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Where are the urban elderly? Clustered and concentrated in aged spaces: Three examples Kitchener-Waterloo, Halifax and Victoria (Ontario, Nova Scotia, British Columbia)

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Where are the Urban Elderly ? Clustered and Concentrated in Aged Spaces: Three Examples Kitchener-Waterloo, Halifax and Victoria

by

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Abstract

This research uses enumeration area data from the 1991 census and a methodology consisting of principal components analysis (PCA), cluster and discriminant analysis to define 'aged spaces', highly localized concentrations of the elderly, in Kitchener-Waterloo, Halifax and Victoria. The results show that: (1) it is possible to define aged spaces on the basis of the old-age family status dimensions identified by the PCA for each individual city, as well as a joint analysis of all three cities; (2) the old-age dimensions derived by the PCA are differentiated by marital status, advanced age and gender and (3) aged spaces defined on the basis of different old-age factors vary in size and are located in different areas of the city. Aged spaces characterized by a pre-elderly or young elderly population for example, are spatially extensive and are located in the inner suburbs of Kitchener-Waterloo; whereas aged spaces characterized by an old elderly population consist of single enumeration areas and are scattered throughout each city. An analysis of aged residential segregation in each city and the joint analysis of all three cities shows that the old elderly are less evenly distributed and more concentrated than the young or middle-aged elderly populations.

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Chapter 1

Introduction

'Youth is everywhere in place. Age, like women, requires fit surroundings'

(Emerson 1862: 134 - 138)

In the spirit of Ralph Waldo Emerson's oft quoted sentiment regarding the 'place' of aging and the elderly in society, the aging of the 'western' world's population and, closer to home, Canada's population, provides the 'fit surroundings' for the ensuing description of the intra-urban spatial distribution of the elderly population in three Canadian cities. Briefly, between 1986 and 1995 the proportion of the population aged 65 and over in Canada increased to 12 from 10 percent (Statistics Canada 1997). Projections indicate that by the year 2041 the portion of Canada's population aged 65 and over could be almost 23 percent (Statistics Canada 1997). Likewise, the size of the young (65 - 74), middle-aged (75 - 84) and old elderly (85 and over) populations also increased between 1951 and 1995. In 1951 the percentages of the population aged 65 - 74, 75 - 84 and 85 and over were 5.3, 2.0 and 0.4 respectively (Statistics Canada 1997). By 1981, the equivalent figures were 6.0, 2.8 and 0.8 percent (Statistics Canada 1997). In 1995, 7.1 percent of the population was aged 65 - 74, 3.8 percent aged 75 - 84 and 1.2 percent aged 85 and over (Statistics Canada 1997). More significantly, especially from a policy perspective, the size of the oldest elderly population, the 85 and over age group, is increasing at a faster rate than the size of the 65 - 84 year old population and that as a consequence the number of people aged 85 and over is expected to increase substantially (Stone and Frenken 1988: Novak 1993 and Statistics Canada 1997). Statistics Canada (1997) indicate that in 1971, 0.6 percent of the total population was aged 85 and over. In 1995 this figure had doubled to 1.2 percent. Projections suggest that by the year 2041 the proportion of the population aged 85 and over will have increased to 4 percent (Statistics Canada 1997).

In an everyday sense the aging of Canada's population described above. is well known. Hardly a week seems to go by without a newspaper carrying a story about how the aging of Canada's population will impact society and the consequent need for government action to ameliorate such impacts. For the most part, all levels of government and people in general are concerned with how to deal with the perceived present and future costs and consequences of the seemingly burgeoning elderly population in Canada. Two issues in particular, the costs of health care provision and income support policies (old-age security and the Canada Pension Plan), have received much attention and aroused much, often heated, debate in the both the academic literature and the popular press.

The concentration of the elderly in certain cities, communities and even types of residences is likewise almost as well known. For example, most people are aware of the growth and popularity of Victoria, BC, the Niagara region of southern Ontario and Elliot Lake in northern Ontario as retirement destinations. At the city scale, the 'greying' of suburbia, the concentration of the elderly in old-age institutions and more recently, the development of campus style retirement communities in and around many urban areas are readily observable spatial consequences of population aging.

Within the urban geographic literature, studies of the internal social structure of urban areas have however for the most part been concerned with differentiation on the basis of socioeconomic status, ethnicity and more recently gender and sexuality (Bell 1953; Shevky and Bell 1955; Massey 1979, 1980; England 1991; McDowell 1983; LeBourdais and Beaudry 1988; Pratt and Hanson 1988; Pratt 1990; Miller 1996; Rose 1989; Rose and LeBourdais 1986; Davies and Murdie 1993, 1994; Randall and Viaud 1994; Winchester and White 1988; Lauria and Knopp 1985; Adler and Brenner 1992; Knapp 1992). Rather less dramatic and less well known is intra-urban differentiation on the basis of household life cycle or age.

Studies of the spatial distribution of the elderly population in the city, although not as numerous as research on other aspects of intra-urban residential differentiation have, nevertheless, been successful in identifying both significant changes in where the elderly are concentrated and fluctuating levels of aged residential segregation (Cowgill 1958, 1974, 1978; Hiltner and Smith 1974; Smith and Hiltner 1975; Coulson 1968; Fitzpatrick and Logan 1985; Hall *et al.* 1986; Golant 1972, 1975, 1990; Kimmich and Gutowski 1983; Kennedy and DeJong 1977). In particular, significant and enduring concentrations of the elderly population have been identified in the inner city areas of many American cities (Cowgill 1958, 1978; Coulson 1968). Coupled with both a rapid growth in the size of the elderly population starting in the 1960's and increased public awareness of the 'elderly' population explosion, this noted concentration of the 65 and over population in the inner city generated interest in the development of 'geriatric ghettos' (Clark 1971) or, less flatteringly, 'senile CBDs' (Johnson 1971). Later research (Stahura 1980; Fitzpatrick and Logan 1985; Kimmich and Gutowski 1983; Golant 1990) however showed that while the elderly population was becoming increasingly centralized, the opposite was also happening: the 65 and over population was becoming suburbanized. Although popular during the late 1950's, 1960's and mid 1970's, research on the intra-urban location of the elderly and aged segregation continued only sporadically after fears of the development of 'geriatric ghettos' subsided and evidence of the equalization of the spatial distribution of the elderly and non-elderly populations began to surface (Kimmich and Gutowski 1983).

The already alluded to rapid aging of most western societies and the perceived increasing diversification and visibility of the 'elderly' population have however led to renewed interest in research into all aspects of aging and a wide range of topics concerned with the 'geography of old age' (Rowles 1986; Warnes 1990). In his review of geography and aging Rowles (1986) suggested that geographers studying the elderly and aging were primarily interested in three topics: (1) age-related changes in an individual's relationship with his/her environment; (2) service delivery to the elderly and (3) the spatial distribution of the elderly (at a number of scales of analysis), including aged residential segregation and elderly migration.

The preoccupation of geographers with, in particular, the mapping of the intra-urban spatial distribution of the 65 and over population, while necessary and useful in answering certain questions, has come under increasing criticism from a variety of sources in recent years (Warnes 1990; Harper and Laws 1995). Harper and Laws (1995) especially argue that geographers have continued to work in the empiricist and positivist traditions and have therefore remained almost exclusively concerned with the study of the elderly *per se*. Consequently, geographers have failed to examine or recognize the contested nature of aging and the socially constructed nature of 'aging' and the 'elderly' as a group. Even within the empiricist and positivist traditions, geographers studying the intra-urban location of the elderly have been criticized for continuing to use outdated ecological models to explain the spatial distribution of the 65 and over population (Kimmich and Gutowski 1983; Fitzpatrick and Logan 1985). Although such criticisms, particularly concerning the failure of geographers to recognize the contested nature of aging, should not be dismissed, in the present context it is felt more fundamental problems arising from the failure of the literature on the intra-urban location of the elderly to (1) link the increased diversification of that population with changes in urban social structure and (2) apply more up-to-date models of urban social differentiation to describing and explaining the intra-urban distribution of the aged, warrant a re-examination of the spatial distribution of the urban elderly population.

This research seeks to address such shortcomings by examining how the increased diversity and visibility of the 'elderly' as an identifiable 'group' in society and the changing socio-spatial structure are reflected in the formation of localized and fragmented concentrations of the elderly population or 'aged spaces'. The identification of several old-age family status factors, differentiated primarily on the basis of advanced chronological age, gender and marital status, rather than the more traditional family status factor that contrasts older single/two person households with young large households containing children, it is argued indicates that the elderly population is indeed diverse. High levels of aged residential segregation, especially area-specific aged residential segregation, in turn suggest that the elderly are both spatially and socially distinct from the non-elderly. The social and spatial distinctiveness then aids the conceptualization of the elderly as a separate 'group' in society.

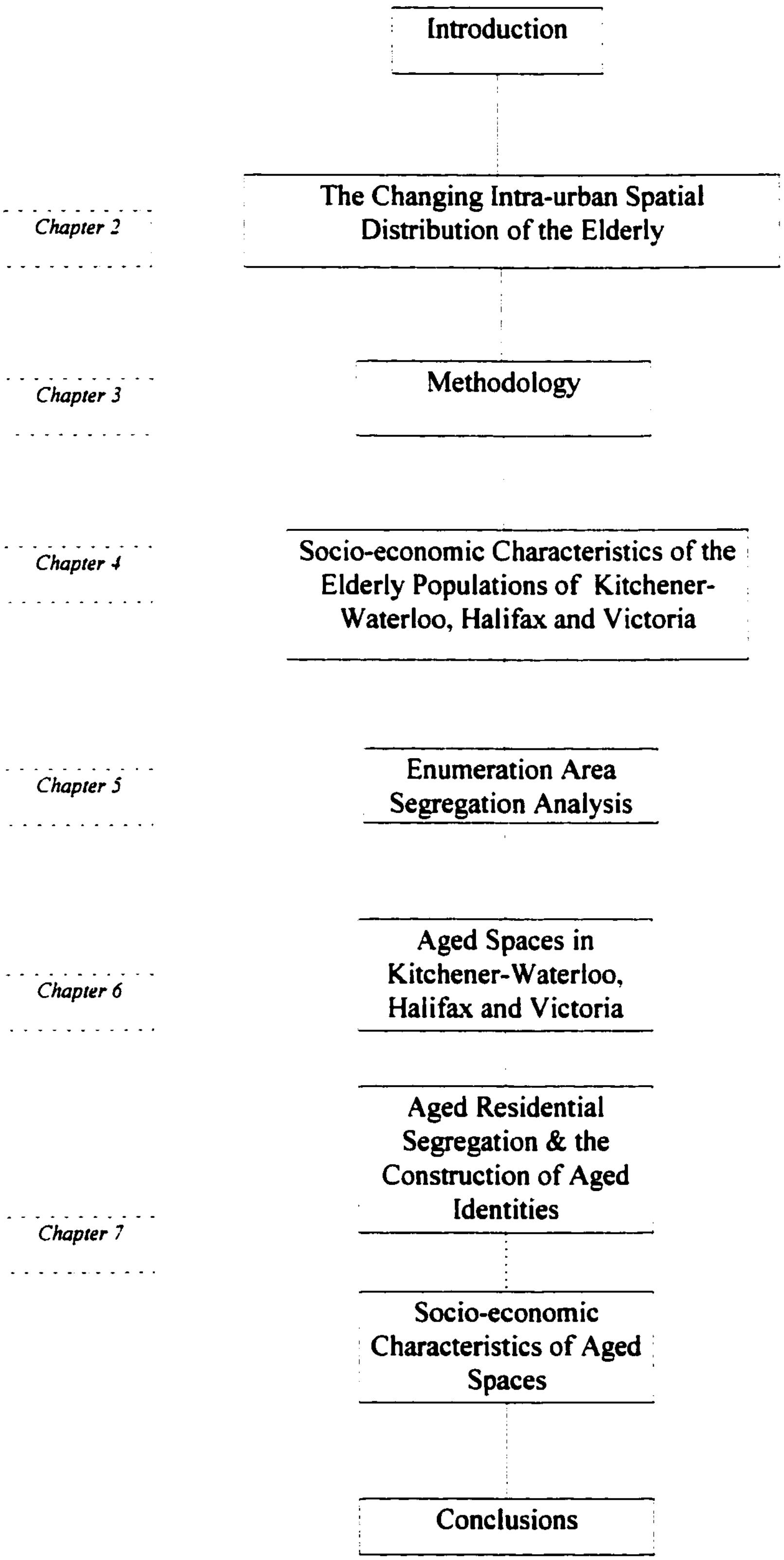
With regard to the literature on the spatial distribution of the elderly, it is suggested that this literature has, for the most part, described and explained the intra-urban location of the 65 and over population exclusively in terms of large scale, neat spatial clusters formed around a single CBD/centre and ecological processes, including competition and urban expansion. The dispersal of urban employment, population decentralization, gentrification, the development of numerous single use activity nodes; combined with increased ethnic and social diversity and an increase in the size and diversity of the urban elderly population it is argued have caused significant changes in the nature and patterns of elderly concentration. These new patterns of elderly concentration cannot be described or explained by the older models of urban social structure frequently used to describe the intra-urban location of the elderly. New models of urban social structure therefore need to be applied to the description of the spatial distribution of the elderly.

Following this introduction, Chapter 2 examines the literature on the changing spatial distribution of the elderly population and the consequent development of 'aged spaces' or spatially localized concentrations of the elderly population, as well as fluctuating levels of aged segregation (Figure 1.1). The models of urban social structure traditionally used to describe and, to a lessor degree, explain, the spatial distribution of the urban elderly population are also reviewed. A final section then presents a number of hypotheses concerning the spatial distribution of the elderly and the anticipated existence of aged spaces.

Chapter 3 first describes the methodology for identifying aged spaces and then the measures used to quantify the extent of aged residential segregation. Using enumeration area data from the 1991 census for three cities, Kitchener-Waterloo, Halifax and Victoria, aged spaces are defined using a three stage method consisting of principal components analysis, cluster analysis and discriminant analysis. The three aspects of aged residential segregation included in the analysis are: (1) the extent to which the population aged 65 and over and three elderly groups (the young, middle-aged and old elderly) are concentrated in the central part of the city; (2) the overall and area-specific concentration of the total elderly population, as well as the young, middle-aged and old elderly and (3) how much the spatial distribution of each elderly population differs from the spatial distribution of the non-elderly and elderly populations. Public Use Microdata or 3 percent Sample Data for the same year and urban areas is then used to examine the characteristics of the elderly populations assumed to reside in each aged space.

In following three chapters, Chapters 4, 5 and 6, the socio-economic characteristics of the elderly populations of all three cities are examined; the level of aged residential segregation in Halifax, Victoria and Kitchener-Waterloo is analyzed and the

Figure 1.1: Overall Structure



results of the identification of aged spaces are presented. The results of a joint analysis, the application of the same methodology (principal components analysis, cluster analysis and discriminant analysis) to a single data set consisting of enumeration area data from all three cities, are also discussed. Selected socio-economic characteristics of the elderly populations of Victoria, Kitchener-Waterloo and Halifax are discussed in Chapter 4. Chapter 5 in turn reports the results of the analysis of aged residential segregation, using the enumeration area as the unit of analysis. The role aged segregation plays in indicating how socially distinct the elderly are from the non-elderly and the role aged segregation might play in the construction and reproduction of specific aged identities are also considered. The structure of the old-age family status factors derived in Victoria, Kitchener-Waterloo and Halifax are discussed, along with the location and characteristics of the aged spaces identified in each respective city are presented in Chapter 6. Finally, in Chapter 7 the socio-economic characteristics of the populations assumed to be resident in the aged spaces identified in each city are briefly discussed. Each original hypothesis is discussed in the conclusion, along with the policy implications of the identification of aged spaces and future research directions.

Chapter 2

The Changing Intra-Urban Spatial Distribution of the Elderly Population

Studies of the spatial distribution of ethnic minorities and social groups (Duncan and Duncan 1955; Taeuber and Taeuber 1965; Harris 1984; Massey 1979, 1980; Bell 1953; Shevky and Bell 1955; McDowell 1983; Bourne *et al.* 1986; Pratt 1990), suggest that urban socio-patterning tends to be characterized by the existence of spatially clustered, concentrated and segregated 'groups'. Within this general pattern, the existence of spatial clusters of elderly [1] has been acknowledged for sometime (Cowgill 1958, 1978; Coulson 1968; Hiltner and Smith 1974; Smith and Hiltner 1975; Fitzpatrick and Logan 1985; Stahura 1980; LaGory *et al.* 1980; Kimmich and Gutowski 1983; Kennedy and DeJong 1977; Golant 1972, 1975, 1990). The following section describes past trends in the changing location and evolving patterns of elderly concentration in the city as a precursor to a more contemporary empirical analysis of the changing spatial distribution of the elderly population and the formation of 'aged spaces'. The evolution of aged spaces is traced from the early identification of large scale 'concentric' zones and 'sectors' extending outward from the city centre to the more recent description of fragmented clusters of census tracts characterized by high proportions of the elderly population.

2.1 The Changing Spatial Distribution of the Elderly Population

Using census data from 1950 Cowgill (1958) analyzed the patterns of relative concentration of households of persons aged 65 and over in 57 American cities in order

[1] Unless otherwise stated, the 'elderly' population is defined as the population aged 65 and over.

to investigate if the elderly population was distributed evenly throughout the city, or if it was concentrated in specific areas. The results showed that while the location of the elderly population varied, there was some evidence of the elderly population being concentrated in the core areas of the cities studied. Ten years later in his study of Kansas City, Coulson (1968) again found that the elderly population was not distributed evenly. Rather older age structures (roughly equivalent to the 65 and over population) were associated with the older parts of the city, close to the centre. Census tracts with abnormally old, unbalanced age structures were concentrated in a compact area, incorporating the central city and stretching in a north-south direction. Using data from the censuses of 1940, 1950, 1960 and 1970 for all tracted urban areas, Cowgill (1978) confirmed both these findings and the long-term nature of elderly central city concentration, when he too concluded that the elderly population had become increasingly concentrated in the core area of the city between 1940 and 1970. In the earliest period, 1940 and 1950, the 65 and over population became only slightly more concentrated in the central area of the city. In contrast, during the 1950's and 1960's the earlier trends toward elderly concentration in the central areas of the city were consolidated. As a consequence, by 1970 the population aged over 65 years of age had become increasingly concentrated in the inner city areas, whilst the proportion of the population aged under 65 years had become concentrated in the suburbs.

During the late 1960's, at the same time that many studies (Cowgill 1958, 1978; Coulson 1968; Hiltner and Smith 1974; Smith and Hiltner 1975; Golant 1972, 1975) indicated that the elderly population was becoming increasing centralized, other studies

(Hiltner and Smith 1974; Smith and Hiltner 1975; Fitzpatrick and Logan 1985; Stahura 1980; LaGory *et al.* 1980; Kimmich and Gutowski 1983; Kennedy and DeJong 1977; Golant 1990) began to show that the opposite was happening: the 65 and over population was becoming suburbanized, at least in the sense that it was becoming increasingly concentrated in the pre-1950 suburban ring, immediately surrounding the core area of the city (Stahura 1980; Fitzpatrick and Logan 1985; Kimmich and Gutowski 1983; Kennedy and DeJong 1977). Stahura (1980) found that between 1960 and 1970 the percent of the suburban population aged below 44 years decreased, whilst the percent aged over 45 years of age and 65 years of age grew. Although aging-in-place was one factor, Stahura (1980) found that substantial increases in the suburban 65 and over population were caused by the in-migration of this age group. Over approximately the same time period Fitzpatrick and Logan (1985) showed that the proportion of suburban residents aged 65 and over increased consistently. Between 1960 and 1970 the suburban elderly population increased at an average rate of between 7.5 and 8.5 percent. During the 1970's gains in the proportion of the population aged 65 and over living in the suburbs were more marked, with the average growth rate increasing to between 10 and 13 percent.

Extending the analysis into the 1980's Golant (1990) analyzed how the metropolitan-nonmetropolitan and city-suburb locations of the 'young-old' (65-74 age group) and the 'old-old' (75 and over) populations had changed between 1970 and 1988. Golant (1990) found that the percentage of the 65 -74 population group living in the suburbs, as opposed to the central city, increased steadily, from 51 percent in 1970 to 58 percent in 1988. Nevertheless, in 1988 the 65 - 74 age group was still less likely to live in the suburbs than any other age group. With regards to the 'old-old' population, the percentage of the 75 and over age group living in the suburbs increased more slowly than the percentage of the 65-74 age group living in the suburbs. Between 1970 and 1988 the percentage of the 75 and over population living in the suburbs had increased from 50 to 56 percent. It was not until 1980 that the size of the suburban 75 and over population exceeded the size of the central city 75 and over population.

2.2 Aged Residential Segregation

Changes in the level of aged residential segregation not only indicate fluctuations in how closely the spatial distribution of the elderly population matches the distribution of non-elderly cohorts and, if other dimensions or aspects [2] of segregation are measured, the degree to which the elderly population is spatially concentrated/clustered; but also the extent to which the elderly are spatially and socially integrated with younger cohorts and form an identifiable and distinct 'group' within society (if a 'group' is not different, or has not been constructed as different, from the rest of society it will not be subject to different treatment i.e., discrimination and therefore socially and spatially segregated) (Peach 1975; Laws 1993; Sibley 1988, 1992, 1995). The following section briefly describes changing levels of aged residential segregation and then details how differing

[2] Massey and Denton (1988) suggest that residential segregation can be described by five conceptual aspects or dimensions, rather than one general definition alluding to the degree to which two populations live apart. Each dimension describes one of a variety of ways in which two populations can be separated or segregated. See Section 3.6 for a more in depth discussion.

levels of aged residential segregation can be interpreted as indicating the extent to which the elderly are spatially and socially integrated in society.

Research into aged residential segregation can be roughly divided into studies that have investigated aged segregation across a number of urban areas or specific parts (central city/suburbs) of cities relative to other age groups in a large number of urban areas and studies that have examined the degree of intra-urban aged segregation. Such studies typically use the census tract as the unit of analysis and measure aged residential segregation using the index of dissimilarity (Smith 1998). Beginning with the former. arguing that it is necessary to consider different subgroups within what is usually termed the 'elderly' population, Tierney (1987) examined relatively contemporary changes in the level of aged segregation between the 65 to 74 age group and the 75 and over age group for 18 metropolitan areas between 1970 and 1980. The results showed that there were differences in the level of aged residential segregation between the two groups both over time and between the cities studied. In 1970 the average difference in the level of segregation, as measured by the index of dissimilarity, between the 65-74 age group and the 75 and over age group was 3.3. In 1980 the average difference had increased to 6.7. indicating that the 75 and over age group was both more segregated than the 65-74 age group and becoming increasingly segregated. At the metropolitan level in both 1970 and 1980 the segregation level of the 75 and over age group exceeded that of the 65-74 age group in all the cities included in the study.

In a Canadian context, two studies Okraku (1987) and Smith (1998) respectively examined levels of aged residential segregation in cities between 1971, 1976 and 1981, and between 1981 and 1991. Okraku (1987) examined levels of aged segregation in all Canadian tracted cities in 1971, 1976 and 1981. Comparing inter-urban levels of aged residential segregation in 1981 Okraku (1987) found substantial, but varying levels of segregation. The index of dissimilarity varied from a low of 17 in Peterborough, meaning that 17 percent of the 65 and over population of that city would have to move in order that their spatial distribution match that of the non-elderly population, to a high of 38 in Calgary, meaning that 38 percent of the 65 and over population of Calgary would have to move in order that their spatial distribution match that of the non-elderly population. Four western cities, Calgary (38), Edmonton (37), Regina (37) and Saskatoon (36) had the highest levels of aged residential segregation; whereas St. Catharines-Niagara (20), Brantford (17) and Peterborough (17) had the lowest levels of aged segregation.

Between 1971 and 1981 Okraku (1987) also found that the level of aged residential segregation in Canadian cities increased. The mean level of segregation was 24 (indicating that 24 percent of the total urban elderly population would have to move in order that their distribution be the same as the non-elderly population) in 1971, 26 in 1976 and 28 in 1981. However, not all cities experienced increasing levels of aged segregation. In small cities, including St. John, Regina and Saskatoon increased dramatically and continuously between 1971 and 1981. In Saint John, Regina and Saskatoon the level of aged residential segregation increased 47, 43 and 47 percent respectively. Larger cities, for example, Toronto, Ottawa-Hull, Calgary and Vancouver in contrast experienced only moderate or no increases in the level of aged segregation.

Examining changes in the level of aged residential segregation in essentially the same cities between 1981 and 1991, Smith (1998) noted that the overall level of aged segregation, as measured by the index of dissimilarity, remained high in the vast majority of Census Metropolitan Areas (CMAs) in 1991. The levels of aged segregation were highest in 1981 in Regina, Calgary, Edmonton and Saskatoon and lowest in St. Catharines-Niagara, Windsor and Vancouver. Ten years later, the elderly populations of the same CMAs, Regina, Calgary, Edmonton and Saskatoon were still the most segregated; whereas the aged populations of St. Catharines-Niagara, Kitchener, Chicoutimi-Jonquiere/Thunder Bay and St. John's were the least segregated. A comparison of the mean value of the index of dissimilarity in 1981 and 1991 further showed that despite the high levels of aged residential segregation and changes in the relative positions of individual CMAs, the level of segregation fell from approximately 30 percent of the aged population having to move in order for the distribution of the elderly to be identical to the spatial distribution of the non-elderly population, to 26 percent of the 65 and over population having to move.

Inter-urban studies of aged segregation within the central areas of cities completed as early as the 1940's Schmid (1944) and Smith and McMahan (1951), found concentrations of the elderly population in the rooming-house districts immediately surrounding the Central Business Districts (CBDs) of Chicago and Seattle respectively. Comparing the percentage of the 65 and over population in the central areas of US cities in 1940 with the percentage of the elderly population in central cities in 1950, Cowgill (1958) confirmed that in the ten year period the percentage of the total population of the central cities studied aged 65 and over, rose compared with the proportion of the total population living outside the CBD aged 65 and over. Also, the percentage of the aged population living in the central cities not only increased between 1940 and 1950. but increased at a faster rate than the total population of the same area. Using data from the 1960's Kennedy and DeJong (1977) confirmed that the concentration of the 65 and over population in the central city had continued. Based on their analysis of 10 US inner cities, it was found that the percentage of the elderly population residing in the central city between 1960 and 1970 was greater than the percentage of the non-elderly population living in the same area of the city.

In their study of Toledo, Ohio, Hiltner and Smith (1974) found similar patterns of elderly concentration in the central city and CBD between 1940 and 1970. The population aged 65 and over was found to be concentrated in a more or less continuous sector extending west from the CBD towards the periphery. Between 1940 and 1970 the proportion of the population of the CBD aged 65 over increased from approximately 11 to 31 percent. The 65 and over population in contrast made up comparatively small proportions of more peripheral census tracts between 1940 and 1960. After 1960 however the proportion of the population aged 65 and over in peripheral census tracts began to increase.

From the second perspective, studies examining the extent of and trends in intra-urban aged segregation have identified a number of changes in the distribution of the 65 and over population compared to younger populations in the period 1940 - 80. Using the index of dissimilarity Cowgill (1978) measured aged residential segregation in all US

SMSAs in 1940, 1950, 1960 and 1970. During the 1940's the level of segregation increased slightly, despite evidence that the elderly population was becoming increasingly concentrated in the central areas of the city. In contrast, between 1950 and 1960 the level of aged segregation increased dramatically in all the cities studied. The average level of segregation rose from 16 to 22 percent, an increase of 33 percent. Although the level of segregation continued to increase during the 1960's, the increases were not as uniform or dramatic.

In contrast, Kennedy and DeJong (1977) found moderate levels of aged residential segregation and no clear pattern of either increasing or decreasing aged segregation between 1960 and 1970 in their 10 city study. Comparisons of the index of dissimilarity for the inner city elderly population showed that while approximately half the cities studied experienced a decrease in the level of aged segregation, the remainder experienced an increase. In those cities where the level of aged segregation rose, the increase was not statistically significant. Kennedy and DeJong (1977) therefore concluded that the degree of segregation experienced by the inner city elderly was not only moderate but relatively constant over time.

From a different perspective, such changes in the level of aged residential segregation or the extent to which the elderly are sorted into particular areas of the city and, at the same time, excluded from other spaces, indicates both the degree to which the elderly are integrated (socially and spatially) with other elderly groups and younger cohorts and the extent to which the elderly, are identifiable as a distinct and different group in society (Anderson 1987, 1988; Sibley 1988, 1992, 1995). The sorting of the elderly population into relatively age homogeneous clusters or aged spaces is a mechanism whereby boundaries can be erected and distance generated between the elderly and younger cohorts (Sibley 1988, 1992, 1995). The physical or spatial distance, as measured by the level of aged segregation, between the elderly and younger cohorts indicates the 'social' distance or the degree of integration between the two groups (Park *et al.* 1926; Peach 1975; Laws 1993). High or increasing levels of aged residential segregation and the existence of aged spaces would therefore indicate that not only is the elderly population not distributed in the same manner as the non-elderly population, but that the elderly and non-elderly populations are not socially integrated, just as they are not spatially integrated (Laws 1993). This in turn suggests that there is some characteristic or attribute, in this case, a specific chronological age, that marks the elderly population as different from the non-elderly population, socially and spatially (Sibley 1988, 1992, 1995). If the elderly population were indistinguishable from the non-elderly population, the level of aged residential segregation would be low, indicating that the elderly population is distributed in much the same way as the non-elderly population.

The increasing heterogeneity of the elderly population, in terms of marital status, age, income level, source of income, ethnicity, health etc., further suggests that not only is there one characteristic or attribute that distinguishes the elderly population from the non-elderly population, but that there are a number of attributes that distinguish one elderly population from another elderly population. For example, one elderly sub-population may be distinguished from another elderly sub-population in terms of age, gender, marital status and income level. If it is now assumed that the diversity of the elderly population is reflected in the socio-spatial structure, just as the diversity of the entire population is manifest in the urban socio-spatial structure and that all these differing elderly populations will be to some degree socially and spatially sorted or segregated from both each other and non-elderly populations, then increasing differentiation within the elderly population will produce a large number and wide variety of highly localized concentrations of different elderly populations or 'aged spaces'. It is therefore suggested that the heterogeneity and visibility of the elderly population will be manifest or expressed in an increasingly complex and fragmented pattern of 'aged spaces'.

2.3 Models of Urban Social Structure

Several possible explanations for the changes in the spatial distribution of the elderly and accompanying fluctuations in aged segregation levels identified previously, have been suggested. For example, Litwak and Longino (1987) suggest that the changing spatial distribution of the elderly population can be accounted for by the development of chronic disabilities which force the elderly into a series of moves in order to receive assistance and medical care. The most common explanations used however are ecological models which seek to explain the intra-urban location of the elderly in terms of urban expansion, competition between population groups and the eventual decentralization of younger, more upwardly mobile populations (LaGory *et al.* 1980; Birch 1971; Stahura 1980). In the present study the Concentric Zone (Burgess 1925) and Sector (Hoyt 1939) models and the Social Mosaic Hypothesis (Bourne 1987,

1989) are evaluated for their ability to depict and explain the spatial distribution of the elderly population.

2.3.1 Ecological Models of Social Differentiation

Focusing on the population component of the urbanization process, the ecological models developed by the Chicago School sought to explain the internal structure of the city in terms of natural areas, competition, invasion and succession (Park *et al.* 1926). Although three models/theories were developed by the Chicago School, the Concentric Zone Model (Burgess 1925), the Sector Model (Hoyt 1939) and the Multiple Nuclei Model (Harris and Ullman 1945), only the Concentric Zone Model has been extensively utilized in attempts to explain the spatial distribution of the elderly (Cowgill 1958, 1978; Coulson 1968; Golant 1972; Hiltner and Smith 1974; LaGory 1980).

The initial explanation advanced for the concentration of the elderly in the centre of the city were based on the Concentric Zone Model (Burgess 1925). The emergence of zones around the centre of the city was considered to be a result of increased competition for the city's limited space caused by urban decentralization and expansion. The decentralization of the population caused by the construction of suburbs, population growth and the consequent intensification of competition and demand for both land and housing resulted in neighbourhoods being invaded and succeeded by upwardly mobile population groups as these groups moved out to the periphery (Birch 1971). The resultant patterns of 'invasion' and 'succession' are characterized by what Frye (1975) described as a 'circulation of the young'. Because only young families could afford to leave the inner city and compete for expensive suburban housing, the greatest concentration of young households would be at the periphery. Elderly households, who were unable to compete for the better, newer suburban housing, became concentrated at or close to the city centre (Golant 1972).

Consequently, a distinct pattern of elderly concentration developed, characterized by the movement of young households and the residential inertia of the aged (LaGory *et al.* 1980). The concentration of the elderly in the core area of the city and their relative absence from the suburbs changed the spatial distribution of the elderly and intensified aged residential segregation through the physical separation of the generations (Laws 1993). Such changes in the intra-urban location of the 65 and over population are in keeping with both the initial concentration of the 65 and over population in the core areas of the city during the 1940's, 1950's and 1960's and the increasing levels of aged residential segregation during the 1950's and 1960's and 1970's (Cowgill 1957, 1978; Coulson 1968; Hiltner and Smith 1974; Smith and Hiltner 1975).

Although two other ecological models, the Sector Model (Hoyt 1939) and Multiple Nuclei Model (Harris and Ullman 1945) were developed, neither have been used extensively to explain either the changing intra-urban location of the elderly or aged residential segregation. The Sector Model (Hoyt 1939) suggests that the concentric zone pattern identified by Burgess (1925) was overlaid by a sectoral pattern. According to Hoyt (1939) a pattern of wedge-shaped sectors, characterized by different activities, spread outward from the Central Business District (CBD) along natural features, for example, rivers, and transportation routes. Individual wedges are characterized by high income housing, working-class housing, manufacturing activities or specific ethnic groups. Within residential sectors housing quality and cost respectively increase as distance from the CBD increases. Peripheral areas within a residential sector are therefore both more costly and contain better quality housing. Inner city areas will be higher density, cheaper and older than their more distant suburban counterparts.

Residential differentiation is once more based on 'rent paying ability' (Godrey 1988, 39). As far as the elderly are concerned where they live is determined, as before, by their ability to compete in the housing market. If it is assumed that the elderly are not able to compete for suburban housing because of small or fixed incomes, then the elderly would be found either in the low income zone immediately surrounding the CBD or in the inner part of a low income residential sector. However, the aging-in-place of the wealthier 45-54 and 55-64 age groups may, over time, produce concentrations of the elderly population away from the low income zone traditionally associated with the elderly.

Although limited, Golant (1971); Hiltner and Smith (1974) and Smith and Hiltner (1975) find some evidence to support the development of wedge shaped patterns of elderly concentration. In his study of Toronto Golant (1972) found that the elderly were not only concentrated in the inner city, but also along transportation routes radiating from the CBD. Although fragmented, the concentration of the elderly along transportation routes produced two 'wedge' shaped sectors extending from the CBD to the suburbs in different directions. The first sector extended along Toronto's main north-south thoroughfare; whereas the second extended northwestwards from the CBD along another main transportation route. Between 1940 and 1970 Hiltner and Smith (1974) and Smith and Hiltner (1975) likewise found that the elderly population of Toledo was spatially concentrated in a wedge shaped sector extending west across the city. By 1970, despite becoming increasingly discontinuous, the sector had expanded northwestward into the more peripheral areas of the city. Moreover by 1970, the elderly population had become increasingly concentrated in the peripheral parts of the sector, as opposed to the more centrally located areas.

Unlike either the Concentric Zone or Sector Model, the Multiple Nuclei Model developed by Harris and Ullman (1945) was a more broadly based model which recognized the existence of both concentric zones and sectors. The Multiple Nuclei Model challenged the supremacy of the CBD by suggesting that special purpose districts e.g., industrial areas, parks universities, would carve out spheres of influence that would in turn, affect the distribution of activities around them. Where particular activities would locate was governed by four principles: (1) like activities attract similar activities; (2) unlike activities repel each other; (3) location is determined by cost and (4) some activities require special facilities and will, therefore locate where these facilities exist. Thus, urban space is divided into relatively large parcels of homogeneous, but segregated land uses. As far as residential neighbourhoods are concerned, the Multiple Nuclei Model predicted that these would form around employment nodes, so that workers would commute only a short distance. Low or high income housing would likewise form around exclusive nodes.

As far as the intra-urban location of the elderly population is concerned, it is suggested that the 65 and over population could cluster around frequently used service nodes (public transit stations, stores), amenities (public parks, golf courses) or various residential nuclei. Alternatively, other nuclei or clusters may develop as residential neighbourhoods age and evolve into *de facto* 'retirement communities'. Such nuclei will initially be older pre-1950 suburban areas, but as other middle aged populations, located in more distant, traditionally family oriented areas, age-in-place, other old-age residential nuclei will develop. In addition, purposefully designed and constructed 'campus style' retirement communities may produce 'instant' elderly residential nuclei (Golant 1980; Heintz 1976; Kuntz 1989). The location of such elderly residential nuclei could be determined by accessibility to nearby amenities, land availability or zoning.

2.3.2 The Social Mosaic Hypothesis

Unlike the ecological models previously discussed, the Social Mosaic Hypothesis (Bourne 1989) is an attempt, albeit an empirically based attempt, to describe contemporary patterns of urban social differentiation. It is argued that the development of a social mosaic is itself essentially a product of far reaching changes in urban structure summarized in the idea of the *dispersed city* (Bourne 1989; Filon and Bunting 1996). The dispersed city is a 'composite urban agglomeration which is spatially decentralized and held together through complex spatial arrangements between many locationally discrete, specialized activities' (Bunting and Filion 1996:9). Bunting and Filion (1996) argue that the increased use of the car (and the consequent construction of expressways) and an increase in the demand for space have gradually led, on the one hand, to the dispersal of the city (through suburbanization and decentralization) and, on the other, to the clustering and segregation of activities, be they retail, residential or employment. As a consequence of this clustering and segregation of activities a complex pattern of 'locationally discrete, specialized' activity centres or nodes characterize the dispersed city (Bunting and Filion 1996: 9). Without a dominant CBD and combined with the existence of numerous employment nodes, a number of studies (Erickson 1986; Griffith 1981) have noted a flattening of the city wide CBD dominated accessibility gradient identified by Alonso (1960). If it is assumed that each employment node generates its own unique accessibility gradient (just as the once dominant CBD generated an accessibility gradient), then a much more complex pattern of urban social differentiation emerges (Simpson 1992; White 1988). Rather than there being one pattern of social differentiation centred on the CBD, now there exist numerous patterns of differentiation, each one potentially overlapping patterns centred around other nodes.

The pattern of urban social differentiation within the dispersed city is further complicated by significant changes in the ethnic and demographic composition of the urban population (Bourne 1989; Shulman 1980; Bourne 1991; Ley and Bourne 1993). Such changes include, but are not limited to, increasing numbers of female headed (Miller 1996; Rose and Villeneuve 1988; Rose and LeBourdais 1986) and gay households (Adler and Brenner 1992; Lauria and Knopp 1985); an increase in social polarization (Winchester and White 1988; Murdie 1990; Ley 1991; Bourne 1990); an increase in ethnic diversity (Balakrishnan 1988; Beaujot 1991) and of particular interest, an increase in the number of elderly households (Shulman 1980; Smith 1998). When combined with the changes in urban structure described above as the dispersed city, Bourne (1989) argues that the increased social diversity of the urban population has resulted in the development of a 'social mosaic'.

In the most general terms Bourne (1989) and Filion and Bunting (1996) describe the urban social mosaic as representing a shift away from a pattern of urban social differentiation which is characterized by the existence of large scale, geometric and homogeneous zones and sectors i.e., the Concentric Zone and Sector Models of Burgess (1925) and Hoyt (1939) respectively, to a more spatially variable, less rigid pattern. Bourne (1989: 319) further describes the social mosaic generated by the nucleated and segregated dispersed city and its diverse population as consisting of 'numerous spatial clusters of socially distinct groups' scattered across 'a wider variety of types of urban neighbourhoods and environments than ever before'. Although many studies (Ley 1993, 1991; Filion 1987; Bunting and Filion 1996) have pointed to the increasing diversity of the Canadian inner city, Bourne (1989) suggests that the existence of the social mosaic is most apparent in the suburbs. No longer the preserve of the owner occupier young nuclear family, the suburbs are becoming characterized by concentrations of small non-nuclear family households, low income households, diverse ethnic groups and the elderly (Muller 1981; Knox 1994; Ray *et al.* 1997; Eveden and Walker 1993; Fava 1980; Miller 1996; Conrad 1996; (Vischer 1987; Gutowski and Feild 1979; Kimmich and Gutowski 1983; Fitzpatrick and Logan 1985; Golant 1990).

In the present study it is further suggested that not only are the elderly part of the social mosaic of Canadian urban areas, but that the spatial distribution of the 65 and over population is itself increasingly complex and characterized by its own specific 'social mosaic'. It is argued in the following section that the spatial distribution of the elderly population is characterized by the existence of a large variety of segregated aged spaces scattered across the city in a number of different environments.

2.4 The Development of 'Aged Spaces'

Changes in both the level of aged residential segregation, the spatial distribution of the elderly population and urban social structure previously discussed, suggest that there have been significant changes in the extent to which the 65 and over population is spatially clustered and in which part of the city the elderly are predominately located. In the following section it is argued that the spatial distribution of the elderly population is characterized by the existence of fragmented, spatially localized and highly differentiated 'aged spaces'. It is suggested below that the currently observable pattern of spatially localized and distinct 'aged spaces' has evolved over time as a number of changes have occurred in the size and composition of the urban elderly population, as well as urban social structure. A summary of the changes in the nature, location and characteristics of aged spaces follows.

Beginning in the late 1940's and continuing through to the early 1950's, rapid population decentralization, caused by the construction of an outer suburban ring, increased population growth, unprecedented increases in personal wealth for younger cohorts and, at the same time, the relative inability of elderly households to compete for the better suburban dwellings, led to the development of a distinct pattern of residential differentiation on the basis of age (Golant 1972; LaGory *et al.* 1980). Due initially to their inability to compete in the housing market and later, aging-in-place, the elderly became concentrated in the inner area of the city (Cowgill 1958, 1978; Coulson 1968). At the same time, the elderly were strikingly absent from the distant, family oriented suburbs (Golant 1972; Schnore 1961). Combined with the outmigration of younger cohorts, the residential inertia of the elderly population intensified aged segregation through the physical separation of the generations (Golant 1972; Laws 1993). Cowgill (1978) for example, found that between 1940 and 1950 the mean level of aged residential segregation increased in all tracted US cities, suggesting that the mismatch in the spatial distribution of the elderly and non-elderly populations (as measured by the proportion of the elderly population that would have to move in order that the distribution of the 65 and over population be identical to the distribution of the non-elderly population) had increased, which in turn produced the physical separation of the generations noted above.

As already suggested the overall pattern of residential differentiation on the basis of age that developed as a consequence of these processes is marked by a distance decay from the CBD in the proportion of the 65 and over population, or the existence of concentric zones, as described by Burgess (1925). As far as the aged spaces that developed within this pattern are concerned, they are located in the inner city. During the 1950's Golant (1972) for example, notes that the largest proportions of the 65 and over population were concentrated in the inner city as opposed to the suburbs. Similarly, Hiltner and Smith (1974) identified an 'aged space' in Toledo during the 1940's and 1950's that included the CBD and extended northwestwards toward the periphery of the city. The outmigration of younger cohorts, their concentration in the suburbs, the residential inertia of the elderly population and the subsequent *de facto* concentration of the 65 and over population in the inner city suggests that the aged spaces that developed during the 1940's and 1950's were relatively age homogeneous and spatially distinct.

The growth of the suburban elderly population during the 1960's and 1970's (Kimmich and Gutowski 1983; Fitzpatrick and Logan 1985; Stahura 1980; LaGory *et al.* 1980; Vischer 1987; Gutowski and Feild 1979), combined with a significant increase in the size and heterogeneity of the elderly population, led to further important changes in the internal composition and spatial distribution of aged spaces. As well as being evident in the inner core area of the city, marked concentrations of the 65 and over population were identifiable in the inner, older pre-1950 suburbs immediately surrounding the inner city. For example, LeBourdais and Beaudry (1988) found that on the whole between 1971 and 1981 census tracts in Montreal had aged significantly. Spatially, the general aging of the population had resulted in census tracts containing large percentages of aging households, with no children at home being concentrated in the well established suburbs constructed before 1971, immediately surrounding the core area of Montreal and census tracts with high proportions of 'young' households being located in the newer suburbs (LeBourdais and Beaudry 1988). Davies and Murdie (1993) confirm this finding, suggesting that census tracts with large numbers of elderly households are concentrated in the inner city and areas of the city that dated from 1960. In census tracts in the downtown LeBourdais and Beaudry (1988) found other concentrations of the elderly, characterized by low income families, increasing rates of poverty and one person households. This contrasted with aging middle income suburban census tracts that were distinguished by large families, few single person households and families with no children at home.

Increases in the overall, city wide level of aged residential segregation in the 1960's and 1970's indicate that the spatial distribution of the 65 and over population was still significantly different from that of the non-elderly population and that the difference between the distributions of the two groups increased (Cowgill 1978). In contrast, Fitzpatrick and Logan (1985) reported decreasing levels of aged residential segregation in the suburbs during the same period. Kennedy and DeJong (1977) however found that the opposite to be the case in the inner city. Across the city as a whole the increasing levels of aged residential segregation suggest that during the 1960's and 1970's aged spaces became increasingly spatially distinct. Taken individually, aged spaces in the suburbs were relatively undifferentiated from their surroundings, suggesting perhaps as Kimmich and Gutowski (1983) and Golant (1975) anticipated that the suburban elderly populations were less socially and spatially different from younger suburban residents; whereas inner city aged spaces were increasingly differentiated from their surroundings over the period in question.

As with the level of aged residential segregation, the population of aged spaces located in the inner city and suburbs differed increasingly in terms of income, household type and age during the 1960's and 1970's. The aging-in-place of the initial wave of suburban dwellers resulted in the development of spatial concentrations of, or aged spaces, characterized by elderly married, middle class, owner occupier couples (Gutowski and Feild 1979; Vischer 1987; Conrad 1996). The inner city aged spaces or spatial concentrations of the elderly population in contrast, contained an older poorer, often widowed elderly population (Winchester and White 1988; Massey 1980; Pineo 1988; Hamm *et al.* 1988). As a result of these changes by the end of the 1970's the variety of aged spaces had increased in terms of both their location and internal composition.

During the 1980's the continued dispersal of the city and the increased social and demographic heterogeneity of the urban population have produced additional changes in the distribution, composition of aged spaces. Increasing levels of aged segregation for the 65 and over population (Okraku 1987; Smith 1998), but especially for the 75 and over age group (Tierney 1987) suggest once again that the 'social distance' between the elderly, old elderly and non-elderly populations increased during the 1980's. In combination with the noted tendency for residential activities to be clustered, it is argued that aged spaces have become more numerous and spatially distinct than in the past. The aging-in-place of the elderly populations of aged spaces located in the inner city and pre-1950 suburbs will have produced inner city aged spaces that are characterized by an old-old elderly (aged 85 and over) population comprised of a large proportion of widows and single person households and inner suburban aged spaces containing a younger elderly population living in owner occupied dwellings. In addition the continuing suburbanization of the elderly population (Golant 1990) and the low mobility of middle aged households has led to the aging-in-place and consequent development of aged spaces in the more distant newer suburbs. Income polarization (Murdie 1990; Ley 1991) and the already noted tendency for the marginalized elderly households to be concentrated in the inner city (Winchester and White 1988; Massey 1980) suggests that these newly evolving aged spaces will not contain concentrations of the disadvantaged elderly, but rather concentrations of aging empty nesters that moved to the suburbs during the 1970's.

2.5 Hypotheses

In light of the previous discussion, five hypotheses are formulated concerning the spatial distribution of the 65 and over population:

1. It is suggested that the increasing complexity and heterogeneity of the 65 and over population is reflected in the identification of multiple old-age family status factors. Old-age family status factors are derived using principal components analysis.

Enumeration area data on age, gender, marital status, household size, household composition and tenure are used initiailly to derive all the family status components which describe the populations of three study areas and a joint analysis of the individual cities included in the analysis. Only the old-age family status dimensions, those that describe the elderly populations of the study areas, are included in any further analysis or discussions.

2. The newly emerged old-age family status factors are primarily differentiated on the basis of marital status, gender and advanced chronological age. Taken by themselves or considered together, marital status (notably the distinction between being married or being widowed), age (especially the uneven growth of the old elderly population, commonly defined as either the 75 and over or 85 and over population) and being female are thought by many authors to be the principle sources of division within the elderly population (Stone and Frenken 1988:35; McDaniel 1986:35; Statistics Canada 1990, 1997; Moore and Rosenberg 1997). Moreover, changes in the age, marital status and the proportion of the elderly population that is female have not only affected the composition of the elderly population, but also significantly impacted a number of public policy areas including, long term care and institutionalization (Gee and Gimball 1987:54 - 63; Cohen *et al.* 1986; Kelman and Thomas 1990; Shapiro and Tate 1988; Lagergren 1996; Shapiro and Roos 1987); welfare, particularly the maintenance of age related benefits funded through general tax revenues (Dooley 1994; National Council of Welfare 1988; Arens 1982; Statistics Canada 1997; Ruggeri *et al.* 1994; Fellegi 1988; Diamond 1996; Henripin 1994; Messinger and Powell 1987; Denton and Spencer 1997; Brown 1991, 1997; Gee and McDaniel 1994) and economic dependency (Foot 1989; Denton *et al.* 1986; Burke 1991); which in turn have further increased the importance of age, marital status and gender as sources of division within the elderly population.

A simple comparison of the structure of each old-age component derived by the principal components analysis is used to confirm whether or not age, gender and marital status are the primary sources of division within the elderly population. The identification of multiple old-age factors with high loadings on one or more marital status, gender or age variables is considered adequate 'proof' that the hypothesized differentiation of the newly emerged old-age components on the basis of age, gender and marital status.

3. The segmentation of and changes in the composition of the elderly population, in combination with changes in urban social structure, have produced new patterns of urban social differentiation on the basis of age. The spatial distribution of the 65 and over population is no longer characterized by the existence of a single specific spatial pattern, whether concentric or sectoral, but rather spatially localized and discrete concentrations of the elderly population or 'aged spaces'.

A three step methodology consisting of principal components analysis, cluster analysis and discriminant analysis is used to identify aged spaces. The successful identification of aged spaces in each of the study areas is considered sufficient evidence to support the decrease in size, but increase in number and variety of localized spatial concentrations of the elderly, as indicated by the literature on the changing intra-urban location the population aged 65 and over reviewed previously.

4. Aged spaces defined on the basis of different old-age family status factors are located in different parts of the city. For example, aged spaces defined on the basis of the old-age family status factors which load highly on the widow and female variables are located in the central part of the city; whereas aged spaces defined on the basis of old-

age family status factors which load highly on the married and 65 - 74 age group variables are located in the older inner suburban areas of the city.

5. High levels of aged residential segregation, as measured by the index of dissimilarity and the coefficient of localization, indicate that the spatial distribution of the 65 and over population is both significantly different from that of the non-elderly population and that the elderly population is concentrated in specific areas of the city. The more unevenly distributed and concentrated the 65 and over population, the more spatially distinct are aged spaces. Of the three elderly populations (young, middle-aged and old elderly) studied it is anticipated that the old elderly (85 and over) will be the most highly segregated and concentrated; whereas the young elderly (65 - 74 years) will be the least segregated and concentrated.

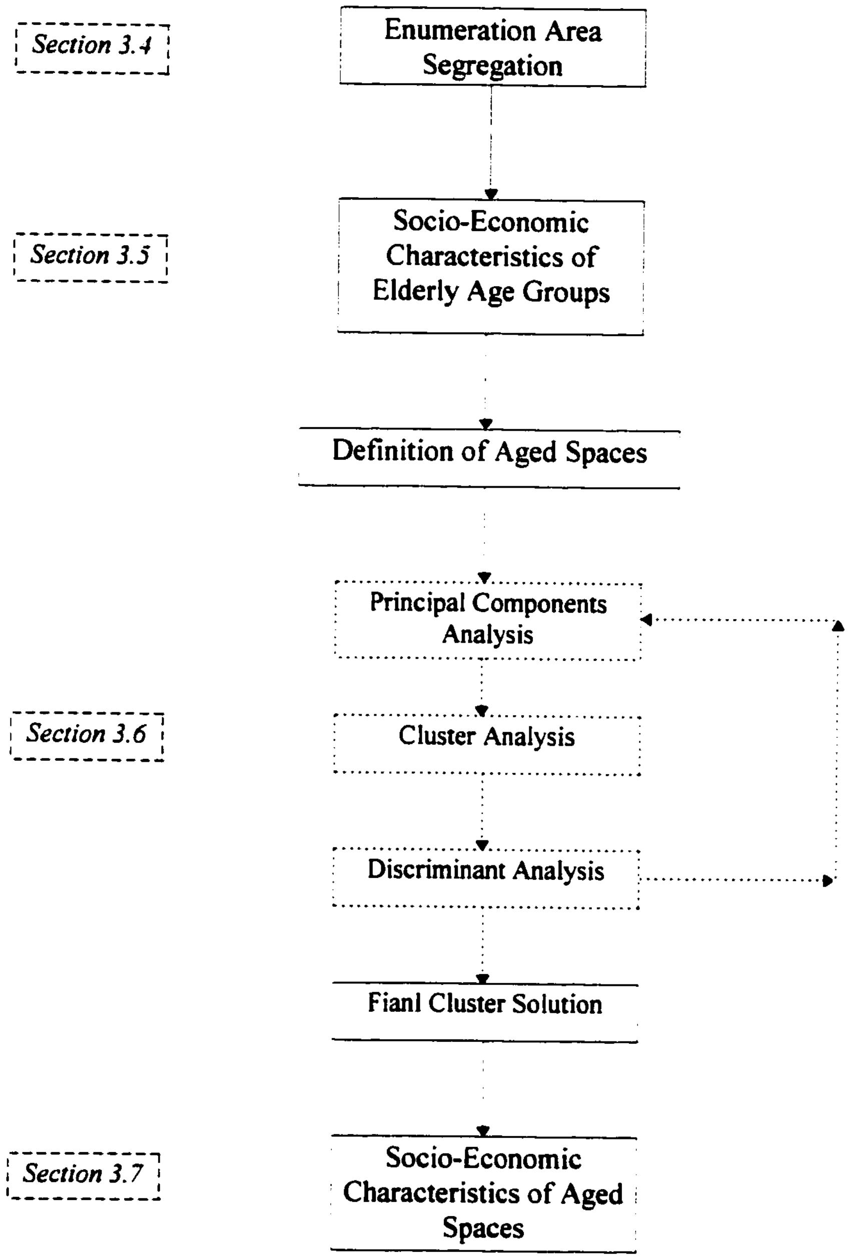
Chapter 3

Methodology

The literature on the spatial distribution of the urban elderly population suggests that over time the concentric zone pattern of intra-urban differentiation on the basis of age, characterized by a marked concentration of the 65 and over population in the central area of the city and a steady decline as distance from the centre increases, has been eroded by the development of smaller scale spatial clusters of the elderly population in a wide variety of intra-urban locations. At the same time, changes in the level of aged residential segregation since 1945 indicate that the levels of aged residential segregation increased significantly as postwar urban expansion occurred, remained constant and then, increased again. If spatial distance and 'social' distance are equivalent, the social distance between the elderly and the non elderly has likewise increased, remained constant and then increased again.

In the following chapter a methodology for measuring three aspects (centralization, evenness and concentration) of aged residential are described, along with a means of identifying aged spaces. Aged spaces are defined using principal components analysis, cluster analysis and discriminant analysis. The overall structure of the methodology is shown in Figure 3.1. Enumeration area data from the 1991 census for three cities, Kitchener-Waterloo, Halifax and Victoria, is used to identify aged spaces; whereas Public Use Microdata or 3 percent Sample Data (PUMF) for the same year and urban areas is initially used to examine selected socio-economic characteristics of the

Figure 3.1: Structure of the Methodology



elderly populations of each city and the elderly population groups assumed to reside in each aged space.

3.1 Data

3.1.1 Enumeration Area Data

The enumeration area data used to define aged spaces consists of 28 variables derived from the 1991 census. Data for three cities: Kitchener-Waterloo, Halifax and Victoria is used in the analysis. In Kitchener-Waterloo, 323 enumeration areas are included in the analysis, 172 enumeration areas in Halifax and 150 in Victoria. All the 28 variables used describe only one (family status or stage in household lifecycle) of the

Table 3.1: Variables used in the Definition of Aged Spaces

Variable Name	Variable Description
Male, Total	Percent of the total population that is male
Female, Total	Percent of the total population that is female
0 - 9 Years	Percent of total population aged 0 - 9 years
10 - 19 Years	Percent of total population aged 10 - 19 years
20 - 34 Years	Percent of total population aged 20 - 34 years
35 - 44 Years	Percent of total population aged 35 - 44 years
45 - 54 Years	Percent of total population aged 45 - 54 years
55 - 64 Years	Percent of total population aged 55 - 64 years
65 - 74 Years	Percent of total population aged 65 - 74 years
75 - 84 Years	Percent of total population aged 75 - 84 years
85 and Over	Percent of total population aged 85 and Over
Never Married	Percent of the total population aged 15 and over that is never married
Married	Percent of the total population aged 15 and over that is married and living together
Widowed	Percent of the total population aged 15 and over that is widowed

cont'd ...

Table 3.1 cont'd

Owned	Percent of total occupied private dwellings that are owner occupied, with or without a mortgage
Rented	Percent of total occupied private dwellings that are rented
Detached	Percent of total occupied private dwellings that are detached
Semi-Detached	Percent of total occupied private dwellings that are semi-detached
Apartments	Percent of total occupied private dwellings that are rented apartments
Size of Household, 1 Person	Percent of total households containing 1 person
Size of Household, 2 Persons	Percent of total households containing 2 persons
Size of Household, 3 Persons	Percent of total household containing 3 persons
Size of Household, 4 - 5 Persons	Percent of total household containing 4 - 5 persons
Size of Household, 6 or more Persons	Percent of total households containing 6 or more persons
Non-Family Households	Percent of total household that are non-family

three dimensions originally identified by Shevky and Bell (1955). As Table 3.1 shows the 28 variables used to define aged spaces can be divided into five groups. The first three groups describe the sex, age and marital status respectively of the populations of Halifax, Victoria and Kitchener-Waterloo. A fourth group describes the tenure and type of dwellings occupied by the 65 and over population and a final group of variables describes the size of households in the study areas.

3.1.2 Public Use Microdata: 3 Percent Sample Data

The data set used to describe the social and economic characteristics of the non-institutionalized elderly populations of Halifax, Victoria and Kitchener-Waterloo consists of 17 variables taken from the Public Use Microdata (PUMF) for each city. The non-institutionalized elderly population is the population aged 65 and over that is normally resident in private dwellings. The institutionalized elderly population is the population aged 65 and over that is usually resident in 'institutional' collective dwellings; where 'institutional' collective dwellings are 'children's homes and orphanages, chronic care hospitals, residences for senior citizens . . . and jails' (Statistics Canada 1991: 52). In 1991, unlike previous censuses, only basic data (age, gender, marital status and mother tongue) were collected for institutional residents, including the elderly. Other data, for example, mobility status, ethnic origin, income status, were not collected for the institutionalized elderly population. As will be shown in Chapter 6, using enumeration area data to define aged spaces (clusters of enumeration areas) it is possible to identify individual old-age institutions. Given the coverage of the PUMF data the elderly populations (defined on the basis of the same variables as the old-age factors on which particular aged spaces are defined) assumed to be resident in these aged spaces are described only in terms of age, gender, marital status and mother tongue. In Chapter 7 however the populations of these 'institutional' aged spaces are also described in terms of additional variables, for example, ethnic origin, mobility and average income. In so doing, it is acknowledged that these variables describe the attributes of the non-institutionalized rather than the institutionalized elderly population. It is however assumed that the non-institutionalized and the institutionalized elderly populations (if defined using the same shared characteristics) are identical in every aspect, age, gender, marital status and mother tongue, except, that one is institutionalized and the other is not.

Unlike the enumeration area level data used previously to define aged spaces, the PUMF data contains an extensive number of variables, including occupation classification, labour force activity, knowledge of various languages and ethnic origin.

Table 3.2: Variables Used in the 3 Percent Analysis

Variable Name/Description	Variable Code	Variable Definition
Ethnic Origin	ETHNICRP	'roots' or origins, both paternal and maternal, of the population
Total Income	TOTINCP	total income from wages and salaries; Old Age Security, Guaranteed Income Supplement and Spouses' Allowances; retirement pensions, superannuation, annuities and RRSPs; Canada or Quebec Pension Plan (including retirement pensions, survivors' pensions and disability pensions); investments, savings certificates, bonds and dividends on stocks; Family Allowances; Federal Child Tax Credit; benefits from Unemployment Insurance; net farm self-employment income; net non-farm self employment income and income from other Government sources
OAS/GIS/SA	OASGIP	income from Old Age Security (OAS), Guaranteed Income Supplement (GIS) and Spouses' Allowances (SA)
CPP/QPP	CQPPBP	income from the Canada or Quebec Pension Plan, includes retirement pensions, survivors' pensions and disability pensions
Retirement	RETIRP	income from retirement pensions, superannuation, annuities and Registered Retirement Savings Plan (RRSPs)
Investment	INVSTP	income from investments, including savings certificates, bonds and dividends on stocks
Mobility Status (1 Year)	MOB1P	relationship between a person's usual place of residence on Census Day and his/her usual place of residence 1 year earlier

In the present context the variables listed in Table 3.2 are used to describe the socio-economic characteristics and attributes of each city's total elderly population (section 3.5) and the elderly populations assumed to be resident in the aged spaces defined in each city (section 3.6). As such the description of the elderly population assumed to be resident in the previously defined aged spaces will further support the hypothesized variation in the location of aged spaces defined on the basis of different old-age factors.

For example, it was suggested in section 2.5: 35 that aged spaces defined on the basis of the old-age dimensions which describe a widowed and female elderly population would be located in the central part of the city. Aged spaces defined on the basis of old-age dimensions which describe a married and young elderly (65 - 74 years) population in contrast would be located in the suburbs. Clearly 'female widow' and 'young elderly' aged spaces are defined on the basis of different variables and identify different elderly populations. Differences in ethnic origin, average income, source of income and mobility between the populations assumed to be resident in these aged spaces therefore confirm the previously hypothesized differences between aged spaces located in different parts of the city.

3.2 Study Areas

Aged spaces are defined in three Canadian cities: Kitchener-Waterloo, Ontario, Victoria, British Columbia and Halifax Nova Scotia. Figures 3.2, 3.3 and 3.4 show the area of each city for which enumeration area data are available. In all three cities enumeration area data are only available for the city proper i.e., the City of Victoria or the City of Halifax. As such, data from the municipalities, counties or rural townships surrounding each city are not included in the present study.

Table 3.3 shows the distribution of the total elderly population and all three elderly age groups included in the analysis between the area of each CMA for which enumeration area data is available ('CMA Covered by Enumeration Data' in Table 3.3 and the shaded areas in Figures 3.2, 3.3 and 3.4) and the area of each CMA for which enumeration data is *not* available ('CMA not Covered by Enumeration Data' in Table 3.3).

Figure 3.2: Census Tract Map of Halifax Showing the Area Covered by Enumeration Areas

Figure 3.3: Census Tract Map of Victoria showing the Area Covered by Enumeration Areas

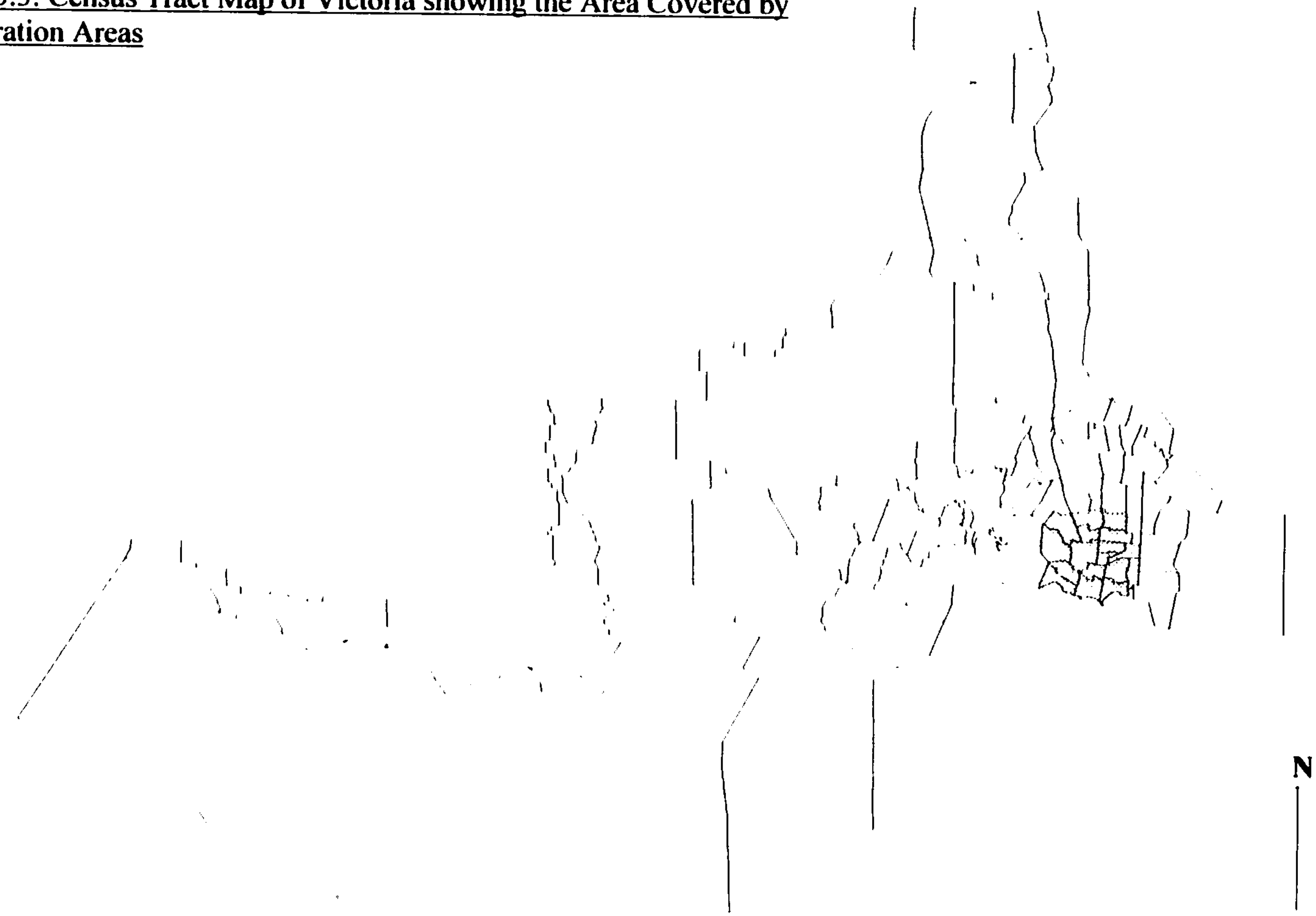


Figure 3.4: CensusTract Map of Kitchener-Waterloo Showing the Area Covered by Enumeration Areas

The size of the elderly population as a proportion of the total population in each individual city is also included for comparison.

Table 3.3: The Distribution (%) of the Elderly, Young, Middle-aged and Old Elderly Populations in Kitchener-Waterloo, Halifax and Victoria Census Metropolitan Areas (CMAs)

	Kitchener-Waterloo	Halifax	Victoria
Entire CMA			
Under 65	90	83	81
65 & Over	10	17	19
65 - 74	6	10	10
75 - 84	3	5	6
85 & Over	1	2	3
CMA *not* Covered by Enumeration Area Data	**33**	**67**	**76**
Under 65	29	55	63
65 & Over	4	8	13
65 - 74	2	5	8
75 - 84	1	2	4
85 & Over	1	1	1
CMA Covered by Enumeration Area Data	**67**	**37**	**25**
Under 65	60	27	19
65 & Over	7	10	6
65 - 74	4	5	3
75 - 84	2	3	2
85 & Over	1	2	1

As Table 3.3 shows the total elderly populations of the CMAs of Victoria and Halifax are considerably larger than the elderly population of the Kitchener-Waterloo CMA. In Victoria and Halifax 19 and 17 percent respectively of the total population of each CMA is aged over 65; whereas only 10 percent of the population of the Kitchener-

Waterloo CMA is elderly. The distribution of each elderly population between the area of each CMA for which enumeration area data is available (the shaded area on Figures 3.2, 3.3 and 3.4 or the cities of Halifax, Victoria and Kitchener-Waterloo) and the area of each CMA for which enumeration data is *not* available is not the same for each study area. In Victoria the percent of the total elderly, young, middle-aged and old elderly populations in the area of each CMA for which enumeration area data is available (the shaded area on Figure 3.3: 45) is less than the percent of the total elderly, young, middle-aged and old elderly populations in the area of each CMA for which enumeration area data is *not* available. In Kitchener-Waterloo the opposite is true. The percent of the total elderly, young, middle-aged and old elderly populations in the area of the CMA for which enumeration area data is available (the shaded area on Figure 3.4: 46) is greater than the percent of the total elderly, young, middle-aged and old elderly populations in the area of the CMA for which enumeration area data is *not* available. In Halifax the total elderly population and the young, middle-aged and old elderly are distributed relatively evenly between in the area of the CMA for which enumeration area data is available (the shaded area on Figure 3.2: 44) and the area of the CMA for which enumeration area data is *not* available.

The uneven distribution (except in the case of Halifax) of the elderly population between the areas of each CMA for which enumeration area data is available and area of each CMA for which enumeration area data is not available, as well as the differences in the size of each city (the shaded areas in Figures 3.2, 3.3 and 3.4) obviously impacts any description of the location and spatial distribution of aged spaces in each respective city.

Any descriptions of the location and spatial distribution of aged spaces identified in each city therefore need to be understood within the specific spatial context of the distribution of each elderly population between the area of each CMA for which enumeration area data is available and the area of each CMA for which enumeration data is not available in each study area. The inclusion of additional data from the area of each CMA for which it is currently not available would obviously change the interpretation of any patterns found.

Kitchener-Waterloo, Victoria and Halifax were selected as study areas for the following reasons: (1) all three cities are located in different parts of the country: Victoria and Halifax are located in Canada's periphery; whereas Kitchener-Waterloo is located in Canada's industrial/economic heartland; (2) Victoria is a well known retirement destination and actively markets itself as such and should therefore have a different elderly population than either Halifax or Kitchener-Waterloo and (3) Kitchener-Waterloo (see p. 48) has a very different physical structure (it is comprised of two separate city centres that have grown together over time) than Halifax or Victoria. A concise description of each city now follows.

Famous for its gardens and British heritage, the City of Victoria, British Columbia is located on Canada's west coast on the southern end of Vancouver Island. The modern day Region of Victoria, which includes the municipalities of Victoria, Esquimalt, Saanich and Oak Bay, has a population of approximately 326 000 (Figure 3.5). The small settlement of Victoria, originally named Fort Victoria, was first established as a fur trading post by a representative of the Hudson's Bay Company in 1843. The discovery of gold on the mainland in 1858 however transformed the small town of Fort Victoria into a large

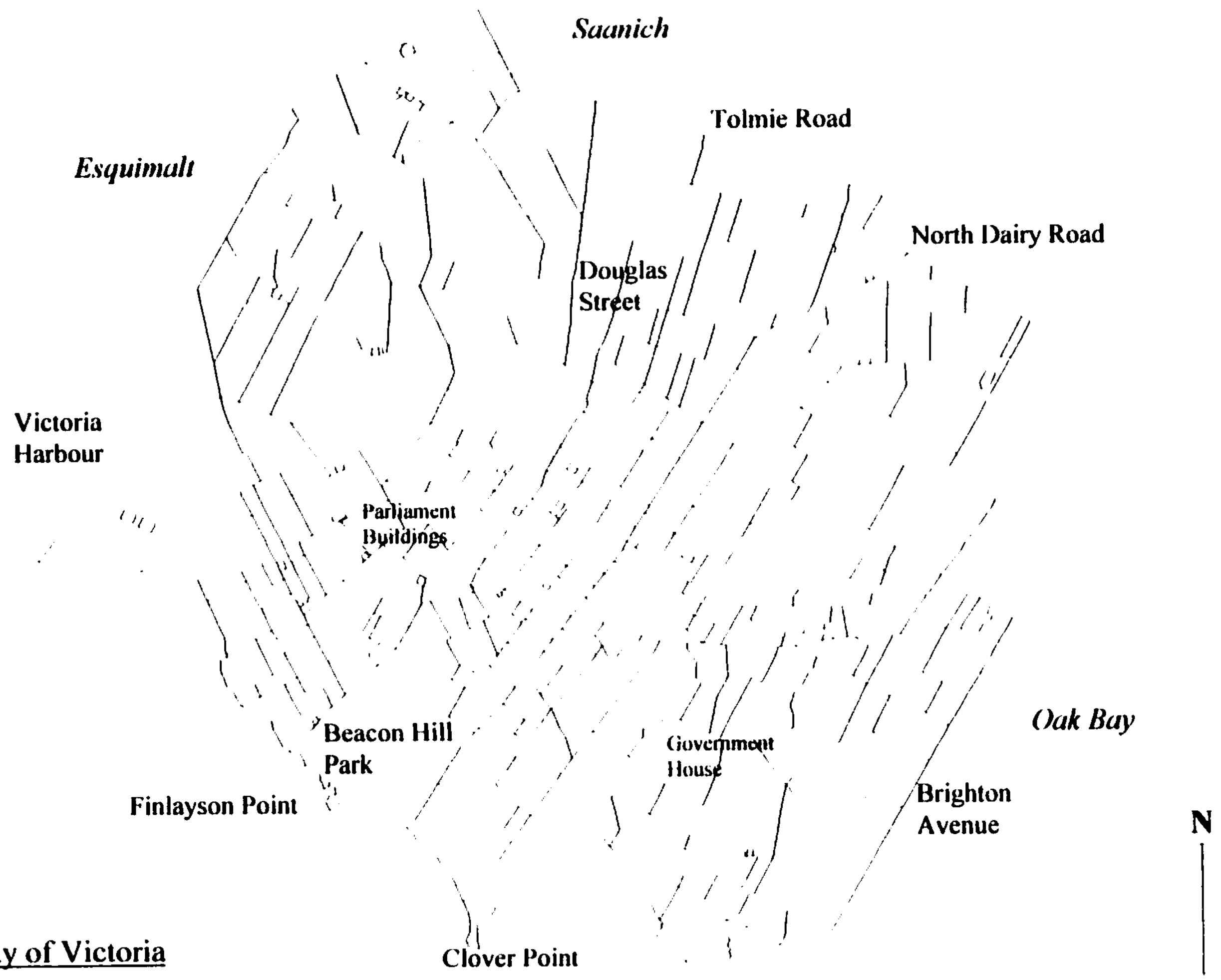


Figure 3.5: The City of Victoria

commercial centre, a function it retains to the present. The City of Victoria was incorporated on August 2nd 1862. Following Confederation in 1871, when British Columbia became the 6th province in the Dominion of Canada, Victoria became British Columbia's provincial capital. At the same time, naval and military headquarters were established at Esquimalt. Today, along with the military, shipbuilding, forestry, government, tourism and a number of research industries connected to the University of Victoria are the City's main employers. Of particular relevance in the present context however is Victoria's role and popularity as a retirement destination. The income and jobs generated by the 'retirement industry' also contribute significantly to Victoria's economic base.

Located on the world's 2nd largest natural harbour, Halifax, Nova Scotia's capital city, was first established in 1749 as a fort by the British to counter the establishment of Louisbourg on Cape Breton Island by the French (Figure 3.6). Halifax's strategic location led first to the establishment and growth of the settlement as a major naval base during the 19th century and at the same time also contributed to its development as a commercial port. Up to World War II, industries related to the naval base, including shipbuilding and ship repair, were the City's primary employers. Although the importance of shipbuilding and the naval base have declined, both continue contribute to the economic base of present day Halifax. Five universities, government and the commercial port, which handles 11 million metric tonnes of cargo a year, are the other main employers. The modern Regional Municipality of Halifax is comprised of the City of Halifax, the Town of Bedford, the City

Figure 3.6: The City of Halifax

of Dartmouth and Halifax County. The total population of the Regional Municipality of Halifax is currently 342 966.

Unlike either Victoria or Halifax, Kitchener-Waterloo is comprised of two adminsitratively separate cities that have, over time, grown together (Figure 3.7). The current population of the City of Waterloo is approximately 90 000; whereas the population of the City of Kitchener is 180 700. The City of Waterloo was first settled by Mennonites in 1804 on land purchased from the Six Nations Indians. Named for the battle that ended the Napoleonic Wars in Europe the Township of Waterloo was established in 1816. The Town of Waterloo was created in 1876 and the City of Waterloo in 1948. From the 1830's and until 1993, brewing was Waterloo's main industry, with both Seagrams and Labatts having substantial investments in the City. More recently, the insurance industry (major insurance companies in Waterloo include the Mutual Group and Manulife Financial) and the City's two universities, along with spin-off high tech firms, are Waterloo's main industries.

The adjacent, but separate town of Berlin, located to the southeast of Waterloo was built by the large number of German immigrants who arrived in southern Ontario following the end of the Napoleonic Wars (Figure 3.7). By the 1840's the German population was considerably larger than the Mennonite population. The outbreak of World War I in 1914 led to the renaming of Berlin for the British Commander, Lord Kitchener. Along with Oktoberfest, held every year in celebration of Kitchener's German heritage, the automotive industry (Budd Canada and Uniroyal Goodrich), footwear production (Kaufmann) and food processing (Dare Foods Ltd. and J.M. Schneider Ltd.) are

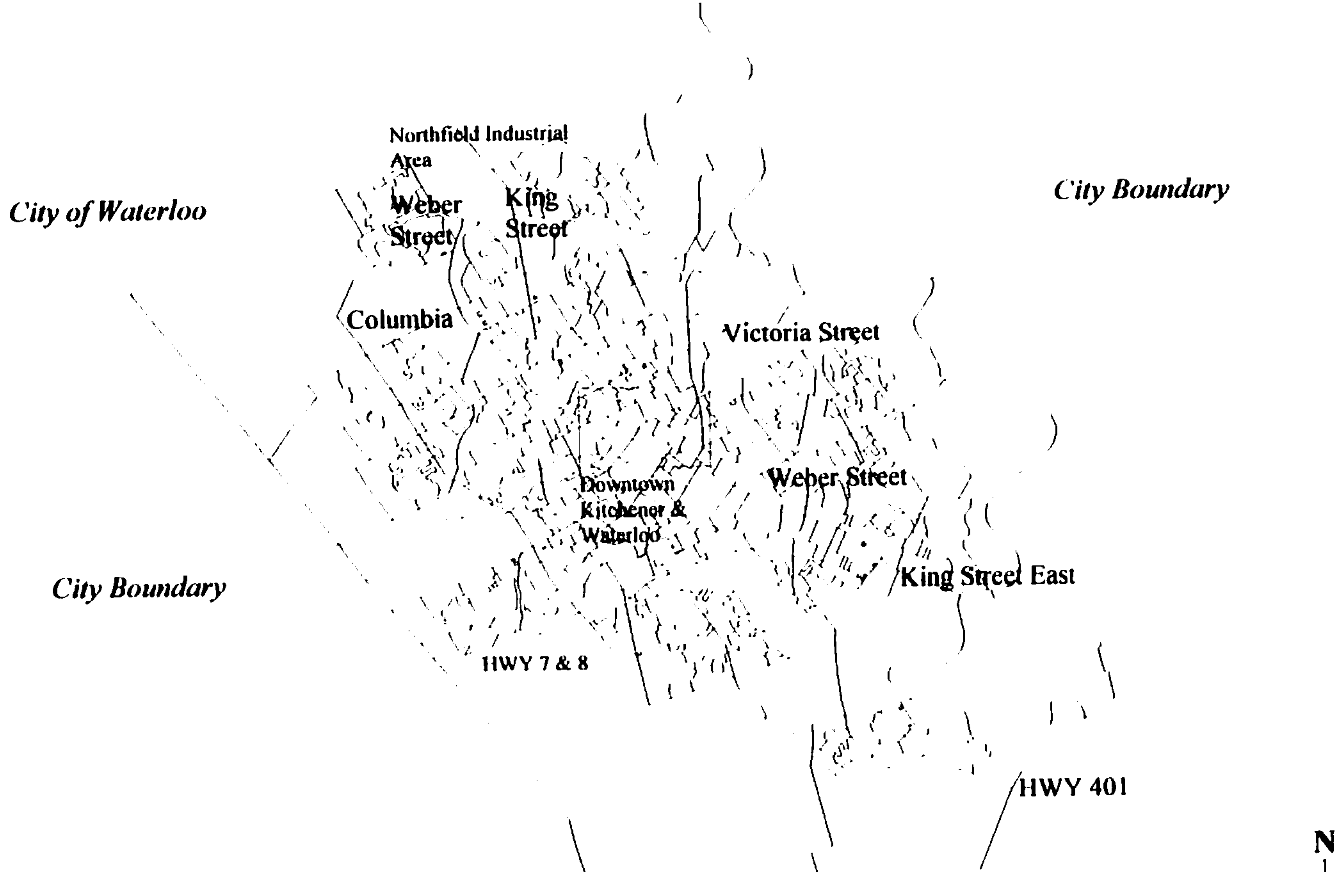


Figure 3.7: The City of Kitchener-Waterloo

Kitchener's main employers. The expansion of both the City of Waterloo and the City of Kitchener during the 1950's and 1960's and the creation of a regional level of government, led to creation of the Regional Municipality of Waterloo in 1973.

3.3 The Definition of the 'Elderly' Population

In the present context the elderly population is defined in the conventional manner, as the total population, male and female, aged 65 and over. Where appropriate, three elderly age groups are also defined: 65 - 74 (the young elderly), 75 - 84 (the middle-aged elderly) and the 85 and over age group or the old elderly. The elderly population is defined as the population aged 65 and over for three reasons: (1) compatibility with other studies of the intra-urban location of the elderly population, particularly early research on the spatial distribution of the elderly; (2) the limited scope of the enumeration area data used to define age spaces and (3) the continuing widespread and institutionalized (Harper and Thane 1989; Haldemann 1991) use of 65 as a means of determining who is elderly or when old-age has been reached. In the analysis of the socio-economic characteristics of the elderly population (Chapter 4) the elderly population is defined as the population aged 55 and over. To facilitate inter age group comparisons the total 55 and over age group is divided into the following groups: 55 - 59, 60 - 64, 65 - 69, 70 - 74, 75 - 79, 80 - 84 and 85 and over. Because of data limitations it is not possible to further subdivide the 85 and over age group.

It should be noted that in using chronological age as the sole means of defining the elderly population, no attempt is made to address any of the criticisms made concerning the rarefication of chronological age in gerontology (Chudacoff 1989; Cole *et al.* 1992;

Moody 1993) and in geographical studies of the elderly (Harper and Laws 1995; Laws 1995a). Although such criticisms should not be dismissed, data limitations and the nature of the present study do not necessitate a full discussion of the most appropriate method of defining the elderly population. In the present context, an awareness of the problems and pitfalls encountered in defining the elderly population in terms of chronological age only is felt to be sufficient.

3.4 Aged Residential Segregation

As a preliminary step to defining aged spaces, the extent to which the total elderly population, the young (65 - 74), middle-aged (75 - 84) and old (85 and over) elderly age groups are segregated from the elderly and non-elderly populations is measured. It is argued (section 2.5: 35) that high levels of aged residential segregation indicate that the elderly may indeed be clustered and concentrated in aged spaces. Low levels of aged residential segregation on the other hand suggest the opposite: that the elderly are not concentrated or clustered. The old elderly (85 and over) are anticipated to be the more segregated, clustered and concentrated than either the young or middle-aged elderly. The old elderly are therefore more likely to be clustered and concentrated in aged spaces than either the middle-aged or old elderly.

The level of aged residential segregation is assessed by measuring three of the five conceptual aspects or dimensions of residential segregation described by Massey and Denton (1988). The three dimensions of aged residential segregation measured are: evenness, concentration (overall and area specific) and centralization. The index of dissimilarity is used to measure evenness, the coefficient of localization to quantify the overall level of concentration, the location quotient to assess area specific concentration and the central city ratio to measure the degree to which each elderly population is concentrated in the central/inner city. With the exception of the central city ratio all aspects of aged segregation are measured for each individual city, as well as for the combined elderly population of all three cities (the joint analysis). The central city ratio is calculated for Kitchener-Waterloo, Halifax and Victoria only.

Conceptually, as previously explained, the level of aged residential segregation is used to indicate the extent to which the elderly population is spatially and socially integrated with the non-elderly population. As suggested by Park *et al.* (1926: 18) 'it is because social relationships are so frequently and so inevitably correlated with spatial relationships; because physical distances so frequently are, or seem to be, the indexes of social distances' that the spatial separation of the elderly population from the non-elderly population (implied by the differences in the distribution and concentration of the two groups) suggests that the non-elderly and elderly populations are socially distinct. An unevenly distributed or segregated elderly population, high levels of both city wide and area specific concentration and high levels of centralization indicate that the elderly population is spatially and socially distinct from the non-elderly population.

What is more, the concentration of the elderly population in spatially distinct enumeration areas inform practices of spatial exclusion and isolation that not only organize space, thereby partly determining where the elderly live (and therefore contribute to the development and continued existence of aged spaces) but also aid the construction and reproduction of specific social identities, by conjuring up particular images about an individual social group, in this case the elderly (Giddens 1984; Anderson 1987, 1988; Sibley 1992, 1995). The concentration of the elderly in specific enumeration areas, for example enumeration areas located in the central part of the city or residential care homes (both of which are undesirable, marginalized locations), aids the construction and reproduction of specific negative images of the elderly population that both reaffirm that the elderly are a marginalized group (because they are associated with undesirable, marginalized locations) and generate distance between the elderly and non-elderly. Thus, the social distinctiveness of the elderly population is maintained.

3.4.1 Evenness

Evenness, which refers to the distribution of each elderly population among the areal units (in this case, enumeration areas) of a city, is used to measure the extent to which different elderly groups are segregated from the non-aged population. A population is said to be more segregated if it is unevenly distributed over an urban area (Blau 1977). Evenness is maximized and segregation minimized, when all areal units in an urban area contain the same relative number of each population.

The index of dissimilarity, *D*, is used to measure how evenly each population is distributed. The index of dissimilarity, *D*, is both the most widely used and discussed measure of residential segregation [3]. Although it was originally developed to quantify

[3] No attempt is made in this paper to discuss in depth the problems associated with the use of the index of dissimilarity. Briefly, the problems associated with the use of the index of dissimilarity include (1) the valus of *D* is affected by the size of the minority (elderly) population in relation to the total population; (2) differences in the size of the elderly population of each individual aged space and (3) the size of the unit of

ethnic or racial segregation it has been used extensively to measure aged residential segregation, (for example, Tierney 1987; Cowgill 1978; Okraku 1987; Smith 1998; Kennedy and DeJong 1977).

Conceptually, the index of dissimilarity refers to the proportion of a population, in the present context the 65 and over population [4], that would have to be redistributed over all the enumeration areas in a city in order that the distribution of the elderly population be identical to the distribution of the non-elderly population (Duncan and Duncan 1955; Taeuber and Taeuber 1965). Assuming that the index of dissimilarity is reported as a percent, a value of 25 would indicate that 25 percent of the 65 and over population would have to move in order that the distribution of the elderly population would be the same as the distribution of the non-elderly population.

The measure is defined by the following formula:

$$D = 1/2 \sum_{n=1}^{n} \left\| \left[x_i / X - y_i / Y \right] \right\|$$

where x_i is the number of population X in *ith* enumeration area, y_i is the number of population Y in *ith* enumeration area, X is the total population of X in the city and Y is the total population Y in the city. The index of dissimilarity is calculated for the population aged 65 and over, compared to the non-elderly population and the young, middle-aged and old elderly groups.

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analysis. See Taeuber and Taeuber (1976); Cortese, Falk and Cohen (1976) and White (1983) for more comprehensive discussions on the possible pitfalls associated with the index of dissimilarity.

[4] For the sake of clarity, the following discussion refers only to the 65 and over population. It should be noted that the index of dissimilarity, the location quotient, the coefficient of localization and the central city ratio are also calculated for the 65 - 74, 75 - 84 and 85 and over age groups.

The index varies between 0 and 1.0 [5]. A value of zero indicates that all enumeration areas have the same composition as the city, i.e., there is total similarity between the distributions of the two populations. A value of 1.0 indicates that no parcels of land contain mixed population groups, i.e., the distributions of the two populations are totally dissimilar.

In keeping with findings from other research (Tierney 1987) it is expected that the oldest and middle-aged elderly populations will exhibit the highest levels of segregation or that the distributions of both these populations will be significantly different from the non-elderly and elderly populations in all three cities. The distribution of the oldest elderly in particular is anticipated to be very different from that of the other age groups, especially the non elderly population. Of the three cities, the elderly populations of Halifax are expected to be the most segregated; whereas the elderly populations in Victoria are expected to be the least segregated. Differences in income levels between the elderly and non-elderly populations, as well as between the young, middle-aged and old elderly are suggested as possible initial reasons for the differences in segregation levels.

3.4.2 Concentration

Concentration is defined as the relative amount of physical space occupied by each elderly population in each urban area (Massey and Denton 1988; Massey 1979).

[5] The index of dissimilarity can also be reported as percent. The index would therefore vary between 0 and 100.

An elderly population that occupies a small section of an urban area is considered to be more segregated than a population that occupies a large section of an urban area.

The overall level of concentration of the 65 and over population is measured using the coefficient of localization, CL (Barber 1988). The coefficient of localization measures the concentration of each population group relative to the total population. The coefficient of localization is defined by the following formula:

$$CL_i = 1/2 \sum_{n=1}^{n} \left[x_i / X - b_i / B \right]$$

where x_i is the size of population X in the ith enumeration area, b_i is the total population in the ith enumeration area. Population X is the 65 and over or elderly population and population B is the total population.

The coefficient of localization varies between 0 and 1.0. A value of zero indicates that the 65 and over population and the total population are equally distributed across an area, i.e., there is no concentration of the elderly population. Values greater than zero can also be thought of as reflecting increasing relative concentration of the 65 and over population. A value of 1.0 indicates that the two populations are totally displaced, i.e., concentrated in mutually exclusive areas.

The area-specific concentration of both populations is measured using the location quotient (Barber 1988). The location quotient allows the spatial concentration of each group to be assessed for each individual enumeration area. The location quotient, LQ, is defined by the following formula:

$$LQ_i = \frac{X_i / \sum X_i}{B_i / \sum B_i}$$

where LQ_i is the location quotient for enumeration area i, X_i is the number of the population 65 and over in area i and B_i is the total population in enumeration area i.

If LQ > 1, there is a relative concentration of the elderly population in enumeration area i, compared to the city as a whole. If LQ < 1, enumeration area i has a smaller share of the 65 and over population than the city as a whole. Finally, if LQ = 1, then the concentration of the population in question in enumeration area i is the same as the concentration of that population across the entire city.

Once again, the oldest elderly age group in each city is expected to be more concentrated than the two younger age groups, especially the youngest elderly. The youngest elderly in turn are expected to exhibit lower levels of overall concentration than the middle-aged and old elderly. As far as the level of are-specific concentration is concerned, it is anticipated that the oldest elderly will be concentrated in only a small number of enumeration areas; whereas the youngest and total elderly populations will concentrated in a large number of enumeration areas.

3.4.3 Centralization

The degree to which the elderly population is located in the centre of each urban area is measured using the concept of centralization. Given past trends in elderly concentration (Clark 1971; Johnson 1971; Cowgill 1958, 1978; Coulson 1968; Hiltner and Smith 1974) and the role played by the degree to which the elderly population is concentrated in the inner city in exacerbating levels of aged residential segregation (Kennedy and Dejong 1977; Fitzpatrick and Logan 1985; Kimmich and Gutowski 1983), the measurement of this aspect of aged residential segregation is particularly significant.

The most frequently used measure of centralization is the Central City Ratio (CCR), which measures the proportion of a population that resides within the central city boundary (Glaster 1984; Massey and Denton 1988). In each individual city the 'central' city is defined as a ring of enumeration areas that are contiguous to the enumeration area/s that comprise the downtown. For Victoria and Halifax the 'centres' of each city are located close to the shore or harbour, because they are both port cities, rather than the centre of each city. Formally, the CCR is defined by the following formula:

$$CCR = X_{cc}/X$$

where X is the population aged 65 and over and X_{cc} is the total elderly population that lives in the central city. The CCR is also only calculated for Kitchener-Waterloo, Halifax and Victoria. It is impossible to calculate the CCR for the combined or all city data because it is not possible to identify a common or joint city centre for all three cities.

The previously noted concentration of the 65 and over population in the inner city and the findings of Winchester and White (1988) suggest that the impoverished elderly in particular are concentrated in the inner city. Because the oldest elderly are most likely to live in poverty (Ruggeri *et al.* 1994; Moore and Rosenberg 1997) and/or rely on government transfer payments (Old Age Security, Guaranteed Income Supplement, Spouses' Allowance and, to a lesser degree, the Canada Pension Plan) (Moore and Rosenberg 1997; Lindsay and Donald 1988) the degree of centralization should be greater, once more, for the oldest elderly. The higher than average incomes of the elderly in Victoria and Kitchener-Waterloo also suggest that the old elderly in Halifax will exhibit the highest levels of centralization.

3.5 Socio-Economic Characteristics of the Elderly Population

Prior to a more detailed analysis of the socio-economic characteristics of the elderly populations of the aged spaces identified in each city, a more general analysis of the attributes of the total elderly population of Kitchener-Waterloo, Halifax and Victoria is undertaken using the 3 percent Public Use Microdata (PUMF). The analysis of the socio-economic characteristics of the population aged 55 and over is restricted to 7 attributes: age, gender, marital status, ethnic origin, household size, average income and average income by source and mobility. The first three characteristics considered are thought to be the principle sources of division within the elderly population (see section 2.5: 34) and therefore may contribute to the formation of aged spaces. The remainder of the characteristics (ethnic origin, household size, average income and average income by source and mobility) may serve to reinforce the more fundamental divisions within the elderly population formed on the basis of age, gender and marital status. For the purposes of this analysis the elderly population is defined as the population 55 and over.

The 55 and over population is further subdivided into 7 age groups: 55 - 59, 60 - 64, 65 - 69, 70 - 74, 75 - 79, 80 - 84, 85 and over.

3.6 The Definition of 'Aged Spaces'

A review of the literature on the spatial distribution of the urban elderly population indicates that it may be increasingly problematic to describe the spatial distribution of the elderly in terms of a single pattern, whether concentric or sectoral. Instead, changes in urban structure, accompanied by increasing levels of aged segregation, significant changes in the ethnic composition of the urban population and the increased heterogeneity of the elderly population itself suggest that a large number and wide variety of highly localized concentrations of different population groups, including the elderly, have developed over time. The definition of 'aged spaces', spatially localized and discrete concentrations of the elderly population, in each city reflects this hypothesized spatial (and social) fragmentation and concentration of the elderly population (section 2.5: 35).

Aged spaces are defined in each individual city and all three cities combined (the joint analysis) using a three step procedure. Principal components analysis is initially performed to identify the family status factors which describe enumeration areas in terms of the population aged 65 and over: old-age family status factors. Using the old-age family status factors identified by the principal components analysis, a cluster analysis is performed on enumeration areas. Finally a discriminant analysis is used to test the accuracy of the cluster analysis. Aged spaces are then identified by modifying the final cluster solution for each city and the joint analysis. Each element is now discussed in more detail below.

3.6.1 Principal Components Analysis

Principal components analysis (PCA) is a statistical technique that linearly transforms an original set of correlated variables (in this case variables describing the age, household characteristics and marital status of the populations of Kitchener-Waterloo, Victoria and Halifax) into a substantially smaller set of uncorrelated variables or underlying dimensions, principal components or factors, that represent most of the information in the original set of variables (Dunteman 1989). Unlike factor analysis which focuses on explaining the common variance in a set variables, PCA explains the total variance in the original variables on the basis of the maximum variance properties of the principal components or factors [6].

The initial factors derived explain or account for the largest percent of the variance present in the original variables or the enumeration area data. The first principal component or factor derived explains the largest share of the variance present in the original variable set and each factor derived thereafter explains successively less variance. For example, in their analysis of neighbourhood change in Winnipeg between 1971 and 1981; Hamm *et al.* (1988) derived three principal components in each year. In 1971, the first principal component extracted (a low income factor) explained 40 percent of the variance; a second principal component (a high income family status factor) explained 31 percent of the variance and a final, high occupational status principal

[6] The terms 'factor', 'dimension' and 'principal component' are used interchangably throughout.

component explained 29 percent of the variance. Ten years later in 1981, the same three factors were again identified. The first principal component, a low income factor, explained 36 percent of the variance; the second principal component or high occupational status factor explained 34 percent of the variance and lastly the high income family status factor explained 30 percent of the variance.

Principal components analysis (PCA) is used in the present context to identify family status factors which describe enumeration areas in terms of the population aged 65 and over. Initially, the analysis is not limited to identifying only those family status factors which describe the elderly population. Rather, all the family status factors are derived and the non old-age factors are then excluded from any further analysis. The remaining old-age family status factors describe the demographic composition (age, sex and marital status), household size and type of dwelling occupied by the 65 and over population. The initial or unrotated factor matrix is then rotated orthogonally using the varimax method. The eigenvalue is set at 1.0. Only variables that load highly or account for greater than $|0.5|$ or 50 percent of the variability associated with each factor are used in the interpretation of a factor's structure (Murdie 1980; Davies and Murdie 1991; Foggin and Polese 1977; Hamm *et al.* 1988). Each factor is then given a title that reflects its structure.

The sampling adequacy of each PCA performed is assessed using the Kaiser-Meyer-Olkin (KMO) test of sampling adequacy. The KMO test of sampling adequacy compares the magnitude of the zero correlation order coefficients in the zero order correlation matrix with the magnitude of the partial or anti-image correlation coefficients in the partial or anti-image correlation matrix (SPSS 1994). It is computed

$$\text{KMO} = \frac{\sum_{i \neq j} \sum r_{ij}^2}{\sum_{i \neq j} \sum r_{ij}^2 + \sum_{i \neq j} \sum a_{ij}^2}$$

where r^2_{ij} is the simple correlation coefficient between i and j; $a^2 j$ is the partial correlation between i and j; where i and j are variables. If the sum a^2_{ij} between all pairs of variables is small compared to r^2_{ij}, the KMO is close to 1. Values of KMO close to 1 indicate that correlations between pairs of variables can be explained by the other variables. Small values of KMO indicate the opposite: that correlations between pairs of variables cannot be explained by the other variables. Values of the KMO test statistic in the 90's are characterized as 'marvelous', in the 80's as 'meritorious', in the 70's as 'middling', in the 60's as 'mediocre', in the 50's as 'miserable' and below 50 as 'unacceptable' (SPSS 1994).

Bartlett's test of Sphericity is used to test whether the zero order correlation matrix for each PCA is an identity matrix (all diagonal terms = 1 and all off diagonal = 0) (SPSS 1994). The hypothesis that the correlation matrix for a specific PCA is an identity matrix can be rejected if the test statistic for sphericity is large and the significance level is small. If the hypothesis that the correlation matrix for a specific PCA ia an identity matrix cannot be rejected then the PCA should be reconsidered. The zero order correlation matrices and the anti-image correlation matrices for each individual city PCA and the joint analysis PCA can be found in appendices B, C, D and E.

It is suggested that the increased complexity and heterogeneity of the elderly population is reflected in the splitting of the traditional family status factor and consequent identification of multiple old-age family status dimensions. For example, in the original three axis model of urban social structure old-age was part of the Urbanization or Family Status axis (Shevky and Bell 1955). Davies and Murdie (1991: 58) suggest that the increasing heterogeneity of the urban population and population aging have led to the splitting of the traditional 'Shevky and Bell' Family Status axis and the development of a separate 'Age' axis, as well as a 'Young and Completed Family' axis. In the present context it is further suggested that population aging and the increased internal fragmentation of the elderly population has produced multiple old-age components each of which describes a very different elderly population. The 'Davies and Murdie' axis has therefore also 'split' and resulted in the recent emergence of a more complicated model of urban social structure and urban differentiation on the basis of age.

As a means of identifying both common old-age family status factors or old-age factors that identify shared attributes which segment the elderly population and the extent to which it is then possible to define identical aged spaces in Kitchener-Waterloo, Halifax and Victoria, all enumeration area data are combined into a single data set. A principal components analysis is then carried out in order to extract the old-age family status factors that describe the total population (of all three cities) aged 65 and over. City specific old-age family status factors are also extracted using only the data from each individual city (Table 3.1). On the basis of these city specific old-age family status factors, city specific aged spaces are defined in Halifax, Victoria and Kitchener-Waterloo.

Differences in the old-age family status factors identified by the city specific and joint analyses suggest that the elderly populations of each city are segmented on the basis of different attributes or characteristics than the total elderly population of all three cities. Nevertheless it is anticipated that advanced chronological age, gender and widowhood are the main characteristics upon which the total and individual city elderly populations are divided. As far as the joint analysis is concerned it is anticipated that a widowed, possibly an old (75 and over) female widowed factor will be extracted, along with an old elderly factor describing the more general elderly population aged 75 and over. The aging-in-place of the suburban middle-aged married population without children at home is expected to show up as what Davies and Murdie (1993) describe as an 'early-and-late family' factor.

On an individual basis, the popularity of Victoria as a retirement destination and the 'active retiree' image it both constructs and reproduces (Holdsworth and Laws 1994) is expected to lead to the extraction of a young married pre-elderly/elderly factor that describes a married population aged 55 - 74, living in two person households and owner occupied dwellings; as well as an old female widowed factor that describes a female widowed population. In Kitchener-Waterloo, a perhaps more economically diverse city that does not have a perceptibly older population, it is again anticipated that a female elderly widowed factor will emerge. The identification of concentrations of late middle-aged and young elderly empty nester households by Bunting and Filion (1996) in Kitchener-Waterloo suggests that a late middle-aged/young elderly empty nester factor may also emerge. An elderly widow factor is again expected to emerge in Halifax, along with a more generally defined old elderly factor. As described previously for Kitchener-Waterloo and Victoria, the elderly widowed factor should describe an old widowed population, aged 75 and over that is predominantly female. The more general old elderly population of Halifax is expected to be described by the extraction of a factor describing the total elderly population aged 75 and over.

3.6.2 Cluster Analysis

Aldenderfer and Blashfield (1987:7) describe cluster analysis as a 'multivariate statistical procedure that starts with a data set containing information about a sample of entities and attempts to reorganize those entities into relatively homogeneous groups'. In the present context the purpose of the cluster analysis is to form relatively homogeneous groups or 'clusters' of enumeration areas, on the basis of the old-age family status factors derived by the PCA. The data set or matrix therefore consists of N entities or enumeration areas measured on P variables or the old-age family status factor scores.

How alike are two enumeration areas i and j is measured by the concept of 'distance'. The distance or similarity between two cases/entities or enumeration areas is calculated using the squared Euclidean distance. The squared Euclidean distance is defined as

$$d_{ij}^2 = \sum_{k=1}^{p} \left(x_{ik} - x_{jk}\right)^2$$

where d_{ij}^2 is the squared distance between cases i and j, or enumeration areas i and j and x_{ik} is the value of the k^{th} variable, or old-age family status factor score, for the i^{th} case/enumeration area. The squared Euclidean distance between two enumeration areas is small for enumeration areas that are similar and large between enumeration areas that are dissimilar. Distance measures in general are therefore known as dissimilarity rather than similarity measures (Aldenderfer and Blashfield 1984).

Enumeration areas are combined into clusters using the average linkage between groups agglomerative hierarchical cluster method. The average linkage between groups clustering method computes an average of the dissimilarity of a specific case with all cases in an existing cluster and joins the case under consideration to the existing cluster if a given level of dissimilarity is reached (Aldenderfer and Blashfield 1984). In other words, the average linkage between groups clustering method defines the distance between two clusters or a case (enumeration area) and a cluster as the average distance between all pairs of cases (enumeration areas) in each cluster.

In order to establish which cluster analysis is used to identify aged spaces in both the city specific and joint analyses, an iterative process, whereby a number of cluster and discriminant analyses are performed and the results compared, is used. For each iteration the number of clusters to be formed is set. Discriminant analysis is then used to assess the accuracy of each cluster solution, as measured by the percent of enumeration areas that are correctly grouped. The final cluster solution, or the cluster solution used as the basis on which to define aged spaces, is selected not only the basis of percent of enumeration areas correctly grouped, but also on the basis of four additional considerations: (1) the number of 'aged spaces' ultimately produced; (2) the amount of detail lost vs. the search for order; (3) the amount of detail lost vs. any increase in the percent of enumeration areas grouped correctly and (4) the practical limits imposed by the number of clusters/aged spaces that can be distinguished on a map.

It should be noted that cluster analysis is an aspatial technique which takes no account of the location of the enumeration areas being grouped i.e., enumeration areas. A spatial element is therefore incorporated by refining the final cluster solution. Two refinements are made: (1) if a cluster consists of two or more spatially disjointed areas then each area is considered a separate cluster, because of its unique location and (2) if any spatially contiguous cluster traverses a road, highway or green space that may act as a barrier to movement or that may delineate in general different land uses or in particular different residential areas, the cluster is divided along the line of that road or highway or at that green space.

3.6.3 Discriminant Analysis

Discriminant analysis is a statistical technique which can be used to classify cases into mutually exclusive groups, identify variables that are important for distinguishing between groups and test the accuracy of an existing classification (SPSS 1994). Discriminant analysis uses linear combinations of a set of characteristics or variables as a means of assigning new cases to groups or for testing actual group membership against predicted group membership. The procedure estimates an optimal function which minimizes the probability of misclassification.

In the present context discriminant analysis is used to test the validity of the cluster analysis. If the classification produced by the cluster analysis is accurate, then the classification produced by the discriminant analysis should be similar. Where a enumeration area is misclassified i.e., the discriminant analysis classifies the enumeration areas in a different 'group' than the cluster analysis, the enumeration areas is reassigned to the cluster indicated by the discriminant analysis.

In discriminant analysis a linear combination of the independent variables is formed and serves as the basis for assigning cases or enumeration areas to specific groups (SPSS 1994). The single index or discriminant score, *D*, thus calculated is a weighted average of independent variables included in the discriminant function. Formally, the linear discriminant function is defined as

$$D = B_o + B_1X_1 + B_2X_2 + \ldots + B_pX_p$$

where D is the discriminant score, B_p is the value of the p^{th} discriminant coefficient and X_p is the value of the p^{th} variable.

The discriminant function is optimized (the probability of misclassification minimized) and the difference between groups maximized when the ratio between-groups sum of squares/ within-groups sum of squares is maximized. Cases are classified into individual groups using the discriminant score D and Bayes' rule. The probability that a case with a discriminant score D belongs to a group i is estimated by

$$P(G_i/D) = \frac{P(D/G_i)P(G_i)}{\sum_{i=1}^{g} P(D/G_i)P(G_i)}$$

where $P(G_i)$ is the prior probability or the estimate of the likelihood that a case belongs to a specific group when no other information about that case is known; $P(D/G_i)$ is the conditional probability or the probability of obtaining a specific value of D given that the group membership of a case is known and $P(G_i/D)$ is the posterior probability. The posterior probability is an estimate of how likely membership in a group is when the group membership of a specific case is unknown. A case is classified, or assigned to a group, on the basis of its discriminant score D and the posterior probability. A case is assigned to the group for which its posterior probability is the largest.

The validity of each cluster solution is assessed by comparing the actual group membership (as indicated by the cluster membership) for each enumeration area with the group membership predicted by the discriminant analysis. If the posterior probability is less than the conditional probability for an individual enumeration area then that enumeration area is misclassified. Conversely, if the posterior probability exceeds the conditional probability for an individual enumeration area then the actual group membership for that enumeration area is identical to the predicted group membership and the case is therefore classified correctly.

3.7 Socio-Economic Characteristics of Aged Spaces

A simple methodology, utilizing information from the previously performed Principal Components Analysis (PCA) is used to re-define the elderly populations of each city using different data: 3 percent Public Use Microdata (PUMF). Information from the PCA for each city, specifically which variables load highly on each old-age family status factor, is used to define identical elderly populations from the PUMF data. In Halifax for example, two elderly populations are distinguishable, each corresponding to one of the two old-age family status factors previously derived by the PCA for that city. The first of these populations is described by the ***Old Widows*** old-age family status factor and is comprised of widowed individuals aged 85 and over. The elderly population described by the second old-age family status factor, the ***Young/Middle-aged Widows*** factor, is made up of individuals that are widowed and individuals aged 65 - 84 years. Identical populations, one consisting of widows aged 85 and over and the second, consisting of widowed individuals in the 65 - 84 age range, are defined from the PUMF data for Halifax. The old-age family status factors thus defined from the PUMF data are identical to the elderly populations identified by the PCA. The same methodology is used to identify the elderly populations, based on the respective old-age family status factors, of Victoria and Kitchener-Waterloo.

With regard to the PUMF data it should be noted that it is comprised of individual rather than areal data. That is, each case refers to a single respondent and the variables describe the characteristics of that individual, rather than the attributes of a specific census tract or enumeration area. What is more, unlike the enumeration area data, data in the public use microdata file is not georeferenced. It is not therefore possible to determine in which census tract or enumeration area a specific case (in this instance an individual respondent) is located. Concomitantly, it is not possible to directly link particular elderly individuals and therefore populations with specific aged spaces (because aged spaces are comprised of modified clusters of enumeration areas).

In order to link the elderly populations defined using the PUMF data with the aged spaces it is assumed that the elderly populations and aged spaces that share the same characteristics, which in turn are defined on the basis of the variables that load highly on each old-age family status factor, are linked. For example, on the basis of information from the PCA for Halifax, two elderly groups, elderly widows and old-old widows, can be identified from the 3 percent data. The first of these two groups consists of widowed individuals aged 65 - 84; whereas the second population is comprised of widows aged 85 and over. From the PCA and cluster analysis a number of aged spaces characterized for example, by a relative concentration of the ***Old Widows*** old-age family status factor (or a population aged 85 and over and widowed) were produced independently, using the enumeration data. Although it is not possible to ascertain which old widowed individual/s are located in a particular aged space, it is assumed that the old widowed population (defined from the 3 percent data) in Halifax is located in the aged spaces defined on the basis of the ***Old Widows*** old-age family status factor. However, because there is no way of knowing which old widowed individuals live in which specific aged spaces, it is only feasible to assume that the old widowed population is associated with all the aged spaces defined on the basis of the ***Old Widows*** family status factor.

Chapter 4

Selected Socio-Economic Characteristics of the Elderly Populations of Kitchener-Waterloo, Victoria and Halifax

In the following chapter selected socio-economic and demographic characteristics of the elderly populations of Kitchener-Waterloo, Halifax and Victoria are described. For the purposes of this chapter alone, the elderly population is defined as 55 and over and is divided into seven age groups: 55 - 59, 60 - 64, 65 - 69, 70 - 74, 75 - 79, 80 - 84 and 85 and over. In describing the socio-economic and demographic structure of the 55 and over population it is hoped to highlight demographic, social or economic attributes that might segment the elderly population and therefore differentiate old-age family status factors (see section 2.5: 33), contribute to aged residential segregation and ultimately aid the formation of aged spaces. The identification of multiple old-age components in each individual city and the joint analysis of all three cities (see section 3.6: 65) indicates that the elderly population is indeed internally heterogeneous and that both the traditional three axis model of urban social structure (Shevky and Bell 1955) and the identification of a separate 'Age' axis (Davies and Murdie 1991) do not adequately describe the contemporary elderly population. Secondly, the limited description of the elderly populations of Kitchener-Waterloo, Halifax and Victoria outlined in this chapter also provide some background to the later identification of aged spaces in each city.

4.1 Age Distribution

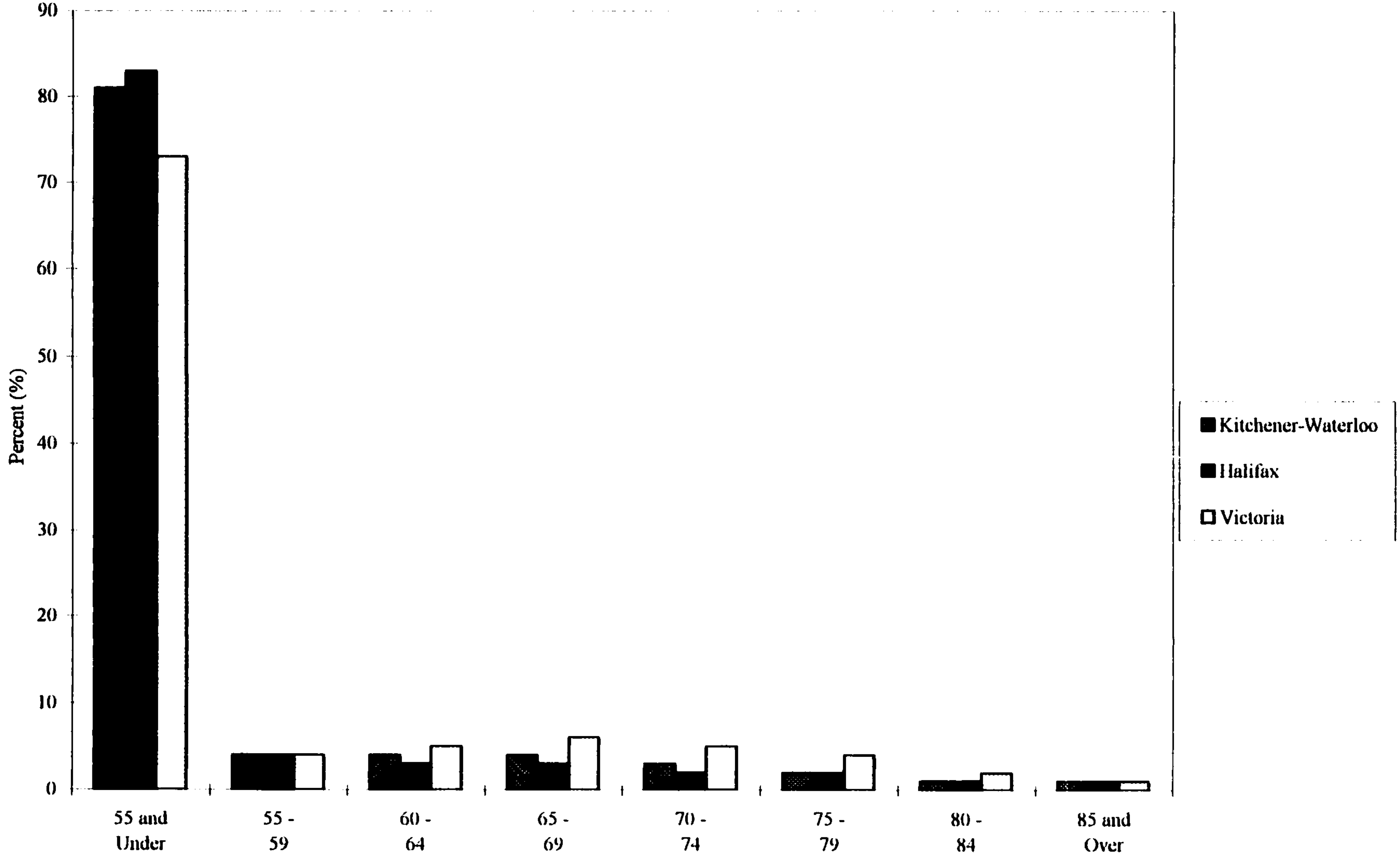
The proportion of each city's population aged 55 - 59, 60 - 64, 65 - 69, 70 - 74, 75 - 79, 80 - 84 and 85 and over is shown in Table 4.1 and Figure 4.1. In Kitchener-Waterloo and Halifax the population aged under 55 and the youngest elderly age groups, 55 - 74, are the largest; whereas the oldest elderly, especially the old elderly age groups are the smallest. Table 4.1 for example shows that in Halifax 4 percent of the city's population is aged 55 - 59, 3 percent 60 - 64 and 65 - 69, 2 percent 70 -74 and 75 - 79 and 1 percent 85 and over.

Table 4.1: The Age Distribution of the 55 and Over Population in Halifax, Victoria and Kitchener-Waterloo

	Kitchener-Waterloo (%)	**Halifax** (%)	**Victoria** (%)
55 and Under	81	83	73
55 - 59	4	4	4
60 - 64	4	3	5
65 - 69	4	4	6
70 - 74	3	2	5
75 - 79	2	2	4
80 - 84	1	1	2
85 and Over	1	1	1

In Victoria, although the same decline in population size with increasing age is apparent, the population aged 55 and under is smaller than the equivalent populations of

Figure 4.1: Age Distribution of the 55 and Over Population in Halifax, Kitchener-Waterloo and Victoria



Halifax and Kitchener-Waterloo and each respective elderly age group is therefore proportionately larger than in Halifax and Kitchener-Waterloo, with the exception of the 80 - 84 and 85 and over age groups (Table 4.1 and Figure 4.1). For example in Victoria, 5 percent of the population is aged 60 - 64 and 70 - 74, 6 percent 65 - 69 and 4 percent 75 - 79. Both the slightly younger population (only 73 percent is aged under 55, as opposed to 81 and 83 percent in Kitchener-Waterloo and Halifax respectively) and the larger proportions of the 'young' elderly or pre-elderly in Victoria, compared to the other two cities, is in keeping with Victoria's reputation as a retirement destination.

The small size of the oldest elderly age groups (80 - 84 and 85 and over) in particular suggest that advanced chronological age may serve to segregate the oldest elderly not only from the non-elderly population, but also from the younger elderly population, particularly as the oldest elderly are more likely to be institutionalized than the younger elderly (Cohen *et al.* 1986; Foley *et al.* 1992; Shapiro and Tate 1986). As such advanced age may be one of characteristics that differentiates old-age dimensions and identifies and distinguishes aged spaces.

4.2 Age Distribution and Gender

The gendered character of the elderly population, exemplified by Table 4.2, whether the elderly population is defined as 55 and over or 65 and over, is of course well known. The imbalance in the proportions of each successively older group that are male and female is primarily caused by changes in the mortality of men and women, especially increases in life expectancy among women and historical events, particularly world wars, that are often gender specific (Stone and Frenken 1986). For example, the cohort that turned 80 during the 1970's was exposed to the high and gender specific mortality rates of the First World War. Therefore, that 'old elderly' cohort is essentially female, partly as a consequence of different mortality rates but also because of the First World War.

Table 4.2 shows that regardless of city, the percent of each age group that is

Table 4.2 Gender by Age for Halifax, Victoria and Kitchener-Waterloo

	Female (%)	Male (%)
Kitchener-Waterloo		
55 and under	50	50
55 - 59	52	48
60 - 64	51	49
65 - 69	53	47
70 - 74	62	38
75 - 79	57	43
80 - 84	64	36
85 and over	70	30
Halifax		
55 and under	51	49
55 - 59	52	48
60 - 64	51	49
65 - 69	55	45
70 - 74	58	42
75 - 79	61	39
80 - 84	59	41
85 and over	78	22
Victoria		
55 and under	50	50
55 - 59	53	47
60 - 64	53	47
65 - 69	53	47
70 - 74	59	41
75 - 79	62	38
80 - 84	62	38
85 and over	66	34

female increases with age. Thus, the percentage of the population aged 85 and over that is female is greater that the percentage of the 65 - 69 age group that is female. For example in Halifax, 55 percent of the 65 - 69 age group is female; whereas 59 and 79 percent of the 80 - 84 and 85 and over age groups respectively are female (Figure 4.2a); whereas in Victoria 53, 62 and 64 percent of the same age groups are female (Figure 4.2b). Among younger age groups the proportion of males and females is much less skewed. In Kitchener-Waterloo, 52 percent of the 55 - 59 age group and 51 percent of the 60 - 64 age group is female (Figure 4.2c).

Given the significant differences that exist in the proportion of the oldest elderly and the rest of the 55 and over population that is female, it seems reasonable to suggest that gender may be a source of segregation amongst the elderly. It is also suggested that gender, especially the proportion of the population that is female, will be one of the variables that load highly on the old-age dimensions derived by the PCA and ultimately distinguish aged spaces.

4.3 Marital Status

In terms of the proportion of each age group that is either married, widowed, never married/single or divorced, Table 4.3 shows married and widowed are the two most significant. The proportions of each age group that are either single or divorced are comparatively small and in general do not vary across age groups. This suggests that marital status, particularly the proportion of the population that is either married or widowed, could differentiate aged spaces. Given that the largest percentage of the old elderly population is female, that women tend to outlive their husbands and advanced

Figure 4.2a: Percent Female by Age Group, Halifax

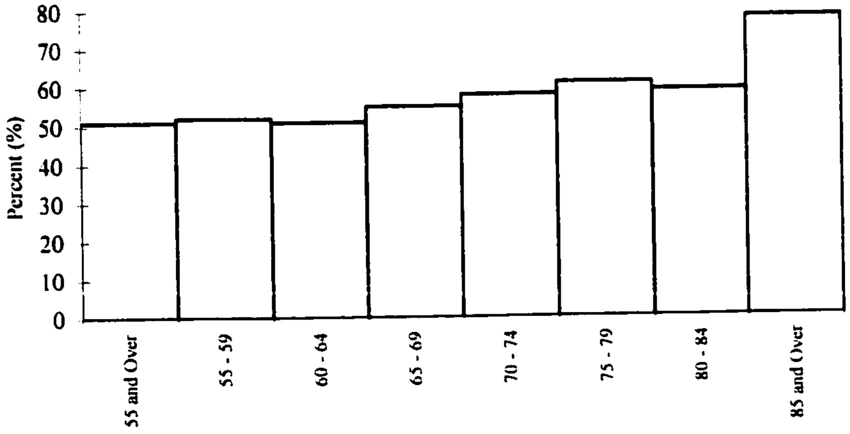


Figure 4.1b: Percent Female by Age Group, Victoria

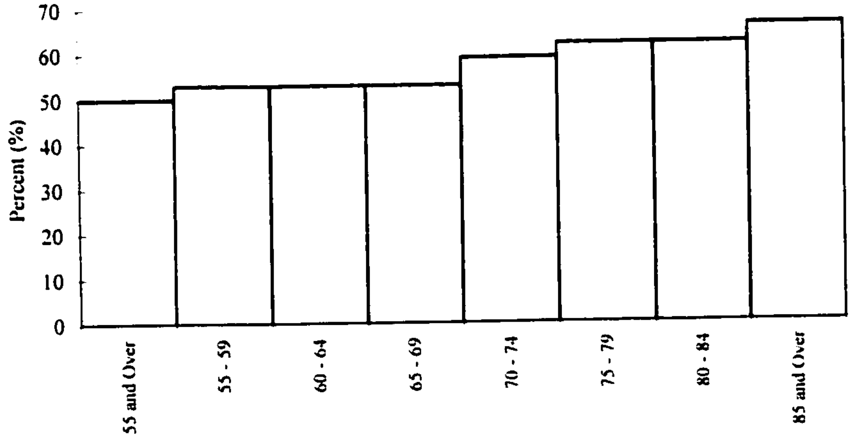
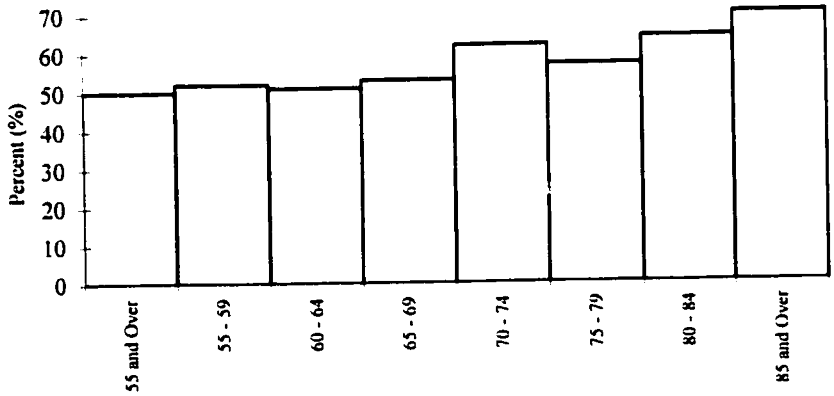


Figure 4.2c: Percent Female by Age Group, Kitchener-Waterloo



age has already been suggested as one possible variable that might lead to the formation of aged spaces, it is suggested that aged spaces defined on the basis of advanced age

Table 4.3: Marital Status by Age Group for the 55 and Over Population in Halifax, Victoria and Kitchener-Waterloo

	Never Married (%)	Married (%)	Widowed (%)	Divorced (%)
Kitchener-Waterloo				
55 and under	52	41	0	4 *
55 - 59	2	79	9	6
60 - 64	4	81	9	5
65 - 69	4	71	18	5
70 - 74	5	65	28	1
75 - 79	4	56	36	2
80 - 84	7	45	46	2
85 and over	7	32	60	0
Halifax				
55 and under	54	39	0	4
55 - 59	4	76	10	8
60 - 64	7	72	12	8
65 - 69	6	69	17	6
70 - 74	10	52	33	3
75 - 79	8	50	41	1
80 - 84	13	27	55	3
85 and over	10	26	62	0
Victoria				
55 and under	53	37	1	7
55 - 59	3	73	8	12
60 - 64	4	74	8	11
65 - 69	4	73	16	5
70 - 74	4	66	22	6
75 - 79	4	58	32	5
80 - 84	7	44	44	4
85 and over	9	24	62	2

* Please note that row totals do not sum to 100 percent because only four out of five possible responses were considered. The response legally married but separated was omitted from the analysis.

might also be differentiated on the basis of widowhood. Aged spaces on the other hand distinguished by a younger elderly population could also be identified on the basis of a relative concentration of a married population.

As far as the proportions of each age group that is married or widowed are concerned, three different trends are detectable (Figure 4.3a, 4.3b and 4.3c). First, as age increases the proportion of each successively older age group that is married decreases, while the proportion that is widowed increases; second, the proportion of the 55 - 59. 60 - 64 and 65 - 69 age groups that are either married or divorced are relatively constant and third, the proportion of the 55 and over age group that is married decreases and the percentage that is widowed increases markedly first for the 70 - 74 age group and then for the 80 - 84 or 85 and over groups.

4.4 Household Size

Table 4.4 shows that the proportion of each age group living in one or two person households is greatest for the older age groups. For example. 46 and 62 percent of the 80 - 84 and 85 and over age groups in Victoria live in single person households. compared to 13 percent of the 55 - 59 age group and 16 percent of the 60 - 64 age group (Table 4.4). The proportion of each age group living in larger 4 or 5 person households in contrast is much smaller and remains relatively constant as age increases. The percentage of the 85 and over older age group living as part of a four or five person households in Kitchener-Waterloo, is 3 percent in both cases (Table 4.4). The equivalent percentages of the 60 - 64 age group living in five or six person households

Figure 4.3a: Percent Married/Widowed by Age Group, Kitchener-Waterloo

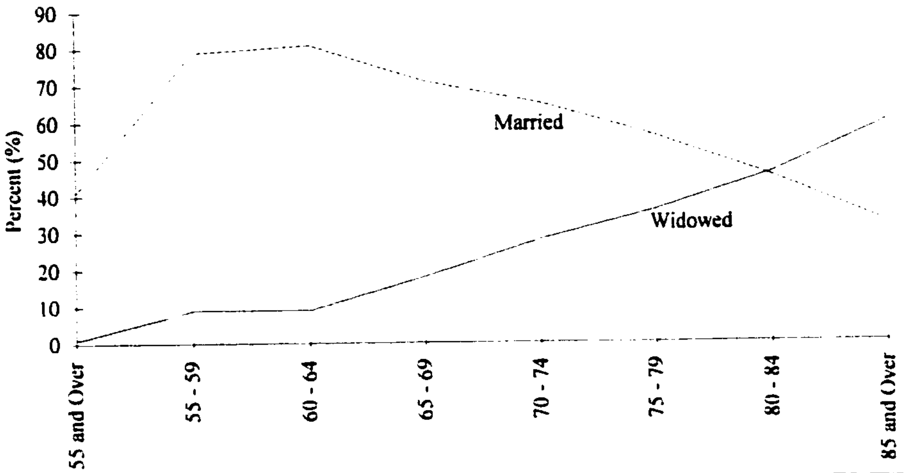


Figure 4.3b: Percent Married/Widowed by Age Group, Halifax

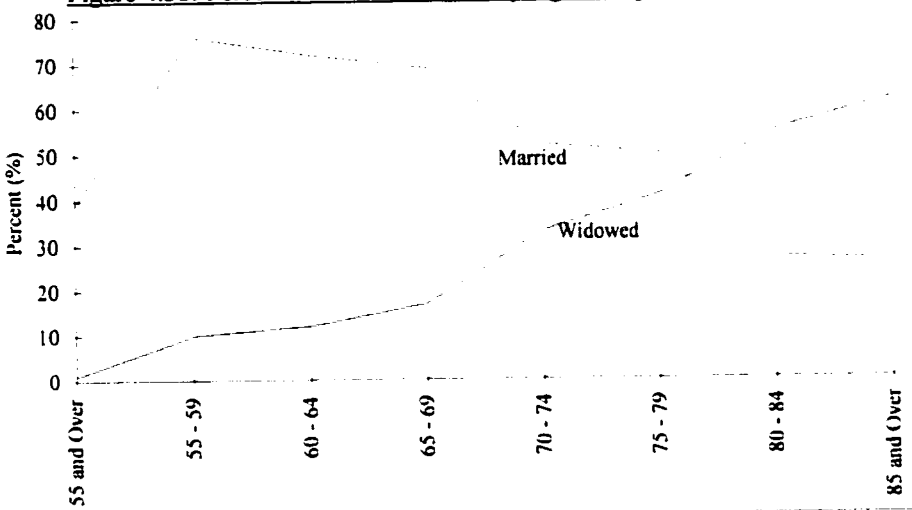
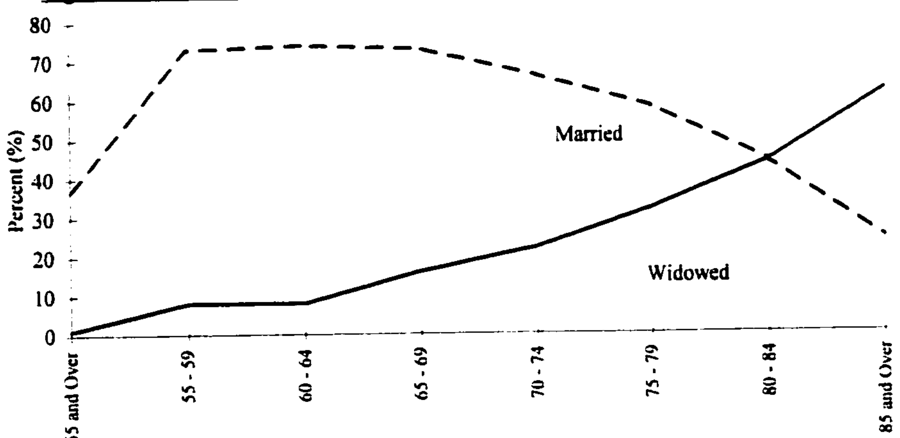


Figure 4.3c: Percent Married/Widowed by Age Group, Victoria



in Kitchener-Waterloo are 7 and 2 (Table 4.4). The proportion of each age group living in four or five person households is only significantly larger for the population aged 55 and under. In Victoria, 30 and 13 percent of the population 55 and under lives in four

Table 4.4: Household Size by Age Group in Halifax, Victoria and Kitchener-Waterloo

	One Person (%)	Two Persons (%)	Three Persons (%)	Four Persons (%)	Five Persons (%)
Kitchener-Waterloo					
55 and under	5	16	21	33	17 *
55 - 59	10	46	26	12	4
60 - 64	11	59	20	7	2
65 - 69	23	59	10	4	2
70 - 74	22	63	7	3	5
75 - 79	35	54	4	3	2
80 - 84	36	50	8	2	5
85 and over	55	26	10	3	3
Halifax					
55 and under	6	20	23	32	15
55 - 59	11	42	25	14	4
60 - 64	17	46	23	8	3
65 - 69	18	55	17	6	2
70 - 74	32	48	13	3	3
75 - 79	29	52	8	5	4
80 - 84	46	28	12	3	6
85 and over	41	32	13	9	4
Victoria					
55 and under	8	22	22	30	13
55 - 59	13	51	21	9	3
60 - 64	16	66	13	4	1
65 - 69	19	67	10	3	1
70 - 74	27	64	5	1	2
75 - 79	33	58	6	1	1
80 - 84	46	47	4	2	1
85 and over	62	28	7	1	0

* Please note row totals may not sum to 100 percent because of rounding.

and five person households respectively; whereas 32 and 15 percent of the same population live in four or five person households in Halifax and 33 and 17 percent live in four or five person households in Kitchener-Waterloo.

The differences in the proportion of each age group living in different sized households highlighted in Table 4.4 show that household size distinguishes the 55 and under population and the old elderly population once more. The 55 and under population is concentrated in four or five person households, whereas the 80 - 84 and 85 and over age groups are concentrated in single person or two person households. Such a division obviously reflects the increased likelihood that individuals aged 55 and under are part of families containing children. Older individuals are more likely to live in households that do not contain children or live in single person households. Therefore, household size may aid the formation of aged spaces. Aged spaces may be formed on the basis of the disproportionately large percentages of the 55 and under population and 55 - 59 age group that live in large households (perhaps non-aged or young elderly aged spaces) and the significantly large proportions of the oldest elderly who live in two or single person households.

The final three socio-economic attributes of the 55 and over population considered, while illustrating age group differences in average income, ethnic origin and mobility, do not and cannot contribute to the formation of aged spaces (because the data (enumeration area) used to identify aged spaces does not contain these variables). Nevertheless, average income, ethnic origin and mobility may differentiate the populations of aged spaces. Consequently, average income, ethnic origin and mobility are included in the present discussion. Average income is selected because of the social and policy concerns generated by the so-called 'feminization of poverty' (Gee and Kimball 1987: 54-58; Minkler and Stone 1985) and the already mentioned fears surrounding the costs of maintaining old-age benefits in the face of a rapidly growing elderly population. Ethnic origin is discussed because of the unique and different ethnic composition of two of the study areas: Kitchener-Waterloo and Victoria and residential mobility is considered worthy of inclusion because aging-in-place (the lack of mobility) plays an important role in determining the intra-urban spatial distribution of the elderly.

4.5 Average Income by Age Group

Changes in average income from all sources (total income from wages and salaries; Old Age Security, Guaranteed Income Supplement and Spouses' Allowances; retirement pensions, superannuation, annuities and RRSPs; Canada or Quebec Pension Plan (including retirement pensions, survivors' pensions and disability pensions); investments, savings certificates, bonds and dividends on stocks; Family Allowances; Federal Child Tax Credit; benefits from Unemployment Insurance; net farm self-employment income; net non-farm self employment income and income from other Government sources); wages and salaries; retirement pensions, superannuation, annuities and Registered Retirement Savings Plan (RRSPs); OAS/GIS (income from Old Age Security (OAS), Guaranteed Income Supplement (GIS) and Spouses' Allowances (SA)) with age are shown in Table 4.5.

Table 4.5: Average Income ($) by Age Group in Halifax, Victoria and Kitchener-Waterloo

	Total Average Income *	Wages & Salaries	Retirement Pensions**	Investment	OAS/GIS	Canada/ Quebec Pension Plan
Kitchener-Waterloo						
55 and under	23368	19900	84	635	0	57
55 - 59	28022	20035	570	3149	0	497
60 - 64	23094	12166	2789	3817	236	1396
65 - 69	21657	4270	3825	3628	3807	3315
70 - 74	20745	1420	3808	6306	4928	3125
75 - 79	20858	1644	3227	6651	5081	3189
80 - 84	17106	481	1534	6006	5602	2263
85 and over	18067	867	1096	7134	6200	1309
Halifax						
55 and under	21581	18565	164	482	0	83
55 - 59	25414	18865	2014	1801	0	653
60 - 64	22369	11567	4239	2627	368	1598
65 - 69	22235	4789	5282	3174	4356	2986
70 - 74	20434	1418	4021	5216	5645	2928
75 - 79	20798	1235	4605	5193	5410	2639
80 - 84	14847	120	2503	2910	6350	2016
85 and over	13527	306	1566	2352	7256	790
Victoria						
55 and under	22943	18796	169	726	0	64
55 - 59	26998	17252	2728	2752	0	428
60 - 64	24127	9900	5248	4080	219	1609
65 - 69	25316	3072	6926	5983	3523	3648
70 - 74	23419	1110	6302	6167	4881	3246
75 - 79	22898	1053	4909	7608	5025	2553
80 - 84	19568	101	4431	6166	5156	2302
85 and over	20967	1083	3906	7282	5874	1308

* Total average income is not the sum of the individual totals for wages & salaries, retirement pensions, investment, OAS/GIS and the Canada/Quebec Pension Plan. The figure reported for Total Average Income is calculated using the separate variable TOTINCP (see Table 3.2).

** Total average income from retirement pensions includes private retirement pensions, superannuation, annuities and Registered Retirement Savings Plan (RRSPs).

Considering each source of income in turn, average income from wages and salaries, as well as total average income both generally decline as age increases, the exception being in Victoria where average income and average income from wages and salaries remain relatively constant with increasing age (Table 4.5). Both total average income and average income from wages and salaries is highest for the youngest age groups and lowest for the oldest age groups (Table 4.5). For example, average income declines from $28 022 for the 55 - 59 age group in Kitchener-Waterloo to $20 745 for the 70 -74 age group in that city. Average income from wages and salaries is obviously highest for the pre-retirement age groups, assuming that retirement occurs at 65. Table 4.5 shows that the greatest decline in average income from wages and salaries occurs for the 65 - 69 age group in Halifax and Kitchener-Waterloo and for the 60 - 64 age group in Victoria, perhaps reflecting the greater number of individuals in that city who opted for early retirement.

Average income from the Canada/Quebec Pension Plan (CPP), retirement pensions etc. and investments more or less increase with age and then decline, particularly for the oldest elderly (Table 4.5). In Halifax for example, average income from retirement pensions etc. declines from $5 282 for the 65 - 69 age group to $2 503 for the 80 - 84 age group and then declines further to $1 566 for the 85 and over age group. Average income for the same age groups in Halifax is $3 174, $2 910 and $2 352 respectively. Table 4.5 also shows that average income from the CPP declines dramatically for the 85 and over age group. Average income from the CPP for the oldest elderly is $1 309 in Kitchener-Waterloo, $790 in Halifax and $1 308 in Victoria. For the

80 - 84 age group the equivalent figures are $2 263, $2 016 and $2 302. Such a drop in average income from the CPP for the oldest elderly is the result of their not being eligible to receive benefits, principally because the oldest elderly did not necessarily contribute to the CPP, or contributed only small amounts.

Finally, average income from Old Age Security (OAS), Guaranteed Income Supplement (GIS) and Spouses' Allowances (SA) (OAS/GIS) is lowest for the young elderly age groups and highest for the oldest elderly. The 55 and under population and the 55 - 59 age group are not eligible to receive GIS, OAS or SA. In Halifax for example, average income from OAS/GIS increases from $4 356 for the 65 - 69 age group to $5 410 for the 75 - 79 age group and $7 256 for the 85 and over population.

4.6 Ethnic Origin

With regard to ethnic origin it should be noted that problems interpreting multiple responses i.e., persons who claim membership of two ethnic groups and the small number of observations in many multiple response categories resulted in only single responses, individuals who provide one ethnic origin, being included in the analysis. The ethnic origin of the elderly population is considered for two reasons: (1) recent changes in the source areas of immigrants and subsequent changes in the composition of the immigrant population, especially the marked increase in the percentage of immigrants from Asia and Africa (Beaujot 1991), suggest that the ethnic composition of the urban elderly population will change significantly in the near future and that the current ethnic 'homogeneity' of the elderly population will disappear and (2) all three cities studied have different 'ethnic' flavours: Victoria for example, is very 'British'; whereas Kitchener-Waterloo is of course famous for its German heritage.

Table 4.6 shows that the largest proportions of each age group in Kitchener-

Table 4.6: Ethnic Origin by Age Group in Halifax, Victoria and Kitchener-Waterloo

	British (%)	French (%)	German (%)
Kitchener-Waterloo			
55 and under	21	2	9 *
55 - 59	28	3	22
60 - 64	29	2	24
65 - 69	31	3	21
70 - 74	33	1	19
75 - 79	32	1	32
80 - 84	27	0	32
85 and over	34	0	29
Halifax			
55 and under	38	5	2
55 - 59	48	7	4
60 - 64	51	4	4
65 - 69	55	6	2
70 - 74	50	7	5
75 - 79	52	7	3
80 - 84	52	9	2
85 and over	48	15	6
Victoria			
55 and under	28	2	2
55 - 59	48	3	7
60 - 64	42	2	9
65 - 69	49	2	6
70 - 74	61	2	3
75 - 79	58	1	5
80 - 84	61	1	3
85 and over	68	3	3

* Please note that row totals will not sum to 100 percent because results for only three ethnic groups are reported.

Waterloo, Halifax and Victoria, with the exception of the 55 and under population, are of British ethnic origin and that the proportion of each age group that is British increases as age increases, obviously reflecting past immigration streams. In Victoria for example, 48 percent of the 55 - 59 age group, 61 percent of 70 - 74 age group and 68 percent of the 85 and over age group is 'British'. In comparison, only 28 percent of the 55 and under population in Victoria is of British ethnic origin, a reflection of changes in recent immigration.

Of the two other ethnic origin categories considered, only in Kitchener-Waterloo do individuals of German ethnic origin (a reflection of Kitchener-Waterloo's German heritage) comprise a relatively large proportion of each age group, once again with the exception of the 55 and under population (Table 4.6). Less than 10 percent of the population aged under 55 is of German origin, compared to 21 percent of 65 - 69 age group and 32 percent of the 75 - 79 and 80 - 84 age groups.

4.7 Mobility Status (1 Year)

The residential inertia of 55 and over population in general and older age groups in particular noted in the literature on elderly residential mobility (Gutowski and Feild 1979; Golant 1972, 1975; Hiltner and Smith 1974; Kimmich and Gutowski 1983; Kennedy and DeJong 1977) is confirmed by Table 4.7. In all three cities the largest proportion of each age group, including the 55 and under population, did not move in the period June 1990 to June 1991. For example, in Kitchener-Waterloo Table 4.7 shows that 81 percent of the population aged 55 and under did not move, compared to over 90 percent of the remaining age groups. Much smaller proportions, 17 percent of the population aged 55 and under and less than 10 percent of each age group made intraprovincial moves. Of the remaining two categories, external moves and interprovincial moves, extremely small proportions, under 2 percent, of each age group

Table 4.7: Mobility Status (1 Year) by Age Group in Halifax, Victoria and Kitchener-Waterloo

	Non-Movers (%)	Intraprovincial Movers (%)	Interprovincial Movers (%)	External Movers (%)
Kitchener-Waterloo				
55 and under	81	17	1	1
55 - 59	93	7	0	0
60 - 64	95	5	0	0
65 - 69	94	5	0	1
70 - 74	92	6	0	1
75 - 79	96	4	0	0
80 - 84	92	7	0	0
85 and over	92	7	1	0
Halifax				
55 and under	78	18	3	1
55 - 59	93	6	0	0
60 - 64	93	6	0	0
65 - 69	96	3	1	0
70 - 74	95	5	0	0
75 - 79	94	5	1	0
80 - 84	96	4	0	0
85 and over	99	1	0	0
Victoria				
55 and under	74	21	4	1
55 - 59	86	11	2	1
60 - 64	90	7	3	1
65 - 69	90	9	1	0
70 - 74	91	7	2	0
75 - 79	89	9	2	0
80 - 84	90	7	1	2
85 and over	96	4	0	0

* Please note that the row totals may not sum to 100 percent because of rounding.

made external moves (moves to Canada from another country) in Kitchener-Waterloo, Halifax and Victoria. Slightly higher proportions, particularly in Victoria, of the 55 - 59 and 60 - 64 age groups made interprovincial moves between June 1990 and June 1991. For example, 2 percent of the 55 - 59 age group in Victoria made interprovincial moves, compared to none of the same age group in both Kitchener-Waterloo and Halifax.

4.8 Inter-City Variations in Selected Socio-Economic Characteristics of the Elderly Populations of Kitchener-Waterloo, Victoria and Halifax

As far as inter-city variations in marital status (at least with respect to the percent of the population that are either married or widowed), gender and age distribution are concerned Tables 4.1, 4.2 and 4.3 show only small differences between Halifax, Kitchener-Waterloo and Victoria. Table 4.2 for example shows that in Halifax, Victoria and Kitchener-Waterloo approximately half the 55 and over population is female and half is male. Among the 70 - 74 age group approximately 60 percent is female and 40 percent is male. Table 4.3 likewise shows that the proportion of each age group that is either married or widowed does not vary between Halifax, Victoria and Kitchener-Waterloo.

In contrast, the age distribution of the 55 and over population of Victoria is somewhat different from that of the other two cities. The population aged 55 and over accounts for 27 percent of the total population of Victoria; whereas approximately 17 percent of the population of both Halifax and Kitchener-Waterloo is aged over 55. Accordingly Table 4.1 shows that slightly higher percentages of the population of

Victoria are aged 60 - 64, 65 - 69 and 70 - 74 than are the populations of Halifax and Kitchener-Waterloo. Five percent of the population of Victoria is aged 60 - 64, 6 percent 65 - 69 and 5 percent 70 - 74. The equivalent figures for Kitchener-Waterloo are 4, 4 and 3 percent respectively. In Halifax 3 percent of the population is aged 60 - 64, 4 percent 65 - 69 and 2 percent 70 - 74.

Compared to the lack of inter-city variation in age distribution and more so marital status and gender; household size, average income from retirement pensions etc. (private retirement pensions, superannuation, annuities and Registered Retirement Savings Plan (RRSPs)) and investments, mobility status and ethnic origin do vary between all three cities. As already suggested Victoria's popularity as a retirement destination and the characteristics of the (primarily early) retirees who select Victoria as a place to retire probably explains the higher proportions of the 60 - 64, 65 - 69 and 70 - 74 age groups in the city that live in two person household, compared to the proportions of the same age groups in Halifax and Kitchener-Waterloo who live in two person households. In Victoria Table 4.4 shows that 66 percent of the 60 - 64 age group live in two person households; whereas 46 and 59 percent of the same age group live in households containing two persons in Halifax and Kitchener-Waterloo respectively. Among the 65 - 69 age group in Victoria 67 percent reside in two person households, compared to 55 percent in Halifax and 59 percent in Kitchener-Waterloo. Almost 65 percent of the 70 - 74 age group in Victoria and 63 percent in Kitchener-Waterloo live in households containing two people; whereas only 48 percent of the 70 - 74 age group in Halifax live in two person households. Victoria's popularity as a retirement destination also explains the higher proportion of each age group, compared to Kitchener-Waterloo and Halifax, that made intraprovincial and, to a lesser extent, interprovincial moves in the June 1990 - June 1991 period. In Kitchener-Waterloo only 4 percent of the 75 - 79 age group made intraprovincial moves, compared to 5 percent in Halifax and 9 percent in Victoria. Among the 85 and over age group 7 percent in both Victoria and Kitchener-Waterloo made an intraprovincial move between June 1990 and June 1991; whereas only 1 percent of the 85 and over age group in Halifax made an intraprovincial move.

Table 4.6 shows that while significant differences in ethnic origin do not exist between age groups on an individual city basis, significant differences do exist between Halifax, Kitchener-Waterloo and Victoria in terms of the proportion of each population that is British, German or French. In Kitchener-Waterloo almost equal proportions of each age group are either German or British. For example, 32 percent of the 75 - 79 age group is German and the same proportion is British. Among the 80 - 84 age group 27 percent claim British ethnicity, compared to 32 percent claiming German ethnicity. Only 3 percent of the 75 - 79 age group in Halifax and 3 percent of the same age group in Victoria is German. Equally small, 3 percent, of the 80 - 84 age group in Victoria and Halifax are German. If Kitchener-Waterloo is distinguished from Victoria and Halifax by a population that is predominately German, then Victoria and, to a lesser degree Halifax, are distinguished by populations that are essentially British. In Halifax Table 4.2 shows that over half of each age group, with the exceptions of the 55 and under population, the 55 - 59 and 85 and over age groups, are British. In Victoria over 60 percent of the 70 - 74, 75 - 79, 80 - 84 and 85 and over age groups are British. Approximately half of the 55 - 59 and 65 - 69 age groups are also British.

In terms of average income from two sources, OAS/GIS and the Canada/Quebec Pension Plan, Table 4.5 shows that inter-urban variations are small. Variations in total average income, with the exceptions of the 80 - 84 and 85 and over age groups, are also small. For the 80 - 84 and 85 and over age groups Table 4.5 shows that in Halifax total average income is just $14 847 for the 80 - 84 age group and $13 527 for the 85 and over population. In Victoria total average income for the 80 - 84 age group is $19 568 and $20 967 for the 85 and over group. Average income from investments and retirement pensions etc. (private retirement pensions, superannuation, annuities and Registered Retirement Savings Plan (RRSPs)) is highest in Victoria and lowest in Halifax. Differences between Halifax and Victoria in average income from investments and retirement pensions etc. again is most noticeable for the 80 - 84 and 85 and over age groups. For example, the 85 and age group in Victoria earns an average of $7 282 from investments, compared to just $2 352 for the 85 and over age group in Halifax. Likewise, the 80 - 84 age group in Halifax earns only $1 566 from retirement pensions etc.; whereas the same age group in Victoria earns an average of $4 431 from retirement pensions etc.

4.9 Summary

Inter-city comparisons between Halifax, Victoria and Kitchener-Waterloo reveal that there are both similarities and differences in terms of ethnic origin, average income from investments, average income from retirement pensions, superannuation, annuities and RRSPs, household size, especially the proportion of individuals living in two person households and mobility status, particularly the percentage of people making intraprovincial and interprovincial moves. In terms of average income from investments and retirement pensions, superannuation, annuities and RRSPs, the proportion of individuals living in two person households and the percentage of intraprovincial movers Victoria stands out from both Halifax and Kitchener-Waterloo. Considering only average income from investments and retirement pensions, superannuation, annuities and RRSPs, Halifax is distinct from Kitchener-Waterloo and Victoria in that average income from both sources is much lower in Halifax than in the other two cities.

The analysis of selected socio-economic and demographic characteristics of the elderly populations (in this chapter defined as the population aged 55 and over) of Victoria, Kitchener-Waterloo and Halifax shows that age, gender, marital status and household size may segment the elderly population and differentiate old-age family status dimensions aged spaces. Specifically, being widowed or married, female, living in one or two person households and being 85 and over may distinguish old-age components and contribute to the formation of aged spaces in each city.

Chapter 5

Aged Residential Segregation

In the following chapter the results of the analysis of aged residential segregation in Kitchener-Waterloo, Halifax and Victoria are discussed. For comparison, the results of the analysis of aged residential segregation for all three cities, or the joint analysis, are also reported. Three aspects of aged residential segregation are measured: (1) how evenly the total elderly population, the young, middle-aged and old groups are distributed compared to the non-elderly and elderly populations; (2) the overall level of elderly concentration, measured for the population aged 65 and over and the young, middle-aged and old elderly groups; the area-specific concentration of the same age groups and (3) the degree to which each elderly age group and the total elderly population are concentrated in the central area of each city. The index of dissimilarity, the coefficient of localization, the location quotient and the central city ratio respectively are used to measure how evenly the elderly are distributed, the overall level of concentration, variations in the area-specific concentration of the elderly and the extent to which the elderly are concentrated in the central area of city. Enumeration areas are used as the unit of analysis.

It is suggested that the level of aged residential segregation indicates the extent to which the elderly population may be concentrated in aged spaces. An unevenly distributed or highly segregated elderly population, high levels of both city wide and area-specific concentration and high levels of centralization indicate that the elderly population is more likely to be spatially concentrated and clustered (possibly in aged spaces), than an elderly population that is relatively evenly distributed and not spatially concentrated. High levels of enumeration area-specific concentration, as measured by the location quotient, also indicate that an individual enumeration area is characterized by an extreme concentration of the elderly, suggesting perhaps that it could be an aged space.

5.1 Evenness

The extent to which the four elderly populations (the total, young, middle-aged and old) are segregated from the non-elderly and, in the case of the young, middle-aged and old groups, the total elderly population, is measured using the index of dissimilarity (Tables 5.1 and 5.2). An elderly population is more segregated if it is unevenly distributed across an urban area. Evenness is maximized and segregation minimized when all the enumeration areas in an individual urban area contain the same relative proportions of a particular elderly population (65 and over population, young, middle-aged and old) and either the 65 and over or non-elderly. Evenness is minimized and segregation maximized when no enumeration area contains members of either the 65 and over or non-elderly population and a specific elderly age group.

On an individual city basis, a comparison of aged residential segregation for each age group relative to both the non-elderly and elderly populations shows (1) that each age group is more evenly distributed compared to the 65 and over population than the non-elderly population; (2) that aged residential segregation increases with age and (3) the total elderly population is more evenly distributed than the middle- aged and

Table 5.1: Index of Dissimilarity (%) for the Young, Middle-aged and Old Elderly Compared to the Non-Elderly

	Kitchener-Waterloo	Halifax	Victoria	Joint Analysis
Number of Enumeration Areas	323	172	150	646
65 and Over	39	29	35	38
Young Elderly	35	24	28	32
Middle-aged Elderly	46	36	40	45
Old Elderly	60	53	57	60

oldest elderly, but more segregated than the youngest elderly (Tables 5.1 and 5.2). First, with regard to differences in how evenly each elderly population is distributed compared to the non-elderly and elderly populations, Tables 5.1 and 5.2 show that in each individual city each elderly group is more evenly distributed or less segregated from the 65 and over population. In Victoria 28, 40 and 57 percent of the young, middle-aged and old elderly would have to be redistributed across the city in order that their respective distributions match that of the non-elderly population. In comparison only 14, 8 and 31 percent of the young, middle-aged and old elderly would have to be redistributed across Victoria in order that the distribution of each group match that of the elderly population. Second, of the three elderly groups, the oldest elderly are the most unevenly distributed; whereas the youngest elderly are the most evenly distributed, except in Victoria. In Halifax the level of aged segregation for the youngest and middle-aged elderly is 11 percent. The level of aged residential segregation increases to 34 percent for the

Table 5.2: Index of Dissimilarity (%) for the Young, Middle-aged and Old Elderly Compared to the Elderly

	Kitchener-Waterloo	Halifax	Victoria	Joint Analysis
Number of Enumeration Areas	323	172	150	646
Young Elderly	10	11	14	13
Middle-aged Elderly	13	11	8	11
Old Elderly	36	34	31	35

oldest elderly (Table 5.2). Third, the total elderly population is more evenly distributed than the middle-aged and oldest elderly, but more segregated than the youngest elderly. For example, in Kitchener-Waterloo the level of aged segregation for the total elderly population is 39 percent (Table 5.1). The level of aged segregation for the young elderly is 35 percent, with values of 46 and 60 percent for the middle-aged and old elderly respectively.

5.2 Concentration

Concentration is defined as the relative amount of physical space occupied by a population, in this case the elderly population or one of the three elderly age groups (young, middle-aged and old elderly), in an urban area, Kitchener-Waterloo, Halifax and Victoria (Massey and Denton 1988; Massey 1979). A population that occupies a small section of an urban area is considered to be more segregated than a population that occupies a large section of an urban area.

A comparison of the overall level of concentration of each elderly group in Kitchener-Waterloo, Halifax, Victoria and the joint analysis of all three cities shows that the levels of overall concentration for each age group are highest in Kitchener-Waterloo (Table 5.3). For the middle-aged elderly the overall level of concentration varies from a high of 42 percent in Kitchener-Waterloo to a low of 32 percent in Halifax and Victoria (Table 5.3). The overall level of concentration of the middle-aged elderly in the joint analysis is 40 percent.

Table 5.3 shows that the total elderly population is generally less concentrated than the middle-aged and old elderly, but more concentrated than the young elderly. The coefficient of localization for the oldest elderly and middle-aged elderly in Victoria for

Table 5.3: The Overall Level of Concentration (%) for the Total Elderly Population, the Young, Middle-aged and Old Elderly

	Kitchener-Waterloo	**Halifax**	**Victoria**	**Joint Analysis**
Number of Enumeration Areas	323	172	150	646
65 and Over Population	35	25	27	33
Young Elderly	31	20	33	27
Middle-aged Elderly	42	32	32	40
Old Elderly	56	49	46	56

example is 46 and 32 percent. For the youngest and total elderly populations the coefficient of localization is 33 and 32 percent respectively. In Kitchener-Waterloo, Halifax and the joint analysis the coefficient of localization for the young elderly is lower than the coefficient of localization for the total populations (Table 5.3). For example, for the joint analysis the coefficient of localization is 33 percent for the total elderly, compared to 27 for the young elderly. For Halifax the equivalent figures are 25 and 20 percent respectively.

Considering only the young, middle-aged and old elderly, the level of concentration increases in all cities and the joint analysis for each successively older elderly population (Table 5.3). The young elderly are therefore less concentrated than the old elderly. In the joint analysis the level of concentration increases from 27 percent for the young elderly to 40 percent for the middle-aged elderly and 56 percent for the old elderly. In Kitchener-Waterloo the equivalent figures are 31, 42 and 56 percent. The high levels of concentration exhibited by the oldest elderly possibly reflect the increased likelihood that the oldest elderly will be institutionalized and therefore concentrated in specific enumeration areas. The young and middle-aged elderly, in contrast, are more likely to live in their own homes and are therefore relatively unconcentrated.

The enumeration area area-specific concentration of the elderly population, as well as the young, middle-aged and old elderly age groups is measured using standardized location quotients. The analysis of the distribution of enumeration areas shows that regardless of city, the largest proportion of enumeration areas have a smaller share of each elderly population than each city as a whole (Table 5.4). Lower proportions of enumeration areas therefore have a relative concentration of each elderly population (Table 5.4). For example in Kitchener-Waterloo 93 percent of enumeration areas have a smaller proportion of the middle-aged elderly than the city as a whole;

Table 5.4: The Percent of Enumeration Areas with LQ < 1, LQ = 1 and LQ > 1

	LQ < 1	LQ = 1	LQ > 1
Kitchener-Waterloo			
65 and Over	93	1	6
Young Elderly	84	8	8
Middle-aged Elderly	93	1	6
Old Elderly	96	0	0
Halifax			
65 and Over	92	0	8
Young Elderly	89	4	7
Middle-aged Elderly	93	0	7
Old Elderly	94	0	0
Victoria			
65 and Over	85	3	12
Young Elderly	89	6	5
Middle-aged Elderly	84	5	11
Old Elderly	89	0	11
Joint Analysis			
65 and Over	90	3	7
Young Elderly	86	8	6
Middle-aged Elderly	90	2	8
Old Elderly	94	0	6

whereas only 8 percent of enumeration areas have a relative concentration of the middle-aged elderly. The same figures for the middle-aged elderly in Halifax are 93 and 7 percent (Table 5.4). For the old elderly 94 percent of enumeration areas in the joint analysis of Kitchener-Waterloo, Halifax and Victoria have a smaller share of that population than all three cities combined (Table 5.4). Only 6 percent of enumeration areas in the joint analysis have a relative concentration of the old elderly.

Table 5.4 shows that in general there is little variation between Kitchener-Waterloo, Halifax and Victoria in the proportion of enumeration areas with a smaller share of the total elderly, young elderly, middle-aged and old elderly populations. In Halifax for example, 92 percent of enumeration areas have a smaller share of the total elderly population than the City of Halifax as a whole (Table 5.4). The same figures for the young elderly, middle-aged and old elderly populations are 89, 93 and 94 percent respectively. A similarly high proportion (93 percent) of enumeration areas in Kitchener-Waterloo have a smaller share of the elderly population than the entire city; whereas 84, 93 and 96 percent of enumeration areas in Kitchener-Waterloo have a smaller share of the young elderly, middle-aged and old elderly populations respectively than the city as a whole.

Although considerably fewer in number, Table 5.4 also shows that there is little variation in the proportion of enumeration areas with a relative concentration (LQ > 1) of any elderly population. Across all three cities or the joint analysis for example, 7, 6, 8 and 6 percent of enumeration areas have a relative concentration of the elderly, young, middle-aged and old elderly populations respectively. In Halifax equally low proportions of enumeration areas have a relative concentration of the total elderly, young, middle-aged and old elderly populations are 8, 7, 7 and zero respectively (Table 5.4)

Finally, as age increases the proportion of enumeration areas with a smaller share of each elderly population increases, with the exception of Victoria (Table 5.4). For the joint analysis of all three cities, 86 percent of enumeration areas have a smaller share of the young elderly population than all three cities combined; whereas 90 and 94 percent respectively of enumeration areas in the joint analysis have a smaller share of the middle-aged and old elderly populations. In Victoria Table 5.4 shows that that the proportion of enumeration areas with a smaller share of the young elderly is greater than the proportion of enumeration areas with a smaller share of the middle-aged elderly. The proportion of enumeration areas with a smaller share of the old elderly however exceeds proportion of enumeration areas with a smaller share of the middle-aged elderly (Table 5.4). The proportion of enumeration areas with a smaller share of the young elderly age group in Victoria is 89 percent, compared to 84 percent with a smaller share of the middle-aged elderly and 89 percent with a smaller share of the old elderly.

The above analysis of enumeration area area-specific concentration shows that the largest proportion of enumeration areas have a smaller share of the total elderly population and each elderly age group than each individual city. These results therefore suggest that the total elderly population, the young, middle-aged and old elderly are concentrated in only a few enumeration areas in each city.

5.3 Centralization

The calculation of the central city ratio for Kitchener-Waterloo, Halifax and Victoria shows that the proportion of the 65 and over population and each elderly age group resident in the central part of each city is 30 percent in Kitchener-Waterloo, 20 in Halifax and 13 in Victoria. Table 5.5 also shows that there is very little or no variation in the extent to which the elderly population, the young, middle-aged and old elderly populations are concentrated in the central cities of Kitchener-Waterloo, Halifax and Victoria. The central city ratio is not calculated for the joint analysis.

Table 5.5: Central City Ratio (%) by Age Group and by City

	Kitchener-Waterloo	Halifax	Victoria
Non-Elderly Population	14	20	20
65 and Over Population	30	20	13
Young Elderly	30	20	13
Middle-aged Elderly	30	30	13
Old Elderly	30	30	13

For all three elderly age groups and the 65 and over population in Kitchener-Waterloo 30 percent are concentrated in the 'central' part of the city. In Halifax 20 percent of the youngest elderly and the total population aged 65 and over are resident in the central city; whereas 30 percent of the two oldest elderly age groups, the middle-aged and old elderly populations, are resident in central Halifax. Comparatively speaking, a much lower proportion, 13 percent, of the elderly population, the young, middle-aged and old elderly groups are resident in central Victoria.

When compared to the degree to which the non-elderly population is concentrated in the central part of each city, Table 5.5 shows three different trends. In Kitchener-Waterloo the elderly population and all three elderly age groups are more centralized than the non-elderly population. The non-elderly population in Victoria in contrast exhibits a higher level of centralization than the young, middle-aged and old elderly, as well as the total population aged 65 and over. Lastly, in Halifax the total elderly population and the young elderly exhibit the same degree of centralization as the non-elderly. The middle-aged and old elderly are more centralized than the non-elderly.

Although, as already mentioned, the literature on the intra-urban spatial distribution of the elderly is replete with references (Cowgill 1958, 1978; Coulson 1968; Kennedy and DeJong 1977; Hiltner and Smith 1974) to the extreme concentration of the 65 and over population in the central or inner city, the uncritical transfer of such results to a Canadian context should be viewed with caution for a number of reasons. Ley (1991) argues that the sociologists of The Chicago School erred in their description of the inner city as a homogeneous zone of social disorganization and physical deterioration characterized by extreme spatial concentrations of ethnic and social groups, including the elderly. As a number of studies (Ley 1991; Broadway 1989; Ley and Bourne 1993) have shown significant differences exist between the structure of both Canadian and American cities in general and specifically, the structure, social composition and forces shaping Canadian and American inner cities. Rather than being characterized by the same levels of poverty, concentrations of ethnic and disadvantaged social groups as American inner cities, Ley (1991) and Ley and Bourne (1993) suggest that Canadian inner cities are socially more heterogeneous and diverse than their American counterparts. Furthermore, the ameliorating and countrywide (as opposed to statewide) activities of various levels of government result in fewer areas being characterized by severe population loss, disinvestment, poverty or, more significantly, multiple problems. It would therefore seem plausible to suggest that the extreme concentrations of the elderly population reported in American inner cities are not as likely to have developed in Canadian cities. Thus, the levels of centralization (as measured by the CCR) will also be lower.

5.4 Aged Residential Segregation and the Construction of the 'Elderly'

From a somewhat different perspective it is suggested that the level of aged residential segregation and the three aspects of residential segregation measured indicate the degree to which the elderly are socially integrated with the remainder of the population. It is also argued that, through its role as one of the numerous forces that organize urban social space, aged residential segregation aids the construction and reproduction of the elderly as a separate and marginalized group in society. In the following section the previously reported results from the analysis of aged segregation in Halifax, Victoria and Kitchener-Waterloo are integrated into a discussion of the extent to which the elderly are socially integrated with the non-elderly, the visibility of the elderly as a social group in society and the reciprocal relationship between the construction and reproduction of the elderly as a marginalized group and place.

In order to assess the degree to which the elderly are socially integrated with or distinct from the rest of the urban population it is assumed that the spatial distance (measured by how concentrated, centralized and unevenly distributed the elderly are compared to the non-elderly and total populations) symbolizes the social distance between the two groups. How space is organized, who is felt to belong in a particular place and who is excluded, which groups, including the elderly, are sorted into which areas of the city and which groups are excluded from particular parts of the city depends on practices of spatial exclusion and isolation (Anderson 1987, 1988, 1991; Sibley 1992, 1995). Residential segregation, the sorting of social and ethnic groups into specific areas of a city and the accompanying exclusion of the same groups from other locations, can be thought of as one such practice. The sorting of a population into relatively homogeneous clusters, including aged spaces, concentrated in particular areas as a result of economic factors, actions of estate agents, institutions or discrimination is a mechanism whereby boundaries can be erected and distance generated between groups. Distance and boundary maintenance are used to ensure that marginalized social groups are sorted into distant peripheral or residual spaces (Sibley 1988, 1992, 1995). An unevenly distributed or highly segregated elderly population, high levels of both city wide and area-specific concentration and high levels of centralization indicate first, that the elderly population is spatially concentrated and that, consequently, a certain amount of 'distance' exists between the elderly and the non-elderly populations and second, that the elderly population is socially distinct from the non-elderly population. High levels of enumeration area-specific concentration, as measured by the location quotient, suggest that an individual enumeration is highly visible or distinct from its surroundings. If the opposite were true, that the level of aged space-specific concentration was low or that the elderly population was evenly distributed (compared to the distribution of the non-elderly population) and that the population aged 65 and over exhibited only low levels of centralization, then the elderly and non-elderly populations would be relatively socially integrated.

The index of dissimilarity shows the spatial distribution of the population aged 65 and over is slightly different from the spatial distribution of the non-elderly population in Kitchener-Waterloo, Halifax and Victoria. Approximately 30 percent of the elderly population in Halifax, compared to 39 percent in Kitchener-Waterloo and 35 percent in Victoria, would have to be redistributed in order that its spatial distribution match that of the non-elderly population. The uneven distribution of the 65 and over population suggests that in each city the 65 and over population is segregated from the non-elderly population. Likewise, the index of dissimilarity indicates that the respective spatial distributions of the 65 - 74, 75 - 84 and 85 and over age groups are different than the non-elderly population in Kitchener-Waterloo, Halifax and the joint analysis. In Halifax for example, 24 percent of the 65 -74 age group, 36 percent of the 75 - 84 age group and 53 percent of the oldest elderly would have to move between the enumeration areas in Halifax in order that their respective distributions match that of the non-elderly population.

As well as being unevenly distributed, the elderly population, the young, middle-aged and old elderly are all spatially concentrated and centralized (measured using enumeration areas as the unit of analysis), as measured by the coefficient of localization and the central city ratio. Of the three elderly age groups included in the analysis, the oldest elderly is the most spatially concentrated in each city; whereas the youngest elderly are the least concentrated. In Kitchener-Waterloo the coefficient of localization is 31 percent for the youngest elderly and 56 percent for the oldest elderly. For Halifax the equivalent figures are 20 and 49 percent. Table 5.5 shows that while there is no variation in the degree to which the total population aged 65 and over or each elderly age group is concentrated in the central area of each respective urban area, relatively large proportions, almost a third, of the total elderly population and each age group in Kitchener-Waterloo and approximately a third of the two oldest elderly age groups in Halifax, are resident in the central part of each city.

Taken together the uneven, spatially concentrated and centralized distribution of the elderly population and, to a greater or lesser extent the young, middle-aged and old elderly groups, indicate that the population aged 65 and over is indeed spatially separated from the non-elderly population. If as Park (1926: 18) states 'social relationships are so frequently and so inevitably correlated with spatial relationships; because physical distances so frequently are, or seem to be, the indexes of social distances' then the physical distance, symbolized by the existence of spatial concentrations of the elderly and the uneven distribution of the population aged 65 and over (conceptualized as the percentage of the elderly who would have to move in order that the distribution of that population match that of the non-elderly population), separating the elderly and non-elderly populations translates into social distance. The noted decline in the frequency of visits adult children make with increasing distance to their elderly parents, once those parents are in senior citizen apartments, supports not only the correlation of spatial and social distance, but also the suggested concentration of the elderly in 'aged spaces' (Smith 1998a, Smith 1998b). The 65 and over population is therefore not totally socially integrated with the younger urban population.

Among the elderly age groups identified, the distance between the oldest elderly and the non-elderly population is generally the largest, implying that the 85 and over population is more socially distinct and less integrated with the non-elderly population; whereas the distance (indicated by lower levels of the index of dissimilarity, the coefficient of localization and in Halifax, centralization) between the youngest elderly and the non-elderly is, as would be expected, the smallest. The youngest elderly are therefore the most socially integrated with the younger urban population. Once more, the relatively low levels of enumeration area-specific concentration suggest that enumeration areas characterized by a relative concentration of the 65 and over population are not that different from the areas of each city in which they are located. The apparent concentration of the 85 and over population in distinct and segregated enumeration areas, especially in Victoria, but also in Kitchener-Waterloo and Halifax, reinforces the distinctiveness of the oldest elderly.

The concentration of the elderly population in certain enumeration areas clearly indicates that the elderly population and subgroups of that population are concentrated in specific places. The 'socio-spatial dialectic' (Soja 1989: 58) or the reciprocal relationship between the construction of specific identities and place suggests that the characteristics and images of a place reflect upon the social category [1] concentrated in that place and simultaneously, the images and feelings about the social category reflect upon and become associated with the place in question (Wolch and Dear 1989; Davis 1991; Jackson 1991;

[1] A 'social group' is defined in the following way: 'a class whose nature is determined internally by the type of relations between members' (Jenkins 1994). It should however be noted that a number of authors (Breen 1960; Strieb 1965; Abu-Laban and Abu-Laban 1980) argue that the elderly cannot be described as a social group because (1) the lack of group consciousness and cohesion and (2) the lack of strong internal identification (the elderly very rarely identify themselves as 'old'). Alternatively, Laws (1993) suggests that the elderly can best be described as a 'social category'. Mann (1983) defines a social category is a collective, the nature a composition of which has been externally defined. Who is defined as belonging to a particular category takes place within the larger social context and is ultimately determined by the most powerful group in society (Hagendoorn 1993; Rose 1993). In contrast to social groups, internal processes of definition play a relatively minor role in the construction of social categories. Internal processes of definition are only be important insofar as they confirm or validate external processes of definition (Jenkins 1994).

England 1991; Till 1993). For example [2], following the initial definition of the elderly as a social group, their marginal identity was confirmed by their association with marginal, segregated spaces, historically workhouses and almshouses (Achenbaum 1978; Katz 1986). Although such institutions have been replaced, other segregated institutions (retirement homes, chronic care hospitals and nursing homes) designed to 'care' for the 'problems' and 'diseases' of old-age continue to reproduce the marginal status of the elderly and one particular aged identity: an aged identity that constructs the elderly as socially isolated, economically dependent and as suffering from marked physical and mental deterioration (Laws 1993, 1995). Estes and Binney (1991) argue that the conceptualization of aging and the elderly as medical problems has resulted in the elderly and aging being evermore closely associated with illness and ultimately death and the undesirability of both. The association of the elderly with illness and death in turn informs attitudes towards and images of aging, the aged and the nursing home/retirement home/chronic care hospital aged spaces in which (some of the) elderly are concentrated. The location of the elderly in marginalized spaces reinforces the social

[2] This particular example is chosen simply because several aged spaces were identified in each city that could be old-age institutions. It should be understood that numerous elderly identities coexist. While some of these aged identities construct and reproduce the elderly as a marginalized social group, others do the opposite. For example, Minkler (1991) and Sawchuck (1995) argue that from the 1970's, capitalism has increasingly identified the elderly as 'people with wants to satisfy, money to spend and a willingness to spend it'. General increases in income levels among the elderly, the reconceptualisation of retirement as a time of opportunity, leisure and of course, consumption, improved health and the earlier socialization of the now elderly or pre-elderly baby-boom generations as consumers means that the elderly represent a vast and potentially lucrative market (Sawchuck 1995). Whereas some goods and services have always been marketed to the elderly, for example, burial plans, medical products etc., during the 1970's a significant change took place in both the type of goods and services marketed and the images portrayed by the advertisements. Consumer durables, cars, clothes, travel services, financial planning, leisure and educational opportunities, insurance plans and housing alternatives are all increasing targeted at very specific subcategories of elderly consumers (Sawchuck 1995). The realization that large sections of the elderly population are not economically dependent, that they have wants to satisfy and money available to satisfy those wants of course allows the construction of a new aged identity: that of consumers.

marginalization of the elderly and reproduces the marginal, residual status of the nursing home/retirement home/chronic care hospital aged spaces.

5.5 Summary

In summary, the analysis of aged residential segregation using enumeration areas as the unit of analysis shows that each elderly age group is indeed segregated from both the non-elderly and elderly populations. Each elderly group is more unevenly distributed and concentrated when compared to the non-elderly than the elderly population. The old elderly are more unevenly distributed and concentrated (as measured by the coefficient of localization) than the total elderly population or the young or middle-aged elderly. The analysis of enumeration area-specific concentration however suggests that the total elderly population and each elderly age group are concentrated in only a small percentage of enumeration areas in each individual city and all three cities (the joint analysis). The largest proportion of enumeration areas in Kitchener-Waterloo, Halifax, Victoria and the joint analysis have a smaller share of each elderly population than each city as a whole. The analysis also revealed that there were no or only small differences in the extent to each elderly age group was concentrated in the central area of each city.

Given that the elderly are segregated, it seems feasible to suggest that aged spaces do indeed exist and that it will be possible to identify aged spaces in each individual city. If the elderly were not segregated, then the identification of aged spaces would not be possible, because the elderly population would be distributed in an identical manner to the non-elderly population and would not be concentrated or clustered. The higher levels of segregation noted for the old elderly further suggest that it will be possible to define aged spaces, at least partly, on the basis of advanced age.

Chapter 6

The Identification of 'Aged Spaces'

As described in Chapter 3, a three step procedure is used to identify 'aged spaces' in each city, Halifax, Victoria and Kitchener-Waterloo. For comparisons sake and as a means of identifying common spatial patterns, data from all three cities are combined and used in a joint analysis. It is anticipated that the results from this joint analysis will reveal similarities and differences in the old-age family status factors found in each city and the number and distribution of aged spaces. Principal components analysis is initially performed to identify the family status factors which describe enumeration areas in terms of the population aged 65 and over. Using the old-age family status factors identified by the principal components analysis, a cluster analysis is performed. Finally a discriminant analysis is used to test the accuracy of the cluster analysis. In the following chapter the results of both analyses, including a description of the aged spaces thus identified, are discussed beginning with the results of the principal components analysis for the joint analysis.

6.1 The Joint Analysis

6.1.1 Factor Structure

In the following section the results of the joint principal components analysis (PCA) for all three cities are discussed. The data used in this analysis is comprised of enumeration area data from Kitchener-Waterloo, Halifax and Victoria for 1991. Unlike the later analyses for each individual city (Section 6.4), data are combined into a single data set. This joint analysis not only ensures that the factor scores for each old-age family status dimension are comparable, but also that the relative importance of each enumeration area on each factor across all three cities is measured by the factor score (Davies and Murdie 1990, 1993). It is therefore possible to identify the number or percent of enumeration areas in each city that exhibit an extreme concentration of an individual old-age family status factor. In the later individual city analyses such comparisons are not possible because both the factors and factor scores are specific to each urban area and are not calculated from common data (Davies and Murdie 1990, 1991, 1993).

The joint principal components analysis performed on a zero order correlation matrix, followed by an orthogonal (varimax) rotation of the initial factor matrix, identified three old-age and two non old-age family status factors (Table 6.1). The loadings for each family status factor identify how much of the variability of the original variable is associated with a particular factor. Only variables that load highly or account for greater than $|0.5|$ or 50 percent of the variability associated with each factor are used in the interpretation of a factor's structure (Murdie 1980; Hamm *et al.* 1988; Davies and Murdie 1991; Foggin and Polese 1977). Altogether the five family status factors identified account for approximately 81 percent of the total variance in the correlation matrix (Table 6.1). This means that the variation in the 26 variables was reduced to five factors with the loss of approximately 19 percent of total variability. The first three family status components alone account for almost 71 percent of the total variance in the correlation matrix (Table 6.1). Bartlett's Measure of Sphericity indicates that it is possible to reject the hypothesis that the zero order correlation matrix for the joint analysis is an identity matrix. The test statistic for the joint analysis is 24423.3, considerably larger than the significance level of 0.0000. The KMO measure of sampling adequacy indicates that the sampling adequacy is 'middling' at 0.76556 for the joint analysis PCA (see Appendix B for the zero order correlation and anti-image or partial correlation matrices for the joint analysis PCA). In the following section the old-age family status dimensions are described initially, followed by the non old-age components. The (reversed) factor scores (see Section 6.1.2: 126) for each old-age dimension are given in Appendix F. Maps of the reversed factor scores for the joint analysis of Kitchener-Waterloo, Halifax and Victoria are given in Appendix H.

Table 6.1: Factor Structure, Joint Analysis

FACTOR STRUCTURE AND TITLES	***FACTOR LOADINGS***	**% Variance/ Cumulative %**
Factor 1: Small/Non-Family Apartment Dwellers		36.9/36.9
% of the total number of occupied private dwellings that are owned	-0.6	
% of the total number of occupied private dwellings that are detached	-0.6	
% of the total number of private households that contain 4 - 5 persons	-0.5	
% of the population aged 15 and over that is divorced	0.7	
% of the total number of occupied private dwellings that are apartments	0.9	
% of the total number of private households that contain 1 person	0.7	
% of the total number of private households that contain 2 persons	0.8	
% of the total number of private households that are non-family households	0.9	

cont'd

Table 6.1 cont'd

Factor 2: All Elderly Widows		23.0/60.0
% of the total population aged 65 - 74 years	-0.5	
% of the total population aged 75 - 84 years	-0.7	
% of the total population aged 85 and over	-0.6	
% of the total population aged 15 and over that is widowed	-0.7	
% of total number of occupied private dwellings that are owner occupied	0.5	
% of the total number of private households that contain 6 or more persons	0.6	
% of the total number of private households that contain 4 - 5 persons	0.7	
% of the total population aged 0 - 9 years	0.9	
% of the total population aged 10 - 19 years	0.8	
% of the total population aged 35 - 44 years	0.8	
Factor 3: Old Female Widows		10.9/70.9
% of total population aged 75 - 84 years	-0.6	
% of the total population aged 85 and over	-0.6	
% of the total population aged 15 and over that is widowed	-0.6	
% of the total population that is female	-0.9	
% of the total population aged 15 and over that is single	0.7	
% of the total population that is Male	0.9	
Factor 4: Young Elderly/Mature Family		5.2/76.0
% of the total population aged 45 - 54 years	0.6	
% of the total population aged 55 - 64 years	0.8	
% of the total population aged 65 - 74 years	0.5	
% of the total population aged 15 and over that is married	0.7	
% of the total number of occupied private dwellings are owner occupied	0.5	
Factor 5: Single Person Households		4.6/80.6
% of the total number of private households that contain 3 persons	-0.5	
% of the total population aged 15 and over that is divorced	0.5	
% of the total number of private households that contain 1 person	0.5	
% of the total number of occupied private dwellings that are semi-detached	0.7	

The ***All Elderly Widows*** dimension is the second dimension derived and accounts for 23 percent of the total variance. ***All Elderly Widows***, contrasts enumeration areas with a widowed population and a population aged 65 and over with enumeration areas containing large households (4 or more persons), owned private dwellings, an adult population (aged 35 - 44 years) and a young (0 - 9 years)/teenage population (10 - 19 years) population. ***Old Female Widows***, the third principal component identified, accounts for approximately 11 percent of the total variance. The ***Old Female Widows*** old-age family status factor contrasts enumeration areas characterized by a population aged 75 and over, a female population and a widowed population with areas containing a male population, a population that is single or never married and a young adult population (20 - 34 years). Finally, a ***Young Elderly/Mature Family*** old-age family status factor describes enumeration areas containing a late middle aged/pre-elderly population (45 - 64 years), an elderly population (65 - 74 years), a married population and owned private dwellings. The ***Young Elderly/Mature Family*** dimension accounts for only 5 percent of the variance in the correlation matrix and is the fourth component derived (Table 6.1).

The two remaining family status factors describe the non-elderly population of Kitchener-Waterloo, Halifax and Victoria (Table 6.1). Collectively the two non old-age family status dimensions explain 42 percent of the variance in the correlation matrix. Individually, the ***Small/Non-Family Apartment Dweller*** non old-age dimension accounts for 37 percent of the variance and is the first component identified. The ***Single Person Household*** dimension accounts for only 5 percent of the variance and is the final component identified. A ***Single Person Household*** family status factor contrasts enumeration areas characterized by households containing three persons with enumeration areas containing a divorced population, 1 person households and semi-detached private dwellings. A ***Small/Non-Family Apartment Dweller*** factor contrasts areas containing owner occupied dwellings, detached dwellings and households containing 4 or 5 persons with areas characterized by non-family households, 1 or 2 person households, a divorced population and apartments.

6.1.2 Cluster and Discriminant Analysis

Having identified the family status factors which describe the total elderly population of all three cities, the next step is to form aged spaces using cluster and discriminant analysis. As described in section 3.6.2 cluster analysis is used to form homogeneous groupings of enumeration areas on the basis of the factor scores for the old-age family status factors (***All Elderly Widows***, ***Young Elderly/Mature Family*** and ***Old Female Widows***) identified by the principal components analysis. Discriminant analysis is then used to assess which cluster solution is the most accurate. In order to establish which cluster solution is to be used to identify aged spaces, an iterative process, whereby a number of cluster and discriminant analyses are performed and the results compared, is used. For each iteration the number of clusters to be formed is set. Discriminant analysis is then used to assess the accuracy of each cluster solution, as measured by the percent of enumeration areas that are correctly grouped. The final cluster solution, or the cluster solution used as the basis on which to define aged spaces, is selected on the basis of the criteria previously outlined (see section 3.6.2: 70). The canonical discriminant functions for each cluster solution are given in Appendix J.

The interpretability of the cluster analysis is improved by reversing the signs of the factor scores on certain old-age family status dimensions prior to clustering the enumeration areas. As Table 6.1, shows two (***Old Female Widows*** and ***All Elderly***

Widows) of the three old-age family status factors identified by the PCA for the joint analysis have negative factor loadings. Negative factor loadings measure not only how closely an individual variable and a factor are related but also, because the rotation used is orthogonal, the (negative) correlation between a factor and a variable. When combined with negative factor scores (for one or more enumeration areas) the negative factor loadings indicate that there is a *relative concentration* of a variable in one or more enumeration area/s. Although possible, the relative concentration of a factor in one or more enumeration areas produced by a negative correlation between a variable and an old-age family status dimension (or a negative factor loading); in combination with a negative factor score is conceptually counterintuitive and awkward to interpret. In order to overcome this 'problem' the signs on the factor scores for variables that have high negative loadings on old-age family status dimensions are reversed. For example, the percent of the population aged 75 - 84 and 85 and over; along with the percent of the population that is female and the percent of the population that is 15 years and over that is widowed have negative loadings on F3: ***Old Female Widows***. The percent of the population aged 75 - 84, 85 and over; percent of the population that is female and percent of the population aged 15 years and over that is widowed are all negatively correlated with the ***Old Female Widows*** dimension (Table 6.1). Enumeration areas with negative factor scores are therefore characterized by a relative concentration of the ***Old Female Widows*** (F3), or a concentration of a female, widowed population aged 75 and over. The signs on the factor scores for F3: ***Old Female Widows*** are therefore reversed prior to performing the cluster analysis. Enumeration areas previously characterized by negative factor scores and negative factor loadings are consequently characterized by a relative absence of the same dimension (positive factor scores and negative factor loadings).

In addition to reversing the signs on F3: ***Old Female Widows***, Table 6.1 shows that four variables (the percent of the population 65 - 74, 75 - 84 and 85 and over, as well as the percent of the population aged 15 years and over that is widowed) have high negative loadings on the ***All Elderly Widows*** (F2) dimension. The signs on the factor scores for the ***All Elderly Widows*** (F2) dimension are therefore also reversed prior to performing the cluster analysis. Unlike the age group variables that load on F2: ***All Elderly Widows*** and F3: ***Old Female Widows*** (F3), the old-age variables that load highly on the ***Young Elderly/Mature Family*** (F4) factor are positive. Consequently, high positive factor loadings and positive factor scores indicate a concentration of the ***Young Elderly/Mature Family*** (F4) factor. It is not therefore necessary to reverse the factor scores on the ***Young Elderly/Mature Family*** factor prior to performing the cluster analysis.

The percent of enumeration areas correctly grouped is reported for odd numbered cluster solutions starting at 15 and finishing at 3 clusters. On the basis of Table 6.2, the 7 cluster solution (66 percent of enumeration areas grouped correctly) is selected (see Appendix J for the canonical discriminant functions). The 7 cluster solution is selected in preference to alternative solutions which yielded more accurate results, at least according to the discriminant analysis, because of the accompanying loss of detail. Table 6.2 shows for example that the 3 cluster solution correctly grouped 81 percent of enumeration areas. However, the increase in the percentage of enumeration areas correctly grouped (66 to 81) was accompanied by a decline in the number of clusters produced from 7 to 3. As a result, more and more dissimilar clusters would have been joined together and interesting detail ultimately lost.

Table 6.2: Percent of Enumeration Areas Grouped Correctly by Number of Clusters

Number of Clusters	***Percent of EAs Grouped Correctly***
15	33
13	46
11	62
9	64
7 *	66
5	74
3	81

* indicates the selected cluster solution

6.2 Cluster Characteristics

In the following section the characteristics, in terms of the relative absence and/or relative concentration of the three old-age family status factors previously identified as describing the composition of the total elderly population of Kitchener-Waterloo, Halifax and Victoria are discussed. The characteristics of each individual cluster, at least in terms of the old-age dimensions previously identified, are determined by an examination of the factor scores for each cluster. The factor scores, sorted by cluster, are given in Appendix F. The distribution of enumeration areas among the final unmodified 7 cluster solution for the joint analysis is also reviewed.

Table 6.3 shows on which old-age family status factors each cluster is formed. In Table 6.3 the 'X' indicates that an individual cluster is formed, partially or totally, on the basis of one or more old-age family status factors. For example, cluster 7 is formed on the basis of F3 or the ***Old Female Widows*** old-age family status dimension and F4 or the ***Young Elderly/Mature Family*** factor. It should be noted that unlike the city specific clusters created by the separate or individual cluster analyses, all the clusters formed

Table 6.3: Cluster Characteristics

Cluster Number	**Number of Enumeration Areas**	**Old-Age Family Status Factors** *(Percent of Variance Explained)*		
		F2: All Elderly Widows *(23)*	***F3: Old Female Widows*** *(11)*	***F4: Young Elderly/Mature Family*** *(5)*
1	422	X	X	
2	28			X
3	11			
4	11		X	
5	59			X
6	91	X		X
7	23		X	X

on the basis of the joint analysis old-age family status factors share the same characteristics and because no modifications have been made, i.e., no clusters have been subdivided, the spatial distribution or location of the clusters do not reflect the unique spatial structure of the city in which they are located.

Of the 7 clusters that comprise the final cluster solution for the joint analysis, the largest number (3) are characterized by a relative concentration of two out of the three old-age family status factors identified by the principal components analysis (Table 6.3). Cluster 1 is comprised of enumeration areas clustered on the basis of the ***All Elderly Widows*** (F2) and F3: ***Old Female Widows*** factors. Given that the ***All Elderly Widows (F2)*** factor, contrasts enumeration areas with a widowed population and a population aged 65 and over with enumeration areas containing large households (4 or more persons), owned private dwellings, an adult population (aged 35 - 44 years) and a young (0 - 9 years)/teenage population (10 - 19 years) population and the ***Old Female Widows (F3)*** factor, contrasts enumeration areas characterized by a population aged 75 and over, a female population and a widowed population with areas containing a male population, a population that is single or never married and a young adult population (20 - 34 years) it is not surprising that enumeration areas should be clustered on the basis of both these factors. Cluster 6 is likewise comprised of enumeration areas clustered on the basis of two old-age dimensions: ***All Elderly Widows*** (F2) and ***Young Elderly/Mature Family*** (F4). Enumeration areas in cluster 7 are also clustered on the basis of the ***Young Elderly/Mature Family*** (F4) factor, but in combination with F3: ***Old Female Widows***.

Three clusters, 2, 4 and 5, in contrast, are made-up of enumeration areas grouped on the basis of only one old-age family status dimension. Enumeration areas in cluster 4 are clustered on the basis of the ***Old Female Widows*** (F3) factor; whereas enumeration areas in clusters 2 and 5 are clustered on the basis of the ***Young Elderly/Mature Family*** (F4) dimension. The ***Young Elderly/Mature Family*** (F4) old-age family status factor describes enumeration areas containing a late middle aged/pre-elderly population (45 - 64 years), an elderly population (65 - 74 years), a married population and owned private dwellings. The remaining cluster, 3, is a non aged cluster. The enumeration areas in cluster 3 are characterized by an absence of all three old-age family status dimensions.

As far as the inter-urban distribution of the original 7 clusters is concerned, Table 6.4 shows that enumeration areas grouped together in one specific cluster, for example, cluster 2, are not evenly distributed among all three cities; or that enumeration areas clustered on the basis of the same old-age family status factors are not necessarily

Table 6.4: The Percent of Enumeration Areas in Each Cluster for the Joint Analysis

	Joint Analysis (n = 645)	**Halifax** (n = 172)	**Kitchener-Waterloo** (n = 323)	**Victoria** (n = 150)
Cluster 1	65	68	67	59
Cluster 2	4	4	2	10
Cluster 3	2	1	2	1
Cluster 4	2	0	1	6
Cluster 5	9	5	5	22
Cluster 6	14	18	18	1
Cluster 7	4	3	5	1

present in each city. Of the three cities, enumeration areas in Kitchener-Waterloo and Victoria are grouped on the basis of all 7 original clusters; whereas in Halifax no enumeration areas are clustered on the basis of cluster 4 (Table 6.4). In all three cities, as well as the joint analysis, the largest percentage of enumeration areas are clustered on the basis of cluster 1 and are therefore characterized by a relative concentration of the ***All***

Elderly Widows (F2) and ***Old Female Widows*** (F3) dimensions (see Table 6.3). The percent of enumeration areas clustered on the basis of cluster 1 is 68 in Halifax, 67 in Kitchener-Waterloo and 59 in Victoria. Although noticeably smaller, cluster 6, comprised of enumeration areas grouped on the basis of the ***Young Elderly/Mature Family*** (F4) and ***All Elderly Widows*** (F2) factors (see Table 6.3), is the next largest cluster in the joint analysis, Halifax and Kitchener-Waterloo (Table 6.4). In the joint analysis 14 percent of enumeration areas are grouped on the basis of cluster 6; whereas 18 percent of enumeration areas are grouped on the basis of cluster 6 in Halifax and Kitchener-Waterloo. Only 1 percent of enumeration areas in Victoria are grouped on the basis of cluster 6. The spatial distribution of the 7 cluster solution for the joint analysis in Kitchener-Waterloo, Halifax and Victoria is shown in Figures 6.1, 6.2 and 6.3.

6.3 Aged Spaces in Kitchener-Waterloo, Halifax and Victoria

In the following section the characteristics, spatial location and distribution of aged spaces defined in Kitchener-Waterloo, Halifax and Victoria are discussed. For ease of presentation the characteristics, spatial location and distribution of aged spaces are discussed city by city (starting with Halifax), beginning with a comparative preliminary overview of the distribution of aged spaces in each city.

For the joint analysis the original 7 cluster solution yielded a total of 141 aged spaces, after all the appropriate modifications had been completed. As a result of these modifications the aged spaces thus created are in part common to all three urban areas, because of the shared old-age family status factors, and unique to each city, because of the specific and unique modifications made to the final cluster solution in Halifax, Victoria and Kitchener-Waterloo.

The distribution of the 141 aged spaces identified is shown in Table 6.5. Aged space 1 (AS1) whilst appearing to be one of the smallest aged spaces, is infact the largest and the most spatially extensive (Figures 6.4, 6.5 and 6.6). Because of its spatial extent cluster 1 is not broken down into smaller aged spaces. It is simply left as a large aged space, equivalent to cluster 1 in Figures 6.1, 6.2 and 6.3. Table 6.5 shows that the largest proportion of aged spaces in Halifax and Kitchener-Waterloo, as well as the joint analysis, are composed of enumeration areas characterized by a relative concentration of

Table 6.5: The Proportion of Aged Spaces in Each Cluster by City for the 7 Cluster Solution

	Joint Analysis (n=141)	**Halifax (n=36)**	**Victoria (n=31)**	**Kitchener-Waterloo (n=74)**
Total Percent of Aged Spaces	100	25	23	52
Cluster 1	3	1	1	1
Cluster 2	18	4	10	3
Cluster 4	2	0	2	0
Cluster 5	23	5	9	9
Cluster 6	42	13	1	27
Cluster 7	13	3	1	9

cluster 6. Cluster 6 is composed of enumeration areas clustered on the basis of the ***Young Elderly/Mature Family*** and ***All Elderly Widows*** old-age dimensions. In the joint analysis 41 percent of aged spaces are formed on the basis of cluster 6. This compares to 13 and 27 percent respectively in Halifax and Kitchener-Waterloo. In Victoria in

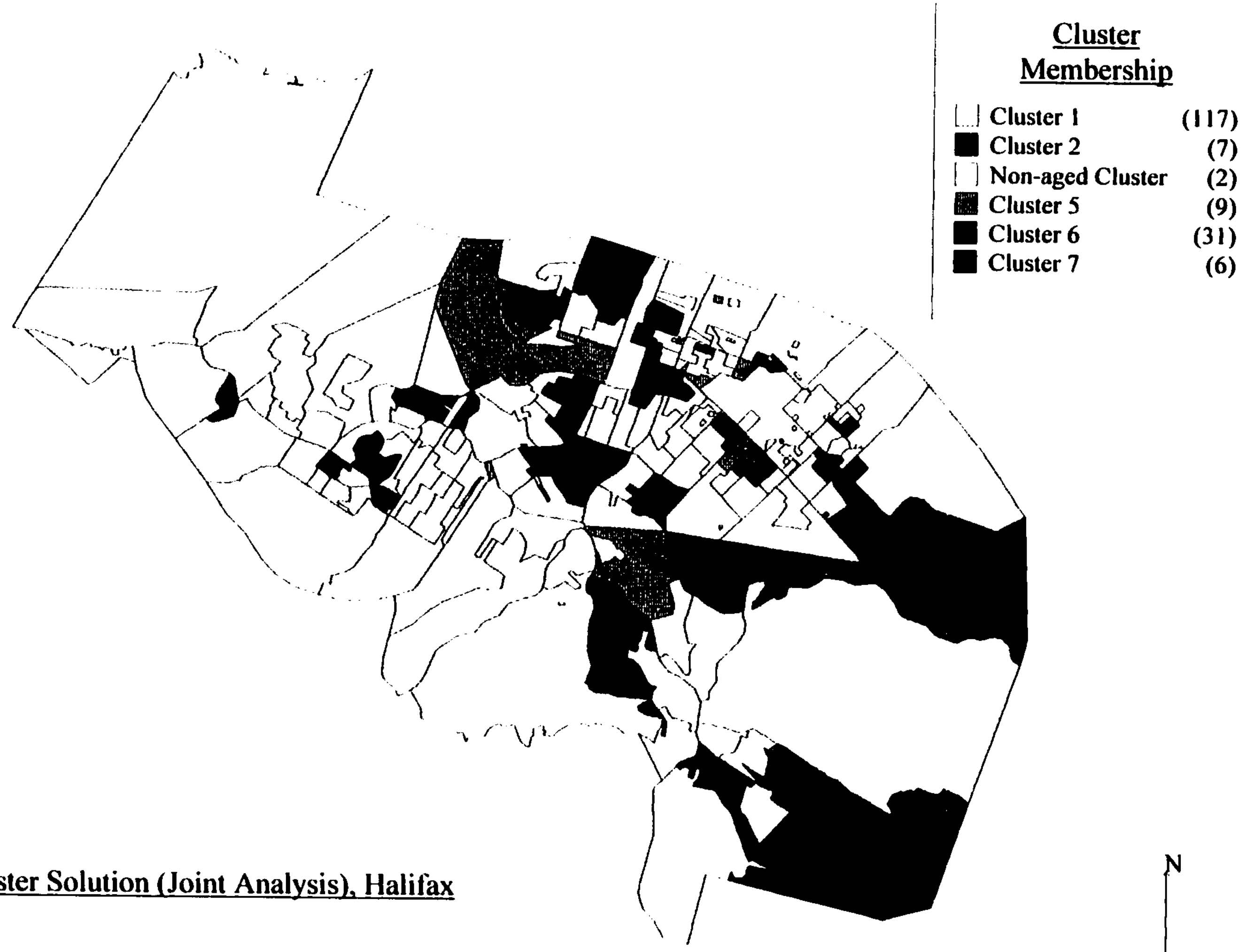


Figure 6.1: 7 Cluster Solution (Joint Analysis), Halifax

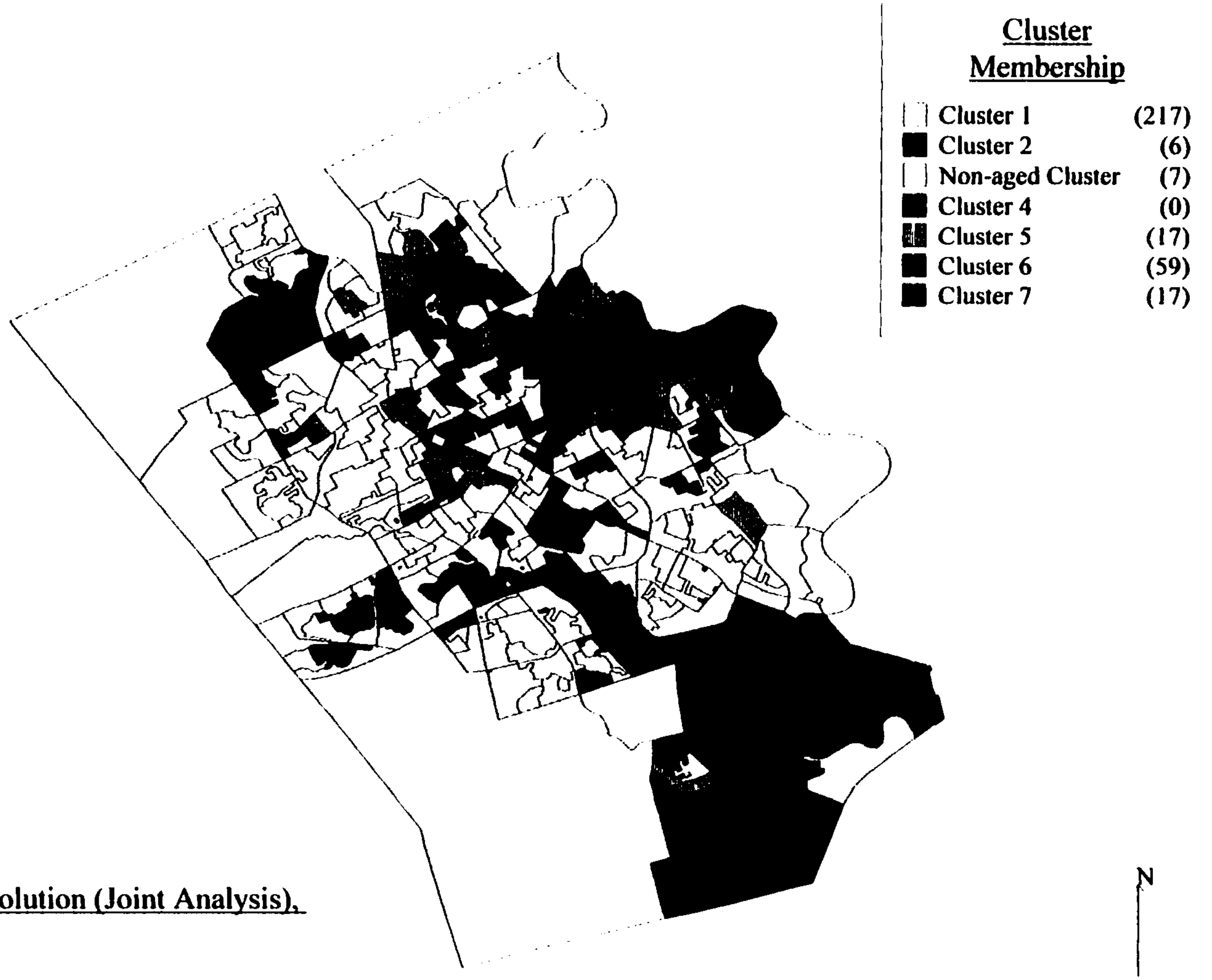


Figure 6.2: 7 Cluster Solution (Joint Analysis), Kitchener-Waterloo

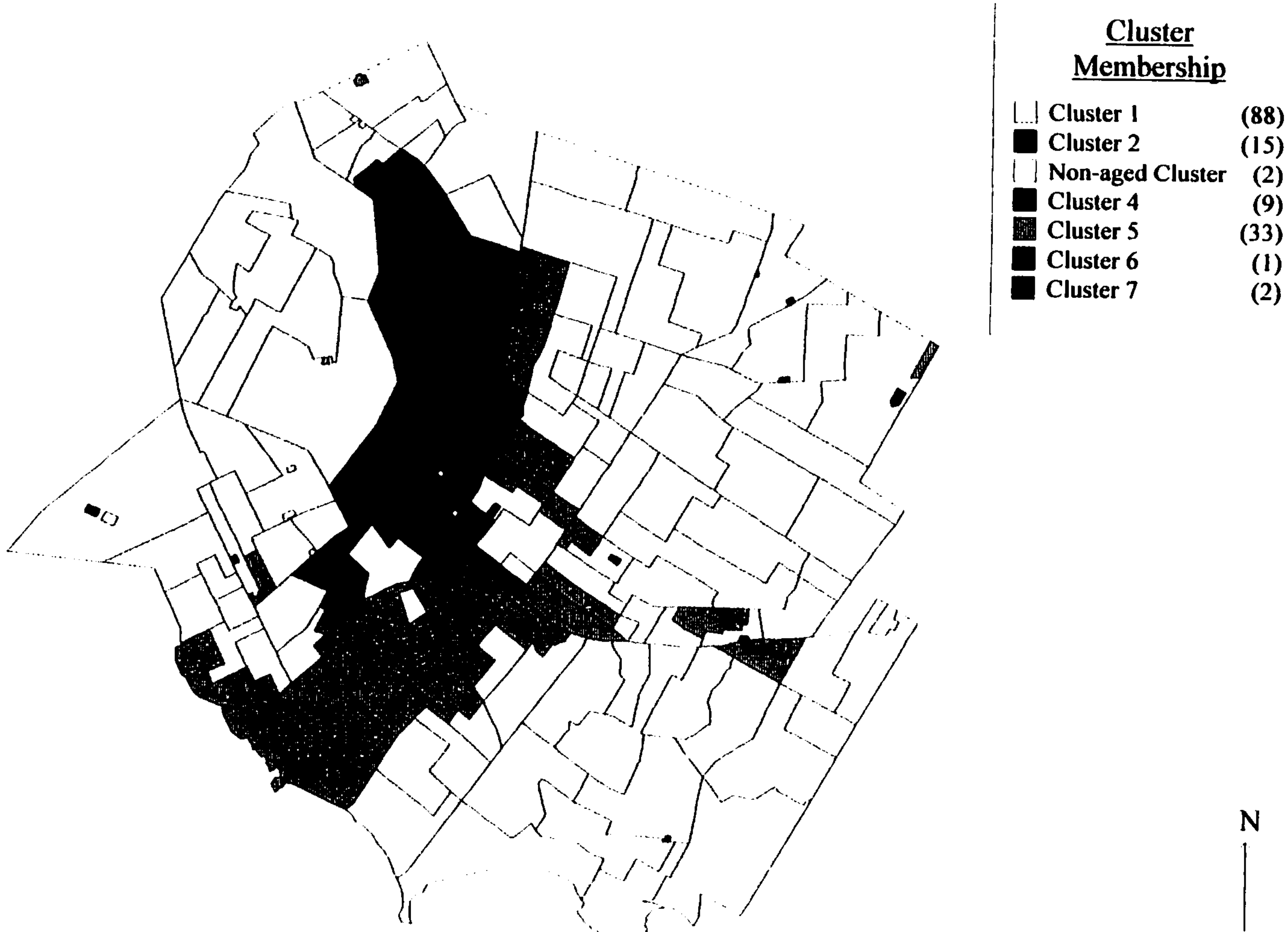


Figure 6.3: 7 Cluster Solution (Joint Analysis), Victoria

contrast, only 1 percent of aged spaces are formed on the basis of cluster 6. Aged spaces formed on the basis of cluster 5 make-up the next largest proportion of aged spaces in the joint analysis (23 percent), Kitchener-Waterloo (9 percent) and Victoria (5 percent). In Halifax aged spaces formed on the basis of cluster 2 make-up the next largest proportion (10 percent) of aged spaces in that city. Finally, no aged spaces are derived from cluster 3 in any of the three study areas. Cluster 3 is a non-aged cluster. It is composed of enumeration areas characterized by a relative absence of all three old-age components derived by the joint analysis PCA.

On an individual city basis Figures 6.4 and 6.5 show that 36 aged spaces or 25 percent of the total number of aged spaces derived from the 7 cluster solution are in Halifax (Table 6.5). The largest proportion (13 percent) are comprised of enumeration areas grouped on the basis of cluster 6. These aged spaces range in size from small, single enumeration area aged spaces, for example, AS16 and AS21, to spatially extensive multi-enumeration area aged spaces, for example AS4 and AS20. The four largest of these aged spaces (AS1, 2, 3 and 4) are located in the northeast and southeast of Halifax (Figure 6.4). A group of spatially less extensive, widely scattered, aged spaces, AS24, 29, 28 and 27, are located on the western side of the city. As Figure 6.5 also shows the largest number of aged spaces are formed on the basis of ***the Young Elderly/ Mature Family*** and ***Old Female Widows*** or the ***Young Elderly/Mature Family*** components are located in the centre or oldest part of Halifax, close to the harbour. Contained within this group are both single enumeration area aged spaces (AS8, 21, 16,

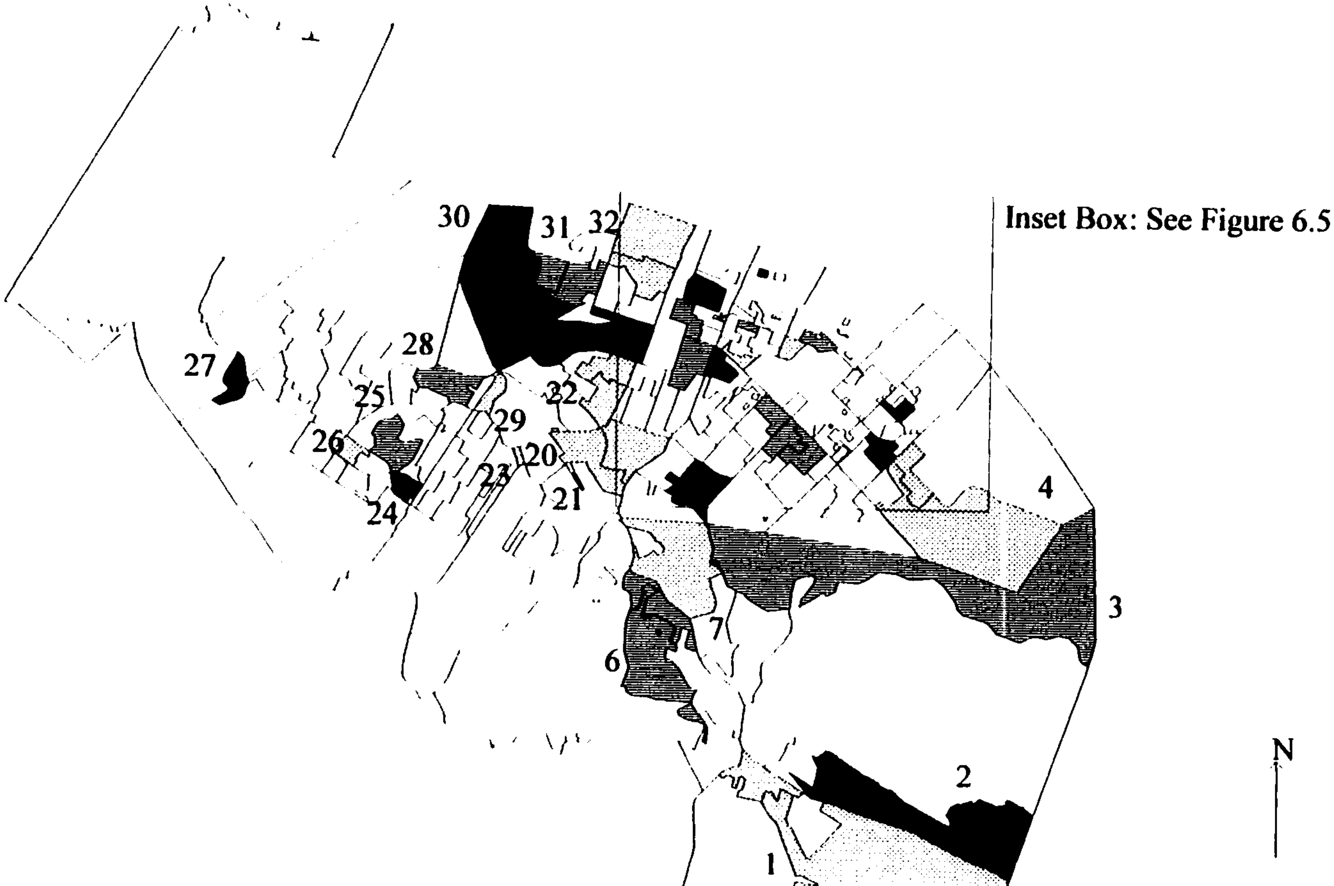
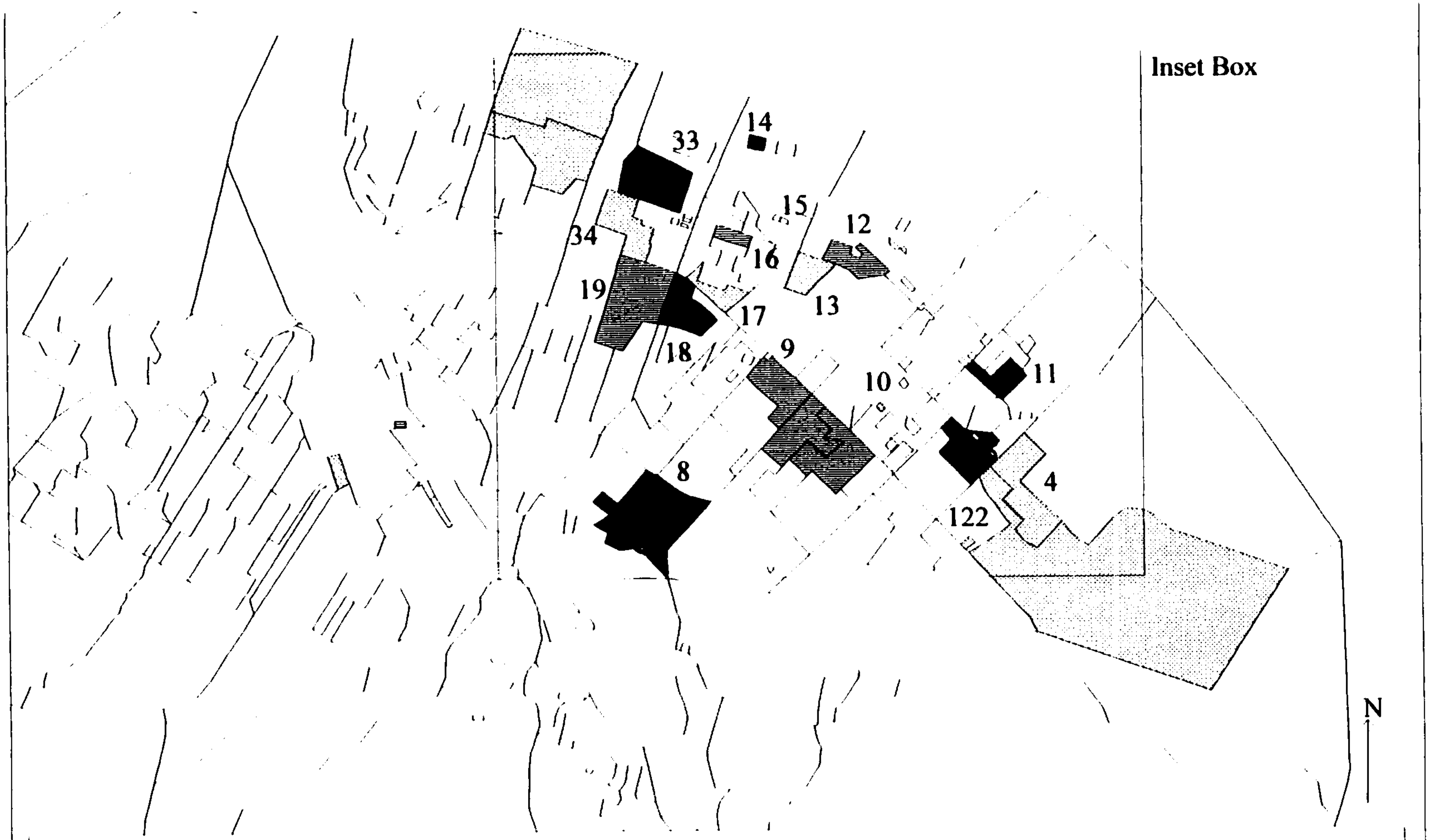


Figure 6.4: Selected Aged Spaces (Joint Analysis) Halifax

* Please note: The shading scheme used merely allows the aged spaces to be differentiated more easily. It has no other meaning.



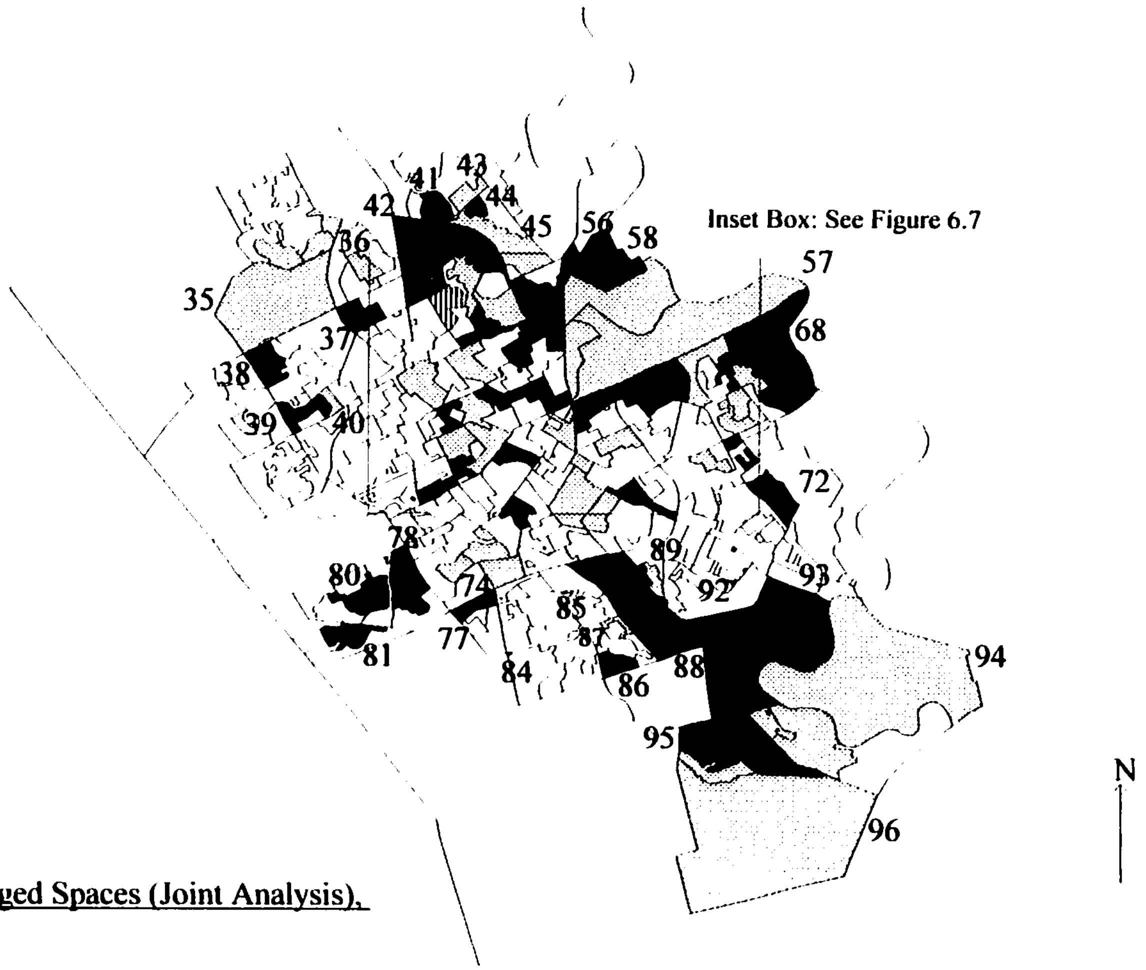
<u>Figure 6.5: Selected Aged Spaces (Joint Analysis) Halifax</u>

* Please note: The shading scheme used merely allows the aged spaces to be differentiated more easily. It has no other meaning.

10, 12, 34 and 18) and larger aged spaces, AS31, 32 and 22, made-up of several enumeration areas.

Aged spaces formed on the basis of cluster 5, characterized by a relative concentration of a pre (45-64 age group) and young (65-74 age group) elderly population that is married and living in owner occupied housing or the ***Young Elderly/Mature Family*** dimension, make-up only 5 percent (or 7 out of 36 aged spaces) of aged spaces in Halifax. As Figure 6.5 shows the majority of these aged spaces are concentrated in the oldest part of Halifax and the northwest area of the city. With the exceptions of AS30 and 7, all ***Young Elderly/Mature Family*** aged spaces are spatially compact. Only two ***Young Elderly/Mature Family*** aged spaces, AS30 and 9, are composed of more than one enumeration area. AS30 is composed of two enumeration areas; whereas AS9 is made-up of 4 enumeration areas.

Over half (52 percent) of the 141 aged spaces defined from the 7 cluster solution for the joint analysis are in Kitchener-Waterloo. The aged spaces identified in Kitchener-Waterloo are predominately formed from three clusters: 6 (39 percent), 5 (13 percent) and 7 (13 percent) (Table 6.5). Table 6.5 shows that 27 percent of the total number of aged spaces derived from the joint analysis in Kitchener-Waterloo or 39 aged spaces are formed from the cluster 6. As in Halifax, aged spaces derived from cluster 6 comprise the largest proportion of aged spaces in Kitchener-Waterloo (Figure 6.6). As Figure 6.6 shows 5 large multiple enumeration area aged spaces (AS95, 35, 57, 96 and 68), located for the most part on the periphery, can be identified in Kitchener-Waterloo. These aged spaces are located in the older inner suburbs and more recently developed



<u>Figure 6.6: Selected Aged Spaces (Joint Analysis), Kitchener-Waterloo</u>

* Please Note: The shading scheme used merely allows aged spaces to be differentiated more easily. It has no other meaning.

peripheral suburbs. In addition, aged spaces (for example AS49, 65 and 74) formed from the ***Young Elderly/Mature Family*** dimension, in combination with F2: ***All Elderly Widows*** component form a discontinuous ring around the centre of the City of Waterloo (Figure 6.7).

Such a pattern is in keeping with the identification of spatial concentrations of the pre-elderly and young elderly populations in the older, inner pre-1970 suburban areas of a number of cities (Stahura 1980; Fitzpatrick and Logan 1985; Hiltner and Smith 1974; Kennedy and DeJong 1977 and Kimmich and Gutowski 1983). In a Canadian context, LeBourdais and Beaudry (1988) and Davies and Murdie (1993) likewise found spatially localized concentrations of aging or completed families in the well established, but now 'greying', pre-1970 suburbs in a number of cities including, but not limited to Montreal and Toronto. LeBourdais and Beaudry (1988) for example, found that between 1971 and 1981 the general aging of Montreal's population had resulted in the development of spatial concentrations of aging or 'splitting' families in older suburban tracts immediately adjacent to Montreal's downtown. It is suggested that these peripheral, spatially extensive and more centrally located aged spaces in Kitchener-Waterloo are primarily a consequence of one process: aging-in-place (Golant 1972 and 1975; Hiltner and Smith 1974; Kennedy and DeJong 1977 and Kimmich and Gutowski 1983). Over time, the low propensity of families with school aged children and middle aged families to move and the high propensity of these families to age along with the dwellings and neighbourhoods in which they reside, has led to the development of concentrations of the elderly in aged spaces located in the older, inner suburbs. The

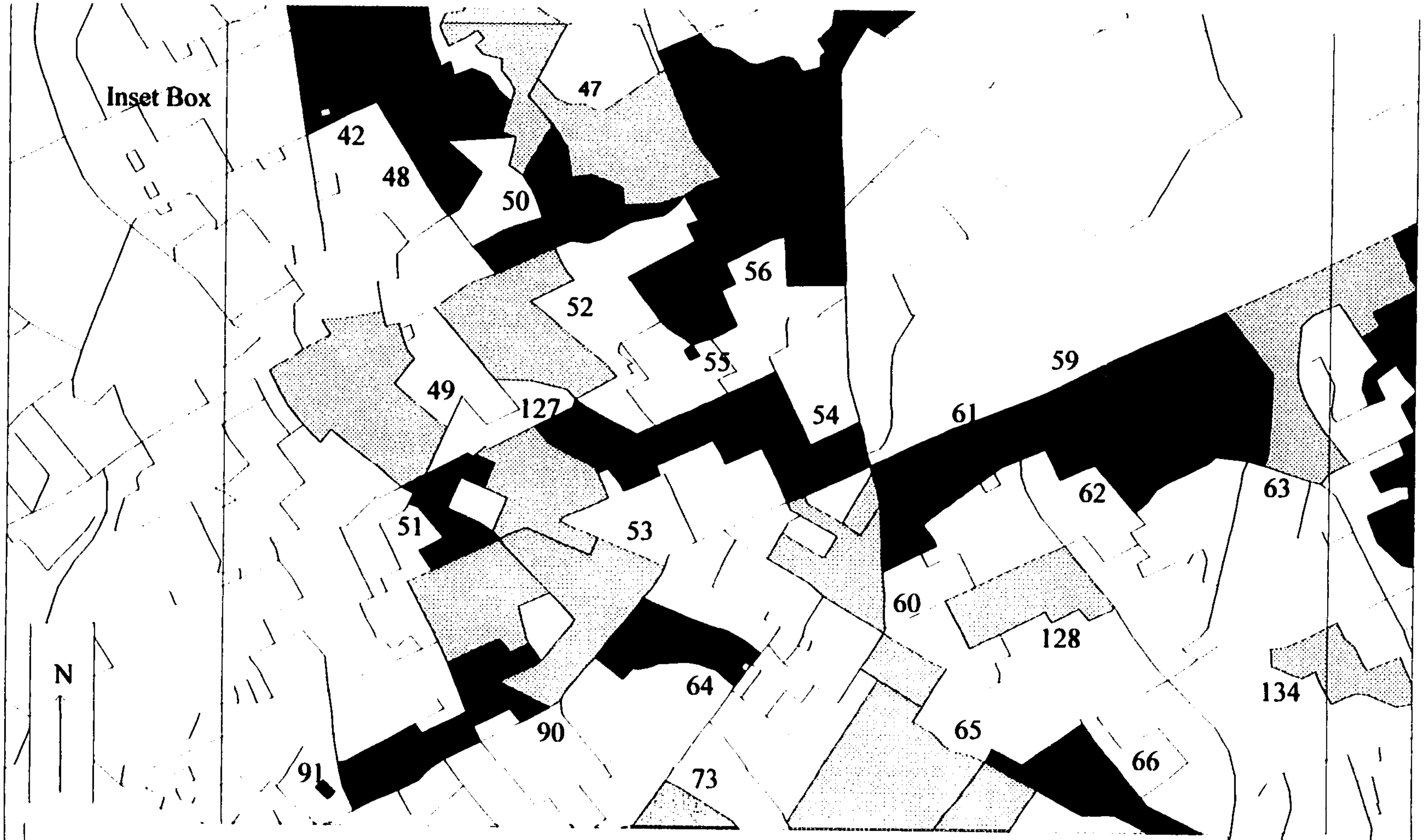


Figure 6.7: Selected Aged Spaces (Joint Analysis), Kitchener-Waterloo

* Please Note: The shading scheme used merely allows aged spaces to be differentiated more easily. It has no other meaning.

continued growth of the suburban elderly population during the 1970's (Golant 1990; Fitzpatrick and Logan 1985; Stahura 1980 and LaGory *et al.* 1980) further suggests that this process is on-going and involves the empty-nester population identified by the empty-nester factor in Kitchener-Waterloo. Evidence, again from LeBourdais and Beaudry (1988), suggests that in Montreal the aging-in-place of what were young and middle aged 'established' families during the 1970's has indeed led directly to the growth of a number of spatial clusters of empty-nesters in the pre-1970 suburbs surrounding Montreal's downtown core. The continued aging of younger families evident at greater distances from Montreal's downtown core also suggests that future concentrations of empty-nester families will eventually develop in newer post-1970 suburbs beyond the now evident pre-1970 suburban concentrations. Likewise, Hall *et al.* (1986) report the development of similar spatial concentrations of the elderly population in Auckland, New Zealand between 1971 and 1981. The existence of localized spatial clusters of pre-elderly and elderly (no distinction is unfortunately made by Hall *et al.* between elderly age groups in the oldest suburban ring immediately surrounding Auckland's downtown, as well as other suburban cities in 1981) is seen primarily as a legacy of patterns of congregation and concentration i.e., aging-in-place, in the preceding decade.

A smaller proportion, 13 percent, of aged spaces in Kitchener-Waterloo are formed from enumeration areas clustered on the basis of clusters 5 and 7 old-age factor (Figures 6.6 and 6.7). Cluster 5 is formed from enumeration areas clustered on the basis of the ***Young Elderly/Mature Family*** component; whereas cluster 7 is composed of enumeration areas grouped on the basis of the ***Young Elderly/Mature Family*** and ***Old Female Widows*** dimensions. Figure 6.6 shows that 4 groups of these aged spaces are identifiable in Kitchener-Waterloo. The first of these groups is comprised of 3 spatially extensive aged spaces, AS96, 93 and 88. These 3 aged spaces are located on the southern most edge of the City of Kitchener and are in an area of the city undergoing considerable development and expansion. A second group (AS72, 67, 63 and 59), located in northeast Kitchener, is made-up of 4 smaller, single enumeration area aged spaces. A more compact cluster, consisting of AS64, 53, 40 and 49, is located close to the downtown's of both the City of Kitchener and the City of Waterloo. One aged space, AS40, included in this group is some distance from the other aged spaces. It is located in northwest Waterloo.

Finally, in the City of Victoria Figure 6.8 shows that four large, multiple enumeration area aged spaces (AS118, 125, 126 and 119) are identifiable; along with numerous smaller aged spaces (AS111, 110, 130, 131 and 132) in the central area of the city. The remaining aged spaces in Victoria are scattered throughout the city (Figure 6.8). For example, AS108, 106, 105, 104 and 102 are located in the northern most part of the city on Tolmis Road and North Dairy Road (Figure 3.5: 50). The largest proportion (9 percent) of aged spaces in Victoria, including AS118, 120 and 107; as well as three additional multiple enumeration area aged spaces AS113, 115 and 117, are ***Young Elderly/Mature Family*** aged spaces. Two of these aged spaces, AS113 and 120, are composed of 4 enumeration areas; whereas AS117 is comprised of 3 enumeration areas and AS115 is made-up of only 2 enumeration areas. AS118 in contrast, contains

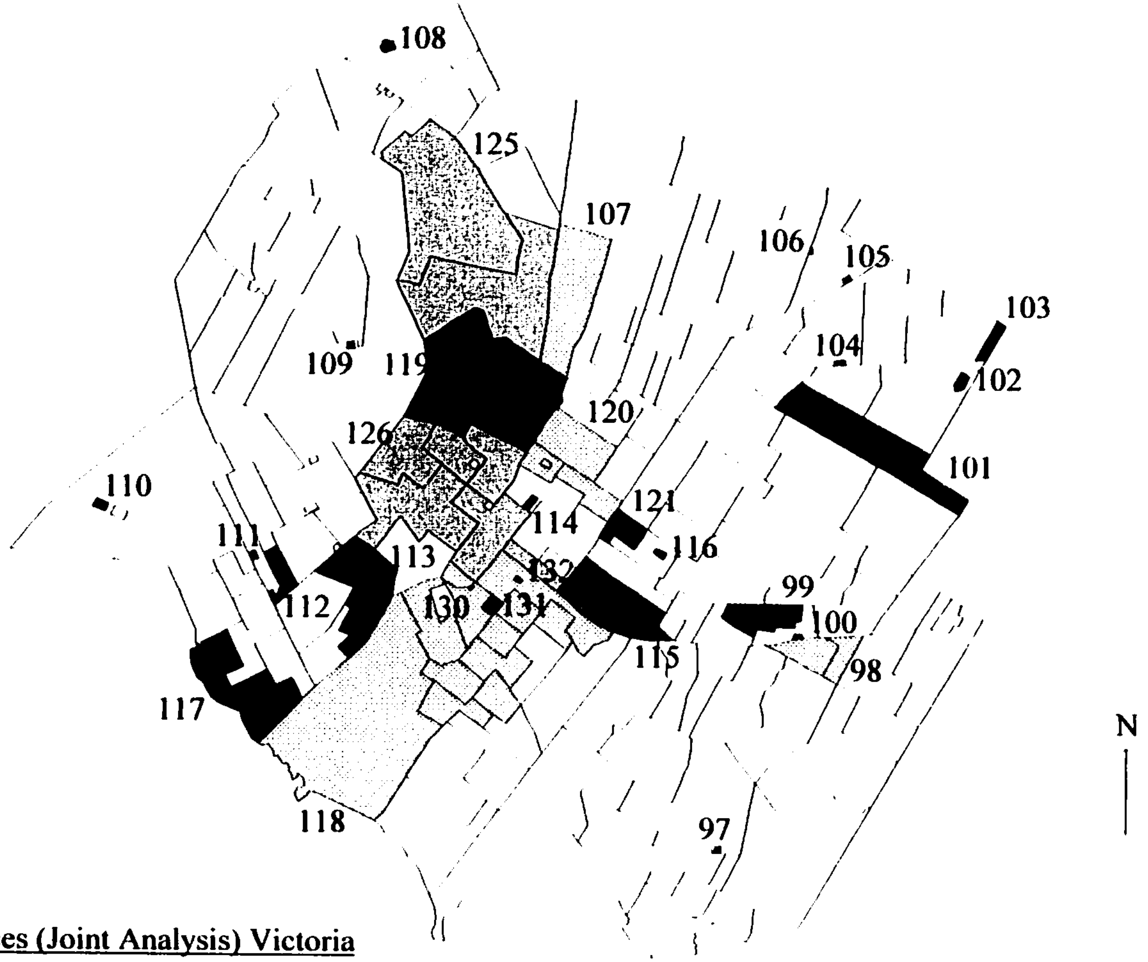


Figure 6.8: Aged Spaces (Joint Analysis) Victoria

* Please note: The shading scheme used merely allows the aged spaces to be differentiated more easily. It has no other meaning.

12 enumeration areas and one unenumerated enumeration area (Figure 6.8). Only 2 aged spaces (AS126 and 125) are ***Old Female Widows*** aged spaces. Figure 6.8 shows that the ***Old Female Widows*** aged spaces are located in central areas Victoria. ***Old Female Widows*** aged spaces comprise only 1 percent of the total number of aged spaces in Victoria, eventhough they are spatially extensive, multi enumeration area aged spaces.

6.4 Individual City Analysis

6.4.1 Principal Components Analysis and Factor Structure, Kitchener-Waterloo

In the following section the results of the principal components analysis (PCA) for each individual city in 1991 are discussed, beginning with Kitchener-Waterloo. As in the combined analysis only factor loadings exceeding | 0.5 | are used in the

Table 6.6: Factor Structure, Kitchener-Waterloo

FACTOR STRUCTURE AND TITLES	*FACTOR LOADINGS*	**% Variance/ Cumulative %**
Factor 1: Small Non-Family Households		38.3/38.3
% of the total number of occupied private dwellings that are owned	- 0.7	
% of the total number of occupied private dwellings that are detached	- 0.7	
% of the total number of private households that contain 4 - 5 persons	- 0.6	
% of the population aged 15 and over that is divorced	0.8	
% of the total number of occupied private dwellings that are rented	0.9	
% of the total number of occupied private dwellings that are apartments	0.9	
% of the total number of private households that contain 1 person	0.8	
% of the total number of private households that contain 2 persons	0.7	
% of the total number of private households that are non-family households	0.9	

cont'd

Table 6.6 cont'd

Factor 2: Middle-aged/Old Female Widows		23.0/61.3
% of the total population aged 75 - 84 years	- 0.9	
% of the total population that is aged 85 and over	- 0.8	
% of the total population aged 15 and over that is widowed	- 0.9	
% of the total population that is female	- 0.9	
% of the total population aged 15 and over that is single	0.5	
% of the total number of private households that contain 3 persons	0.6	
% of the total population aged 20 - 34 years	0.7	
% of the total population that is male	0.9	
Factor 3: Large Mature Families		12.3/73.6
% of the total number of private households that contain 4 - 5 persons	0.5	
% of the total number of private households that contain 6 or more persons	0.7	
% of the total population aged 35 - 44 years	0.6	
% of the total population aged 10 - 19 years	0.7	
% of the total population aged 45 - 54 years	0.6	
Factor 4: Early Elderly		5.3/78.9
% of the total population aged 45 - 54 years	0.5	
% of the total population aged 55 - 64 years	0.8	
% of the total population aged 65 - 74 years	0.6	
% of the total population aged 15 and over that is married	0.7	
% of the total number of private households that contain 2 persons	0.5	
Factor 5: Young Families		3.9/82.7
% of the total population aged 15 and over that is single	- 0.5	
% of the total number of private households that contain 3 persons	0.5	
% of the total population aged 0 - 9 years	0.7	
% of the total number of occupied private dwellings that are semi-detached	0.6	

interpretation of each factor's structure i.e., which variables load on each individual factor. The principal components analysis identified five interpretable family status dimensions in 1991 for Kitchener-Waterloo (Table 6.6). The family status factors which describe the elderly population of Kitchener-Waterloo are discussed initially, followed by a brief discussion of the family status factors not related to old-age or the elderly. The (reversed) factor scores (see Section 6.1.2: 126) for each old-age dimension are given in Appendix G.

The five family status factors identified accounted for approximately 83 percent of the overall total variance in the correlation matrix. Two (***Early Elderly*** and ***Middle-aged/Old Female Widows***) out of the five family status factors identified were related to the elderly or old-age and were therefore used in the subsequent cluster analysis (Table 6.6). The first old-age family status factor alone explains 23 percent of the total variance in the correlation matrix, whereas the second old-age family status dimension accounts for 5 percent of the total variance. The first old-age family status factor, ***Early Elderly***, describes areas with a married population, population aged 45 - 54, 55 - 64 and 65 - 74 years and two person households. The second old-age family status factor, ***Middle-aged/Old Female Widows*** (Table 6.6), contrasts areas with a population that is female, widowed, aged 75 - 84 and 85 years and over with areas containing large households (3 persons), a young adult population (20 - 34 years of age), a single population and a male population.

The remaining three family status factors describe the non-elderly urban population in Kitchener-Waterloo (Table 6.6). The first non-elderly family status factor, ***Small Non-Family Households***, contrasts areas with owner occupied dwellings, detached dwellings and large private households containing 4 - 5 persons with areas containing small 1 - 2 person households, non-family households, rented dwellings, apartments and a population that is divorced. The second non-elderly, family status factor, ***Large Mature Family***, identifies areas with large (4 - 5 and 6 person) households, a teenage population (10 - 19 years), an adult population (35 - 44 years), a middle aged population and detached dwellings; whilst a ***Young Family*** factor contrasts areas containing a population that is single with areas characterized by 3 person households, a young population (0 - 9 years) and semi-detached dwellings.

6.4.2 Principal Components Analysis and Factor Structure, Victoria

The principal components analysis once again identified five interpretable family status factors in 1991 for Victoria. Three out of the five family status factors identified described the elderly population of Victoria. These three old-age or elderly factors are discussed initially, followed by a brief discussion of the family status factors not related to old-age or the elderly (Table 6.7). The factor scores for each old-age component are given in Appendix G.

The five family status factors identified as describing family status in Victoria accounted for approximately 84 percent of the overall total variance in the correlation matrix. When the two non old-age family status factors were removed, the total overall

Table 6.7: Factor Structure, Victoria

FACTOR STRUCTURE AND TITLES	***FACTOR LOADINGS***	**% Variance/ Cumulative %**
Factor 1: General Widows		37.0/37.0
% of the total population aged 65 - 74 years	- 0.6	
% of the total population aged 75 - 84 years	- 0.7	
% of the total population aged 85 and over	- 0.6	
% of the total population aged 15 and over that is widowed	- 0.7	
% of the total population that is female	- 0.9	
% of the total population aged 35 - 44 years	0.6	
% of the total population aged 20 - 34 years	0.8	
% of the total population aged 15 and over that is single	0.9	
% of the total population that is male	0.9	

cont'd

Table 6.7 cont'd

Factor 2: Middle-aged Elderly		25.8/62.9
% of the total population aged 75 - 84 years	- 0.5	
% of the total number of private households that contain 4 - 5 persons	0.9	
% of the total number of private households that contain 6 or more persons	0.7	
% of the total number of private households that contain 3 persons	0.7	
% of the total population aged 10 - 19 Years	0.8	
% of the total population aged 0 - 9 Years	0.9	
% of the total number of occupied private dwellings that are semi-detached	0.6	
% of the total number of occupied private dwellings that are detached	0.8	
% of the total number of occupied private dwellings that are owned	0.6	
Factor 3: Old Elderly		12.1/74.9
% of the total population aged 85 and over	- 0.5	
% of the total number of occupied private dwellings that are rented	0.8	
% of the total number of occupied private dwellings that are apartments	0.7	
% of the total number of private households that are non-family households	0.9	
% of the total number of private households that contain 1 person	0.9	
% of the total population aged 15 and over that is divorced	0.8	
Factor 4: Completed Family		5.0/80.0
% of the total population aged 45 - 54 Years	0.7	
% of the total population aged 55 - 64 Years	0.5	
% of the total population aged 15 and over that is married	0.9	
% of the total number of occupied private dwellings that are owned	0.7	
% of the total number of private households that contain 2 persons	0.6	
Factor 5: Small Households		3.9/83.9
% of the total number of private households that contain 2 persons	0.5	

variance in the correlation matrix explained fell to 74 percent. The three old-age family status dimensions and individually explain 37, 26 and 12 percent of the total variance in the correlation matrix. The first old-age family status factor, ***General Widows***, contrasts enumeration areas with an elderly population aged 65 and over, widowed and female with areas characterized by a young adult (20-34 years) and adult (35 - 44 years) population, male, single population. A ***Middle-aged Elderly*** (75 - 84 years) family status factor contrasts areas characterized by an elderly population aged 75 - 84 years, with areas containing a young (0 - 9 years) population, a teenage population (10 - 19 years), large 4 - 6 person households, semi-detached and detached dwellings. The final old-age factor, ***Old Elderly***, contrasts areas characterized with a relative concentration of the oldest elderly, aged 85 and over, with areas characterized by rented dwellings, apartments, non-family households, one person households and a divorced population.

The two remaining family status factors do not describe the elderly population and therefore were not included in the subsequent cluster analysis (Table 6.7). A ***Completed Family*** factor describes enumeration areas containing a late middle aged (45 - 54 years), pre-elderly (55 - 64 years) population, a married population, two person households and owned dwellings; whilst the final ***Small Households*** dimension describes enumeration areas characterized by two person households.

6.4.3 Principal Components Analysis and Factor Structure, Halifax

Unlike the analysis for Kitchener-Waterloo and Victoria, the principal components analysis for Halifax identified six interpretable family status factors in 1991 (Table 6.8). Two out of the six family status factors describe the elderly population. The two old-age factors are once again discussed initially, followed by a brief discussion of the family status factors not related to old-age or the elderly population. The (reversed) factor scores (see Section 6.1.2: 126) for each old-age dimension are given in Appendix G.

The six family status factors identified accounted for approximately 81 percent of the overall total variance in the correlation matrix. When the two old-age family status

Table 6.8: Factor Structure, Halifax

FACTOR STRUCTURE AND TITLES	*FACTOR LOADINGS*	**% Variance/ Cumulative %**
Factor 1: Small/Non-Family Apartment Dwellers		29.4/29.4
% of the total number of occupied private dwellings that are detached	- 0.6	
% of the total number of occupied private dwellings that are owned	- 0.5	
% of the total number of occupied private dwellings that are rented	0.8	
% of the total number of occupied private dwellings that are apartments	0.9	
% of the total number of private households that are non-family households	0.9	
% of the total number of private households that contain 1 person	0.8	
% of the total population aged 15 and over that is divorced	0.7	
Factor 2: Old Widows		22.8/52.2
% of the total population aged 85 and over	- 0.6	
% of the total population aged 15 and over that is widowed	- 0.5	
% of the total population aged 15 and over that is married	0.7	
% of the total number of occupied private dwellings that are detached	0.7	
% of the total number of occupied private dwellings that are owned	0.8	
% of the total population aged 55 - 64 years	0.6	
% of the total population aged 35 - 44 years	0.6	
% of the total population aged 45 - 54 years	0.8	
Factor 3: Young/Middle-aged Widows		11.5/63.7
% of the total population aged 15 and over that is single	- 0.8	
% of the total population aged 20 - 34 years	- 0.8	
% of the total population aged 55 - 64 years	0.6	
% of the total population aged 65 - 74 years	0.8	
% of the total population aged 75 - 84 years	0.6	
% of the total population aged 15 and over that is widowed	0.6	
Factor 4: Mature Large Family/Children		7.1/70.8
% of the total number of private households that contain 2 persons	- 0.5	
% of the total population aged 35 - 44 years	0.5	
% of the total population aged 10 - 19 years	0.7	
% of the total population aged 0 - 9 years	0.8	
% of the total number of private households that contain 6 or more persons	0.5	
% of the total number of occupied private dwellings that are semi-detached	0.5	
Factor 5: Female		5.1/75.9
% of the total population that is male	- 0.9	
% of the total population that is female	0.9	

cont'd

Table 6.8 cont'd

Factor 6: Medium Sized/Large Family		4.8/80.6
% of the total number of private households that contain 3 persons	0.9	
% of the total number of private households that contain 4 - 5 persons	0.7	

factors were removed, the total overall variance in the correlation matrix explained fell to 46 percent (Table 6.8). A ***Old Widows*** old-age family status factor contrasts enumeration areas with a relative concentration of an old-elderly (85 and over), widowed population with areas characterized by a relative concentration of a married, middle-aged (35 - 44 years) and pre-elderly population, detached dwellings and owned dwellings (Table 6.8). A ***Young/Middle-aged Widows*** factor contrasts areas with a relative concentration of a single young adult population (20 - 34 years) with areas characterized by a widowed, pre-elderly (55 - 64 years) and elderly (65 - 84 years) population. Together the ***Old Widows*** and ***Young/Middle-aged Widows*** factors explain 34 percent of the total variance (Table 6.8).

The remaining four family status factors describe the non-elderly urban population of Halifax. The first non old-age family status dimension (***Small/Non-Family Apartment Dwellers***) contrasts areas characterized by detached, owner occupied housing with areas characterized by a relative concentration of rented housing, apartments, a divorced population, single person households and non-family households. A ***Large Family/Children*** factor describes areas containing an early middle-aged population, a teenage population, households containing 6 or more persons and semi-detached private dwellings. Not surprisingly, a ***Female*** family status factor, contrasts areas characterized by a male population with areas containing a predominately female population. Finally, areas characterized by private households containing 3 persons and 4 - 5 person households are described by a sixth family status factor: ***Medium Sized/Large Family***.

Table 6.9 shows the Bartlett Measure of Sphericity and the KMO Measure of Sampling Adequacy test statistics for each individual city PCA. The test statistic for Bartlett's test of sphericity indicates that it is possible to reject the hypothesis that the zero order correlation matrices for the individual analyses of Kitchener-Waterloo, Halifax and Victoria are identity matrices. The test statistic for Victoria for example, is

Table 6.9: KMO Measure of Sampling Adequacy and Bartlett's Test of Sphericity for the Individual City PCA's

	Kaiser-Meyer-Olkin Measure of Sampling Adequacy	**Bartlett's Test of Sphericity**	**Significance Level**
Victoria	0.77009	5850.1	0.0000
Halifax	0.65545	6284.2	0.0000
Kitchener-Waterloo	0.78633	13376.7	0.0000

5850.1 (Table 6.9). This is larger than the associated significance level of 0.0000, thus indicating that the hypothesis (that the zero order correlation matrix for Victoria is an identity matrix) can be rejected. The KMO measure of sampling adequacy indicates that the sampling adequacy is 'middling' for the individual analyses of Kitchener-Waterloo and Victoria, at 0.77009 and 0.78633 respectively; but only 'mediocre' for the

PCA of Halifax (Table 6.9). On the basis of the above results the individual city PCAs are considered adequate. The zero order and partial/anti-image correlation matrices for Kitchener-Waterloo, Halifax and Victoria are given in Appendices E, D and C respectively.

6.4.4 Cluster Analysis and Discriminant Analysis

Having identified the family status factors which describe the respective elderly populations of Kitchener-Waterloo, Halifax and Victoria, aged spaces are formed using cluster and discriminant analysis. In order to establish which cluster analysis is used to identify aged spaces, an iterative process, whereby a number of cluster and discriminant analyses are performed and the results compared, is used. For each iteration the number of clusters to be formed is set. A discriminant analysis is then performed for each cluster solution. The discriminant analysis is used to test the validity of each cluster analysis. If the classification produced by the cluster analysis is accurate, then the classification produced by the discriminant analysis should be similar. Where an enumeration area is misclassified i.e., the discriminant analysis classifies the enumeration area in a different 'group' than the cluster analysis, the enumeration area is reassigned to the cluster indicated by the discriminant analysis.

The interpretability of the cluster analysis for Kitchener-Waterloo, Halifax and Victoria is improved by reversing the signs of the factor scores on certain old-age family status dimensions prior to clustering the enumeration areas. As Table 6.6, 6.7 and 6.9 show, one out of the two old-age family status dimensions in Kitchener-Waterloo and

Halifax and all three old-age family status factors in Victoria have negative factor loadings. For example, in Kitchener-Waterloo the percent of the population aged 75 - 84 and 85 and over and the percent of the population that is 15 years and over and widowed have negative loadings on F2: ***Middle-aged/Old Female Widows***. The percent of the population aged 75 - 84, 85 and over; percent of the population that is female and percent of the population aged 15 years and over and widowed are all negatively correlated with the ***Middle-aged/Old Female Widows*** dimension (Table 6.6). Enumeration areas with negative factor scores are therefore characterized by a relative concentration of the ***Middle-aged/Old Female Widows*** (F2), or a concentration of a female, widowed population aged 75 and over. The signs on the factor scores for F2: ***Middle-aged/Old Female Widows*** are therefore reversed prior to performing the cluster analysis.

The factor score signs on the ***Old Widows*** (F2) old-age family status factor in Halifax and the ***General Widows*** (F1), ***Middle-aged Elderly*** (F2) and ***Old Elderly*** (F2) old-age family status dimensions in Victoria are reversed. Unlike the age group variables that load on these factors, the old-age variables that load highly on the ***Young/Middle-aged Widows*** (F3) factor in Halifax and the ***Early Elderly*** (F4) old-age family status dimension in Kitchener-Waterloo are positive. Consequently, high positive factor loadings and positive factor scores indicate a concentration of the ***Early Elderly*** (F4) and ***Elderly Widow*** (F3) factors. It is not therefore necessary to reverse the factor scores on the ***Early Elderly*** (F4) and ***Young/Middle-aged Widows*** (F3) factors prior to performing the cluster analysis.

The cluster solution used as the starting point for the definition of aged spaces in all three individual cities is selected on the basis of the criteria discussed in section 3.6.2: 70. Table 6.10 shows the results of this process for each city. The canonical discriminant functions for each cluster solution and city are given in Appendix J.

Table 6.10: Percent of Enumeration Areas Grouped Correctly by Number of Clusters, and City

Number of Clusters	***Percent of Enumeration Grouped Correctly***		
	Kitchener-Waterloo	**Halifax**	**Victoria**
15	91	92	97
13	94	92	96
11	94	95	97
9	95	92	99
7	95	100*	98
5	98*	100	100*
3	100	100	100

* indicates the selected cluster solution

Table 6.10 reports the percent of enumeration areas grouped correctly, based on a comparison of the cluster analysis and discriminant analysis results for each cluster solution and city. The percent of enumeration areas correctly grouped is once again reported for odd numbered cluster solutions starting at 15 and finishing at 3 clusters. For example, for the 15 cluster solution i.e., the cluster solution that produced 15 clusters, 91 percent of enumeration areas are grouped correctly in Kitchener-Waterloo, 92 in Halifax and 97 in Victoria. Table 6.10 also shows that according to the discriminant analysis 100 percent of the enumeration areas in Kitchener-Waterloo were grouped correctly by the cluster solution that produced only three clusters i.e., based on the discriminant analysis, the 3 cluster solution for Kitchener-Waterloo did not misclassify any enumeration areas. For Halifax all the 172 enumeration areas in the city were correctly grouped by the cluster solution that produced 7, 5 and 3 clusters; whereas the 150 enumeration areas in Victoria were all grouped correctly by the 5 and 3 cluster solutions. The percent of enumeration areas grouped correctly for the final cluster solution, where all enumeration areas are combined into a single cluster, is not reported.

On the basis of Table 6.10 and the stated criteria, the 5 cluster solution (100 percent of enumeration areas grouped correctly) is selected for the City of Victoria; the 7 cluster solution (100 percent of enumeration areas grouped correctly) for the City of Halifax and the 5 cluster solution (98 percent of enumeration areas grouped correctly) for the city of Kitchener-Waterloo. In the case of Kitchener-Waterloo a cluster solution with less than 100 percent of enumeration areas grouped correctly is selected in preference to alternative solutions which yielded more accurate results because of the accompanying loss of detail caused by the reduction in the number of clusters from 5 to 3. The characteristics of each cluster are now discussed, beginning with Kitchener-Waterloo.

Table 6.11 shows on which of the old-age family status factors each of the 5 original clusters in Kitchener-Waterloo are formed. In Table 6.11 the 'X' indicates that an individual cluster is formed on the basis of one or more old-age family status factors. For example, cluster 1 is formed on the basis of one (***Middle-aged/Old Female Widows*** (F2)), of the two old-age family status factors identified in Kitchener-Waterloo. The

Middle-aged/Old Female Widows (F2) factor contrasts enumeration areas characterized by a relative concentration of a single male population aged 20 -34 years, living in 3

Table 6.11: Cluster Characteristics, Kitchener-Waterloo

Cluster Number	**Number of Enumeration Areas**	**Old-Age Family Status Factors** *(Percent of Variance Explained)*	
		F2: Middle-aged/Old Female Widows *(23)*	***F4: Early Elderly*** *(5)*
1	301	X	
2	12		
3	7		X
4	1	X	X
5	2	X	

person households with a female, widowed, middle-aged and old elderly population.

Out of the 5 clusters that comprise the final cluster solution for the individual analysis of Kitchener-Waterloo, 3 are characterized by a relative concentration of one old-age family status dimension; whereas only one is formed on the basis of two old-age family status factors (Table 6.11). Clusters 1 and 5 are comprised of enumeration areas clustered on the basis of the ***Middle-aged/Old Female Widows*** factor. Cluster 3 is characterized by enumeration areas with a relative concentration of a married middle-aged (45-54 age group), pre-elderly (55-64 age group) and a young elderly (65-74 age group) population, living in owner occupied housing or the ***Early Elderly*** (F4) factor. Cluster 4 in contrast is comprised of enumeration areas clustered on the basis of both old-age dimensions identified in Kitchener-Waterloo. The remaining cluster, cluster 2, is a non-aged cluster. The enumeration areas in cluster 2 are characterized by a relative absence of both old-age factors. The spatial distribution of the 5 cluster solution for Kitchener-Waterloo is shown in Figure 6.9.

The old-age family status dimension/dimensions on which each cluster in Halifax is formed are showed in Table 6.12. An 'X' in Table 6.12 indicates that an individual cluster is formed on the basis of that specific old-age factor. For example, cluster 4 is

Table 6.12: Cluster Characteristics, Halifax

Cluster Number	**Number of Enumeration Areas**	**Old-Age Family Status Factors** *(Percent of Variance Explained)*	
		F2: Old Widows *(23)*	***F3: Young/Middle-aged Widows*** *(12)*
1	157	X	X
2	6		X
3	1	X	
4	1	X	X
5	2		X
6	2		
7	3		X

formed on the basis of both the ***Old Widows*** (F2) and ***Young/Middle-aged Widows*** (F3) factors. Out of the 7 clusters identified in Halifax two are formed on the basis of both old-age factors identified by the PCA as describing the elderly population of Halifax; 4 are formed on the basis of only one old-age dimension and the remaining cluster (cluster 6) is a non-aged cluster and is therefore characterized by a relative absence of both old-age factors. The spatial distribution of clusters in Halifax is shown in Figure 6.10.

Cluster 1 and 4 are comprised of enumeration areas with a relative concentration of both the ***Old Widows*** (F2) and ***Young/Middle-aged Widows*** (F3) factors. The ***Old***

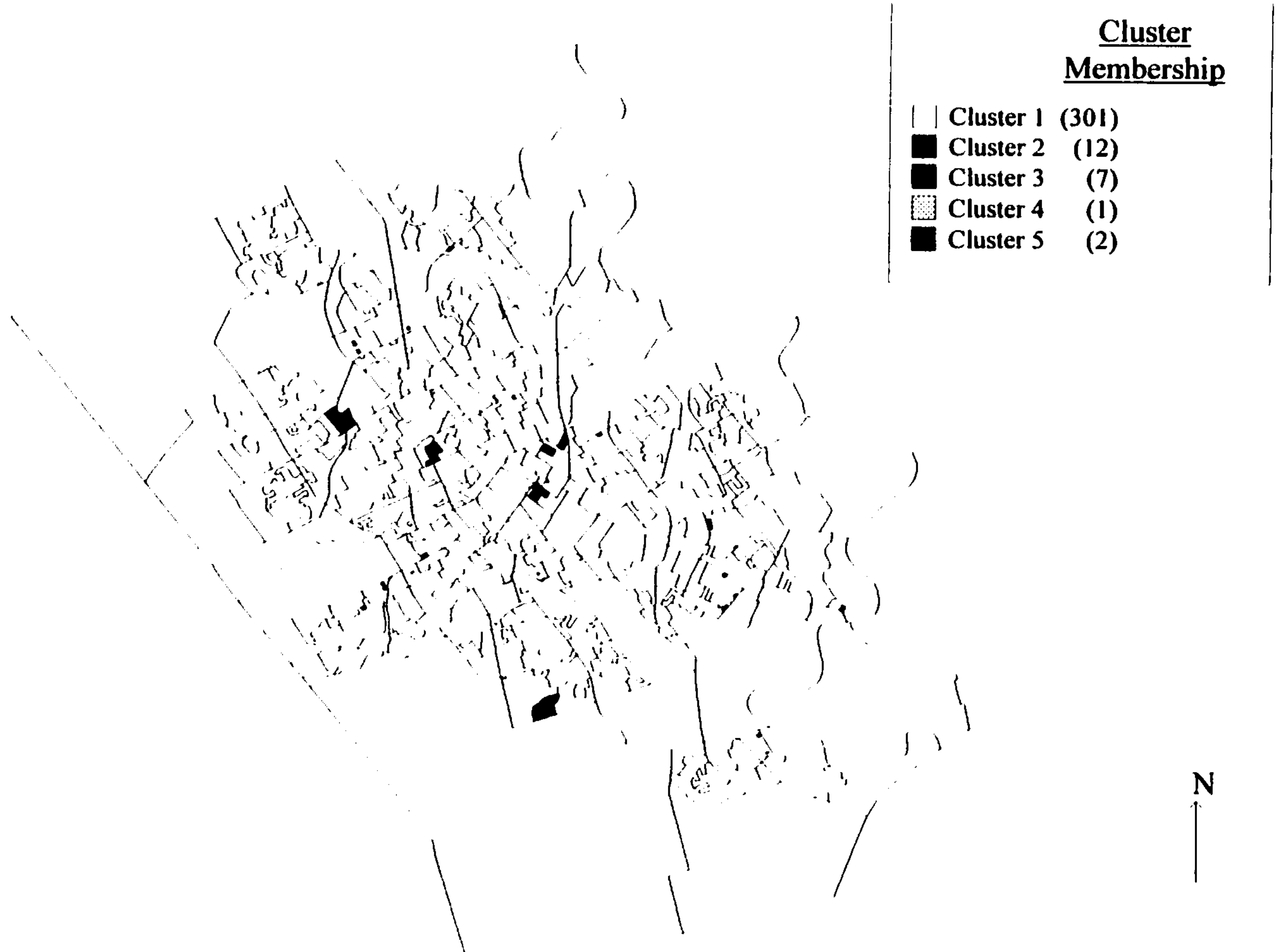


Figure 6.9: 5 Cluster Solution, Kitchener-Waterloo

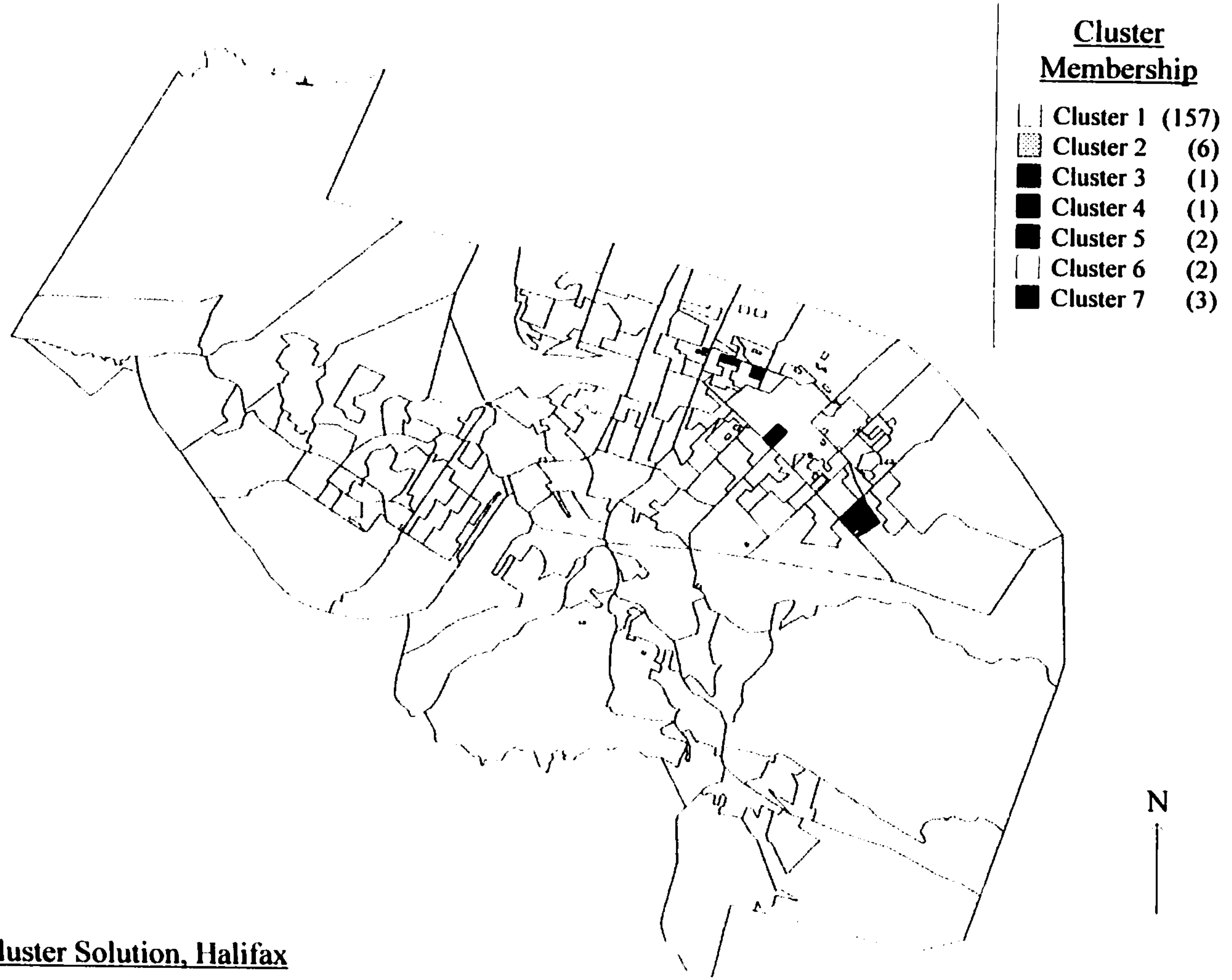


Figure 6.10: 7 Cluster Solution, Halifax

Widows (F2) factor contrasts enumeration areas with a relative concentration of a widowed, old elderly population with enumeration areas containing a married population aged 35-64 years, living in owned detached dwellings (Table 6.12). The ***Young/Middle-aged Widows*** (F3) dimension contrasts areas containing a single, young adult (20-34 years) population with enumeration areas characterized by a pre elderly and a young and middle-aged elderly widowed population. Clusters 7, 5 and 2 on the other hand are formed from enumeration areas grouped on the basis of one old-age factor, F3: ***Young/Middle-aged Widows***. Cluster 3, the fourth single old-age dimension cluster, is characterized exclusively by a concentration of the ***Old Widows*** (F2) factor.

Table 6.13 shows that the old-age family status factors which characterize each cluster in Victoria. The 'X' in Table 6.13 indicates on which old-age factors each individual cluster is formed. For example cluster 3, is made-up of two old-age family status factors: ***Middle-aged Elderly*** (F2) and the ***Old Elderly*** (F3). Of the 5 clusters in the final solution for Victoria one is formed on the basis of all three old-age family status factors; two are formed on the basis of two old-age factors and one is formed on the basis of one old-age factor. Cluster 2 is a non aged cluster and is therefore characterized by a relative absence of the ***Middle-aged Elderly*** (F2), ***General Widows*** (F1) and the ***Old Elderly*** (F3) factors.

Cluster 1 is comprised of enumeration areas characterized by a relative concentration of all three old-age family status factors in Victoria (Table 6.12). According to Table 6.6 the ***General Widows*** (F1) factor contrasts enumeration areas with an elderly population aged 65 and over, widowed and female with areas

Table 6.13: Cluster Characteristics, Victoria

Cluster Number	**Number of Enumeration Areas**	**Old-Age Family Status Factors** *(Percent of Variance Explained)*		
		F1:*General Widows* *(37)*	***F2: Middle-aged Elderly*** *(26)*	***F3: Old Elderly*** *(12)*
1	124	X	X	X
2	14			
3	4		X	X
4	1	X		
5	7	X		X

characterized by a young adult (20-34 years) and adult (35 - 44 years) population, male, single population. The ***Middle-aged Elderly*** dimension (75 - 84 years) family status factor contrasts areas characterized by an elderly population aged 75 - 84 years, with areas containing a young (0 - 9 years) population, a teenage population (10 - 19 years), large 4 - 6 person households, semi-detached and detached dwellings. F3: ***Old Elderly*** factor, contrasts areas characterized with a relative concentration of the oldest elderly, aged 85 and over, with areas characterized by rented dwellings, apartments, non-family households, one person households and a divorced population. Both clusters 3 and 5 are formed on the basis of F3: ***Old Elderly*** factor and either the ***Middle-aged Elderly*** (F2) dimension or the ***General Widows*** (F1) factor (Table 6.13). The final cluster, 4, is formed solely on the basis of the ***General Widows*** (F1) factor. Figure 6.11 shows the spatial distribution of clusters in Victoria.

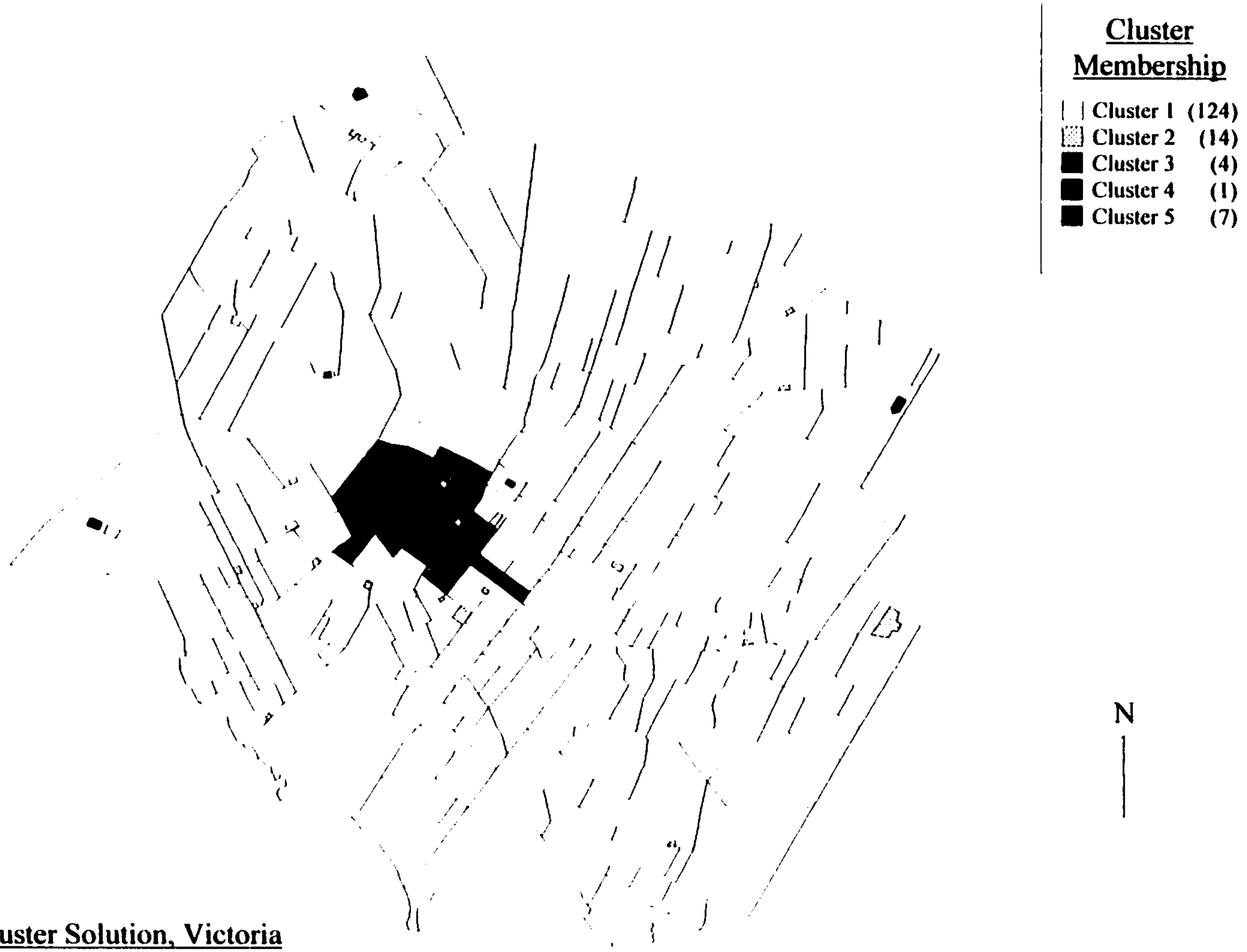


Figure 6.11: 5 Cluster Solution, Victoria

6.5 Aged Spaces in Kitchener-Waterloo, Halifax and Victoria

6.5.1 Aged Spaces in Kitchener-Waterloo

For the City of Kitchener-Waterloo the selected cluster solution yielded a total of 11 aged spaces after all the appropriate modifications had been completed. The aged spaces thus formed were all spatially localized, single enumeration area or multiple enumeration area aged spaces (Figure 6.12). In the following section the characteristics, spatial location and distribution of aged spaces in Kitchener-Waterloo are considered.

Covering by far the largest portion of Kitchener-Waterloo and containing 301 out of the 323 or 93 percent of the total number of enumeration areas in the city is a aged space: AS1 (Figure 6.12). Characterized by a relative concentration of the ***Middle-aged/Old Female Widows*** and the ***Early Elderly*** factors, this aged space is formed from cluster 1. From Figure 6.9 it can be seen that this non-aged space covers the whole of Kitchener-Waterloo (AS1 is left blank to aid the interpretation of Figure 6.9). with the exception of 12 enumeration areas and a small number of unenumerated enumeration areas for which no data is available.

As Figure 6.12 shows 8 aged spaces were derived from the few enumeration areas in Kitchener-Waterloo not contained in the extensive aged cluster previously described. The largest number 6 of these aged spaces are formed on the basis of cluster 3. Enumeration areas in cluster 3 are grouped partly or completely on the basis of the ***Early Elderly*** (F4) factor. The ***Early Elderly*** (F4) dimension describes areas with a married population, population aged 45 - 54, 55 - 64 and 65 - 74 years and two person households (Table 6.6). The aged spaces formed from the ***Early Elderly*** (F4)

Figure 6.12: Aged Spaces, Kitchener-Waterloo

* Please note: The shading scheme used merely allows aged spaces to be differentiated more easily. It has no other meaning.

dimension are AS2, 4, 5, 6, 7, 8 and 9. Only two aged spaces (AS2 (which is also formed partly on the basis of the ***Early Elderly*** factor) and 3) are characterized by enumeration areas with a relative concentration of the ***Middle-aged/Old Female Widows*** (F2) dimension. The ***Middle-aged/Old Female Widows*** old-age family status factor (Table 6.6) contrasts areas with a population that is female, widowed, aged 75 - 84 and 85 years and over with areas containing large households (3 persons), a young adult population (20 - 34 years of age), a single population and a male population.

Aged spaces 2, 3, 4, 5, 6, 7 and 8 in Kitchener-Waterloo are concentrated in a line running in a northwest/southeast direction through the centre of the City of Kitchener and to a slightly lesser degree the centre of the City of Waterloo (Figure 6.12). Within this larger 'group' of aged spaces it is possible to identify three smaller subgroups: one located in the City of Waterloo (the 'Waterloo' group), one in the oldest and most central part of the Kitchener (the 'Kitchener' group) and one located in the southeastern part of the City of Kitchener (the 'southeastern' group). The 'Waterloo' group is comprised of four aged spaces: 2, 3, 4 and 5. In contrast to the other three aged spaces, AS3 is comprised of two enumeration areas. The 'Kitchener' group is made-up of three aged spaces: 6,7 and 8. All three aged spaces are single enumeration area aged spaces. Finally, the 'southeastern' group is made-up of two aged spaces: 10 and 11.

6.5.2 Aged Spaces in Halifax

For the City of Halifax the modified cluster solution yielded a total of 11 aged spaces (Figures 6.13 and 6.14). The aged spaces thus formed include 168 out of the 172 enumeration areas in Halifax. Only 4 enumeration areas are characterized by a relative absence of both old-age family status dimensions (***Old Widows*** (F2) and ***Young/Middle-aged Widows*** (F3)) identified as describing the elderly population of Halifax. The non aged cluster in Halifax is therefore extremely small and disjointed. The size of the non aged cluster is in keeping with the non aged cluster in Kitchener-Waterloo. In Kitchener-Waterloo the non-aged space contains 14 out of the 323 or 4 percent of the enumeration areas in that city. The non-aged space in Halifax is therefore almost identical to the non-aged space in Kitchener-Waterloo. The largest aged space in Halifax, AS1, contains 157 out of the 172 or 91 percent of enumeration areas in Halifax. Because it is so extensive AS1 is not subdivided into smaller aged spaces. Instead it is considered the backdrop, as is AS1 in Kitchener-Waterloo, against which the spatial distribution of other aged spaces is discussed.

AS1 is composed of two clusters: 1 and 4. Enumeration areas in both clusters 1 and 4 are grouped on the basis of both old-age family status factors in Halifax. The ***Old Widows*** (F2) old-age family status factor contrasts enumeration areas with a relative concentration of an old-elderly (85 and over), widowed population with areas characterized by a relative concentration of a married, middle-aged (35 - 44 years) and pre-elderly population, detached dwellings and owned dwellings. The ***Young/Middle-aged Widows*** (F3) factor contrasts areas with a relative concentration of a single young adult population (20 - 34 years) with areas characterized by a widowed, pre-elderly (55 - 64 years) and young/middle-aged elderly (65 - 84 years) population.

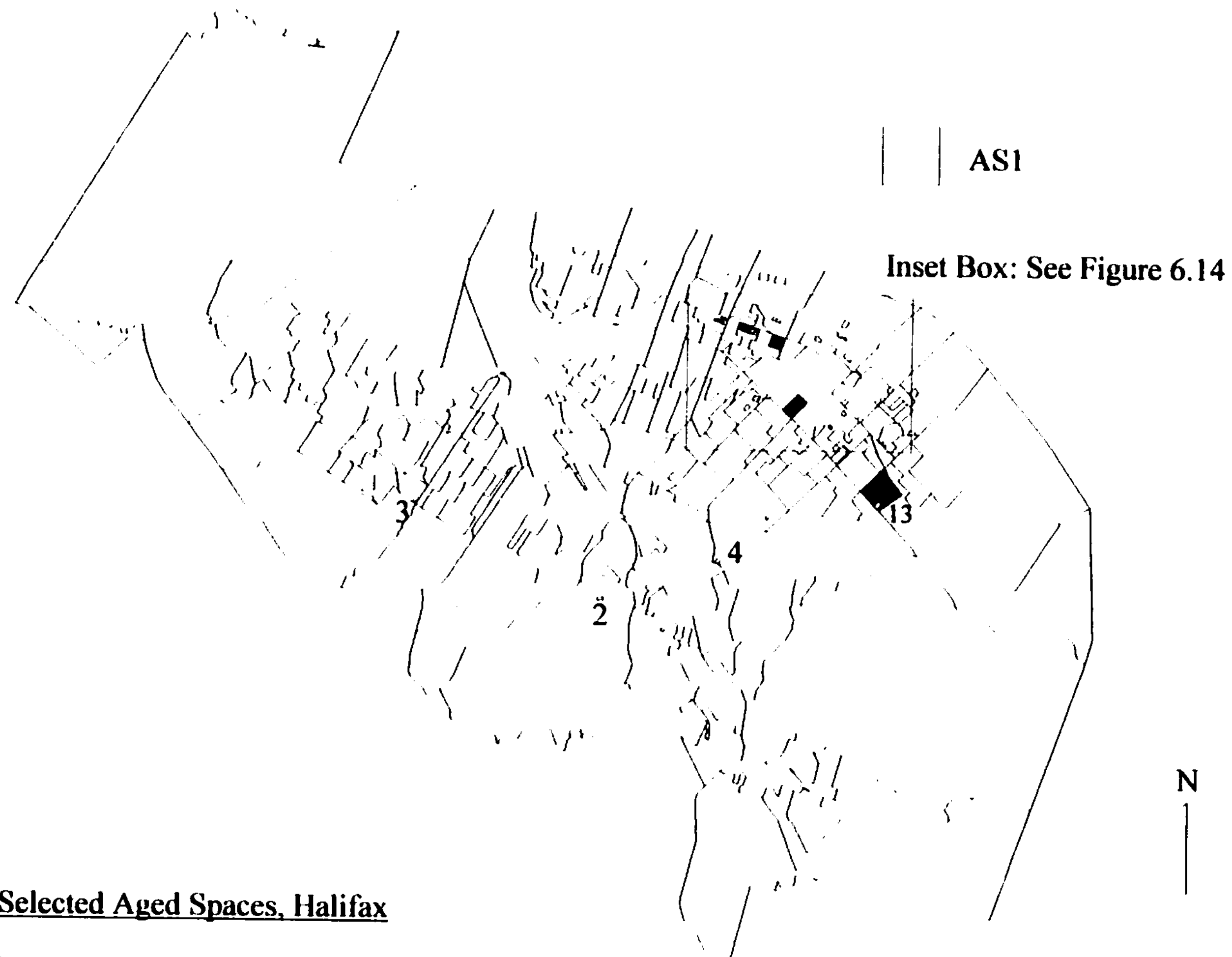


Figure 6.13: Selected Aged Spaces, Halifax

* Please Note: The shading scheme used merely allows the aged spaces to be differentiated more easily. It has no other meaning

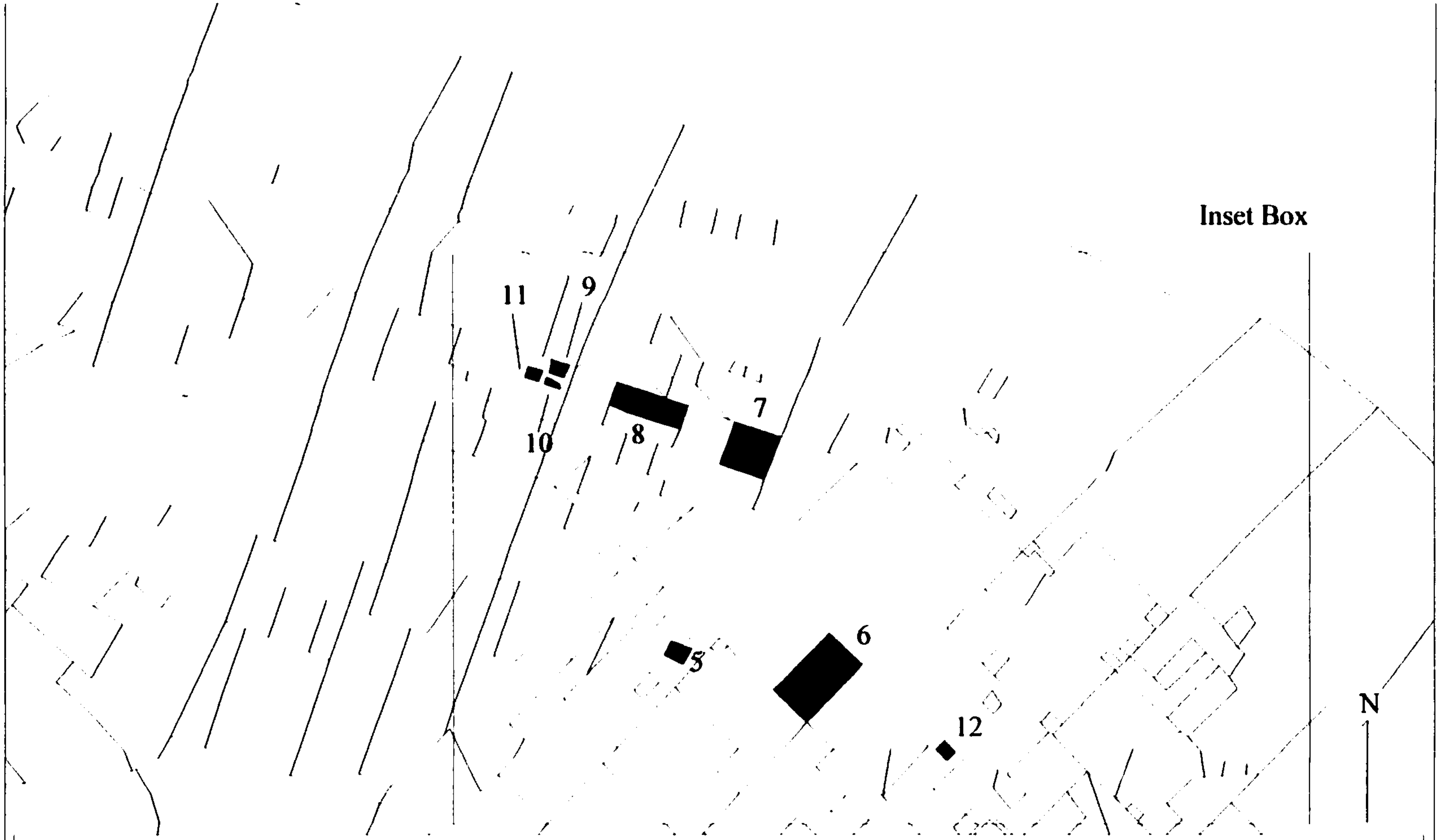


Figure 6.14: Selected Aged Spaces, Halifax

* Please Note: The shading scheme used merely allows the aged spaces to be differentiated more easily. It has no other meaning.

In total the remaining aged spaces (AS2, 3, 4, 5, 6, 7, 8, 10 and 11) in the City of Halifax are made-up of only 8 percent or 13 out of 172 of the enumeration areas included in the analysis. Unlike AS1 which is formed on the basis of enumeration areas clustered on both old-age components, the remaining aged spaces are primarily formed on the basis of enumeration areas grouped on the basis of the ***Young/Middle-aged Widows*** dimension. As Figures 6.13 and 6.14 suggest, all the remaining aged spaces in Halifax are completely different from AS1: are spatially compact and comprised of one enumeration area. The only exception is AS9. This aged space is made-up of two enumeration areas. Three aged spaces (AS2, 3 and 4) are located in a semi-circle in south Halifax. All the other aged spaces are clustered together in the oldest part of Halifax, close to the harbour.

Given that the likelihood of institutionalization increases with advanced chronological age (Cohen *et al.* 1986; Gee and Kimball 1987: 54 - 63; Shapiro and Roos 1987; Shapiro and Tate 1988; Kalman and Thomas 1990 and Lagergren 1996) and widowhood (Wister and Strain 1986; Forbes *et al.* 1987: Shapiro and Roos 1987 and Rosenthal 1994) and the compact size of these aged spaces, it is suggested that AS2, 3, 4, 5, 6, 7, 8, 9, 10, 11 and 12 are old-age institutions. Also, the provision of only basic age, gender and marital status PUMF data for the enumeration areas that make-up these aged spaces would seem to support this suggestion. As previously explained, the institutionalized elderly population is the population aged 65 and over that is usually resident in 'institutional' collective dwellings; where 'institutional' collective dwellings are 'children's homes and orphanages, chronic care hospitals, *residences for senior citizens* . . . and jails' (Statistics Canada 1991: 52). In 1991, unlike previous censuses, only basic data (age, gender, marital status and mother tongue) were collected for elderly and other institutional residents.

6.5.3 Aged Spaces in Victoria

After modification, the selected 5 cluster solution for Victoria yielded 7 aged spaces. The aged spaces formed from the selected cluster solution for the City of Victoria included all but 14 of the 150 enumeration areas within the City's boundaries. That is, 91 percent of enumeration areas in Victoria are characterized by a relative concentration of one or more of the old-age family status factors identified as describing the elderly population of that city.

Beginning with the non aged cluster, only 9 percent of enumeration areas in the City of Victoria are characterized by a relative absence of the ***General Widow*** (F1), ***Middle-aged Elderly*** (F2) and ***Middle-aged Elderly***(F3) dimensions identified by the individual PCA as describing the elderly population of Victoria. The non-aged space in Victoria is therefore larger than the non-aged space in Halifax (2 enumeration areas) and the non-aged space in Kitchener-Waterloo (12 enumeration areas). The 14 enumeration areas which comprise the non aged cluster are shown on Figure 6.15.

Containing 91 percent or 136 out of 150 enumeration areas in Victoria is a single enumeration area, AS1. This aged space, not surprisingly, covers the entire city (Figure 6.15).

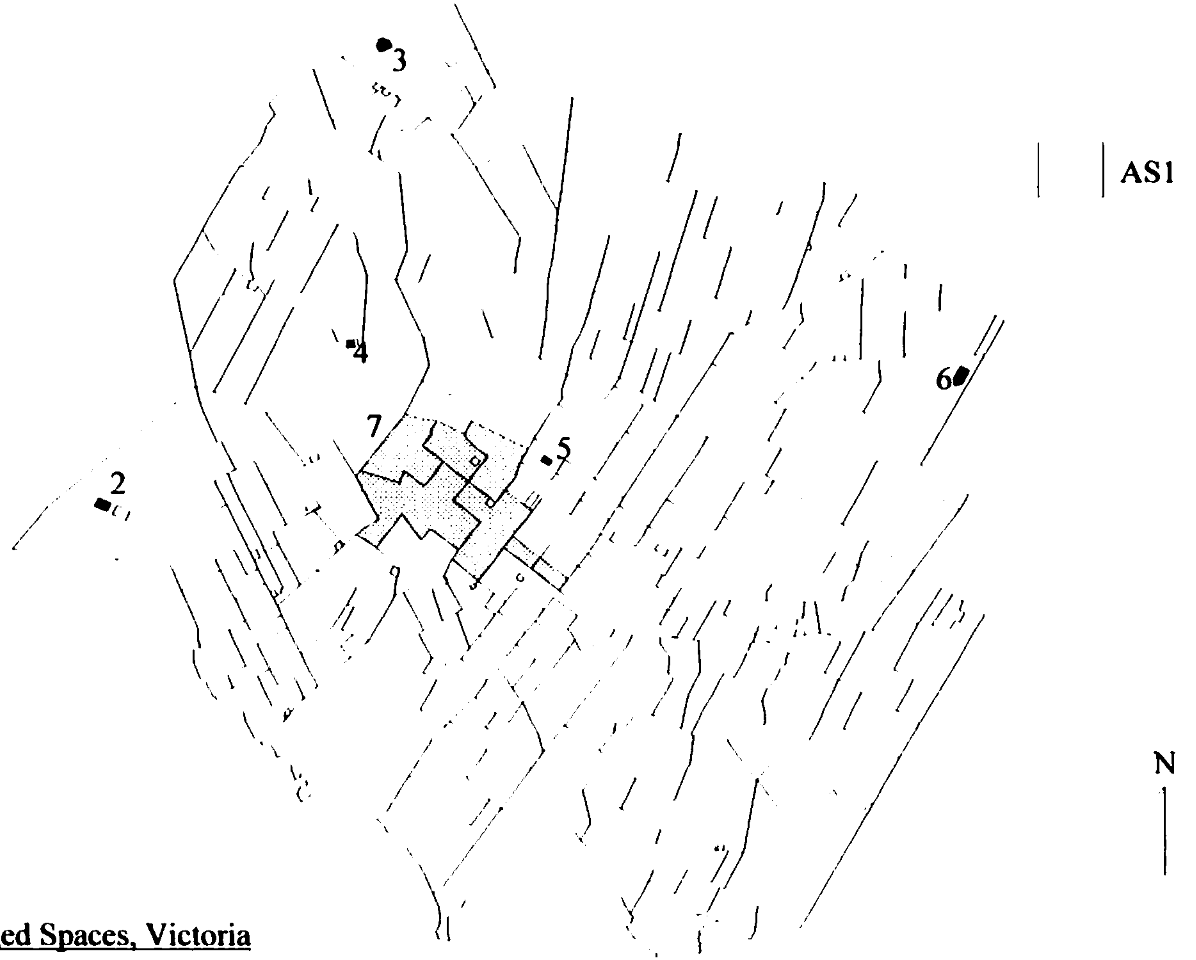


Figure 6.15: Aged Spaces, Victoria

* Please Note: The shading scheme used merely allows the aged spaces to be differentiated more easily. It has no other meaning.

As with AS1 in Halifax, no attempt is made to subdivide AS1. The enumeration areas which form AS1 are clustered on the basis of all old-age family status dimensions (***General Widow*** (F1), ***Middle-aged Elderly*** (F2) and ***Middle-aged Elderly*** (F3)) identified in Victoria. The ***General Widows*** (F1) old-age family status factor contrasts enumeration areas with an elderly population aged 65 and over, widowed and female with areas characterized by a young adult (20-34 years) and adult (35 - 44 years) population, male, single population. The ***Middle-aged Elderly*** (F2) dimension (75 - 84 years) family status factor contrasts areas characterized by an elderly population aged 75 - 84 years, with areas containing a young (0 - 9 years) population, a teenage population (10 - 19 years), large 4 - 6 person households, semi-detached and detached dwellings. The final old-age factor, ***Old Elderly*** (F3), contrasts areas characterized with a relative concentration of the oldest elderly, aged 85 and over, with areas characterized by rented dwellings, apartments, non-family households and one person households.

Composed of 7 enumeration areas and located in the centre of the City of Victoria, AS7 is formed on the basis of enumerationa reas clustered on the basis of one cluster, cluster 5. In turn, cluster 5 is formed on the basis of the ***General Widows*** and ***Old Elderly*** old-age components. The ***General Widows*** and ***Old Elderly*** old-age factors essentially describe an old widowed population.

The final aged spaces identified in Victoria, AS2, 3, 4, 5 and 6 are a single enumeration area aged spaces located throughout Victoria. Aged Space 2 is formed on the basis of the ***General Widows*** factor; whereas all the other aged spaces are clustered on the basis of the ***General Widows*** and ***Old Elderly*** dimensions. As such all 6 of these aged spaces are formed on the basis of old-age dimensions that essentially describe the oldest elderly population.

Chapter 7

The Populations of Aged Spaces: Selected Socio-Economic Characteristics

From Chapter 4 it is known that differences exist in the age distribution of the elderly population and between elderly aged groups in terms of gender, marital status and household size. Based on the analysis of aged residential segregation, the total elderly population. as well as the young, middle-aged and old elderly populations were all found to be segregated from both the elderly (in the case of the young, middle-aged and old elderly) and the non-elderly populations to varying degrees. As a consequence of this segregation, aged spaces were identified in Halifax, Victoria and Kitchener-Waterloo. Not surprisingly, given the higher levels of segregation (measured by overall and enumeration area-specific concentration and how evenly the old elderly were distributed) reported for the old elderly, a large proportion of aged spaces identified in each city were characterized by concentrations of the old elderly. For example, in Kitchener-Waterloo The second old-age family status factor, ***Middle-aged/Old Female Widows***, derived by the PCA contrasts areas with a population that is female, widowed, aged 75 and over with areas containing large households (3 persons), a young adult population (20 - 34 years of age), a single population and a male population.

In the following chapter section 7.1 how the elderly populations assumed to be resident in each previously defined aged space are discussed. The elderly populations assumed to be resident in each aged space are defined using the PUMF data. A final section, 7.2, describes selected demographic and socio-economic characteristics of the aged spaces identified in Kitchener-Waterloo, Halifax and Victoria.

7.1 The Definition of Elderly Populations in Kitchener-Waterloo, Halifax and Victoria

The elderly populations of the aged spaces in each city are defined using information from the previously performed Principal Components Analysis (PCA) for each city. Specifically the variables that load highly on each old-age family status factor, are used to define identical elderly populations from the 3 percent (PUMF) data. The elderly populations thus defined from the PUMF data are identical to the elderly populations derived by the PCA. For example, on the basis of information from the PCA for Halifax, two elderly populations, elderly widows and old-old widows (identical to the ***Young/Middle-aged Widows*** and ***Old Widows*** family status factors respectively), can be identified from the 3 percent data. The first of these two groups consists of widowed individuals aged 65 - 84; whereas the second population is comprised of widows aged 85 and over.

Unlike the enumeration area data however, data in the Public Use Microdata is not georeferenced. It is not therefore possible to determine in which enumeration area an individual respondent is located. Concomitantly, it is not possible to directly link particular elderly populations with specific aged spaces. In order to link the elderly populations defined using the PUMF data with aged spaces it is assumed that elderly populations and aged spaces with the same characteristics (which in turn are defined on the basis of the same variables that load highly on each old-age family status factor) are linked. Returning to the Halifax example discussed previously, the PCA and cluster analysis identified a number of aged spaces characterized by a relative concentration of the ***Old Widows*** old-age family status factor, or a population aged 85 and over and widowed. Although it is not possible to ascertain which old-old widowed individual/s are located in a particular enumeration area or aged space (because the 3 percent data is not georeferenced), it is assumed that that the old-old widowed population (defined from the 3 percent data) in Halifax is located in the aged spaces defined on the basis of the ***Old Widows*** old-age family status factor, because of shared characteristics i.e., marital status: widowed and age: 85 and over.

Using the same method, three elderly populations are defined from the 3 percent data in Victoria and two elderly populations in Kitchener-Waterloo. In Victoria, a population aged 75 - 84 years, equivalent to the ***Middle-aged Elderly*** old-age family status factor; an elderly population aged 85 and over, equivalent to the ***Old Elderly*** old-age family status factor and lastly, a female widowed population aged 65 and over, equivalent to the ***General Widows*** factor are derived from the PUMF data. A female widowed population aged 75 and over, equivalent to the old female widow factor and the much younger empty nester (45 and over, married, 2 person household) population, equivalent to the ***Early Elderly*** factor are identified in Kitchener-Waterloo from the 3 percent data. In Halifax, as already mentioned, two elderly groups are identified from the PUMF data on the basis of the two old-age family status factors previously derived by the PCA. The first of these two groups consists of widowed individuals aged 65 - 84; whereas the second population is comprised of widows aged 85 and over.

7.2 Selected Socio-economic Characteristics of the Elderly Populations of Aged Spaces in Kitchener-Waterloo, Halifax and Victoria

In the following section selected social and economic characteristics of each aged space population or the elderly population defined on the basis of the variables that load highly on each individual old-age family status factor, are described. The socio-economic attributes included in the discussion are limited to ethnic origin, household size, mobility and average income. For ease of presentation the changing socio-economic characteristics of each elderly group are discussed on an attribute by attribute basis.

7.2.1 Ethnic Origin

As before, problems interpreting multiple responses i.e., persons who claim membership of two ethnic groups and the small number of observations in many multiple response categories resulted in only single responses, individuals who provide one ethnic origin, being included in the analysis.

Without exception elderly individuals of British ethnic origins make-up the largest proportions of the population of aged spaces in all three cities (Table 7.1). Individuals of French, German and Dutch origin in turn make-up considerably smaller proportions of the aged space populations in each city. In Victoria for example, the British ethnic group comprises approximately 59 percent of the large family/family household population, 68 percent of the middle-aged elderly and 57 percent of the general widows population. In Kitchener-Waterloo, individuals claiming British origins account for 32 percent of the

Table 7.1: Ethnic Origin (%) by Old-Age Factor Population, Kitchener-Waterloo, Halifax and Victoria

	British	French	German	Dutch
Kitchener-Waterloo				
Early Elderly	35	0	9	0
Young Elderly/Mature Family	32	0	27	1
Halifax				
Young/Middle-aged Widows	51	9	5	0
Old Widows	49	13	8	0
Victoria				
Middle-aged Elderly	59	1	4	1
Old Elderly	68	3	3	2
General Widows	57	3	4	1

middle-aged/old female widows population and 35 percent of the early elderly population of early elderly aged spaces (Table 7.1).

Of the remaining three ethnic groups considered, Table 7.1 shows that only individuals of German and French origins comprise relatively large proportions of the elderly population of aged spaces in any of the cities. Individuals of German origin comprised a significant proportion, 27 percent, of the middle-aged/old female widows of middle-aged/old female widows aged spaces in Kitchener-Waterloo; whereas the French make-up a relatively large proportion of the population of aged spaces in Halifax only. In the case of the latter, 9 percent of the population of young/middle-aged widows aged spaces and 13 percent of the old widows population are French (Table 7.1).

7.2.2 Household Size

Because household size is used to derive early elderly aged spaces and the early elderly population defined using the variables that load highly on the ***Early Elderly*** factor in Kitchener-Waterloo, changes in household size are considered for the young/middle-aged and old widows populations of Halifax, the young/middle-aged widows and old elderly population of Victoria and the middle-aged/old female widows population in Kitchener-Waterloo.

In general, Table 7.2 shows that there is little variation in the proportion of each aged space population living in any sized household and that the largest proportions of the elderly populations in all three cities live in small households. Consistently, smaller proportions of each aged space elderly population therefore lives in larger, 5 or 6 person

Table 7.2: Household Size (%) by Old-Age Factor Population, Kitchener-Waterloo, Halifax and Victoria

	One Person	Two Persons	Three Persons	Four Persons	Five Persons	Six Persons
Kitchener-Waterloo						
Early Elderly	0	100	3	0	0	0
Young Elderly/Mature Family	70	17	3	5	5	1
Halifax						
Young/Middle-aged Widows	61	19	7	5	5	2
Old Widows	51	18	13	10	5	3
Victoria						
Middle-aged Elderly	38	55	6	1	1	1
Old Elderly	62	28	7	1	0	3
General Widows	79	11	6	1	2	1

households. Three quarters of the middle-aged/old female widows and 70 percent of the younger female widow population for example of Kitchener-Waterloo live in one person households. For the young/middle-aged widows and old widows populations of Halifax the equivalent figures are 61 and 51 percent (Table 7.2). At the other end of the size spectrum, 2 percent of the young/middle-aged widows and 3 percent of the old widows populations of Halifax live in 6 person households and only 1 percent of the old elderly population of old elderly aged spaces in Kitchener-Waterloo live in 6 person households.

7.2.3 Residential Mobility

Several studies of elderly residential mobility suggest that not only is the tendency for middle-aged and elderly households to move low, but that aging-in-place is the process primarily responsible for changes in the spatial distribution of the elderly population, especially at the city scale (Golant 1972, 1975; Hiltner and Smith 1974; Kennedy and DeJong 1977; Gutowski and Feild 1979; Kimmich and Gutowski 1983). While the low proportions of all the elderly populations who moved over the short term, June 1990 to June 1991, appears to substantiate the hypothesized low mobility of the elderly (Tables 7.3), they do not distinguish aged spaces. The residential mobility of the elderly, or lack thereof, is therefore considered because of its importance in determining the intra-urban spatial distribution of the elderly, rather than because it varies significantly between aged spaces.

Over the short term, June 1990 to June 1991, the proportion of elderly non-movers in each individual elderly population exceeds the percentage who did move. In Victoria, 90, 96 and 93 percent of the middle-aged elderly, old elderly and general widows

Table 7.3: Residential Mobility by Old-Age Factor Population, Kitchener-Waterloo, Halifax and Victoria

	Non-Movers	Intra-Provincial	Inter-Provincial	External Movers
Kitchener-Waterloo				
Early Elderly	61	39	0	0
Young Elderly/Mature Family	93	6	1	0
Halifax				
Young/Middle-aged Widows	94	6	0	0
Old Widows	100	0	0	0
Victoria				
Middle-aged Elderly	90	8	1	1
Old Elderly	96	4	0	0
General Widows	93	5	2	0

populations respectively did not move in the period June 1990 - June 1991. For the younger early elderly population of Kitchener-Waterloo, a much smaller percentage, 61, did not move over the same period.

Considering only the elderly populations who did move, the highest proportions made intraprovincial moves (Table 7.3). The early elderly population of early elderly aged spaces in Kitchener-Waterloo not surprisingly made the largest percentage of intraprovincial moves, 39; whereas 6 percent of the moves completed by the middle-aged/old female widows population were intraprovincial. In Halifax, none of the old widows population made an intraprovincial move between June 1990 and June 1991. Only 6 percent of the young/middle-aged widows population of Halifax completed an intraprovincial move in the same period.

7.2.4 Average Income

Unlike household size, ethnic origin and residential mobility, average income and more especially, average income from wages and salaries, retirement pensions and investments varies between aged spaces in each city (Table 7.4). Average income from the Canada/ Quebec Pension Plan (CPP) and Old-Age Security/Spouse's Allowances and Guaranteed Income Supplement (OAS/GIS) varies little across aged spaces. As a result. average income and average income wages and salaries, retirement pensions and investments appear to be one attributes that differentiate aged space populations in each city.

Examining each income source in turn, beginning with total average income. Table 7.4 shows that average income is relatively constant in Victoria between the middle-aged elderly, old elderly and general widows populations, but varies in Halifax between the young/middle-aged widows population of young/middle-aged widows aged spaces and the old widows population and in Kitchener-Waterloo between the early elderly population of early elderly aged spaces and the middle-aged/old female widows. In the case of Kitchener-Waterloo the variation is particularly noticeable and is probably a result of the comparison of a working or semi-retired population, the early elderly, with an older population, the middle-aged/old female widows population of middle-aged/old female widows aged spaces.

Average income from wages and salaries, retirement pensions and investments again varies between aged spaces in Kitchener-Waterloo and Halifax, but remains relatively constant across aged spaces in Victoria. Once again, the more marked variation in all three sources across aged space populations (the early elderly and middle- aged/old female

Table 7.4: Average Income ($) by Selected Source by Old-Age Factor Population, Kitchener-Waterloo, Halifax and Victoria

	Total Average Income	Wages & Salaries	Retirement Pensions	Investments	OAS/GIS	Canada Pension Plan
Kitchener-Waterloo						
Early Elderly	34532	27549	0	1687	0	665
Young Elderly/Mature Family	27341	3711	5363	8179	5698	3321
Halifax						
Young/Middle-aged Widows	13274	259	1169	3319	5004	2505
Old Widows	18172	2986	2641	2054	7803	708
Victoria						
Middle-aged Elderly	20054	722	4743	7106	5070	2466
Old Elderly	20967	1083	3906	7282	5874	1308
General Widows	21740	373	3636	6264	5676	2437

widows populations) in Kitchener-Waterloo is a caused by the comparison of two very different populations, one comprised of widows aged 75 and over and the other, made-up of a young married elderly population aged under 74, living in two person households. Average income from retirement pensions and investments in Kitchener-Waterloo is higher for the older middle-aged/old female widows population; whereas average income from wages and salaries is higher for the early elderly population of early elderly aged spaces (Table 7.4). In Halifax average income from wages and salaries and retirement pensions is higher for the older old widows population; but average income from investments is lower for the same population and higher for the young/middle-aged widows population of young/middle-aged widows aged spaces. For example, Table 7.4 shows that average income from investments declines from $3 319 for the younger young/middle-aged widows population of young/middle-aged widows aged spaces in Halifax to $2 054 for the older old widows population. For the elderly widow population, average income from wages and salaries is just $259, compared to $2 986 for the old widows population.

Table 7.4 shows that with regard to average income from OAS/GIS and the CPP the greatest differences once again exist between the early elderly population of early elderly aged spaces and the middle-aged/old female widows population of middle-aged/old female widows aged spaces in Kitchener-Waterloo. These differences are a consequence of the early elderly population being ineligible to receive OAS/GIS and of the part of the early elderly population being ineligible for CPP benefits. Average income from OAS/GIS is also highest for the older old widows population of Halifax, at $7 803 compared to $5 004 for the young/middle-aged widows population, but relatively constant for the middle-aged elderly, old elderly and general widows populations in Victoria. Finally, average income from the CPP is highest for the younger young/middle-aged widows population in Halifax and the younger middle-aged elderly and general widows populations in Victoria. For the old widows population of old widows aged spaces in Halifax average income from the CPP is just $708. For the young/middle-aged widows population of the same city, average income from the CPP is $2 505.

Chapter 8

Conclusions

To end at the beginning with Ralph Waldo Emerson's oft quoted sentiment, 'Youth is everywhere in place. Age, like women requires fit surroundings.', a review of the literature on intra-urban differentiation on the basis of age shows that increasingly the 'fit surroundings' for 'age' (the elderly) are spatially compact, distinct and irregularly distributed 'aged spaces'. Beginning in the late 1940's and continuing through to the early 1950's, rapid population decentralization caused by the construction of an outer suburban ring, led to the development of a distinct pattern of residential differentiation on the basis of age, characterized by the existence of large scale 'aged spaces' in the central city. At the same time, aged spaces were strikingly absent from the newly constructed and distant, family oriented suburbs.

The aging-in-place of the initial wave of suburban dwellers during the 1960's and 1970's and a significant increase in the size and heterogeneity of the elderly population, led to the development of aged spaces in additional areas of the city, the inner suburbs immediately surrounding the inner city. These aged spaces were characterized by a different elderly population than that found in the well established inner city aged spaces. The elderly population found in these suburban aged spaces was married, middle class, owner occupier couples, living two person households. The inner city aged spaces in contrast, contained an older, poorer, often widowed elderly population, living in 1 person households and rented dwellings.

More recently the continued dispersal of the city and the increased social and demographic heterogeneity of the urban population (exemplified by the identification of a separate 'old-age' factor/dimension in ecological studies of Canadian cities) have produced additional changes in the distribution and composition of aged spaces. Accompanied by increasing levels of aged segregation and the increased tendency for residential activities to cluster, more numerous, localized and spatially distinct aged spaces have emerged than in the past. The continued aging-in-place of the elderly populations located in the inner city and the older suburbs have produced inner city aged spaces that are characterized by an old-old elderly (aged 85 and over) population comprised of a large proportion of widows and single person households and inner suburban aged spaces containing a younger, yet aging, elderly population living in owner occupied dwellings and two person households. In addition, the continuing suburbanization of the elderly population and the low mobility of middle-aged households is leading to the aging-in-place and consequent development of aged spaces in the more distant, newer suburbs constructed after 1970, a residential environment previously considered the preserve of the nuclear family. Income polarization and the tendency for the marginalized poor elderly households to be concentrated in the inner city, suggest that these newly evolving outer suburban aged spaces will not contain concentrations of the disadvantaged elderly, but rather concentrations of wealthy, active elderly, living in owner occupied housing, perhaps enjoying early retirement and a leisure based lifestyle.

The distinctive pattern of elderly concentration (essentially a distance decay gradient with the proportions of elderly decreasing as distance from the CBD or city centre increases) that developed from the 1950's onwards led partly to the almost exclusive use of ecological models, especially the Concentric Zone Model (Burgess 1925), to describe and explain the intra-urban spatial distribution of the elderly. Briefly, the emergence of zones around the centre of the city were considered to be a result of the decentralization of the population (caused by the construction of the suburbs), population growth and the consequent intensification of competition for both land and housing. As a result, neighbourhoods were invaded and succeeded by upwardly mobile population groups as these groups moved out to the periphery (Birch 1971). The resultant patterns of 'invasion' and 'succession' were characterized by what Frye (1975) described as a 'circulation of the young'. Because only young families could afford to leave the inner city and compete for expensive suburban housing, the greatest concentration of young households occurred at the periphery. Elderly households, who were unable to compete for the better, newer suburban housing, became concentrated at or close to the city centre (Golant 1972).

In the light of recent far reaching changes in urban form (the increased construction of expressways, a flattening of the city wide CBD dominated accessibility gradient and the clustering and segregation of activities, be they retail, residential or employment at specific locations or nodes, each with its own unique accessibility gradient) and significant changes in the ethnic and demographic composition of the urban population (increasing numbers of female headed (Miller 1996; Rose and Villeneuve 1988; Rose and LeBourdais 1986) and gay households (Adler and Brenner 1992; Lauria and Knopp 1985); an increase in social polarization (Winchester and White 1988; Murdie 1990; Ley 1991; Bourne 1990); an increase in ethnic diversity (Balakrishnan 1988; Beaujot 1991) and of particular interest, an increase in the number of elderly households (Shulman 1980; Smith 1998) Bourne (1989) and Filion and Bunting (1996) argue an 'urban social mosaic', characterized in the most general terms by a shift away from a pattern of urban social differentiation characterized by the existence of large scale, geometric zones and sectors, to a more spatially variable, less rigid pattern, has emerged. As such the use of ecological models to describe and explain the spatial distribution of the elderly has been called into question (Harper and Laws 1995).

8.1 Hypotheses

Given past changes in the intra-urban spatial distribution of the elderly population and the development of aged spaces, the present study sought to address six hypotheses pertaining to changes in the composition of the elderly population, aged residential segregation, the nature and spatial distribution of aged spaces. Each of these hypotheses is now discussed in turn.

1. The current research suggests that the fracturing of the traditional axes of social differentiation hypothesized by Davies and Murdie (1991) have not only produced multiple family status factors, but multiple old-age family status dimensions.

In Kitchener-Waterloo, Halifax, Victoria and the joint analysis (a data set consisting of data from all three individual cities combined together) multiple old-age family status factors or dimensions were identified by each respective principal components analysis. Three old-age family status factors, ***All Elderly Widows***, ***Old***

Female Widows, ***Young Elderly/Mature Family*** and ***General Widows***, ***Middle-aged Elderly*** and ***Old Elderly*** were identified respectively in the joint analysis and the individual city analysis of Victoria. In the joint analysis, the ***Old Female Widows*** old-age family status factor contrasts enumeration areas characterized by a population aged 75 and over, a female population and a widowed population with areas containing a male population, a population that is single or never married and a young adult population (20 - 34 years). A ***Young Elderly/Mature Family*** old-age family status factor describes enumeration areas containing a late middle aged/pre-elderly population (45 - 64 years), an elderly population (65 - 74 years), a married population and owned private dwellings. The ***All Elderly Widows*** dimension, contrasts enumeration areas with a widowed population and a population aged 65 and over with enumeration areas containing large households (4 or more persons), owned private dwellings, an adult population (aged 35 - 44 years) and a young (0 - 9 years)/teenage (10 - 19 years) population.

The first old-age family status factor, ***General Widows***, identified in Victoria contrasts enumeration areas with an elderly population aged 65 and over, widowed and female with areas characterized by a young adult (20-34 years) and adult (35 - 44 years) population, male, single population. A ***Middle-aged Elderly*** (75 - 84 years) family status factor contrasts areas characterized by a middle-aged elderly population, with areas containing a young (0 - 9 years) population, a teenage population (10 - 19 years), large 4 - 6 person households, semi-detached and detached dwellings. The final old-age factor, ***Old Elderly***, contrasts areas characterized by a relative concentration of the oldest elderly, with areas characterized by rented dwellings, apartments, non-family households, one person households and a divorced population.

In Kitchener-Waterloo and Halifax two old-age family status dimensions were derived. An ***Early Elderly*** dimension and a ***Middle-aged/Old Widows*** factor describe the elderly population in Kitchener-Waterloo; whereas an ***Young/Middle-aged Widows*** and a ***Old Widows*** dimension describe the elderly population in Halifax. The ***Old Widows*** old age family status factor contrasts enumeration areas with a relative concentration of an old-elderly (85 and over), widowed population with areas characterized by a relative concentration of a married, middle-aged (35 - 44 years) and pre-elderly population, detached dwellings and owned dwellings. The ***Young/Middle-aged Widows*** factor contrasts areas with a relative concentration of a single young adult population (20 - 34 years) with areas characterized by a widowed, pre-elderly (55 - 64 years) and elderly (65 - 84 years) population. The first old-age family status factor, ***Early Elderly***, in Kitchener-Waterloo describes areas with a married population, a population aged 45 - 74 years and two person households. The second old-age family status factor, ***Middle-aged/Old Widows***, contrasts areas with a population that is female, widowed, aged 75 and over with areas containing large households (3 persons), a young adult population (20 - 34 years of age), a single population and a male population.

The derivation of multiple old-age family status factors in all three cities appears to offer strong support for not only the fracturing of the traditional old-age axis identified by ecological studies of Canadian cities and the emergence of multiple old-age family status dimensions, but also the increased complexity and heterogeneity of the elderly population: if the heterogeneity of the elderly population had not increased, multiple old-age dimensions would not be derived.

2. The newly emerged old-age family status factors are primarily differentiated on the basis of marital status, gender and advanced chronological age.

An examination of the structure of each old-age family status factor clearly demonstrates that marital status, gender and advanced chronological age are indeed the primary sources of differentiation. In Victoria all three old-age dimensions load highly on advanced chronological age (75 and over in the case of the ***General Widows*** and ***Middle-aged Elderly*** dimensions and 85 and over for the ***Old Elderly*** dimension). Gender and marital status also load highly on the ***General Widows*** factor, but not on the other two old-age components. Advanced chronological age (75 and over) and marital status (widowhood) once again load highly on both old-age family status dimensions (***Young/Middle-aged Widows*** and ***Old Widows***) identified by the principal components analysis in Halifax. In Kitchener-Waterloo, gender, marital status (widowhood) and advanced age (75 and over) load highly on the ***Middle-aged/Old Female Widows*** factor; whereas two other marital status and age variables, the percent of the population that is married and the percent of the population that is aged 65 - 74 years, load highly on the other old-age dimension, ***Early Elderly***. Finally in the joint analysis, advanced chronological age (75 and over) and widowhood loaded highly on two old-age dimensions, ***All Elderly Widows*** and ***Old Female Widows***. The percent of the population that is married and the percent of the population that is aged 65 - 74 years, load highly on the other old-age dimension, ***Young Elderly/Mature Family***. Gender alone loads highly one old-age factor, ***Old Female Widows***, in the joint analysis.

3. The segmentation of and changes in the composition of the elderly population, in combination with changes in urban social structure, have produced new patterns of urban social differentiation on the basis of age. The spatial distribution of the elderly population is no longer characterized by the existence of either concentric or sectoral patterns, but rather spatially localized and discrete concentrations of the elderly population or 'aged spaces'.

Aged spaces, highly localized spatial concentrations of the elderly population, were identified in each city both on an individual basis and on the basis of the joint analysis. From the joint analysis a total of 141 aged spaces were derived: 23 percent of the aged spaces thus formed were in Victoria, 25 percent in Halifax and 52 percent in Kitchener-Waterloo. In the light of Victoria's popularity as a retirement destination this result seems surprising. However, the nature of the elderly population in Victoria (large proportions of pre- and young elderly) may explain the relatively small number of aged spaces identified in that city, given that the elderly population was defined as 65 and over. Kitchener-Waterloo's larger population and the disproportionate number of enumeration areas in that city (323 compared to 172 in Halifax and 150 in Victoria) undoubtedly impacted the results as well.

From the individual analyses approximately the same number and size, in terms of the number of composite enumeration areas were derived. 11 aged spaces were identified in Kitchener-Waterloo and Halifax and 7 in Victoria. In each city one large, spatially extensive aged space, comprised of a large proportion of the enumeration areas in the particular city, and several smaller single enumeration area aged spaces were identified.

4. Aged spaces defined on the basis of different old-age family status factors are located in different parts of the city.

An examination of the spatial distribution of aged spaces defined either by the joint analysis or any individual city analysis supports the hypothesized concentration of aged spaces defined on the basis of different old-age factors in different areas of the city. In Halifax, for example, the spatial distributions of aged spaces defined on the basis of either the ***Old Widows*** and ***Young/Middle-aged Widows*** factors (derived by the individual PCA for that city), both of which essentially identify an old, female and widowed population, are characterized by a relative concentration of these aged spaces in the oldest part of Halifax, close to Halifax harbour. Three spatially compact, single enumeration area aged spaces, characterized by a relative concentration of the same factors, are also evident in the more distant older suburbs. Both the size and population characteristics of these inner city and 'older suburban' aged spaces suggests that many of these aged spaces are old-age institutions, perhaps retirement or nursing homes.

Aged spaces characterized by a relative concentration of the ***Young Elderly/Mature Family*** factor (identified by the joint PCA analysis of Kitchener-Waterloo, Halifax and Victoria) in Kitchener-Waterloo, in contrast, are more spatially extensive, multiple enumeration area clusters. The ***Young Elderly/Mature Family*** old-age family status factor, in contrast to the ***Old Widows*** and ***Young/Middle-aged Widows*** dimensions, describes a late middle-aged/pre-elderly and young elderly population that is married and living in owned private dwellings. The ***Young Elderly/Mature Family*** aged spaces identified in Kitchener-Waterloo form a discontinuous ring in the older suburbs and more recently developed suburbs located on the periphery of the city. As already suggested the development of these aged spaces is the consequence of the aging-in-place of the initial wave of younger households who moved to the suburbs immediately following W.W.II.

5. High levels of aged residential segregation, as measured by the index of dissimilarity and the coefficient of localization, indicate that the spatial distribution of the 65 and over population or any elderly population is both significantly different from that of the non-elderly population and that each elderly population is concentrated in specific areas of the city. The more unevenly distributed and concentrated any elderly age group, the more socially distinct are those populations from the non-elderly population and, where appropriate, the total elderly population. Of the three elderly populations (young, middle-aged and old elderly) studied it is anticipated that the old elderly (85 and over) will be the most highly segregated; whereas the young elderly (65 - 74 years) will be the least segregated.

Based on the enumeration area analysis, high levels of aged residential segregation, as measured by the index of dissimilarity and the coefficient of localization, indicate that the spatial distribution of each elderly age group (young, middle-aged and old) are significantly different from that of the non-elderly and elderly populations. The extent to which the elderly are concentrated in one specific part of the city, the central part the city, is quantified by the central city ratio.

Taken together, the index of dissimilarity, the central city ratio and the coefficient of localization indicate that each specific elderly group is segregated from both the total elderly population or the non-elderly population and that the level of segregation generally increases with age. The central city ratio however suggests that approximately constant proportions of the total elderly population, as well as the young, middle-aged and old elderly are concentrated in the central parts of Halifax, Victoria and Kitchener-Waterloo.

8.2 Policy Implications

Public and academic concern with how the aging of Canada's population, changes in the composition of that population (especially the rapid increase in the number of old women and widows) and to a much lesser degree, changes in the spatial distribution of the elderly, will impact society and the consequent need for government action to ameliorate such (presumed negative) impacts has already been alluded to in the introduction. Two issues in particular, health care policies (including the provision of long term care and what form that care should take) and income support policies (old-age security and the Canada Pension Plan), have received much attention in the both the academic literature and the popular press. In the following section a small number of the many and diverse impacts population aging might have on public policy are considered. Space constraints mean that this review is not, and never could be, exhaustive and is general, rather than specific, in nature.

In the most general sense much attention has focused on how population aging, or simply the increase in the size of the elderly population, will impact the sheer cost of health care (Dentine and Spencer 1995; Getzen 1992; Evans 1987), income support policies (Dooley 1994; National Council of Welfare 1988; Arens 1982; Statistics Canada 1997; Ruggeri *et al.* 1994; Fellegi 1988; Diamond 1996; Henripin 1994; Messinger and Powell 1987; Dentine and Spencer 1997; Brown 1991, 1997; Gee and McDaniel 1994), economic dependency (Foot 1989; Dentine *et al.* 1986; Burke 1991) and long term care/ institutionalization (Gee and Gimball 1987: 54-63; Cohen *et al.* 1986; Kelman and Thomas 1990; Shapiro and Tate 1988; Lagergren 1996; Shapiro and Roos 1987) and whether or not society can afford such costs. Although there are a few dissenters (McDaniel 1986, 1987; Gibson 1989), the concensus is that society can not afford the associated costs of population aging and that as a result radical changes in policy are needed. For example, its is feared that contributions to the Canada Pension Plan will have to increase dramatically if current payment are to be maintained in the face of population aging (and of course, a decrease in the size of the working (paying) population). Fellegi (1088: 31) forecasts that pension costs in constant dollars, for a person aged 20 - 64 will increase to $3 286 in 2036 from $1 282 in 1986, even if benefits do not increase. The annual rate of increase in contributions would be approximately 2 percent. If benefits were to increase, as they have done in the past, the rate of increases rises to 3 percent. Such increases are apparently deemed too steep and there seem many (judging from the popular press) who would change the Canada Pension Plan and replace it with a totally private system.

Moreover, changes in the age, marital status and the proportion of the elderly population that is female are expected to impact policies concerned with long term care and institutionalization (Gee and Gimball 1987:54 - 63; Cohen *et al.* 1986; Kelman and Thomas 1990; Shapiro and Tate 1988; Lagergren 1996; Shapiro and Roos 1987); welfare provision (Old Aged Security and Guaranteed Income Support) (Dooley 1994; National Council of Welfare 1988; Arens 1982; Statistics Canada 1997; Ruggeri *et al.* 1994; Fellegi 1988; Diamond 1996; Henripin 1994; Messinger and Powell 1987; Dentine and Spencer 1997; Brown 1991, 1997; Gee and McDaniel 1994) and economic dependency (Foot 1989; Dentine *et al.* 1986; Burke 1991). For example, given that the likelihood of institutionalization increases with advanced chronological age (Cohen *et al.* 1986; Gee and Kimball 1987: 54 - 63; Shapiro and Roos 1987; Shapiro and Tate 1988; Kalman and Thomas 1990 and Lagergren 1996) and widowhood (Wister and Strain 1986; Forbes *et al.* 1987: Shapiro and Roos 1987 and Rosenthal 1994), increases in the size of these populations is anticipated, once more, to foretell significant increases in the costs of providing institutionalized care. Consequently some changes have been made to what care is provided and where that care is given. In Manitoba and Ontario for example, the provision of long term care has shifted from an emphasis on institutional to home based care (Ontario Ministry of Health 1993). If care is to be provided in an individual's home describing and mapping the changing intra-urban location of the elderly of course takes on added importance. In his review of the geographical literature on the elderly Rowles

(1986) suggests that service delivery to the elderly is one of the main foci for geographers studying the elderly. Given the current climate of fiscal constraint, population aging and changes in the intra-urban location of the elderly suggested by this research geographical studies of the elderly may once again take on great importance, especially as far as allowing for the efficient, cost effective delivery of services is concerned.

Closely connected to increases in the size of the old elderly population and the gendered character of that population are the costs of providing Old Age Security and Guaranteed Income Support to the oldest old, women and widows and the so-called 'feminization of poverty' (Minkler and Stone 1985; Gee and Kimball 1987; O'Rand 1988). As a result of work patterns, increased life expectancy, lower wages and ineligibility for Canada Pension Plan benefits Gee and Kimball (1987) estimate that over one third of elderly women in Canada are poor. Because many of these women never worked or earned less than their male counterparts, Old Age Security and Guaranteed Income Support are their only sources of income. Given that Old Age Security and Guaranteed Income Support are funded through general tax revenues the costs of funding both programs is expected to increase as the old elderly (female, widowed) population grows. If the costs of providing Old Age Security and Guaranteed Income Support increase, the fear is that dependency ratios (basically the ratio of the non-working to the working population) will increase and tax deductions will increase (Foot 1989; Burke 1991).

8.3 The Future

This research has attempted to examine the contemporary intra-urban spatial distribution of the elderly population in Canadian cities. In the broadest sense, this research has attempted to address one criticism frequently levelled at geographers studying the elderly (the almost exclusive use of outdated ecological models to describe and, to a lesser degree, explain the spatial distribution of the elderly population) by suggesting that the intra-urban spatial distribution of the elderly is marked by the existence of spatially localized clusters, 'aged spaces', as opposed to large scale patterns of concentration, be they sectors or rings. Rather than being a consequence of the out migration of younger cohorts and the aging-in-place of population groups unable to compete for better more expensive suburban housing, this research suggests that the contemporary spatial distribution of the elderly population is considered to be a result of a number of processes (suburbanization, the development of multiple single use nodes, the flattening of the city accessibility gradient and the development of numerous accessibility gradients) that have significantly changed the physical form and composition of cities and equally importantly, the increased heterogeneity of the urban population, increased levels of segregation and increased levels of economic polarization.

More specifically, this research set out to examine (1) the fracturing of the traditional three axis model of social differentiation (family status, ethnicity and economic status) into multiple *old-age* family status factors; (2) the differentiation of the 65 and over population on the basis of advanced chronological age, gender and marital status and (3) the new patterns of urban social differentiation on the basis of age that have emerged as a consequence of the changes in urban structure briefly mentioned above and the emergence of multiple old-age family status dimensions (which in turn suggest the increased differentiation of the elderly population in the basis of advanced chronological age, gender and marital status already noted).

The individual principal components analyses of Kitchener-Waterloo, Halifax and Victoria, as well as the joint analysis of all three cities, supported both the hypothesized existence of multiple old-age family status factors and the differentiation of the elderly population on the basis of advanced chronological age (85 and over), gender (female) and marital status (widowed as opposed to married). The successful identification of aged spaces in all three cities studied confirms that the spatial distribution of the elderly population is indeed characterized by the existence of aged spaces or localized concentrations of the elderly population, rather than large scale geometric patterns of differentiation on the basis of age. The identification of aged spaces and the accompanying application of a more recent (although highly empirical) body of urban theory to the description of the spatial distribution of the elderly marks a departure from the application of older ecological models to the description of the intra-urban location of the elderly. The accompanying hypothesized heterogeneity of the elderly population also marks a significant departure from the assumption implicit in much geographic research on the elderly, that the elderly are one undifferentiated homogeneous group. Obviously the identification of multiple old-age family status factors suggests that the elderly are far from being a single homogeneous group.

In describing the contemporary spatial distribution of the elderly population in terms of the increased heterogeneity of the elderly population and the emergence of new old-age family status factors, no attempt has been made to link the identification of aged spaces with the role space and place play in the construction and reproduction of elderly identities. Such a task, except at a very rudimentary level, lies well beyond the scope of this research. Nevertheless, the linking of aged spaces with the construction and reproduction of specific elderly identities is one possible and inviting future direction for geographic research on the elderly. The patterns of elderly concentration identified in this study could very well serve as the starting point for any such research. Within such a context, it would be possible to analyze the role aged spaces play in the construction and reproduction of 'ordinary' or 'everyday' elderly identities rather than the more exceptional identities constructed and reproduced by more exceptional and unusual retirement communities or destinations, the common subject of such studies.

The addition, of a temporal dimension to the identification of aged spaces through the inclusion of enumeration area data from another year would allow not only the changing location and distribution of aged spaces to be studied, but it would also permit changing elderly identities to be studied. If, as suggested, aged spaces have evolved from large scale heterogeneous spaces to localized compact and homogeneous spaces, the addition of data from another year would help confirm the hypothesis that aged spaces are indeed shrinking in size and increasing in number. Obviously, the examination of the changing location and distribution of aged spaces over time is beyond the scope of this research.

The addition, of data from larger urban areas, for example Toronto or Vancouver, would allow one component of aged spaces that is not examined in the current study: the ethnic component. Except in terms of German, French and British ancestry and their relative homogeneity, the ethnic origins/ character of the elderly populations of Kitchener-Waterloo, Halifax and Victoria were not examined. The inclusion of data from larger urban areas would allow the impact of ethnicity on the structure of old-age components and the variety, size and location of aged spaces to be examined. The presumably greater variety of aged spaces identified by such analysis would perhaps ultimately allow a more general model of the changing intra-urban location of the elderly to be developed.

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Appendix A

Appendix A: Variable Lists for the Enumeration Analysis

Individual Analysis of Kitchener-Waterloo and the Joint Analysis

Variable Name	*Variable Description*
ZV4	% of the total population that is male
ZV5	% of the total population that is female
ZV6	% of the total population aged 0 - 9 years
ZV7	% of the total population aged 10 - 19 years
ZV8	% of the total population aged 20 - 34 years
ZV9	% of the total population aged 35 - 44 years
ZV10	% of the total population aged 45 - 54 years
ZV11	% of the total population aged 55 - 64 years
ZV12	% of the total population aged 65 - 74 years
ZV13	% of the total population aged 75 - 84 years
ZV14	% of the total population aged 85 and Over
ZV15	% of the total population aged 15 years and older that is single (never married)
ZV16	% of the total population aged 15 years and older that is married
ZV18	% of the total population aged 15 years and older that is widowed
ZV19	% of the total population aged 15 years and older that is divorced
ZV21	% of the total number of private dwellings that are owner occupied
ZV22	% of the total number of private dwellings that are rented
ZV23	% of the total number of private dwellings that are detached

ZV24	% of the total number of private dwellings that are semi-detached
ZV26	% of the total number of private dwellings that are apartments
ZV27	% of the total number of households that contain 1 person
ZV28	% of the total number of households that contain 2 persons
ZV29	% of the total number of households that contain 3 persons
ZV30	% of the total number of households that contain 4 - 5 persons
ZV31	% of the total number of households that contain 6 or more persons
ZV32	% of the total number of households that are non-family households

Individual Analysis of Halifax and Victoria

Variable Name	*Variable Description*
ZV3	% of the total population that is male
ZV4	% of the total population that is female
ZV5	% of the total population aged 0 - 9 years
ZV6	% of the total population aged 10 - 19 years
ZV7	% of the total population aged 20 - 34 years
ZV8	% of the total population aged 35 - 44 years
ZV9	% of the total population aged 45 - 54 years
ZV10	% of the total population aged 55 - 64 years
ZV11	% of the total population aged 65 - 74 years
ZV12	% of the total population aged 75 - 84 years
ZV13	% of the total population aged 85 and Over
ZV14	% of the total population aged 15 years and older that is single (never married)
ZV15	% of the total population aged 15 years and older that is married
ZV17	% of the total population aged 15 years and older that is widowed
ZV18	% of the total population aged 15 years and older that is divorced
ZV19	% of the total number of private dwellings that are owner occupied
ZV20	% of the total number of private dwellings that are rented
ZV21	% of the total number of private dwellings that are detached
ZV22	% of the total number of private dwellings that are semi-detached

ZV24	% of the total number of private dwellings that are apartments
ZV25	% of the total number of households that contain 1 person
ZV26	% of the total number of households that contain 2 persons
ZV27	% of the total number of households that contain 3 persons
ZV28	% of the total number of households that contain 4 - 5 persons
ZV29	% of the total number of households that contain 6 or more persons
ZV30	% of the total number of households that are non-family households

Appendix B

Zero Order Correlation Matrix: Joint Analysis

	ZV10	ZV11	ZV12	ZV13	ZV14	ZV15	ZV16
ZV10	1.00000						
ZV11	.37563	1.00000					
ZV12	-.09847	.50419	1.00000				
ZV13	-.48806	-.01198	.60000	1.00000			
ZV14	-.48058	-.25253	.19122	.77574	1.00000		
ZV15	-.10865	-.18386	-.18081	-.22709	-.26250	1.00000	
ZV16	.57547	.41934	-.00791	-.41056	-.41972	-.56301	1.00000
ZV19	-.09750	.11908	.31035	.06051	-.18671	.33854	-.45087
ZV18	-.49895	-.10644	.42038	.90301	.91874	-.30868	-.45421
ZV21	.58350	.26383	-.16996	-.42532	-.35458	-.43941	.77816
ZV22	-.22252	-.03980	.11733	-.04406	-.25971	.48894	-.43321
ZV23	.50060	.19971	-.22236	-.37284	-.27085	-.39267	.66836
ZV24	-.07864	-.00264	.22463	.13880	-.04415	.18450	-.27164
ZV26	-.16745	.10522	.28003	.06558	-.18846	.45161	-.34648
ZV27	-.17355	.19477	.53515	.32212	-.06470	.33937	-.41542
ZV28	.12965	.27979	.28236	-.15481	-.39515	.39291	.04273
ZV29	.27646	.01279	-.37796	-.59915	-.46914	.01396	.31148
ZV30	.43555	-.03953	-.49755	-.57159	-.40583	-.30869	.56532
ZV31	.35067	-.05249	-.32231	-.37952	-.26950	-.23700	.38101
ZV32	-.14061	.15676	.40078	.10460	-.22850	.50115	-.38892
ZV4	.34457	-.00639	-.38043	-.69727	-.65906	.30847	.25630

cont'd

Zero Order Correlation Matrix: Joint Analysis cont'd

	ZV10	ZV11	ZV12	ZV13	ZV14	ZV15	ZV16
ZV5	-.32837	.02555	.38664	.69520	.65123	-.31160	-.24378
ZV6	.19773	-.20688	-.58859	-.63629	-.45084	-.33168	.43920
ZV7	.47017	-.04847	-.54448	-.64678	-.48013	-.23466	.48901
ZV8	-.11850	-.29146	-.45930	-.56579	-.51282	.75693	-.24058
ZV9	.52827	-.00684	-.41557	-.68579	-.61385	-.04187	.44070

	ZV19	ZV18	ZV21	ZV22	ZV23	ZV24	ZV26
ZV19	1.00000						
ZV18	-.03972	1.00000					
ZV21	-.46434	-.41136	1.00000				
ZV22	.63674	-.14820	-.71971	1.00000			
ZV23	-.55764	-.32702	.82901	-.62616	1.00000		
ZV24	.62152	.02649	-.22869	.33485	-.36016	1.00000	
ZV26	.64022	-.06198	-.64696	.85284	-.64908	.42574	1.00000
ZV27	.71308	.15087	-.47422	.64769	-.47165	.53776	.71005
ZV28	.45051	-.31470	-.22320	.59406	-.34683	.32396	.69069
ZV29	-.11422	-.53997	.25483	.01764	.20789	-.23553	-.11530
ZV30	-.49252	-.50136	.68073	-.46667	.68054	-.34623	-.58928
ZV31	-.37462	-.34164	.50914	-.33614	.53378	-.25920	-.43986
ZV32	.72563	-.05757	-.50629	.78800	-.53680	.48239	.81781
ZV4	.01941	-.70906	.30461	-.01962	.27003	-.03625	-.06548

cont'd

Zero Order Correlation Matrix: Joint Analysis cont'd

	ZV19	ZV18	ZV21	ZV22	ZV23	ZV24	ZV26
ZV5	-.01168	.70192	-.28444	.01574	-.25794	.04445	.06542
ZV6	-.30001	-.55146	.47914	-.17836	.46419	-.26430	-.38275
ZV7	-.36107	-.57904	.61599	-.32374	.60926	-.24885	-.49395
ZV8	.22073	-.56987	-.27016	.50506	-.24675	.06568	.42296
ZV9	.04057	-.68811	.51912	-.07698	.38593	.06160	-.13650

	ZV27	ZV28	ZV29	ZV30	ZV31	ZV32	ZV4
ZV27	1.00000						
ZV28	.45149	1.00000					
ZV29	-.36087	.19941	1.00000				
ZV30	-.58958	-.30635	.60155	1.00000			
ZV31	-.41527	-.34554	.24121	.55667	1.00000		
ZV32	.89892	.64123	-.17307	-.57629	-.39010	1.00000	
ZV4	-.17881	.14954	.40869	.41168	.24539	-.05325	1.00000
ZV5	.18461	-.13660	-.39733	-.40514	-.22888	.05280	-.98532
ZV6	-.54360	-.31361	.50359	.73112	.51822	-.46011	.34460
ZV7	-.54664	-.33737	.43187	.80100	.61638	-.50402	.41617
ZV8	.12046	.43654	.31840	-.04431	-.11807	.35936	.53072
ZV9	-.18088	.04738	.36382	.53098	.36343	-.05364	.47796

cont'd

Zero Order Correlation Matrix: Joint Analysis cont'd

	ZV5	ZV6	ZV7	ZV8	ZV9
ZV5	1.00000				
ZV6	-.34555	1.00000			
ZV7	-.41160	.74310	1.00000		
ZV8	-.53623	.09784	-.01603	1.00000	
ZV9	-.46770	.54825	.60428	.12529	1.00000

Anti-image or Partial Correlation Matrix: Joint Analysis

	ZV10	ZV11	ZV12	ZV13	ZV14
ZV10	.22657				
ZV11	.07499	.24908			
ZV12	.06591	.04523	.11130		
ZV13	.05146	.05591	.01890	.05609	
ZV14	.03624	.04942	.03916	.02275	.04500
ZV15	-.01714	-.01317	-.00714	-.00398	-.00714
ZV16	-.01423	-.01608	-.01080	-.00253	-.00666
ZV18	-.00819	-.00833	-.00488	-.00787	-.01238
ZV19	-.02452	-.02555	-.01258	.00893	.00146
ZV21	-.01516	-.00555	.00602	.00399	.00761
ZV22	-.01386	-.00365	.00695	.00220	.00637
ZV23	-.01034	-.01767	-.00171	.00489	-.00129
ZV24	.01946	.03052	.01097	-.01190	-.01591
ZV26	-.02121	-.01651	.01001	.00458	.00637
ZV27	.00299	.00865	-.00349	-.00569	.00497
ZV28	-.00854	.00271	-.02465	-.01244	-.00933
ZV29	-.01655	-.02880	-.01206	.01156	-.00599
ZV30	-.00493	.01216	.01783	.00034	.01190
ZV31	-.00261	.06360	.01638	.01469	.01337
ZV32	.00832	-.00872	-.01512	-.00124	-.00499
ZV4	-.00278	-.00980	-.00470	-.00506	-.00399
ZV5	-.00051	-.00911	-.00294	-.00548	-.00488
ZV6	.04021	.03395	.01511	.01351	.00779
ZV7	.03107	.03954	.03224	.02496	.02009
ZV8	.05399	.05643	.04233	.02739	.02326

Anti-image or Partial Correlation Matrix: Joint Analysis cont'd

	ZV10	ZV11	ZV12	ZV13	ZV14
ZV9	.04909	.10073	.07260	.04006	.02965

	ZV15	ZV16	ZV18	ZV19	ZV21
ZV15	.03197				
ZV16	.02828	.03195			
ZV18	.01933	.01826	.01794		
ZV19	.03726	.04212	.02147	.13404	
ZV21	.00058	-.00513	-.00065	.00497	.03810
ZV22	.00219	-.00097	.00066	.00556	.03190
ZV23	-.00555	-.00655	-.00476	.01665	-.02931
ZV24	.00481	.00565	.00936	-.06612	-.00883
ZV26	.00224	-.00625	-.00107	.00853	.02266
ZV27	.00439	.00527	.00133	-.01405	-.01309
ZV28	-.00301	-.00647	.00152	-.01451	-.03563
ZV29	.01797	.01648	.00810	-.00680	.00601
ZV30	-.00459	-.00498	-.00360	.02364	.01417
ZV31	.01577	.01847	.01425	.04292	-.00760
ZV32	-.00509	-.00060	-.00231	-.00413	-.01415
ZV4	-.00258	-.00167	-.00110	-.00761	-.00481
ZV5	-.00309	-.00174	-.00141	-.00655	-.00667
ZV6	.02630	.02235	.01637	.02179	-.01668
ZV7	.01109	.01505	.00919	.01863	-.01809
ZV8	-.00824	-.00465	-.00309	-.00018	.00028
ZV9	-.00143	-.00317	.00377	-.01477	-.00320

Anti-image or Partial Correlation Matrix: Joint Analysis cont'd

	ZV22	ZV23	ZV24	ZV26	ZV27
ZV22	.03888				
ZV23	-.01740	.20803			
ZV24	.00908	.02306	.46881		
ZV26	.00237	.02117	-.02662	.12814	
ZV27	-.01381	-.01619	-.03361	-.01777	.07073
ZV28	-.03823	.02513	-.04595	-.03970	.03673
ZV29	-.00016	.02196	.04722	.02072	.03406
ZV30	.01844	-.02414	-.00314	.01845	-.03250
ZV31	-.00438	-.02944	-.00320	-.00416	.02861
ZV32	-.01722	.01453	.01517	-.01046	-.03637
ZV4	-.00371	.00159	.00089	-.00279	-.00406
ZV5	-.00561	.00295	.00192	-.00458	-.00338
ZV6	-.01885	.00202	.00324	-.00834	.01763
ZV7	-.02385	.00395	-.02238	-.00108	.01837
ZV8	-.00016	-.00205	.00227	-.00365	.00231
ZV9	.00314	.00148	-.01008	-.00164	.01723

	ZV28	ZV29	ZV30	ZV31	ZV32
ZV28	.14248				
ZV29	-.05034	.30589			
ZV30	-.02340	-.10651	.12944		
ZV31	.03450	.00452	-.00118	.47556	
ZV32	-.00081	-.01902	.00785	-.03063	.05572
ZV4	.00124	-.00809	-.00067	-.01895	.00819

Anti-image or Partial Correlation Matrix: Joint Analysis cont'd

	ZV28	ZV29	ZV30	ZV31	ZV32
ZV5	.00173	-.00935	.00040	-.01736	.00769
ZV6	.02773	.00542	-.02182	.02028	.00255
ZV7	.02981	.02106	-.03850	-.00132	.00628
ZV8	-.01020	-.00902	.00701	.02386	-.00640
ZV9	-.00607	.01239	-.00564	.05397	-.03189

	ZV4	ZV5	ZV6	ZV7	ZV8	ZV9
ZV4	.02477					
ZV5	.02387	.02485				
ZV6	-.00176	-.00215	.06335			
ZV7	-.00245	-.00154	.03319	.12761		
ZV8	-.00452	-.00259	.00963	.02586	.03479	
ZV9	-.00942	-.00711	.01950	.03065	.04782	.16448

	ZV10	ZV11	ZV12	ZV13	ZV14	ZV15	ZV16
ZV10	.69432						
ZV11	.31566	.41231					
ZV12	.41508	.27164	.67696				
ZV13	.45643	.47299	.23919	.79530			
ZV14	.35888	.46675	.55335	.45281	.72862		
ZV15	-.20143	-.14761	-.11969	-.09398	-.18824	.56545	
ZV16	-.16721	-.18019	-.18110	-.05978	-.17554	.88487	.66654
ZV18	-.12848	-.12467	-.10924	-.24797	-.43574	.80717	.76252
ZV19	-.14072	-.13981	-.10302	.10293	.01884	.56912	.64359

Anti-image or Partial Correlation Matrix: Joint Analysis cont'd

	ZV10	ZV11	ZV12	ZV13	ZV14	ZV15	ZV16
ZV21	-.16322	-.05693	.09244	.08634	.18372	.01665	-.14714
ZV22	-.14769	-.03711	.10566	.04713	.15238	.06221	-.02745
ZV23	-.04762	-.07763	-.01121	.04529	-.01335	-.06809	-.08035
ZV24	.05970	.08931	.04802	-.07339	-.10954	.03931	.04620
ZV26	-.12448	-.09243	.08383	.05407	.08384	.03502	-.09775
ZV27	.02366	.06520	-.03929	-.09041	.08814	.09231	.11088
ZV28	-.04753	.01439	-.19574	-.13917	-.11651	-.04466	-.09583
ZV29	-.06285	-.10435	-.06538	.08822	-.05105	.18168	.16668
ZV30	-.02880	.06774	.14851	.00394	.15592	-.07135	-.07738
ZV31	-.00796	.18478	.07120	.08996	.09143	.12793	.14983
ZV32	.07402	-.07405	-.19206	-.02224	-.09960	-.12061	-.01431
ZV4	-.03713	-.12470	-.08942	-.13561	-.11944	-.09165	-.05945
ZV5	-.00678	-.11578	-.05595	-.14678	-.14602	-.10952	-.06164
ZV6	.33565	.27025	.17999	.22656	.14586	.58449	.49668
ZV7	.18271	.22180	.27051	.29495	.26512	.17363	.23570
ZV8	.60813	.60621	.68037	.62005	.58784	-.24713	-.13959
ZV9	.25430	.49765	.53658	.41709	.34464	-.01976	-.04371

	ZV18	ZV19	ZV21	ZV22	ZV23	ZV24	ZV26
ZV18	.73933						
ZV19	.43783	.76004					
ZV21	-.02483	.06952	.77994				
ZV22	.02492	.07697	.82893	.74689			
ZV23	-.07790	.09971	-.32922	-.19350	.94801		
ZV24	.10211	-.26375	-.06605	.06724	.07385	.89490	

Anti-image or Partial Correlation Matrix: Joint Analysis cont'd

	ZV18	ZV19	ZV21	ZV22	ZV23	ZV24	ZV26
ZV26	-.02235	.06511	.32432	.03361	.12969	-.10861	.93468
ZV27	.03740	-.14429	-.25226	-.26341	-.13345	-.18457	-.18662
ZV28	.03016	-.10501	-.48361	-.51362	.14598	-.17779	-.29381
ZV29	.10932	-.03360	.05565	-.00150	.08707	.12468	.10465
ZV30	-.07467	.17949	.20178	.25997	-.14708	-.01274	.14328
ZV31	.15433	.16999	-.05648	-.03220	-.09358	-.00678	-.01685
ZV32	-.07321	-.04783	-.30721	-.36994	.13492	.09384	-.12378
ZV4	-.05231	-.13206	-.15652	-.11952	.02218	.00828	-.04944
ZV5	-.06660	-.11344	-.21687	-.18035	.04101	.01779	-.08110
ZV6	.48565	.23650	-.33949	-.37986	.01762	.01881	-.09257
ZV7	.19216	.14248	-.25943	-.33864	.02423	-.09151	-.00848
ZV8	-.12356	-.00261	.00764	-.00444	-.02409	.01775	-.05462
ZV9	.06945	-.09947	-.04041	.03932	.00803	-.03632	-.01130

	ZV27	ZV28	ZV29	ZV30	ZV31	ZV32	ZV4
ZV27	.82866						
ZV28	.36586	.74078					
ZV29	.23157	-.24113	.83225				
ZV30	-.33964	-.17234	-.53528	.88705			
ZV31	.15598	.13256	.01186	-.00475	.90325		
ZV32	-.57935	-.00908	-.14571	.09241	-.18816	.85038	
ZV4	-.09691	.02096	-.09289	-.01177	-.17458	.22055	.77902
ZV5	-.08067	.02906	-.10722	.00709	-.15974	.20668	.96234
ZV6	.26339	.29188	.03891	-.24097	.11683	.04297	-.04435

Anti-image or Partial Correlation Matrix: Joint Analysis cont'd

	ZV27	ZV28	ZV29	ZV30	ZV31	ZV32	ZV4
ZV7	.19335	.22105	.10661	-.29954	-.00536	.07451	-.04349
ZV8	.04658	-.14495	-.08746	.10443	.18551	-.14535	-.15388
ZV9	.15977	-.03967	.05524	-.03865	.19296	-.33317	-.14752

	ZV5	ZV6	ZV7	ZV8	ZV9
ZV5	.77375				
ZV6	-.05430	.73313			
ZV7	-.02738	.36918	.84131		
ZV8	-.08794	.20522	.38806	.56101	
ZV9	-.11124	.19106	.21156	.63217	.71955

Appendix C

Zero Order Correlation Matrix: Victoria Individual Analysis

	ZV10	ZV11	ZV12	ZV13	ZV14	ZV15	ZV17
ZV10	1.00000						
ZV11	.50628	1.00000					
ZV12	-.17147	.47878	1.00000				
ZV13	-.46550	-.02069	.71858	1.00000			
ZV14	-.04572	-.40102	-.60380	-.52932	1.00000		
ZV15	.36759	.21889	-.29046	-.39037	-.28564	1.00000	
ZV17	-.30650	.23589	.88654	.91300	-.61283	-.45357	1.00000
ZV18	.51551	.25797	-.31566	-.58661	.38663	-.11109	-.46650
ZV19	.28024	.01253	-.40889	-.41322	-.20712	.74795	-.46141
ZV20	.26645	.12323	-.26091	-.52458	.52165	-.18268	-.42289
ZV21	.05935	-.18280	-.37373	-.29977	-.19909	.55927	-.35920
ZV22	.04099	-.14019	-.24258	-.22254	-.10356	.34073	-.26234
ZV24	.39807	.25355	-.17751	-.46137	.51393	-.07753	-.36632
ZV25	.43787	.53089	.16103	-.28147	.27007	-.24697	-.07277
ZV26	.36350	.18522	-.42990	-.67236	.34006	.51307	-.65640
ZV27	.02997	-.40304	-.67254	-.45590	.09953	.36936	-.57672
ZV28	.01100	-.36174	-.57263	-.42000	-.06533	.46225	-.50969
ZV29	-.03107	-.25072	-.36090	-.25450	-.04198	.27720	-.31730
ZV5	-.04719	-.48415	-.64914	-.45099	.03352	.30220	-.55356
ZV6	-.00669	-.46719	-.70644	-.54749	.23202	.31625	-.64975
ZV7	-.07792	-.49013	-.74755	-.64047	.89133	-.09166	-.73066
ZV8	.22469	-.32382	-.79360	-.70971	.39815	.41789	-.81463
ZV9	.43054	-.03284	-.57900	-.62166	.24032	.51303	-.66435

cont'd

Zero Order Correlation Matrix: Victoria Individual Analysis cont'd

	ZV10	ZV11	ZV12	ZV13	ZV14	ZV15	ZV17
ZV30	.43316	.34714	-.17855	-.56602	.48506	-.07561	-.41956
ZV4	-.09910	.35947	.72376	.67903	-.71331	-.08150	.75210

	ZV18	ZV19	ZV20	ZV21	ZV22	ZV24	ZV25
ZV18	1.00000						
ZV19	-.07519	1.00000					
ZV20	.67190	-.42001	1.00000				
ZV21	-.24724	.80599	-.38239	1.00000			
ZV22	-.11895	.49230	-.18044	.57332	1.00000		
ZV24	.66318	-.33566	.81404	-.56925	-.32713	1.00000	
ZV25	.67398	-.32352	.71192	-.40697	-.21640	.69333	1.00000
ZV26	.44186	.23767	.55796	-.04554	.02223	.69646	.30042
ZV27	.01797	.50694	.04971	.56093	.34995	-.14327	-.40515
ZV28	-.12448	.67907	-.20938	.83524	.55629	-.45829	-.48515
ZV29	-.11358	.42505	-.14947	.55319	.32884	-.34008	-.34569
ZV5	.00142	.51306	-.03094	.63193	.44156	-.29305	-.44444
ZV6	.02267	.49094	.02397	.58999	.48079	-.20205	-.38620
ZV7	.27947	-.04694	.49345	.01486	.01912	.40567	.06571
ZV8	.41364	.54467	.21604	.43916	.29843	.17910	-.06469
ZV9	.43234	.53123	.17002	.26931	.14419	.27384	.10212
ZV30	.74211	-.17721	.86768	-.28098	-.10631	.82323	.89047
ZV4	-.36916	-.25527	-.26600	-.19348	-.12513	-.21383	-.03135

cont'd

Zero Order Correlation Matrix: Victoria Individual Analysis cont'd

	ZV26	ZV27	ZV28	ZV29	ZV5	ZV6	ZV7
ZV26	1.00000						
ZV27	.23352	1.00000					
ZV28	-.00359	.71190	1.00000				
ZV29	-.07750	.44259	.62191	1.00000			
ZV5	.04384	.79132	.86156	.57851	1.00000		
ZV6	.16697	.70476	.83713	.54276	.81396	1.00000	
ZV7	.41996	.38669	.18890	.11056	.31422	.44081	1.00000
ZV8	.51756	.60055	.55292	.29836	.54874	.62449	.46811
ZV9	.55572	.30140	.27935	.14253	.26016	.29120	.23545
ZV30	.59450	-.09369	-.26439	-.20841	-.19942	-.10402	.37224
ZV4	-.36555	-.33804	-.31410	-.17505	-.36293	-.48171	-.70830

	ZV8	ZV9	ZV30	ZV4
ZV8	1.00000			
ZV9	.71119	1.00000		
ZV30	.25487	.29739	1.00000	
ZV4	-.65974	-.49187	-.27354	1.00000

Anti-image or Partial Correlation Matrix: Individual Analysis Victoria

	ZV10	ZV11	ZV12	ZV13	ZV14	ZV15	ZV17
ZV10	.64134						
ZV11	.17872	.62411					
ZV12	.49532	.38045	.79357				
ZV13	.44265	.62094	.61863	.75640			
ZV14	.01763	.01257	.04393	-.13555	.67296		
ZV15	-.25024	-.25721	-.16699	-.30004	.68966	.57925	
ZV17	-.21407	-.17990	-.27779	-.38907	.73082	.85814	.76950
ZV18	-.20036	-.20440	-.01592	-.09143	.57061	.72049	.65570
ZV19	-.03103	.14291	.22394	.22884	.15323	.03305	.11997
ZV20	-.00531	.20097	.22591	.22958	.17769	.03739	.11101
ZV21	-.09805	.05958	-.09912	.02883	-.11202	-.15434	-.12291
ZV22	-.07488	.13237	.01174	.05246	-.01261	-.01433	.02306
ZV24	-.35361	.13216	-.00723	.11661	-.21121	-.07074	-.06719
ZV25	-.01631	-.03393	-.00308	.06987	.03470	.05181	.03948
ZV26	.28789	-.08565	-.06427	-.01057	.10112	-.18106	-.04416
ZV27	-.12289	-.20069	-.08028	-.23470	.13748	.15158	.08668
ZV28	.05625	-.00794	.08836	.10034	.12761	.00851	.06608
ZV29	.09166	.03240	.05306	.08190	-.02119	-.00990	.02606
ZV5	.25698	.24412	.17820	.12356	.53729	.40095	.39964
ZV6	-.05387	.08276	.06018	.12854	-.03474	.14734	.10185
ZV7	.30293	.46122	.53945	.59963	-.26903	-.04821	-.05664
ZV8	.29930	.48326	.41589	.35057	-.07548	-.12548	-.08363
ZV9	.13307	.40360	.36613	.34566	-.03216	-.11708	-.04977
ZV30	-.00957	-.27792	-.28954	-.30370	-.17117	.04252	-.04125
ZV4	.14812	.05998	.11024	-.05129	.24142	-.05276	-.03131

Anti-image or Partial Correlation Matrix: Individual Analysis Victoria cont'd

	ZV18	ZV19	ZV20	ZV21	ZV22	ZV24	ZV25
ZV18	.71221						
ZV19	.15142	.65515					
ZV20	.13368	.93369	.63936				
ZV21	.03314	-.36838	-.24092	.86664			
ZV22	.02167	.12195	.16676	-.07375	.90005		
ZV24	-.06052	.06201	.03802	.42350	.20109	.85829	
ZV25	-.11972	-.33086	-.34374	-.07679	-.00260	.01800	.78312
ZV26	-.08655	-.60666	-.59911	.12103	-.15279	-.38861	.50388
ZV27	.03742	-.51602	-.52505	.03619	-.02565	-.00938	.43588
ZV28	.03521	-.10217	-.12565	-.33542	-.02143	.04864	.33620
ZV29	-.02272	-.18109	-.19729	-.06240	.03569	.00404	.25000
ZV5	.22115	-.25890	-.26887	.05270	-.08709	-.20011	.16250
ZV6	.13571	-.04245	-.07253	.19768	-.14952	.12513	.01106
ZV7	.03749	.27264	.22818	-.17441	.10673	.07224	.10399
ZV8	-.26939	.18260	.22015	-.20081	.06999	-.02427	.14636
ZV9	-.09059	-.12999	-.07204	.09880	.07496	.06552	.06532
ZV30	-.03885	-.49595	-.56829	.10047	-.21760	-.22291	-.48246
ZV4	.02511	.12144	.09866	-.15565	-.05937	-.33044	-.02523

	ZV26	ZV27	ZV28	ZV29	ZV5	ZV6	ZV7
ZV26	.69615						
ZV27	.34607	.78917					
ZV28	.30089	.18944	.90163				
ZV29	.24497	.15871	.06474	.90410			

Anti-image or Partial Correlation Matrix: Individual Analysis Victoria cont'd

	ZV26	ZV27	ZV28	ZV29	ZV5	ZV6	ZV7
ZV5	.32642	.00644	-.11871	.04699	.81196		
ZV6	-.11619	-.00331	-.41327	-.04859	.03041	.92915	
ZV7	-.21519	-.29642	.04696	.10941	.06165	.15286	.70983
ZV8	-.13143	-.26715	-.03503	.09794	.13579	-.05733	.51566
ZV9	.04179	.07377	.07744	.07906	.18616	.20425	.38203
ZV30	.07326	.10681	-.17896	-.03783	.11424	.08619	-.29123
ZV4	.06996	-.14311	-.03408	-.06986	.10972	-.07250	.02581

	ZV8	ZV9	ZV30	ZV4
ZV8	.81081			
ZV9	.01683	.83806		
ZV30	-.33467	-.04427	.76751	
ZV4	.21232	.04442	-.08955	.92522

Appendix D

Zero Order Correlation Matrix: Halifax Individual Analysis

	ZV10	ZV11	ZV12	ZV13	ZV14	ZV15	ZV17
ZV10	1.00000						
ZV11	.55224	1.00000					
ZV12	.08649	.73253	1.00000				
ZV13	-.10283	.39134	.78140	1.00000			
ZV14	-.51471	-.44444	-.20674	-.16587	1.00000		
ZV15	.53135	.18660	-.25619	-.33783	-.68440	1.00000	
ZV17	.06270	.60158	.87528	.88153	-.33692	-.27987	1.00000
ZV18	.02547	.01035	-.04554	-.14336	.12280	-.38617	.04324
ZV19	.48632	.08391	-.24960	-.26131	-.44656	.73949	-.26297
ZV20	-.26632	-.25085	-.22476	-.35936	.35917	-.33055	-.23638
ZV21	.36385	.00718	-.21592	-.21545	-.38407	.65095	-.23825
ZV22	.12657	-.10347	-.20811	-.13680	-.14966	.15042	-.15397
ZV24	-.11386	-.05441	-.08933	-.24456	.30353	-.22678	-.11047
ZV25	.09420	.28393	.22924	-.09060	.24601	-.30122	.17636
ZV26	-.05469	-.14003	-.33985	-.44574	.34304	.08620	-.40663
ZV27	-.09942	-.33999	-.45377	-.37039	.00630	.15408	-.40712
ZV28	.06708	-.25430	-.37834	-.29707	-.18178	.32098	-.34093
ZV29	.15009	-.13850	-.25908	-.21787	-.26527	.30986	-.24022
ZV3	-.23995	-.31246	-.48461	-.46873	.20907	.10147	-.45897
ZV30	.00135	.04841	-.05442	-.29490	.35605	-.25243	-.09367
ZV4	.22974	.30364	.47505	.46998	-.18674	-.10680	.44859
ZV5	.04506	-.35017	-.49904	-.38804	-.43181	.39178	-.41862

cont'd

Zero Order Correlation Matrix: Halifax Individual Analysis cont'd

	ZV10	ZV11	ZV12	ZV13	ZV14	ZV15	ZV17
ZV6	.06062	-.41949	-.53940	-.41607	-.23451	.32117	-.46930
ZV7	-.57919	-.68294	-.59035	-.50200	.75441	-.33038	-.58375
ZV8	.18938	-.37279	-.65907	-.57888	-.15061	.41727	-.59082
ZV9	.44042	-.17519	-.50792	-.49964	-.19164	.58307	-.50407

	ZV18	ZV19	ZV20	ZV21	ZV22	ZV24	ZV25
ZV18	1.00000						
ZV19	-.45390	1.00000					
ZV20	.48972	-.62080	1.00000				
ZV21	-.50329	.89997	-.57558	1.00000			
ZV22	-.00150	.26030	-.12343	.17422	1.00000		
ZV24	.46391	-.60271	.83245	-.65800	-.22088	1.00000	
ZV25	.50707	-.38833	.56866	-.41409	-.18737	.67144	1.00000
ZV26	.09370	-.06877	.48737	-.12120	-.12295	.49443	.25299
ZV27	-.06860	.10004	-.02333	.08345	.08369	-.08994	-.29823
ZV28	-.32935	.41346	-.34632	.42128	.21155	-.43168	-.43461
ZV29	-.29890	.45894	-.24593	.47819	.22756	-.34182	-.33267
ZV3	-.04137	.11742	-.10170	.12436	.06832	-.12814	-.24445
ZV30	.49317	-.38802	.71273	-.42732	-.15151	.79077	.87507
ZV4	.04199	-.08827	.09522	-.10274	-.05909	.11266	.22978
ZV5	-.08295	.31165	.01965	.30317	.26403	-.22075	-.47212
ZV6	-.24187	.43942	-.18695	.46912	.32226	-.44239	-.51216

cont'd

Zero Order Correlation Matrix: Halifax Individual Analysis cont'd

	ZV10	ZV11	ZV12	ZV13	ZV14	ZV15	ZV17
ZV7	.17335	-.35195	.52477	-.31339	-.10550	.46006	.16625
ZV8	.11051	.42483	.04447	.34997	.25623	-.01433	-.10632
ZV9	-.17923	.68305	-.19918	.59525	.24051	-.20999	-.20892

	ZV26	ZV27	ZV28	ZV29	ZV3	ZV30	ZV4
ZV26	1.00000						
ZV27	.35728	1.00000					
ZV28	.10297	.80519	1.00000				
ZV29	-.25303	.12538	.37559	1.00000			
ZV3	.19167	.35534	.35026	.11190	1.00000		
ZV30	.41269	-.18505	-.40555	-.25395	-.15263	1.00000	
ZV4	-.16710	-.34861	-.35386	-.10954	-.98941	.13834	1.00000
ZV5	-.18505	.38064	.42504	.49265	.07163	-.34098	-.06721
ZV6	-.24339	.30826	.56058	.49069	.24088	-.44820	-.24920
ZV7	.55384	.24139	-.03843	-.21307	.47672	.38679	-.46376
ZV8	.08330	.22245	.25837	.31063	.16991	.11578	-.16602
ZV9	.22000	.27578	.45043	.39729	.14277	-.15384	-.11726

	ZV5	ZV6	ZV7	ZV8	ZV9
ZV5	1.00000				
ZV6	.67939	1.00000			
ZV7	-.13129	-.08136	1.00000		
ZV8	.46880	.38014	.07799	1.00000	
ZV9	.29719	.44772	-.08086	.53291	1.00000

Anti-image or Parial Correlation Correlation Matrix: Halifax Individual Analysis

	ZV10	ZV11	ZV12	ZV13	ZV14	ZV15	ZV17
ZV10	.56649						
ZV11	.10773	.58969					
ZV12	.62361	.25576	.63606				
ZV13	.45208	.47682	.56161	.61245			
ZV14	-.17408	-.06459	-.25993	-.34648	.51163		
ZV15	-.15753	-.13983	-.20284	-.30847	.91677	.58400	
ZV17	-.18746	-.05397	-.33686	-.59490	.86246	.77986	.64980
ZV18	-.14273	.05782	.01281	.03116	.62523	.65004	.40750
ZV19	-.00726	.06236	.05321	.23497	.11036	-.00890	-.03656
ZV20	.05734	.12596	-.04526	.18701	.22314	.20114	.07716
ZV21	.00982	.18645	.03712	.10969	-.12292	-.20828	-.10418
ZV22	-.04651	-.03840	-.01027	-.07007	.02236	.01425	.03452
ZV24	-.11826	.14077	-.00482	.03655	.11700	-.08517	.06900
ZV25	.00855	-.16910	-.07704	.14667	-.17181	-.11270	-.25237
ZV26	-.04560	-.34699	-.02987	-.15192	-.14967	-.14016	-.07290
ZV27	.10158	-.01034	.14373	.18311	-.05854	-.07028	-.11575
ZV28	-.08775	.15162	-.13389	-.07433	.24118	.23542	.20201
ZV29	.02795	-.04310	-.00618	-.02951	.13063	.21346	.10980
ZV3	-.02118	-.31149	-.14331	-.22039	-.25399	-.12874	-.15970
ZV30	.06822	-.07741	.19539	.10360	-.23257	-.15354	-.18795

Anti-image or Parial Correlation Correlation Matrix: Halifax Individual Analysis cont'd

	ZV10	ZV11	ZV12	ZV13	ZV14	ZV15	ZV17
ZV4	-.06291	-.25458	-.17881	-.28497	-.24283	-.10802	-.11400
ZV5	.30808	.32578	.39001	.23286	.37709	.28662	.32163
ZV6	.37698	.43647	.59673	.47800	-.00773	.02551	-.03609
ZV7	.59068	.72227	.74423	.63546	-.29389	-.25148	-.23869
ZV8	.43305	.57363	.57450	.36830	.04688	.00874	.08755
ZV9	.21999	.50715	.50997	.43264	-.33134	-.32917	-.24906

	ZV18	ZV19	ZV20	ZV21	ZV22	ZV24	ZV25
ZV18	.53144						
ZV19	.24556	.74913					
ZV20	.24745	.68458	.68714				
ZV21	-.01074	-.45162	-.26085	.86188			
ZV22	-.06520	-.18475	-.14755	.21912	.82282		
ZV24	.16065	.21627	-.09322	.40726	.11294	.88809	
ZV25	-.26694	-.14185	-.20591	-.03856	.05736	-.14012	.81152
ZV26	-.19118	-.47329	-.67051	.07135	.10463	-.14855	.32152
ZV27	-.12737	.14568	.10413	.08521	.07412	-.01107	.15577
ZV28	.35474	.20758	.34677	-.11980	-.12287	.14850	-.31083
ZV29	.19474	-.05317	.00098	-.15330	-.02713	-.11035	.16633
ZV3	-.30143	-.34621	-.22550	-.00195	-.01572	-.10975	.07626
ZV30	-.12675	-.25692	-.32015	.05080	-.01398	-.26930	-.49137
ZV4	-.28358	-.38187	-.25406	-.00349	-.01343	-.12113	.05292
ZV5	.21012	-.16123	-.27476	.10643	.03405	.05406	.01193
ZV6	.10212	-.11005	-.22711	.09858	-.03537	.09531	.00522
ZV7	-.03788	.02264	.00808	.09809	-.04319	-.02325	-.07523

Anti-image or Parial Correlation Correlation Matrix: Halifax Individual Analysis cont'd

	ZV18	ZV19	ZV20	ZV21	ZV22	ZV24	ZV25
ZV8	-.00624	-.02585	.04885	.05672	-.04985	.06298	.01109
ZV9	-.19924	-.19124	-.14746	.11976	-.02402	-.10458	-.11216

	ZV26	ZV27	ZV28	ZV29	ZV3	ZV30	ZV4
ZV26	.60334						
ZV27	-.14912	.72456					
ZV28	-.35814	-.73770	.70729				
ZV29	.14740	.12151	-.12567	.87211			
ZV3	.12376	-.11564	.00367	-.02495	.59054		
ZV30	.14961	-.02132	-.11897	-.21740	.19554	.78894	
ZV4	.10702	-.14948	.04751	.00329	.97988	.16107	.58132
ZV5	.15947	-.13497	-.00664	-.10827	-.31164	.12395	-.32981
ZV6	.14056	.22871	-.28710	.07179	-.11214	.16757	-.11374
ZV7	-.22994	.03542	.01892	.00824	-.24001	.05476	-.20641
ZV8	-.09584	.05672	.00665	.07742	-.22122	-.22066	-.19892
ZV9	-.11269	.05720	-.16335	-.19297	-.17701	.30179	-.18120

	ZV5	ZV6	ZV7	ZV8	ZV9
ZV5	.63514				
ZV6	.37711	.64559			
ZV7	.41990	.60412	.53817		
ZV8	.38244	.55466	.69626	.56167	
ZV9	.37238	.34387	.63235	.32834	.61896

Appendix E

Zero Order Correlation Matrix: Kitchener-Waterloo Individual Analysis

	ZV10	ZV11	ZV12	ZV13	ZV14	ZV15	ZV16
ZV10	1.00000						
ZV11	.31549	1.00000					
ZV12	.02576	.59772	1.00000				
ZV13	-.35988	.10253	.52364	1.00000			
ZV14	-.35382	-.15109	.18897	.84784	1.00000		
ZV15	-.17628	-.06759	-.06093	-.21994	-.26986	1.00000	
ZV16	.58298	.43384	.05347	-.43153	-.48209	-.47390	1.00000
ZV18	-.34783	.00021	.40704	.93766	.93815	-.26468	-.49681
ZV19	-.17384	.08988	.25389	-.01082	-.17817	.39318	-.42850
ZV21	.53371	.16819	-.20766	-.44085	-.35679	-.42554	.76720
ZV22	-.31655	-.03103	.17300	-.00364	-.19351	.47272	-.45143
ZV23	.51765	.15419	-.18296	-.38359	-.29980	-.38853	.70250
ZV24	-.03720	-.24865	-.29813	-.22532	-.14169	-.10436	.02436
ZV26	-.24409	.14075	.35052	.11216	-.12472	.41837	-.32241
ZV27	-.18148	.27548	.61288	.27382	-.08561	.39377	-.30979
ZV28	.00430	.47443	.49717	-.06310	-.33008	.35253	.09843
ZV29	.19787	.02826	-.31430	-.67167	-.61772	.01231	.34627
ZV30	.40107	-.20403	-.59921	-.62152	-.45866	-.36091	.55910
ZV31	.31762	-.18568	-.32679	-.34579	-.25248	-.18433	.27627
ZV32	-.19723	.22627	.49918	.10704	-.19612	.52070	-.31591
ZV4	.32461	-.02259	-.41462	-.86089	-.77402	.33514	.40317
ZV5	-.31064	.05047	.41593	.86036	.76595	-.35359	-.37540
ZV6	-.00222	-.46764	-.68303	-.64697	-.47733	-.24671	.23619

cont'd

Zero Order Correlation Matrix: Kitchener-Waterloo Individual Analysis cont'd

	ZV10	ZV11	ZV12	ZV13	ZV14	ZV15	ZV16
ZV7	.47674	-.17873	-.55261	-.62392	-.47618	-.24464	.42348
ZV8	-.36783	-.28523	-.32874	-.47751	-.46083	.73302	-.28620
ZV9	.42971	-.20651	-.49394	-.65505	-.57058	-.21738	.50582

	ZV18	ZV19	ZV21	ZV22	ZV23	ZV24	ZV26
ZV18	1.00000						
ZV19	-.04081	1.00000					
ZV21	-.41942	-.55218	1.00000				
ZV22	-.08903	.71737	-.80660	1.00000			
ZV23	-.36010	-.59036	.90239	-.74532	1.00000		
ZV24	-.19393	-.03246	.13983	-.05762	-.03149	1.00000	
ZV26	.00845	.66293	-.70780	.85680	-.70804	-.21132	1.00000
ZV27	.12776	.66183	-.51679	.66813	-.48964	-.20781	.72638
ZV28	-.19620	.53000	-.32494	.60476	-.36819	-.23794	.74435
ZV29	-.65503	.16389	.21559	.18274	.15624	.12527	.03213
ZV30	-.57235	-.48407	.73966	-.49919	.71623	.31839	-.62736
ZV31	-.33544	-.33884	.45210	-.32457	.48058	.10746	-.41552
ZV32	-.02076	.70914	-.55329	.76992	-.52897	-.19477	.78380
ZV4	-.85417	-.01307	.41635	-.04749	.39210	.15242	-.12654
ZV5	.84583	.01517	-.39202	.03575	-.36674	-.15573	.11733
ZV6	-.59080	-.18440	.36722	-.09627	.32773	.37973	-.30206
ZV7	-.58042	-.31358	.60938	-.34490	.58038	.28839	-.49421

cont'd

Zero Order Correlation Matrix: Kitchener-Waterloo Individual Analysis cont'd

	ZV18	ZV19	ZV21	ZV22	ZV23	ZV24	ZV26
ZV8	-.49104	.39312	-.33556	.53033	-.36990	.08383	.44775
ZV9	-.65070	-.20287	.57465	-.23792	.55804	.21347	-.34337

	ZV27	ZV28	ZV29	ZV30	ZV31	ZV32	ZV4
ZV27	1.00000						
ZV28	.63089	1.00000					
ZV29	-.17123	.22649	1.00000				
ZV30	-.62623	-.51612	.31610	1.00000			
ZV31	-.37023	-.38728	.15627	.51552	1.00000		
ZV32	.92189	.74366	.01817	-.61714	-.36046	1.00000	
ZV4	-.19742	.07398	.50693	.49561	.32193	-.04591	1.00000
ZV5	.20537	-.07465	-.49225	-.47506	-.27301	.04215	-.97114
ZV6	-.48567	-.37283	.47939	.75164	.39291	-.39464	.45613
ZV7	-.52874	-.45318	.37473	.85089	.59405	-.50755	.46723
ZV8	.22048	.38143	.35836	-.15480	-.17190	.41467	.50000
ZV9	-.32140	-.22518	.37446	.77279	.41775	-.28566	.53043

	ZV5	ZV6	ZV7	ZV8	ZV9
ZV5	1.00000				
ZV6	-.46472	1.00000			
ZV7	-.44897	.64204	1.00000		
ZV8	-.51616	.20550	-.17040	1.00000	
ZV9	-.52029	.63003	.75015	-.06517	1.00000

<u>Anti-image or Partial Correlation Matrix: Kitchener-Waterloo Individual Analysis</u>

	ZV10	ZV11	ZV12	ZV13	ZV14	ZV15	ZV16
ZV10	.65928						
ZV11	.44584	.46118					
ZV12	.37984	.41366	.68683				
ZV13	.33365	.16005	.18400	.92339			
ZV14	.32469	.45719	.54908	.15927	.78170		
ZV15	-.13616	-.18111	-.06502	.00376	.04943	.62296	
ZV16	-.13281	-.22938	-.26525	-.08640	-.06994	.74450	.70629
ZV18	-.07586	-.09872	-.12212	-.24258	-.32458	.62961	.59168
ZV19	-.12978	-.17917	-.11284	.13548	.04725	.42946	.54549
ZV21	-.15955	-.18900	.02827	.04079	.06953	.18858	-.11340
ZV22	-.16169	-.20949	-.00764	.00693	.03898	.19281	-.03485
ZV23	-.04054	-.08940	-.13168	.01925	-.06206	-.05653	-.01202
ZV24	-.00058	.02191	-.05455	-.00464	-.02338	.07805	.05336
ZV26	-.10136	.04117	.14357	.05695	.09175	.02990	-.15423
ZV27	.12738	.13546	-.04542	-.10070	.24916	.08756	.12654
ZV28	.02101	-.05337	-.09400	.02076	-.01107	.02035	-.07506
ZV29	.05979	.10534	.20566	.18983	.17738	.18131	.01129
ZV30	.08620	.20412	.36013	.12142	.27691	-.13958	-.26442
ZV31	.11734	.32805	.22088	.05305	.22218	.13441	.10348
ZV32	-.01885	-.01250	-.18767	-.05965	-.21643	-.23818	.04528
ZV4	-.04242	-.16919	-.05660	-.02299	-.15523	-.00867	-.05682
ZV5	.04785	-.09455	-.01351	-.14869	-.13687	.02214	.01636
ZV6	.35936	.25885	.11462	.13357	.21340	.59287	.52377
ZV7	.15917	.18726	.14196	.12427	.14051	.10236	.32543
ZV8	.63918	.65778	.65260	.31170	.47339	-.20961	-.10384
ZV9	.33318	.57593	.59844	.21061	.36540	.05665	-.11041

Anti-image or Partial Correlation Matrix: Kitchener-Waterloo Individual Analysis cont'd

	ZV18	ZV19	ZV21	ZV22	ZV23	ZV24	ZV26
ZV18	.82298						
ZV19	.19006	.84152					
ZV21	.14541	-.01075	.77058				
ZV22	.17649	.01931	.93765	.72500			
ZV23	-.08443	.17022	-.29173	-.12467	.92599		
ZV24	.02917	.02092	-.23272	-.18359	.45429	.69270	
ZV26	-.08350	-.02040	-.00044	-.14541	.21127	.24736	.92683
ZV27	.06244	-.10860	-.36707	-.35960	-.01859	.03815	-.14691
ZV28	.10699	-.06308	-.39992	-.39856	.08912	.10283	-.23726
ZV29	.05866	-.09173	-.30171	-.37285	-.00779	.13982	.28442
ZV30	-.14852	-.00601	-.23533	-.27670	-.14262	-.04934	.21572
ZV31	.18192	.14802	-.10347	-.11303	-.11937	.05813	.04813
ZV32	-.16128	-.03634	-.35851	-.40144	.02288	.04118	.03825
ZV4	.05053	-.13846	.04413	.03939	-.04329	-.01943	-.01298
ZV5	-.00913	-.06912	-.00508	.00131	.02881	.00316	-.05874
ZV6	.40457	.19754	-.27908	-.29889	-.01718	.05034	-.08949
ZV7	.23772	.05820	-.39026	-.38372	.06457	.01907	-.12415
ZV8	.01119	-.05401	-.09518	-.09300	-.03497	-.05366	-.06650
ZV9	.13008	-.08714	.08174	.06330	-.13535	.00612	.06576

	ZV27	ZV28	ZV29	ZV30	ZV31	ZV32	ZV4
ZV27	.80131						
ZV28	.43754	.81684					
ZV29	.38857	.15113	.75612				
ZV30	.13015	.25162	.38063	.87816			

Anti-image or Partial Correlation Matrix: Kitchener-Waterloo Individual Analysis cont'd

	ZV27	ZV28	ZV29	ZV30	ZV31	ZV32	ZV4
ZV31	.17313	.15298	.20100	.28643	.76812		
ZV32	-.51062	-.17842	-.11799	.02048	-.15134	.86360	
ZV4	-.11052	.02926	-.09857	-.17239	-.30156	.06508	.84670
ZV5	-.18177	-.08468	-.18058	-.21577	-.26328	.14644	.84788
ZV6	.33225	.27110	.16018	-.18252	.15268	-.04592	.05081
ZV7	.27316	.29929	.06885	-.15086	-.02516	.10172	-.01122
ZV8	.10047	-.06355	.05739	.21875	.31917	-.11694	-.19287
ZV9	-.02774	-.10954	.15016	.07103	.31118	-.22306	-.09097

	ZV5	ZV6	ZV7	ZV8	ZV9
ZV5	.84360				
ZV6	.06930	.73975			
ZV7	-.01560	.42460	.84816		
ZV8	-.06290	.16248	.38400	.59731	
ZV9	-.02277	.15270	.04761	.63092	.76755

Appendix F

Cluster 1

EA ID	FAC2	FAC3	FAC4	*EA ID*	FAC2	FAC3	FAC4
12008009	-0.39	-0.13	1.03	*12008179*	-0.99	-0.08	-1.64
12008011	-0.65	-0.13	0.70	*12008180*	0.37	-0.88	-0.46
12008012	-1.15	0.38	-0.72	*12008181*	0.77	-0.89	-0.78
12008013	-0.78	-0.22	-0.23	*12008182*	0.25	-0.79	-1.55
12008014	-1.86	1.00	-1.67	*12008201*	-0.13	0.08	0.48
12008015	-0.74	0.18	0.02	*12008203*	0.22	0.27	0.35
12008016	-0.03	-0.34	1.01	*12008205*	0.32	-0.55	-0.92
12008051	-0.81	0.26	-0.30	*12008206*	0.42	-0.88	-0.46
12008052	-0.59	0.00	-0.68	*12008207*	-0.56	0.38	0.25
12008053	-0.51	0.04	0.21	*12008208*	-0.22	-0.11	-0.21
12008054	-0.79	0.51	0.10	*12008210*	-0.67	-0.01	-0.48
12008055	-0.52	0.12	0.87	*12008211*	-0.27	-0.18	0.20
12008056	0.07	0.12	0.66	*12008212*	-0.01	-0.44	-0.46
12008057	-0.02	-0.17	0.26	*12008213*	0.05	-0.83	-0.56
12008058	-0.71	0.27	-0.42	*12008214*	-0.10	-0.35	-0.69
12008059	-0.87	0.01	-0.62	*12008215*	-0.48	-0.13	-0.07
12008060	-0.80	0.42	-1.03	*12008216*	-0.37	0.16	0.18
12008061	0.40	-1.13	-1.14	*12008217*	-0.38	0.15	0.88
12008062	-0.61	-0.12	-0.08	*12008218*	-0.30	0.14	0.62
12008063	-0.32	-0.13	-0.18	*12008251*	0.07	0.02	0.08
12008064	-0.71	0.11	-0.18	*12008252*	-0.13	-0.04	0.11
12008066	0.00	-0.18	0.67	*12008253*	-0.26	0.16	0.37
12008068	0.01	0.01	0.31	*12008254*	0.26	0.01	0.17
12008101	0.21	-0.67	-0.85	*12008255*	0.33	-0.28	1.03
12008102	-0.21	0.00	1.13	*12008256*	0.60	-0.55	-0.10
12008103	0.00	-0.52	-0.23	*12008257*	-0.14	0.31	1.05
12008104	-1.50	0.45	-1.25	*12008258*	0.28	0.04	0.55
12008106	0.92	-1.58	-1.09	*12008260*	0.47	0.01	2.35
12008107	1.33	-2.03	-1.67	*12008261*	0.17	0.51	-0.05
12008109	1.22	-1.66	-1.06	*12008262*	0.85	0.25	0.07
12008110	1.16	-1.88	-0.59	*12008263*	0.40	0.06	0.91
12008111	1.05	-1.88	-1.45	*12008264*	0.63	-0.35	0.73
12008112	1.05	-1.83	-1.01	*12008265*	0.76	0.58	0.89
12008114	0.65	-0.70	-0.52	*12008266*	0.42	-0.61	-0.24
12008115	1.16	0.18	-0.32	*12008267*	-1.14	0.73	-0.79
12008116	0.66	-0.03	-0.10	*12008301*	-0.95	0.05	-1.29
12008117	0.55	-1.36	-1.09	*12008302*	0.02	-1.33	-1.25
12008119	0.86	-0.80	-0.32	*12008303*	-0.15	-1.11	-0.85
12008120	0.85	-0.61	-0.27	*12008305*	-0.23	-0.64	-0.75
12008151	-0.31	-0.16	0.89	*12008306*	-1.46	0.98	-1.37
12008152	-0.30	-0.06	0.82	*12008308*	0.10	-1.05	-0.71
12008153	-0.08	0.10	-0.41	*12008309*	0.11	-0.71	-0.23
12008154	1.15	-1.82	-0.26	*12008310*	0.46	-0.18	0.67
12008155	0.64	0.26	-0.27	*12008311*	0.88	-1.92	-1.34
12008161	1.17	-1.89	-0.31	*12008312*	-0.05	-0.30	-0.43
12008166	0.94	-1.00	-0.18	*12008313*	0.05	-0.80	-0.06
12008168	0.42	-1.32	-0.50	*12008320*	-0.10	-0.33	-0.12
12008169	0.94	0.12	-0.12	*12008321*	-1.54	0.50	-1.58

EA ID	FAC2	FAC3	FAC4	*EA ID*	FAC2	FAC3	FAC4
12008171	0.77	-0.57	-0.86	*12008351*	0.15	-0.54	0.15
12008352	0.23	-0.45	0.50	*12009160*	0.07	-0.44	0.50
12008353	0.04	0.37	0.57	*12009167*	-0.23	0.21	0.36
12008354	0.07	-0.22	0.37	*12009170*	-0.19	-0.37	1.20
12008355	-1.39	0.99	-1.62	*12009171*	-0.15	-0.21	0.31
12008356	0.09	-0.01	0.05	*35009211*	-0.94	0.20	0.78
12008357	0.02	-0.39	0.43	*35009212*	-1.29	0.29	-0.04
12008358	0.50	-0.33	1.35	*35009213*	-1.90	0.51	-0.89
12008360	0.17	-0.24	0.50	*35009214*	-0.21	-0.58	-1.05
12008361	0.51	-0.63	0.41	*35009215*	-1.05	-0.07	-0.31
12008362	0.36	-0.02	1.17	*35009216*	-0.41	-0.08	-0.59
12008364	-0.60	0.29	-0.37	*35009217*	-1.69	0.04	-0.53
12008366	-1.08	0.70	-0.90	*35009218*	0.25	-0.94	-0.53
12008368	0.86	-1.37	-0.70	*35009221*	-1.59	0.30	-0.23
12009051	-0.03	-0.01	1.36	*35009222*	-1.22	0.30	-0.86
12009052	0.10	-0.30	0.61	*35009223*	-0.70	-0.03	0.64
12009053	-0.13	0.03	0.70	*35009224*	-0.92	-0.12	-0.02
12009054	-0.38	-0.01	-0.78	*35009301*	0.00	0.43	1.83
12009055	0.11	-0.47	0.31	*35009302*	-1.26	0.30	0.61
12009056	0.02	0.12	-0.19	*35009303*	-1.21	0.03	0.15
12009057	-0.37	-0.01	-0.97	*35009305*	-1.21	0.04	0.03
12009058	0.15	-0.38	-0.81	*35009306*	-1.64	0.41	-1.02
12009059	-0.83	0.42	-1.16	*35009307*	-1.41	0.27	-0.41
12009060	-0.42	0.29	1.33	*35009308*	-1.62	0.06	0.23
12009067	-0.14	-0.43	0.97	*35009309*	-1.51	0.02	-0.44
12009073	0.60	-0.75	-0.35	*35009310*	-1.05	-0.27	0.14
12009101	0.97	-0.24	1.06	*35009311*	-0.59	-0.46	0.34
12009102	0.19	-0.12	0.65	*35009312*	-1.13	0.05	-0.09
12009103	0.15	-0.29	1.23	*35009313*	-0.96	-0.49	0.20
12009104	0.33	-0.50	0.06	*35009314*	-1.28	0.18	-0.41
12009105	-0.61	-0.02	0.06	*35009315*	-0.22	0.26	-0.54
12009106	0.02	-0.15	0.56	*35009316*	-0.88	-0.23	-1.64
12009107	0.13	-0.26	0.59	*35009317*	-1.62	0.37	-0.91
12009108	0.36	0.17	1.10	*35009319*	-1.77	0.59	-0.68
12009109	0.20	0.01	-0.24	*35009320*	-1.71	0.42	-0.90
12009110	0.62	-0.36	0.39	*35009321*	-1.62	0.35	-0.95
12009111	-0.17	0.12	-0.33	*35009322*	-1.52	0.51	-1.56
12009112	-0.64	0.32	-0.16	*35009323*	-1.39	0.47	-1.37
12009113	0.00	-0.11	0.56	*35009324*	-0.94	0.03	-1.10
12009114	0.47	-0.28	0.61	*35038001*	-1.25	0.02	0.18
12009116	-0.13	-0.49	0.93	*35038002*	-0.85	0.98	-0.62
12009117	-0.60	-0.19	-0.95	*35038003*	-0.05	-0.26	1.78
12009151	0.78	-0.78	0.48	*35038004*	-0.17	0.06	1.67
12009152	-0.18	-0.54	1.16	*35038005*	1.13	0.56	2.34
12009153	-0.03	-0.41	1.29	*35038007*	-0.82	-0.05	0.43
12009155	-0.50	-0.39	0.00	*35038008*	-0.78	-0.14	0.61
12009156	-0.22	-0.14	0.51	*35038009*	0.09	0.28	1.35
12009157	0.36	-0.60	-0.25	*35038010*	0.71	0.32	2.17
12009158	0.23	-0.65	0.07	*35038011*	0.21	0.31	1.83

EA ID	FAC2	FAC3	FAC4	*EA ID*	FAC2	FAC3	FAC4
12009159	-0.20	-0.17	1.28	*35038012*	0.07	-0.05	0.73
35038013	0.54	-0.32	2.32	*35038158*	-0.69	-0.08	0.59
35038014	0.72	0.08	1.18	*35038159*	-0.35	-0.38	-0.40
35038016	0.31	0.40	1.32	*35038160*	-0.03	-0.06	0.92
35038018	-1.17	-0.07	0.28	*35038161*	-0.24	-0.24	-0.10
35038019	-0.87	-0.15	0.17	*35038162*	-1.18	0.29	-1.24
35038020	-1.02	0.23	0.02	*35038163*	-0.31	-0.11	-0.17
35038021	-1.06	0.75	-0.71	*35038164*	-0.98	0.13	-0.50
35038022	-1.16	-0.07	-0.14	*35038165*	0.13	-0.25	0.38
35038051	-1.18	0.11	0.31	*35038166*	-0.27	-0.44	-0.15
35038053	-0.51	-0.11	0.82	*35038167*	-1.00	-0.07	-0.79
35038054	-1.46	0.33	-0.68	*35038169*	-1.00	0.95	-1.20
35038055	-1.30	0.07	-1.06	*35038170*	-1.42	0.27	-0.16
35038056	-0.77	0.18	-0.89	*35038201*	0.14	-0.11	0.77
35038057	-0.39	-0.07	0.12	*35038202*	0.04	0.15	1.09
35038058	-1.71	0.97	-1.43	*35038203*	0.46	0.37	1.01
35038059	-0.97	0.09	-0.52	*35038204*	0.10	-0.43	0.38
35038060	-0.97	-0.21	-1.09	*35038205*	-0.28	0.05	0.98
35038061	-0.22	-0.10	1.03	*35038206*	-0.01	-0.33	0.34
35038065	0.16	-0.05	0.59	*35038207*	-0.24	0.11	-0.21
35038066	-0.20	-0.31	0.39	*35038208*	0.24	-1.04	-0.70
35038067	0.15	0.43	0.83	*35038209*	0.14	-1.02	-0.31
35038070	-0.43	-0.40	1.48	*35038211*	0.56	0.07	-0.05
35038072	0.03	-0.15	0.52	*35038212*	1.22	-0.07	0.68
35038101	-0.93	0.44	-0.67	*35038213*	0.68	-1.66	-0.46
35038102	-0.39	-0.46	-0.16	*35038215*	0.04	0.17	1.41
35038103	0.46	-0.66	-0.49	*35038216*	0.09	-0.36	0.66
35038104	-0.78	0.01	-1.13	*35038251*	-0.83	0.21	-0.81
35038106	-1.20	0.87	-0.77	*35038252*	-0.60	-0.05	0.44
35038107	-0.40	0.62	0.35	*35038253*	-0.70	0.10	-0.01
35038108	-0.10	-0.26	0.39	*35038254*	-0.02	-0.35	1.74
35038109	-0.32	-0.29	0.68	*35038255*	0.35	-0.33	1.80
35038110	0.41	-0.17	2.26	*35038256*	0.26	-0.23	1.60
35038111	-0.65	0.23	-0.23	*35038257*	-0.41	0.10	0.75
35038112	-0.58	-0.60	-1.08	*35038258*	0.42	-0.12	1.23
35038113	-1.08	-0.07	0.26	*35038259*	0.03	-0.02	0.63
35038114	-0.39	0.01	0.71	*35038261*	-0.34	-0.25	-0.02
35038115	-1.11	-0.18	0.18	*35038262*	-0.11	-0.39	0.48
35038116	-1.45	0.08	-0.78	*35038263*	-0.01	0.01	-0.20
35038117	0.97	-1.10	-0.42	*35038265*	0.74	-0.08	1.56
35038118	-1.40	0.13	-0.68	*35038266*	0.35	-0.47	2.11
35038121	0.68	-0.11	2.72	*35038267*	-0.80	0.36	-0.14
35038122	-1.12	0.01	-0.61	*35038268*	0.21	-0.71	-0.61
35038151	-0.71	0.09	0.02	*35038301*	0.29	-0.34	1.21
35038152	-0.10	0.07	1.16	*35038302*	0.69	-0.35	2.38
35038153	0.47	-0.34	1.42	*35038303*	-0.96	0.27	0.01
35038154	0.50	-0.40	1.40	*35038304*	0.50	0.32	1.27
35038155	0.46	0.24	0.97	*35038305*	0.28	-0.21	1.12
35038156	-1.09	-0.08	-0.37	*35038306*	-0.17	0.02	0.39

EA ID	FAC2	FAC3	FAC4	*EA ID*	FAC2	FAC3	FAC4
35038157	-1.23	0.26	-1.50	*35038307*	-0.09	-0.24	-0.04
35038309	0.13	0.88	-0.11	*35089056*	-1.21	0.36	-1.21
35038310	-0.32	-0.20	-0.26	*35089057*	-0.76	-0.20	-1.16
35038312	-0.75	-0.04	-0.48	*35089058*	-0.56	0.05	-0.74
35038313	-0.44	-0.03	0.22	*35089059*	-1.07	0.52	-1.32
35038315	-0.10	0.31	0.37	*35089060*	-0.55	0.04	-0.42
35038316	0.29	-0.07	1.16	*35089062*	0.17	-0.43	0.00
35038317	0.51	-0.52	2.12	*35089064*	-0.52	0.12	0.19
35038318	0.04	-0.24	-0.02	*35089065*	0.61	-0.16	0.30
35038319	-0.38	-0.05	-0.16	*35089066*	-0.03	-0.11	0.69
35038352	0.59	-0.39	2.43	*35089067*	-1.09	0.38	-1.15
35038353	-0.07	-0.35	1.85	*35089069*	0.53	-0.97	0.12
35038356	-0.89	0.31	-0.13	*35089070*	-0.19	-0.22	-0.42
35038357	-1.21	0.03	-0.52	*35089071*	-1.84	1.01	-2.16
35038358	-0.87	0.00	0.40	*35089104*	-1.51	0.58	-1.05
35038359	-1.03	-0.15	0.35	*35089105*	-1.00	-0.26	0.01
35038360	-1.50	0.04	-0.40	*35089106*	-0.54	-0.31	-0.82
35038361	-1.11	-0.15	0.28	*35089107*	-0.13	-0.36	1.16
35038363	-1.14	-0.08	0.47	*35089108*	0.22	-0.42	1.52
35038364	-1.56	0.18	-0.23	*35089109*	-0.04	-0.10	1.03
35038365	-1.60	0.35	-0.86	*35089110*	0.66	-0.42	1.36
35038366	-1.34	0.10	-0.52	*35089111*	0.30	0.11	1.35
35038367	-1.31	-0.06	-0.30	*35089112*	0.14	-0.35	-0.27
35038368	1.06	-1.58	-0.12	*35089113*	-0.50	-0.24	0.84
35038369	-1.31	0.66	-1.10	*35089114*	-1.04	0.17	0.78
35038370	-1.50	0.06	-0.21	*35089117*	-1.09	-0.04	-0.28
35038371	-0.57	-0.34	-0.84	*35089118*	0.02	-0.61	0.50
35038372	-1.26	-0.01	-0.40	*35089119*	-0.58	0.83	-0.69
35038373	-1.01	-0.28	-0.34	*35089121*	1.01	0.21	-0.02
35089005	0.08	-0.42	0.40	*35089122*	-1.06	0.28	-1.47
35089006	0.00	-0.08	0.77	*35089123*	-1.15	-0.06	-0.99
35089007	-0.23	-0.34	0.62	*35089151*	0.66	0.22	2.17
35089008	-0.20	-0.15	1.29	*35089152*	0.53	-0.12	1.51
35089009	-0.12	-0.33	0.64	*35089153*	0.68	0.27	0.81
35089012	0.28	-0.05	1.15	*35089154*	0.12	0.18	0.23
35089013	0.17	-0.05	1.11	*35089157*	0.19	-0.26	-0.34
35089014	0.37	-0.36	0.78	*35089159*	0.09	-0.68	-0.37
35089015	0.04	-0.06	-0.08	*35089160*	0.81	-0.39	0.70
35089016	0.00	-0.44	0.37	*35089162*	0.60	-0.27	1.83
35089017	0.46	0.07	0.63	*35089163*	-0.94	0.07	-0.10
35089018	-0.25	-0.50	-0.11	*35089164*	0.43	0.32	0.39
35089019	-0.53	-0.31	-0.21	*35089165*	-0.71	-0.33	0.12
35089020	-0.12	-0.46	0.27	*35089166*	0.59	-0.22	2.02
35089021	-0.17	-0.80	0.62	*35089167*	0.40	-0.35	1.75
35089022	0.19	0.36	0.48	*35089168*	0.07	-0.19	0.50
35089051	-0.21	-0.62	-0.46	*35089202*	0.45	-0.25	0.86
35089052	-0.88	0.06	-0.70	*35089206*	-0.96	-0.04	0.04
35089053	-0.19	-0.21	-0.37	*35089208*	-1.18	0.13	-0.32
35089054	-0.91	0.02	-0.90	*35089209*	-1.71	0.29	-0.90

EA ID	FAC2	FAC3	FAC4	*EA ID*	FAC2	FAC3	FAC4
35089055	-0.60	0.03	0.30	*35089210*	-1.61	0.36	-0.40
35089211	0.96	-0.15	0.22	*35089405*	-1.37	-0.05	0.03
35089212	0.85	0.37	1.42	*35089406*	-0.97	-0.04	-0.24
35089213	0.56	0.60	1.71	*35089407*	-0.86	-0.06	-0.44
35089214	0.67	-1.65	-0.93	*35089408*	-1.50	0.32	-0.17
35089215	-0.81	-0.14	0.95	*35089409*	-1.17	0.07	0.07
35089216	-0.91	-0.06	0.85	*35089410*	-1.38	0.10	0.33
35089218	-1.09	-0.02	-0.06	*35089411*	-0.44	0.00	0.90
35089219	-0.38	-0.37	0.04	*35089412*	-1.13	-0.08	-0.18
35089220	-1.51	0.73	-1.65	*35089413*	-1.79	0.23	-0.20
35089221	1.07	-0.70	1.89	*35089414*	-1.01	-0.03	0.58
35089222	-1.08	-0.01	0.49	*35089415*	0.43	-0.49	1.64
35089223	-0.94	-0.09	0.36	*59032069*	-0.10	0.03	-0.25
35089258	-0.08	-0.36	0.10	*59032070*	-0.06	0.16	0.00
35089259	0.81	-1.04	-0.21	*59032072*	0.69	0.37	0.02
35089260	0.58	-0.61	0.25	*59032073*	0.42	1.18	0.79
35089261	-0.74	0.00	-1.22	*59032074*	0.08	-0.12	-0.23
35089262	0.33	-0.79	1.36	*59032075*	0.14	-0.67	-0.69
35089264	-0.66	0.05	-0.87	*59032113*	-0.82	-0.15	-1.02
35089265	-0.47	-0.48	0.67	*59032114*	0.13	-1.57	-0.78
35089266	-0.72	-0.16	-0.25	*59032115*	-0.37	-0.69	-0.08
35089267	-1.16	-0.08	-0.41	*59032116*	-0.30	-0.75	-1.22
35089268	-1.28	0.14	-0.01	*59032117*	-0.41	-0.62	-1.05
35089269	0.81	-0.54	1.07	*59032118*	-0.41	0.24	0.05
35089270	-1.21	0.08	-0.61	*59032119*	0.15	0.17	0.50
35089271	-1.20	0.10	-0.54	*59032120*	0.07	-0.30	1.11
35089272	-1.00	0.06	0.23	*59032123*	0.01	0.11	0.61
35089306	-0.18	-0.21	1.15	*59032124*	0.39	0.10	-0.77
35089307	-0.32	-0.60	1.37	*59032125*	-0.15	-0.19	0.17
35089308	-0.32	-0.51	1.14	*59032127*	0.12	0.24	0.46
35089309	-1.04	-0.24	0.51	*59032201*	-0.59	0.36	0.40
35089314	-0.58	-0.79	1.43	*59032202*	-0.20	0.27	0.41
35089315	-1.23	0.00	-1.79	*59032203*	-0.54	0.53	0.44
35089316	0.06	-0.23	-1.43	*59032204*	-0.55	0.38	0.49
35089317	-0.70	-0.32	0.51	*59032205*	-0.87	0.49	-0.08
35089318	-0.53	-0.31	0.60	*59032206*	0.01	0.61	1.18
35089319	-1.14	-0.03	0.05	*59032207*	-0.12	0.28	0.78
35089323	0.66	0.07	0.42	*59032208*	-0.96	0.55	-0.48
35089324	-0.36	-0.18	-0.96	*59032209*	-0.39	0.66	0.59
35089325	0.98	-1.40	-0.52	*59032211*	0.10	0.58	1.01
35089327	1.13	-0.56	1.55	*59032212*	0.08	0.12	1.06
35089328	0.04	-0.44	-0.84	*59032213*	-0.09	-0.14	-0.15
35089329	0.67	-1.22	-0.29	*59032214*	-0.37	0.50	0.11
35089332	0.33	-0.54	0.55	*59032215*	0.25	-0.59	0.01
35089334	-1.59	0.12	0.25	*59032251*	-0.65	0.26	-0.16
35089335	0.31	-0.04	0.72	*59032253*	0.20	0.20	-0.26
35089401	0.05	0.23	-0.13	*59032255*	0.26	0.25	0.28
35089402	-0.39	-0.57	-0.90	*59032256*	0.36	-0.05	-0.29
35089403	-0.80	0.04	-0.42	*59032257*	0.48	0.78	0.33

EA ID	FAC2	FAC3	FAC4	EA ID	FAC2	FAC3	FAC4
35089404	-1.22	0.07	-0.16	59032458	-0.89	-0.24	-0.87
59032259	0.52	0.49	0.14	59032258	0.77	0.36	0.26
59032260	0.43	0.59	0.13	59032459	-0.24	-0.42	-0.47
59032261	-0.59	0.37	-0.13	59032461	-0.20	-0.49	-0.52
59032265	-1.02	0.57	-0.10	59032462	-0.52	-0.34	-0.29
59032266	0.38	0.22	0.34	59032466	0.89	-0.12	0.01
59032268	0.68	1.04	0.35	59032467	0.57	0.20	0.22
59032301	0.41	0.65	0.75	59032469	0.62	-0.87	-0.48
59032303	0.20	0.54	1.04	59032470	0.01	0.61	-0.59
59032304	-0.13	0.54	0.07	59032503	-0.43	0.16	0.20
59032305	-1.07	0.22	-1.19	59032505	0.00	-0.24	-0.22
59032306	-0.06	0.76	1.16	59032506	-0.27	-0.53	-0.81
59032307	-0.14	0.02	-0.31	59032507	-0.25	-0.99	-1.63
59032308	-0.15	0.30	0.33	59032508	-2.03	0.84	-1.91
59032309	-1.18	0.59	-0.28	59032509	0.14	-0.92	-0.53
59032311	0.23	0.95	0.25	59032511	-0.42	-0.16	-0.04
59032312	0.47	0.75	0.05	59032512	-0.69	-0.03	-0.97
59032315	-0.24	0.37	0.00	59032514	-0.20	0.37	0.47
59032317	-0.36	0.42	0.17	59032518	-0.47	-0.18	-0.60
59032318	0.02	1.62	-0.13	59032519	-0.89	-0.06	-1.02
59032351	0.54	0.82	0.89	59032520	-0.08	-0.61	-0.77
59032352	0.55	0.76	1.42	59032521	-0.44	-0.83	-1.47
59032353	0.97	0.44	1.82	59032562	-0.46	0.11	0.01
59032356	0.25	-0.42	1.94	59032564	0.28	0.62	-0.41
59032370	0.71	-0.16	2.77	59032565	0.02	0.27	0.37
59032372	-0.13	0.54	1.27	59032566	-0.25	-0.19	-0.22
59032373	0.57	-0.84	-0.10	59032571	-0.22	-0.17	-0.03
59032374	-1.10	0.20	-0.61	59032572	-0.47	0.24	0.16
59032375	-0.85	-0.41	-0.76	59032573	-2.02	0.98	-1.61
59032376	-0.85	-0.07	-0.54	59032574	-0.33	0.14	-0.06
59032377	0.85	0.52	-0.08	59032577	-0.50	0.39	0.25
59032378	0.06	1.85	-1.05	59032607	0.56	-1.29	-0.34
59032379	-0.61	0.40	-0.51	59032609	0.62	-1.77	-0.92
59032382	-1.16	0.36	-0.91	59032610	0.59	-0.38	0.54
59032404	0.17	-0.97	-0.47	**Average Scor**	-56.68	-37.55	28.23
59032407	-0.37	-1.81	-0.62				
59032409	-0.73	-0.32	-1.36				
59032410	-0.25	0.05	0.11				
59032420	0.30	-0.40	-0.76				
59032423	0.85	-0.24	-0.45				
59032424	-0.44	-0.54	-1.27				
59032425	0.53	-0.09	-0.06				
59032426	0.19	0.40	-0.72				
59032451	0.55	0.31	-0.12				
59032453	0.66	0.58	0.55				
59032454	0.10	0.01	-0.29				
59032455	0.50	-0.43	-0.23				
59032456	0.50	-0.01	0.52				
59032457	0.38	-0.61	-0.28				

Cluster 2			
EA ID	**FAC2**	**FAC3**	**FAC4**
12008010	2.32	1.23	-1.00
12008065	2.40	1.07	-0.93
12008183	2.21	2.58	-2.31
12008316	2.34	2.29	-1.74
12008317	2.39	1.59	-1.42
12009115	2.55	1.77	-1.21
12009154	2.66	1.66	-1.05
35009318	2.25	2.77	-1.88
35038052	2.27	1.49	-0.33
35038062	2.62	1.60	-0.66
35038064	2.17	1.46	-1.05
35038105	2.50	1.97	-1.69
35038168	2.33	2.37	-1.91
35038260	2.41	1.93	-1.76
35038311	2.22	2.45	-1.93
35038362	2.63	1.88	-1.08
35038374	2.68	1.62	-1.37
35089207	2.22	1.95	-2.09
35089416	2.41	2.62	-1.52
59032071	2.09	3.30	-1.93
59032122	2.44	1.23	-0.87
59032210	1.99	2.88	-1.95
59032269	2.08	2.01	-2.23
59032270	2.14	3.18	-2.35
59032302	2.39	2.33	-2.35
59032316	2.64	2.28	-2.00
59032357	2.83	0.97	-1.86
59032421	2.31	2.71	-2.10
59032452	2.27	2.37	-2.16
59032460	2.13	2.72	-2.40
59032468	2.30	3.07	-2.35
59032567	2.08	2.93	-2.00
59032575	2.07	2.09	-1.03
59032576	2.20	2.43	-1.61
Average Score	*80*	*73*	*-56*

Cluster 3							
EA ID	FAC2	FAC3	FAC4				
12008170	1.15	1.22	1.19				
12008259	0.51	1.13	1.27				
12008304	1.68	1.23	1.03				
12008307	0.10	1.71	-0.14				
12008314	2.12	1.98	1.79				
12008315	1.60	2.68	-0.21				
12008359	0.31	1.31	1.38				
35038063	1.50	2.92	0.96				
35038120	0.90	1.07	2.38				
35038210	1.39	1.71	1.62				
35038264	1.27	0.88	1.33				
35038308	0.72	0.78	1.19				
35089063	1.17	0.80	1.65				
35089120	1.75	0.97	2.57				
59032126	1.75	1.68	0.78				
59032252	0.76	1.00	0.55				
59032254	1.14	1.18	1.23				
59032310	1.16	1.45	1.24				
59032314	1.05	1.49	0.94				
59032371	0.82	2.96	1.32				
59032408	0.68	3.97	0.88				
59032563	1.48	2.84	-1.38				
59032601	1.00	0.73	1.38				
Average Score	*26.00*	*37.67*	*24.97*				

Cluster 4			
EA ID	**FAC2**	**FAC3**	**FAC4**
12008172	1.61	0.94	4.28
35089155	2.11	0.21	4.20
Average Score	***3.72***	***1.16***	***8.48***
Cluster 5			
12008187	3.77	-6.49	-2.44
12008363	2.85	-4.88	-2.68
35089330	3.64	-4.53	-2.53
35089331	3.40	-4.30	-2.67
59032319	4.19	-6.86	-2.56
Average Score	***17.85***	***-27.06***	***-12.88***
Cluster 6			
12008105	2.85	-3.57	-0.05
12008178	4.45	-2.96	0.26
Average Score	***7.30***	***-6.53***	***0.21***
Cluster 7			
12008162	1.56	-2.85	-0.79
12008318	0.54	-4.17	-0.62
59032112	0.18	-2.02	-2.06
59032422	0.53	-1.87	-0.25
59032606	0.59	-2.49	-1.40
59032612	0.53	-2.74	-1.48
59032614	0.21	-3.00	0.34
59032615	1.60	-2.70	0.91
Average Score	***5.73***	***-21.84***	***-5.36***

Appendix G

Cluster 1					
EA_ID	**FAC3_1**	**F2**	***EA_ID***	**FAC3_1**	**F2**
12008009	0.43	-1.38	*12008318*	-0.70	1.83
12008011	0.36	-1.04	*12008320*	0.21	0.14
12008012	-0.01	0.58	*12008321*	-0.75	1.19
12008013	-0.06	-0.12	*12008351*	0.21	-0.27
12008014	-0.44	1.40	*12008352*	0.44	-0.46
12008015	0.25	-0.15	*12008353*	0.71	-0.40
12008016	0.50	-1.13	*12008354*	0.19	-0.56
12008051	0.14	0.29	*12008355*	-0.45	1.57
12008052	0.07	0.84	*12008356*	-0.12	-0.16
12008053	0.59	-0.12	*12008357*	0.34	-0.47
12008054	0.28	-0.32	*12008358*	0.67	-1.30
12008055	0.34	-1.11	*12008359*	1.48	-0.71
12008056	0.59	-0.61	*12008360*	0.20	-0.59
12008057	0.40	-0.19	*12008361*	0.27	-0.34
12008058	0.47	0.50	*12008362*	0.56	-1.11
12008059	-0.02	0.47	*12008364*	-0.13	0.26
12008060	-0.64	0.72	*12008366*	-0.24	0.87
12008061	-1.38	0.74	*12008368*	-1.27	0.21
12008062	0.10	-0.07	*12009051*	0.39	-1.60
12008063	0.11	0.24	*12009052*	-0.05	-0.95
12008064	0.17	0.00	*12009053*	0.44	-0.82
12008066	0.20	-0.89	*12009054*	-0.70	0.49
12008068	0.31	-0.22	*12009055*	-0.07	-0.42
12008101	-1.02	0.16	*12009056*	0.35	0.61
12008102	0.22	-1.49	*12009057*	-0.33	0.96
12008103	-0.47	-0.28	*12009058*	-0.90	0.57
12008104	-0.58	0.89	*12009059*	-0.31	1.20
12008106	-1.31	0.34	*12009060*	0.89	-1.37
12008107	-2.56	0.40	*12009067*	0.47	-1.05
12008109	-1.64	0.24	*12009073*	-0.67	0.30
12008110	-0.97	-0.10	*12009101*	0.46	-0.82
12008111	-2.03	0.37	*12009102*	0.37	-0.67
12008112	-1.54	0.16	*12009103*	0.62	-1.18
12008114	-1.04	-0.08	*12009104*	-0.24	-0.06
12008115	0.27	0.60	*12009105*	0.18	-0.17
12008116	0.53	0.27	*12009106*	0.18	-0.65
12008117	-1.44	0.10	*12009107*	0.42	-0.53
12008119	-0.82	-0.20	*12009108*	0.52	-0.82
12008120	-0.72	-0.18	*12009109*	0.07	0.41
12008151	-0.11	-1.48	*12009110*	0.06	-0.33
12008152	0.01	-1.32	*12009111*	-0.11	0.30
12008153	-0.41	0.20	*12009112*	0.32	0.31
12008154	-0.56	-0.04	*12009113*	0.37	-0.39
12008155	-0.48	0.11	*12009114*	0.61	-0.32
12008161	-0.78	-0.06	*12009116*	0.31	-1.11
12008162	-1.62	0.05	*12009117*	-0.71	0.59
12008166	-0.59	-0.19	*12009151*	0.20	-0.30
12008168	-0.52	0.16	*12009152*	0.05	-1.63

EA_ID	**FAC3_1**	**F2**	*EA_ID*	**FAC3_1**	**F2**
12009153	0.41	-1.50	*12008311*	-1.52	0.66
12008169	-0.08	0.11	*12008312*	0.13	0.45
12008170	1.44	-0.45	*12008313*	0.01	-0.11
12008171	-0.99	0.07	*12009154*	-1.19	1.07
12008179	-1.03	1.12	*12009155*	-0.52	-0.56
12008180	-0.76	-0.08	*12009156*	0.05	-0.88
12008181	-1.57	0.17	*12009157*	-0.63	0.10
12008182	-1.95	0.78	*12009158*	-0.41	-0.30
12008201	0.01	-0.82	*12009159*	0.45	-1.52
12008203	0.20	-0.48	*12009160*	-0.24	-0.86
12008205	-0.77	0.47	*12009167*	0.27	-0.28
12008206	-0.99	-0.27	*12009170*	0.32	-1.49
12008207	0.04	-0.71	*12009171*	-0.06	-0.55
12008208	-0.42	-0.25	***Average Score***	***-18.71***	***-25.11***
12008210	-0.52	-0.21			
12008211	-0.06	-0.60			
12008212	-0.68	-0.12			
12008213	-0.59	0.09			
12008214	-0.52	0.33			
12008215	-0.31	-0.54			
12008216	0.05	-0.60			
12008217	-0.10	-1.49			
12008218	0.06	-1.08			
12008251	0.00	-0.33			
12008252	0.13	-0.34			
12008253	0.19	-0.65			
12008254	0.22	-0.30			
12008255	0.41	-1.17			
12008256	-0.38	-0.26			
12008257	0.86	-1.04			
12008258	0.32	-0.62			
12008259	1.55	-0.58			
12008260	1.45	-1.95			
12008261	-0.01	-0.04			
12008262	0.35	0.01			
12008263	0.55	-0.80			
12008264	0.65	-0.34			
12008265	1.01	-0.10			
12008266	-0.20	0.26			
12008267	0.13	0.93			
12008301	-0.31	1.22			
12008302	-0.76	0.94			
12008303	-0.37	0.65			
12008305	0.02	0.71			
12008306	-0.45	1.08			
12008308	-0.56	0.46			
12008309	0.43	0.44			
12008310	1.10	-0.27			

Cluster 2			
EA_ID		**FAC3_1**	**F2**
12008010	2.00	1.14	2.16
12008065	2.00	2.31	2.91
12008183	2.00	0.40	3.31
12008316	2.00	1.04	3.05
12008317	2.00	1.55	3.03
12009115	2.00	1.84	2.96
Average Score		***8.28***	***17.43***

Cluster 3			
EA_ID		**FAC3_1**	**F2**
12008105	3.00	-4.01	-1.89
Average Score		***-4.01***	***-1.89***

Cluster 4			
EA_ID		**FAC3_1**	**F2**
12008172	4.00	3.53	-2.20
Average Score		***3.53***	***-2.20***

Cluster 5			
EA_ID		**FAC3_1**	**F2**
12008178	5.00	3.43	2.75
12008315	5.00	3.30	2.07
Average Score		***6.73***	***4.82***

Cluster 6			
EA_ID		**FAC3_1**	**F2**
12008187	6.00	-1.91	2.20
12008363	6.00	-1.78	2.45
Average Score		***-3.69***	***4.65***

Cluster 6			
EA_ID		**FAC3_1**	**F2**
12008304	7.00	3.54	1.08
12008307	7.00	1.64	1.06
12008314	7.00	2.68	0.16
Average Score		***7.87***	***2.31***

Cluster 1							
EA ID	**F1**	**F3**	**F2**	***EA ID***	**F1**	**F3**	**F2**
59032069	-0.22	0.07	-0.38	*59032303*	0.31	0.02	0.62
59032070	-0.18	0.25	0.01	*59032304*	0.10	-0.26	0.31
59032072	0.22	-0.65	0.87	*59032305*	-0.40	-0.39	-0.73
59032073	0.78	-0.84	0.71	*59032306*	0.27	-0.48	0.52
59032074	-0.29	0.02	0.08	*59032307*	-0.34	-0.44	0.23
59032075	-0.68	0.48	-0.74	*59032308*	0.00	-0.40	0.01
59032112	-1.59	-0.11	-1.15	*59032309*	-0.21	0.22	-0.82
59032113	-0.44	0.14	-1.29	*59032310*	1.38	-0.61	1.04
59032114	-1.47	0.17	-0.07	*59032311*	0.60	-0.66	-0.11
59032115	-1.18	-0.66	0.69	*59032312*	0.19	-0.99	0.94
59032116	-0.98	0.35	0.22	*59032314*	1.30	-1.12	1.03
59032117	-0.91	-0.34	0.21	*59032315*	-0.16	-0.43	0.31
59032118	0.05	0.20	-1.18	*59032317*	0.02	-0.27	-0.20
59032119	-0.21	-0.37	1.08	*59032318*	0.95	-0.81	-0.22
59032120	-0.42	0.80	-0.30	*59032351*	0.77	-0.52	0.02
59032123	0.15	0.67	-0.89	*59032352*	0.43	-1.16	1.14
59032124	-0.18	-0.54	0.65	*59032353*	0.57	0.48	1.13
59032125	-0.10	0.84	-1.45	*59032356*	-0.47	0.53	0.69
59032127	0.30	0.75	-1.40	*59032370*	-0.02	0.34	1.36
59032201	0.01	0.56	-1.05	*59032372*	0.23	-0.56	0.22
59032202	0.20	0.53	-1.15	*59032373*	-0.85	-0.27	1.14
59032203	0.23	0.37	-1.02	*59032374*	-0.14	0.41	-1.95
59032204	0.09	0.25	-1.05	*59032375*	-0.43	-0.17	-2.14
59032205	-0.13	0.46	-0.83	*59032376*	-0.23	0.60	-1.97
59032206	0.66	0.37	-1.38	*59032377*	0.26	-0.75	1.13
59032207	0.20	0.66	-1.05	*59032378*	0.82	0.62	0.19
59032208	-0.04	-0.05	-1.07	*59032379*	-0.20	-0.42	0.00
59032209	0.71	0.09	-2.12	*59032382*	-0.10	-0.29	-1.44
59032211	0.44	0.05	-0.17	*59032404*	-1.09	-0.49	0.71
59032212	0.07	0.20	-0.02	*59032407*	-1.61	0.01	-0.27
59032213	-0.44	0.30	0.14	*59032409*	-0.47	-0.32	-1.62
59032214	0.05	0.20	-0.42	*59032410*	0.10	-1.34	-1.07
59032215	-0.80	0.26	0.69	*59032420*	-0.49	-0.64	0.25
59032251	-0.08	0.38	-0.97	*59032423*	-0.28	-0.90	0.85
59032252	0.74	-0.47	0.76	*59032424*	-0.79	-0.07	-0.24
59032253	-0.12	-0.39	0.36	*59032425*	-0.09	-1.30	0.18
59032254	1.13	-0.22	1.07	*59032426*	0.06	-0.13	0.25
59032255	0.02	-0.27	0.47	*59032451*	0.05	-0.56	0.91
59032256	-0.20	-0.41	0.32	*59032453*	0.48	-0.78	0.77
59032257	0.45	-0.98	0.73	*59032454*	-0.25	-0.22	0.42
59032258	0.30	-0.34	0.69	*59032455*	-0.53	-0.44	0.78
59032259	0.27	-0.61	0.78	*59032456*	-0.21	-0.57	1.11
59032260	0.20	-0.84	0.84	*59032457*	-0.72	-0.72	0.69
59032261	-0.08	0.25	-0.60	*59032458*	-0.64	0.01	-0.81
59032265	0.22	0.17	-2.12	*59032459*	-0.62	-0.31	-0.05
59032266	0.08	-0.74	0.61	*59032461*	-0.62	0.38	-0.43
59032268	0.73	-1.34	0.60	*59032462*	-0.49	0.47	-1.27
59032301	0.39	-0.84	0.55	*59032466*	-0.12	-0.48	0.97

EA ID	F1	F3	F2
59032467	0.21	-0.68	0.30
59032469	-0.86	-0.32	0.94
59032470	0.10	-0.35	0.22
59032503	0.22	0.49	-1.87
59032505	-0.31	0.17	-0.37
59032506	-0.65	-0.07	-0.45
59032507	-1.22	0.33	0.07
59032508	-0.02	-0.39	-2.17
59032509	-0.99	-0.38	0.29
59032511	-0.24	0.65	-1.27
59032512	-0.40	0.27	-0.76
59032514	0.20	0.70	-0.73
59032518	-0.23	0.54	-1.66
59032519	-0.33	-0.05	-1.38
59032520	-0.70	0.19	-0.41
59032521	-0.88	-0.20	-0.88
59032562	-0.03	0.77	-1.55
59032564	0.26	-0.70	0.61
59032565	0.26	0.62	-0.94
59032566	-0.24	0.35	-1.06
59032571	-0.24	0.69	-1.29
59032572	0.07	0.90	-1.39
59032573	0.12	0.10	-2.34
59032574	0.18	0.12	-1.43
59032575	1.61	0.17	0.80
59032577	0.24	0.60	-1.45
59032601	0.69	-0.63	1.24
59032610	-0.34	0.28	1.47
Average Score	***-9.24***	***-13.21***	***-23.68***

Cluster 2			
EA ID	**F1**	**F3**	**F2**
59032071	2.01	1.77	0.87
59032122	0.64	1.94	1.36
59032210	1.58	2.09	1.01
59032269	0.90	2.05	1.13
59032270	1.80	1.84	0.86
59032302	1.19	2.33	1.18
59032316	1.36	1.79	1.00
59032357	0.53	1.65	1.19
59032421	1.56	2.13	1.07
59032452	1.23	2.39	1.20
59032460	1.39	2.31	1.07
59032468	1.69	2.05	0.99
59032567	1.63	1.87	0.95
59032576	1.49	1.73	1.00
Average Score	***18.99***	***27.95***	***14.87***

Cluster 3			
EA ID	**F1**	**F3**	**F2**
59032126	1.77	-2.07	0.19
59032371	2.59	-4.65	-0.59
59032408	3.18	-3.52	-0.29
59032563	2.22	-1.17	-0.21
Average Score	***9.75***	***-11.42***	***-0.90***

Cluster 4			
EA ID	**F1**	**F3**	**F2**
59032319	-4.82	2.62	2.05
Average Score	**-4.82**	**2.62**	**2.05**

Cluster 5			
EA ID	**F1**	**F3**	**F2**
59032422	-1.71	-1.06	0.98
59032606	-2.34	-0.82	0.93
59032607	-1.31	-1.72	0.77
59032609	-1.90	-1.21	1.14
59032612	-2.45	-0.05	1.03
59032614	-3.02	0.61	1.61
59032615	-1.95	-1.70	1.20
Average Score	***-14.68***	***-5.95***	***7.66***

Cluster 1					
EA_ID	**FAC_2**	**FAC4_2**	*EA_ID*	**FAC_2**	**FAC4_2**
35009211	-0.12	0.98	*35038019*	-0.24	-0.28
35009212	0.01	-0.25	*35038020*	0.02	0.04
35009213	0.16	-0.84	*35038021*	0.30	-0.43
35009214	-1.03	-0.86	*35038022*	-0.25	-0.22
35009215	-0.45	-0.20	*35038051*	-0.22	0.36
35009216	-0.40	-0.40	*35038053*	-0.20	0.74
35009217	0.03	-1.13	*35038054*	0.07	-0.38
35009218	-0.92	-0.88	*35038055*	-0.30	-1.22
35009221	-0.07	-0.09	*35038056*	-0.20	-0.85
35009222	-0.20	-0.56	*35038057*	-0.33	0.26
35009223	-0.21	0.88	*35038058*	0.59	-1.19
35009224	-0.15	-0.18	*35038059*	-0.20	-0.49
35009301	-0.32	1.21	*35038060*	-0.69	-0.83
35009302	0.48	-0.22	*35038061*	-0.22	0.73
35009303	-0.15	0.17	*35038065*	-0.16	0.64
35009305	-0.23	-0.13	*35038066*	-0.28	0.01
35009306	-0.07	-0.67	*35038067*	0.56	0.79
35009307	0.00	-0.41	*35038070*	-0.46	1.03
35009308	-0.09	-0.25	*35038072*	-0.23	0.43
35009309	-0.09	-0.69	*35038101*	0.04	-0.47
35009310	-0.28	-0.21	*35038102*	-0.61	-0.38
35009311	-0.39	-0.12	*35038103*	-0.60	-0.85
35009312	-0.06	-0.39	*35038104*	-0.34	-1.36
35009313	-0.38	-0.49	*35038106*	0.38	-0.38
35009314	-0.08	-0.48	*35038107*	0.28	0.64
35009315	-0.09	-0.17	*35038108*	-0.51	0.39
35009316	-0.59	-1.59	*35038109*	-0.43	0.48
35009317	0.00	-0.60	*35038110*	-0.21	1.98
35009319	0.08	-0.54	*35038111*	-0.28	-0.05
35009320	0.14	-0.90	*35038112*	-0.97	-1.05
35009321	0.03	-0.93	*35038113*	-0.28	0.12
35009322	-0.07	-1.38	*35038114*	-0.17	0.79
35009323	-0.07	-1.13	*35038115*	-0.24	-0.14
35009324	-0.46	-1.07	*35038116*	-0.16	-0.75
35038001	-0.16	-0.13	*35038117*	-1.36	-0.14
35038002	0.85	-0.38	*35038118*	-0.18	-0.72
35038003	-0.05	1.25	*35038122*	-0.22	-0.74
35038004	-0.10	1.26	*35038151*	-0.10	-0.23
35038007	-0.20	0.34	*35038152*	-0.11	1.07
35038008	-0.18	0.26	*35038153*	-0.37	1.19
35038009	0.30	1.36	*35038154*	-0.29	1.04
35038010	0.41	2.15	*35038155*	0.30	0.98
35038011	0.30	1.73	*35038156*	-0.19	-0.41
35038012	0.01	0.37	*35038157*	-0.60	-0.97
35038013	-0.35	2.01	*35038158*	0.00	0.39
35038014	0.31	0.91	*35038159*	-0.50	-0.58
35038016	0.53	1.31	*35038160*	-0.08	0.92
35038018	-0.08	-0.15	*35038161*	-0.66	-0.01

EA_ID	FAC_2	FAC4_2	EA_ID	FAC_2	FAC4_2
35038162	-0.69	-0.58	35038318	-0.30	-0.31
35038163	-0.34	-0.18	35038319	-0.03	-0.41
35038164	-0.18	-0.63	35038352	-0.29	1.91
35038165	-0.41	0.35	35038353	-0.31	1.23
35038166	-0.45	-0.56	35038356	0.38	-0.55
35038167	-0.19	-1.29	35038357	-0.01	-0.83
35038169	0.20	-0.77	35038358	-0.07	0.08
35038170	0.22	-0.65	35038359	-0.07	-0.20
35038201	-0.12	0.69	35038360	-0.19	-0.72
35038202	0.13	1.04	35038361	-0.16	-0.12
35038203	0.53	0.99	35038363	0.01	-0.08
35038204	-0.50	0.17	35038364	-0.07	-0.29
35038205	0.01	0.85	35038365	-0.15	-0.48
35038206	-0.14	-0.12	35038366	-0.26	-0.35
35038207	0.41	-0.72	35038367	-0.21	-0.50
35038208	-0.52	-1.87	35038368	-1.65	-0.37
35038209	-0.87	-1.16	35038369	-0.28	-0.27
35038213	-1.15	-1.67	35038370	-0.17	-0.33
35038215	0.25	1.29	35038371	-0.65	-1.02
35038216	-0.47	0.52	35038372	-0.36	-0.38
35038251	-0.19	-0.76	35038373	-0.67	-0.02
35038252	-0.17	0.06	35089005	-0.43	0.14
35038253	0.08	-0.34	35089006	-0.10	0.68
35038254	-0.43	1.19	35089007	-0.58	0.61
35038255	-0.28	1.43	35089008	-0.02	1.05
35038256	-0.24	1.32	35089009	-0.40	0.40
35038257	-0.01	0.75	35089012	-0.10	1.19
35038258	-0.19	1.18	35089013	-0.05	0.97
35038259	-0.06	0.53	35089014	-0.26	0.46
35038261	-0.41	-0.05	35089015	-0.50	0.28
35038262	-0.45	0.27	35089016	-0.49	0.12
35038263	0.07	-0.43	35089017	0.13	0.50
35038265	-0.04	1.53	35089018	-0.40	-0.65
35038266	-0.40	1.61	35089019	-0.47	-0.42
35038267	0.09	0.08	35089020	-0.55	0.08
35038268	-0.62	-0.81	35089021	-0.86	0.29
35038301	-0.55	1.14	35089022	0.12	0.77
35038302	-0.23	2.04	35089051	-0.56	-1.08
35038303	-0.02	-0.19	35089052	-0.20	-0.78
35038304	0.52	1.27	35089053	-0.45	-0.34
35038305	-0.35	1.17	35089054	-0.23	-1.31
35038306	-0.06	0.35	35089055	-0.11	0.05
35038307	-0.20	-0.37	35089056	-0.07	-1.27
35038310	-0.19	-0.64	35089057	-0.66	-1.21
35038312	-0.11	-0.80	35089058	-0.47	-0.56
35038313	-0.10	0.06	35089059	-0.06	-1.08
35038315	0.10	0.49	35089060	-0.08	-0.80
35038316	-0.02	1.04	35089062	-0.37	-0.19
35038317	-0.57	1.83	35089064	0.18	-0.04

EA_ID	FAC_2	FAC4_2	*EA_ID*	FAC_2	FAC4_2
35089065	0.03	0.13	*35089221*	-0.61	1.66
35089066	-0.17	0.46	*35089222*	-0.14	0.28
35089067	0.12	-1.15	*35089223*	-0.15	-0.01
35089069	-0.76	-0.35	*35089258*	-0.66	0.16
35089070	-0.32	-0.18	*35089259*	-0.97	-0.72
35089071	0.38	-1.82	*35089260*	-0.83	0.13
35089104	0.29	-0.80	*35089261*	-0.43	-1.08
35089105	-0.14	-0.18	*35089262*	-0.83	0.83
35089106	-0.57	-1.02	*35089264*	-0.39	-0.70
35089107	-0.35	0.98	*35089265*	-0.45	0.16
35089108	-0.36	1.22	*35089266*	-0.42	-0.39
35089109	-0.18	0.90	*35089267*	-0.48	-0.38
35089110	-0.25	1.02	*35089268*	-0.23	-0.05
35089111	0.17	1.21	*35089269*	-0.33	0.57
35089112	-0.41	-0.60	*35089270*	-0.39	-0.27
35089113	-0.29	0.40	*35089271*	-0.20	-0.36
35089114	0.32	0.04	*35089272*	-0.34	0.39
35089117	-0.68	0.07	*35089306*	-0.18	0.78
35089118	-0.45	-0.02	*35089307*	-0.30	0.47
35089119	0.76	-0.53	*35089308*	-0.36	0.58
35089121	0.52	-0.02	*35089309*	-0.10	-0.17
35089122	-0.03	-1.42	*35089314*	-0.67	0.77
35089123	-0.24	-1.04	*35089315*	-0.39	-1.89
35089151	0.40	1.98	*35089316*	-0.70	-1.31
35089152	0.10	1.26	*35089317*	-0.27	-0.11
35089153	0.60	0.65	*35089318*	-0.36	0.35
35089154	0.35	0.07	*35089319*	-0.26	-0.12
35089157	0.07	-0.90	*35089323*	0.38	0.11
35089159	-0.50	-0.89	*35089324*	-1.02	-0.33
35089160	-0.07	0.33	*35089325*	-1.02	-1.40
35089162	-0.23	1.61	*35089327*	-0.37	1.21
35089163	-0.08	-0.13	*35089328*	-1.11	-0.52
35089164	0.51	0.32	*35089329*	-1.65	-0.41
35089165	-0.31	-0.12	*35089332*	-0.45	0.21
35089166	-0.21	1.81	*35089334*	0.17	-0.58
35089167	-0.28	1.32	*35089335*	0.48	0.52
35089168	-0.58	0.76	*35089401*	0.05	0.04
35089202	-0.13	0.55	*35089402*	-0.63	-0.94
35089206	-0.23	0.00	*35089403*	-0.33	-0.11
35089208	-0.16	-0.33	*35089404*	0.02	-0.16
35089209	0.13	-0.59	*35089405*	-0.03	-0.60
35089210	0.01	-0.33	*35089406*	-0.59	0.20
35089211	0.22	-0.14	*35089407*	-0.52	0.03
35089214	-1.48	-1.65	*35089408*	-0.04	-0.09
35089215	0.03	0.29	*35089409*	-0.17	-0.09
35089216	-0.02	0.42	*35089410*	0.13	-0.26
35089218	-0.33	0.02	*35089411*	-0.13	0.73
35089219	-0.56	-0.10	*35089412*	-0.18	-0.23
35089220	-0.03	-0.97	*35089413*	0.10	-0.62

EA_ID	**FAC_2**	**FAC4_2**
35089414	-0.15	0.40
35089415	-0.62	1.72
Average Score	***-62.72***	***3.16***

Cluster 2

EA ID	FAC 2	FAC 4
35009318	4.92	-1.57
35038052	3.30	-0.39
35038062	3.53	-0.73
35038063	4.59	0.87
35038064	3.82	-1.44
35038105	4.13	-1.63
35038168	4.53	-1.71
35038260	4.24	-1.76
35038311	4.52	-1.70
35038362	3.94	-1.19
35038374	3.69	-1.07
35089207	3.97	-1.90
35089416	4.82	-1.25
Average Score	***54.01***	***-15.48***

Cluster 5

EA ID	FAC 2	FAC 4
35089330	-3.24	-4.68
35089331	-2.98	-4.74
Average Score	***-6.22***	***-9.41***

Cluster 3

EA ID	FAC 2	FAC 4
35038005	0.81	2.37
35038120	1.61	2.21
35038210	2.57	1.76
35038211	0.63	-0.60
35038212	0.55	0.03
35038264	1.61	1.23
35038308	1.12	1.03
35038309	1.21	-0.20
35089063	1.57	1.33
35089120	1.63	2.60
35089212	0.63	1.32
35089213	1.11	1.42
Average Score	***15.05***	***14.50***

Cluster 4

EA ID	FAC 2	FAC 4
35038121	-0.47	2.96
35089155	0.34	4.27
Average Score	***-0.13***	***7.23***

Appendix H

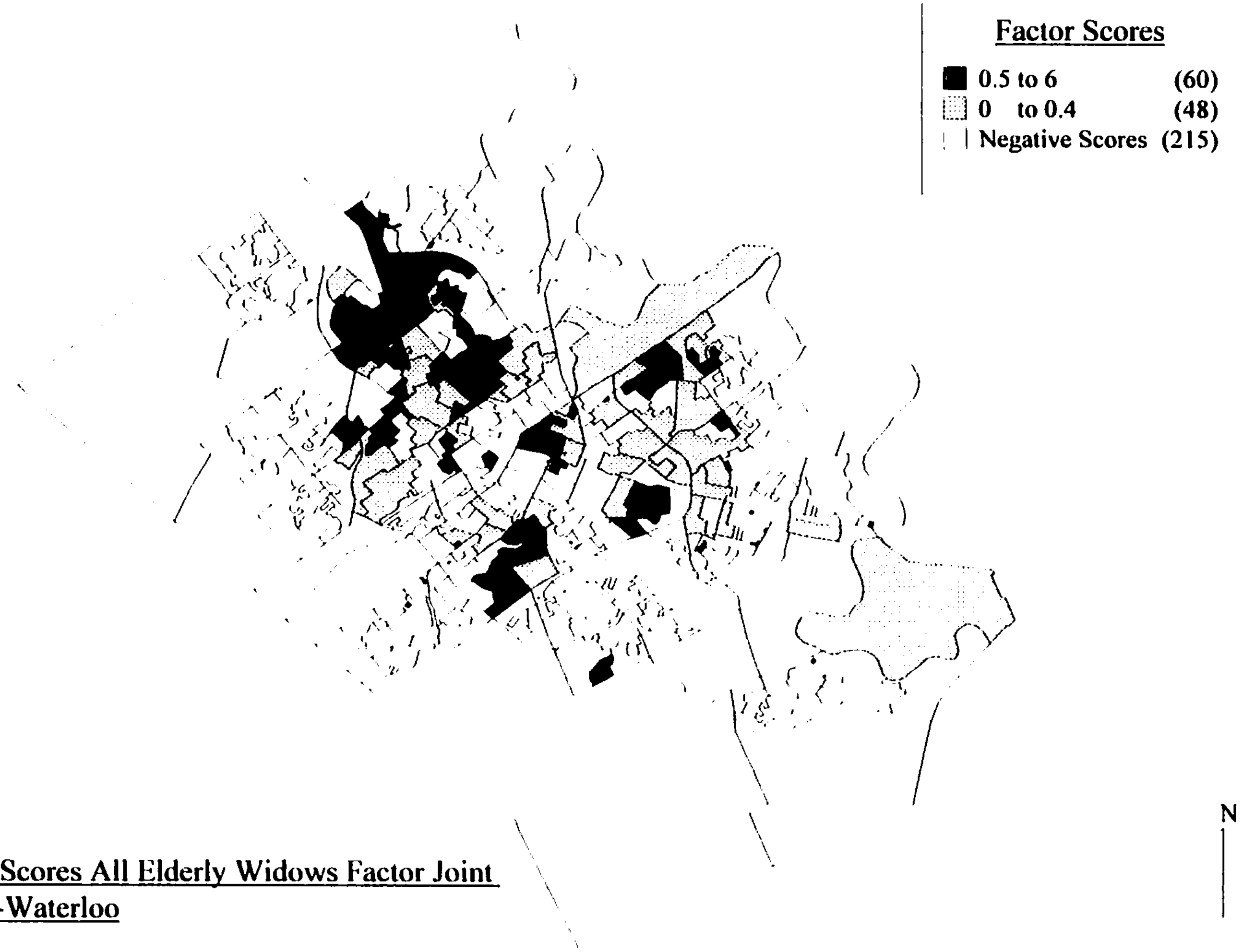


Figure H1: Positive Scores All Elderly Widows Factor Joint Analysis, Kitchener-Waterloo

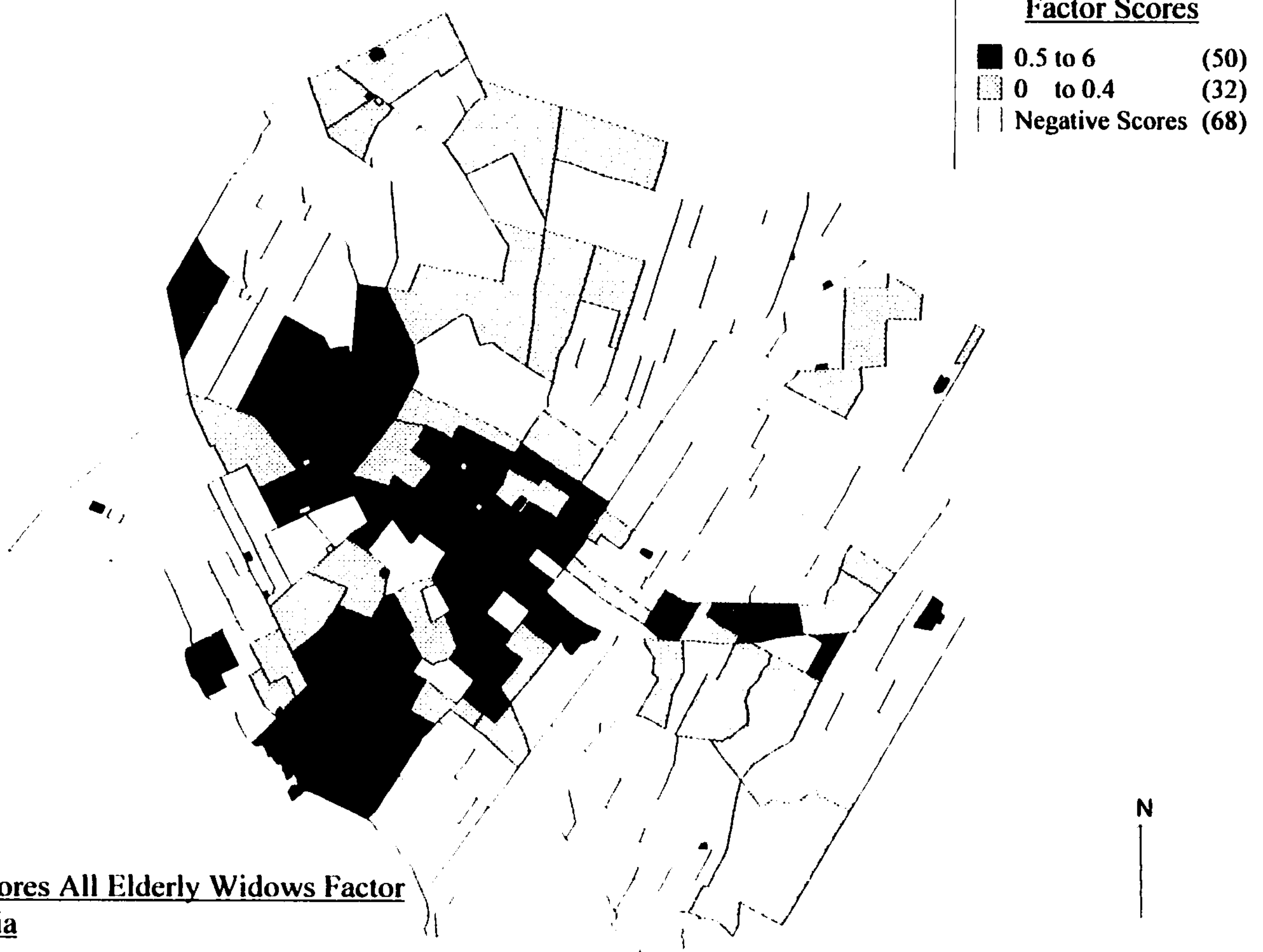


Figure H2: Positive Scores All Elderly Widows Factor
Joint Analysis, Victoria

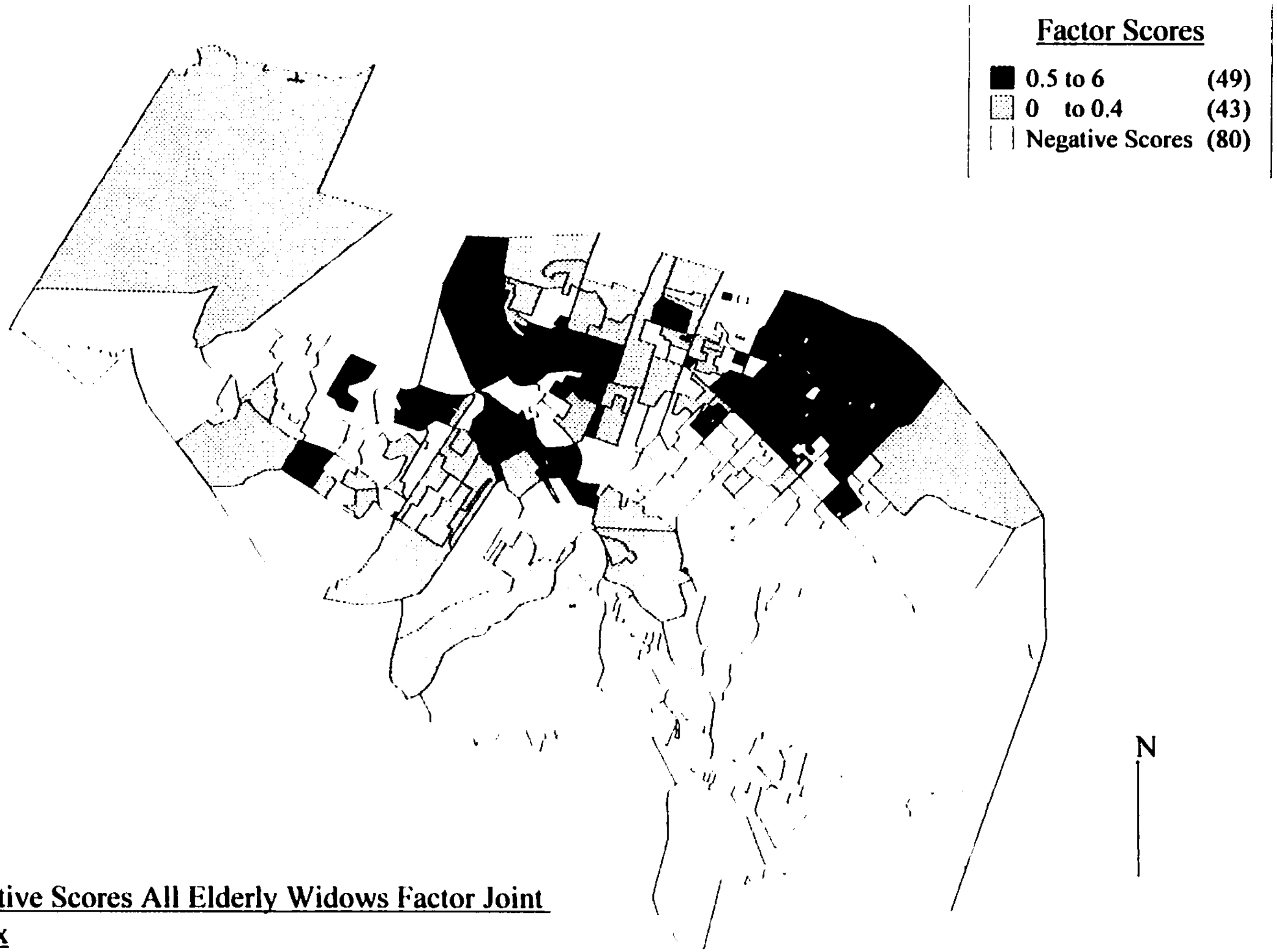


Figure H3: Positive Scores All Elderly Widows Factor Joint Analysis Halifax

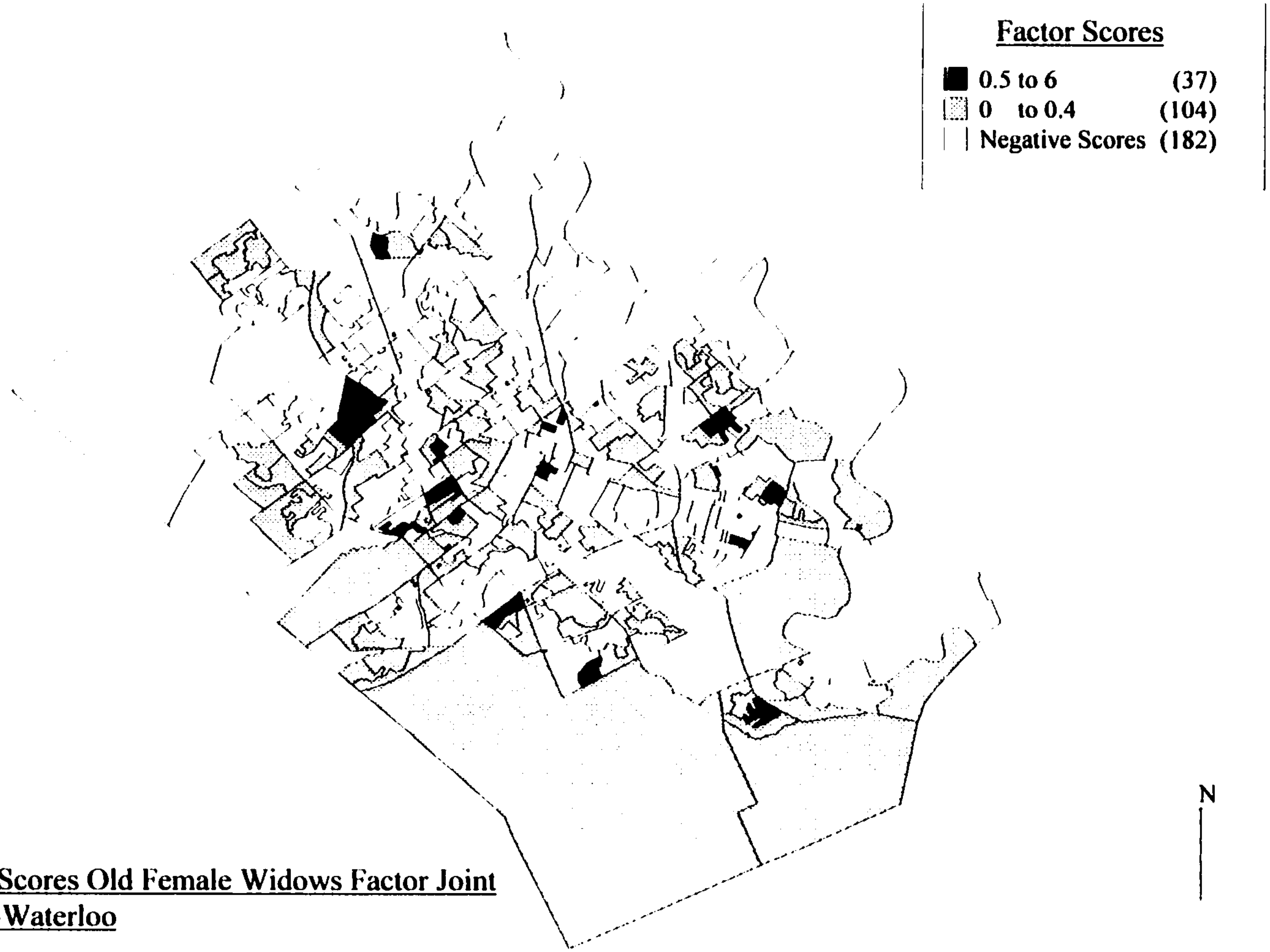


Figure H4: Positive Scores Old Female Widows Factor Joint Analysis, Kitchener-Waterloo

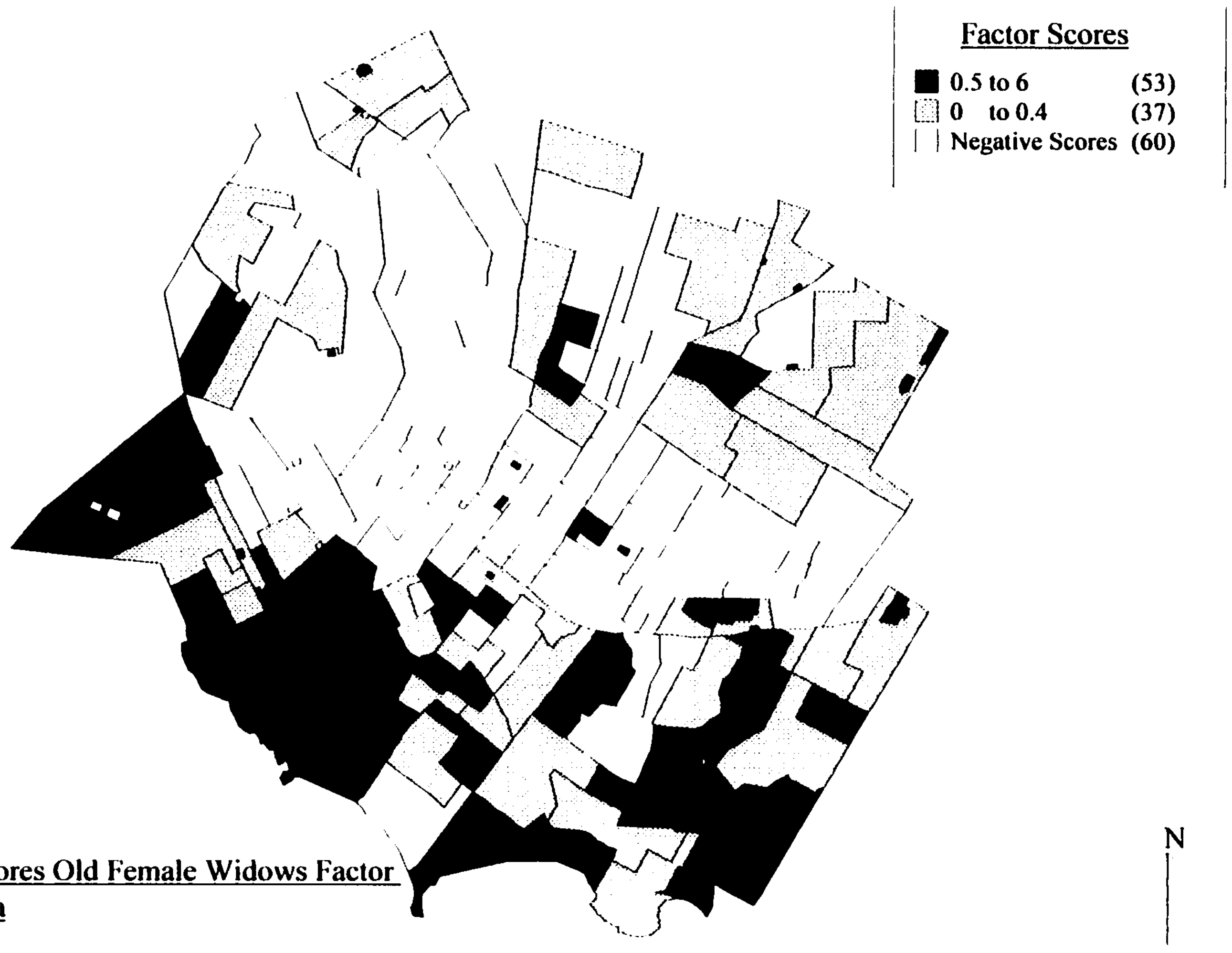


Figure H5: Positive Scores Old Female Widows Factor
Joint Analysis, Victoria

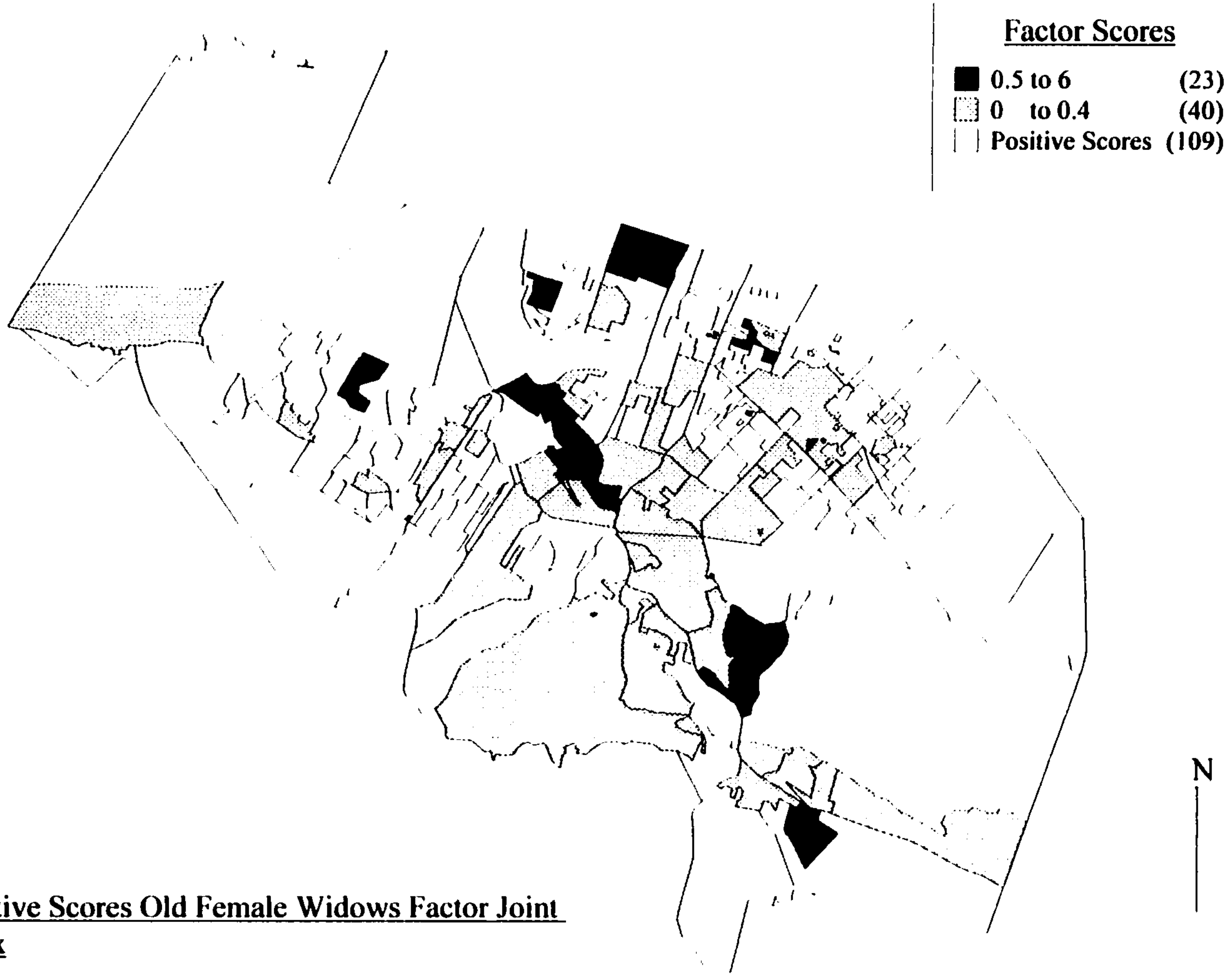


Figure H6: Positive Scores Old Female Widows Factor Joint Analysis Halifax

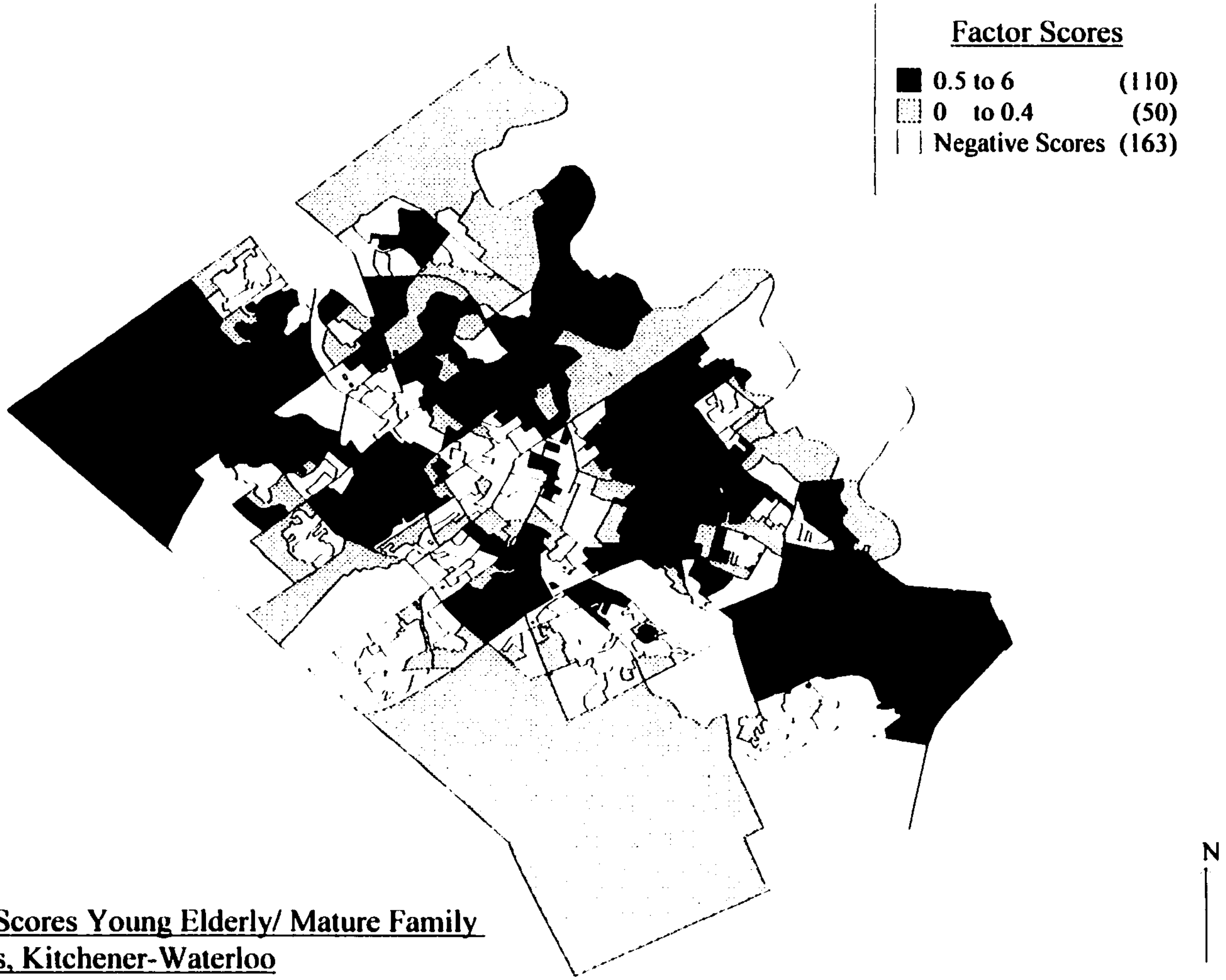


Figure H7: Positive Scores Young Elderly/ Mature Family Factor Joint Analysis, Kitchener-Waterloo

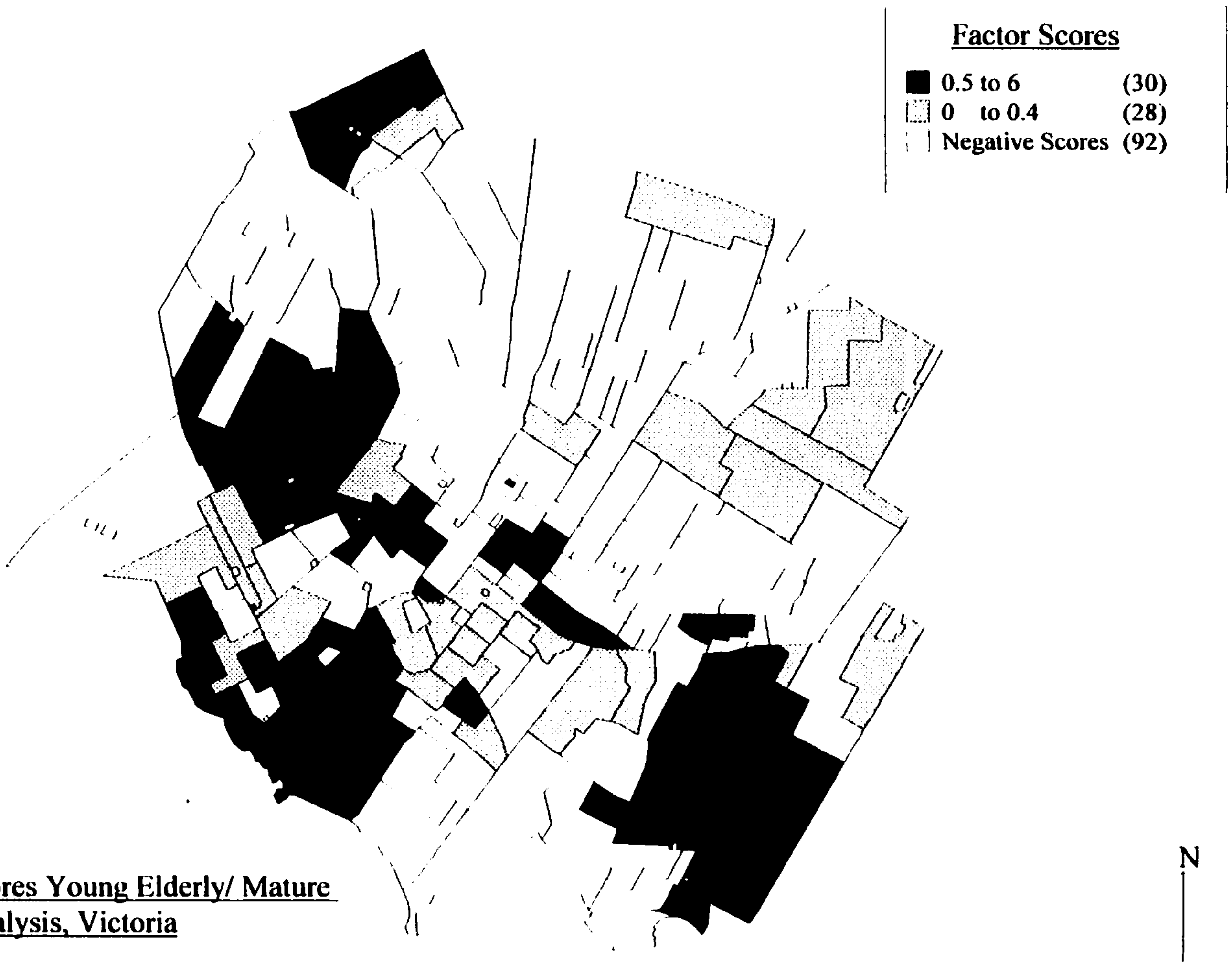


Figure H8: Positive Scores Young Elderly/ Mature Family Factor Joint Analysis, Victoria

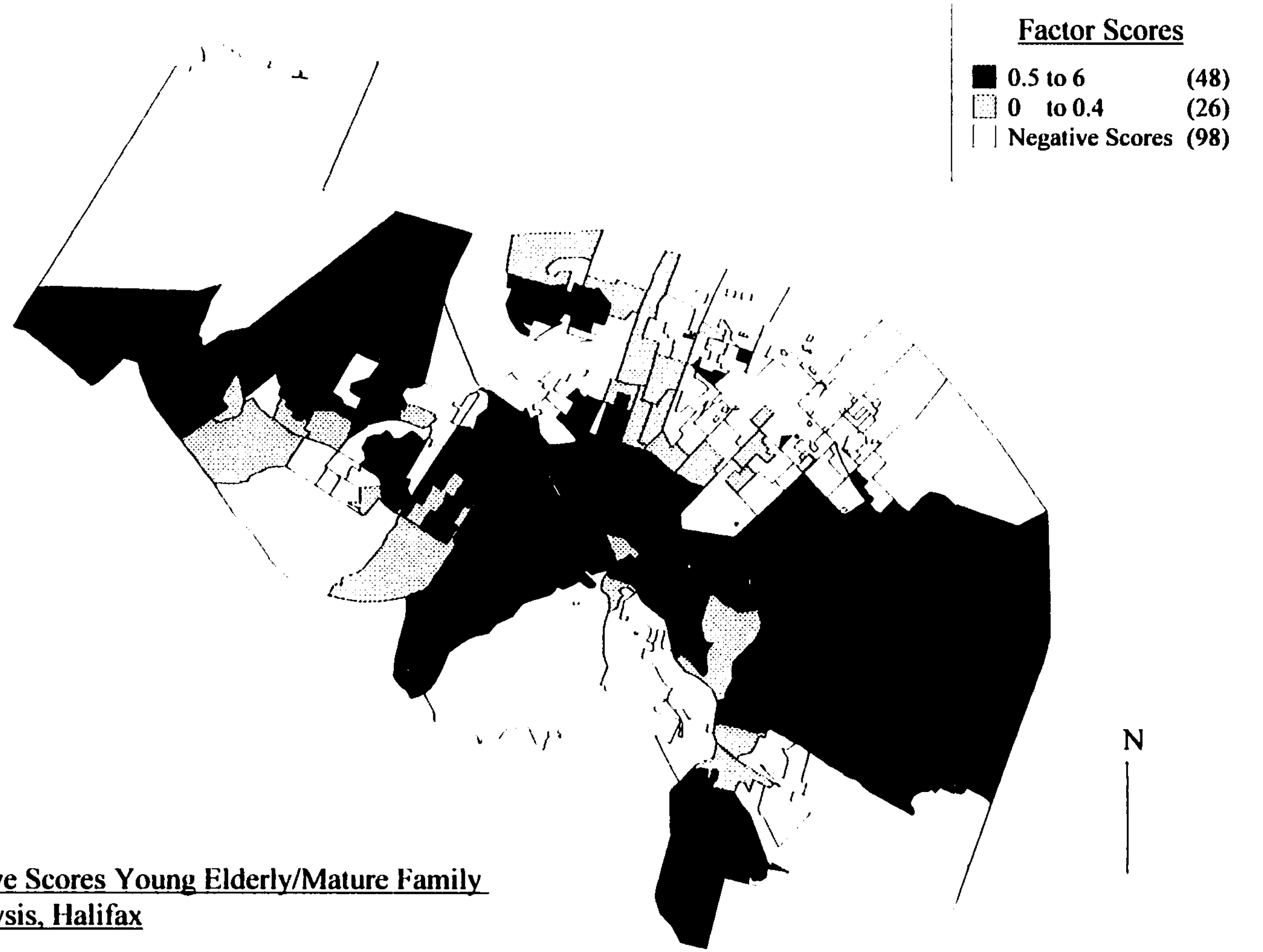


Figure H9: Positive Scores Young Elderly/Mature Family Factor Joint Analysis, Halifax

Appendix I

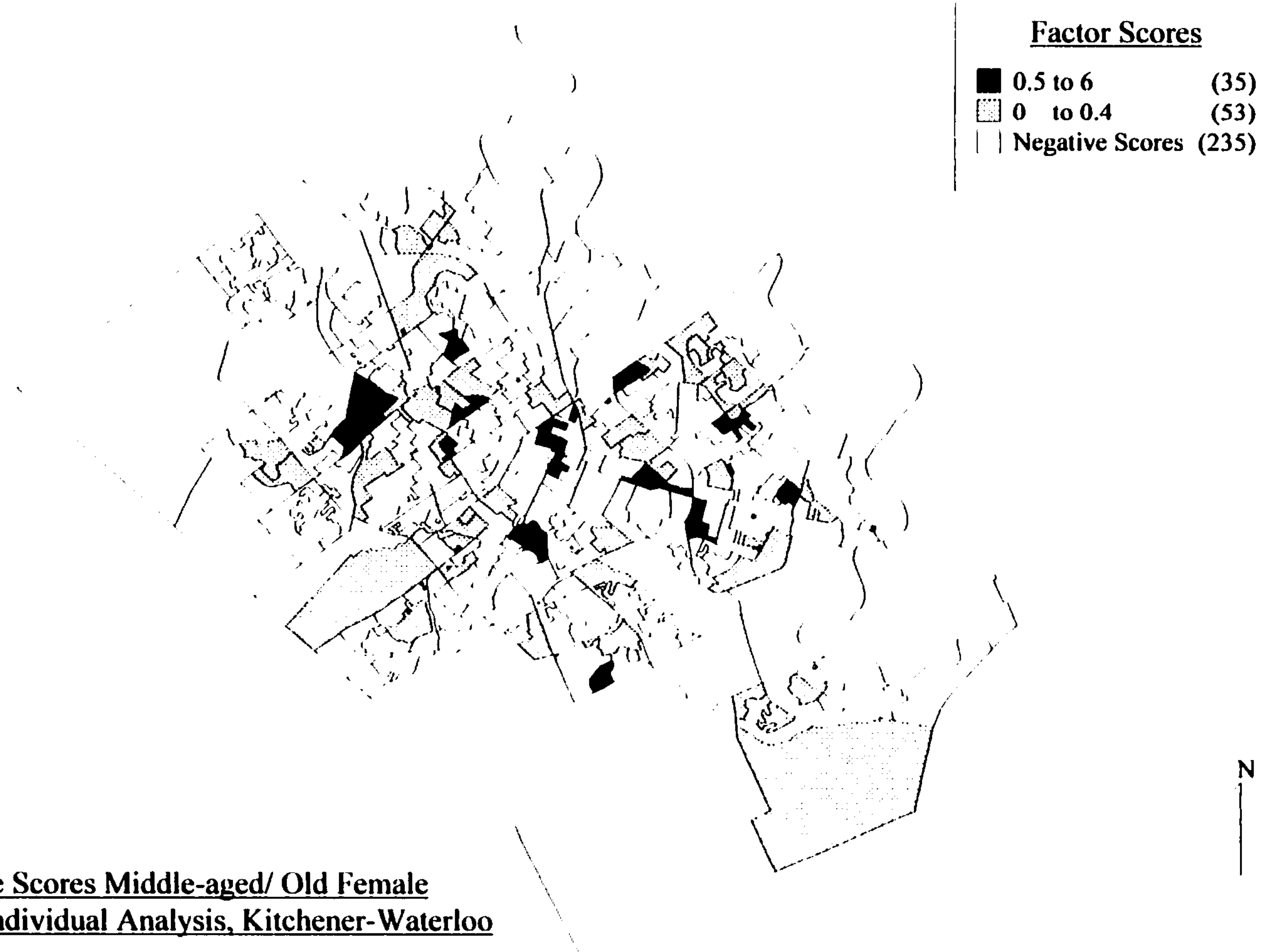


Figure I1: Positive Scores Middle-aged/ Old Female Widows Factor Individual Analysis, Kitchener-Waterloo

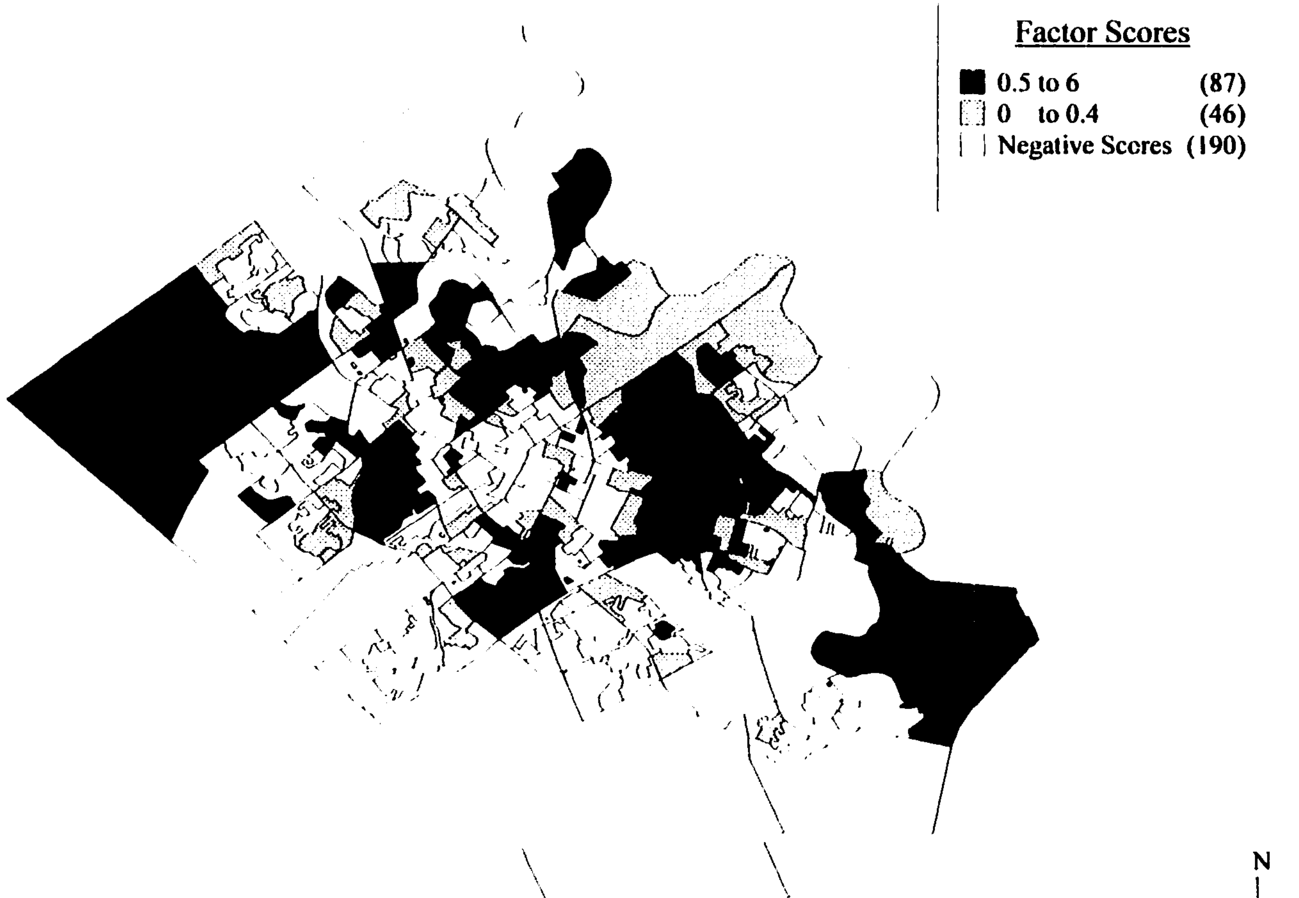


Figure I2: Positive Scores Early Elderly Factor Individual Analysis, Kitchener-Waterloo

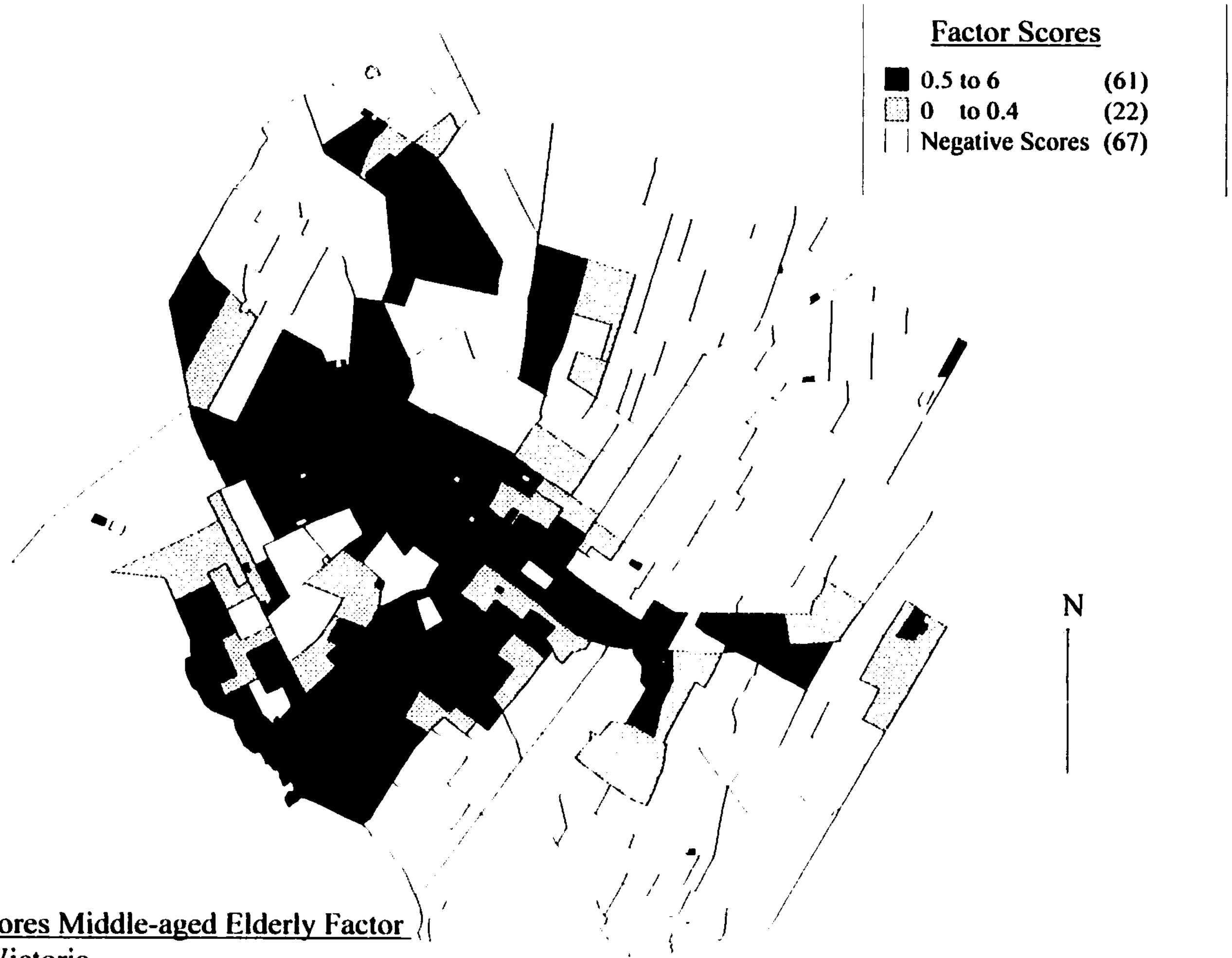


Figure 13: Positive Scores Middle-aged Elderly Factor Individual Analysis, Victoria

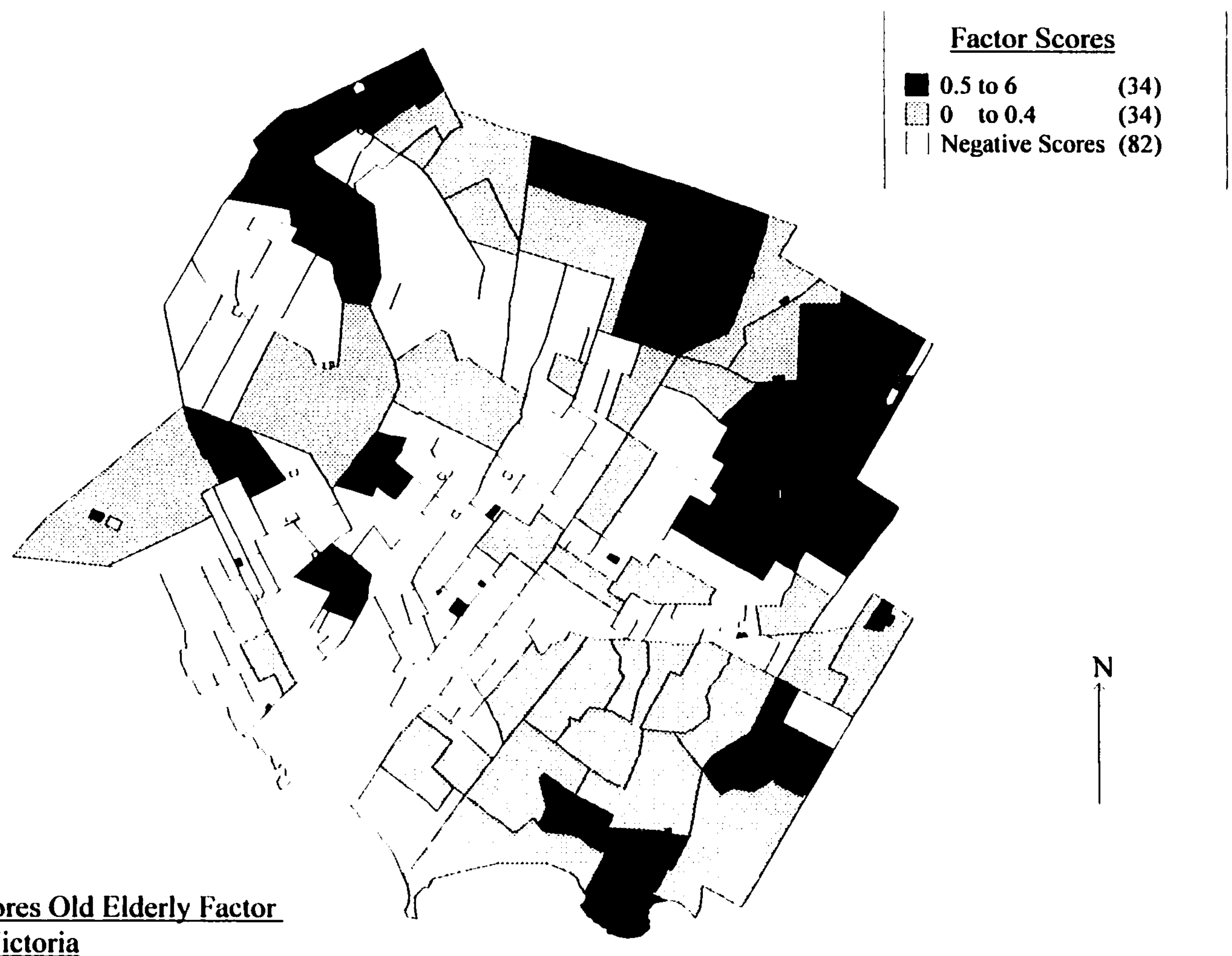


Figure I4: Positive Scores Old Elderly Factor
Individual Analysis, Victoria

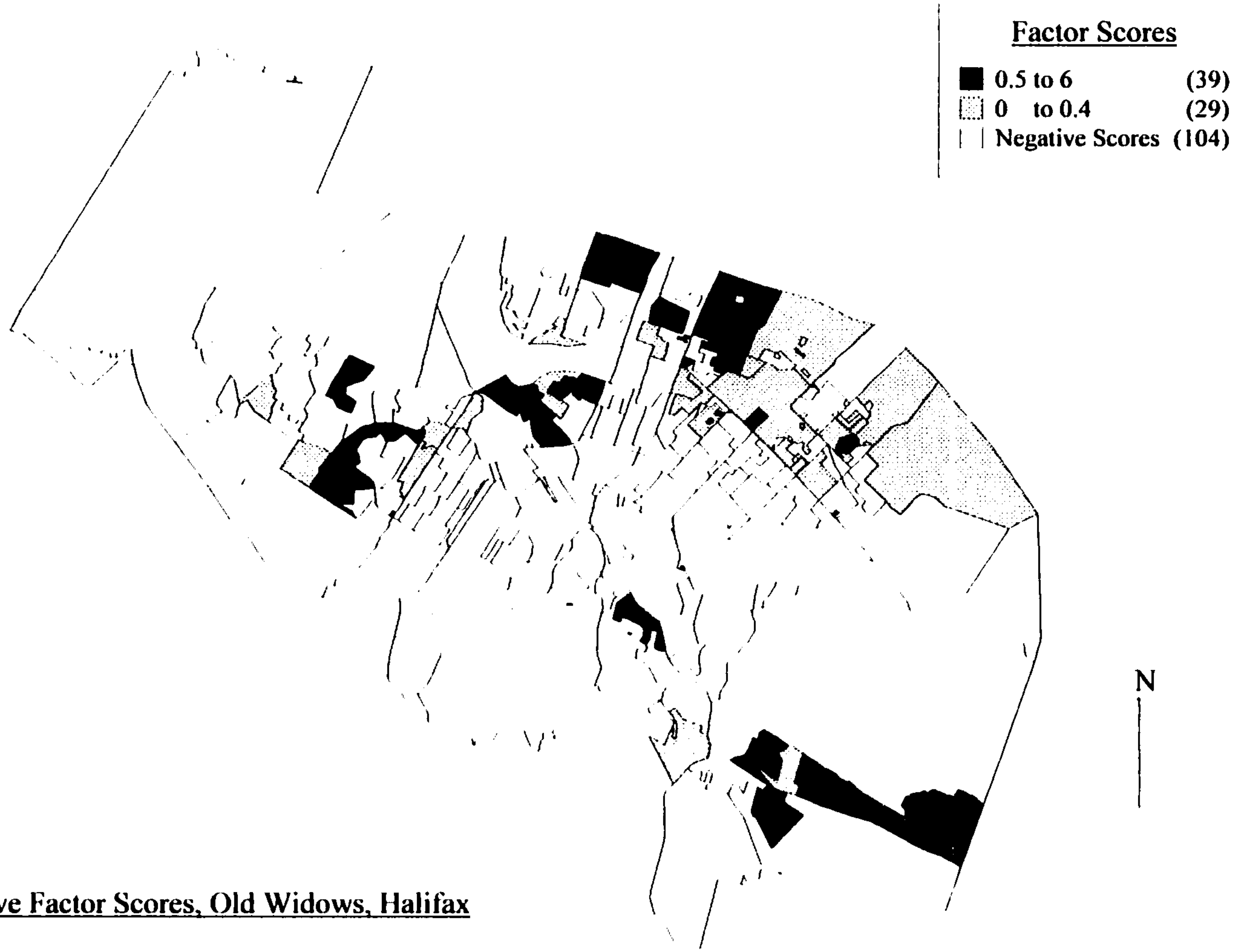
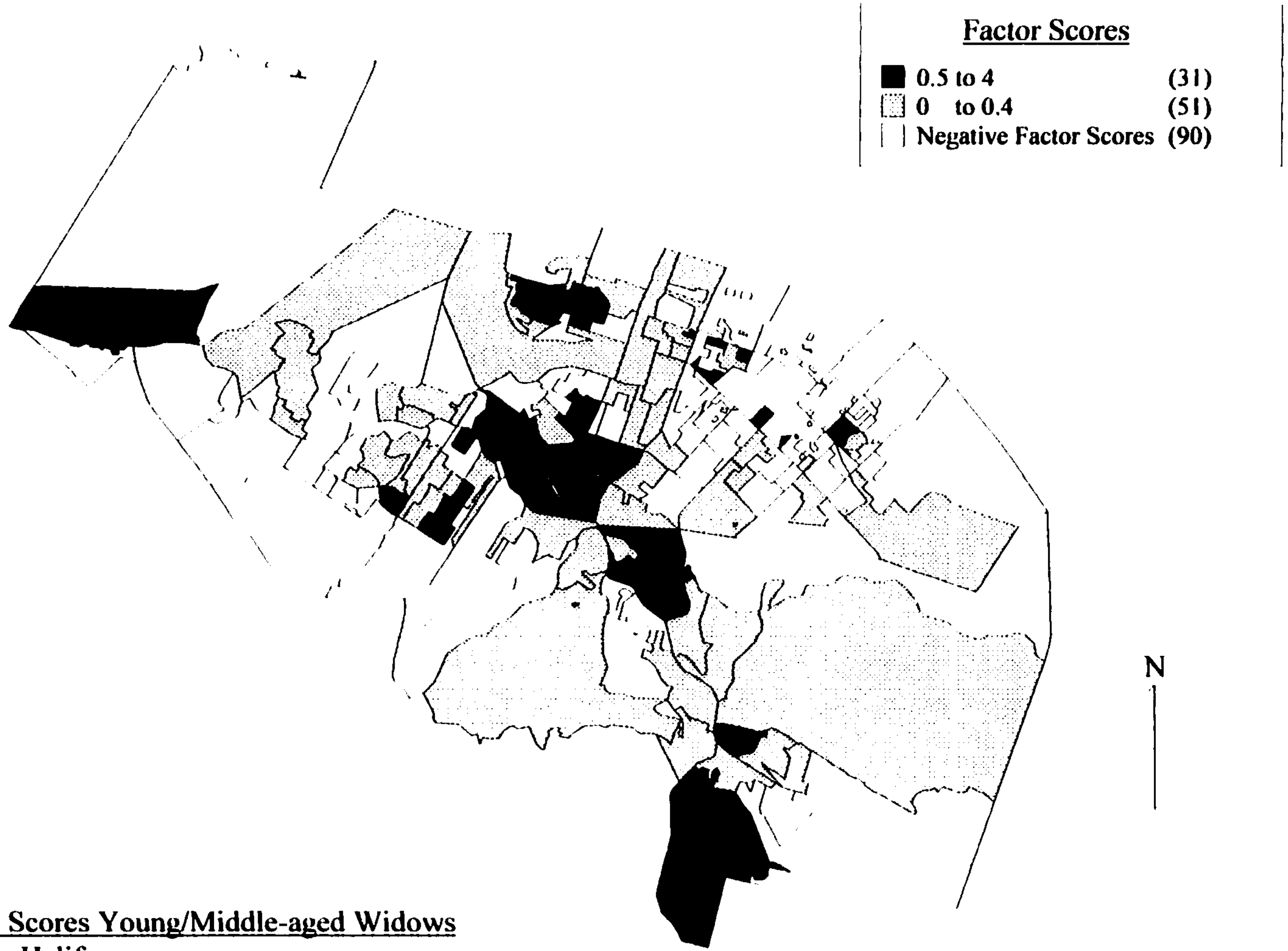


Figure I5: Positive Factor Scores, Old Widows, Halifax



Fibure I6: Positive Scores Young/Middle-aged Widows
Individual Analysis Halifax

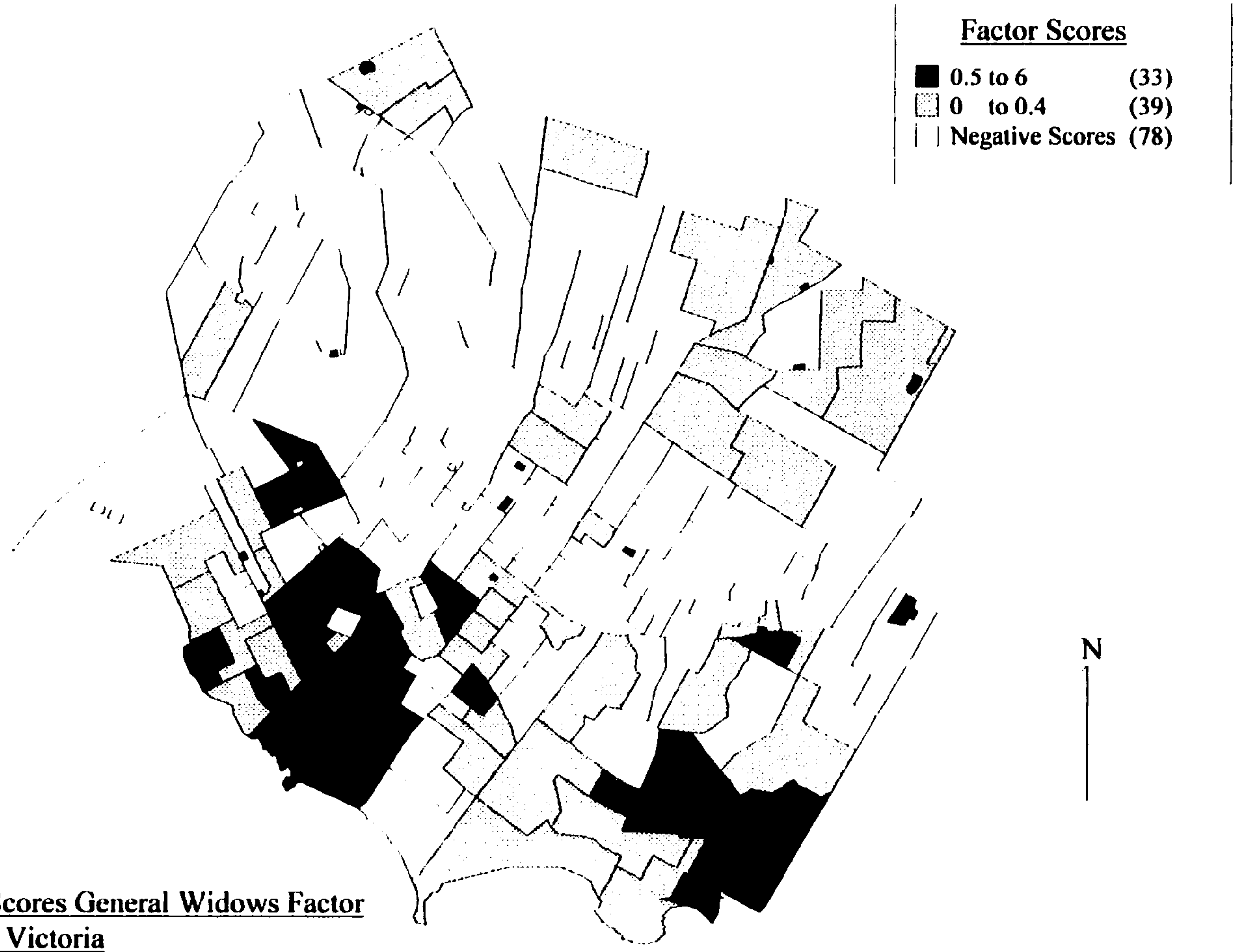


Figure I7: Positive Scores General Widows Factor
Individual Analysis, Victoria

Appendix J

Table J1: Canonical Discriminant Functions 15 Cluster Solution Joint Analysis

Fcn	Eigenvalue	Percent of Variance	Cumulative Percent of Variance	Canonical Correlation	After Function	Wilks' Lambda	Chi-Squared	df	Significance
				:	0	.173715	1090.461	378	.0000
1*	.5175	25.97	25.97	.5840 :	1	.263605	830.648	338	.0000
2*	.4125	20.70	46.67	.5404 :	2	.372332	615.506	300	.0000
3*	.2735	13.73	60.40	.4634 :	3	.474168	464.879	264	.0000
4*	.1906	9.57	69.97	.4001 :	4	.564548	356.187	230	.0000
5*	.1748	8.77	78.74	.3857 :	5	.663222	255.832	198	.0035
6*	.0967	4.85	83.59	.2969 :	6	.727346	198.334	168	.0548
7*	.0886	4.45	88.04	.2853 :	7	.791819	145.422	140	.3595
8*	.0592	2.97	91.01	.2364 :	8	.838703	109.585	114	.5995
9*	.0495	2.48	93.49	.2171 :	9	.880190	79.506	90	.7778
10*	.0411	2.06	95.56	.1988 :	10	.916395	54.393	68	.8843
11*	.0338	1.70	97.25	.1807 :	11	.947343	33.700	48	.9414
12*	.0298	1.50	98.75	.1702 :	12	.975595	15.393	30	.9873
13*	.0193	.97	99.72	.1377 :	13	.994447	3.469	14	.9979
14*	.0056	.28	100.00	.0745 :	14				

* Marks the 14 canonical discriminant functions remaining in the analysis.

Maximum number of functions............. 14
Minimum cumulative percent of variance... 100.00
Maximum significance of Wilks' Lambda.... 1.0000

Prior probability for each group is .06667

Table J2: Canonical Discriminant Functions 13 Cluster Solution Joint Analysis

Fcn	Eigenvalue	Percent of Variance	Cumulative Percent of Variance	Canonical Correlation	After Function	Wilks' Lambda	Chi-Squared	df	Significance
					0	.197241	1012.958	324	.0000
1*	.4937	26.69	26.69	.5749 :	1	.294623	762.565	286	.0000
2*	.4115	22.25	48.94	.5399 :	2	.415856	547.507	250	.0000
3*	.2621	14.17	63.10	.4557 :	3	.524835	402.275	216	.0000
4*	.1874	10.13	73.24	.3973 :	4	.623207	295.075	184	.0000
5*	.1656	8.95	82.19	.3770 :	5	.726433	199.436	154	.0080
6*	.0890	4.81	87.00	.2859 :	6	.791113	146.212	126	.1052
7*	.0792	4.28	91.29	.2709 :	7	.853771	98.650	100	.5194
8*	.0491	2.65	93.94	.2163 :	8	.895686	68.743	76	.7102
9*	.0423	2.29	96.23	.2015 :	9	.933585	42.883	54	.8617
10*	.0385	2.08	98.31	.1926 :	10	.969536	19.305	34	.9797
11*	.0254	1.37	99.68	.1572 :	11	.994117	3.682	16	.9994
12*	.0059	.32	100.00	.0767 :					

* Marks the 12 canonical discriminant functions remaining in the analysis.

Maximum number of functions............. 12
Minimum cumulative percent of variance... 100.00
Maximum significance of Wilks' Lambda.... 1.0000

Prior probability for each group is .07692

Table J3: Canonical Discriminant Functions 11 Cluster Solution Joint Analysis

Fcn	Eigenvalue	Percent of Variance	Cumulative Percent of Variance	Canonical Correlation	After Function	Wilks' Lambda	Chi-Squared	df	Significance
					0	.241306	888.555	270	.0000
1*	.4779	29.51	29.51	.5687 :	1	.356635	644.401	234	.0000
2*	.3673	22.68	52.20	.5183 :	2	.487630	448.874	200	.0000
3*	.2525	15.59	67.79	.4490 :	3	.610761	308.156	168	.0000
4*	.1831	11.31	79.10	.3934 :	4	.722600	203.062	138	.0003
5*	.1339	8.27	87.37	.3437 :	5	.819368	124.514	110	.1628
6*	.0743	4.59	91.95	.2629 :	6	.880223	79.737	84	.6114
7*	.0561	3.46	95.42	.2304 :	7	.929589	45.633	60	.9149
8*	.0415	2.56	97.98	.1996 :	8	.968164	20.221	38	.9920
9*	.0261	1.61	99.59	.1594 :	9	.993395	4.142	18	.9997
10*	.0066	.41	100.00	.0813 :					

* Marks the 10 canonical discriminant functions remaining in the analysis.

Maximum number of functions............. 10
Minimum cumulative percent of variance... 100.00
Maximum significance of Wilks' Lambda.... 1.0000

Prior probability for each group is .09091

Table J4: Canonical Discriminant Functions 9 Cluster Solution Joint Analysis

Fcn	Eigenvalue	Percent of Variance	Cumulative Percent of Variance	Canonical Correlation	After Function	Wilks' Lambda	Chi-Squared	df	Significance
					0	.338313	678.449	216	.0000
1*	.3685	30.35	30.35	.5189	1	.462973	482.074	182	.0000
2*	.2801	23.06	53.41	.4677 :	2	.592631	327.513	150	.0000
3*	.2504	20.62	74.03	.4475 :	3	.740998	187.648	120	.0001
4*	.1597	13.16	87.18	.3711 :	4	.859371	94.873	92	.3979
5*	.0747	6.15	93.34	.2637 :	5	.923572	49.771	66	.9318
6*	.0439	3.62	96.96	.2052 :	6	.964161	22.847	42	.9930
7*	.0302	2.49	99.44	.1712 :	7	.993286	4.217	20	.9999
8*	.0068	.56	100.00	.0819 :					

* Marks the 8 canonical discriminant functions remaining in the analysis.

Maximum number of functions............. 8
Minimum cumulative percent of variance... 100.00
Maximum significance of Wilks' Lambda.... 1.0000

Prior probability for each group is .11111

Table J5: Canonical Discriminant Functions 7 Cluster Solution Joint Analysis

Fcn	Eigenvalue	Percent of Variance	Cumulative Percent of Variance	Canonical Correlation	After Function	Wilks' Lambda	Chi-Squared	df	Significance
					0	.471228	471.763	162	.0000
1*	.3368	40.10	40.10	.5020 :	1	.629960	289.736	130	.0000
2*	.2748	32.72	72.82	.4643 :	2	.803077	137.504	100	.0077
3*	.1157	13.77	86.59	.3220 :	3	.895961	68.882	72	.5824
4*	.0616	7.34	93.92	.2409 :	4	.951168	31.391	46	.9507
5*	.0442	5.27	99.19	.2058 :	5	.993255	4.244	22	1.0000
6*	.0068	.81	100.00	.0821 :					

* Marks the 6 canonical discriminant functions remaining in the analysis.

Maximum number of functions............. 6
Minimum cumulative percent of variance... 100.00
Maximum significance of Wilks' Lambda.... 1.0000

Prior probability for each group is .14286

Table J6: Canonical Discriminant Functions 5 Cluster Solution Joint Analysis

Fcn	Eigenvalue	Percent of Variance	Cumulative Percent of Variance	Canonical Correlation	After Function	Wilks' Lambda	Chi-Squared	df	Significance
					0	.587901	333.591	108	.0000
1*	.3368	56.42	56.42	.5019 :	1	.785898	151.303	78	.0000
2*	.2018	33.81	90.23	.4098 :	2	.944501	35.858	50	.9340
3*	.0488	8.18	98.41	.2158 :	3	.990624	5.916	24	.9999
4*	.0095	1.59	100.00	.0968 :					

* Marks the 3 canonical discriminant functions remaining in the analysis.

Maximum number of functions............. 4
Minimum cumulative percent of variance... 100.00
Maximum significance of Wilks' Lambda.... 1.0000

Prior probability for each group is .20000

Table J7: Canonical Discriminant Functions 3 Cluster Solution Joint Analysis

Fcn	Eigenvalue	Percent of Variance	Cumulative Percent of Variance	Canonical Correlation	After Function	Wilks' Lambda	Chi-Squared	df	Significance
					0	.934202	42.811	54	.8635
1*	.0594	85.09	85.09	.2368 :	1	.989697	6.514	26	1.0000
2*	.0104	14.91	100.00	.1015 :					

* Marks the 2 canonical discriminant functions remaining in the analysis.

Maximum number of functions............. 2
Minimum cumulative percent of variance... 100.00
Maximum significance of Wilks' Lambda.... 1.0000

Prior probability for each group is .33333

Table J8: Canonical Discriminant Functions 15 Cluster Solution Individual Analysis Kitchener-Waterloo

Fcn	Eigenvalue	Percent of Variance	Cumulative Percent of Variance	Canonical Correlation	After Function	Wilks' Lambda	Chi-Squared	df	Significance
					0	.000003	3846.502	364	.0000
1*	187.2566	90.23	90.23	.9973 :	1	.000542	2267.304	325	.0000
2*	11.1643	5.38	95.61	.9580 :	2	.006594	1514.005	288	.0000
3*	4.1164	1.98	97.60	.8970 :	3	.033738	1021.823	253	.0000
4*	2.2836	1.10	98.70	.8339 :	4	.110781	663.362	220	.0000
5*	.7970	.38	99.08	.6660 :	5	.199068	486.653	189	.0000
6*	.7114	.34	99.42	.6447 :	6	.340694	324.646	160	.0000
7*	.3613	.17	99.60	.5152 :	7	.463791	231.649	133	.0000
8*	.3093	.15	99.75	.4860 :	8	.607238	150.398	108	.0044
9*	.1702	.08	99.83	.3814 :	9	.710604	103.004	85	.0894
10*	.1341	.06	99.89	.3439 :	10	.805930	65.051	64	.4399
11*	.0785	.04	99.93	.2698 :	11	.869189	42.269	45	.5883
12*	.0657	.03	99.96	.2483 :	12	.926322	23.075	28	.7293
13*	.0398	.02	99.98	.1956 :	13	.963177	11.312	13	.5847
14*	.0382	.02	100.00	.1919 :					

* Marks the 14 canonical discriminant functions remaining in the analysis.

Maximum number of functions............. 14
Minimum cumulative percent of variance... 100.00
Maximum significance of Wilks' Lambda.... 1.0000

Prior probability for each group is .06667

Table J9: Canonical Discriminant Functions 13 Cluster Solution Individual Analysis Kitchener-Waterloo

Fcn	Eigenvalue	Percent of Variance	Cumulative Percent of Variance	Canonical Correlation	After Function	Wilks' Lambda	Chi-Squared	df	Significance
					0	.000005	3713.871	312	.0000
1*	182.4648	90.85	90.85	.9973 :	1	.000854	2137.234	275	.0000
2*	10.4141	5.18	96.03	.9552 :	2	.009751	1400.692	240	.0000
3*	3.3614	1.67	97.70	.8779 :	3	.042528	955.171	207	.0000
4*	2.1293	1.06	98.76	.8249 :	4	.133081	610.080	176	.0000
5*	.7709	.38	99.15	.6598 :	5	.235675	437.204	147	.0000
6*	.6851	.34	99.49	.6376 :	6	.397136	279.352	120	.0000
7*	.3285	.16	99.65	.4972 :	7	.527580	193.435	95	.0000
8*	.2894	.14	99.80	.4738 :	8	.680266	116.544	72	.0007
9*	.1638	.08	99.88	.3751 :	9	.791661	70.671	51	.0355
10*	.1303	.06	99.94	.3395 :	10	.894782	33.631	32	.3884
11*	.0751	.04	99.98	.2643 :	11	.962007	11.717	15	.7003
12*	.0395	.02	100.00	.1949 :					

* Marks the 12 canonical discriminant functions remaining in the analysis.

Maximum number of functions............. 12
Minimum cumulative percent of variance... 100.00
Maximum significance of Wilks' Lambda.... 1.0000

Prior probability for each group is .07692

Table J10: Canonical Discriminant Functions 11 Cluster Solution Individual Analysis Kitchener-Waterloo

Fcn	Eigenvalue	Percent of Variance	Cumulative Percent of Variance	Canonical Correlation	After Function	Wilks' Lambda	Chi-Squared	df	Significance
					0	.000010	3493.776	260	.0000
1*	174.7664	91.81	91.81	.9972 :	1	.001760	1924.937	225	.0000
2*	8.9276	4.69	96.50	.9483 :	2	.017472	1228.309	192	.0000
3*	2.5092	1.32	97.82	.8456 :	3	.061313	847.299	161	.0000
4*	2.1151	1.11	98.93	.8240 :	4	.190997	502.444	132	.0000
5*	.7677	.40	99.33	.6590 :	5	.337623	329.548	105	.0000
6*	.5632	.30	99.63	.6003 :	6	.527787	193.956	80	.0000
7*	.3177	.17	99.80	.4910 :	7	.695445	110.232	57	.0000
8*	.1641	.09	99.88	.3754 :	8	.809550	64.122	36	.0027
9*	.1320	.07	99.95	.3415 :	9	.916400	26.496	17	.0659
10*	.0912	.05	100.00	.2891 :					

* Marks the 10 canonical discriminant functions remaining in the analysis.

Maximum number of functions............. 10
Minimum cumulative percent of variance... 100.00
Maximum significance of Wilks' Lambda.... 1.0000

Prior probability for each group is .09091

Table J11: Canonical Discriminant Functions 9 Cluster Solution Individual Analysis Kitchener-Waterloo

Fcn	Eigenvalue	Percent of Variance	Cumulative Percent of Variance	Canonical Correlation	After Function	Wilks' Lambda	Chi-Squared	df	Significance
					0	.000022	3263.772	208	.0000
1*	174.1154	92.57	92.57	.9971 :	1	.003876	1690.894	175	.0000
2*	8.2777	4.40	96.97	.9446 :	2	.035958	1012.584	144	.0000
3*	2.4608	1.31	98.28	.8432 :	3	.124443	634.549	115	.0000
4*	2.0872	1.11	99.39	.8222 :	4	.384182	291.296	88	.0000
5*	.6525	.35	99.74	.6284 :	5	.634877	138.342	63	.0000
6*	.2297	.12	99.86	.4322 :	6	.780736	75.369	40	.0006
7*	.1632	.09	99.95	.3746 :	7	.908140	29.341	19	.0608
8*	.1012	.05	100.00	.3031 :					

* Marks the 8 canonical discriminant functions remaining in the analysis.

Maximum number of functions............. 8
Minimum cumulative percent of variance... 100.00
Maximum significance of Wilks' Lambda.... 1.0000

Prior probability for each group is .11111

Table J12: Canonical Discriminant Functions 7 Cluster Solution Individual Analysis Kitchener-Waterloo

Fcn	Eigenvalue	Percent of Variance	Cumulative Percent of Variance	Canonical Correlation	After Function	Wilks' Lambda	Chi-Squared	df	Significance
					0	.000051	3017.538	156	.0000
1*	173.4961	93.68	93.68	.9971 :	1	.008956	1440.577	125	.0000
2*	7.1873	3.88	97.56	.9369 :	2	.073323	798.236	96	.0000
3*	2.2585	1.22	98.78	.8325 :	3	.238923	437.358	69	.0000
4*	1.8232	.98	99.76	.8036 :	4	.674533	120.286	44	.0000
5*	.2867	.15	99.92	.4720 :	5	.867928	43.273	21	.0029
6*	.1522	.08	100.00	.3634 :					

* Marks the 6 canonical discriminant functions remaining in the analysis.

Maximum number of functions............. 6
Minimum cumulative percent of variance... 100.00
Maximum significance of Wilks' Lambda.... 1.0000

Prior probability for each group is .14286

Table J13: Canonical Discriminant Functions 5 Cluster Solution Individual Analysis Kitchener-Waterloo

Fcn	Eigenvalue	Percent of Variance	Cumulative Percent of Variance	Canonical Correlation	After Function	Wilks' Lambda	Chi-Squared	df	Significance
					0	.001865	1926.240	104	.0000
1*	36.1465	84.25	84.25	.9864 :	1	.069269	818.282	75	.0000
2*	5.8464	13.63	97.87	.9241 :	2	.474242	228.660	48	.0000
3*	.5688	1.33	99.20	.6021 :	3	.743998	90.637	23	.0000
4*	.3441	.80	100.00	.5060 :					

* Marks the 3 canonical discriminant functions remaining in the analysis.

Maximum number of functions............. 4
Minimum cumulative percent of variance... 100.00
Maximum significance of Wilks' Lambda.... 1.0000

Prior probability for each group is .20000

Table J14: Canonical Discriminant Functions 3 Cluster Solution Individual Analysis Kitchener-Waterloo

Fcn	Eigenvalue	Percent of Variance	Cumulative Percent of Variance	Canonical Correlation	After Function	Wilks' Lambda	Chi-Squared	df	Significance
					0	.004819	1640.585	52	.0000
1*	31.0766	85.03	85.03	.9843 :	1	.154570	574.136	25	.0000
2*	5.4696	14.97	100.00	.9195 :					

* Marks the 2 canonical discriminant functions remaining in the analysis.

Maximum number of functions............. 2
Minimum cumulative percent of variance... 100.00
Maximum significance of Wilks' Lambda.... 1.0000

Prior probability for each group is .33333

Table J15: Canonical Discriminant Functions 15 Cluster Solution Individual Analysis, Halifax

Fcn	Eigenvalue	Percent of Variance	Cumulative Percent of Variance	Canonical Correlation	After Function	Wilks' Lambda	Chi-Squared	df	Significance
					0	.000000	2501.290	364	.0000
1*	67.7191	63.62	63.62	.9927 :	1	.000004	1864.671	325	.0000
2*	11.7880	11.07	74.69	.9601 :	2	.000053	1481.121	288	.0000
3*	9.7240	9.14	83.83	.9522 :	3	.000571	1124.061	253	.0000
4*	7.8113	7.34	91.16	.9415 :	4	.005028	796.569	220	.0000
5*	4.3101	4.05	95.21	.9009 :	5	.026697	545.293	189	.0000
6*	1.5235	1.43	96.64	.7770 :	6	.067370	405.983	160	.0000
7*	1.2155	1.14	97.79	.7407 :	7	.149255	286.266	133	.0000
8*	.8285	.78	98.56	.6731 :	8	.272917	195.437	108	.0000
9*	.5653	.53	99.10	.6010 :	9	.427197	128.002	85	.0018
10*	.4098	.38	99.48	.5391 :	10	.602260	76.313	64	.1393
11*	.2417	.23	99.71	.4412 :	11	.747840	43.730	45	.5258
12*	.1986	.19	99.89	.4070 :	12	.896328	16.472	28	.9583
13*	.0729	.07	99.96	.2607 :	13	.961685	5.880	13	.9504
14*	.0398	.04	100.00	.1957 :					

* Marks the 14 canonical discriminant functions remaining in the analysis.

Maximum number of functions.............. 14
Minimum cumulative percent of variance... 100.00
Maximum significance of Wilks' Lambda.... 1.0000

Prior probability for each group is .06667

Table J16: Canonical Discriminant Functions 13 Cluster Solution Individual Analysis, Halifax

Fcn	Eigenvalue	Percent of Variance	Cumulative Percent of Variance	Canonical Correlation	After Function	Wilks' Lambda	Chi-Squared	df	Significance
					0	.000001	2173.304	312	.0000
1*	50.0301	62.66	62.66	.9902 :	1	.000030	1577.544	275	.0000
2*	11.1119	13.92	76.58	.9578 :	2	.000364	1199.674	240	.0000
3*	7.2070	9.03	85.61	.9371 :	3	.002986	880.769	207	.0000
4*	4.3894	5.50	91.11	.9025 :	4	.016095	625.578	176	.0000
5*	3.4577	4.33	95.44	.8807 :	5	.071748	399.142	147	.0000
6*	1.2705	1.59	97.03	.7480 :	6	.162903	274.912	120	.0000
7*	1.1423	1.43	98.46	.7302 :	7	.348983	159.489	95	.0000
8*	.5687	.71	99.17	.6021 :	8	.547464	91.273	72	.0623
9*	.2514	.31	99.49	.4482 :	9	.685100	57.296	51	.2531
10*	.2404	.30	99.79	.4402 :	10	.849805	24.656	32	.8197
11*	.0939	.12	99.91	.2930 :	11	.929627	11.055	15	.7487
12*	.0757	.09	100.00	.2653 :					

* Marks the 12 canonical discriminant functions remaining in the analysis.

Maximum number of functions............. 12
Minimum cumulative percent of variance... 100.00
Maximum significance of Wilks' Lambda.... 1.0000

Prior probability for each group is .07692

Table J17: Canonical Discriminant Functions 11 Cluster Solution Individual Analysis, Halifax

Fcn	Eigenvalue	Percent of Variance	Cumulative Percent of Variance	Canonical Correlation	After Function	Wilks' Lambda	Chi-Squared	df	Significance
					0	.000001	2061.530	260	.0000
1*	45.3314	62.61	62.61	.9891 :	1	.000062	1476.567	225	.0000
2*	10.4547	14.44	77.05	.9554 :	2	.000714	1104.712	192	.0000
3*	6.0798	8.40	85.45	.9267 :	3	.005058	806.231	161	.0000
4*	4.1569	5.74	91.19	.8978 :	4	.026084	556.079	132	.0000
5*	3.4160	4.72	95.91	.8795 :	5	.115189	329.580	105	.0000
6*	1.2653	1.75	97.65	.7474 :	6	.260936	204.881	80	.0000
7*	.8119	1.12	98.77	.6694 :	7	.472785	114.240	57	.0000
8*	.5367	.74	99.52	.5910 :	8	.726510	48.724	36	.0765
9*	.2427	.34	99.85	.4419 :	9	.902838	15.587	17	.5532
10*	.1076	.15	100.00	.3117 :					

* Marks the 10 canonical discriminant functions remaining in the analysis.

Maximum number of functions............. 10
Minimum cumulative percent of variance... 100.00
Maximum significance of Wilks' Lambda.... 1.0000

Prior probability for each group is .09091

Table J18: Canonical Discriminant Functions 9 Cluster Solution Individual Analysis, Halifax

Fcn	Eigenvalue	Percent of Variance	Cumulative Percent of Variance	Canonical Correlation	After Function	Wilks' Lambda	Chi-Squared	df	Significance
					0	.000011	1748.736	208	.0000
1*	44.8545	68.70	68.70	.9890 :	1	.000517	1161.526	175	.0000
2*	9.1318	13.99	82.69	.9494 :	2	.005241	806.070	144	.0000
3*	4.8397	7.41	90.10	.9104 :	3	.030605	535.191	115	.0000
4*	3.5632	5.46	95.56	.8837 :	4	.139657	302.174	88	.0000
5*	1.6725	2.56	98.12	.7911 :	5	.373235	151.282	63	.0000
6*	.7058	1.08	99.20	.6432 :	6	.636663	69.308	40	.0027
7*	.4080	.62	99.82	.5383 :	7	.896409	16.786	19	.6043
8*	.1156	.18	100.00	.3219 :					

* Marks the 8 canonical discriminant functions remaining in the analysis.

Maximum number of functions............. 8
Minimum cumulative percent of variance... 100.00
Maximum significance of Wilks' Lambda.... 1.0000

Prior probability for each group is .11111

Table J19: Canonical Discriminant Functions 7 Cluster Solution Individual Analysis, Halifax

Fcn	Eigenvalue	Percent of Variance	Cumulative Percent of Variance	Canonical Correlation	After Function	Wilks' Lambda	Chi-Squared	df	Significance
					0	.000038	1572.442	156	.0000
1*	44.7965	72.57	72.57	.9890 :	1	.001741	981.602	125	.0000
2*	8.3755	13.57	86.14	.9452 :	2	.016321	635.815	96	.0000
3*	3.9060	6.33	92.47	.8923 :	3	.080071	390.088	69	.0000
4*	3.0992	5.02	97.49	.8695 :	4	.328228	172.120	44	.0000
5*	1.1039	1.79	99.27	.7244 :	5	.690546	57.207	21	.0000
6*	.4481	.73	100.00	.5563 :					

* Marks the 6 canonical discriminant functions remaining in the analysis.

Maximum number of functions............. 6
Minimum cumulative percent of variance... 100.00
Maximum significance of Wilks' Lambda.... 1.0000

Prior probability for each group is .14286

Table J20: Canonical Discriminant Functions 5 Cluster Solution Individual Analysis, Halifax

Fcn	Eigenvalue	Percent of Variance	Cumulative Percent of Variance	Canonical Correlation	After Function	Wilks' Lambda	Chi-Squared	df	Significance
					0	.001192	1046.791	104	.0000
1*	11.9793	51.51	51.51	.9607 :	1	.015477	648.189	75	.0000
2*	7.5319	32.39	83.89	.9396 :	2	.132046	314.826	48	.0000
3*	2.6988	11.60	95.50	.8542 :	3	.488408	111.432	23	.0000
4*	1.0475	4.50	100.00	.7153 :					

* Marks the 3 canonical discriminant functions remaining in the analysis.

Maximum number of functions............. 4
Minimum cumulative percent of variance... 100.00
Maximum significance of Wilks' Lambda.... 1.0000

Prior probability for each group is .20000

Table J21: Canonical Discriminant Functions 3 Cluster Solution Individual Analysis, Halifax

Fcn	Eigenvalue	Percent of Variance	Cumulative Percent of Variance	Canonical Correlation	After Function	Wilks' Lambda	Chi-Squared	df	Significance
					0	.053759	457.487	52	.0000
1*	8.0530	88.42	88.42	.9432 :	1	.486681	112.703	25	.0000
2*	1.0547	11.58	100.00	.7165 :					

* Marks the 2 canonical discriminant functions remaining in the analysis.

Maximum number of functions............. 2
Minimum cumulative percent of variance... 100.00
Maximum significance of Wilks' Lambda.... 1.0000

Prior probability for each group is .33333

Table J22: Canonical Discriminant Functions 15 Cluster Solution Individual Analysis, Victoria

Fcn	Eigenvalue	Percent of Variance	Cumulative Percent of Variance	Canonical Correlation	After Function	Wilks' Lambda	Chi-Squared	df	Significance
					0	.000000	2322.048	364	.0000
1*	337.4110	89.15	89.15	.9985 :	1	.000005	1573.630	325	.0000
2*	16.3860	4.33	93.47	.9708 :	2	.000084	1206.677	288	.0000
3*	10.1739	2.69	96.16	.9542 :	3	.000933	896.532	253	.0000
4*	7.1860	1.90	98.06	.9369 :	4	.007639	626.371	220	.0000
5*	2.1718	.57	98.63	.8275 :	5	.024229	478.044	189	.0000
6*	1.5288	.40	99.04	.7775 :	6	.061271	358.830	160	.0000
7*	1.0917	.29	99.33	.7224 :	7	.128158	264.002	133	.0000
8*	.7311	.19	99.52	.6499 :	8	.221859	193.484	108	.0000
9*	.6910	.18	99.70	.6393 :	9	.375171	125.978	85	.0026
10*	.4887	.13	99.83	.5729 :	10	.558505	74.850	64	.1666
11*	.2545	.07	99.90	.4504 :	11	.700646	45.714	45	.4423
12*	.1940	.05	99.95	.4031 :	12	.836552	22.933	28	.7364
13*	.1039	.03	99.98	.3067 :	13	.923432	10.236	13	.6745
14*	.0829	.02	100.00	.2767 :					

* Marks the 14 canonical discriminant functions remaining in the analysis.

Maximum number of functions............. 14
Minimum cumulative percent of variance... 100.00
Maximum significance of Wilks' Lambda.... 1.0000

Prior probability for each group is .06667

Table J23: Canonical Discriminant Functions 13 Cluster Solution Individual Analysis, Victoria

Fcn	Eigenvalue	Percent of Variance	Cumulative Percent of Variance	Canonical Correlation	After Function	Wilks' Lambda	Chi-Squared	df	Significance
					0	.000000	2106.829	312	.0000
1*	303.2215	90.88	90.88	.9984 :	1	.000026	1366.380	275	.0000
2*	10.3117	3.09	93.97	.9548 :	2	.000296	1052.234	240	.0000
3*	8.4357	2.53	96.50	.9455 :	3	.002792	761.571	207	.0000
4*	5.8421	1.75	98.25	.9240 :	4	.019106	512.529	176	.0000
5*	2.1533	.65	98.89	.8264 :	5	.060246	363.806	147	.0000
6*	1.0112	.30	99.20	.7091 :	6	.121168	273.320	120	.0000
7*	.8981	.27	99.46	.6879 :	7	.229991	190.328	95	.0000
8*	.6877	.21	99.67	.6383 :	8	.388148	122.555	72	.0002
9*	.4757	.14	99.81	.5678 :	9	.572796	72.161	51	.0272
10*	.3334	.10	99.91	.5000 :	10	.763764	34.900	32	.3318
11*	.1968	.06	99.97	.4056 :	11	.914110	11.630	15	.7068
12*	.0940	.03	100.00	.2931 :					

* Marks the 12 canonical discriminant functions remaining in the analysis.

Maximum number of functions............. 12
Minimum cumulative percent of variance... 100.00
Maximum significance of Wilks' Lambda.... 1.0000

Prior probability for each group is .07692

Table J24: Canonical Discriminant Functions 11 Cluster Solution Individual Analysis, Victoria

Fcn	Eigenvalue	Percent of Variance	Cumulative Percent of Variance	Canonical Correlation	After Function	Wilks' Lambda	Chi-Squared	df	Significance
					0	.000000	1969.491	260	.0000
1*	297.5769	92.08	92.08	.9983 :	1	.000083	1225.768	225	.0000
2*	8.8376	2.73	94.81	.9478 :	2	.000820	927.417	192	.0000
3*	6.1353	1.90	96.71	.9273 :	3	.005848	670.977	161	.0000
4*	5.7896	1.79	98.50	.9234 :	4	.039708	421.019	132	.0000
5*	2.1352	.66	99.16	.8252 :	5	.124491	271.899	105	.0000
6*	.9816	.30	99.46	.7038 :	6	.246689	182.652	80	.0000
7*	.7624	.24	99.70	.6577 :	7	.434761	108.701	57	.0000
8*	.4317	.13	99.83	.5491 :	8	.622431	61.873	36	.0047
9*	.2939	.09	99.93	.4766 :	9	.805382	28.245	17	.0422
10*	.2416	.07	100.00	.4412 :					

* Marks the 10 canonical discriminant functions remaining in the analysis.

Maximum number of functions............. 10
Minimum cumulative percent of variance... 100.00
Maximum significance of Wilks' Lambda.... 1.0000

Prior probability for each group is .09091

Table J25: Canonical Discriminant Functions 9 Cluster Solution Individual Analysis, Victoria

Fcn	Eigenvalue	Percent of Variance	Cumulative Percent of Variance	Canonical Correlation	After Function	Wilks' Lambda	Chi-Squared	df	Significance
					0	.000002	1758.969	208	.0000
1*	259.1960	92.83	92.83	.9981 :	1	.000404	1027.641	175	.0000
2*	7.6933	2.76	95.58	.9407 :	2	.003510	743.265	144	.0000
3*	5.7188	2.05	97.63	.9226 :	3	.023581	492.771	115	.0000
4*	3.3279	1.19	98.82	.8769 :	4	.102058	300.111	88	.0000
5*	1.4833	.53	99.35	.7729 :	5	.253438	180.502	63	.0000
6*	.9217	.33	99.68	.6925 :	6	.487026	94.606	40	.0000
7*	.6067	.22	99.90	.6145 :	7	.782523	32.248	19	.0293
8*	.2779	.10	100.00	.4663					

* Marks the 8 canonical discriminant functions remaining in the analysis.

Maximum number of functions............. 8
Minimum cumulative percent of variance... 100.00
Maximum significance of Wilks' Lambda.... 1.0000

Prior probability for each group is .11111

Table J26: Canonical Discriminant Functions 7 Cluster Solution Individual Analysis, Victoria

Fcn	Eigenvalue	Percent of Variance	Cumulative Percent of Variance	Canonical Correlation	After Function	Wilks' Lambda	Chi-Squared	df	Significance
					0	.000006	1584.887	156	.0000
1*	250.9124	94.25	94.25	.9980 :	1	.001609	852.284	125	.0000
2*	5.5975	2.10	96.36	.9211 :	2	.010613	602.296	96	.0000
3*	4.7086	1.77	98.12	.9082 :	3	.060588	371.485	69	.0000
4*	2.7533	1.03	99.16	.8565 :	4	.227407	196.234	44	.0000
5*	1.4314	.54	99.70	.7673 :	5	.552912	78.514	21	.0000
6*	.8086	.30	100.00	.6686 :					

* Marks the 6 canonical discriminant functions remaining in the analysis.

Maximum number of functions............. 6
Minimum cumulative percent of variance... 100.00
Maximum significance of Wilks' Lambda.... 1.0000

Prior probability for each group is .14286

Table J27: Canonical Discriminant Functions 5 Cluster Solution Individual Analysis, Victoria

Fcn	Eigenvalue	Percent of Variance	Cumulative Percent of Variance	Canonical Correlation	After Function	Wilks' Lambda	Chi-Squared	df	Significance
					0	.000099	1230.569	104	.0000
1*	228.5643	96.30	96.30	.9978 :	1	.022787	504.839	75	.0000
2*	5.1543	2.17	98.47	.9152 :	2	.140239	262.248	48	.0000
3*	2.7027	1.14	99.61	.8544 :	3	.519260	87.489	23	.0000
4*	.9258	.39	100.00	.6934 :					

* Marks the 3 canonical discriminant functions remaining in the analysis.

Maximum number of functions............. 4
Minimum cumulative percent of variance... 100.00
Maximum significance of Wilks' Lambda.... 1.0000

Prior probability for each group is .20000

Table J28: Canonical Discriminant Functions 3 Cluster Solution Individual Analysis, Victoria

Fcn	Eigenvalue	Percent of Variance	Cumulative Percent of Variance	Canonical Correlation	After Function	Wilks' Lambda	Chi-Squared	df	Significance
					0	.101380	307.855	52	.0000
1*	2.8789	65.11	65.11	.8615 :	1	.393247	125.531	25	.0000
2*	1.5429	34.89	100.00	.7789 :					

* Marks the 2 canonical discriminant functions remaining in the analysis.

Maximum number of functions............. 2
Minimum cumulative percent of variance... 100.00
Maximum significance of Wilks' Lambda.... 1.0000

Prior probability for each group is .33333