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SOCIAL AND ECONOMIC DIMENSIONS OF AN AGING POPULATION

**Geographic Dimensions of Aging in Canada
1991-2001**

Eric G. Moore and Michael A. Pacey

SEDAP Research Paper No. 97

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GEOGRAPHIC DIMENSIONS OF AGING IN CANADA 1996-2001

Abstract

Although population aging at the national level has received much attention, its geographical dimensions have not. Here we explore the demographic processes which underlie population aging at the provincial and metropolitan scale for the periods 1991-1996 and 1996-2001. A demographic accounting framework is proposed which differentiates between the effects of *aging-in-place* and *net migration* on population aging. We also examine the relationships between the various measures of aging and social and economic characteristics of metropolitan areas over the two periods. We demonstrate that the path of population aging is susceptible to social and economic context; in particular, the struggles of the British Columbian economy in the second half of the decade and the deteriorating economies of older resources based communities are associated with increases in population aging over and above the general aging taking place in Canadian society.

GEOGRAPHIC DIMENSIONS OF AGING IN CANADA
1991-2001

by

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GEOGRAPHIC DIMENSIONS OF AGING IN CANADA

1991-2001¹

1. INTRODUCTION

The rapid increase in population aging in Canada triggered by the end of the baby boom in the 1960s continued with little abatement throughout the 1990s. As the overall rate of population growth declines, fertility remains below replacement levels and life expectancy continues to improve, with immigration providing the primary mechanism for even modest growth. The result is that the population over 65 (and even more markedly the population over 80) continues to grow at a faster rate than the rest of the population. From 1996-2001, while total population growth fell to 0.9 percent a year, the population over 65 continued to grow at 1.8 percent a year and the population over 80 grew at 3.5 percent a year. While the major focus in the policy literature continues to be 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 this paper we extend earlier work on aging of the Canadian population during the 1980s and early 1990s (Moore and McGuinness, 1999, Moore, McGuinness and Pacey, 2000) to include the most recent population estimates for provinces and large CMAs for 2001².

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 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 (Moore et al, 1997, ch.4). However, in this paper the analysis deals primarily with the population over 65.

The major focus of this paper is on geographic dimensions of aging in Canada during the 1990s with specific emphasis on changes at provincial and metropolitan scales and the demographic processes which underlie them. Canada is an urban society with 63% of the population living in the 25 largest cities in 2001³. The question we address is how the proportion that is elderly changes in the period from 1991 to 2001 and the way in which these changes relate to the demographic and socio-economic attributes of different jurisdictions.

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 in both the numerator and denominator, namely 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 immigrants 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 smaller areas become absorbed into the aging-in-place component at larger scales.

In this paper, we utilize the accounting framework in Moore and McGuinness (1999) which is built on earlier work by McCarthy (1983) and Rogerson (1996). Not only are the demographic accounts of interest but the parameters of these accounts reflect underlying changes in the characteristics of regions and communities. In particular, 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, as established in the earlier work

(Moore et al, 1997), both the structure and processes of population aging are 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 and 1996-2001 are constructed. The aging profiles are constructed for the provinces and CMAs and the relations between structure and processes of aging at the CMA level and their socio-economic characteristics are assessed for both five-year periods.

2. POPULATION AGING: CONCEPTS AND MEASURES⁴

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.

$P_{\text{tot}}(0)$, $P_{\text{tot}}(1)$ is the total population.

$f_{65}(0)$, $f_{65}(1)$ are the proportions of the population over 65, where

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

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;

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

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

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

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

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

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 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,

$$C_{65} = 1 + \alpha + \eta \quad [5]$$

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

$$C_{65}(S) = \frac{\frac{S_{65}(1)}{S_{tot}(1)}}{\frac{P_{65}(0)}{P_{tot}(0)}} = 1 + \alpha \quad [6]$$

$$\text{then} \quad \alpha = C_{65}(S) - 1 \quad [7]$$

$$\text{and} \quad \eta = C_{65} - C_{65}(S) \quad [8]$$

3. POPULATION AGING IN CANADA

Geographical differences are played out within the framework of the national experience. 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 31.1 million in 2001. 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%. and this fell to 0.9% a year in the second half of the 1990s.

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 2001, the population 65 years of age and over

stood at 3.9 million or 12.6 percent of the total population and the population over 80 had grown more than sixfold to 954,000 or 3.1 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 1). However, it has slowed recently and this feature is shown more dramatically in the series for C65 at the national level (Figure 2). 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 3 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 (Mitra, 1992).

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 Level

For any set of subnational regions, such as provinces or metropolitan areas, 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 smaller entities such as metropolitan areas.

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 3 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.

A simple regression for census division data for the period 1991-96 shows that 86 percent of the variation in aging-in-place among the population over 65 in the 25 largest CMAs (see table 2) is attributable to these two variables. A similar analysis for 1996-2001 shows this effect to be virtually identical with 85 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 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 immigration. The overall effect of migration will depend on the detailed balance of immigration 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 has been even stronger producing a net migration effect which actually slows the rate of aging in the province. In much of the 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 periods (1991-2001) 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 aging⁵.

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 2001, 12.6% of Canada's population were over 65 and 3.1% were over 80. The variation in the proportion of the population over 65 at the provincial level in 2001 is substantial (Table 1). The North West Territories and the Yukon have less than 4 percent of the population in this category, while Alberta has 10.2 percent of its population over 65, and Saskatchewan lies at the other end of the spectrum at 14.6 percent. Although all provinces have increased the proportion over 65 consistently during the 1990s, there is also much variation. The Territories have the largest increases, followed by Newfoundland, Quebec and Alberta, while PEI and Manitoba have increased the proportion over 65 by less than two percent.

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. The simple correlation between %>65 in 1991 and C65 for 1991-96 is -0.82 for all provinces excluding the Yukon/NWT and -0.62 for 1996-2001

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.

If we calculate the net migration rates by age for the provinces between 1991 and 2001, we see that the patterns for the younger and older ages exhibit important commonalities and differences (Figures 4,6). During the first half of the decade 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. Much of the rest of the provinces experiences small net outflows of younger individuals. In the period from 1996-2001, however, significant changes occur, the most dramatic being large declines in net in-migration of younger people to British Columbia and Quebec together with a shift in the net flows of the elderly to Quebec from negative to positive. Ontario and Alberta retain their attractiveness to younger individuals while the rest of the provincial flows are similar to the earlier five-year period.

The relative roles of aging-in-place and net migration have changed somewhat between the two five-year periods. From 1991-96, aging-in-place was the dominant force in most provinces (Figure 5). Only in PEI and British Columbia did net-migration have a larger effect on aging. In British Columbia the large influx of younger individuals, including immigrants, more than offset both the arrival of older individuals and the aging of the population resident in the province in 1991. In six provinces, especially in the West, net migration served to ameliorate the rate of aging. However, in the latter half of the decade (Figure 7), patterns shifted and only two provinces, Ontario and Alberta (the two thriving regional economies), experienced migration whose net effects reduced the rate of aging. Most dramatic is the change in status of British Columbia, with the net effects of migration virtually eliminated. As indicated above, this reflects a change in the structure of migration with very significant declines in the migration of younger people to the flagging economic environment of the West Coast. It shows quite markedly how shifting economic fortunes can have rapid effects on population aging with its own set of consequences for a broad range of services.

4.3 Aging at the CMA Level

When we consider the percentages of the population over 65 at the metropolitan level, the variation is as substantial as at the provincial level (Table 2). There are a number of different patterns which emerge. The majority of cities (17 out of 25) have increased the proportion of the population over 65 at a faster rate than the country as a whole. Those with the highest rates of increase tend to comprise two different scenarios: (i) those cities such as Chicoutimi, Sudbury and Thunder Bay which are older industrial and resource-based towns with struggling economies and (ii) cities such as Calgary, Edmonton and Oshawa whose aging is more a function of having small elderly populations to begin with such that the aging of the 60-64 cohort produces high internal aging. The reverse of this situation occurs for cities experiencing low increases in the proportion over 65. Toronto and Vancouver are dynamic environments with high levels of in-migration which ameliorate aging, although the in-migration of younger people to Vancouver declines sharply after 1996. In contrast, Victoria and, to a lesser degree, Winnipeg, start out with relatively high proportions of elderly and regress somewhat toward the national mean.

The net flows for younger and older individuals are dominated by the experience of Toronto and Vancouver, although, as might be expected from the provincial analysis, there is a significant decline in the attractiveness of Vancouver to younger people in the latter part of the decade (Figures 8,10). Montreal also declined in attraction of those under 65 while both Calgary and Edmonton increased substantially. The central Canadian cities, Regina, Saskatoon, Winnipeg, Sudbury and Thunder Bay, all experienced losses among the younger population by the latter part of the 1990s. The pattern of net migration of those over 65 remained fairly stable although Montreal lost population in this older group after 1996.

Aging-in-place is still the dominant force for aging in cities in both five year periods (Figures 9,11). In most cities the period 1991-96 saw net migration ameliorating the aging process, with the effect being particularly strong in Vancouver, Toronto and Windsor. Net migration only tended to increase aging in the Central Canadian and Atlantic cities. In the second half of the decade, significantly more cities were experiencing increases in aging from net migration, largely due to outmigration of younger people. This phenomenon was particularly dramatic in Chicoutimi, Trois Rivieres, Sudbury, and Thunder Bay. Regina, Saskatoon and Winnipeg also joined this group. Oshawa also experienced a similar situation although in its case the increase was produced by a net influx of older individuals rather than a loss of those under 65. The ameliorating effects of net migration were confined to Calgary, Toronto, Vancouver and Windsor.

5. 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 community 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 significant links with selected social, economic and demographic variables. In this section, the various propositions regarding

the links between aging and metropolitan profiles are tested with a series of correlation analyses¹. Two sets of analyses are pursued; the first relates measures of change between 1991 and 1996 to characteristics in 1991 and changes in socio-economic measures between 1991 and 1996. The second links characteristics in 1996 and changes between 1991 and 1996 to changes between 1996 and 2001. Unfortunately data on changes in economic attributes between 1996 and 2001 are not yet available. Because of the complexity of the relations underlying aging, these analyses are intended to be descriptive rather than explanatory, characterizing the types of communities associated with particular aging scenarios. Because we are limited to 25 metropolitan areas, any regression analysis would be overly simplistic as there are insufficient degrees of freedom to allow for more than two or three variables to produce significant parameters.

The proposition behind much of this analysis is that population aging is concentrated in areas which tend to be less economically advantaged. In Table 3, the correlations between the measures of aging for the years 1991-1996 and metropolitan characteristics in 1991 and changes between 1991 and 1996 are presented. Table 4 provides similar correlations for the 1996-2001 period. Here the strong negative association between population aging and measures of economic advantage (average family income, rates of recent growth, changes in unemployment and concentration of low income families) become evident.

Table 3 illustrates the links between population growth, immigration and basic economic variables between 1991 and 1996. Metropolitan areas with higher growth rates have greater proportions of their populations who are immigrants, higher median family incomes and lower unemployment. Over this period cities with higher growth rates also tended to be somewhat larger and have lower increases in unemployment, although the proportion of families with low incomes tended to grow more rapidly. Among the aging variables, the proportion over 65 in

1991 tended to be linked to those cities which experienced larger declines in family income over the ensuing five years. C_{65} tended to be lower in those cities that were growing more rapidly and had more immigrants. C_{65} was also smaller in cities where family income grew more rapidly, while it also had a negative relation with the proportion over 65 in 1991 which indicates some convergence in rates over the five years.

The general pattern remains the similar for 1996-2001 (Table 4), although these relations are linked to economic changes in the earlier period. Higher values of the proportion over 65 and of C_{65} are still associated with low growth cities, although population growth in 1996-2001 is also associated with those cities which had high increases in the proportion of the population who were immigrants between 1991 and 1996. Higher levels of C_{65} are also found in cities with higher levels of unemployment in 1996 and in cities whose increases in unemployment had been greater in the earlier period. Cities with lower increases in median family income also tended to have higher values of C_{65} .

The components of aging also reflect linkages to the economic and social context. The aging-in-place component, α , is more strongly a function of pure demographic effects as those cities that already have higher proportions over 65 tend to have lower values of α . α tends to be somewhat higher in larger cities and in both periods is larger in those cities which have smaller increases in median family income. More sensitive to economic factors are the net migration component, η , and its largest element, the net migration of individuals under 65. They are negatively correlated with each other in both years (-0.814 in 1991-96 and -0.834 in 1996-2001). The net migration effect on aging is higher and positive in cities with slower growth rates, fewer immigrants and with lower average incomes.

7. CONCLUSION

The primary intent of the research reported here has been to underscore the complexity of the process of population aging at different scales. 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 significantly determined by the distribution of the younger elderly population.

Net migration assumes much greater importance in those areas and communities where out-migration of the young is particularly dramatic. Manitoba, Saskatchewan and the Atlantic Provinces have long been the sources of much outmigration among the younger working age population and this has had consistent impacts on accelerated rates of aging in those areas. Return migration of older populations in the Atlantic provinces and the eastern Prairies also reinforces aging. The obverse of this situation comprises the strong inflows of younger migrants to Ontario and British Columbia which have had consistent ameliorating effects on aging. 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. These provincial differences are reflected in the experiences of the major cities, with Toronto and other cities in Southern Ontario, Vancouver, Calgary, and Edmonton gaining younger populations, while cities in the Prairies, Quebec and

Atlantic provinces do not fare as well, although some continue to draw younger migrants from their hinterlands.

Some significant changes occurred in patterns of aging between the first and second half of the decade. Most important is the changing role of British Columbia in general and Vancouver in particular. As the British Columbian economy struggled, the attractiveness of the region to younger migrants declined. The drop in positive net migration at younger ages, produced increases in aging after 1996. The other major changes occurred with significant increases in the net migration component of aging for the industrial/resource-based cities of Sudbury, Thunder Bay , Chicoutimi and Trois Rivières stemming from increased outmigration of younger people.

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.

ENDNOTES

- 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).

- 2 The original intent was to use the counts from the 2001 Census released in the summer of 2002. However, these data pose a problem for the analysis of changing proportions of the elderly as no adjustment has been made for undercounts. These undercounts appear to be substantial, especially for the population in their twenties. Although the undercounts for seniors themselves are not severe, the undercounts for younger adults makes the denominator for estimating percentages unreliable. We therefore use the estimates of age-sex distributions provided in CANSIM series 051-0001 and 051-0016.
- 3 The 25 largest CMA were used as these were the CMAs for which consistent data were available in the CANSIM series for 1991, 1996 and 2001 standardized to the 1996 boundaries.
- 4 For a more complete framework see Moore et al (1997), Moore et al (2000).
- 5 The relations between community profiles and measures of aging at the census division level for the periods 1986-1991 and 1991-96 were reported in Moore et al (1997) and Moore et al (2000). At this scale the strong relations between economic disadvantage and more rapid aging were well supported.

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Figure 1: Percent of the Population Over 65 - Canada 1951-2001

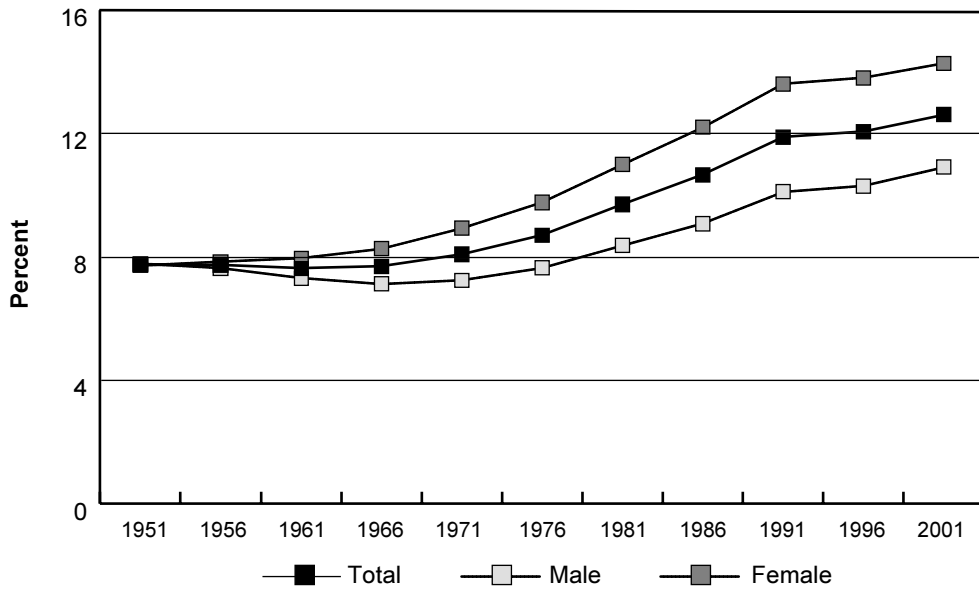


Figure 2: C65 - Canada 1951-2001

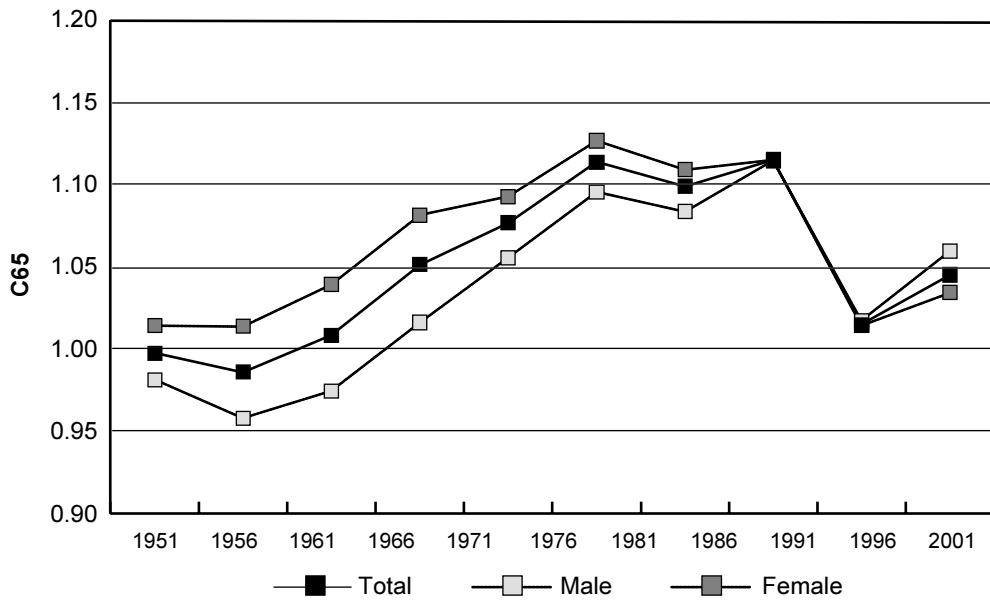


Figure 3: Ratio of Population Aged 60-64 / Population Aged 65-69 in 2001

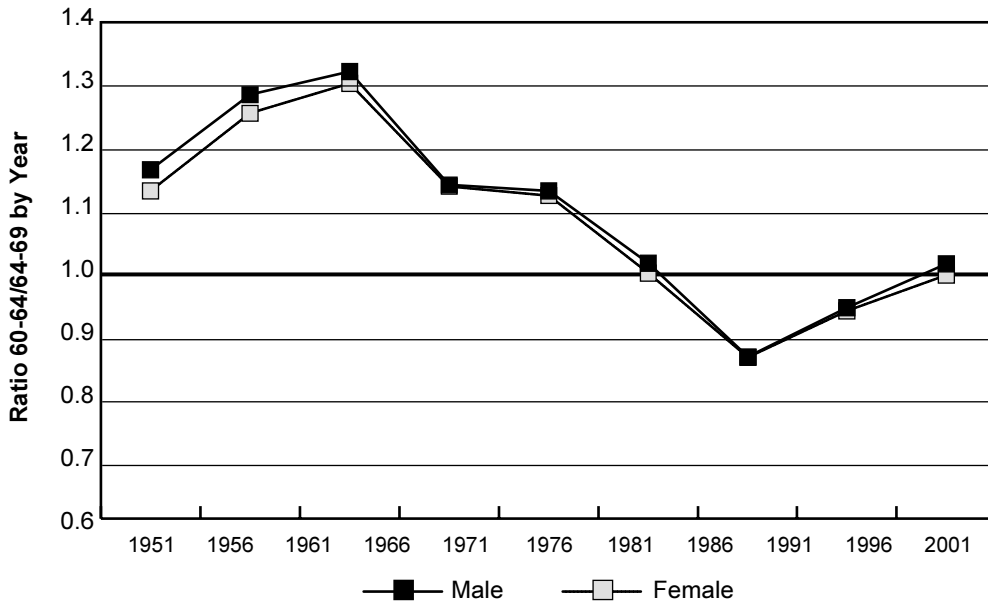


Figure 4: Net Migration by Age by Province 1991-1996

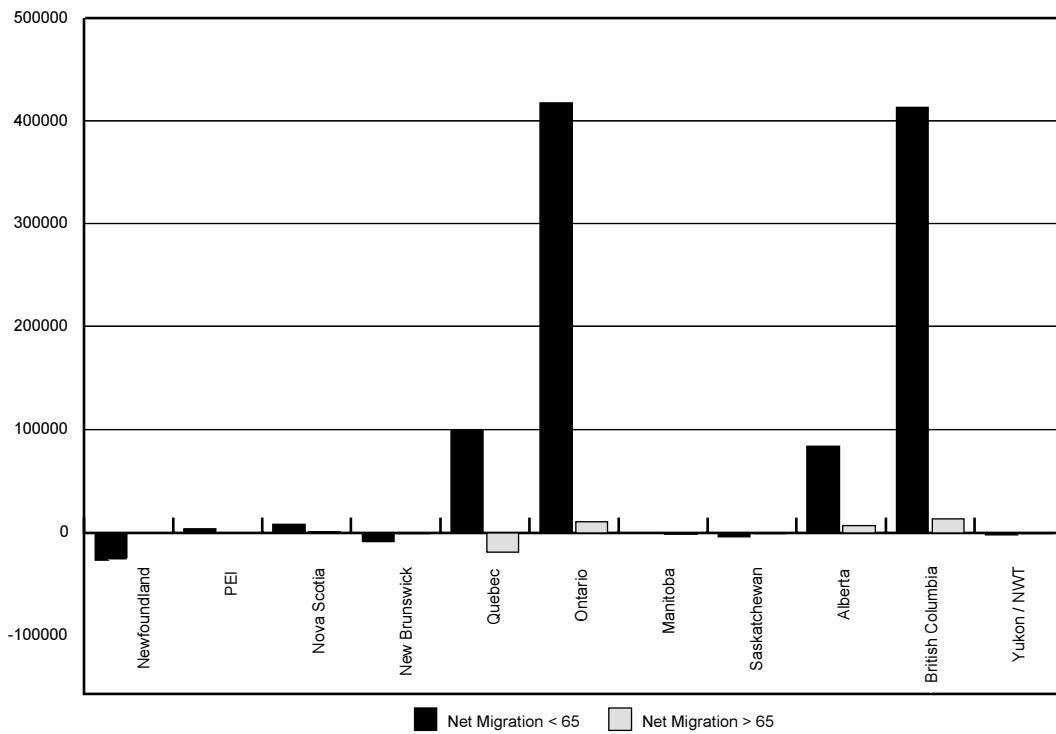


Figure 5: Rates of Aging-in-Place and Net Migration by Province, 1991-1996

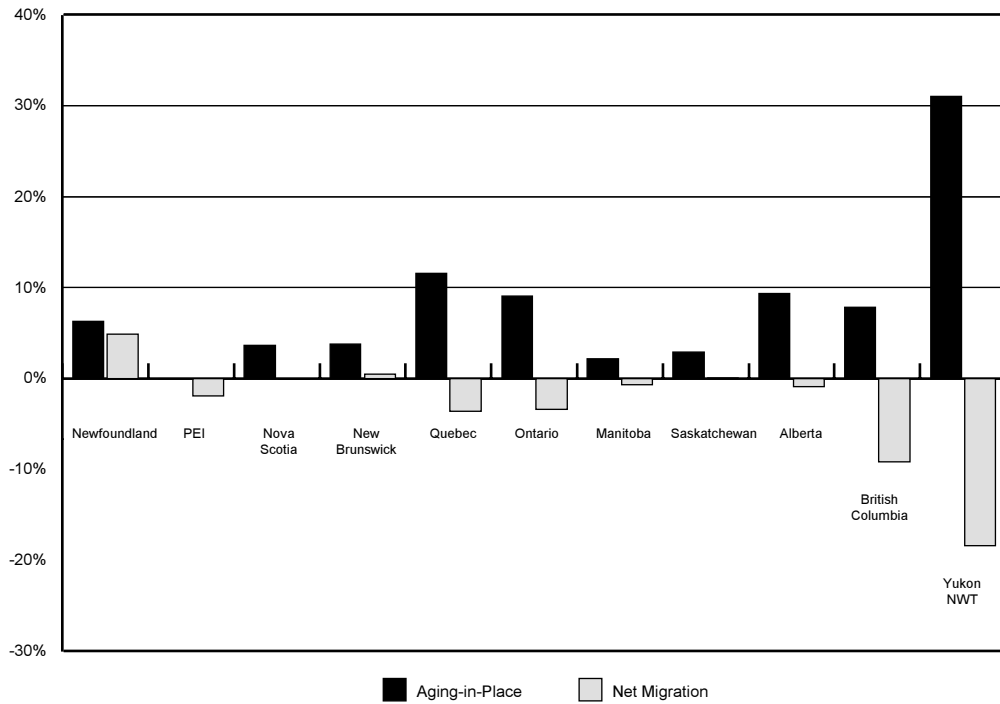


Figure 6: Net Migration by Age by Province 1996-2001

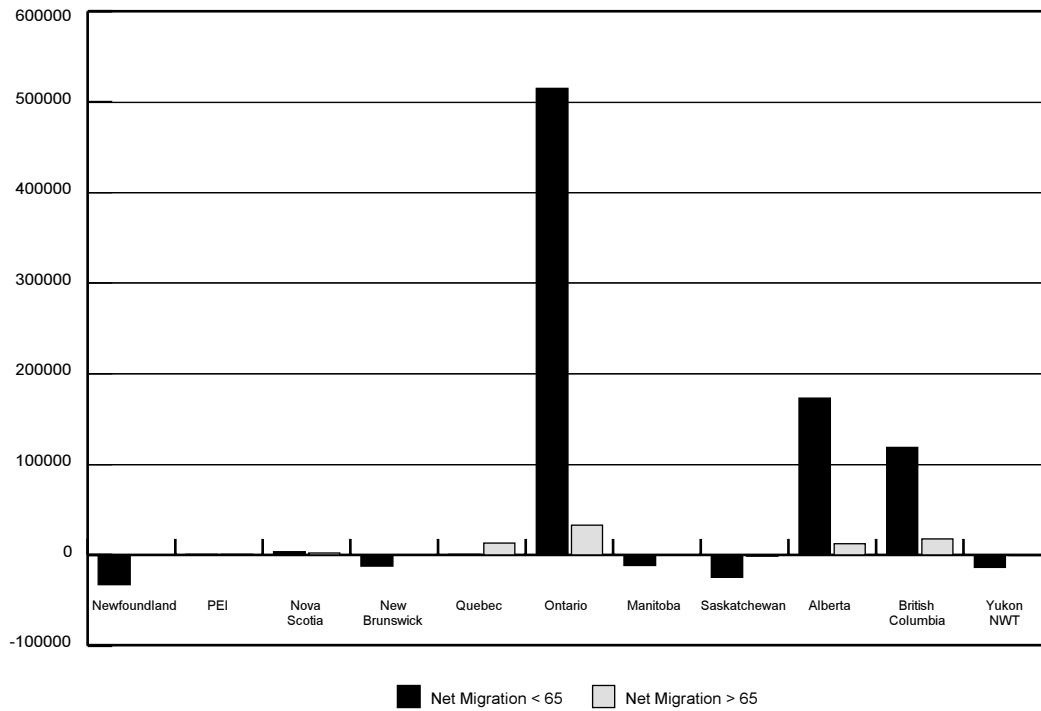


Figure 7: Rates of Aging-in-Place and Net Migration by Province 1996-2001

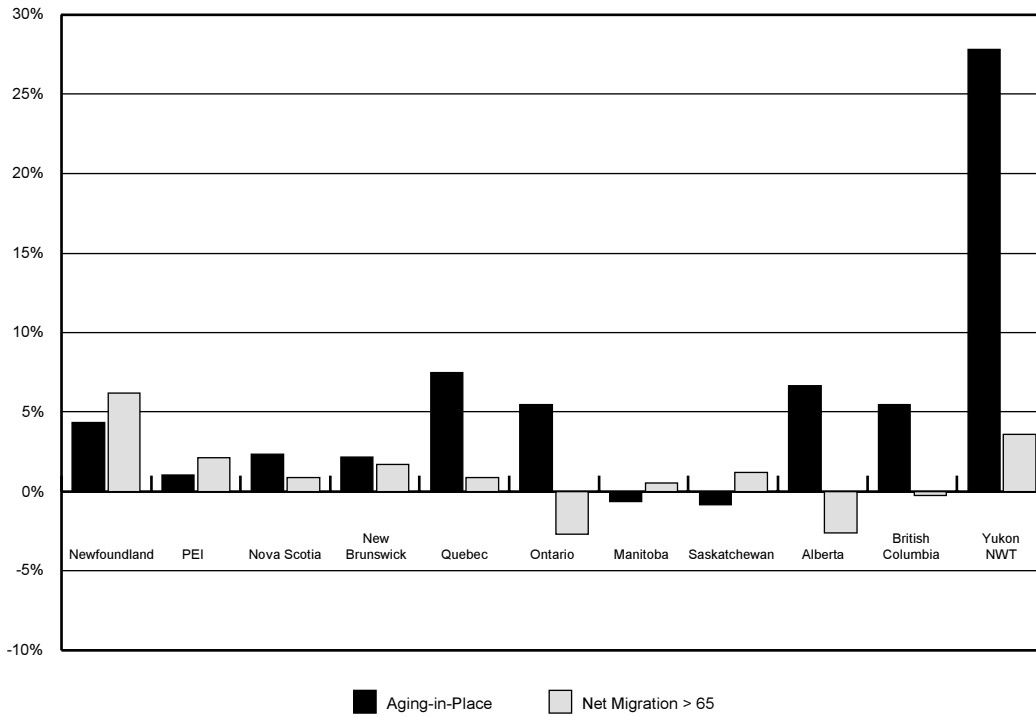


Figure 8: Net Migration by Age by CMA 1991-96

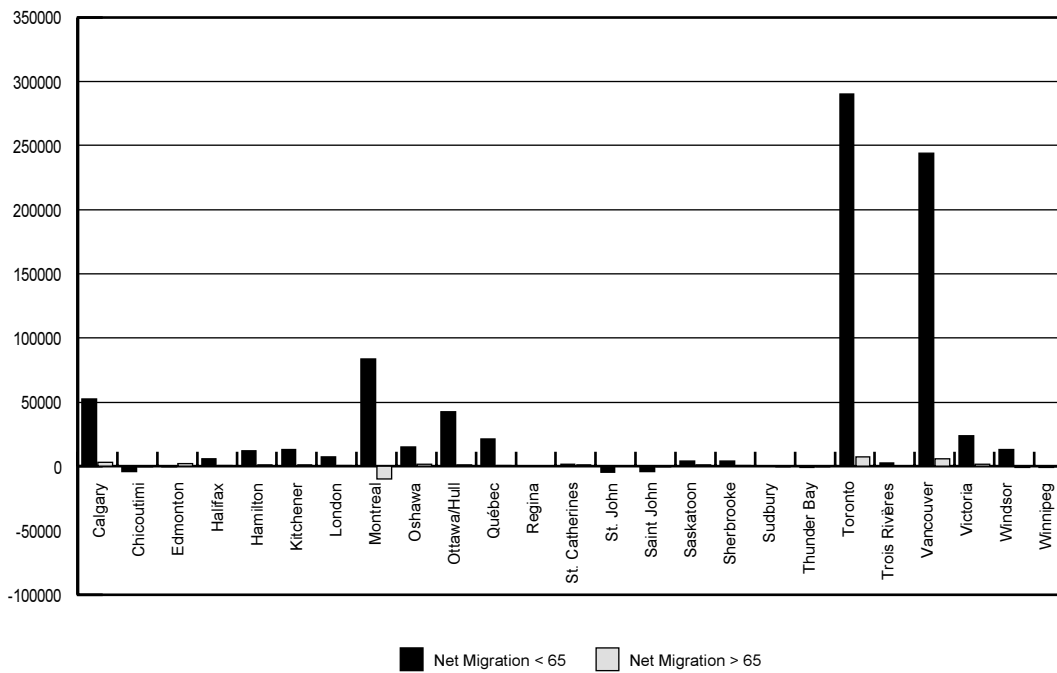


Figure 9: Rates of Aging-in-Place and Net Migration by CMA 1991-96

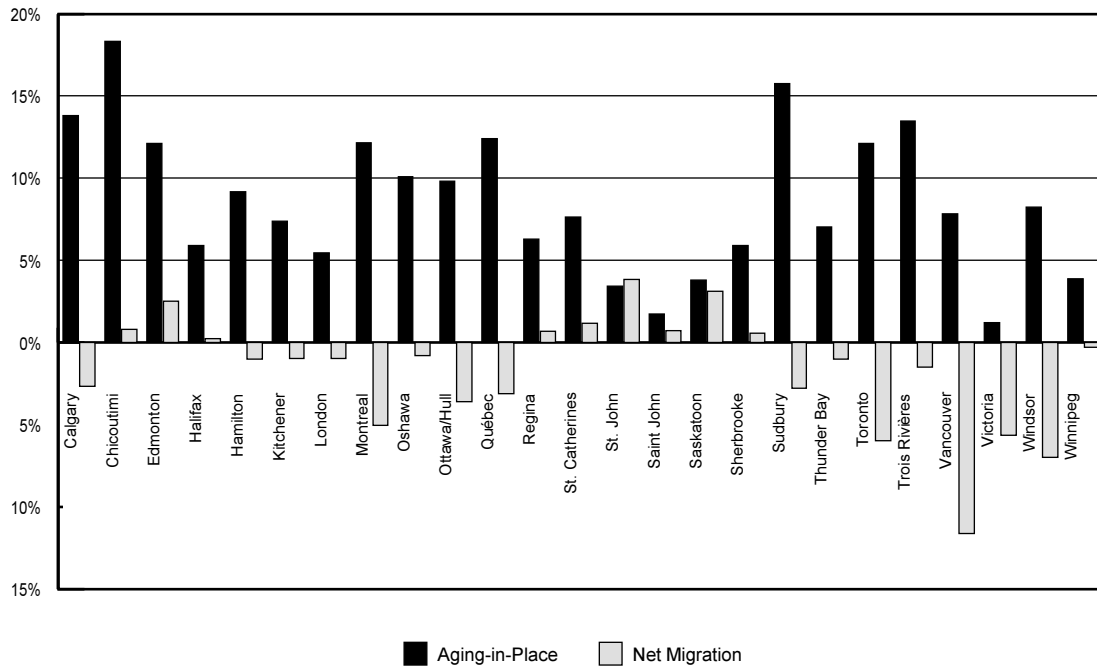


Figure 10: Net Migration by Age by CMA 1996-2001

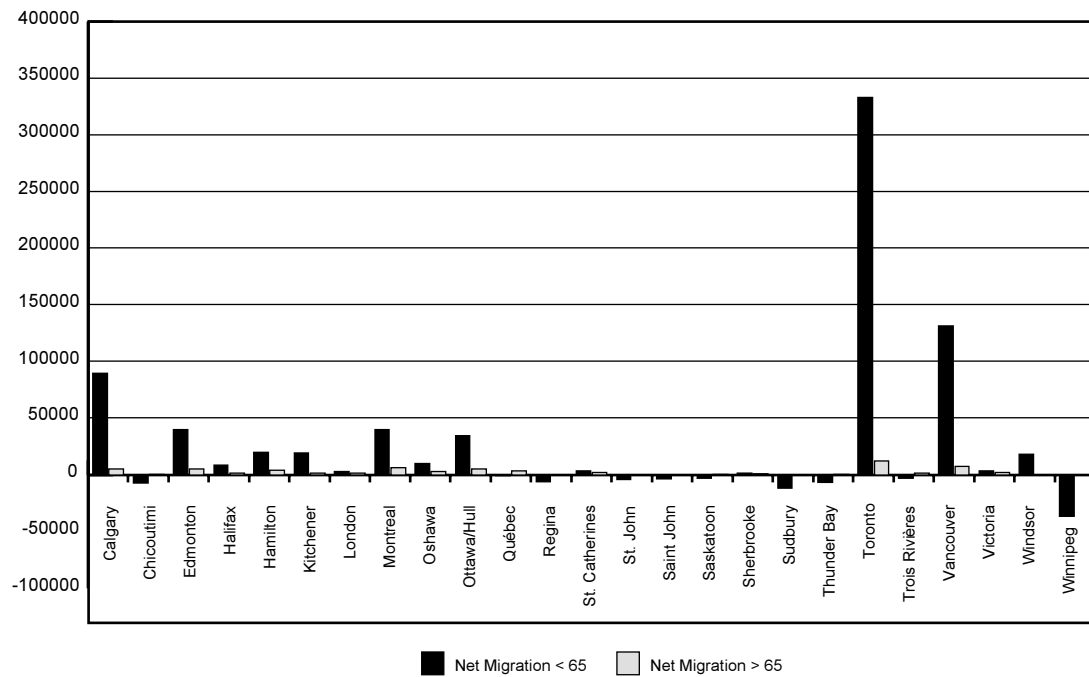


Figure 11: Rates of Aging-in-Place and Net Migration by CMA 1996-2001

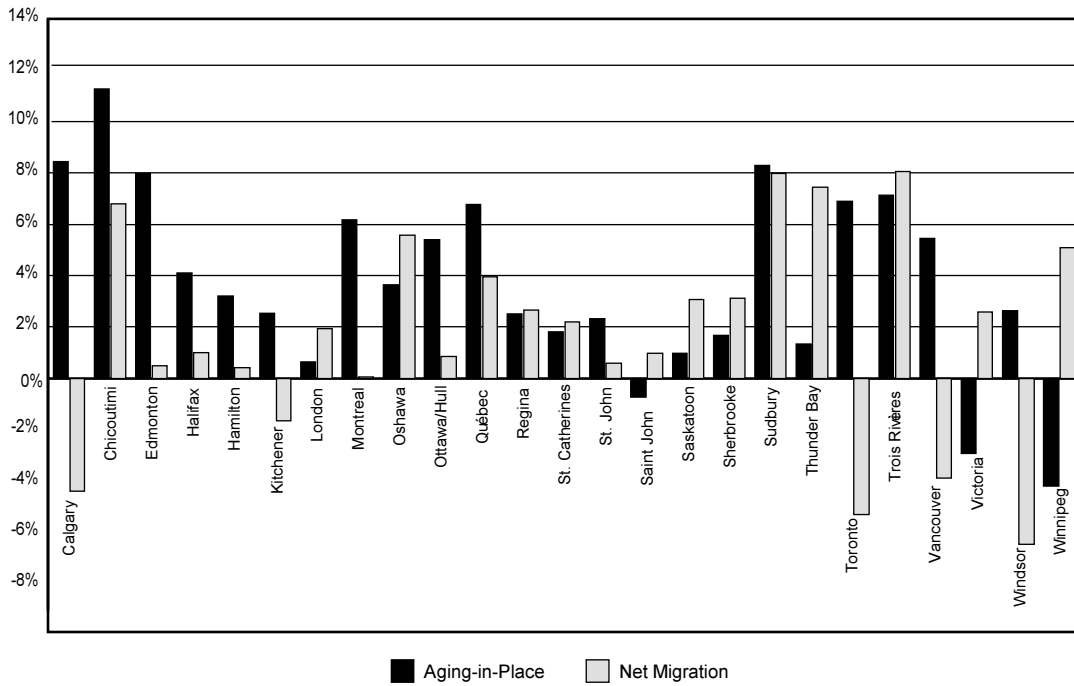


TABLE 1: PERCENT OVER 65 BY PROVINCE 1991-2001

<i>PROVINCE</i>	<i>1991</i>	<i>1996</i>	<i>2001</i>	<i>% increase in proportion over 65</i>
Newfoundland	9.6	10.7	11.8	23.0
Prince Edward Island	13.1	12.9	13.3	1.3
Nova Scotia	12.5	12.9	13.4	7.0
New Brunswick	12.0	12.5	13.0	8.4
Quebec	11.1	12.0	13.0	17.1
Ontario	11.6	12.2	12.6	8.7
Manitoba	13.3	13.5	13.5	1.6
Saskatchewan	14.1	14.5	14.6	3.5
Alberta	9.0	9.8	10.2	13.0
British Columbia	12.7	12.5	13.2	3.9
Yukon Territory	3.9	4.4	5.7	48.2
Northwest Territories	2.7	3.0	3.6	32.9
NWT	3.1	3.5	4.2	35.5
Nunavut	1.9	2.1	2.6	35.2
CANADA	11.5	12.1	12.6	9.8

TABLE 2: PERCENT OVER 65 BY CMA 1991-2001

<i>CMA</i>	<i>1991</i>	<i>1996</i>	<i>2001</i>	<i>% increase in proportion over 65</i>
Chicoutimi	9.0	10.7	12.7	40.7
Sudbury	10.3	11.6	13.5	31.3
Trois Rivières	11.7	13.1	15.1	29.0
Edmonton	8.4	9.6	10.5	24.3
Québec	10.6	11.6	12.8	21.0
Oshawa	8.9	9.7	10.6	19.4
Calgary	7.7	8.6	8.9	15.6
Thunder Bay	13.1	13.9	15.1	15.3
Montreal	11.1	11.9	12.7	13.8
St. Catherines	14.8	16.1	16.7	13.1
Ottawa	9.5	10.0	10.7	12.9
Regina	10.8	11.6	12.2	12.5
Hamilton	12.7	13.7	14.2	12.1
Halifax	9.4	10.0	10.5	11.5
Sherbrooke	11.4	12.1	12.7	11.5
Saskatoon	10.3	11.0	11.5	11.3
St. John	9.2	9.9	10.2	10.4
CANADA	11.5	12.1	12.6	9.8
Toronto	10.2	10.8	11.0	7.8
Kitchener	10.1	10.7	10.8	7.4
London	11.9	12.4	12.8	7.2
Winnipeg	12.7	13.2	13.3	4.6
Saint John	12.2	12.5	12.6	2.7
Vancouver	12.0	11.6	11.8	-2.3
Windsor	12.6	12.7	12.2	-2.6
Victoria	18.3	17.5	17.5	-4.8

TABLE 3: CORRELATION BETWEEN SELECTED SOCIOECONOMIC AND AGING MEASURES 1991-96

	<i>popsize</i>	<i>gro91-6</i>	<i>%imm91</i>	<i>incrimm</i>	<i>unemp</i>	<i>lowinc</i>	<i>faminc</i>	<i>dfaminc</i>	<i>dlowinc</i>	<i>dunemp</i>	<i>pct65</i>	<i>c65</i>	<i>a</i>	<i>n</i>
<i>popsize</i>	1.000													
<i>gro91-6</i>	0.364	1.000												
<i>%imm91</i>	0.618	0.691	1.000											
<i>incrimm</i>	-0.065	-0.079	-0.244	1.000										
<i>unemp</i>	-0.056	-0.265	-0.328	0.243	1.000									
<i>lowinc</i>	0.226	-0.401	-0.347	0.160	0.395	1.000								
<i>faminc</i>	0.318	0.628	0.642	-0.216	-0.540	-0.652	1.000							
<i>dfaminc</i>	-0.584	-0.131	-0.097	-0.090	0.105	-0.199	-0.286	1.000						
<i>dlowinc</i>	0.544	0.468	0.428	0.078	-0.172	-0.339	0.589	-0.713	1.000					
<i>dunemp</i>	-0.039	-0.305	-0.455	0.475	-0.188	0.103	-0.095	-0.431	0.211	1.000				
<i>pct65</i>	-0.079	0.010	0.254	0.017	0.013	-0.292	-0.129	0.541	-0.207	-0.068	1.000			
<i>c65</i>	-0.124	-0.414	-0.428	0.060	0.022	0.230	-0.070	-0.460	0.070	0.324	-0.623	1.000		
<i>a</i>	0.259	0.024	-0.070	0.049	0.010	0.193	0.210	-0.533	0.346	0.299	-0.541	0.740	1.000	
<i>n</i>	-0.508	-0.635	-0.537	0.025	0.019	0.094	-0.368	-0.001	-0.334	0.097	-0.229	0.530	-0.179	1.000

Variables:

- popsize* = population in 1991
- gro91-6* = percent increase in population 1991-1996
- %imm91* = percent of population who are immigrants in 1991
- unemp* = unemployment rate for males 25 and over 1991
- lowinc* = percent of families who fall below Statistics Canada's low income cut-off (LICO) 1991
- faminc* = median family income in 1991

- dfaminc = percent change in median family income 1991-1996
 dlowinc = percent change in percent of families below LICO 1991-1996
 dunemp = percent change in unemployment rate of males 25 and over 1991-1996
 pct65 = percent of population over 65 in 1991
 c65 = ratio of percent over 65 in 1996 to percent over 65 in 1991
 a = aging-in-place component of aging 1991-1996 (α)
 n = net migration component of aging (η)

TABLE 4: CORRELATION BETWEEN SELECTED SOCIOECONOMIC AND AGING MEASURES 1996-2001

	<i>popsiz</i>	<i>gro96-01</i>	<i>%imm96</i>	<i>incrimm</i>	<i>unemp</i>	<i>lowinc</i>	<i>faminc</i>	<i>dfaminc</i>	<i>dlowinc</i>	<i>dunemp</i>	<i>pct65</i>	<i>c65</i>	<i>a</i>	<i>n</i>
<i>popsiz</i>	1.000													
<i>gro96-01</i>	0.412	1.000												
<i>%imm96</i>	0.675	0.683	1.000											
<i>incrimm</i>	0.585	0.688	0.979	1.000										
<i>unemp</i>	-0.041	-0.482	-0.390	-0.433	1.000									
<i>lowinc</i>	0.508	-0.049	-0.021	-0.083	0.483	1.000								
<i>faminc</i>	0.089	0.510	0.541	0.559	-0.677	-0.655	1.000							
<i>dfaminc</i>	-0.588	-0.136	-0.175	-0.024	-0.254	-0.533	0.109	1.000						
<i>dlowinc</i>	0.563	0.321	0.499	0.335	0.022	0.106	0.320	-0.713	1.000					
<i>dunemp</i>	-0.015	-0.499	-0.275	-0.335	0.547	0.215	-0.273	-0.431	0.211	1.000				
<i>pct65</i>	-0.209	-0.570	-0.106	-0.063	0.513	-0.057	-0.257	0.347	-0.228	0.358	1.000			
<i>c65</i>	-0.175	-0.451	-0.515	-0.577	0.431	0.207	-0.252	-0.455	0.163	0.571	0.086	1.000		
<i>a</i>	0.290	0.182	-0.016	-0.086	0.133	0.391	-0.027	-0.590	0.365	0.235	-0.368	0.663	1.000	
<i>n</i>	-0.502	-0.770	-0.673	-0.691	0.453	-0.085	-0.311	-0.063	-0.119	0.545	0.455	0.723	-0.038	1.000

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