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SOCIAL AND ECONOMIC DIMENSIONS OF AN AGING POPULATION

Geographic Dimensions of Aging: The Canadian Experience 1991-1996

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SEDAP Research Paper No. 23

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GEOGRAPHIC DIMENSIONS OF AGING:
THE CANADIAN EXPERIENCE 1991-1996

by

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June 2000

ABSTRACT

The major focus of this paper is on the geographic dimensions of population aging in Canada between 1991 and 1996 and the demographic processes which underlie them. The question we address is how the proportion of the population that is over 65 changes in the period from 1991 to 1996 and the way in which these changes relate to the demographic and socio-economic attributes of small areas. We develop an accounting framework which links changes in the elderly population to the two components of *aging-in-place* and *net migration* for both elderly and non-elderly populations in each area and demonstrate how the structure of these two components defines differing aging profiles in different parts of the country. Aging in the southern parts of Saskatchewan and Manitoba, together with much of the Atlantic provinces are dominated by net migration while aging-in-place dominates in much of the rest of the country. The geographical structure of aging in the early nineties is also compared with outcomes of an earlier analysis of aging in the latter half of the eighties.

The paper goes beyond the representation of components of population aging within an accounting framework. Communities with more active and growing local economies are particularly attractive to younger migrants while those communities with declining economic opportunities are likely to see younger populations depart at a faster rate than older individuals. Sustained over longer periods of time, these processes produce shifts in the age structure of local communities and would lead us to expect that both the structure and processes of population aging would be intimately linked to the economic geography of the national landscape. This paper shows that the geography of aging is strongly linked to the geography of economic disadvantage, indicating that those areas which have both high and growing proportions of elderly are most likely to be areas of slow growth with below average incomes.

GEOGRAPHIC DIMENSIONS OF AGING:

THE CANADIAN EXPERIENCE 1991-1996[1]

1. INTRODUCTION

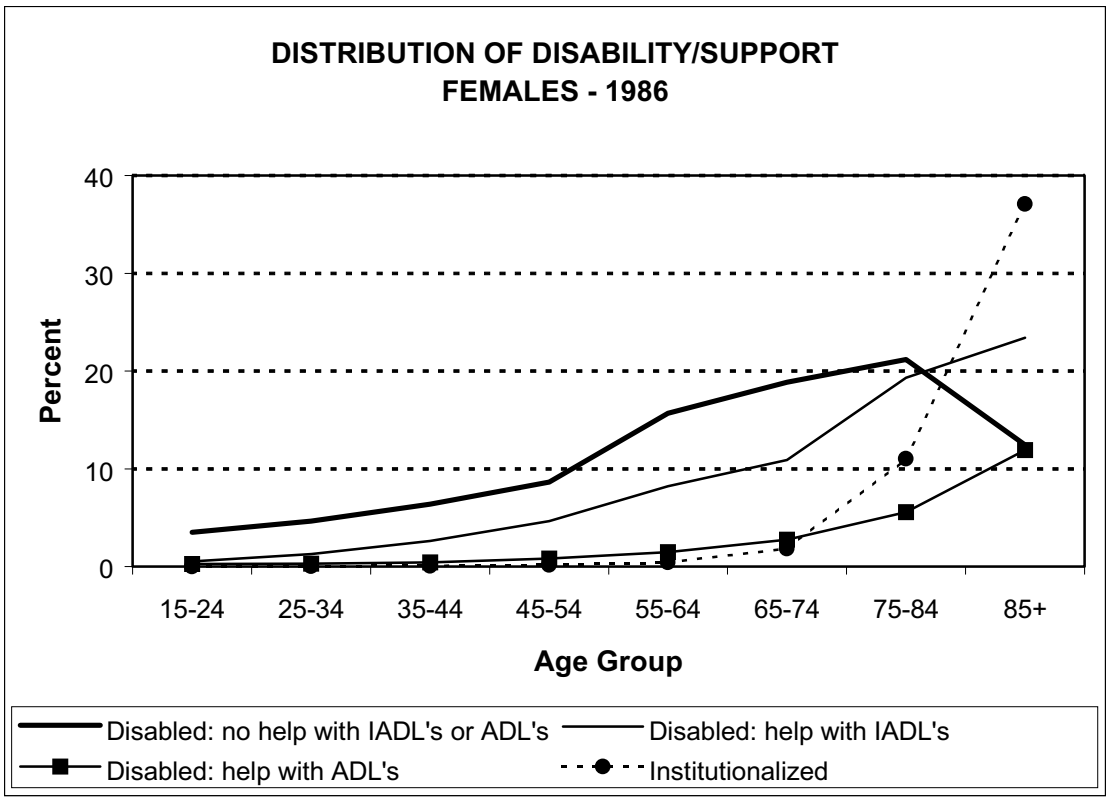
The impacts of an aging population play an increasing role in social and economic policy in many developed countries. As the overall rate of population growth declines, fertility has fallen to below replacement levels and life expectancy continues to improve. While the major focus in the policy literature has been on the macro-level effects of increasing proportions of elderly at the national level, particularly in regard to implications for health care, pensions and social security, attention is also being given to the geographical consequences of aging (Rogers, 1992, Moore, Rosenberg and McGuinness, 1997, Moore and McGuinness, 1999). The distribution of the elderly in both absolute and relative terms is far from even with the result that jurisdictions at all levels of government face different demands for local goods and services for the elderly in different places. In responding to this situation, it is important that we understand both the demographic and socio-economic processes which underlie the changing landscape of population aging.

Population aging refers specifically to the relative size and attributes of the elderly in the population as a whole. While trends in population aging clearly reflect temporal shifts in the experiences of elderly individuals, they are sensitive to changes in all segments of the population, young and old. Conventional wisdom has focussed on the age of 65 as the significant dividing line between 'young' and 'old', largely because of its traditional and institutionalized links to separation from the labour force and initiation of a range of social benefits. The proportion of the population over 65 is the most common measure of population aging (McDaniel, 1986, Rogerson, 1996) and is extensively used in this paper. However, there is no necessary transition in the life of an individual at that age and it is clear that the great majority of individuals over 65 consider themselves active, healthy and contributing to the larger

[1] This paper is an updated version of Moore and McGuinness (1999) and is based on research funded by Statistics Canada as part of the MCRI project entitled *Social and Economic Dimension of an Aging Population* (SEDAP).

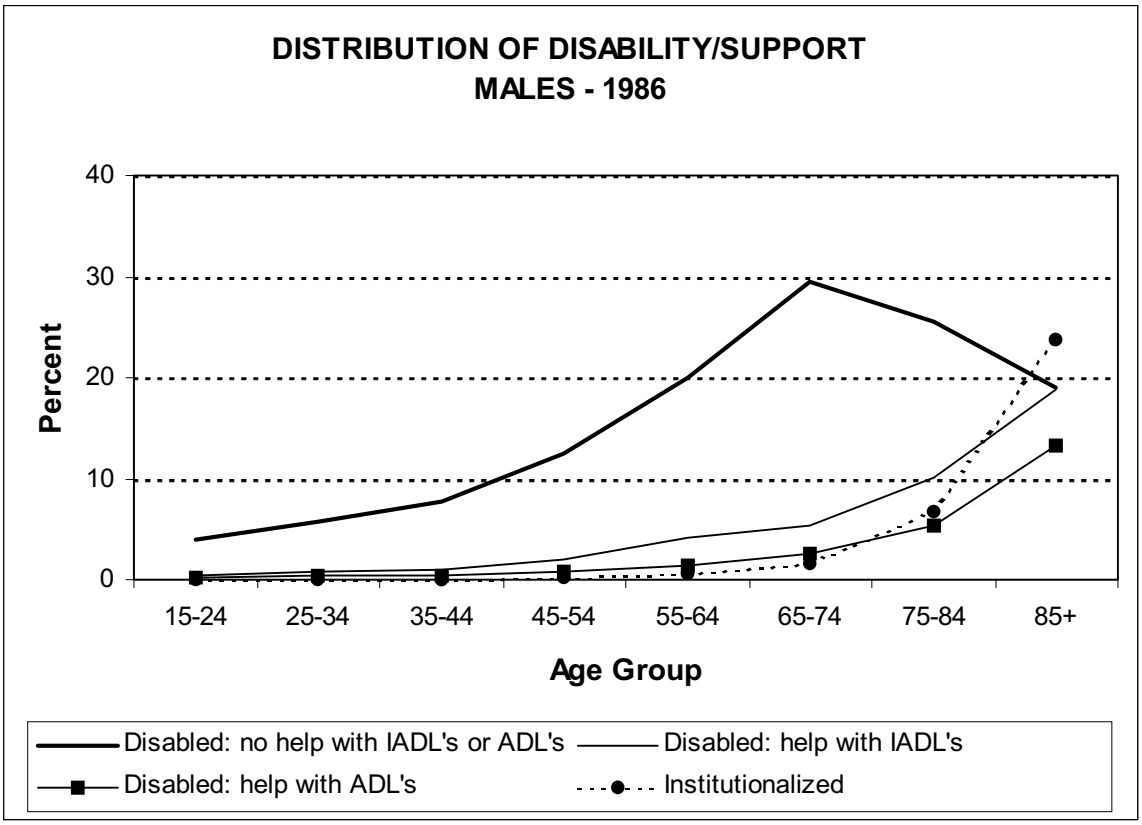
society (Stone and Fletcher, 1986). The most significant changes in the likelihood of experiencing major health problems, loss of independence and institutionalization tend to occur much later and increase sharply over the age of 80 (Figure 1). However, in this paper the analysis deals primarily with the population over 65[2].

FIGURE 1A



[2] Note that we refer to the population over 65 in the demographic sense that individuals have passed their 65th birthday.

FIGURE 1B



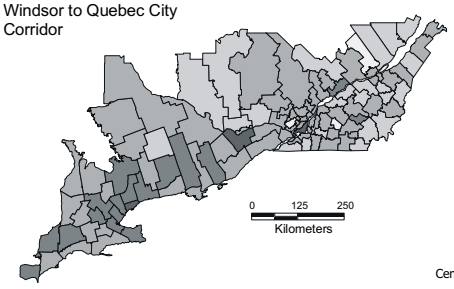
Source: Health and Activity Limitation Survey, 1986

The major focus of this paper is on the geographic dimensions of aging and the demographic processes which underlie them, with the empirical focus being on the Canadian experience in early 1990s. While the distribution of the elderly in absolute numbers as represented by the share of the total elderly population of Canada in each census division (Figure 2) reflects the overall urban concentration of the total population, the proportion of the population that is over 65 varies considerably between census divisions across the country (Figure 3). The question we address is how the proportion that is elderly changes in the period from 1991 to 1996 and the way in which these changes relate to the demographic and socio-economic attributes of small areas.

Figure 2.

Share of the Population Aged 65 and Over,[1] by Census Division, Canada, 1996

Windsor to Quebec City Corridor



Percent

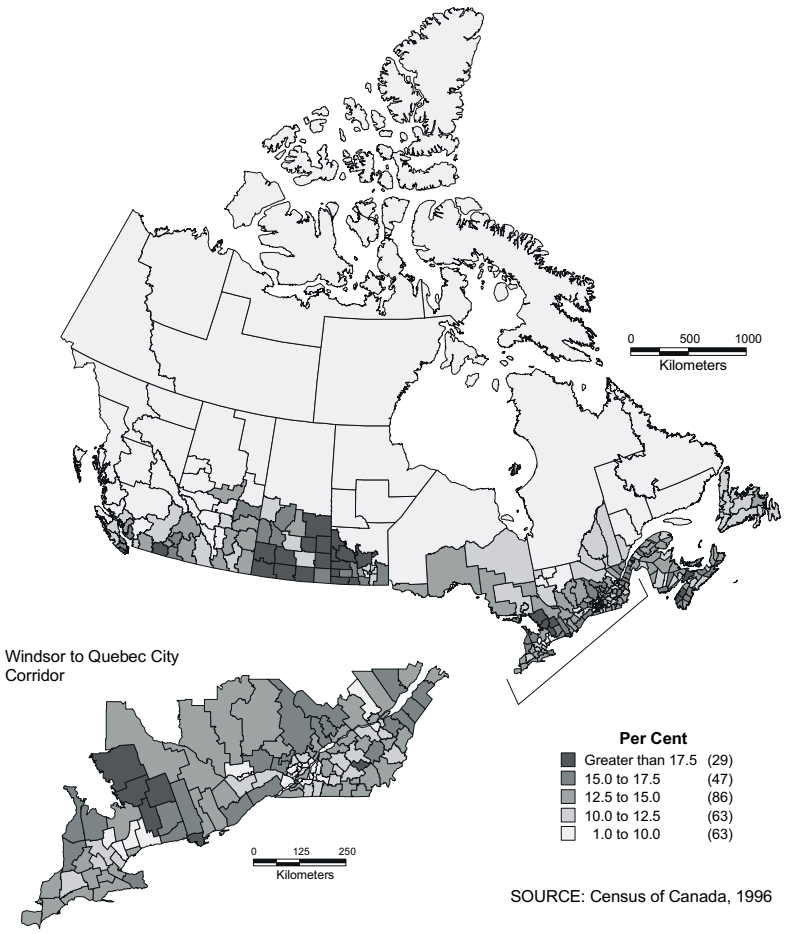
Greater than 2.0	(7)
0.50 to 2.00	(31)
0.10 to 0.50	(140)
0.05 to 0.10	(80)
0.00 to 0.05	(30)

SOURCE: Census of Canada, 1996

[1] Share of the Elderly = Census division population 65+ / Canadian population 65+ X 1000

Figure 3.

Percentage of Population Aged 65 and Older By Census Divsion, Canada, 1996



There are several ways in which the proportion of the population that is over 65 changes in any given geographical area. Given that we are concerned with the *proportion* of the population that is elderly, it is clear that this measure must be sensitive to changes which occur both to the segments of the population who are over 65 and those who are under 65. Forces which act on each of these population segments produce changes *within* the geographical area arising from local fertility, aging and mortality and changes which derive from external flows of inmigrants and outmigrants of different ages. Although there is some variation in terminology in the literature, there would appear a convergence on the concept of *aging-in-place* as referring to the processes of change which accrue from births, individual aging and deaths within a given area and *net migration* as the summation of changes arising from external flows.

Here we focus specifically on the relative roles of aging-in-place and net migration in population aging at different scales. The role of scale is significant since age-differentiated local flows which contribute to net migration effects for small areas become absorbed into the aging-in-place component at larger scales.

McCarthy (1983) examined the structure of migrant flows of both the young and the old in changing the concentration of the elderly population at the county level in the U.S. He identified three main processes by which migration contributes to the changing concentration of the elderly: *accumulation*, where the elderly are left behind by the outmigration of younger individuals: *recomposition*, where younger individuals leave and older ones arrives; and *congregation*, where older individuals arrive at a faster rate than younger ones. These processes, however, are overlain on the effects of aging-in-place, which, as Morrison (1992) argues, are becoming progressively more important in population aging. In this paper, we utilize the framework in Moore and McGuinness (1999) which expands on McCarthy's work by combining the structure of his migration scenarios with aging-in-place to produce a classification of aging scenarios.

The paper also seeks to go beyond the representation of components of population aging within an accounting framework. The characteristics of the origins and destinations of younger and older migrants have received much attention in the research literature. In particular, communities with more active and growing local economies are particularly attractive to younger migrants (Shaw, 1985) while those communities with declining economic opportunities are likely to see younger populations depart at a faster rate than older individuals. Sustained over longer periods of time, these processes produce shifts in the age structure of local communities and would lead us to expect that both the structure and processes of population aging would be intimately linked to the economic geography of the national landscape.

The next section develops a formal accounting of the processes of population aging. The components of aging were derived for Canada at the provincial and local (county) level for 1986-1991 in Moore and McGuinness (1999). In this paper, the corresponding elements for 1991-1996 are constructed and the changes from the previous period examined. The aging scenarios are constructed for the counties and the relations between structure and processes of aging at the county level and their socio-economic characteristics are assessed for both five-year periods.

2. POPULATION AGING: CONCEPTS AND MEASURES

The most thorough treatment of the accounting for changes in the proportion of the population over 65 is provided by Rogers and Woodward (1988), Rogers (1992) and, more recently, by Rogerson (1996). They focus explicitly on the relation between aging-in-place and migration in changing this proportion. We follow the general structure of their argument in the following. Population aging is defined as the change in the proportion of the population of an area who are over 65. The following notation is used.

$P_{65+}(0)$, $P_{65+}(1)$ are the number of people over 65 at time 0, 1 respectively.
$P_{<65}(0)$, $P_{<65}(1)$ are the number under 65.
$P_{tot}(0)$, $P_{tot}(1)$ is the total population.
$f_{65}(0)$, $f_{65}(1)$ are the proportions of the population over 65, where

$$f_{65}(0) = P_{65+}(0) / P_{tot}(0) \qquad [1]$$

2.1 Measures of Population Aging

The basic measure of change is defined by the ratio of the proportion of the population over 65 at two different times;

$$C_{65} = f_{65}(1) / f_{65}(0) \qquad [2]$$

We can also focus on the change in the elderly population itself and define a growth rate

$$g_{65} = P_{65+}(1) / P_{65+}(0) - 1 \qquad [3]$$

If the time interval from 0-1 is the normal inter-censal period of five years (in Canada), then

$$g^*_{65} = (P_{65+}(1) / P_{65+}(0))^{1/5} - 1 \qquad [4]$$

g^*_{65} is the annualized growth rate of the population over 65. Similar measures can be defined for the total population P_{tot} and the population under 65, $P_{<65}$.

2.2 Components of Population Aging

Any area population changes as a function of births and deaths, in-migration and out-migration. Thus,

$$P_{tot}(1) = P_{tot}(0) + B - D + I - O \qquad [5]$$

where B = births in the interval 0, 1[3];
D = deaths;
I = in-migrants to the areas in the interval 0, 1; and
O = out-migrants from the area in the interval 0, 1.

If a general concept of 'births' to an age-group refers to arrivals from the immediately younger age-group and 'deaths' as those passing to the next older age-group, equation (5) can be used to define changes in those younger and older than 65.

Thus,

$$P_{65+}(1) = P_{65+}(0) + B_{65} - D_{65} + I_{65} - O_{65} \qquad [6]$$

where B_{65} is the number of individuals who become 65 during the interval 0, 1.

$$P_{<65}(1) = P_{<65}(0) + B_{<65} - D_{<65} + I_{<65} - O_{<65} \qquad [7]$$

where $D_{<65}$ is the number who die plus the number who become 65 during the interval 0, 1.

In equation (6), we can define the value $(B_{65} - D_{65})$ as **aging-in-place** of the population over 65 (A_{65}) and $(I_{65} - O_{65})$ as **net-migration** of the population over 65 (N_{65}).

Thus,

$$P_{65+}(1) = P_{65+}(0) + A_{65} + N_{65} \qquad [8]$$

$$= P_{65+}(0)\ (1 + a_{65} + n_{65}) \qquad [9]$$

[3] A complete accounting would also consider births and deaths to in-migrants and out-migrants (Rogers, 1995), but only small errors are introduced by ignoring such multiple events.

where a_{65}, n_{65} are the proportionate changes in the population over 65 due to aging-in-place and net migration respectively.

Similarly,

$$P_{<65}(1) = P_{<65}(0)\ (1 + a_{<65} + n_{<65}) \qquad [10]$$

Integrating the above information, it can be shown that:

$$C_{65} = \frac{1 + a_{65} + n_{65}}{f_{65}(0)(1 + a_{65} + n_{65}) + (1 - f_{65}(0))(1 + a_{<65} + n_{<65})} \qquad [11]$$

It follows directly that C_{65} increases if $(a_{65} + n_{65}) > (a_{<65} + n_{<65})$. However, since $a_{65} > a_{<65}$ in the majority of communities and a_{65} is greater than n_{65} virtually everywhere, it follows that the overall net migration defined by n_{65} and $n_{<65}$ serves to reinforce or ameliorate the dominant aging-in-place effects. And, in general, C_{65} increases as a_{65} and n_{65} increase and decreases as $a_{<65}$ and $n_{<65}$ increase.

2.3 Decomposing C_{65}

It is useful to decompose the ratio of the proportions over 65 at times 0 and 1 into the components of change attributable to aging-in-place and to net migration.

Thus,

$$C_{65} = 1 + \alpha + \eta \qquad [12]$$

where α is the proportionate change due to aging-in-place; and
η is the proportionate change due to net migration.

if, $S_{65+}(1)$ is the population which survives in the area from 0 to 1 and is over 65 at 1; and
$S_{<65}(1)$ is the population which survives from 0 to 1 and is under 65 at 1. It includes those born to residents of the areas between 0 and 1

then

$$C_{65}(S) = \frac{\frac{S_{65}(1)}{S_{tot}(1)}}{\frac{P_{65}(0)}{P_{tot}(0)}} = 1 + \alpha \qquad [13]$$

then $\alpha = C_{65}(S) - 1$ [14]

and $\eta = C_{65} - C_{65}(S)$ [15]

3. POPULATION AGING IN CANADA

The national experience establishes a context within which geographical differences are played out. Social values with respect to fertility and reproduction, advances in medical knowledge influencing mortality and morbidity, and controls over immigration have a strong national component which sets the larger stage.

Canada's population has experienced one of the largest growth rates in the developed world since the end of the Second World War, fuelled by the most substantial of 'baby-booms' which lasted from the late 1940s to the early 1960s (Romaniuc, 1994). The total population in 1951 was 14.0 million and reached 28.8 million in 1996. The peak growth rate reached 2.8 percent a year during the height of the baby boom between 1951 and 1956 and declined steadily until the early-1980s when it fell to just under 1.0 percent a year. However, with a marked increase in immigration levels and the stemming of the free fall in fertility rates at the end of the 1980s, the growth rate for 1986-1991 increased again to 1.5 percent a year. In 1991-1996, with rates of immigration declining slightly and fertility relatively constant, the growth rate settled back to 1.1%.

As in all other developed countries experiencing declining fertility and mortality, the elderly population is growing at a considerably faster rate than the total population. In 1951 the population 65

years of age and over totaled 1.4 million and constituted 8.0 percent of the total population. Of the population 65 years of age and over, 149,000 were 80 years of age and over and comprised 1.1 percent of the population. By 1996, the population 65 years of age and over stood at 3.5 million or 12.2 percent of the total population and the population over 80 had grown more than fourfold to 788,000 or 2.7 percent of the population. The population over 65 had sustained a growth rate of over 3 percent a year for the entire forty-five years while for those over 80 it was close to 4 percent a year. Not only has the Canadian population been aging steadily but the internal composition of the conventionally defined group of elderly 'over 65' has itself changed and contains a progressively higher proportion of 'very old' individuals (i.e. over 80) with a range of important consequences for public policy.

At the national level, the proportion of the population over 65 has increased steadily for both women and men since 1951 (Figure 4). However, it has slowed recently and this feature is shown more dramatically in the series for C65 at the national level (Figure 5). The peak rate of growth of the proportion over 65 was in the latter half of the 1970s. The rate of increase was slower in the 1980s and dropped quite markedly in the first half of the 1990s. This drop reflects the larger demographic trend of changing fertility and those becoming 65 during the 1990s are from the smaller birth cohorts of the late twenties and the depression years of the thirties. The relative sizes of birth cohorts provide a major driving force behind population aging. Figure 6 shows the relative sizes of successive five year age groups at the time of the 1996 census and the date at which these relative sizes would impact on the rate at which people turn 65. It indicates the impact of the arrival of the baby boom cohorts after 2010 and the sharp decline in pressures on aging between 2020 and 2030. Immigration will have only a small effect on the timing of these demographic impacts on population aging.

FIGURE 4: PERCENT OF THE POPULATION OVER 65 - CANADA 1951-1996

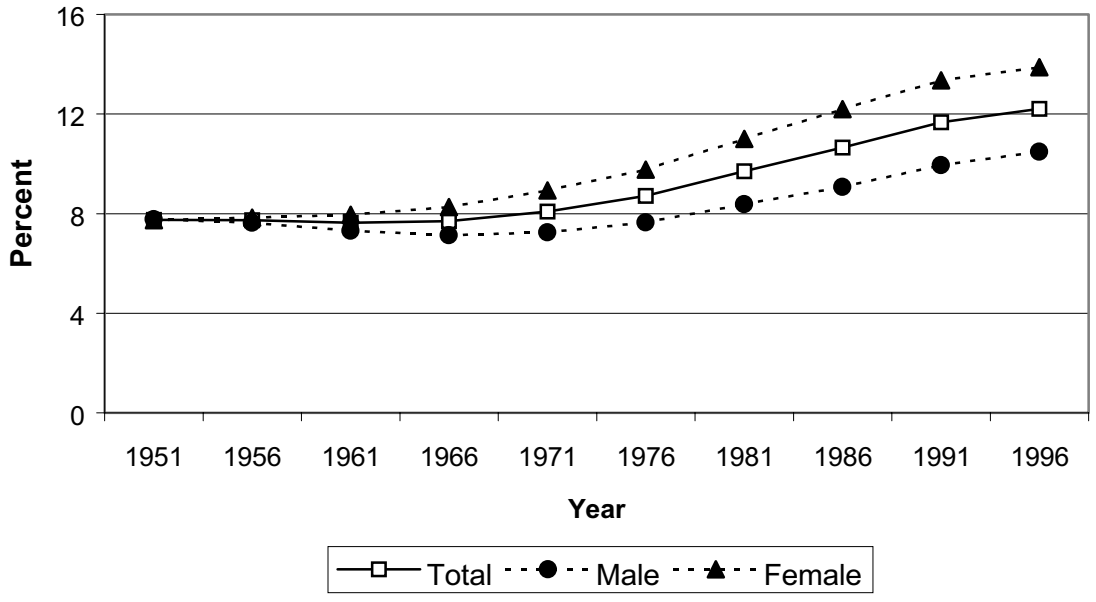


FIGURE 5: C65- CANADA 1951-1996

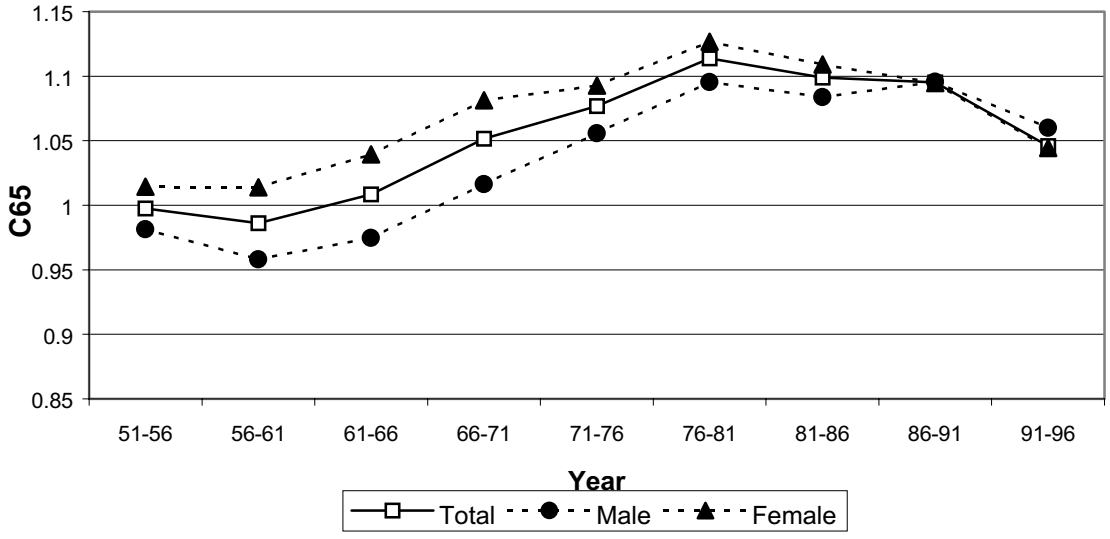


FIGURE 6: AGING IN PLACE 1996-2041 DERIVING FROM AGE STRUCTURE OF CANADIAN POPULATION IN 1996

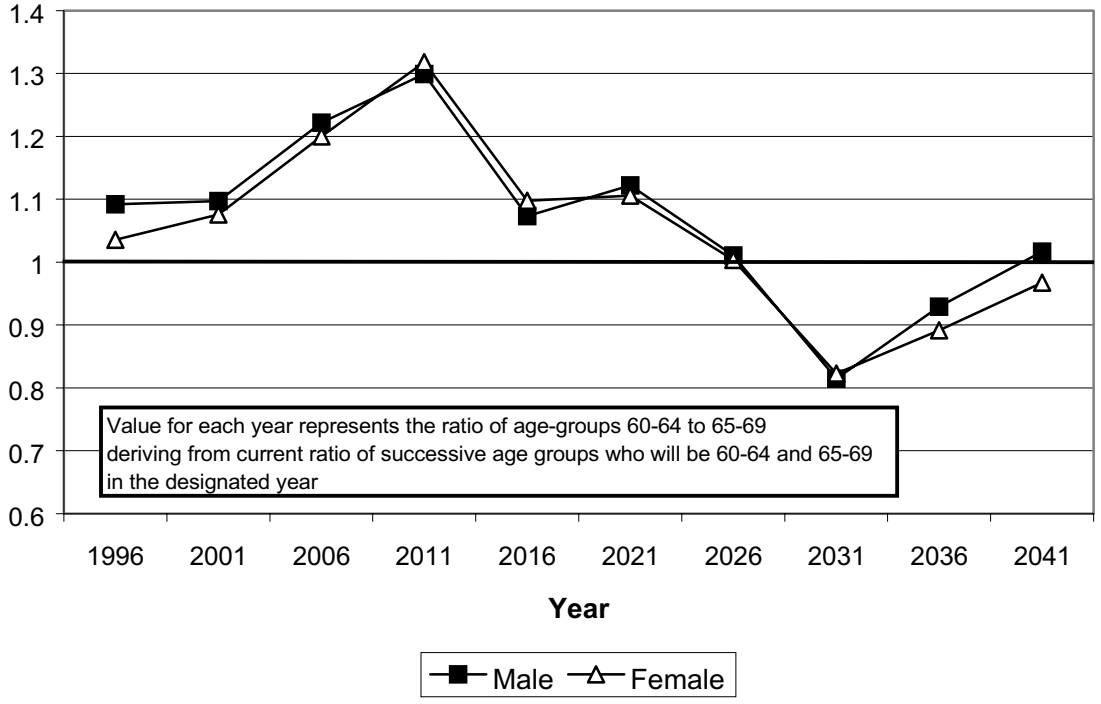


FIGURE 7: PERCENT OVER 65 BY PROVINCE - 1996

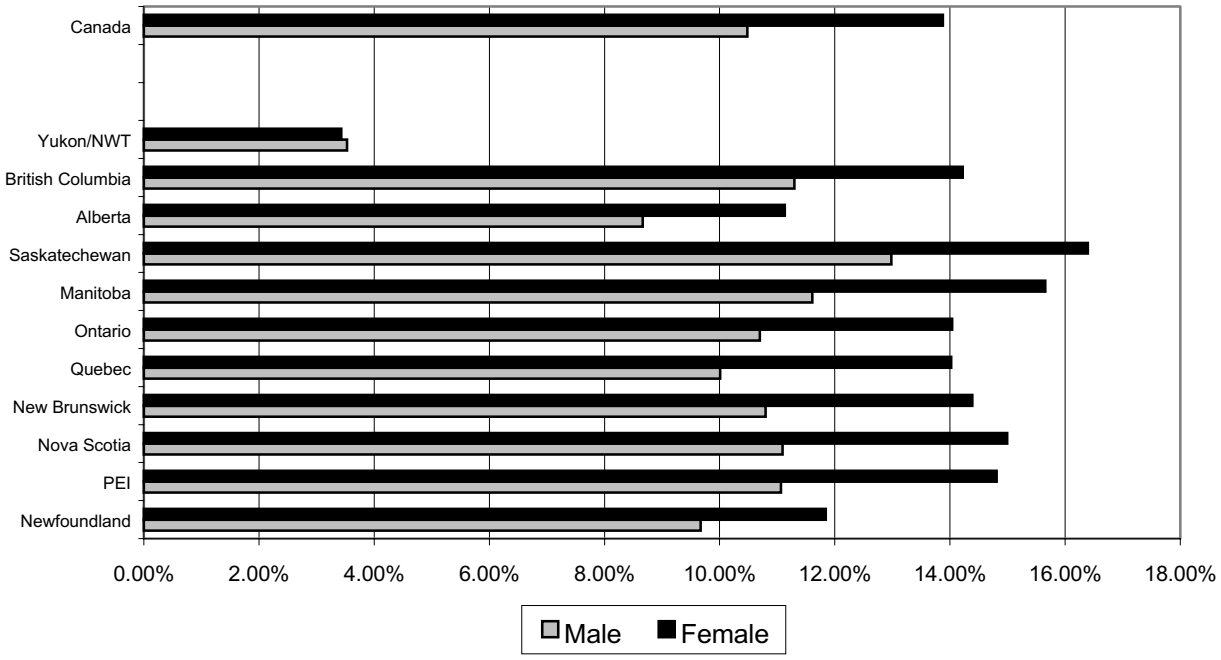


FIGURE 8: C65 BY PROVINCE 1991-1996

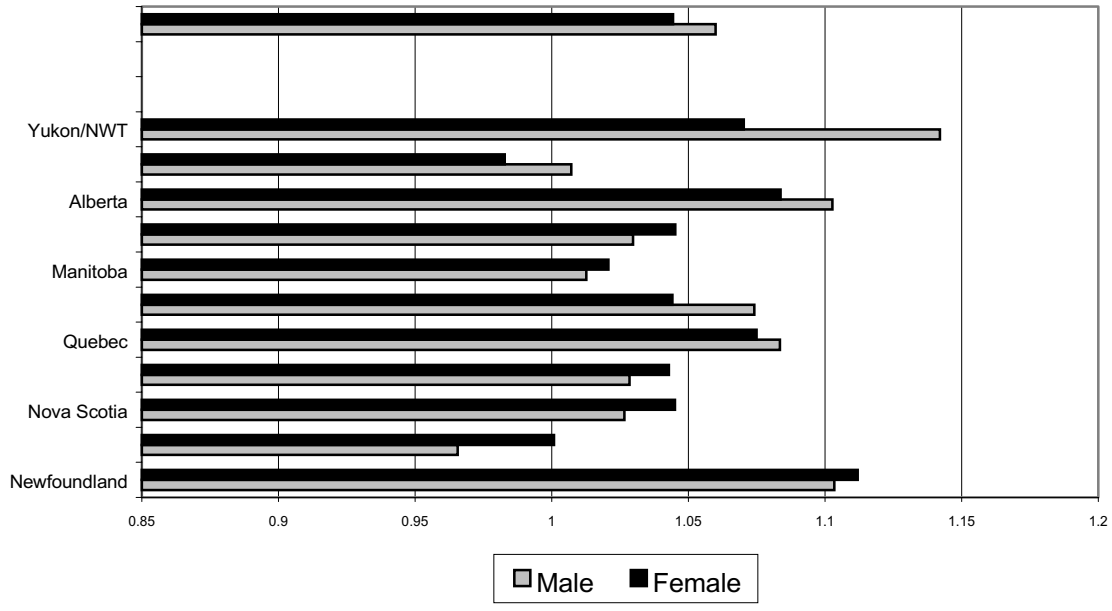


FIGURE 9: NET MIGRATION BY AGE BY PROVINCE
1991-1996

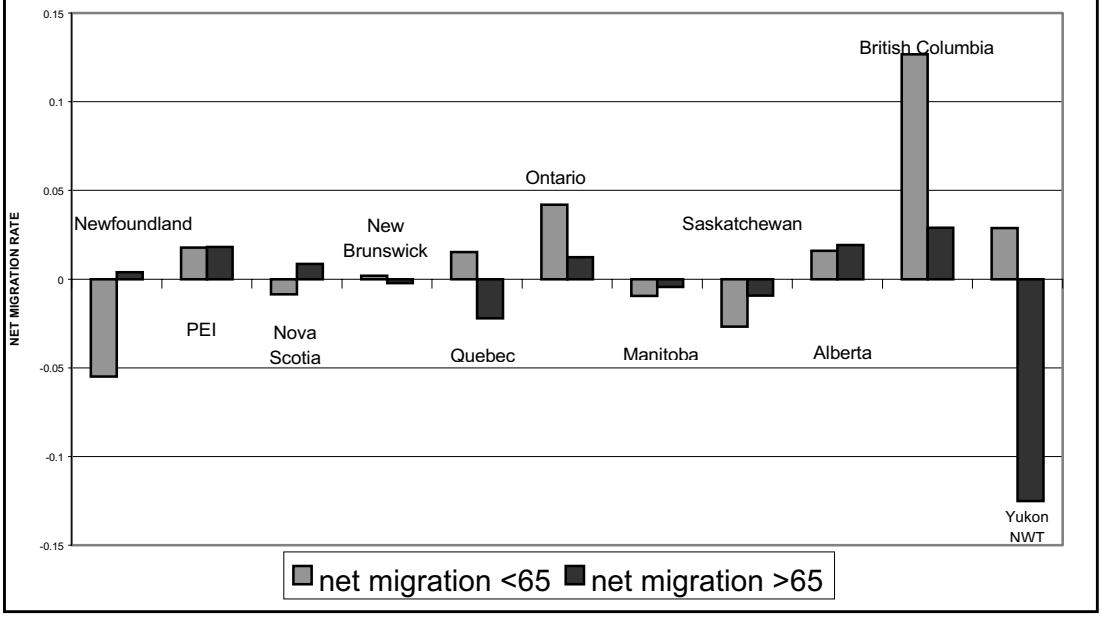
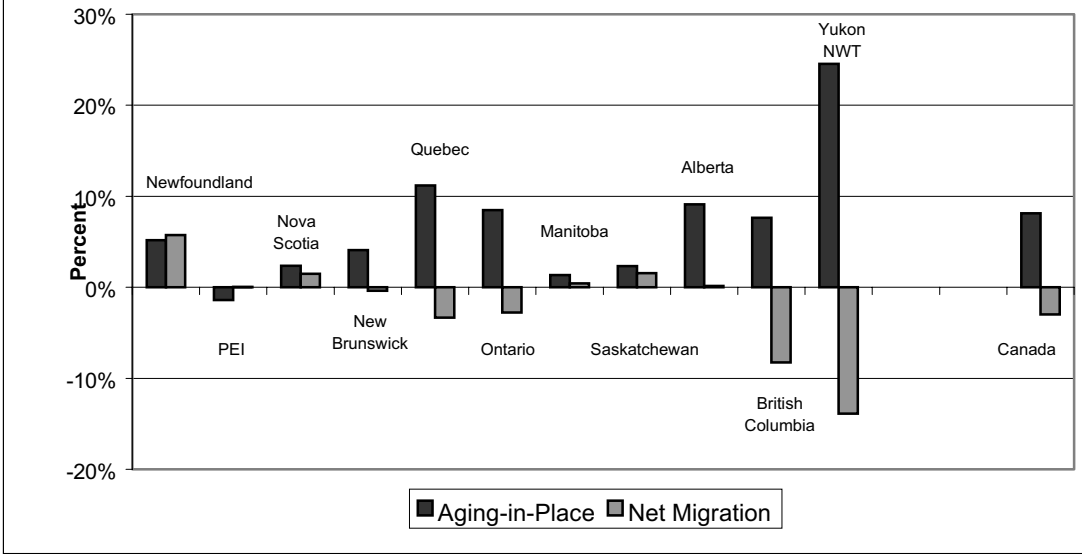


FIGURE 10: COMPONENTS OF AGING BY PROVINCE
1991-1996



3.1 The Role of Immigration

At the national level, there are three main contributors to population aging: fertility and mortality which define the internal aging of the population and immigration which adds an incremental new population in each time period. As Mitra (1992) has shown, immigration has little effect on aging in the long run as immigrants themselves age and their mortality and fertility experience converges on that of the host population. However, in the short run, there is a tendency for immigration to slow the rate of aging as immigrants are significantly younger than the general population.

Among immigrants who arrived in Canada between 1991 and 1996, only 4.6% were over 65 compared with 12.2 % for the population as a whole. This immigrant flow produces a net effect on aging measured by η in Equation 12 as -0.030 or -3.0% which offsets to a degree the effect of aging-in-place of 8.1% (α =.081). These are similar to the figures for 1986-1991 (α = .109, η = -0.013), although the relative impact of immigration has increased as the overall rate of aging has slowed.

4. THE GEOGRAPHY OF AGING

The national picture embraces a great deal of geographical diversity in both the distribution and rates of growth of the elderly population. The underpinnings of the differences lie primarily in the regional disparities in both economic opportunity and access to amenity which generate migration flows which are strongly age-selective (Shaw, 1985, Rogers, 1992). The foundations of migration decision-making in human capital investment imply much higher propensities to migrate among the young and, therefore, in general, significant out-migration for the population as a whole will be associated with increases in the rate of aging while substantial in-migration has the opposite effect. There is a secondary effect, which receives little attention, and that is the impact of migration decisions on fertility; often the decision by females to leave rural or small town environments to pursue tertiary education or to join the labour force elsewhere is also a decision to forego earlier marriage and childbearing (Moore, 1993). Spatially, this results in higher fertility in rural areas and a small effect in reducing the rate of aging,

although this effect is offset by the much larger migration effects associated with young people leaving rural areas.

4.1 Change in Population Aging at the Provincial and Local Level

For any set of subnational regions, such as provinces or census divisions, not only does the degree of population aging vary considerably between areas but the relative importance of different components of change also tends to shift. Because the likelihood of migrating declines strongly with distance for any origin population, it follows that, the smaller the region, the greater the potential role to be played by migration. Thus inter-provincial migration plays a role in changing provincial population distributions, while that role is magnified for the much smaller census divisions. For seniors, as for the population in general, the likelihood of moving from a rural census division to an adjacent urban census division is greater than for moving from one province to another.

Since population change is brought about by births, deaths and migration, variation in aging is attributable to long-run differences in fertility, mortality and migration rates. Change is cumulative so that, for any five-year intercensal period, the rate of population aging is dependent primarily on two demographic influences;

i) the demographic structure of the area at the beginning of the period which determines the magnitude of *aging-in-place*. Aging-in-place is the increase in the proportion of the population over 65 which is attributable to births and age-specific deaths occurring to the population at the beginning of the period. In a given five-year period, the dominant predictors of the increase in the proportion over 65, are

   a) the ratio of the population aged 60-64 to that aged 65-69, which represents the potential for those about to be 'elderly' to increase that segment of the population; if the younger age group is significantly larger it will more than offset the accumulated number of deaths in the elderly population. Figure 6 indicates the general pattern of variation in this ratio for the next 40 years.
   b) the proportion of those over 65 who are over 80. This variable defines the shape of the elderly age pyramid; the smaller the ratio, the younger the elderly population and the greater the potential for rapid increase. There is a strong correlation between the proportion over 65

and the proportion of those over 65 who are over 80 (r=.657) with the oldest elderly populations being in the southern Prairies and the Atlantic provinces.

A simple regression for census division data for the period 1986-1991 shows that 73 percent of the variation in aging-in-place among the population over 65 (the variable a_{65}) is attributable to these two variables. A similar analysis for 1991-1996 shows this effect to be even larger with over 91 percent of the variation in aging-in-place being so explained.

ii) the impact of the demographic structure of migration into and out of the area during the five year period as defined by the relation between n_{65} and $n_{<65}$ above.

As is discussed further below in Section 4, the relationship between migration for those in the labour force years and for older Canadians is complex. Younger individuals are more strongly influenced by economic opportunity, with limited opportunity encouraging outmigration and flourishing local economies acting as attractors. Significant outmigration will increase population aging in the originating communities, while outmigration of older individuals has the opposite effect. The converse effects are associated with inmigration. The overall effect of migration will depend on the detailed balance of inmigration and outmigration for older and younger populations. In British Columbia, for example, although the province is noted for its attractiveness as a retirement destination, the attraction for younger Canadians is even stronger producing a net migration effect which actually slows the rate of aging in the province (Figure 10). In the southern Prairies, it is the dominant effect of outmigration from small communities that has been the driving force behind the high levels of aging there.

In the short run, these two factors are more important than local variations in fertility and mortality rates. In the longer run, however, sustained differences in regional fertility and mortality would produce differences in aging experience. Higher mortality rates or higher fertility rates would tend to slow the aging process. It is also worth noting that over longer periods of time it is necessary to take into account the fertility, mortality and subsequent migration experience of the migrants themselves (Rogers,1995) which have the potential to change the rate at which local populations age. However, in a five-year period, the marginal effect of these differences is small.

The cumulative nature of population aging means that the demographic characteristics of an area at the beginning of an inter-censal period reflect a complex history of prior fertility, mortality and migration experience and may not necessarily be explained by any recent set of events or by current community characteristics.

In large part, mortality and fertility effects are macro-scale influences that permeate every part of the country. However, there are also systematic demographic processes that have persisted for many decades which produce geographic variations in the distribution of the elderly. The history of migration within Canada as in other countries has seen young adults moving from areas with limited economic opportunity to places where job prospects are more enticing. In general, these have been moves from rural and small town Canada to bigger towns and cities and they have occurred at consistently higher rates than for older cohorts whose established social networks and higher job security are associated with significantly lower propensities to migrate (Northcott, 1988). A prime consequence of this process has been that many parts of rural Canada, particularly in the Prairies and the Atlantic provinces, have experienced significant aging as the older members of the community remain while the younger ones depart. In the most recent period (1991-96) we would still expect that those communities with the most buoyant local economies would continue to attract young in-migrants and experience slower rates of aging.

More recently, the increasing affluence of the elderly, many of whom have significant financial resources at retirement, has led to greater emphasis on high amenity areas, particularly those with moderate as opposed to harsh winters, as places to live (Serow, 1987, Northcott, 1988). Again, however, selective migration by one group leads to concentration of others who are less mobile; in this case the less affluent elderly will tend to become concentrated in more disadvantaged origin areas. Finally, within the elderly population, the phenomenon of return migration (Newbold, 1993) to gain advantages from proximity to family and to other services would suggest that net flows by the older elderly to less economically and climatically privileged areas would increase and lead to more rapid increases in the population over 80 in many of these areas.

4.2 Aging at the Provincial Level

In 1996, 12.2% of Canada's population were over 65 and 2.7% were over 80. The variation in the proportion of the population over 65 at the provincial level in 1996 is substantial (Figure 7). For both

males and females, the North West Territories and the Yukon have less than 4 percent of the population in this category. Alberta has just under 8.7 percent of its male population over 65, while Saskatchewan lies at the other end of the spectrum at 13.0 percent. The proportion of females over 65 is higher in every province with Alberta and Saskatchewan again anchoring the distribution, Alberta having 11.1 percent and Saskatchewan 16.4 percent of females over 65.

The differentials tend to reflect the long-run patterns of age-selective migration away from rural and primary resource areas in the Atlantic Provinces and the Prairies and towards the regions of economic growth in central Canada and the West. Alberta in particular benefited from the substantial in-migration of younger people in the 1970s and this is reflected in both low proportions of elderly and low rates of growth of this segment of the population in the 1970s. The trend in the 1980s and early 1990s, however, has been for a slow convergence in the interprovincial proportions. The highest rates of aging tend to be in those provinces with the lower proportions over 65 (Quebec, Newfoundland and Alberta) stressing the importance of the overall aging of larger pre-elderly cohorts (Figure 8). The simple correlation between %>65 in 1991 and C65 for 1991-96 is -0.75 for all provinces and -0.85 if the Yukon/NWT are excluded.

The role of interprovincial migration is somewhat more complex than that of immigration which has small but negative effects on the rate of aging in all provinces. The phenomenon of return migration to the place in which you grew up has received some attention in the literature (Newbold, 1993) and this is more likely to occur at higher ages, particularly in those provinces which have been the origin of strong out-migration streams among those in the labour force years. Superimposed on the return migration flows are the movements of the elderly to high amenity regions on retirement, with British Columbia, Ontario and Prince Edward Island being the primary recipients in this regard. The net result is that migration produces differential aging effects across the nation with the Atlantic Provinces and British Columbia being the prime recipients of relative gains in elderly populations from these moves. The only major example of consistently higher proportions of elderly among outmigrants than inmigrants is in Quebec that only serves to ameliorate what is already the highest rate of aging among the provinces.

If we calculate the net migration rates by age for the provinces between 1991 and 1996, we see that the patterns for the younger and older ages exhibit important commonalities and differences (Figure 9). They also exhibit remarkable consistency with the situation for the previous intercensal period, 1986-1991 (Moore et al, 1997). In most, the net effects are in the same direction, while they are in the opposite

direction for the Atlantic Provinces (apart from PEI), Quebec and the Yukon/NWT. As in the previous period, it is particularly important to note that higher in-migration among younger populations in British Columbia and Ontario reduces the rate of aging even if these regions are also attractive to older migrants. In Quebec, continued out-migration of older individuals coupled with net in-migration of younger people produces additional slowing in the rate of population aging.

We see that the combined patterns of the migration outcomes results in quite different *net* effects of migration (η) on aging (Figure 10). Although Ontario and British Columbia receive significant in-flows at all ages, the net effect of migration in both provinces is to produce significant reductions in the rate of aging. Quebec has a similar experience although net in-migration is different between old and young. A significant element in each case is the effect of immigration, which is focussed particularly on the three largest metropolitan areas of Toronto, Montreal and Vancouver and brings a significant increase in the population under 65 relative to those over 65.

4.3 Aging at the Intra-Provincial Level

When we consider the percentages of the population over 65 at the census division level, the variation is even more substantial than at the provincial level. As a percentage of the population in each census division, the elderly made up more than 12.2 percent of the population (the national average) in 59.7 percent of the census divisions across Canada in 1996 (Figure 3). What is striking is the contrast between a *young* northern Canada and an *old* southern Canada. To a large extent, this contrast reflects the differences in the proportion of Native peoples living in northern Canada compared to southern Canada and the differences in fertility and mortality patterns of Native peoples compared to the non-native population.[4] It also reflects the tendency of older individuals to move away from areas with harsh climates.

Within southern Canada, there is also considerable spatial variation in the elderly population. In Atlantic Canada, parts of Cape Breton, much of Nova Scotia and the census divisions surrounding the Bay of Fundy have relatively large elderly populations (greater than 14.0 percent). In Québec, it is mainly in the non-metropolitan census divisions along the St. Lawrence and Ottawa Rivers where relatively large

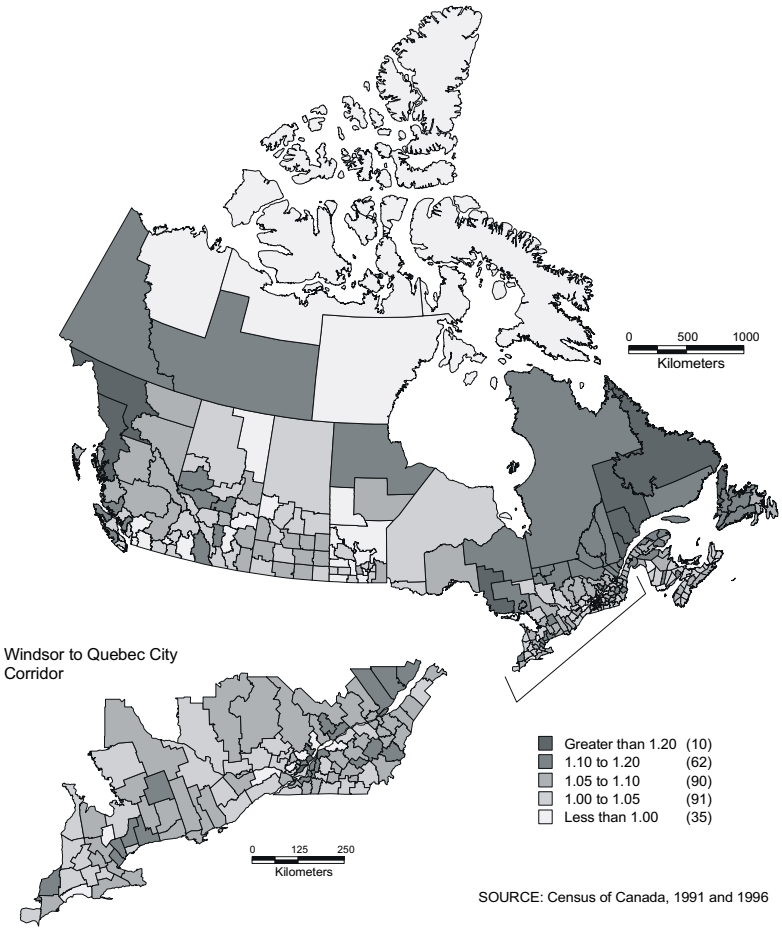
[4] Although Canada's Native peoples are now well into the demographic transition as Beaujot (1991) notes, in relative terms Native peoples living in remote settlements in northern Canada continue to have higher fertility and mortality rates than the non-native population of southern Canada.

elderly populations can be found. In Ontario, there are three distinct clusters of census divisions where the proportions of elderly are high: rural eastern Ontario; a wedge of census divisions stretching from Lake Ontario to the north shore of Georgian Bay; and the rural census divisions along Lake Huron and the southern shore of Georgian Bay. On the Prairies, there is a growing number of rural census divisions along the Manitoba-Saskatchewan and the United States border with these two provinces where the elderly population is over 18.0 percent of the population. In British Columbia, the census divisions of the southern part of Vancouver Island and the south-central interior, which have become well known as retirement destinations, appear among those census divisions with relatively large elderly populations.

When we examine values of C_{65}, they also exhibit considerable spatial variability. High values are concentrated in Newfoundland, Quebec, Northern Ontario, Saskatchewan, Alberta and the interior of British Columbia (Figure 11).

As we noted above, the values of C_{65} can be expressed as a function of the constituent rates of aging-in-place and net migration. The rates of increase in the populations under and over 65 due to aging in place ($a_{<65}$, a_{65}) have similar general distributions. Although the rates are consistently higher for the over 65 population, the rates tend to be relatively higher for both distributions in the northern parts of Québec, the Prairies and British Columbia, while moderately high values are found in Newfoundland. Strong areas of difference between the two rates arise in southern British Columbia where the younger population exhibits increases far below average; similar differences exist for central Ontario and the census divisions in the vicinity of Montréal, while a contrasting picture arises in Nova Scotia outside Halifax where the growth of the elderly population due to aging is relatively much higher than for the younger population.

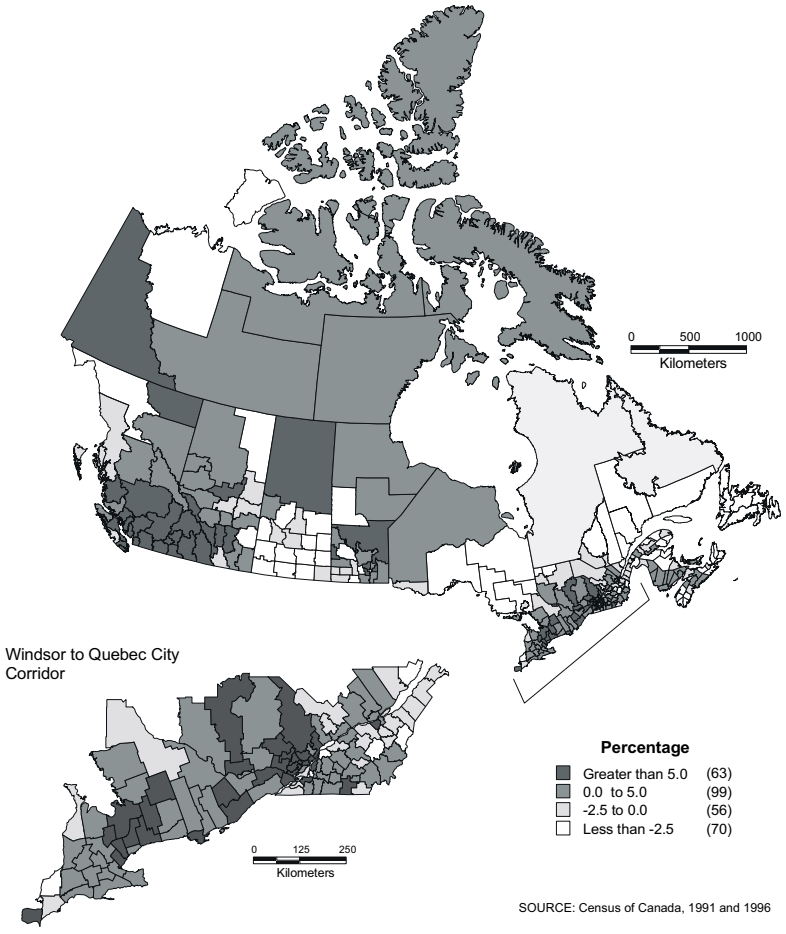
Figure 11.
Ratio of the Proportion of the Population Aged 65 and Over, By Census Division, Canada, 1991 and 1996 (C_{65})



Turning to the net migration rates $n_{<65}$ and n_{65} (Figures 12,13), the two spatial distributions also have some commonalities. The net migration for those under 65 is predominantly one of out-migration from most census divisions, with virtually the whole of the Prairies, Northern Québec and the Atlantic provinces outside the metropolitan areas experiencing net losses of those under 65. The metropolitan fringes and southern British Columbia experienced net gains during this period and, in general, $n_{<65}$ is strongly associated with higher income areas and positive economic growth.

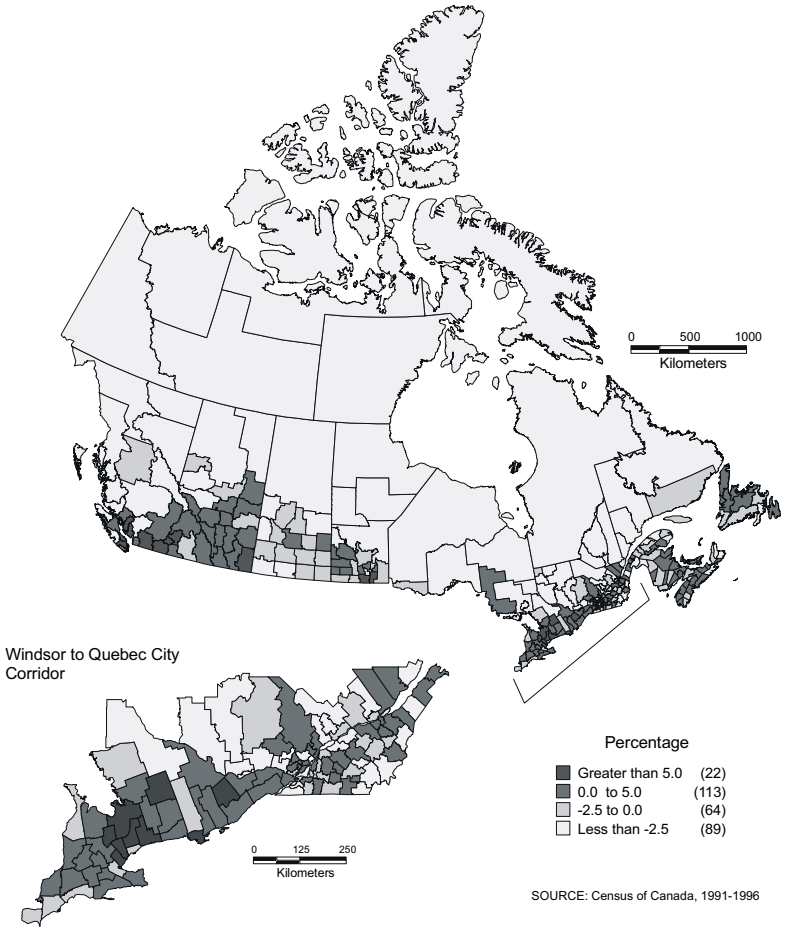
Figure 12.

Net Migration Rate for the Population Aged Less than 65 ($n_{<65}$), By Census Division Canada, 1991-1996



SOURCE: Census of Canada, 1991 and 1996

Figure 13.
Net Migration Rate for the Population Aged 65 and Over ($n_{>65}$), By Census Division Canada, 1991-1996



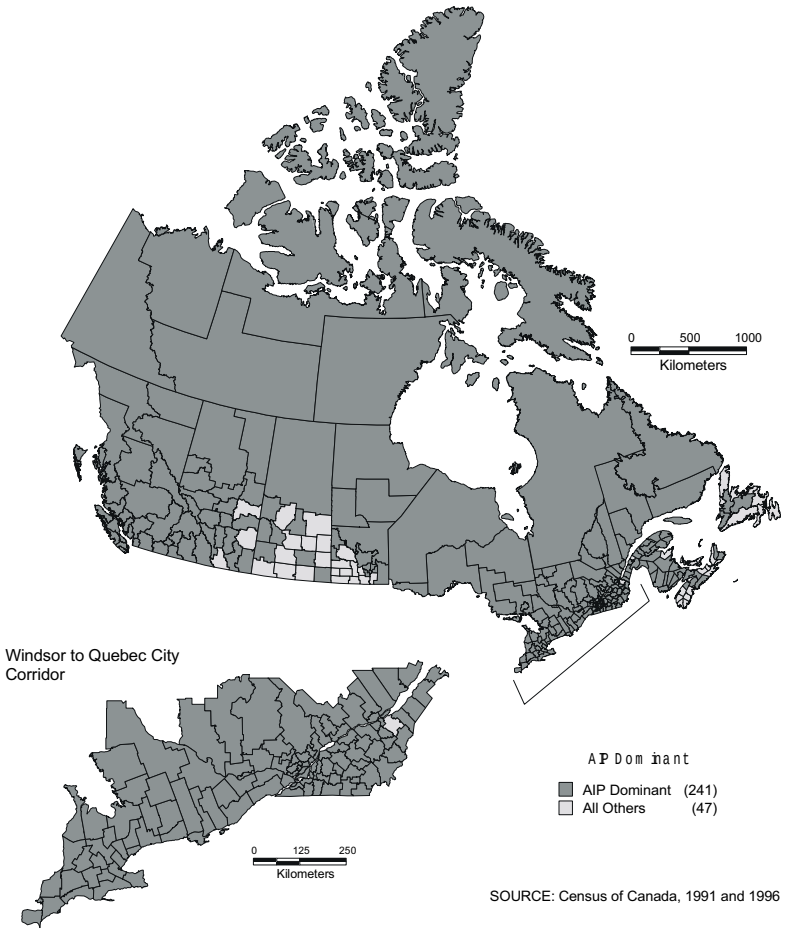
Net migration for the elderly, n_{65}, also tends to be negative for much of the Prairies and Northern Québec, although often the net losses are much less than for the younger population. The main increases are to be found in Central Ontario, the fringes of Montréal and in southern British Columbia.

When we combine these various rates we start to produce a better sense of the components of aging. We first calculate the relative contributions of aging-in-place (α) and net migration (η) to the increase in population aging between 1991 and 1996. For the country as a whole the value of α is .081 (or an 8.1% increase in the proportion over 65) and η is -.030 (a 3.0% decrease) that indicates both the

magnitude of aging in place and the small negative effect on aging produced by immigration. The values for individual census divisions, however, exhibit broad ranges, although in the majority of cases, the aging-in-place component dominates net migration (Figures 14). The aging-in-place component is particularly strong in urban areas (Figure 15).

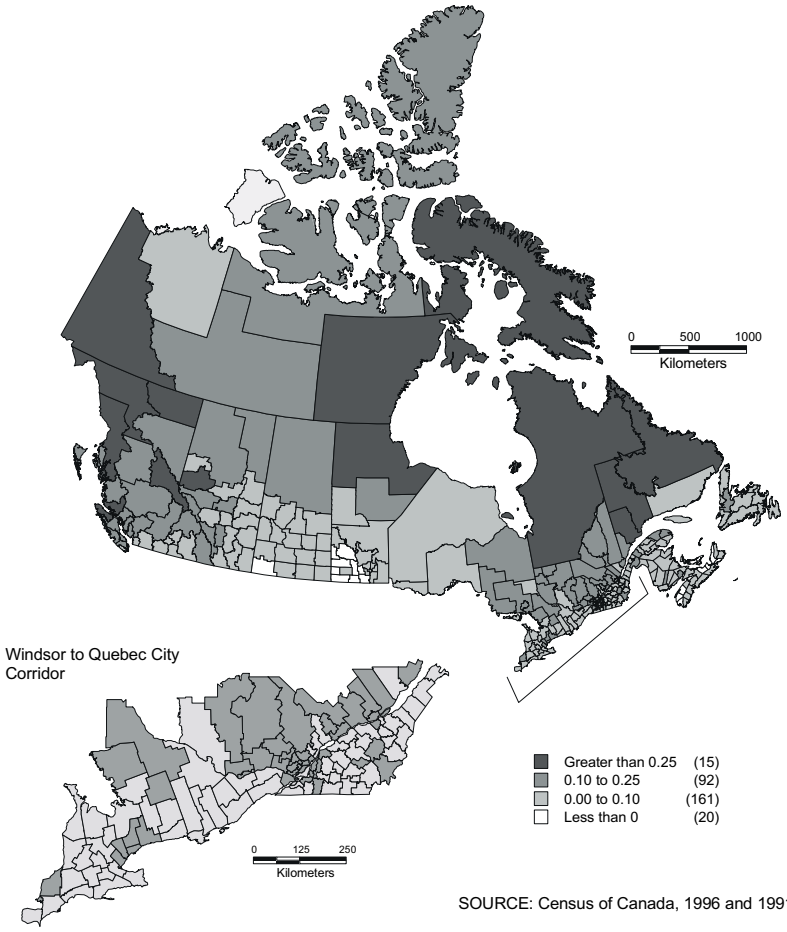
Figure 14.

Census Divisions Dominated by Aging-In-Place, Canada, 1991-1996



SOURCE: Census of Canada, 1991 and 1996

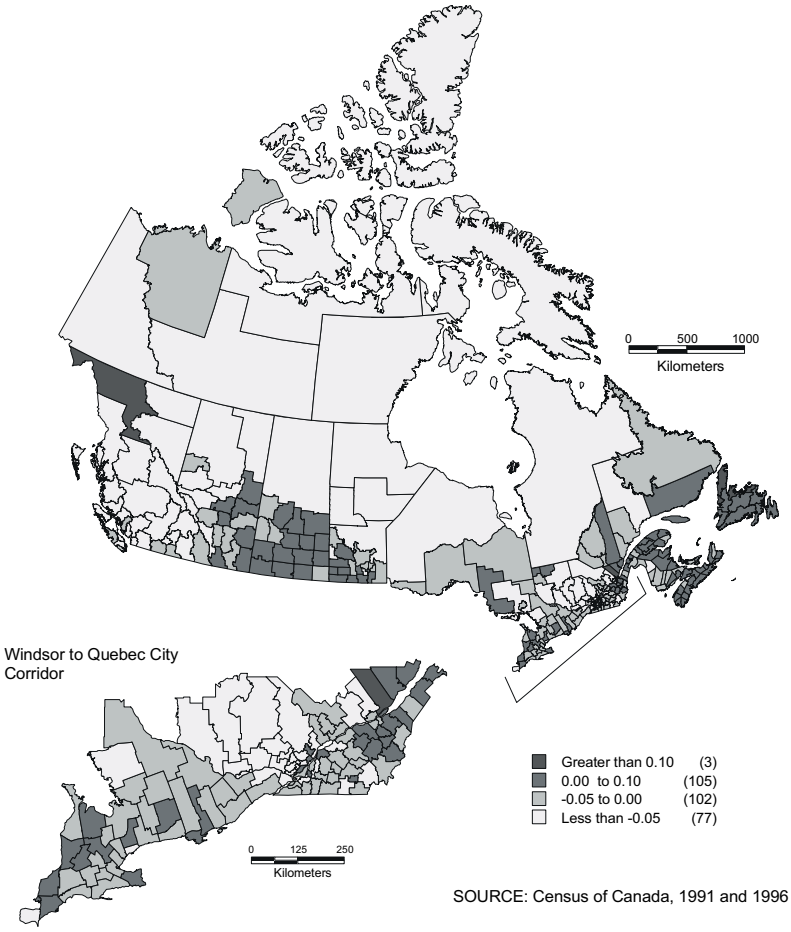
Figure 15.
Proportionate Change in the Population 65 and Over Due to Aging-In-Place By Census Division, Canada, 1991 and 1996



SOURCE: Census of Canada, 1996 and 1991

The net migration effects (η) are quite different (Figure 16). Although both $n_{<65}$ and n_{65+} have positive associations with areas with above average income growth, the net effects on aging have the opposite effect and are strongly associated with areas which are less buoyant. This is because the net in-migration of younger individuals to more prosperous areas consistently dominates the in-flow of older persons and thereby lowers the rates of population aging. At the same time the net effect of migration on aging is consistently higher in the four other regions relative to British Columbia and the Territories, indicating the importance of migration to the latter region of younger people in the labour force years during the latter part of the 1980s.

Figure 16.
Proportionate Change in the Population 65 and Over Due to Net Migration By Census Division, Canada, 1991 and 1996



5. A CLASSIFICATION OF AGING SCENARIOS

The roles of α and η interact in different ways across the country to produce aging effects, as do the components of η. We can use the joint distribution of these values to produce a classification of aging scenarios. This classification extends the work of McCarthy (1983) and Bekkering (1990); McCarthy focussed primarily on the role of migration, while Bekkering added an aging-in-place component as a single category. In this classification we distinguish between those areas in which aging-in-place is dominant although migration is still influential and areas in which migration is dominant in terms of effects on population aging.

Based on the values of α and η and the values of $n_{<65}$ and n_{65+}, the following nine classes are defined:

1. *Stable:* The total effect of aging-in-place and migration produces increases of less than 3.5% in the proportion of the population who are over 65 between 1986 and 1991 and neither individual effect is larger than 3.5%
2. *Deconcentration*: The combined effects of aging-in-place and migration produce a decline in population aging ($\alpha + \eta < 0$)

Aging-in-Place Dominant

3. *Aging-in-Place: Migration stable or reduces aging*: net effects of migration are either insignificant or they act to reduce the rate of population aging ($\alpha + \eta > 3.5$; $\eta <= 0$)
4. *Aging-in-Place: Migration produces Congregation*: Congregation occurs when both the elderly and non-elderly experience net in-migration but the in-migration rate for the elderly is ($\alpha + \eta > 3.5$; $\alpha > \eta$; $\eta > 0$; $n_{<65,}\ n_{65} > 0$[5], $n_{<65} < n_{65}$).
5. *Aging-in-Place: Migration produces Recomposition*: Recomposition occurs when the elderly are net in-migrants and the non-elderly are net out-migrants ($\alpha + \eta > 3.5$; $\alpha > \eta$; $\eta > 0$; $n_{<65,} < 0$, $n_{65+} > 0$, $n_{<65} < n_{65}$).
6. *Aging-in-Place: Migration produces Accumulation*: Accumulation arises when both elderly and non-elderly experience net out-migration but the out-migration rates are higher for the non-elderly ($\alpha + \eta > 3.5$; $\alpha > \eta$; $\eta > 0$; $n_{<65,} < 0$, $n_{65} < 0$, $n_{<65} < n_{65}$).

Migration Dominant

[5] The combined effects of net migration for the elderly and non-elderly is greater than 3.5%.

7. *Migration produces Congregation*: migration is more important than aging-in-place and the elderly are gaining at a faster rate than the non-elderly ($\alpha + \eta > 3.5$; $\eta > \alpha$; $\eta > 0$; $n_{<65,}\ n_{65} > 0$, $n_{<65} < n_{65}$)
8. *Migration produces Recomposition*: ($\alpha + \eta > 3.5$; $\eta > \alpha$; $\eta > 0$; $n_{<65,} < 0$, $n_{65} > 0$), $n_{<65} < n_{65}$).
9. *Migration produces Accumulation*: ($\alpha + \eta > 3.5$; $\eta > \alpha$; $\eta > 0$; $n_{<65,} < 0$, $n_{65} < 0$), $n_{<65} < n_{65}$).

The outcome of this classification shows that the aging scenarios are dominated by aging-in-place processes (Table 1, Figure 14). Almost half of census divisions are experiencing significant aging-in-place which is, in fact, ameliorated by migration, while 19.5% experience both aging-in-place and increased aging due to migration. In contrast to 1986-1991 when less than 10 percent of areas were either stable or experiencing a decline in aging, this proportion had increased to 21.9% in 1991-1996 as overall aging slowed. At the same time, migration-dominated aging declined from 20.1% of areas to 10.1%. Among the migration scenarios, recomposition is the most frequent with accumulation being significantly less important than in earlier periods (Bekkering, 1990). Congregation did not occur as a migration dominant type in 1991-1996 although it was found in areas where aging-in-place is dominant.

TABLE 1: DISTRIBUTION OF AGING SCENARIOS

				AGING IN PLACE DOMINATES			MIGRATION DOMINATES		
	Stable	Decline in Aging	Migration reduces Aging	Congregation	Recomposition	Accumulation	Congregation	Recomposition	Accumulation
Number of CDs by province - 1996									
Newfoundland	0	0	1	0	2	1	0	3	3
PEI	3	0	0	0	0	0	0	0	0
Nova Scotia	7	0	0	2	0	1	0	5	3
New Brunswick	6	0	4	2	1	1	0	1	0
Quebec	0	4	65	7	7	13	0	3	0
Ontario	5	2	31	8	2	1	0	0	0
Manitoba	12	4	5	0	0	1	0	1	0
Saskatechewan	6	0	2	0	0	2	0	2	6
Alberta	4	1	8	2	2	0	0	2	0
British Columbia	1	5	21	0	0	1	0	0	0
Yukon/NWT	0	3	3	0	0	0	0	0	0
Canada	44	19	140	21	14	21	0	17	12
Number of CDs by province - 1991									
Newfoundland	0	0	2	0	2	3	0	2	1
PEI	1	0	0	0	0	0	0	1	1
Nova Scotia	6	0	1	0	1	1	0	7	2
New Brunswick	0	0	4	1	3	5	0	2	0
Quebec	0	1	46	11	18	13	0	7	3
Ontario	2	4	34	5	3	0	1	0	0
Manitoba	0	4	7	0	0	1	1	7	3
Saskatechewan	0	0	2	0	0	2	0	8	6
Alberta	1	0	6	3	3	2	0	3	1
British Columbia	0	4	20	3	2	0	1	0	0
Yukon/NWT	0	3	2	0	0	0	1	0	0
Canada	10	16	124	23	32	27	4	37	17
Percent distribution by region - 1996									
Atlantic	34.8%	0.0%	10.9%	8.7%	6.5%	6.5%	0.0%	19.6%	13.0%
Quebec	0.0%	4.0%	65.7%	7.1%	7.1%	13.1%	0.0%	3.0%	0.0%
Ontario	10.2%	4.1%	63.3%	16.3%	4.1%	2.0%	0.0%	0.0%	0.0%
Prairies	36.7%	8.3%	25.0%	3.3%	3.3%	5.0%	0.0%	8.3%	10.0%
BC	2.9%	23.5%	70.6%	0.0%	0.0%	2.9%	0.0%	0.0%	0.0%
Total	15.3%	6.6%	48.6%	7.3%	4.9%	7.3%	0.0%	5.9%	4.2%
Percent distribution by region - 1991									
Atlantic	15.2%	0.0%	15.2%	2.2%	13.0%	19.6%	0.0%	26.1%	8.7%
Quebec	0.0%	1.0%	46.5%	11.1%	18.2%	13.1%	0.0%	7.1%	3.0%
Ontario	4.1%	8.2%	69.4%	10.2%	6.1%	0.0%	2.0%	0.0%	0.0%
Prairies	1.7%	6.7%	25.0%	5.0%	5.0%	8.3%	1.7%	30.0%	16.7%
BC	0.0%	19.4%	61.1%	8.3%	5.6%	0.0%	5.6%	0.0%	0.0%
Total	3.4%	5.5%	42.8%	7.9%	11.0%	9.3%	1.4%	12.8%	5.9%

The scenarios are far from uniformly distributed geographically (Table 1, which provides both the percentage distributions by region and an index of concentration)[6]. The migration dominated aging areas are much more likely to be found in the Atlantic provinces and the Prairies than elsewhere. Congregation is the exception, but this is associated with net in-migration of the non-elderly and, where it occurs, is found in British Columbia, Ontario and the environs of Montréal. Stable areas, with little change induced either by aging-in-place or migration are primarily an Atlantic region and Prairies phenomenon,

[6] The index is the ratio of the number of areas with a given scenario to the number that would be expected given identical distributions within each region

while decline in aging is only important in British Columbia and migration ameliorated aging is dominant in British Columbia, Quebec and Ontario.

6. SOCIO-ECONOMIC RELATIONS WITH THE PROCESSES OF AGING

The existing knowledge of the processes of population aging suggest that the global aging produced by shifts in fertility and mortality across the country are geographically differentiated by a complex web of additional social, economic and demographic variables. The dominant message, however, is that we would expect to find a strong association at the local level between population aging and economic disadvantage. Communities with more limited local resources can expect to shoulder a disproportionate burden from growth in the elderly population.

The characterization of the structure and change in population aging presented above suggests that the various demographic indicators of aging possess multivariate links with selected social, economic and demographic variables. In this section, the various propositions regarding the links between aging and community profiles are tested with a series of regression analyses. Two types of analysis are pursued; the first relates demographic characteristics in 1996 to socio-economic characteristics in 1996, while the second relates measures of change between 1991 and 1996 to characteristics in 1991 and changes in socio-economic measures between 1991 and 1996. Because of the complexity of the relations underlying aging, these regression analyses are intended to be descriptive rather than explanatory, characterizing the types of communities associated with particular aging scenarios.

As part of these analyses we include regional dummy variables to represent the broad demographic differences among the five main regions (Atlantic Provinces, Quebec, Ontario, Prairies and British Columbia and the Territories). In many cases there are additional regional differentials over and above those attributable to the sets of independent variables included in the analyses. The analyses use British Columbia as the reference region so the coefficients for the other four regions represent the differences between British Columbia and each of these regions after controlling for differences in the other socio-economic variables.

The proposition behind much of this analysis is that population aging is concentrated in areas which tend to be less economically advantaged. In Table 2, the links between the demographic structure

in 1996 and selected variables characterizing local communities are presented in the form of a series of regression models, with and without regional dummy variables. Here the very strong negative association between the concentration of the elderly and measures of economic advantage (average income, rates of recent growth, measures of educational attainment and relative importance of urban as opposed to rural populations in the community). There is also a significant attraction of older populations to places with warmer and sunnier climates. Once all the other variables are controlled, it is interesting to note that Ontario has a higher proportion of the population over 65 than even the Prairie provinces. The implication is that aging in Ontario could increase relatively rapidly if there was a downturn in the Ontario economy relative to other locales.

TABLE 2: MODELS OF DEMOGRAPHIC CHARACTERISTICS OF CENSUS DIVISIONS IN 1996

	DEPENDENT VARIABLES			
Independent variables	**Percent 65 and Over 1996**		**Percent 80 and Over 1996**	
	Model 1	*Model 2*	*Model 3*	*Model 4*
Intercept	58.903 ***	58.819 ***	12.919 ***	13.923 ***
Metropolitan area	-0.638	-0.642	-0.192	-0.226
% urban	-0.436 ***	-0.372 ***	-0.113 ***	-0.101 ***
% recent immigrants	15.546	14.495	5.871	7.347
% low-income families	-0.217 ***	-0.223 ***	-0.074 ***	-0.075 ***
%unemployed over 25	-0.138 ***	-0.102 **	-0.057 ***	-0.044 ***
Average income	-0.261 ***	-1.385 ***	-0.071 ***	-0.088 ***
Population growth 1991-96	-0.120 ***	-0.093 ***	-0.042 ***	-0.034 ***
% less than high school	-0.636	-3.401	3.792 ***	1.351
% with university degree	-21.707 **	-18.310 *	-1.816	-3.535
Health employees per '000	0.089	0.103 *	0.030 *	0.046 **
Physicians/nurses per '000	0.037	0.025	0.035	0.007
Mean July temperature	0.228 **	0.117	0.025	0.045
Mean January temperatture	0.263 ***	0.262 ***	0.082 ***	0.066 ***
Number of hours of sunshine	0.346 ***	0.336 ***	0.140 ***	0.090 **
Atlantic		0.155		0.307
Quebec		0.085		-0.224
Ontario		2.397 ***		0.350 *
Prairies		1.175		0.474 *
Degrees of Freedom	272	268	272	268
R-square (adjusted)	0.757	0.783	0.769	0.798

*** p<0.001
** p<0.01
* p<0.05

Source: Census of Canada, 1991, 1996

C_{65} is a complex measure in that it is positively associated with more urbanized communities but strongly and negatively associated with high growth areas (Table 3); the latter, particularly in Ontario and in the vicinity of Vancouver and Victoria, attract more than enough younger immigrants to offset growth to the elderly population. Rates of population aging are also strongly associated with prior demographic structures, particularly the relative importance of the 60-64 and 65-69 year old cohorts in 1991.

TABLE 3: MODELS OF C65 BY CENSUS DIVISIONS - 1996

Independent variables	C(65) 1991-1996	
	Model 1	*Model 2*
Intercept	0.483 **	0.827 ***
Metropolitan area	0.019	-0.010
% urban	0.007 ***	0.005 ***
% recent immigrants	-0.236	0.521
% low-income families	0.003 **	0.000
%unemployed over 25	0.002 *	0.002 **
Average income	0.002	-0.002 *
Population growth 1991-96	-0.008 ***	-0.007 ***
% less than high school	-0.148	-0.135
% with university degree	0.479 *	0.304
Health employees per '000	-0.002	0.000
Physicians/nurses per '000	-0.001	0.001
Mean July temperature	-0.003	0.000
Mean January temperatture	-0.001	0.002 *
Number of hours of sunshine	0.001	0.007 ***
Atlantic	-0.086 ***	-0.015
Quebec	-0.027	0.000
Ontario	-0.045 **	0.011
Prairies	-0.065 ***	-0.005
% population female aged 20-35		-1.290 ***
Ratio 60-64/65-69 in 1991		0.163 ***
% 65 and over in 1991		-0.294
Proportion of elderly 80 and over		-1.045 ***
Degrees of Freedom	268	268
R-square (adjusted)	0.543	0.783

*** p<0.001
** p<0.01
* p<0.05

Source: Census of Canada, 1991, 1996

Below average values for $a_{<65}$ tend to reflect areas where the women in the childbearing years are a smaller fraction of the local population (Table 4). Values are also lower in urban areas where fertility rates tend to be less than in rural areas; $a_{<65}$ tends to be lower in areas with higher levels of unemployment. Higher rates of a_{65}, on the other hand, are strongly urban related and are also associated with areas with higher average incomes and rates of income increase. This is because the driving force behind the growth of the elderly from direct aging is the shape of the age structure at the beginning of the period; areas with high ratios of 60-64 to 65-69 year olds and low proportions of elderly over 80, a situation which characterizes many urban areas, are often associated with high values of a_{65}.

Compared with the previous period, the relations for $n_{<65}$ are surprisingly weak. The major effect is the general dominance of British Columbia as a relative attractor compared with the remaining provinces. The roles of income and unemployment are in the right direction but are quite weak, while the association with more temperate climates are modest. While n_{65} also exhibits a general relationship to overall growth areas, there are much stronger associations with the climatic variables, indicating the expected attraction of more moderate winters (Table 4).

TABLE 4: MODELS OF AGING IN PLACE AND MIGRATION

Independent variables	DEPENDENT VARIABLES: Net migration under 65 (a)		Net migration over 65 (n)		Aging in place under 65 (a)		Aging in place over 65 (n)	
	Model 1	*Model 2*	*Model 3*	*Model 4*	*Model 5*	*Model 6*	*Model 7*	*Model 8*
Intercept	8.858	18.705	-1.110	9.686	-8.066 **	22.486 ***	-53.012 ***	-18.153
Metropolitan area	3.411	4.129 *	-0.066	0.603	-0.015	-0.057	3.059	0.070
% urban	-0.210	-0.224	-0.151	0.034	0.071 *	-0.151 ***	0.650 ***	0.285
			31.529					
% recent immigrants	24.588	17.331	-0.260 **	12.088	-7.009	-9.895	-52.646	30.388
% low-income families	0.156	0.102	0.097	-0.064	0.056 *	-0.047 **	0.640 ***	0.148
%unemployed over 25	-0.219 *	-0.227 *	-0.205	0.158 *	0.028	-0.069 ***	0.056	-0.089
Change in unemployment 91-96	-0.049	0.021	-0.209 *	-0.308 *	-0.089	0.038	-0.075	0.186
Average income	0.187	0.270 *	-23.422 **	0.074	0.165 ***	-0.026	0.743 ***	0.122
Change in average Income 91-96	6.912	4.210	-0.876	-39.005 ***	1.200	1.449	-15.455	16.423
% with university degree	5.914	3.140		21.883	3.422	-5.214	20.102	-13.084
			0.011					
Health employees per '000	-0.309 *	-0.245	0.367	-0.070	-0.034	0.002	-0.326 *	0.002
Physicians/nurses per '000	0.261	0.068		0.221	-0.072	-0.059	-0.070	0.017
			0.557 **					
Mean July temperature	0.817 ***	0.762 **	0.597 ***	0.176	-0.046	-0.001	-0.432	0.108
Mean January temperatture	0.148	0.018	0.753 **	0.296 ***	-0.211 ***	-0.071 ***	-0.699 ***	-0.203
Number of hours of sunshine	-0.292	-0.557 *		0.453 *	-0.210 **	-0.080	-0.956 ***	-0.234
			3.414 *					
Atlantic	-7.404 ***	-8.753 ***	3.447 *	-1.050	-0.419	-0.995 ***	-14.486 ***	-4.597
Quebec	-4.181 *	-5.637 ***	4.107 **	0.776	-1.299 **	-1.683 ***	-7.385 ***	-3.102
Ontario	-6.775 ***	-8.813 ***	5.770 ***	-0.096	-1.294 **	-0.552 *	-11.677 ***	-3.404
Prairies	-6.253 ***	-6.636 ***		0.994	-0.038	-0.074	-12.381 ***	-3.626
% population female aged 20-35		1.061 *		-0.991 *		0.232 **		0.413
Ratio 60-64/65-69 in 1991		-10.310 ***		-19.664 ***		-1.444 **		26.171
% 65 and over in 1991		0.349		-0.306		-0.604 ***		0.013
Proportion of elderly 80 and over		-0.460 **		0.469 ***		0.185 ***		-1.585
Degrees of Freedom	269	265	269	265	269	265	269	265
R-square (adjusted)	0.293	0.355	0.472	0.604	0.614	0.867	0.739	0.939

*** p<0.001
** p<0.01
* p<0.05

The net effects of aging-in-place (α) are strongly associated with urban areas and also with above average incomes. The net migration effects (η) are much more strongly associated with areas with below average incomes. The expected relations with the climatic variables only take on major significance when the demographic variables are removed as these values are consistently different in Québec and the Atlantic provinces and are coincident with climatic differences (Table 5).

TABLE 5: MODELS OF NET EFFECTS OF AGING IN PLACE AND MIGRATION ON POPULATION AGING

	DEPENDENT VARIABLES			
Independent variables	**Net effects of aging in place** α		**Net effects of migration** η	
	Model 1	*Model 2*	*Model 3*	*Model 4*
Intercept	-129.978 ***	-130.068 ***	18.271	5.047
Metropolitan area	4.215	-0.280	-3.404	-3.896 *
% urban	1.400 ***	1.586 ***	-0.057	0.070
% recent immigrants	-70.500	47.852	-4.201	-3.236
% low-income families	1.454 ***	1.241 ***	-0.589 ***	-0.395 **
%unemployed over 25	-0.230	-0.154	0.308 ***	0.336 ***
Change in unemployment 91-96	0.072	-0.010	-0.236	-0.391 *
Average income	0.341 *	0.093	-0.509 ***	-0.448 ***
Change in average Income 91-96	12.523	41.802 ***	-37.270 ***	-43.085 ***
% with university degree	-6.125	-2.358	27.332	37.506 *
Health employees per '000	-0.453 *	-0.193	0.299 *	0.158
Physicians/nurses per '000	0.431	0.516	-0.118	0.110
Mean July temperature	-0.287	-0.057	-0.665 **	-0.798 ***
Mean January temperatture	0.634 ***	0.801 ***	0.248 *	0.284 **
Number of hours of sunshine	-0.456	0.252	1.015 ***	1.195 ***
Atlantic	-2.607	8.999 ***	6.937 ***	7.205 ***
Quebec	7.565 **	12.611 ***	4.191 *	5.379 **
Ontario	5.232 *	12.582 ***	8.090 ***	9.115 ***
Prairies	6.844 *	13.912 ***	7.562 ***	6.582 **
% population female aged 20-35		0.418		-0.443
Ratio 60-64/65-69 in 1991		25.012 ***		5.465
% 65 and over in 1991		-2.561 ***		-1.769 ***
Proportion of elderly 80 and over		-1.730 ***		0.731 ***
Degrees of Freedom	268	264	268	264
R-square (adjusted)	0.454	0.623	0.402	0.467

*** p<0.001
** p<0.01
* p<0.05

6.1 Socio-Economic Profiles of the Aging Scenarios

The average profiles of areas associated with the differing scenarios provide additional insights into the structure of population aging (Table 6). Demographically, the stable areas and the census divisions dominated by recomposition and accumulation are the oldest both in terms of the proportion over 65 and the relative importance of the very old in the local population. The younger populations are to be found in those census divisions where aging is declining or migration is ameliorating the aging process, both categories also being associated with higher average incomes and high annual growth rates. It is clear that areas associated with congregation differentiate themselves from recomposition and accumulation on these economic variables as well as being much more likely to be urban. The average growth rates are strongly positive in areas with congregation while they are negative for the four recomposition and accumulation categories.

The areas of declining aging are sharply differentiated from those with migration ameliorated aging. The former are primarily non-urban areas with a significant northern component; the latter are dominated by growing areas in Ontario, Québec and British Columbia.

TABLE 6: PROFILES OF AGING SCENARIOS

				AGING IN PLACE DOMINATES			MIGRATION DOMINATES	
Variables	Stable	Decline in Aging	Migration reduces Aging	Congregation	Recomposition	Accumulation	Recomposition	Accumulation
Percent over 65 in 1996	15.2%	9.5%	11.5%	12.9%	12.9%	12.8%	14.8%	16.9%
Percent over 80 in 1996	4.1%	2.1%	2.4%	2.9%	2.9%	2.8%	3.8%	4.5%
Pct change in population 1991-1996	2.56	12.75	5.97	5.30	0.11	-2.70	-1.95	-5.11
No. of Health Workers per '000	24.8	20.2	22.3	28.0	24.7	25.1	25.3	21.3
Median Income	$34,173	$38,751	$38,907	$40,124	$35,042	$33,917	$32,182	$31,169
Average January temperature	-11.9	-13.9	-11.4	-9.2	-10.6	-12.1	-9.5	-10.6
C65	1.00	0.97	1.08	1.10	1.11	1.15	1.07	1.07
No. of cases	44	19	140	21	14	21	17	12

The health service variables suggest that the main relationship is between the health variables and the growth rates of the population. The higher the growth rate, the lower the ratios of health service employees and beds/thousand population. This tends to reinforce the view that smaller places continue to benefit from investments made in earlier periods in relation to a relatively larger population base in

smaller urban and rural communities. There are no great differences in the age-standardized rates of disability among the elderly, apart from the higher rates in the small number of stable areas.

7. CONCLUSION

The primary intent of the research reported here has been to underscore the complexity of the process of population aging for small areas. Population aging is a function of two elements: aging-in-place and net migration. As Morrison (1992) has noted, aging-in-place is a critical component of aging which now dominates in most communities, stressing the importance of the existing population structure in determining the future patterns of change. Aging-in-place also increases in relative importance with age and means that future growth of the older elderly at the local level is almost completely determined by the distribution of the younger elderly population.

Net migration dominates in certain parts of the country where out-migration of the young is particularly dramatic. Although migration decisions by both the young and the elderly are influenced by similar factors and tend to be attracted to the same destinations, with British Columbia's dynamic economy and milder climate proving universally attractive, the net effects of migration are very different. Those areas with significant out-migration of the younger population tend to greatly increase the rate of population aging in the community while the obverse is true in areas with strong in-migrant flows in the labour force years. Return migration of older populations in the Atlantic provinces and the eastern Prairies also reinforces aging.

The main conclusion is that population aging is very much a function of the economic conditions which underlie differential growth in local economies. The greater burden of rapid aging tends to be born by communities with fewer economic advantages. Sudden shifts in regional economic performance could well produce rapid shifts in the pattern of aging if net migration effects changed from ameliorating aging to reinforcing it.

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