the entire sample who do travel to a senior centre (n=20), 35.0% travel by automobile, while 45.0% walk (Table 44).

TABLE 44:
Transportation Modes Used to Travel to a Seniors Centre for the Entire Sample and Sub-Groups

	St. Boniface (n=2) % (n)	Charleswood (n=11) % (n)	Fort Garry (n=7) % (n)	Total (N=20) % (N)
Transport Mode				
Auto	0 (0)	54.5 (6)	14.3 (1)	35.0 (7)
Walking	50.0 (1)	27.3 (3)	71.4 (5)	45.0 (9)
Others*	50.0 (1)	18.2 (2)	14.3 (1)	20.0 (4)

*Represents a variety of transportation modes.

4.2.3.11 Overview of Travel Modes Utilized to Access Service and Activity Sites

In summary, the automobile is the most important form of transportation used to travel to service and activity sites. Approximately one-half of all respondents drive to access the ten sites discussed. Other transportation modes that are important for the entire sample include walking and rides from friends and family, and, to a lesser degree, public transit. There is no relationship between geographic location and the transportation modes used to access service and activity sites.

4.2.4 Distance Travelled to Service and Activity Sites

The respondents were asked to give the location of service and activity sites in each of the ten categories that they travel to most frequently. Specifically, they provided the street address of the grocery store, shopping mall, bank, medical facilities, pharmacy, place of recreation and entertainment, residence of friends and family, place of work or volunteering, seniors centre, and place of worship. The locations of the service and activity sites were recorded and the straight-line distance measurements between the home of the respondent and the service and activity sites were obtained using a base map of Winnipeg, Manitoba. The distance measurements were calculated by first measuring the centimeter distance between the home address and the site, and then converting this measurement to the actual kilometer distance using a mathematical formula based on the scale of the map. [3]

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[3] The formula to convert the centimeter measurement to the kilometer distance is as follows: (centimeters x 30,000) / 100,000.

It should be noted that approximately 80.0% of the locations of the residence of family and friends was indicated only by the area of the city because the respondents were concerned with the confidentiality of information about their friends and family members. When only the area of the city was provided, the measurement was based on the distance between the centre point of the area and the home of the respondent. As a result, in these cases the distance measurements do not have the same degree of accuracy as those using the actual home address of the friend or family member. Overall, however, this distance data do provide important insights into the degree of proximity of service and activity sites to the homes of the respondents.

4.2.4.1 Grocery Store

Over one-half (52.0%) of the respondents travel to a grocery store located less than 1 kilometer from their place of residence, while 32.7% travel between 1 kilometer and 1.99 kilometers to a grocery store, and 15.4% travel between 2 kilometers and 5.22 kilometers (Table 45). The proportional distributions do vary among the three study areas. For example, 62.8% of the Fort Garry respondents patronize a grocery store less than 1 kilometer from their place of residence compared to St. Boniface (47.1%) and Charleswood (45.7%). The high proportion of Fort Garry respondents who travel less than one kilometer to a grocery store is the result of the location of three major chain grocery supermarkets along Pembina Highway that provide relatively easy access for both residents of apartment complexes and residential developments (Figure 3). In contrast, only one major chain grocery store exists in St. Boniface which means that residents, particularly in the Norwood sub-area, may have to travel further than their counterparts in Fort Garry to reach a grocery store (Figure 2). This observation is supported by the high proportion of St. Boniface respondents (44.1%) who travel between 1 kilometer and 1.99 kilometers to a grocery store compared to Fort Garry (34.3%) and Charleswood (20.0%). Finally, although there are two major chain grocery supermarkets located in Charleswood, the low density development of this area creates relatively large travelling distances for its residents (Figure 4). Over one-third (34.3%) of the Charleswood respondents travel between 2 and 5.22 kilometers to a grocery store compared to St. Boniface (8.8%) and Fort Garry (2.9%). As a result of these differences, a statistically significant relationship at the 0.01 level is found between the distance travelled to the grocery store and geographic location (x^2=23.17, df=8, $p<0.01$) (Table 45).

TABLE 45:
Distance Travelled to a Grocery Store for the Entire Sample and Sub-Groups

	St. Boniface (n=34) **% (n)**	Charleswood (n=35) **% (n)**	Fort Garry (n=35) **% (n)**	Total (N=104) **% (N)**
Distance (km)				
0.10-0.49	5.9 (2)	17.1 (6)	31.4 (11)	18.3 (19)
0.50-0.99	41.2 (14)	28.6 (10)	31.4 (11)	33.7 (35)
1.00-1.49	20.6 (7)	11.4 (4)	14.3 (5)	15.4 (16)
1.50-1.99	23.5 (8)	8.6 (3)	20.0 (7)	17.3 (18)
2.00-5.22	8.8 (3)	34.3 (12)	2.9 (1)	15.4 (16)

4.2.4.2 Shopping Mall

Almost three-fifths (58.8%) of the entire sample travel to a regional shopping mall that is less than 4 kilometers from the place of residence (Table 46). The remainder of the sample travel to a shopping mall that is between 4 kilometers and 6.99 kilometers from their home. In both St. Boniface and Charleswood the respondents are divided evenly between these two distance categories. However, in Fort Garry no fewer than 76.3% of the respondents travel to a shopping mall that is less than 4 kilometers from the place of residence. The higher proportion of Fort Garry respondents who travel less than 4 kilometers to a shopping mall is the result of the close proximity if travelling by automobile between St. Vital Centre and Fort Garry (Figure 1). In particular, the concentration of apartments where many of the Fort Garry respondents live is located next to the bridge which connects the shopping mall to Fort Garry. As a result of the differences among the three study areas, a statistically significant relationship at the 0.05 level is found between the distance travelled to a shopping mall and geographic location (x^2=6.56, df=2, $p<0.05$) (Table 46).

TABLE 46:
Distance Travelled to a Shopping Mall
for the Entire Sample and Sub-Groups

	St. Boniface (n=34) **% (n)**	Charleswood (n=34) **% (n)**	Fort Garry (n=34) **% (n)**	Total (N=102) **% (N)**
Distance (km)				
0.10-2.99	41.2 (14)	38.2 (13)	58.8 (20)	46.1 (47)
3.00-3.99	8.8 (3)	11.8 (4)	17.6 (6)	12.7 (13)
4.00-4.49	17.6 (6)	23.5 (8)	2.9 (1)	14.7 (15)
5.00-6.99	32.4 (11)	26.5 (9)	20.6 (7)	26.5 (27)

4.2.4.3 Bank

Almost one-half (46.2%) of the entire sample travel to a bank that is less than 1 kilometer from the place of residence (Table 47). The remainder of the sample travel between 1 kilometer and 14.4 kilometers. This percentage distribution is broadly maintained in the three study areas. Figures 2, 3, and 4 demonstrate that banks are dispersed throughout the three study areas and are relatively close for all respondents. Therefore, no significant relationship is found between the distance travelled to a bank and geographic location (x^2=3.41, df=4, ns) (Table 47).

TABLE 47:
Distance Travelled to a Bank
for the Entire Sample and Sub-Groups

	St. Boniface (n=34) **% (n)**	Charleswood (n=34) **% (n)**	Fort Garry (n=34) **% (n)**	Total (N=102) **% (N)**
Distance (km)				
0.10-0.99	50.0 (17)	40.0 (14)	48.6 (17)	46.2 (48)
1.00-1.99	38.2 (13)	34.3 (12)	25.7 (9)	32.7 (34)
2.00-3.99	8.8 (3)	22.9 (8)	2.9 (1)	11.5 (12)
4.00-14.40	2.9 (1)	2.9 (1)	22.9 (8)	9.6 (10)

4.2.4.4 Medical Centre

Almost three-quarters (70.2%) of the entire sample travel to a medical centre that is less than 4 kilometers from their home, while 29.8% travel between 4 kilometers and 14.1 kilometers to a medical facility (Table 48). Large variations are apparent when the three study areas are compared. The highest proportion of respondents who travel between 1 kilometer and 1.99 kilometers to a medical centre is found in St. Boniface

(44.1%) compared to Charleswood (8.6%) and Fort Garry (2.9%). St. Boniface respondents travel a relatively short distance to a medical clinic because the St. Boniface Hospital and many medical offices are located in this area (Figure 2). In contrast, over one-half (51.4%) of the Fort Garry respondents travel between 4 kilometers and 14.1 kilometers from their place of residence to a medical facility compared to Charleswood (25.7%) and St. Boniface (11.7%). Although Fort Garry has two medical clinics and a hospital while Charleswood has only one clinic, a greater proportion of the Fort Garry respondents travel further to obtain medical services (Figure 3 & 4). Therefore, it can be assumed that more respondents in Charleswood utilize the medical facilities found locally while a greater proportion of the Fort Garry respondents travel outside of the area to receive medical care. As a result of the differences among the three study areas, a statistically significant relationship at the 0.001 level is found between the distance travelled to a medical facility and geographic location (x^2=31.10, df=6, p<0.001) (Table 48).

TABLE 48:
Distance Travelled to Medical Facilities for the Entire Sample and Sub-Groups

	St. Boniface (n=34) **% (n)**	Charleswood (n=35) **% (n)**	Fort Garry (n=35) **% (n)**	Total (N=104) **% (N)**
Distance (km)				
0.10-0.99	17.6 (6)	17.1 (6)	11.4 (4)	15.4 (16)
1.00-1.99	44.1 (15)	8.6 (3)	2.9 (1)	18.3 (19)
2.00-2.99	14.7 (5)	11.4 (4)	22.9 (8)	16.3 (17)
3.00-3.99	11.8 (4)	37.1 (13)	11.4 (4)	20.2 (21)
4.00-6.99	8.8 (3)	14.3 (5)	25.7 (9)	16.3 (17)
7.00-14.10	2.9 (1)	11.4 (4)	25.7 (9)	13.5 (14)

4.2.4.5 Pharmacy

Eighty-seven percent of the entire sample travel less than 3 kilometers to a pharmacy (Table 49). The remainder of the sample travel between 3 kilometers and 11.7 kilometers from their place of residence to a pharmacy. The majority of the respondents in both St. Boniface (97.0%) and Fort Garry (97.1%) travel less than 3 kilometers to a pharmacy compared to only 66.7% of the Charleswood respondents. Pharmacies are relatively accessible in both St. Boniface and Fort Garry (Figures 2 & 3). In contrast, the low density development of Charleswood has resulted in the dispersion of pharmacies which creates relatively large travelling distances (Figure 4). A statistically significant relationship at the 0.001 level is found between the distance travelled to a pharmacy and geographic location (x^2=27.07, df=6, $p<0.001$) (Table 49).

TABLE 49:
Distance Travelled to a Pharmacy
for the Entire Sample and Sub-Groups

	St. Boniface (n=33) **% (n)**	Charleswood (n=33) **% (n)**	Fort Garry (n=34) **% (n)**	Total (N=100) **% (N)**
Distance (km)				
0.10-0.49	9.1 (3)	12.1 (4)	32.4 (11)	18.0 (18)
0.50-0.99	27.3 (9)	15.2 (5)	17.6 (6)	20.0 (20)
1.00-1.99	51.5 (17)	21.2 (7)	41.2 (14)	38.0 (38)
2.00-2.99	9.1 (3)	18.2 (6)	5.9 (2)	11.0 (11)
3.00-11.70	3.0 (1)	33.3 (11)	2.9 (1)	13.0 (13)

4.2.4.6 Facilities for Recreation and Entertainment

Over two-fifths (44.0%) of the entire sample travel less than 3 kilometers from their home to a place of recreation and entertainment, while the remaining 56.0% travel between 3 and 13.2 kilometers (Table 50). In St. Boniface 71.4% of the respondents travel less than three kilometers compared to Charleswood (33.3%) and Fort Garry (33.4%). A statistically significant relationship at the 0.01 level is found between the distance travelled to a place of recreation and entertainment and geographic location (x^2=8.91, df=2, p<0.01) (Table 50).

TABLE 50:
Distance Travelled to Recreation and Entertainment Facilities for the Entire Sample and Sub-Groups

	St. Boniface (n=21) **% (n)**	Charleswood (n=24) **% (n)**	Fort Garry (n=30) **% (n)**	Total (N=75) **% (N)**
Distance (km)				
0.10-0.99	19.0 (4)	12.5 (3)	16.7 (5)	16.0 (12)
1.00-2.99	52.4 (11)	20.8 (5)	16.7 (5)	28.0 (21)
3.00-5.99	28.6 (6)	20.8 (5)	23.3 (7)	24.0 (18)
6.00-13.20	0 (0)	45.8 (11)	43.3 (13)	32.0 (24)

4.2.4.7 Home of Family Member

Fewer than one-half (48.9%) of the entire sample travel less than 4 kilometers from their place of residence to the home of a relative, while the remaining 51.1% travel between 4 kilometers and 17.1 kilometers (Table 51). These proportional distributions are similar among the sub-groups. Therefore, no statistically significant relationship is found between the distance travelled to the home of a relative and geographic location (x^2=2.62, df=4, ns) (Table 51).

**TABLE 51:
Distance Travelled to Family
for the Entire Sample and Sub-Groups**

	St. Boniface (n=30) **% (n)**	Charleswood (n=30) **% (n)**	Fort Garry (n=32) **% (n)**	Total (N=92) **% (N)**
Distance (km)				
0.10-0.99	20.0 (6)	13.3 (4)	12.5 (4)	15.2 (14)
1.00-3.99	33.3 (10)	36.7 (11)	31.3 (10)	33.7 (31)
4.00-6.99	16.7 (5)	13.3 (4)	28.1 (9)	19.6 (18)
7.00-17.10	30.0 (9)	36.7 (11)	28.1 (9)	31.5 (29)

4.2.4.8 Home of Friends

One-half of the entire sample travel less than 4 kilometers to the place of residence of a friend, while the remainder travel between 4 kilometers and 17.4 kilometers (Table 52). St. Boniface and Charleswood have percentage distributions which are similar to that of the entire sample. However, in Fort Garry almost three-quarters (70.6%) of the respondents travel between 4 kilometers and 17.4 kilometers to the home of a friend. Nevertheless, no statistically significant relationship is found between the distance travelled to the home of a friend and geographic location (x^2=4.27, df=2, ns) (Table 52).

TABLE 52:
Distance Travelled to Friends
for the Entire Sample and Sub-Groups

	St. Boniface (n=20) **% (n)**	Charleswood (n=21) **% (n)**	Fort Garry (n=17) **% (n)**	Total (N=58) **% (N)**
Distance (km)				
0.10-0.99	45.0 (9)	9.5 (2)	5.9 (1)	20.7 (12)
1.00-3.99	10.0 (2)	52.4 (11)	23.5 (4)	29.3 (17)
4.00-8.99	25.0 (5)	14.3 (3)	47.1 (8)	27.6 (16)
9.00-17.40	20.0 (4)	23.8 (5)	23.5 (4)	22.4 (13)

4.2.4.9 Church

Approximately two-thirds (66.1%) of the entire sample travel less than 2 kilometers to church, while the remainder travel between 2 kilometers and 14.4 kilometers (Table 53). In St. Boniface, 88.0% of the respondents live less than two kilometers from the church they attend. In contrast, 47.1% of the Charleswood respondents and 57.1% of the Fort Garry respondents travel between 2 kilometers and 14.4 kilometers. There are too few observations for distance to church to conduct statistical analysis (Table 53).

TABLE 53:
Distance Travelled to Church
for the Entire Sample and Sub-Groups

	St. Boniface (n=25) **% (n)**	Charleswood (n=17) **% (n)**	Fort Garry (n=14) **% (n)**	Total (N=56) **% (N)**
Distance (km)				
0.10-0.99	60.0 (15)	17.6 (3)	21.4 (3)	37.5 (21)
1.00-1.99	28.0 (7)	35.3 (6)	21.4 (3)	28.6 (16)
2.00-14.4	12.0 (3)	47.1 (8)	57.1 (8)	33.9 (19)

4.2.4.10 Place of Work or Volunteering

Of those who do travel to work or volunteer (n=29) 37.9% travel less than 1 kilometer, while the remainder travel between 1 and 8.55 kilometers from their place of residence to work or volunteer (Table 54). There are too few observations for distance to place of work or volunteering to conduct statistical analysis.

TABLE 54:
Distance Travelled to Work or Volunteer for the Entire Sample and Sub-Groups

	St. Boniface (n=12) % (n)	Charleswood (n=10) % (n)	Fort Garry (n=7) % (n)	Total (N=29) % (N)
Distance (km)				
0.10-0.99	41.7 (5)	50.0 (5)	14.3 (1)	37.9 (11)
1.00-8.55	58.3 (7)	50.0 (5)	85.6 (6)	62.1 (18)

4.2.4.11 Senior Centre

Of those who do travel to a senior centre (n=14), 78.6% travel less than 1 kilometer, while the remaining 21.4% travel between 1 kilometer and 3 kilometers from their place of residence to a senior centre (Table 55). There are too few observations for distance to senior centre to conduct statistical analysis.

TABLE 55:
Distance Travelled to a Senior Centre for the Entire Sample and Sub-Groups

	St. Boniface (n=2) % (n)	Charleswood (n=8) % (n)	Fort Garry (n=3) % (n)	Total (N=13) % (N)
Distance (km)				
0.10-0.99	100.0 (2)	66.7 (6)	100.0 (3)	78.6 (11)
1.00-3.0	0 (0)	33.3 (3)	0 (0)	21.4 (3)

4.2.4.12 Overview of Travel Distance to Service and Activity Sites

In summary, the distance measurements provide a critical component for the analysis of the service and activity environments of the three study areas. Significant relationships are registered between geographic location and the distances travelled to the grocery store, shopping mall, medical centre, pharmacy, place of recreation and entertainment and church. The characterization of St. Boniface as an inner suburb where service and activity sites are in close proximity to residential locations is confirmed by the findings that the highest proportion of St. Boniface respondents travel the least distance to the bank, medical facilities, places of recreation and entertainment and church. However, although Fort Garry has been categorized as an outer suburb where services and residences are separated by large distances, the highest proportion of its respondents travel the least distance to the grocery store, shopping mall and pharmacy. The close proximity of this sub-group to some of the service and activity sites can be attributed to the proximate locations of their homes to the main artery of Pembina Highway. Conversely, respondents in Fort Garry are located furthest from medical facilities and places of recreation and entertainment. In many cases they must travel outside of the local area to access these opportunities. Finally, Charleswood respondents must travel furthest to reach the grocery store, pharmacy, and places of recreation and entertainment, thus reflecting the low density development of this outer suburb.

As was specified in the discussion of the frequency of travel to the service and activity sites, the variables for the distance to church, to work or volunteer, and to a senior centre will not be included in the analysis of the research questions because of the limited number of respondents who travel to these sites.

4.2.5 Summary of Transportation Usage and Travel Activity Patterns

This descriptive analysis of the transportation usage and travel activity patterns of the respondents of the study has provided an overview of indicators of transportation behaviour identified by Lawton (1980). The mobility of an individual is reflected in the frequency of use of transportation modes, the frequency of travel to service and activity sites, and the distance travelled to service and activity sites. It is postulated in this study that the components of autonomy and security impact upon these transportation behaviours. The descriptive analysis has provided consideration of differences in behaviour according to geographic location. In the next section, the effect of both the variables of autonomy and security on these behaviours will be analyzed.

4.3 **Analysis Relating to the Three Research Questions: The Autonomy-Security Dialectic**

In this study, it is postulated that transportation behaviours can be predicted by the autonomy-security dialectic. Both logistic regression analyses and Ordinary Least Squares (OLS) regression analyses are utilized to evaluate whether the person-environment relationship determines the transportation behaviour of the elderly. Nineteen separate regression models are formulated for the various transportation behaviour dependent variables. The independent variables of the regression equations are defined by the components of autonomy and security. In this section, the dependent and independent variables used to analyze the research questions are first described. This is followed by an evaluation of the results of the regression models and their implications for providing answers to the three research questions.

4.3.1 The Dependent Variables

The dependent variables of the regression models are the transportation behaviours defined as: the frequency of use of transportation modes; the frequency of travel to service and activity sites; and the distance travelled to access service and activity sites. The frequency of use of transportation modes and the frequency of travel to service and activity sites are dichotomous variables requiring the application of logistic regression to evaluate the effect of the autonomy-security dialectic on the outcome. Logistic regression is selected because:

> ...it can be used to examine the relationship between a dichotomous dependent variable and a set of independent variables and to identify the independent variables that are important in the relationship. Furthermore, it does not require the dependent variable to be normally distributed, nor

must the set of independent variables have a multivariate normal distribution for each category of the dependent variables (Smith & Hiltner, 1988, 508-509).

In contrast, the outcome variables of distance to service and activity sites are continuous data and are normally distributed. Therefore, OLS regression analyses are conducted to determine the effect of the autonomy-security dialectic on these outcomes. All study respondents (N=105) were included in the regression analyses.

Four logistic regression models are formulated with frequency of use of four transportation modes treated as dependent variables: use of the automobile; rides from friends and family; walking; and public transit. The dependent variables are coded dichotomously: frequency of use of the automobile (0 = less than once a week; 1 = once a week or more); frequency of rides from friends and family (0 = once a month or less; 1 = more than once a month); frequency of walking (0 = less than twice a month; 1 = twice a month or more); and frequency of use of public transit (0 = less than once a month; 1 = once a month or more).

Seven additional logistic regression models are formulated for frequency of travel to service and activity opportunities including the sites of the: grocery store; shopping mall; bank; medical centre; pharmacy; facilities for recreation and entertainment; and homes of friends and family. These dependent variables are also coded dichotomously: frequency of travel to the grocery store (0 = once a week or less; 1 = more than once a week); frequency of travel to a shopping mall (0 = less than once a week; 1 = once a week or more); frequency of travel to a bank (0 = less than once a week; 1 = once a week or more); frequency of travel to medical facilities (0 = less than once a month; 1

= once a month or more); frequency of travel to a pharmacy (0 = less than once a month; 1 = once a month or more); frequency of travel to recreation and entertainment facilities (0 = less than once a week; 1 = once a week or more); and frequency of travel to the homes of friends and family (0 = less than once a week; 1 = once a week or more).

For distance travelled to service and activity sites, eight OLS regression models are formulated based on the proximity of the sites most frequently patronized by the respondent. The dependent variables include distances to the sites of: grocery store; shopping mall; bank; medical facilities; pharmacy; facilities for recreation and entertainment; home of a friend; and home of a family member. The actual distance measurements are entered as continuous data, thus necessitating OLS solutions of the regression models.

4.3.2 The Independent Variables

The independent variables in each regression equation consist of the components of the autonomy-security dialectic. The variables representing autonomy include the socio-demographic characteristics, health and functional level, and transportation resources of the respondent. Security is represented by residential location as defined by the three sample areas of St. Boniface, Charleswood, and Fort Garry.

The descriptive analysis in the first section of this chapter illustrated that the range of socio-demographic, health and functional, and transportation resource variables is extensive. In order to select appropriate independent variables for the regression models, cross-tabulations between each independent variable and each dependent variable were conducted. The results of these cross-tabulations are found in Appendix B. If the chi-square value resulting from the cross-tabulation indicated a significance level of 0.06 or higher, the independent variable is included in the regression equation of that dependent variable.

The socio-demographic characteristics of the respondents considered for integration in the models include age, gender, marital status, living arrangements, educational level, income, type of housing, and length of residence. The variables of age, the number of years of formal education, the yearly household income, and the number of years living at the present address consist of continuous data. The remainder of the socio-demographic variables are dummy coded: gender (0 = male; 1 = female); marital status (0 = married; 1 = single); living arrangements (0 = lives with someone; 1 = lives alone); and type of housing (0 = apartment; 1 = detached house).

The indicators of the health and functional level of the respondent include self-rated health, chronic conditions, Activities of Daily Living (ADL), barriers to activities caused by health troubles, and satisfaction with health. The number of chronic conditions range from 0 to 11. Self-rated health is scored on a five-point scale (1 = excellent; 2 = good; 3 = fair; 4 = poor; 5 = bad). Health satisfaction is scored based on the seven-point Terrible-Delightful scale (1 = terrible; 2 = very dissatisfying; 3 = dissatisfying; 4 = mixed; 5 = satisfying; 6 = very satisfying; 7 = delightful). The variables of Activities of Daily Living (0 = no limitations; 1 = functional limitations) and barriers to activities caused by health troubles (0 = no troubles; 1 = some or a great deal) are coded dichotomously.

The variables representing the transportation resources of the respondents include the ability to drive, car ownership, the ability to walk, the distance that one can walk, the distance to the bus stop from the place of residence, satisfaction with the bus system, and satisfaction with transportation in general. The variables of distance able to walk and distance to the bus stop consist of continuous data. The variable of the distance a respondent is able to walk ranges from 1 mile or more to less than ten yards. The distance to the bus stop ranges from less than one block to one mile or more. Satisfaction with the bus system is scored on a five point scale (1 = very satisfied; 2 = satisfied; 3 = somewhat satisfied; 4 = dissatisfied; 5 = very dissatisfied). Satisfaction with transportation in general is scored based on the seven-point Terrible-Delightful scale (1 = terrible; 2 = very dissatisfying; 3 = dissatisfying; 4 = mixed; 5 = satisfying; 6 = very satisfying; 7 = delightful). The remainder of the transportation resource variables are coded dichotomously: ability to drive (0 = yes; 1 = no); the number of cars in the household (0 = at least one car; 1 = no car); and ability to walk (0 = can walk; 1 = requires help to walk).

With respect to the security component of the analysis, the three sub-areas are represented by dummy or indicator variables in the regression models. The original variable of residential location consisted of three categories to allocate the sub-areas. When a variable has more than two categories, the number of new dummy variables required to represent a categorical variable is one less than the number of categories

(Norusis, 1993a). Therefore, two dummy variables were created to represent the sub-areas and are designated as follows: St. Boniface (0 = Fort Garry; 1 = St. Boniface) and Charleswood (0 = Fort Garry; 1 = Charleswood). The coefficients for the new dummy variables represent the effect of each category compared to a reference category (Norusis, 1993a). In the case of the dummy variables of residential location, the reference category is Fort Garry.

Before conducting the multivariate analyses, the data were examined for problems with multicollinearity by regressing each independent variable on all the other independent variables (Kleinbaum et al., 1988; Lewis-Beck, 1980)[4]. Separate Ordinary Least Squares (OLS) regressions were conducted for the variables representing the socio-demographic characteristics, health and functional level, and transportation resources of the respondents. A high correlation was only found between marital status and living arrangements (r^2=0.87). Consequently, for the regression models in which both variables were significant at the bivariate level, the variable of marital status is excluded and the living arrangements variable is retained in the model.

4.3.3 Research Question 1: Frequency of Use of Transportation Modes

To evaluate the effect of the autonomy-security dialectic on the frequency of use of various transportation modes, the forced entry method of logistic regression is utilized. For each model, the independent variables pertaining to the autonomy component of

[4] A problem with multicollinearity is said to exist when the correlation coefficient is high (0.80 or higher) and R^2 exceeds 0.64 (Kleinbaum et al., 1988; Lewis-Beck, 1980).

the equation are entered in a single step in one block. In the second and final step, the block of independent variables representing residential location (security) is entered. To determine the significance of the individual variables in each equation two statistics resulting from the logistic regression analysis are examined. The Wald statistic has a chi-square distribution and tests the significance of the regression coefficients. In addition, the *R* statistic considers the partial correlation between the dependent variable and each of the independent variables (Norusis, 1993a). Furthermore, the level of overall explanation provided by each model is indicated by the "-2 times the log of the likelihood" (*-2LL*). It is a measure of how well the estimated model fits the data (Norusis, 1993a). A *-2LL* value of 0 indicates a perfect fit, however, no upper limit exists for the highest value of this measure. Finally, the Improvement Chi-Square is the change in *-2LL* between successive steps of building the model. It tests whether the regression coefficients for the variables entered into the equation at the last step are significant (Norusis, 1993a). Therefore, it expresses the unique effects of residential location (the final block of variables to enter the equation) upon the dependent variable.

4.3.3.1 Frequency of Rides from Friends and Family

The results of the test of the logistic regression model for the frequency of rides from friends and family are summarized in Table 56. The relatively high value of *-2LL* (106.35) indicates that the model does not contribute significantly to the explanation of the frequency of rides from friends and family. The positive and significant ($p<0.05$)

regression coefficients and positive *R* values for the variables of living arrangements and ability to drive suggest that the factors of living alone and not driving contribute to the increased likelihood of rides from friends and family. In contrast, the autonomy variables also included of gender, education, income, and chronic conditions, make a minimal or no contribution to the explanation of the model. In addition, the *R* value of 0 for the variables representing residential location indicates that there is no correlation between each of these independent variables and the dependent variable. Moreover, the Improvement Chi-Square value illustrates that the security component does not contribute significantly to the goodness-of-fit of the model after taking into consideration the level of explanation provided by the variables representing the autonomy component of the equation (Table 56).

Table 56. Logistic Regression:
Predictors of the Frequency of Rides from Friends and Family
(N=100)

Independent Variable	Regression Coefficient	Wald	Standard Error	*R*
Constant	1.32	1.36	1.13	
Gender	0.16	0.06	0.62	0.000
Living Arrange.	1.16	3.42*	0.63	0.12
Education	-0.15	3.36	0.08	-0.11
Income	-0.10	0.18	0.23	0.000
Chronic Cond.	-0.22	2.74	0.13	-0.08
Ability to Drive	1.41	4.86*	0.64	0.16
St. Boniface	-0.08	0.02	0.62	0.000
Charleswood	0.14	0.06	0.60	0.000
Improvement Chi-Square = 0.14				
-2LL = 106.35				

* p<0.05; ** p<0.01

4.3.3.2 Frequency of Automobile Use

The logistic regression analysis conducted for the model of frequency of use of the automobile indicates that a perfect fit exists between the dependent variable and the variables representing the autonomy component of the equation. The value of *-2LL* is 0 after the entry of the first block of autonomy variables. This signifies that the model fits perfectly (Norusis, 1993a). In addition, the Model Chi-Square, which tests the null hypothesis that the coefficients for all the terms in the model are 0, is significant at the 0.01 level (Norusis, 1993a). The statistical output for the perfect fit does not include regression coefficients, Wald statistics, or the *R* value. As a perfect fit is registered after the entry of the first block of variables, the block representing residential location is not included in the analysis. Consequently, the security component of the equation does not contribute to the explanation of the model. The autonomy variables included in this perfect model are: age; gender; living arrangements; educational level; income; chronic conditions; functional level; type of housing; number of years living at the present address; ability to drive; car ownership; distance to the bus stop; and satisfaction with bus service.

4.3.3.3 Frequency of Walking

The results of the test of the logistic regression model for the frequency of walking are summarized in Table 57. The relatively high value of *-2LL* (116.29) denotes that this model does not fit the data well. The negative and significant ($p<0.01$) regression coefficient and negative *R* value for the distance the respondent is able to walk suggests that as the distance a person can walk increases, the likelihood of the frequency of walking also increases. The variables of Activities of Daily Living (ADL), ability to walk, and distance to the bus stop, which comprise the autonomy component of the equation, provide only a small or no contribution to the model. The Improvement Chi-Square is not significant as correlation between each of the residential location variables and the dependent variable is not significant. Therefore, the block representing the security component of the equation does not contribute significantly to the goodness-of-fit of the model after taking into consideration the level of explanation provided by the autonomy variables (Table 57).

Table 57. Logistic Regression:
Predictors of the Frequency of Walking
(N=105)

Independent Variable	Regression Coefficient	Wald	Standard Error	*R*
Constant	3.09	13.98**	0.83	
ADL	-0.45	0.26	0.89	0.000
Ability to Walk	-0.18	0.04	0.88	0.000
Distance - Walk	-1.34	7.56**	0.49	-0.22
Distance-Bus St.	-0.20	3.40	0.11	-0.11
St. Boniface	-1.00	2.85	0.57	-0.08
Charleswood	-0.77	1.83	0.57	0.000
Improvement Chi-Square = 3.36				
-2LL = 116.29				

* p<0.05; ** p<0.01

4.3.3.4 Frequency of Use of Public Transit

The results of the logistic regression analysis conducted for the frequency of use of public transit are presented in Table 58. Again, the high *-2LL* (129.51) value indicates that the model does not fit the data well. The positive and significant (p<0.05) regression coefficient and positive *R* value for the variable of marital status indicates that if a person is single, the frequency of transit use will increase. However, the remainder of the independent variables including gender, Activities of Daily Living (ADL), barriers to activities caused by health troubles, and ability to walk make a minimal or no contribution to the model. The *R* value of 0 for both variables representing residential location indicate that they do not contribute to the explanation of variance of the model. As a result, the Improvement Chi-Square is not significant, and, therefore, the security component of the equation does not contribute to the goodness-of-fit of the model after taking into consideration the level of explanation provided by the variables representing autonomy (Table 58).

Table 58. Logistic Regression:
Predictors of the Frequency of Use of Public Transit
(N=105)

Independent Variable	Regression Coefficient	Wald	Standard Error	*R*
Constant	-0.28	0.33	0.49	
Gender	0.38	0.66	0.47	0.000
Marital Status	1.14	4.17*	0.56	0.13
ADL	-0.78	1.62	0.62	0.000
Health Troubles	0.42	0.80	0.47	0.000
Ability to Walk	-1.27	2.71	0.77	-0.07
St. Boniface	0.18	0.11	0.53	0.000
Charleswood	0.03	0.002	0.52	0.000
Improvement Chi-Square = 0.12				
-2LL = 129.51				

* $p<0.05$; ** $p<0.01$

4.3.3.5 Overview of Frequency of Use of Transportation Modes

The logistic regression analyses conducted for the frequency of use of transportation modes indicates that the model for the frequency of use of the automobile is a perfect fit for the data. In contrast, the high *-2LL* value for the models of frequency of rides from friends and family, walking, and transit use indicates that the models provide only a minimal contribution to the explanation of the frequency of use of these transportation modes. In addition, the security component of the equation represented by the variables of residential location does not contribute to the explanation of the models. For the frequency of use of the automobile, the autonomy variables of age, gender, living arrangements, educational level, income, chronic conditions, functional level, type of housing, number of years living at the present address, ability to drive, car ownership, distance to the bus stop, and satisfaction with bus service provide a complete explanation for the model. In addition, the autonomy variables of living arrangements and ability to drive contribute significantly to the explanation of the frequency of rides from friends and family. The variable of distance able to walk contributes significantly to the model of the frequency of walking. Finally, "marital status" is important for the explanation of the frequency of transit use.

4.3.4 Research Question 2: Frequency of Travel to Service and Activity Sites

The analysis of the frequency of travel to service and activity sites also utilizes the forced entry method of logistic regression to determine the effect of the autonomy-security dialectic. For each model, the independent variables pertaining to the autonomy and security components of the equation are entered in separate steps. Once again, the Wald statistic and the *R* statistic, as well as the *-2LL* and Improvement

Chi-Square are examined to determine the level of explanation provided by the model (Norusis, 1993a).

4.3.4.1 <u>Frequency of Travel to a Grocery Store</u>

The results of the test of the logistic regression model for the frequency of travel to a grocery store are presented in Table 59. The high *-2LL* (130.66) value demonstrates that it offers a low level of explanation for the frequency of travel to a grocery store. The variables representing the autonomy component of the equation provide only a small or no contribution to the explanation of the variance of the model. These variables include living arrangements, chronic conditions, Activities of Daily Living (ADL), the number of years living at the present address, and the number of cars in the household. The negative and significant ($p<0.05$) regression coefficient and negative R value for the variable representing St. Boniface implies that respondents in this sub-area travel less frequently to the grocery store compared to the respondents in Fort Garry. However, the variable for Charleswood does not contribute to the explanation of the model as its R value is 0. As a result, the Improvement Chi-Square is not significant and overall the security component of the equation does not contribute to the goodness-of-fit of the model after the level of explanation provided by the autonomy variables is considered (Table 59).

Table 59. Logistic Regression:
Predictors of the Frequency of Travel to a Grocery Store
(N=105)

Independent Variable	Regression Coefficient	Wald	Standard Error	*R*
Constant	1.16	3.58*	0.61	
Living Arrange.	-0.78	2.15	0.53	-0.03
Chronic Cond.	-0.09	0.48	0.13	0.000
ADL	0.10	0.04	0.53	0.000
Present Address	0.01	0.09	0.02	0.000
Number of Cars	-0.53	0.65	0.66	0.000
St. Boniface	-1.15	3.47*	0.62	-0.10
Charleswood	-0.43	0.66	0.52	0.000
Improvement Chi-Square = 3.60				
-2LL = 130.66				

* p<0.05; ** p<0.01

4.3.4.2 Frequency of Travel to a Shopping Mall

The results of the logistic regression analysis conducted for the frequency of travel to a shopping mall are summarized in Table 60. The high value of *-2LL* (129.55) illustrates that the goodness-of-fit of the model is poor to explain the frequency of travel to a shopping mall. The negative and significant (p<0.01) regression coefficient and negative *R* value of the variable of living arrangements indicates that the frequency of travel to a shopping mall increases if the individual lives with someone else. In addition, the negative and significant (p<0.05) regression coefficient and negative *R* value of the variable representing St. Boniface also suggests that respondents from this area travel less frequently to a shopping mall in comparison to respondents in Fort Garry. Although the *R* value of 0 for the variable representing Charleswood indicates that it has made no contribution to the model, the Improvement Chi-Square is significant at the 0.05 level. This demonstrates that the block representing the security component of the equation contributes to the goodness-of-fit of the model after the explanation provided by the autonomy variable is considered (Table 60).

Table 60. Logistic Regression: Predictors of the Frequency of Travel to a Shopping Mall
(N=105)

Independent Variable	Regression Coefficient	Wald	Standard Error	*R*
Constant	1.07	7.30**	0.40	
Living Arrange.	-1.12	5.94**	0.46	-0.17
St. Boniface	-1.13	4.76*	0.52	-0.14
Charleswood	-0.03	0.004	0.53	0.000
Improvement Chi-Square = 6.49*				
-2LL = 129.55				

* p<0.05; ** p<0.01

4.3.4.3 Frequency of Travel to a Bank

The results of the test of the logistic regression model for the frequency of travel to a bank are presented in Table 61. The lower value of *-2LL* (97.62) in comparison to those models of trip frequency already discussed, suggests that this model results in a higher likelihood of the observed results. The independent variables of age, gender, and ability to drive make only a small contribution to the explanation of the model. The negative and significant (p<0.01) regression coefficient and negative *R* value for the variable representing St. Boniface indicates that the frequency of travel to a bank is less for respondents residing in this sub-area compared to Fort Garry. In addition, the Improvement Chi-Square is significant at the 0.01 level. Therefore, the security component of the equation contributes to the goodness-of-fit of the model after consideration of the explanation provided by the autonomy variables (Table 61).

Table 61. Logistic Regression: Predictors of the Frequency of Travel to a Bank
(N=105)

Independent Variable	Regression Coefficient	Wald	Standard Error	*R*
Constant	6.42	2.71	3.90	
Age	-0.09	2.66	0.05	-0.08
Gender	1.10	3.30	0.64	-0.11
Ability to Drive	-1.17	2.33	0.72	0.06
St. Boniface	-2.45	8.71**	0.83	-0.25
Charleswood	-0.86	2.45	0.55	-0.06
Improvement Chi-Square = 12.47**				
-2LL = 97.62				

* p<0.05; ** p<0.01

4.3.4.4 Frequency of Travel to Medical Facilities

The results of the logistic regression analysis conducted for the frequency of travel to medical facilities are summarized in Table 62. The relatively low *-2LL* (83.45) value indicates that the model fits the data fairly well. The variable of self-rated health has a positive and significant (p<0.01) regression coefficient and positive *R* value. The variable of Activities of Daily Living (ADL) also has a positive and significant (p<0.05) regression coefficient and positive *R* value. This indicates that frequency of travel to medical facilities increases if the respondent reports poor self-rated health and has low functional levels. The remainder of the independent variables of autonomy including chronic conditions, barriers to activities caused by health troubles, satisfaction with health, distance able to walk, and satisfaction with transportation have only a minimal or no correlation with the dependent variable. In addition, the *R* value of 0 for each of the variables representing residential location provides no contribution to the explanation of the variance of the model and the Improvement Chi-Square is not significant. Thus, the block representing the security component of the model does not provide an explanation for the frequency of travel to medical facilities after the autonomy variables are considered (Table 62).

Table 62. Logistic Regression: Predictors of the Frequency of Travel to Medical Facilities
(N=105)

Independent Variable	Regression Coefficient	Wald	Standard Error	*R*
Constant	-3.49	0.97	3.53	
Self-Rated Health	1.46	7.48**	0.53	0.25
Chronic Cond.	-0.18	1.02	0.18	0.000
ADL	1.87	4.81*	0.85	0.18
Health Troubles	1.02	2.33	0.67	0.06
Health Satis.	0.54	2.14	0.37	0.04
Distance -Walk	-0.44	0.63	0.55	0.000
Transport Satis.	-0.82	2.56	0.51	-0.08
St. Boniface	0.94	1.60	0.75	0.000
Charleswood	0.71	0.90	0.74	0.000
Improvement Chi-Square = 1.76				
-2LL = 83.45				

* p<0.05; ** p<0.01

4.3.4.5 <u>Frequency of Travel to a Pharmacy</u>

The results of the logistic regression analysis conducted for the frequency of travel to a pharmacy are presented found in Table 63. The relatively high *-2LL* (126.67) value indicates that it is poor model to explain the frequency of travel to a pharmacy. The negative and significant (p<0.01) regression coefficient and negative *R* value for the variable of ability to walk indicates that the increased frequency of travel to a pharmacy is more likely if the respondent does not require assistance to walk. The positive and significant (p<0.01) regression coefficient and positive *R* value for the variable of chronic conditions suggests that those who have more chronic conditions travel more frequently to a pharmacy. The other independent variable of autonomy, living arrangements, contributes only minimally to the model. Furthermore, the variables representing residential location provide only a small or no contribution to the explanation of the model. As a result, the Improvement Chi-Square is not significant. Thus, the block for residential location does not contribute to the goodness-of-fit of the model after the explanation provided by the autonomy variables is taken into consideration (Table 63).

Table 63. Logistic Regression:
Predictors of the Frequency of Travel to a Pharmacy
(N=105)

Independent Variable	Regression Coefficient	Wald	Standard Error	*R*
Constant	0.12	0.07	0.47	
Living Arrange.	-0.94	3.39	0.51	-0.10
Chronic Cond.	0.35	6.73**	0.14	0.19
Ability to Walk	-1.96	6.73**	0.76	-0.19
St. Boniface	-0.33	0.37	0.55	0.000
Charleswood	-0.96	3.26	0.53	-0.10
Improvement Chi-Square = 3.54				
-2LL = 126.67				

* p<0.05; ** p<0.01

4.3.4.6 Frequency of Travel to Facilities for Recreation and Entertainment

The results of the test for the logistic regression model of frequency of travel to facilities for recreation and entertainment are summarized in Table 64. The relatively high *-2LL* (134.45) value indicates that the model offers little contribution to the explanation of the frequency of travel to facilities for recreation and entertainment. In addition to the variables representing residential location, the model includes the independent variables of satisfaction with health and satisfaction with transportation.

The R value of 0 for all these variables demonstrates that they provide no contribution to the model. Furthermore, the Improvement Chi-Square is not significant thereby indicating that the block for residential location representing the security component of the equation does not contribute to the goodness-of-fit of the model (Table 64).

Table 64. Logistic Regression: Predictors of the Frequency of Travel Facilities for Recreation and Entertainment
(N=105)

Independent Variable	Regression Coefficient	Wald	Standard Error	R
Constant	-1.95	1.40	1.65	
Health Sat.	0.18	0.69	0.22	0.000
Transport Sat.	0.37	1.29	0.33	0.000
St. Boniface	-0.70	1.80	0.52	0.000
Charleswood	-0.56	1.14	0.52	0.000
Improvement Chi-Square = 2.007				
$-2LL$ = 134.45				

* $p<0.05$; ** $p<0.01$

4.3.4.7 <u>Frequency of Travel to the Homes of Friends and Family</u>

The results of the logistic regression analysis conducted for the model of the frequency of travel to the homes of friends and family are summarized in Table 65. The high $-2LL$ (131.32) value indicates that the model does not fit the data well. The negative and significant ($p<0.05$) regression coefficient and negative R value for chronic conditions denotes that the frequency of travel to the homes of friends and family increases as the number of chronic conditions of the individual decreases. The model also consists of the independent variables of age, living arrangements, and satisfaction with transportation which provide only a minimal or no contribution to the explanation of the dependent variable. The variable representing St. Boniface has a negative and significant ($p<0.05$) and negative R value thereby indicating that the respondents in St. Boniface travel less frequently to the homes of friends and family in comparison to the respondents in Fort Garry. However, the Charleswood variable makes no contribution to the model as the R value is 0. Therefore, the Improvement Chi-Square is not significant and the block representing the security component does not contribute to the goodness-of-fit of the model after the explanation provided by the variables of autonomy is considered (Table 65).

Table 65. Logistic Regression:
Predictors of the Frequency of Travel to Homes of Friends and Family
(N=104)

Independent Variable	Regression Coefficient	Wald	Standard Error	*R*
Constant	2.90	0.71	3.44	
Age	-0.03	0.69	0.04	0.000
Living Arrange.	0.83	2.41	0.53	0.06
Chronic Cond.	-0.24	3.77*	0.12	-0.11
Transport Sat.	0.10	0.11	0.31	0.000
St. Boniface	-1.06	4.08*	0.52	-0.12
Charleswood	-0.36	0.49	0.52	0.000
Improvement Chi-Square = 4.36				
-2LL = 131.32				

* $p<0.05$; ** $p<0.01$

4.3.4.8 Overview of Frequency of Travel to Service and Activity Sites

Based on the logistic regression analyses, the models of frequency of travel to a bank and to medical facilities have the highest likelihood of the observed results. Furthermore, the block of residential location variables, representing the security component of the equation, provides a significant contribution to the goodness-of-fit for the models of frequency of travel to a shopping mall and a bank. In addition, the variable representing St. Boniface contributes to the overall explanation for the models of frequency of travel to a grocery store and homes of friends and family. In each model, there are also independent variables of the autonomy component of the equation that contribute to the explanations of the models. "Living arrangements" contributes to the explanation of the frequency of travel to a shopping mall, while "self-rated health" and "Activities of Daily Living" contribute to the explanation of the frequency of travel to medical facilities. In addition, the variables of chronic conditions and ability to walk are significantly correlated with the frequency of travel to a pharmacy, while "chronic conditions" contributes to the explanation of the frequency of travel to the homes of friends and family. In contrast to the other models, all the independent variables included in the model concerning frequency of travel to facilities for recreation and entertainment do not contribute to the goodness-of-fit of the data.

4.3.5 Research Question 3: Distance Travelled to Service and Activity Sites

The evaluation of the distance travelled to service and activity sites is based on Ordinary Least Squares (OLS) regression analysis using the method of forced variable entry. For each model, the block of variables representing autonomy are forced into the equation in the first step. In the second and final step, the variables representing residential location are entered into the equation so that the effect of location on the variation of the dependent variable can be determined. The contribution of each independent variable to predict the outcome of the model is evaluated based on the standardized regression coefficient (*Beta*). Beta coefficients represent the independent variables when all the variables are expressed in standardized (Z score) form (Norusis, 1993b). The goodness-of-fit of the linear model is measured by the coefficient of determination (R^2). In this analysis, the *Adjusted* R^2 will be used as it more closely reflects the goodness-of-fit of the model (Norusis, 1993b). In addition, the overall F statistic is included in the analysis to determine whether there is a linear relationship between the dependent variable and the entire set of independent variables (Norusis, 1993b). Finally, the increase of R^2 for the last step of the regression model is measured to test the contribution of residential location to the model. (This measurement is achieved by a simple subtraction of the R^2 produced after the entry of the first block, from the R^2 resulting from the entry of the second block.) This value will demonstrate the importance of residential location (security) variables in these models which predict travel distances.

4.3.5.1 Distance Travelled to a Grocery Store

The results of the OLS regression analysis conducted for the model of distance travelled to a grocery store are summarized in Table 66. The overall explanation provided by the model is 13%. Furthermore, the F statistic is significant at the 0.01 level thereby demonstrating that linear relationships exist between the dependent variable and independent variables of the model. The variable of bus satisfaction has a positive and significant ($p<0.01$) *Beta* value. This suggests that as distance increases, the dissatisfaction with the bus system also increases. The other independent variable representing the autonomy component of the equation, the number of years living at the present address, does not contribute to the explanation of the model. The *Beta* values for the variables representing St. Boniface and Charleswood are also positive, with the value for Charleswood significant at the 0.05 level. This illustrates that the distance travelled to a grocery store is greater in Charleswood compared to Fort Garry. The significant increase of the R^2 value when the residential location block is entered into the model demonstrates that the security component of the equation contributes to the explanation of the model after the autonomy variables have been considered (Table 66).

Table 66. OLS Regression:
Predictors of the Distance Travelled to a Grocery Store
(N=104)

Independent Variable	Regression Coefficient	Standard Error	*Beta*
Constant	0.11	0.30	
Years at Address	0.01	0.01	0.11
Bus Satisfaction	0.37	0.12	0.29**
St. Boniface	0.09	0.23	0.05
Charleswood	0.48	0.20	0.25*

Adjusted $R^2 = 0.13$
Overall F = 4.73**
Increase in R^2 due to entry of security variables (Block 2) = 0.16 - 0.11 = 0.05

* $p<0.05$; ** $p<0.01$

4.3.5.2 Distance Travelled to a Shopping Mall

The results of the OLS regression analysis conducted for distance travelled to a shopping mall are presented in Table 67. The overall explanation provided by this model for distance travelled to a shopping mall is only 1%. The overall F is not significant thereby illustrating the absence of linear relationships between the dependent and independent variables of the model. In this model, the independent variables for both the autonomy and security components of the equation contribute only minimally to the explanation of the variance of the dependent variable. These variables include those representing residential location and "transportation satisfaction". Furthermore, the minimal contribution of the security component of the equation is illustrated by the minimal change in the R^2 value when the residential location block is entered into the model (Table 67).

Table 67. OLS Regression:
Predictors of the Distance Travelled to a Shopping Mall
(N=102)

Independent Variable	Regression Coefficient	Standard Error	*Beta*
Constant	4.03	1.56	
Transport Sat.	-0.15	0.29	-0.05
St. Boniface	0.68	0.51	0.15
Charleswood	0.82	0.52	0.18

Adjusted $R^2 = 0.01$
Overall F = 1.19
Increase in R^2 due to entry of security variables (Block 2) = 0.03 - 0.01 = 0.02

4.3.5.3 Distance Travelled to a Bank

The results of the test of the OLS regression model of distance travelled to a bank are summarized in Table 68. The model for distance travelled to a bank does not fit the data well as the overall explanation provided is only 1% and the F statistic is not significant. The independent variable of self-rated health, as well as the variables representing residential location make only a small contribution to the explanation of the dependent variable. Furthermore, the increase in R^2 demonstrates that the residential location block does not contribute significantly to the explanation of the dependent variable (Table 68).

Table 68. OLS Regression: Predictors of the Distance Travelled to a Bank
(N=104)

Independent Variable	Regression Coefficient	Standard Error	*Beta*
Constant	2.67	0.61	
Self-rated Health	-0.23	0.23	-0.10
St. Boniface	-0.79	0.46	-0.19
Charleswood	-0.63	0.47	-0.15

Adjusted $R^2 = 0.01$
Overall F = 1.35
Increase in R^2 due to entry of security variables (Block 2) = 0.04 - 0.01 = 0.03

4.3.5.4 <u>Distance Travelled to Medical Facilities</u>

The results of the OLS regression analysis conducted for the model of distance travelled to medical facilities are presented in Table 69. The overall explanation of this model is 13%. Furthermore, the overall F statistic is significant at the 0.01 level thus suggesting that there are linear relationships between the dependent and independent variables. The negative and significant ($p<0.005$) *Beta* value for the variable of years at the present address indicates that the distance travelled to medical facilities decreases as the period of residence increases. The remainder of the independent variables including gender, level of education, income, and the variables of residential location provide non-significant contributions to the explanation of the dependent variable. Furthermore, the addition of the security components to the equation registers only a minimal increase in the R^2 value (Table 69).

Table 69. OLS Regression:
Predictors of the Distance Travelled to Medical Facilities
(N=104)

Independent Variable	Regression Coefficient	Standard Error	*Beta*
Constant	4.39	1.25	
Gender	-0.21	0.58	-0.03
Education	0.06	0.09	0.07
Income	0.18	0.24	0.09
Years at Address	-0.04	0.02	-0.23*
St. Boniface	-1.46	0.79	-0.24
Charleswood	-0.81	0.67	-0.13

Adjusted $R^2 = 0.13$
Overall F = 3.51**
Increase in R^2 due to entry of security variables (Block 2) = 0.18 - 0.15 = 0.03

* p<0.05; ** p<0.01

4.3.5.5 Distance Travelled to a Pharmacy

The results of the test for the OLS regression model of distance travelled to a pharmacy are summarized in Table 70. This model fits the data reasonably well as the overall explanation is 15% and the F statistic is significant at the 0.01 level. The negative and significant (p<0.05) *Beta* value for the variable of marital status indicates that a respondent is more likely to travel a greater distance to a pharmacy if he or she is married. The positive and significant (p<0.01) *Beta* value for the variable representing Charleswood indicates that the distance travelled to a pharmacy is greater in this sub-area in comparison to Fort Garry. Overall, the security component of the equation contributes substantially to the goodness-of-fit as demonstrated by the increase in R^2 when the residential location block is entered (Table 70).

Table 70. OLS Regression:
Predictors of the Distance Travelled to a Pharmacy
(N=100)

Independent Variable	Regression Coefficient	Standard Error	*Beta*
Constant	1.28	0.27	
Marital Status	-0.60	0.31	-0.18*
St. Boniface	0.25	0.36	0.07
Charleswood	1.45	0.36	0.42**
Adjusted $R^2 = 0.15$			
Overall F = 7.13**			
Increase in R^2 due to entry of security variables (Block 2) = 0.17 - 0.02 = 0.15			

* $p<0.05$; ** $p<0.01$

4.3.5.6 Distance Travelled to Facilities for Recreation and Entertainment

The results of the OLS regression analysis conducted for the model of distance travelled to facilities for recreation and entertainment are presented in Table 71. Only the variables representing residential location are included in this model. The level of overall explanation provided by this model is 7%. The goodness-of-fit of the model is demonstrated further by the significance of the F statistic at the 0.01 level. The St. Boniface variable is significant at the 0.01 level and its negative *Beta* value indicates that distance travelled to facilities for recreation and entertainment is greater for respondents in Fort Garry compared to St. Boniface. Although the *Beta* value for the variable representing Charleswood is also positive, it is non-significant (Table 71).

**Table 71. OLS Regression:
Predictors of the Distance Travelled to Facilities
for Recreation and Entertainment**
(N=75)

Independent Variable	Regression Coefficient	Standard Error	*Beta*
Constant	5.50	0.54	
St. Boniface	-1.98	0.77	-0.28**
Charleswood	0.17	0.77	0.02
Adjusted $R^2 = 0.07$			
Overall F = 4.88**			

* p<0.05; ** p<0.01

4.3.5.7 Distance Travelled to the Home of a Family Member

The results of the test of the OLS regression model of distance travelled to the home of a family member are summarized in Table 72. The goodness-of-fit of this model is low as the overall explanation provided by the model is only 0.2% and the F statistic is not significant. The independent variables comprising both the autonomy component of the equation (gender and marital status), and the security component provide only a minimal contribution to the explanation of the dependent variable. Overall, the security component of the equation does not contribute significantly to the explanation of the dependent variable when the residential location block is entered into the model (Table 72).

Table 72. OLS Regression:
Predictors of the Distance Travelled to the Home of a Family Member
(N=92)

Independent Variable	Regression Coefficient	Standard Error	*Beta*
Constant	6.21	0.90	
Gender	-1.61	0.95	-0.18
Marital Status	1.04	0.96	0.12
St. Boniface	-0.29	1.04	-0.03
Charleswood	0.44	1.05	0.05

Adjusted $R^2 = 0.002$
Overall F = 1.08
Increase in R^2 due to entry of security variables (Block 2) = 0.041 - 0.037 = 0.004

4.3.5.8 Distance Travelled to the Home of Friends

The results of the OLS regression analysis conducted for the model of distance travelled to the home of friends are summarized in Table 73. This model does not fit the data well as the overall level of explanation is -0.01% and the F statistic is not significant. The non-significant contribution of type of housing indicates that the autonomy component of the equation is not important. In addition, the relationships between the security variables and the dependent variable are not significant. Furthermore, the non-significant increase of R^2 when the residential location block is entered also demonstrates that the security component of the equation provides only a minimal contribution to the explanation of the dependent variable (Table 73).

Table 73. OLS Regression:
Predictors of the Distance Travelled to the Home of Friends
(N=58)

Independent Variable	Regression Coefficient	Standard Error	*Beta*
Constant	6.22	0.76	
Type of Housing	-0.19	0.91	-0.02
St. Boniface	-1.08	0.97	-0.14
Charleswood	-0.32	0.92	-0.04

Adjusted R^2 = -0.01
Overall F = 0.62
Increase in R^2 due to entry of security variables (Block 2) = 0.02 - 0.01 = 0.01

4.3.5.9 Overview of Distance Travelled to Service and Activity Sites

The results of the linear regression analyses demonstrate that the models of distance travelled to a grocery store, medical facilities, pharmacy, and facilities for recreation and entertainment provide the greatest level of explanation of the respective outcomes. The contribution of the residential location block, the security component of the equation, to the goodness-of-fit is highest for the model of distance travelled to a pharmacy. In addition, the security variable of Charleswood contributes to the explanation of the distance travelled to a grocery store. In the case of the model of distance travelled to facilities for recreation and entertainment, only the residential location block is included and the St. Boniface variable has a significant linear association with the dependent variable. Moreover, there is evidence that relationships exist between some of the dependent variables and the variables of autonomy included in the models. In particular, those independent variables that contribute significantly to the explanation of the respective dependent variables include: bus satisfaction for the model of distance travelled to a grocery store; the number of years living at the present address for the model of distance travelled to medical facilities; and marital status for the model of distance travelled to a pharmacy.

4.3.6 Summary: Analysis of the Research Questions

The application of linear regression analyses and logistic regression analyses has provided a foundation to evaluate the effect of the autonomy-security dialectic on the outcome of transportation behaviours. In this section, the importance of the variables representing autonomy and security as predictors of the nineteen models have been examined. In the concluding chapter that follows, the significance of the results of the regression analyses will be considered to ascertain whether the components of autonomy and security determine the transportation requirements of the urban elderly.

CHAPTER 5

SUMMARY AND CONCLUSIONS

This study has evaluated the relationship between the environment and aging based on the investigation of the transportation requirements of the spatially dispersed urban elderly. In this final chapter, the implications of the research findings are considered to illustrate the study's contribution to a greater understanding of the mobility needs of the elderly. The objective of the study is first reviewed based on the conceptual framework provided by the ecological model of aging (Lawton & Nahemow, 1973; Lawton, 1980; Lawton, 1982; Lawton, 1985; Parmalee & Lawton, 1990). Secondly, the results of the study are examined according to the results of univariate, bivariate, and multivariate levels of analyses. This is followed by a discussion of the contribution of the research findings to the ecological model of aging. It is proposed that the present study endorses the need for future research on the transportation requirements of the urban elderly. Accordingly, directions for future investigation are discussed. Furthermore, the policy implications of the research findings are considered in terms of the study's contribution to improved transportation provision for older persons. Finally, the chapter concludes by evaluating the significance of the study for the further development of gerontological geography.

5.1 **Objective of the Study**

The quality of life of the elderly population is dependent upon the quality of their living environment (Carp, 1988). Concomitantly, mobility is essential to maintain an older person's satisfaction and independence within the community. Therefore, research on transportation for the elderly is imperative as a means of evaluating and improving their residential environment. The investigation of the transportation requirements of the urban elderly, however, must go beyond an evaluation of the adequacy of transportation systems for this population cohort. Instead, an effective analysis of the mobility needs of the elderly should identify both the diminishing physical, social, and financial resources of the elderly individual which can lead to transportation dependency, and the components of the residential environment that may cause mobility constraints.

In this study, the application of the elements of the individual and environment to the issue of transportation for the elderly is based on the conceptual framework provided by Lawton's ecological model of aging (Lawton & Nahemow, 1973; Lawton, 1980; Lawton, 1982; Lawton, 1985; Parmalee & Lawton, 1990). The model predicts the behaviour of older persons according to an evaluation of the dialectic relationship between the autonomy of the individual and the security afforded by the environment. Research on the transportation needs of the elderly has emphasized the effect of individual components on the outcome of transportation behaviour. However, the role of the environment in determining the mobility of seniors has largely been overlooked. Therefore, the objective of the present study is to evaluate the effect of the residential environment, in conjunction with the capability of the individual, on the transportation requirements of the urban elderly.

In the present study, an in-depth analysis was conducted to evaluate the transportation behaviour of the elderly population. The primary research tool used in the study was a questionnaire developed to gather data concerning the respondent's use of transportation and travel patterns. The ecological model of aging provided the framework to formulate the research questions which test the outcome variables of transportation behaviour. The study incorporates three research questions which investigate whether autonomy and security can predict the frequency of use of transportation modes, the frequency of travel to service and activity sites, and the distance travelled to service and activity sites.

It is the basic premise of the study that the outcome of transportation behaviour can be predicted by the dimensions of autonomy and security. Autonomy is defined by the individual's physical, social, and financial resources. In the study's questionnaire, information was also collected about the respondent's housing and service environment, functional level, health status, life satisfaction, and socio-demographic characteristics. Therefore, autonomy is measured based on the variables related to socio-demographic characteristics, health and functional level, and the transportation resources of the respondent.

The security component of the analysis is defined by the residential environment, and, more specifically, the effect of varying residential locations on the ability of the environment to provide security in the form of transportation provision. The focus on residential location is the result of the demographic process of aging-in-place which has made it essential to investigate the implications of the suburban environment for the quality of life of the elderly. Of particular significance to this research is the observation that the low density design of suburban areas creates distinct mobility problems for the elderly. As a result, data was collected in three sub-areas of Winnipeg, Manitoba, in order to determine the effect of residential location on the transportation behaviour of the elderly population. The sub-area of St. Boniface is defined to be the inner suburban location where high density development has resulted in the spatial concentration of services and residences thereby enhancing accessibility for older persons. In contrast, the sub-areas of Fort Garry and Charleswood are designated as outer suburban areas where low density development hinders access for older persons because of the spatial separation of service facilities from the place of residence.

In summary, the significance of mobility for the quality of life of the elderly population requires that the transportation needs of this population cohort be determined. In the present study, Lawton's ecological model of aging (Lawton & Nahemow, 1973; Lawton, 1980; Lawton, 1982; Lawton, 1985; Parmalee & Lawton, 1990) provides a framework to analyze the transportation requirements of the spatially dispersed urban elderly. The objective of the study's research questions is to determine whether the transportation behaviour of the elderly population can be predicted by the dimensions of autonomy, defined to be the resources of the individual, and security, defined in terms of residential location. Furthermore, it is proposed that an analysis of the autonomy-security dialectic will provide a greater understanding of what constitutes adequate transportation for older persons. The effect of the components of autonomy and security on transportation behaviour are evaluated in the following section.

5.2 Implications of the Findings

It should be noted that the findings of the study must be evaluated with caution as a result of the small sample sizes of the sub-areas (n=35 for each area), as well as the low overall response rate (28.9%). These factors suggest that the sample does not sufficiently represent the heterogeneous nature of the elderly population. This issue will be discussed further in the section pertaining to future research. Nevertheless, the research findings are relevant to an increased understanding of the transportation requirements of the urban elderly. Therefore, the implications of the results will be evaluated in accordance with the three research questions developed in Chapter 3. The interpretation of the results will be based, first, on a brief overview of the findings of the univariate analysis, and, secondly, on the significance of the bivariate and multivariate analyses.

5.2.1 The Sample Characteristics

The univariate analysis provides a description of the autonomy components of the sample indicating the physical, social, and financial resources of the respondents. These elements include the variables of age, gender, educational level, income, and self-rated health. The majority of the sample (55.2%) are between the ages of 68 and 74. The possibility of mobility problems increases, however, for the remainder of the sample over the age of 74 as increasing age may result in physical decrements which create greater barriers to the access of appropriate transportation. This includes 28.6% of the sample who rate their health to be "fair", "poor", or "bad". Health problems are an important indicator of mobility problems. Furthermore, 59.0% of the sample are female which also indicates a greater probability of transportation dependency because of the higher proportion of females who do not drive, in addition to the decrease of social support in the event of widowhood.

Almost three quarters (74.3%) of the sample have attained at least a high school education. In addition, 66.0% of the respondents have a yearly household income of $20,000 or more. These two variables suggest that the majority of the sample may have sufficient financial resources to access appropriate transportation provision. The remainder of the sample with a lower income and educational level, however, may experience greater difficulty and become transportation disadvantaged because of the lack of sufficient financial means to overcome mobility constraints.

The indicators of the physical, social, and financial resources of the individual allow for consideration of the possibility of inadequate transportation provision for the elderly population. In the following sub-section, the effect of the autonomy components of the individual, in addition to the significance of the security afforded by the residential environment, on transportation behaviour are evaluated based on the results of the bivariate and multivariate analyses. These analyses of the elements of autonomy and security will provide greater insight than is possible at the univariate level as they evaluate which factors of the person and environment are significant in determining the transportation behaviour of the elderly.

5.2.2 The Determinants of Transportation Behaviour

The purpose of the study's research questions is to determine if the components of autonomy and security can predict transportation behaviours. Therefore, the results of the bivariate and multivariate analyses are evaluated to ascertain the significance of the individual and the environment for the transportation requirements of the urban elderly. The results are presented in accordance with the objectives stated by the three research questions.

5.2.2.1 Research Question 1: Frequency of Use of Transportation Modes

Research Question 1 states:

> Part a) What is the influence of socio-demographic characteristics and health resources on the frequency of use of transportation modes for the urban elderly?; and,
>
> Part b) Are there differences in the frequency of use of transportation modes by the urban elderly according to geographic location?

Logistic regression analyses were conducted to determine the effect of autonomy and security on the frequency of use of the transportation modes of the automobile, rides from friends and family, walking, and public transit. A significant finding was the perfect fit demonstrated for the model of the frequency of use of the automobile. It was found that the autonomy component of the model provided a complete explanation for this transportation behaviour. Therefore, this model predicts the increased use of an automobile according to younger age, being male, living with someone, increasing educational level, increasing income, the decreasing number of chronic conditions, decreasing functional limitations, living in a house, increasing years living at the present address, being able to drive, owning a car, increasing distance to the bus stop, and decreasing satisfaction with bus service. This suggests that physical, social, and financial resources are all important in determining the individual's access to personal transportation.

The findings also demonstrate that rides from friends and family were particularly important for those who live alone and do not drive. In the sample, 29.5% of the respondents live alone and, as was discussed previously, they are more susceptible to mobility constraints because of the possible lack of social supports. In addition, 31.4% of the respondents do not drive which indicates that they may encounter greater transportation problems because of the lack of personal transportation. Therefore, the significance of the variables of living arrangements and ability to drive for the model of rides from friends and family underscores the importance of the provision of alternative forms of transportation. Those older individuals who do not have access to personal transportation, and are considered to be transportation disadvantaged, must rely on rides as other transportation services may be too costly and inadequate for their needs.

Although the variable of "gender" was significant at the bivariate level of analysis, it was not significant when controlled for at the multivariate level. Nevertheless, the issue of increased transportation problems for elderly females is highlighted in the model of rides for friends and family as a greater proportion of females live alone and cannot drive. Therefore, it can be theorized that older female individuals must seek alternative forms of transportation such as rides as a result of the lack of social and financial resources.

The possibility of greater transportation problems for elderly persons who lack social supports is also illustrated by the model of the frequency of use of public transit. In this model it was found that the likelihood of bus usage was greater for those who are unmarried. As 35.2% of the sample are not married, it suggests that these single persons must rely on transportation alternatives other than the car or rides more than those who are married. Once again, the variable of "gender" was significant at the bivariate level but failed to show a significant effect when controlling for other factors at the multivariate level. This finding suggests that the issue of mobility constraints for single persons is particularly relevant for some elderly females. This proposition is supported by the finding that the likelihood of using public transportation in Canada in 1991 was 67% for senior couples, 65% for unattached senior men, and 78% for unattached senior women (NACA, 1993). Therefore, further consideration of the provision of alternative transportation must recognize that the variables of living arrangements, marital status, gender, and inability to drive are predictors of those who are transportation disadvantaged.

It was found that the increasing frequency of walking is related to the increasing distance an individual is able to walk. This illustrates that walking as a form of transportation is only an alternative for those elderly who do not have diminishing health and functional resources. This is supported further by the variables of Activities of Daily Living and ability to walk. Their significance at the bivariate level of analysis indicates that the functional level of an elderly person determines their ability to walk to access service and activity sites. Although these variables were not significant in the multivariate analysis, they do provide support, along with the variable of distance able to walk, that walking is not an alternative form of transportation for those elderly who do not have sufficient physical resources.

It is significant that the security component of residential location does not contribute to the four models included in the analysis of the transportation behaviour of the frequency of use transportation modes. This suggests that the varying environments do not influence the type of transportation mode that is used to access service and activity sites. Furthermore, for the model of frequency of walking, the *R* statistic value, although not significant, does indicate that the frequency of walking is greater for respondents in Fort Garry compared to St. Boniface. This observation is also supported by findings at the univariate level of analysis. It does not support the original postulation that the higher density environment of St. Boniface encourages walking compared to the lower density suburban areas. However, the univariate analysis does indicate that St. Boniface respondents use the bus more frequently which suggests that public transportation addresses the mobility needs of the elderly more adequately in a high density areas.

In summary, the results of the bivariate and multivariate analyses reveals that various elements of autonomy can be used to predict the frequency of use of transportation modes. Of greatest significance is the finding that the use of the automobile is predicted by the physical, social, and financial resources of an elderly individual. In addition, the frequency of use of public transit and rides from friends and family are predicted by the social resources of the individual including gender, living arrangements, and marital status. Finally, the frequency of walking is predicted by physical resources represented by the functional level of the elderly. Therefore, those with the greatest need for alternative transportation provision are elderly females who live alone, those with health and functional limitations, those with inadequate financial resources, and those who do not have access to personal transportation. In contrast, residential location (i.e. security components) is not an indicator of those elderly who require transportation services.

5.2.2.2 Research Question 2: Frequency of Travel to Service and Activity Sites

Research Question 2 attempts to determine:

Part a) Is the frequency of trip-making to essential services and social activity sites affected by socio-demographic characteristics and health resources of the urban elderly?; and,

Part b) Is the frequency of trip-making by the urban elderly affected by geographic location?

Logistic regression analyses were also conducted to determine the contribution of autonomy and security to the explanation of the frequency of travel to the grocery store, shopping mall, bank, medical facilities, pharmacy, facilities for recreation and entertainment, and homes of friends and family. Neither autonomy or security contribute to the explanation of the model of frequency of travel to recreation and entertainment. Concomitantly, the findings reveal that the models for frequency of travel to the bank and to medical facilities register the greatest levels of explanation.

It was found that the security component contributed significantly to frequency of travel to a bank, while the autonomy component did not. Respondents in Fort Garry travel more frequently to the bank than do respondents in St. Boniface and Charleswood. This was also described at the univariate level of analysis and it was suggested that the discrepancy was the result of varying income levels. Overall, the St. Boniface respondents have a lower income and it is possible that they rely on a government pension which only arrives once a month thereby explaining less frequency of travel to the bank. However, the variable of income does not contribute to the model. In addition, the difference in travel frequency cannot be explained by the conjecture that the availability of banks in Fort Garry will encourage easier travel for the elderly. As Figures 2 and 3 illustrate banks are more accessible in St. Boniface in comparison to Fort Garry. However, increased trip frequency to the bank does not result in St. Boniface. Therefore, a clear explanation of this finding cannot be provided.

While frequency to the bank is explained by security, the model for frequency to medical facilities is explained only by autonomy. It was found that the likelihood of travel to medical facilities increases if the individual has poor self-rated health and functional limitations. In addition, the variables of chronic conditions, barriers caused by health troubles, and health satisfaction were significant at the bivariate level of analysis but dropped at the multivariate level. These variables provide additional support to the finding that diminishing health and functional limitations cause increased frequency of travel to medical facilities thereby requiring greater transportation provision to these services. However, poor health and functional limitations may result in barriers to the access of appropriate transportation. This demonstrates that transportation for medical needs must be improved to assure that the elderly population is able to access these required services.

Frequency of travel to a shopping mall is explained by both components of autonomy and security. The frequency of travel to a shopping mall decreases if an elderly individual lives alone. This demonstrates the possibility that the single elderly lack appropriate transportation for their mobility needs. Furthermore, the results of the regression analyses indicate that residential location makes a significant contribution to the explanation of the dependent variable. It was found that respondents in St. Boniface travel less frequently to a shopping mall than do those in Fort Garry. This perhaps demonstrates that suburban areas have greater access to regional shopping malls as low density development has encouraged malls in suburban areas instead of more central locations. As Figure 1 illustrates Fort Garry is within easy driving distance to the St. Vital Shopping Centre.

The elements of autonomy do not contribute to the explanation for the model of frequency of travel to a grocery store. However, it is significant that although "living arrangements" was significant at the bivariate level, this variable was not significant when controlled for at the multivariate level of analysis. Therefore, if a person lives alone, the frequency of travel to a shopping mall will decrease, but the frequency of travel to a grocery store will not be affected significantly. This suggests that although living alone may constrict mobility for some purposes, the need to purchase groceries requires that an elderly person access some form of transportation. Consequently, transportation provision for travel to a grocery store, as for travel to medical facilities, must be improved. Finally, it was found that respondents in St. Boniface travel less frequently to a grocery store than do respondents in Fort Garry.

The likelihood of travel to a pharmacy increases if an individual does not require assistance to walk. This indicates that functional limitations may impede access to required services. Accordingly, transportation provision must be directed towards those who do not have the physical resources to utilize appropriate transportation. In addition, the frequency of travel to a pharmacy increases as the number of chronic conditions increases. This highlights the importance of medical services for elderly persons in poor health once again, and stresses the importance of adequate transportation for the elderly to access such services as a pharmacy. Residential location does not contribute to the model of the frequency of travel to a pharmacy.

In contrast to the frequency of travel to a pharmacy, the frequency of travel to the homes of friends and family decreases as the number of chronic conditions of the individual increases. Therefore, elderly persons in poor health travel for reasons associated with medical needs, but do not travel as often for social purposes. This suggests that the lack of adequate transportation for those in poor health may contribute to isolation. Although the security component does not contribute to the model, it was found that respondents in St. Boniface travel less frequently than respondents in Fort Garry to the homes of friends and family.

In summary, the analysis of the frequency of travel to service and activity sites demonstrates that both components of autonomy and security contribute to an explanation of this transportation behaviour. In particular, the findings emphasize that the physical and social resources of older persons impact on the frequency of travel. An individual with diminishing health resources, or who lives alone, will travel mainly to essential services and will limit his or her trips for social purposes. This highlights the need to assure adequate transportation for both essential services, as well as activity opportunities, to ensure that the quality of life of the elderly population is maintained.

The analysis also indicates that residential location explains the frequency of travel to certain destinations. Based on the higher density environment of St. Boniface, it could be assumed that trip frequency would be greater in this area. However, for the models in which security is significant, the frequency of travel is lower for respondents who reside in St. Boniface. Therefore, it is possible that respondents in this sub-area have greater difficulty in accessing appropriate transportation. This proposition is supported by the findings of the univariate analysis which indicate that determinants of autonomy explain decreased trip-making in St. Boniface. There is a higher probability that mobility problems will be encountered in St. Boniface as there is a greater proportion of respondents who are older, female, single, with lower incomes, and with lower health and functional status. Although these factors are not significant at the multivariate level of analysis, it is still important to evaluate their influence on reduced trip-making. Moreover, these characteristics demonstrate the need for improved transportation provision for those elderly who are transportation disadvantaged particularly in the sub-area of St. Boniface.

5.2.2.3 Research Question 3: Distance Travelled to Service and Activity Sites

The third question states:

> Part a) What is the influence of socio-demographic characteristics and health resources on the distance travelled to essential services and activity sites for the urban elderly?; and,
> Part b) Are there differences in the distance travelled to essential services and activity sites by the urban elderly according to geographic location?

Ordinary Least Squares (OLS) regression analyses were conducted to determine the effect of the components of autonomy and security on the distance travelled to a grocery store, shopping mall, bank, medical facilities, pharmacy, facilities for recreation and entertainment, the home of a friend, and the home of a family member. Neither autonomy or security contribute to the models of distance travelled to a shopping mall, bank, the home of a friend, and the home of a family member. However, the level of explanations provided by the remainder of the models are relatively substantial.

The findings indicate that the satisfaction with bus service decreases as distance travelled to a grocery store increases. This is a significant observation as it illustrates that public transit may not be a suitable form of transportation to access this service.

The use of the bus is particularly problematic when shopping because of the need to walk while carrying parcels. Almost one half (48.6%) of the sample indicated that carrying parcels could be a deterrent to using the bus. The component of security does not contribute significantly to the model. However, it was found that distance travelled to a grocery store is greater for respondents in St. Boniface and Charleswood compared to those in Fort Garry. This supports the suggestion made previously that the concentration of services along Pembina Highway in Fort Garry (Figure 3) provides greater access for those who reside in the residential developments and apartments that adjoin this main artery. Furthermore, this may also provide an explanation for the greater frequency of travel by Fort Garry respondents to a grocery store in comparison to St. Boniface respondents.

The analysis also found that the distance travelled to a pharmacy is greater if the respondent is married. This suggests that in contrast to the single elderly, those elderly persons who are married have greater resources to overcome environmental barriers that could hinder mobility. In addition, the security component provides a significant contribution to the explanation of the model of distance travelled to a pharmacy. Once again, the findings indicate that the distance travelled to a pharmacy is greater for St. Boniface and Charleswood respondents in comparison to those in Fort Garry.

The distance travelled to medical facilities decreases as the number of years at the present address increase. This finding suggests that the distance travelled to medical facilities is greater for respondents in Fort Garry as 57.1% in this sub-area have lived in their present homes for twenty years or less. Furthermore, it was demonstrated in the univariate analysis that St. Boniface respondents live closer to medical facilities as there is a concentration of clinics and a hospital in this sub-area (Figure 2). Despite this observation, residential location is not significant for the model of distance travelled to medical facilities.

Finally, only security is significant for the model of distance travelled to facilities for recreation and entertainment. The distance travelled is greater for respondents in Fort Garry compared to St. Boniface. Furthermore, the distance travelled to facilities for recreation and entertainment is greater for Charleswood respondents compared to respondents in Fort Garry. This finding supports the proposition that the higher density development of St. Boniface provides greater proximity to activity sites compared to the outer suburban environments. Therefore, the respondents in the outer suburbs of Fort Garry and Charleswood may encounter greater mobility problems to reach activity sites which could contribute to social isolation.

In summary, the analysis of the distance travelled to service and activity sites does provide some evidence of the contribution of the components of autonomy and security. With respect to autonomy, the findings indicate that older individuals who are married may have greater resources to overcome distance barriers as they travel further to access a pharmacy. Furthermore, the finding that decreased bus satisfaction is related to increased distance to the grocery store is an indication that public transit may not be an appropriate form of transportation for the elderly population. In terms of security, the Fort Garry sub-area is more proximate to grocery stores and pharmacies, and St. Boniface is more proximate to medical facilities. This finding does provide an explanation for the increased frequency of travel to a grocery store for Fort Garry respondents. However, the frequency of travel to the pharmacy and medical facilities is not significantly different for St. Boniface and Fort Garry. Therefore, this analysis does not provide conclusive evidence that greater distances in varying residential locations creates mobility constraints.

5.2.2.4 Overview of the Autonomy and Security Determinants of Transportation Behaviours

The analysis of the effect of autonomy and security on transportation behaviours provides insight into the transportation requirements of the spatially dispersed elderly population. There is a considerable amount of evidence to support the significance of the impact of autonomy on the transportation needs of seniors. The findings illustrate that the diminishing physical, social, and financial resources of elderly persons affect their level of mobility and their ability to access appropriate transportation. This reflects previous research which has found that the variables of age, gender, income, health and functional status, household composition, and marital status are important predictors of the elderly who are transportation disadvantaged (Ashford & Holloway, 1972; Cutler, 1974; Weaver, 1974; Schmitt, 1979; Iuctovich & Iuctovich, 1988; Golant, 1990; Hodge, 1990; Cutler & Coward, 1992). As a result, transportation provision must be directed towards those elderly who display characteristics of transportation dependency.

The findings pertaining to security do not support the initial assumption of the study that elderly persons in suburban areas experience greater mobility constraints as a result of low density development and fewer transportation options. Instead, the findings suggest that transportation problems may be more acute in the inner suburban area. This supports the conclusion of Cutler (1975) that the elderly who are transportation disadvantaged live closer to the centre of the city. In contrast, the findings of Cutler (1972) and Cutler and Coward (1992) demonstrate that greater transportation problems exist for the elderly residing in decentralized locations of a city. Nevertheless, it is significant that the present study has demonstrated that locational variations are found in terms of the transportation behaviours of trip-frequency and the distance travelled. The apparent mobility reduction of the respondents in St. Boniface, in conjunction with the finding that these elderly individuals may be transportation disadvantaged because of diminishing autonomy, emphasizes the need to address the transportation requirements of older persons in this sub-area. Therefore, this supports the basic premise of the study that the transportation requirements of the elderly must be evaluated based on the diminishing capabilities of the elderly, as well as the location of those who are transportation disadvantaged. As Carp (1979) stipulated, the definition of a good environment is not homogeneous, and a suitable environment co-varies with the attributes of the individual. Therefore, the analysis of the transportation requirements of the elderly population must focus on the identification of the location of the elderly who are transportation disadvantaged.

5.3 The Contribution of the Study to the Ecological Model of Aging

The present research contributes empirically to the study of environment and aging. It demonstrates the applicability of Lawton's ecological model of aging to the investigation of the environment and its effect on the quality of life of the elderly population. The significance of the present study is its extension of the model's definition of environment to include the broader community. Furthermore, the examination of transportation provision and its effect on the ability of the elderly to access services and activities expands the model's initial focus on housing. Therefore, the present study makes a unique contribution to the development of the ecological model of aging based on the evaluation of the ability of autonomy and security to predict the transportation requirements of the spatially dispersed elderly population.

The present study also contributes to Lawton's principle objective that the model advance more effective planning processes for the elderly population and a greater understanding of the effect of environment on the aging process (Lawton, 1982). The findings that the mobility of the elderly is affected by both the individual's diminishing resources and the environmental constraints of residential location, demonstrates that adequate transportation is essential to maintain the independence of the elderly. Transportation provision represents an environmental solution to the improvement of the living environment of the elderly population, and, therefore, further research on the transportation requirements of the elderly population is essential.

5.4 **Suggestions for Future Research**

As transportation is a fundamental element of a good living environment for the elderly, future research must determine the composition of adequate mobility provision based on individual capabilities and environmental considerations. In this section, three recommendations are made for future research which addresses the need for longitudinal studies, a more comprehensive study design, and an extension of the ecological model of aging.

The need for a longitudinal study is particularly relevant to transportation research based on the findings of the present study. According to Goodwin and Layzell (1985):

> It is shown that the process of aging...has a substantial effect on traveller response, in a way that could not be revealed by conventional static, cross-section, or short term analysis (Goodwin & Layzell, 1985, 185).

A longitudinal study would, therefore, take into account the effects of the continuing decrease of individual resources, as well as environmental implications.

The findings of the present study illustrate that the St. Boniface sample has a greater proportion of respondents who are transportation disadvantaged based on the characteristics of age, gender, income, health and functional status, and social support. Mobility problems encountered in this sub-area are confirmed by the decreased frequency of trip-making. A longitudinal study would evaluate the effect of further individual decrements on the mobility of these respondents. Furthermore, whereas the respondents in the outer suburbs are younger and appear to have fewer mobility constraints, it is important to evaluate how their transportation requirements will change in the event of decreasing physical, social, and financial resources.

Accordingly, a longitudinal study would be better able to determine if the suburban environment causes greater mobility constraints for the elderly as they become more aged. A longitudinal study would evaluate the effect of the aging process and how varying environments affect the ability of the elderly with diminishing resources to access adequate transportation provision. This would provide empirical evidence to support Wachs' (1976) assumption that lower density development will cause greater hardship for the ex-driver.

An example of the need to evaluate the effect of diminishing individual resources is the observation made that while 31.4% of the sample do not drive, only 18.1% do not have access to personal transportation in the household. For those who now have access to personal transportation, it can be surmised that mobility may become problematic particularly for those elderly women who may no longer be able to rely on their husbands for rides. A longitudinal study would evaluate the changing access to transportation of those older persons with fewer resources, and once again, compare the role played by varying residential locations in creating transportation dependency.

A further contribution of a longitudinal study would be an evaluation of the effect of extreme climatic conditions on the mobility of the elderly. Although not identified in past research, the extreme weather conditions experienced in Canada can restrict the ability of the elderly to access appropriate transportation provision. As Klinger-Zepic (1995) points out:

> ...winter months mean more time spent indoors, substantially reducing the extent of our living space and reducing our mobility. Outdoor activities are more limited for seniors because of the cold and dark, and because outdoor space has not been designed to take into account seniors growing sensitivity to the cold and less than optional strength or coordination and

> balance. Slippery steps without handrails, doors, walkways and driveways drifted with snow, icy corrugated sidewalks, snowbanks created by municipal ploughs all to eager to keep vehicular traffic moving - all of these are discouraging and dangerous (Klinger-Zepic, 1995, 256).

Therefore, future research on the environmental implications of the transportation requirements of the elderly must provide a comparative analysis of the use of transportation modes and travel patterns of the elderly in varying residential locations in summer and winter conditions.

A second recommendation of future research encompasses the issue of the small sample size and the low response rate of the present study. The findings of the research must be considered with caution because the heterogeneous nature of the elderly population may not be adequately reflected in the sample. Therefore, future research must establish a larger sample which provides a greater representation of the varying individual resources and environmental experiences of older persons. Furthermore, future research should incorporate a greater distinction of environments. Although the present study categorizes the sub-areas of both Fort Garry and Charleswood as outer suburban environments, the results suggest that accessibility to services is greater in Fort Garry. Therefore, it is difficult to make comparisons between the inner and outer suburban environments. Future research would be enhanced by the comparison of two distinct environments, one representing a central city location, and the other a low density suburban environment. This research design would facilitate the evaluation of the effect of distinctive environments on the transportation requirements of the urban elderly.

The final recommendation for future research focuses on the extension of the definition of environment of the ecological model of aging. According to Joseph and Fuller (1991), issues of transportation and mobility must be considered within the context of the location of housing of older people, and the need for social, health, and retail services. Furthermore, the activity spaces of elderly people can be reduced by the lack of access to services caused by limited transportation options and residential location. Therefore, Joseph and Fuller (1991) advocate that a greater linkage of service access, housing location, and transportation usage is required. Future investigation of the mobility of the elderly must incorporate a tripatriate definition of the environment that includes transportation usage, as well as the environmental components of service and housing location. This will contribute to the development of the ecological model of aging, and, in addition, identify an improved living environment for the elderly population.

5.5 Policy Recommendations

As the number of Canada's seniors continues to grow, it will become increasingly imperative to focus policy on the provision of transportation for this population cohort. Adequate mobility is the key to the independence of the elderly in the community and an important contributor to their quality of life. Researchers have indicated that mobility solutions for the elderly must either emphasize the improvement of transport opportunities or changes in land-use to reduce the need to travel (Skelton, 1982; Rosenbloom 1988). However, "until transportation and land-use planning are thoroughly integrated and nontransportation solutions are implemented, strategies must be exercised to link the elderly with the location of goods, services, and activities" (Schmitt, 1979, 127). The findings of the present study provide insight into applicable strategies relating to the transportation requirements of the urban elderly. The examination of the transportation behaviours of older persons demonstrates that the characteristics of the environment that discourage mobility, as well as the effect of diminishing individual resources, must be considered when planning for the provision of transportation for the elderly.

The first recommendation is the implementation of policies which recognize that present transportation provision is not adequate for many older persons as their diminishing physical, social, and financial resources prevent them from accessing available transportation. More varied and flexible transportation services are necessary that can overcome the decreasing capabilities of the elderly individual (Logue, 1987). The need to consider alternative forms of transportation for the elderly is also proposed by Ashford and Holloway (1972). They contend that the specialized needs of the elderly are complicated and unlikely to be adequately satisfied by a fixed-route service provided by traditional systems. Ameliorative services must recognize the problems of present transportation provision which prevent the elderly from adequately utilizing these services. These problems include the physical barriers of the system, the expense, and the inability to connect the residence of the elderly with the area of required services. Therefore, improved transportation must address the physical decrements of the elderly and their lack of financial resources, as well as environmental barriers.

Policies must also be promoted that both increase accessibility to potential activities and provide effective distribution of government expenditure (Fitzpatrick & Logan, 1985). The universal decrease of government funds requires that those elderly who are transportation disadvantaged be targeted for improved transportation provision. In the present study, it is demonstrated that the elderly in the inner suburban area experience greater mobility problems. Accordingly, transportation services which address the needs of the elderly should be directed towards this sub-population of elderly. However, policies must also plan for the future mobility requirements of the elderly. The on-going process of the suburbanization of the elderly requires long range planning to address the consequences of low density design for older persons. Gonyea, Hudson, and Seltzer (1990) stress that planners and service providers must recognize that the process of aging-in-place will be the dominant demographic force shaping suburban communities. Furthermore, Rosenbloom (1988) concludes that:

> Elderly people who have built a life in low-density areas on the basis of the freedom of the private car will not be well served by options that are designed for high-density communities or that do not recognize that the quality of life for the elderly depends on freedom of choice and flexibility. Planners must offer the elderly the freedom of the car as long as possible, using taxis and other paratransit options to approximate the car's flexibility (Rosenbloom, 1988, 22).

Therefore, policies must be implemented that promote transportation provision that can adequately meet the mobility needs of the suburban elderly, particularly if and when they become ex-drivers.

In summary, the above discussion demonstrates that improved transportation must address both the individual needs of the elderly, as well as the environmental considerations which cause mobility constraints. In addition, these alternative proposals demonstrate that further research is required to determine optimum solutions for the problems associated with the mobility of the elderly. Further evaluation is required of the key factors that are necessary to provide a transportation system which meets the needs of the elderly. Cutler (1974), for example, emphasizes the need for continuing research into the mobility-related factors that delimit access to services for the elderly because interaction with the community is important for the morale of the aged.

5.6 **Conclusion**

The present study represents an exploratory investigation of the transportation requirements of the spatially dispersed elderly population. Although the findings are not conclusive, they do contribute to a greater understanding of the mobility needs of the elderly. In addition, the study provides direction for future research of the issue of transportation for seniors. The study's application of the ecological model of aging is particularly significant as it supports the investigation of environment and aging based on the concepts of the autonomy of the individual and the security afforded by the environment. Moreover, it develops the theoretical framework further by extending the model to incorporate the broader community and the environmental component of transportation for the elderly.

The present study also contributes to a theoretical basis for research in gerontological geography. By applying the ecological model of aging to the study of the person and environment, greater insight of the aged population's diverse membership and varied residential environments will result (Golant, 1986). Furthermore, the investigation of the transportation requirements of the spatially dispersed urban elderly demonstrates the applicability of geography to the broader discipline of gerontology. The issue of transportation is an area that is infrequently researched within gerontology. As a result, the present study will contribute to policy aimed at the improvement of the living environment of the elderly through the implementation of more appropriate transportation provision.

APPENDIX A-1: The Cover Letter

Date

Mrs./Mr.
Street Address
Winnipeg, MB.
Postal Code

Dear Mrs./Mr.:

I am a graduate student in the Department of Geography at the University of Manitoba. Professor Geoffrey C. Smith is my research advisor. My area of study concerns the transportation needs of older persons. Presently, I am investigating your area of the city and would like to request your participation in an interview survey. I am sure you have personal experiences and ideas that can help provide research data for policy development. The completion of the study will also contribute to the thesis requirements of my Masters program.

The study will investigate the transportation requirements of senior citizens in different areas of Winnipeg. The interview takes approximately one hour to complete and focuses on the types of transportation and services that you use. I will also welcome your suggestions on how transportation could be improved in your area of Winnipeg, particularly for your age group.

During the next two weeks I will telephone you. If you feel that you would like to contribute to this study, we can arrange an appointment time and place that is most convenient for you. I can be reached at   if you should have any questions.

I thank you for your cooperation and consideration of this request.

Yours Sincerely,

Gina Sylvestre
Department of Geography
University of Manitoba

APPENDIX A-2: The Questionnaire

UNIVERSITY OF MANITOBA
DEPARTMENT OF GEOGRAPHY

TRANSPORTATION REQUIREMENTS OF THE URBAN ELDERLY

Respondent Identification Number: ______________

Date of Interview (day/month/year): ______________

Start Time of Interview: ___hr:___min Completion Time of Interview: ___hr:___min

Interview Obtained *(circle appropriate number):*

1 Complete
2 Incomplete

Interview Not Obtained *(circle appropriate number):*

3 Refusal
4 No reply (after 4 calls)
5 Not available for health reasons
6 Not available for other reasons (specify) ______________________________

RESIDENTIAL CHARACTERISTICS

Community Area *(circle appropriate number):*

1 St. Boniface
2 Charleswood
3 Fort Garry

Type of Housing Arrangement *(circle appropriate number):*

1 Detached
2 Semi-detached
3 Apartment (no more than 4 stories)
4 High-rise
5 Boarding Home/Guest/Hostel
6 Other (specify) __________
8 Don't know
9 Missing

Seniors-Only Housing *(circle appropriate number):*

1 Yes 2 No

INTRODUCTION

I would like to discuss your activities outside your home and what type of transportation you use. I would also like to talk to you about yourself, and your family and friends. I want to assure you that everything you say is confidential and your name will not be used anywhere. I am only interested in your general use and satisfaction with transportation services. Please remember that you can refuse to answer any of these questions or to stop the interview at anytime. Everything you tell me is strictly confidential. Your help with my research is greatly appreciated.

1. HOUSEHOLD STRUCTURE AND DRIVING

To begin, I would like to ask you some questions about who lives with you and if anyone drives in the household.

1. How many people live here with you? ________

2. Please tell me your relationship with all the people who live at this residence.

   1. ______________________________
   2. ______________________________
   3. ______________________________
   4. ______________________________
   5. ______________________________
   6. ______________________________

3. How many automobiles are there in the household? ________

4. Do you drive? *(circle appropriate number)*

   1 Yes
   2 No

If no, please explain why: ____
____
____
____
____

2. HOUSING

Now I would like to ask you some questions about where you live.

5. Do you rent or own this dwelling? *(circle appropriate number)*

1 Own
2 Rent
3 Other (specify) _______________
9 Missing

6. a) How many years have you lived in this dwelling?

__________ years

6. b) Was your last residence...

1 in the same neighbourhood
2 in Winnipeg
3 in a different city
8 DK
9 missing

6. c) Can you describe the most important factors which led you to move to your present residence?
(Prompt: size, location, declining health, close to family, close to friends, safety)

____
____
____
____

6. d) What factor or factors would lead you to move from your present residence?

____
____
____
____

7. The availability of transportation is especially important when your neighbourhood is not close to services. I am interested in looking at which characteristics of a place are important for you to have access to. For each item that I name, I would like to know if you consider it to be an important feature in a place to live. I would also like to know whether or not you think the item describes the place where you now live. *(circle appropriate numbers)*

	Importance				Current Location		
	Very	Slightly	Not	Missing	No	Yes	Missing
a) Food store close by	2	1	0	9	0	1	9
b) Bank close by	2	1	0	9	0	1	9
c) Medical centre close by	2	1	0	9	0	1	9
d) Library close by	2	1	0	9	0	1	9
e) Pharmacy close by	2	1	0	9	0	1	9
f) Senior centre close by	2	1	0	9	0	1	9
g) Bus stop close by	2	1	0	9	0	1	9
h) Park close by	2	1	0	9	0	1	9
i) Post office close by	2	1	0	9	0	1	9
j) Friends and relatives close by	2	1	0	9	0	1	9
k) Other seniors in the area	2	1	0	9	0	1	9

l) Can you think of any other important features in a place to live?

____

____

____

m) What do you consider "close by" to mean?

1	Walking distance	8	DK
2	Driving distance	9	Missing
3	Access by bus		

3. TRANSPORTATION

Now I would like to ask you several questions regarding your use of transportation within Winnipeg.

8. Would you please state how often you use the following modes of transportation. *(First read out the frequency categories. Next state each type of transportation in turn and check the appropriate boxes)*

TRANSPORTATION TYPE	At least once per day	2-6 times per week	Once per week	2-3 times per month	Once per month	< Once per month	Never
Automobile							
Public Transit							
Taxi							
Handi-Transit							
Private Transport Services							
Rides From Friends/ Family/Volunteer							
Walking							
Other (specify)							

9. Please indicate the type of transportation you use most frequently to reach the following destinations. *(First read out the transportation types. Next state the name of each destination type in turn and check appropriate boxes)*

DESTINATION TYPE	Automobile	Public Transit	Taxi	Handi-Transit	Private Trans-port	Friends Family Volunt	Walk
Grocery Store							
Shopping Mall							
Bank							
Medical Facilities							
Pharmacy							
Recreation and Entertainment							
Work/Volunteer							
Friends/Relatives							
Seniors Centre							
Place of Worship							
Other Site Frequented							

10. Please state how often you go to the destinations mentioned above. *(First read out the frequency categories. Next state each destination type in turn and check the appropriate boxes)*

DESTINATION TYPE	At least once per day	2-6 times per week	Once per week	2-3 times per month	Once per month	< Once per month	Never
Grocery Store							
Shopping Mall							
Bank							
Medical Facilities							
Pharmacy							
Recreation and Entertainment							
Work/Volunteer							
Friends/Relatives							
Seniors Centre							
Place of Worship							
Other Site Frequented (specify)							

11. Do you receive any services or assistance in your home that you would normally have to use transportation to obtain?

1 Yes 2 No 8 DK 9 Missing

If yes, please specify:

____

____

____

____

____

12. Please specify the name, street location and area of the city of the destinations you go to most frequently. *(Record the street address and/or the nearest cross street. In all cases record the area of the city based on the map provided)*

DESTINATION TYPE	Outlet Name	Street Location	Area of Winnipeg
Grocery Store			
Shopping Mall			
Bank			
Medical Facilities			
Pharmacy			
Recreation and Entertainment			
Work/Volunteer			
Friends/Relatives			
Seniors Centre			
Place of Worship			
Other Site Frequented (specify)			

13. If public transit is used to reach any of these destinations, please state the routes used, the number of transfers required, and the length of time of the trip. *(First read out the information requested. Next state the name of each destination type)*

DESTINATION TYPE	Route Numbers	Number of Transfers	Trip Time
Grocery Store			
Shopping Mall			
Bank			
Medical Facilities			
Pharmacy			
Recreation and Entertainment			
Work/Volunteer			
Friends/Relatives			
Seniors Centre			
Place of Worship			
Other Site Frequented (specify)			

14. If you don't take the bus, do you think that you may take it in the future?

1 Yes   2 No   8 DK   9 Missing

15. Why do you think you would take the bus?

____

____

____

16. What would stop you from taking the bus?

____

____

____

____

Now I am going to ask you some questions about public transit. If you do not take the bus I would still like to know what your impressions are of this service.

17. How important are the following positive features of public transportation for you? *(check appropriate box)*

POSITIVE FEATURES	Very Important	Somewhat Important	Not Important
No Driving			
No Parking			
The bus is cheaper than other transport			
More convenient in winter			
The bus is better for the environment			
Other positive comments (specify)			

18. Do you consider the following features of public transit to be a problem for you? *(check appropriate box)*

NEGATIVE FEATURES	Very Problematic	Somewhat Problematic	Not Problematic
Walking to the bus stop			
Waiting at the bus stop			
Going up and down bus stairs			
Understanding the bus schedules			
Fear of falling down when the bus is in motion			
Need for an escort			
Weather conditions in winter			
Road/sidewalk conditions in winter			
Coping with parcels on the bus			
Health as a barrier			
Other negative comments (specify)			

19. How far is your home from the bus stop? *(circle appropriate number)*

1	less than a block	6	five blocks
2	one block	7	six blocks
3	two blocks	8	more than six blocks
4	three blocks		
5	four blocks		

20. Do you feel that transit fares are too high? *(circle appropriate number)*

1 Yes 2 No 8 DK 9 Missing

Additional comments:

____

21. Do you (or would you) feel safe using public transit? *(circle appropriate number)*

1 Yes 2 No 8 DK 9 Missing

Additional comments:

22. Do you feel that you can (or could) get around on public transit as well as other forms of transportation such as the car? *(circle appropriate number)*

1 Yes 2 No 8 DK 9 Missing

Additional comments:

23. Are there any places in Winnipeg that you cannot (or could not) go to because bus service is not provided there? *(circle appropriate number)*

1 Yes   2 No   8 DK   9 Missing

Additional comments: (purpose/destination)

____

24. Based on your knowledge of the bus system, are you satisfied with the service provided by Winnipeg Transit? *(circle appropriate number)*

1 Very Satisfied
2 Satisfied
3 Somewhat Satisfied
4 Dissatisfied
5 Very Dissatisfied
8 DK
9 Missing

25. Do you have any suggestions to improve the public transit service available to you?

1 Yes   2 No   8 DK   9 Missing

26. Do you think that bus service is better in other parts of the city compared to the area you live in ? *(circle appropriate number)*

1 Yes   2 No   8 DK   9 Missing

Additional comments:

27. Could or do you use the bus in winter? *(circle appropriate number)*

1 Yes 2 No 8 DK 9 Missing

Additional comments:

28. Do you think public transit should be more available so that all seniors can use it? *(circle appropriate number)*

1 Yes 2 No 8 DK 9 Missing

Additional comments:

29. What do you think would be the best type of transportation services for seniors who do not have automobiles? *(circle appropriate number)*

1 Public Transit
2 Specialized Public Transit for Seniors Only
3 Taxi
4 Handi-Transit
5 Private Transport Services
6 Services such as "Safeway" Buses (specific retail/service destinations)

Additional comments:

30. What is the maximum return fare you would be willing to pay for a door-to-door, specialized seniors transport service in Winnipeg?

1 Less than $2
2 $2 to $5
3 $6 to $8
4 $9 to $11
5 More than $11

4. ACTIVITIES OF DAILY LIVING

I would like to ask you a few questions about various activities. I would like to know if, today, you can do these activities without any help, or if you need some help to do them, or if you can't do them at all. *(provide responses on card)*

31. Can you walk *(circle appropriate number):*

1 Without any help
2 With some help from a device only (cane, walker, crutches or a chair)
3 With some help using a person only
4 With some help from both a person and a device
5 Unable to do it

If answer without any help or with some help:
Do you walk outdoors (assisted or unassisted)
1 1/4 mile to 1 mile or more
2 100 yards to 1/4 mile
3 10 to 100 yards
4 less than 10 yards

32. Can you get about the house *(circle appropriate number):*

1 Without any help
2 With some help from a device only (cane, walker, crutches, or chair)
3 With some help using a person only
4 With some help from both a person and a device
5 Unable to do it

33. Can you go up and down stairs *(circle appropriate number):*

1 Without any help
2 With some help from a device only (walker, handrails, chairlift)
3 With some help using a person only
4 With some help from both a person and a device
5 Unable to do it

34. Can you get to places out of walking distance *(circle appropriate number):*

1 Without any help (can travel alone on bus, taxi, drives a car)
2 With some help from a device only (motorized scooter)
3 With some help using a person only (need someone to go with you)
4 With some help from both a person and a device (Handi-Transit)
5 Unable to do it (need special arrangements)

35. Can you go outdoors in good weather *(circle appropriate number):*

1 Without any help
2 With some help from a device only (cane, walker, crutches, or chair)
3 With some help using a person only
4 With some help from both a person and a device
5 Unable to do it

36. Can you go outdoors in winter *(circle appropriate number):*

1 Without any help
2 With some help from a device only (cane, walker, crutches, or chair)
3 With some help using a person only
4 With some help from both a person and a device
5 Unable to do it

37. Can you go shopping for your groceries or clothes *(circle appropriate number):*

1 Without any help
2 With some help from a device only (cane, walker, crutches, or chair)
3 With some help using a person only
4 With some help from both a person and a device
5 Unable to do it

5. HEALTH

38. For your age, would you say that your health is *(circle appropriate number):*

1 Excellent (never prevents activities)
2 Good (rarely prevents activities)
3 Fair (occasionally prevents activities)
4 Poor (very often prevents activities)
5 Bad (health troubles of infirmity all the time-prevents most activities)

39. I am going to read to you a list of health problems that people often have. Please tell me if you have had the problem within the last year. *(circle appropriate number)*

	Yes	No
Allergies	1	2
Cancer	1	2
Heart Disease	1	2
High Blood Pressure	1	2
Stroke	1	2
Arthritis or Rheumatism	1	2
Palsy (Parkinson's)	1	2
Eye Trouble (cataracts, glaucoma)	1	2
Ear Trouble (hearing loss)	1	2
Dental Problems	1	2
Respiratory (TB, asthma, emphysema)	1	2
Stomach Trouble	1	2
Kidney Trouble	1	2
Diabetes	1	2
Foot Trouble	1	2
Nerve Trouble	1	2
Skin Problems	1	2

Other (specify)____

____

40. How much do your health troubles stand in the way of your doing the things you want to do? *(circle appropriate number)*

1 Not at all
2 A little
3 A great deal

6. LIFE SATISFACTION

Now I would like you to consider your life as it is right now. Here are a number of key words or phrases which people use to identify various areas of their lives.

41. Please evaluate the following aspects of life at present using one of the following responses *(provide responses on card)*:

1 Terrible
2 Very Dissatisfying
3 Dissatisfying
4 Mixed
5 Satisfying
6 Very Satisfying
7 Delightful
8 No opinion (not applicable, can't remember, no comment)
9 Missing

(Place appropriate number in space)

a) HEALTH - The present state of your general, overall health (relatively free of common and chronic illnesses) is: ________

b) FINANCES - Your income and assets are: ________

c) FAMILY RELATIONS - Kind of contact and frequency of contact with your family members is: ________

d) PAID EMPLOYMENT - Any work for wages, salaries or fees: ________

e) FRIENDSHIPS - Kind of contact and frequency of contact you have with your friends is: ________

f) HOUSING - The present type, atmosphere and state of your home is: ________

g) RECREATION ACTIVITY - Personal recreation activities you engage in for pure pleasure when you are not doing normal daily living chores or some type of work. This includes relaxing, reading, TV, regular get-togethers, church activities, arts and crafts, exercises, trips, etc.: ________

h) RELIGION - Your spiritual fulfillment: ________

i) SELF-ESTEEM - How you feel about yourself; your sense of self-respect is: ________

j) TRANSPORTATION - Public and private transportation (including, convenience, expense) is: ________

42. Now, using the same scale, how do you feel about your life as a whole right now? ________

7. SOCIO-DEMOGRAPHIC CHARACTERISTICS

To conclude, I would like to ask you some general questions about yourself. Remember, you do not have to respond if you feel uncomfortable with any of the questions.

Sex of Respondent *(circle appropriate number):*

1 Male 2 Female

43. In what year were you born? __________

44. How many years of education did you complete? *(check appropriate space)*

_____ Years _____ 77 Refused _____ 88 Don't know

45. What is your marital status? *(circle appropriate number)*

1 Single (never married)
2 Married
3 Divorced/separated
4 Widowed
5 Other (specify) _______________
9 Missing

46. I would like to ask you about your income. What you tell me is confidential information. What is the average yearly income of this household including the old age security payments? (Note: household income not personal income) *(circle appropriate number)*

00 Less than $10,000
01 $10,001 - $15,000
02 $15,001 - $20,000
03 $20,001 - $30,000
04 $30,001 - $40,000
05 Over $40,000

47. How well do you think your income and assets currently satisfy your needs? *(circle appropriate number)*

1 Completely adequate
2 Somewhat adequate
3 Somewhat inadequate
4 Totally inadequate
9 Missing

48. If you had what you consider to be some additional or extra income, which one of the following would you spend it on? *(circle appropriate number)*

1 Better housing
2 House repairs
3 More or better food
4 More or better clothing
5 More or better furniture
6 Medical needs
7 Recreational equipment or activities
8 Transportation or new car
9 Trips and/or holidays
10 Other (specify) ______________________________

I would like to thank you for your cooperation.

APPENDIX B-1:

Significance Levels of Chi-Square Values for Cross-Tabulations between the Frequency of Use of Transportation Modes and the Indicators of the Respondents' Socio-Demographic Characteristics, Health and Functional Levels, and Transportation Resources

	Rides	Auto	Walk	Transit
Age	ns	.001	ns	ns
Gender	.001	.000	ns	.01
Marital Status	.02	.001	ns	.01
Living Arrangem't	.01	.01	ns	ns
Level of Education	.01	.01	ns	ns
Household Income	.003	.000	ns	ns
Housing Type	ns	.01	ns	ns
Length of Residence	ns	.06	ns	ns
Self-Rated Health	ns	ns	ns	ns
Chronic Conditions	.01	.01	ns	ns
Activities of Daily Living	ns	.01	.003	.05
Health Troubles	ns	ns	ns	.03
Health Satisfaction	ns	ns	ns	ns
Ability to Drive	.000	.000	ns	ns
Car Ownership	ns	.000	ns	ns
Ability to Walk	ns	ns	.03	.03
Distance Can Walk	ns	ns	.000	ns
Distance to Bus Stop	ns	.02	.06	ns
Bus Satisfaction	ns	.06	ns	ns
Transport Satisfaction	ns	ns	ns	ns

APPENDIX B-2:

Significance Levels of Chi-Square Values for Cross-Tabulations between the Frequency of Travel to Service and Activity Sites and the Indicators of the Respondents' Socio-Demographic Characteristics, Health and Functional Levels, and Transportation Resources

	Grocery St.	Sh. Mall	Bank	Med. Ctr.
Age	ns	ns	.04	ns
Gender	ns	ns	.01	ns
Marital Status	.01	.05	ns	ns
Living Arrangem't	.01	.05	ns	ns
Level of Education	ns	ns	ns	ns
Household Income	ns	ns	ns	ns
Housing Type	ns	ns	ns	ns
Length of Residence	.02	ns	ns	ns
Self-Rated Health	ns	ns	ns	.000
Chronic Conditions	.05	ns	ns	.001
Activities of Daily Living	.05	ns	ns	.000
Health Troubles	ns	ns	ns	.000
Health Satisfaction	ns	ns	ns	.02
Ability to Drive	ns	ns	.04	ns
Car Ownership	.01	ns	ns	ns
Ability to Walk	ns	ns	ns	ns
Distance Can Walk	ns	ns	ns	.003
Distance to Bus Stop	ns	ns	ns	ns
Bus Satisfaction	ns	ns	ns	ns
Transport Satisfaction	ns	ns	ns	.02

APPENDIX B-2 (continued)

	Pharmacy	Recreation	Friends/Family
Age	ns	ns	.01
Gender	ns	ns	ns
Marital Status	ns	ns	ns
Living Arrangement	.03	ns	ns
Level of Education	ns	ns	ns
Household Income	ns	ns	ns
Housing Type	ns	ns	ns
Length of Residence	ns	ns	ns
Self-Rated Health	ns	ns	ns
Chronic Conditions	.01	ns	.03
Activities of Daily Living	ns	ns	ns
Health Troubles	ns	ns	ns
Health Satisfaction	ns	.05	ns
Ability to Drive	ns	ns	ns
Car Ownership	ns	ns	ns
Ability to Walk	.03	ns	ns
Distance Can Walk	ns	ns	ns
Distance to Bus Stop	ns	ns	ns
Bus Satisfaction	ns	ns	ns
Transport Satisfaction	ns	.02	.05

APPENDIX B-3:

Significance Levels of Chi-Square Values for Cross-Tabulations between the Distance Travelled to Service and Activity Sites and the Indicators of the Respondents' Socio-Demographic Characteristics, Health and Functional Levels, and Transportation Resources

	Grocery St.	Sh. Mall	Bank	Med. Ctr.
Age	ns	ns	ns	ns
Gender	ns	ns	ns	.04
Marital Status	ns	ns	ns	ns
Living Arrangem't	ns	ns	ns	ns
Level of Education	ns	ns	ns	.01
Household Income	ns	ns	ns	.002
Housing Type	ns	ns	ns	ns
Length of Residence	.002	ns	ns	.000
Self-Rated Health	ns	ns	.06	ns
Chronic Conditions	ns	ns	ns	ns
Activities of Daily Living	ns	ns	ns	ns
Health Troubles	ns	ns	ns	ns
Health Satisfaction	ns	ns	ns	ns
Ability to Drive	ns	ns	ns	ns
Car Ownership	ns	ns	ns	ns
Ability to Walk	ns	ns	ns	ns
Distance Can Walk	ns	ns	ns	ns
Distance to Bus Stop	ns	ns	ns	ns
Bus Satisfaction	.05	ns	ns	ns
Transport Satisfaction	ns	.06	ns	ns

APPENDIX B-3: (continued)

	Pharmacy	Recreation	Family	Friend
Age	ns	ns	ns	ns
Gender	ns	ns	.05	ns
Marital Status	.06	ns	.05	ns
Living Arrangem't	ns	ns	ns	ns
Level of Education	ns	ns	ns	ns
Household Income	ns	ns	ns	ns
Housing Type	ns	ns	ns	.02
Length of Residence	ns	ns	ns	ns
Self-Rated Health	ns	ns	ns	ns
Chronic Conditions	ns	ns	ns	ns
Activities of Daily Living	ns	ns	ns	ns
Health Troubles	ns	ns	ns	ns
Health Satisfaction	ns	ns	ns	ns
Ability to Drive	ns	ns	ns	ns
Car Ownership	ns	ns	ns	ns
Ability to Walk	ns	ns	ns	ns
Distance Can Walk	ns	ns	ns	ns
Distance to Bus Stop	ns	ns	ns	ns
Bus Satisfaction	ns	ns	ns	ns
Transport Satisfaction	ns	ns	ns	ns

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