Changing People, Changing Participation:
Demographic and Behavioral Trends
as a Context for the Future of the Canada Pension Plan, 2001 to 2051

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I. A Maturing Focus on Demography

Much of the focus on population issues in Canada has been, and in some isolated quarters still is, on a single number; the growth rate of the ***total*** population. Historically, population growth was sought after, with cities vied for the title of fastest growing, immigrants from around the globe recruited to settle in the vast spaces of Canadian geography, and the Welcome Wagon visiting new households to help them settle in.

So much for the charm and generosity of earlier days. Now population growth rates are rarely mentioned (as they are at century lows, this is not surprising): when they are, it is generally in a negative context, with conservatives of both the environmental and cultural stripes talking about too many people. As these folks are already here and are not planning to leave, they are really talking about too many *other* people, and, elliptically or not, how to keep them out of their neighbourhood.

Mercifully, the focus of the public and of policy makers is both more mature and more sophisticated: it is not on the single parameter of population ***growth***, but rather on ***change*** in its underlying composition. The reality that some (but by no means all) human behaviour is correlated with age (lifecycle behaviour) means that changes in the age composition of a population may have a much greater impact on public (and private) life than changes in its total size. The awareness of the impact of compositional change now informs discussions of the future of health care, education, labour supply, consumer spending, transit use, tourism, professional sports, real estate, and, of course, pension plans.

This paper provides a summary of projections of demographic change Canada can anticipate over the next half century, based on evidence of trends indicated in data from the past three-quarters of a century. It commences with the consideration of the future implications of the current levels of natality and mortality, labour force participation, and of the current age profile of Canada's population. This status quo projection establishes a baseline to which future changes in these factors can be evaluated.
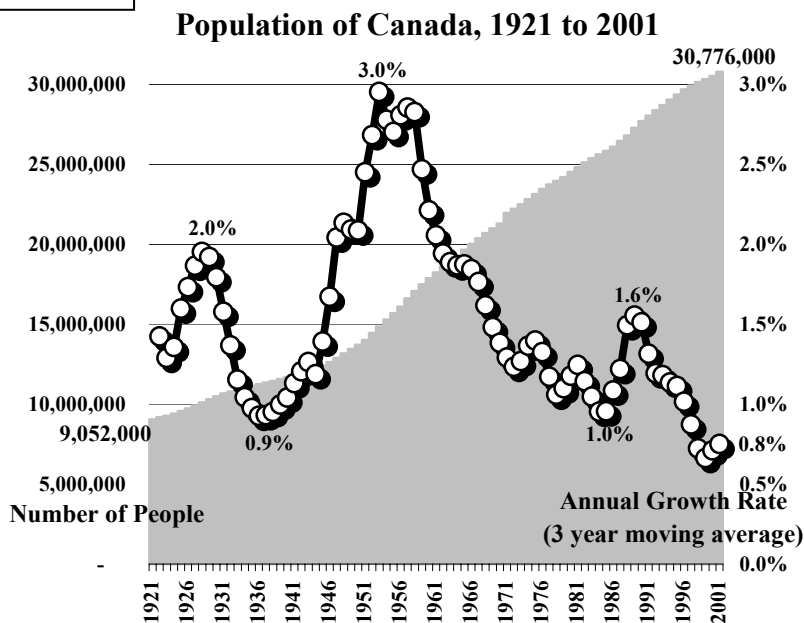
The next sections consider historical change in these variables, along with immigration and emigration, to present projections of Canada's future population composition based on historical trends. The final section gives consideration to the strategic implications of this trend projection as well as a discussion of some of the non-trend changes that might affect this projection in the context of funding inter-generational transfers such as the Canada Pension Plan. Appended is the documentation of the data sources used in the calculation of the values, rates and profiles used in this report.

II. The Starting Point: Canada's Current Population and Its Current Behaviour

A. The Structure of the Current Population.

The population of Canada has more than tripled since 1921, and more than doubled since 1951, growing from 9 million people in 1921 and 14 million in 1951 to almost 31 million people in 2001 (Figure 1). Population growth averaged 1.54% per year over the 1921 to 2001 period and 1.59% per year over the 1951 to 2001 period. The 1990s had the lowest average growth rate (0.7%) in the 1921 to 2001 period, well below the 1.0% average of the Great Depression decade of the 1930s. The highest growth occurred in the 1950s, with an average of 2.5% per year, followed by the 1960s with an average of 1.6% per year and then by the 1940s with an average of 1.4% per year.

Figure 1

Population of Canada, 1921 to 2001
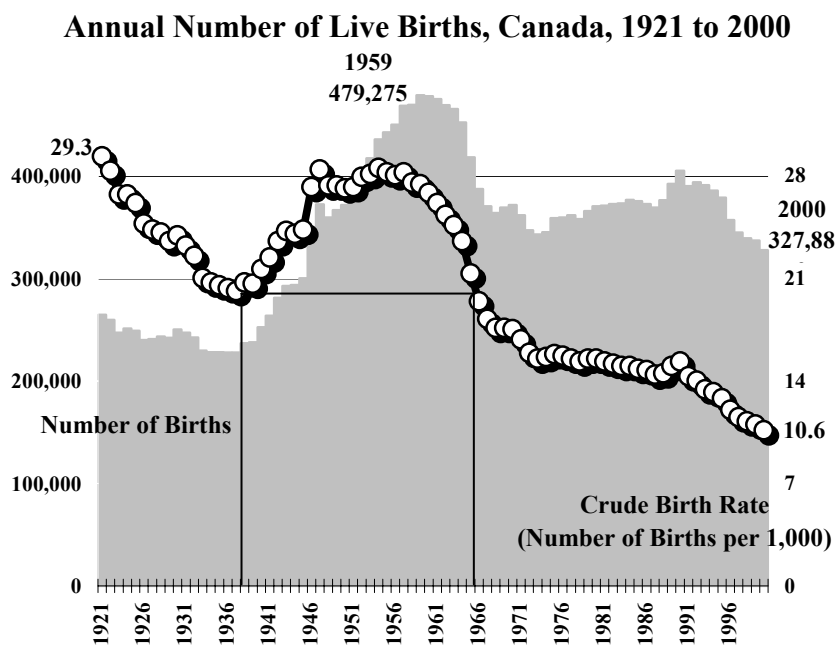
This changing historical pattern of population growth is largely (but not entirely) explained by the changing number and rate of births. The increase in the population growth rate from 1938 to 1953 corresponds to an increasing crude birth rate (the number of births per 1000 population) over this period (Figure 2). In the same manner, the decline in the rate of population growth from 1958 to today corresponds closely to the decline in the crude birth rate from the peak in the late 1950's to today.

Figure 2

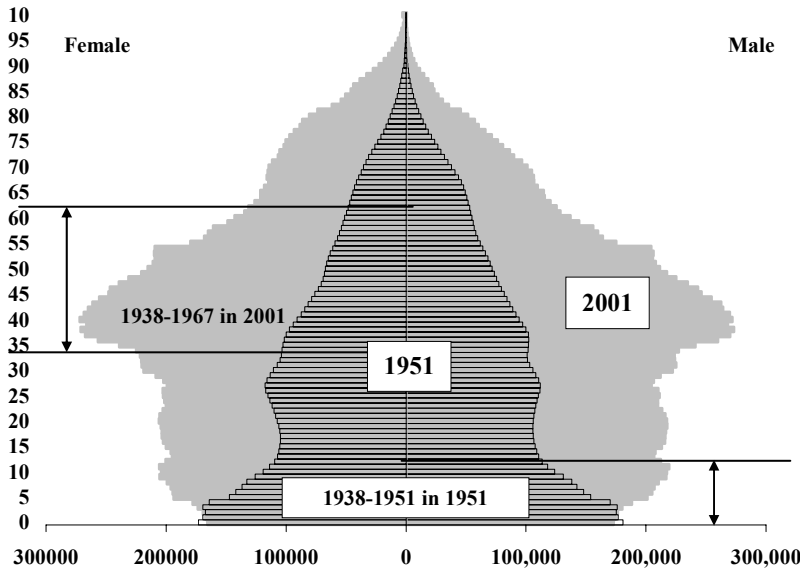**Annual Number of Live Births, Canada, 1921 to 2000**

The historical pattern of births in Canada warrants examination as it sets the stage for the pattern of demographic change over the coming decades. Perhaps the most significant fact is that

the 327,882 births in Canada in 2000, two-thirds of the number born in 1959, was the smallest in the post-World War Two period. There were 7,437,288 births in Canada in the past twenty years, 13% fewer than the 8,527,170 births between 1946 and 1965.

Further, while much of the focus of recent demographic analysis has been on the post-war part of the large number of mid-century births, the beginning of this baby boom was actually in 1938, when both the annual number of births and the crude birth rate began their upward march to their post-war records.

Figure 3

Age Profile of Canada's Population, 1951 & 2001

The current age profile of Canada's population reflects this historical pattern of births. The 30 year period from 1938 to 1967 that was marked by a high absolute level of births and crude birth rates above 20 births per year per 1000 population is shown in the demographic wedge between the ages of 63 and 34 in the 2001 age profile, a cohort that currently accounts for 42% of the population (Figure 3). The beginning of this wedge is shown in the outward flaring of the 1951 age profile under the age of 14. [Note that the "waist" in the 1951 age profile between ages 14 and 26 matches the decline in the annual number of births and birth rates in the post-1926 depression years.]

Figure 4
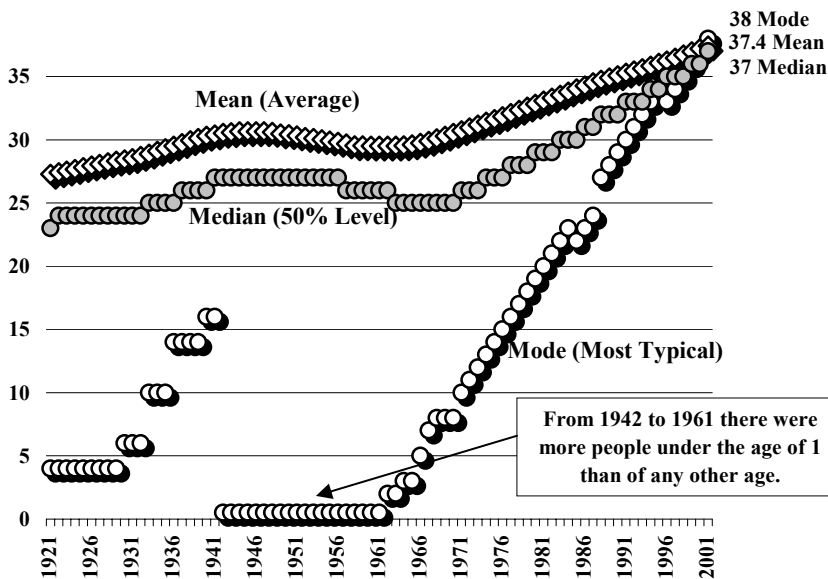
The aging of Canada's population that has resulted from the combination of the decline in the number of births since 1967 and the aging of the 1938 to 1967 baby boom is shown in the difference between the 1951 and 2001 age profiles. For example, in 1951 there were more people under the age of 1 than of any other age group: in 2001 the typical Canadian (most frequently occurring, or mode) was 38 years old. Half of the people in Canada in 1951 were under the age of 27: this median age had risen to 37 by 2001. The average age of the population in 1951 was 30.3 years: in 2001 this mean age had increase to 37.4. By 2001 there were fewer children under the age of 4 in Canada than there were in 1951.

Age Compositon of Canada's Population, 1921 to 2001

The process of the aging of Canada's population that occurred in the past four decades is shown in the pattern of change in the average age: in 1971 the average age passed its previous record high of 30.7 years set in 1946 (Figure 4). Similarly, the median age (50 % level) reached 28 in 1977, passing the previous record of 27 set in the 1941 to 1956 period. The modal (most typical) age reached 17 in 1978, passing the previous record of 16 set in 1941.

The extent to which Canada's population continues to follow the pattern of aging that has been experienced since the end of the Second World War will depend upon how birth, death and migration rates modify the shape of its age profile as its current population changes over the rest of this century.

B. The Behaviour of Canada's Current Population.

In isolation, the future population of Canada would be determined by the size and composition of this current population and the age specific rates at which it procreates and expires. As Canada does not exist in isolation, its future will not be solely determined by its current demography: some people will emigrate from Canada (about 0.2% of the population per year at current rates) while others will immigrate to Canada (about 0.8% or the population per year).

In order to have a base to measure the relative consequences of this migratory component, this section focuses only on the future of the 2001 population and its current behaviour with respect to natality and mortality. A projection which considers only these factors is referred to as a natural increase projection. While unrealistic in open societies such as Canada, such projections are a staple of demographic analysis, as they demonstrate the consequences of the status quo, and hence permit measurement of the impact of trends and factors which take a population away from its current state. In specific, this baseline projection facilitates the assessment of the magnitude of change in Canada's future population and labour force that will be brought about by changes in natality, mortality labour force participation and migration.

1. Current Birth Rates

The crude birth rate is a ratio of the annual number of births to the size of the population: it indicates the relative contribution of births to population growth, but provide no basis for projecting the future level of births. In order to both explain and project the level of births, it is necessary to relate births to population characteristics. This is generally done using age specific birth rates, expressed as the average number of births per 1000 women of each specific age.

Birth rates in Canada demonstrate a clear life cycle pattern of change (Figure 5). Currently the highest age specific birth rate is the average of 110 births per 1000 women aged 28 and 29, with the rates falling off in both directions from this age. Viewing these data in probabilistic terms, women aged 22 and 34 have approximately the same 6.2% propensity to give birth during a year.

Figure 5

Births per 1000 Women in Age Group, 1998-1999 Average
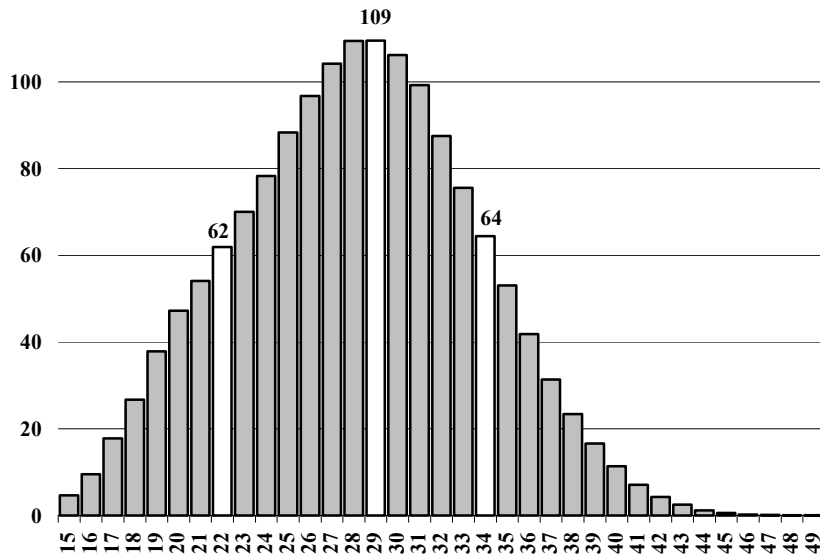
A status quo natural increase projection assumes that this age specific pattern remains constant in the future: if this was the case, this pattern (Figure 5) describes the lifecycle probability of a woman giving birth during her life time. Summing these age specific natality rates equals the average number of children born to women during their lifetime, a statistic referred to as the total birth rate, and currently equal to 1526 births per 1000 women, or 1.53 births per woman.

Figure 6

Average Number of Births Per 1000 Women Aged 15 to 49, Canada, 1921 to 1999
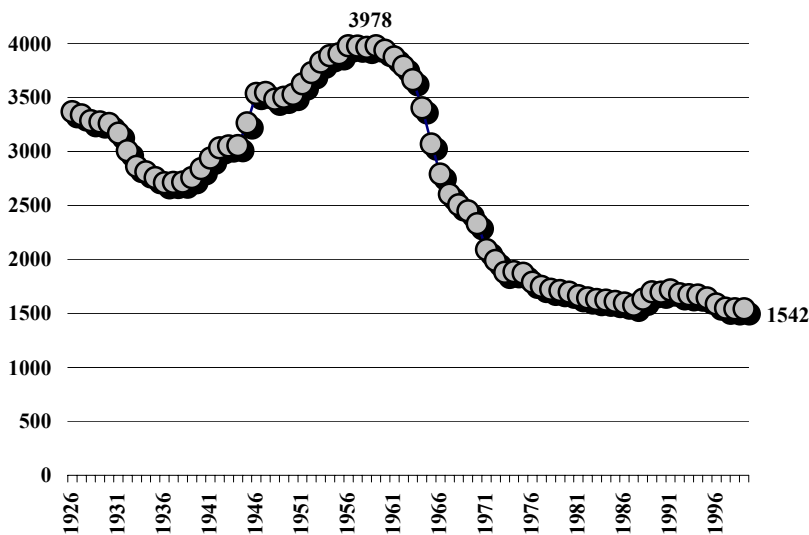
Over the long run, all other things equal and without migration, if the average number of births per woman during her lifetime is above two, the population will both grow and grow younger, as more than two younger people are added to the population to ultimately replace two older people. This is the situation that prevailed in Canada in the pre-1971 period (Figure 6), and which largely (but not entirely) explains the relative youthfulness and growth of Canada's population during this period.

At an average of slightly more than two births per woman during her lifetime, all other things equal, the size of a population will remain constant. As a result, a total birth rate of 2.1 children per woman is referred to as the *replacement level* birth rate.

If, over the long run, the average number of births per woman during her lifetime is below this level, the population will both decline and grow older, as fewer than two younger people are added to the population to ultimately replace two older people. This is the situation that prevailed in the post-1971 period, and which largely (but not entirely) explains the aging and slow growth of Canada's population during this period.

2. Current Death Rates

While without migration below the replacement level birth rates dictate a declining population, this will occur only over the long run. In the short term, the size of a population may still increase if the age profile of the population is relatively young and has long life expectancies. In these circumstances, the date at which the parents leave the population is far in future relative to the births of their (below the replacement level) children. In Canada, such has been, is, and will continue to be the case for about a decade and half, with the demographic wedge of the 1938 to 1967 births not only in the population, but currently between 20 and 50 years away from the final reckoning. Further, the date of final reckoning is continually being pushed further out by advances in medical technology extending life expectancies.

<div style="border:1px solid black; display:inline-block; padding:4px">Figure 7</div>

**Annual Number of Deaths, Canada, 1921 to 2000**
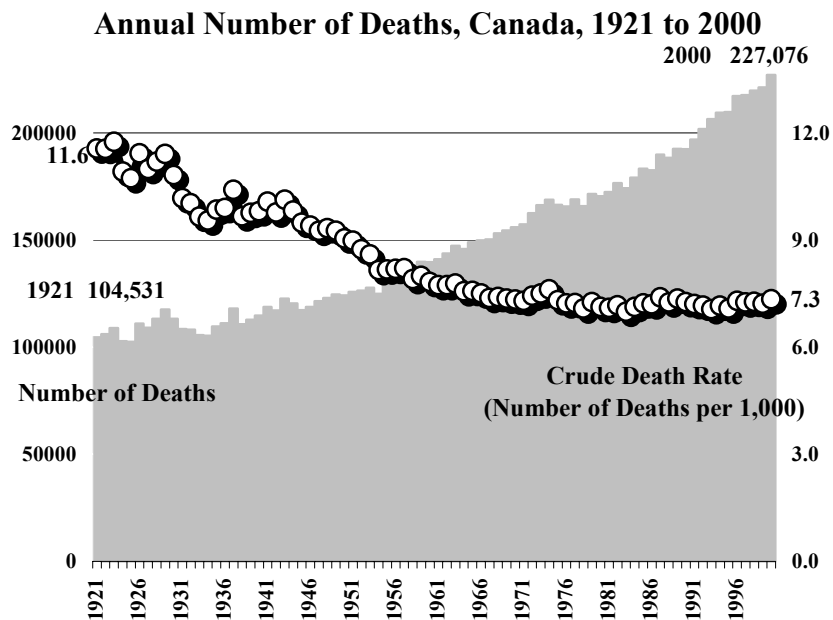
While discussions of the history and consequences of birth rates are now common place, much less attention is given to those of mortality rates. The combination of trends in changes in these rates will soon focus much greater attention on mortality rates: the annual number of births in Canada is declining now at five decade low, while the annual number of deaths is climbing and is at a historical high (Figure 7). The 227,076 deaths in Canada in 2000 were more than twice the number that occurred in 1921. The population in 2000 was more than three times the population in 1921, and hence the number of deaths per 1000 population declined from 11.6 per 1000 in 1921 to 7.3 per 1000 in 2000.

Note that the crude death rate declined during the 1921 to 1978 period and has effectively remained constant since then: this is not to say that deaths rates have not declined since then, but rather that they have declined sufficiently to offset the impact of an aging population which otherwise would have increased the annual number of deaths in the post 1978 period.

The stability of the crude death rate in the 7 per 1000 population range, and the decline in the crude birth rate to the 10 per 1000 range, by 2000 means that births and deaths now have an almost equal impact on population change in Canada. This balancing is shown in the level of natural increase, or the difference between birth and deaths (Figure 8).

Figure 8

### Annual Natural Increase, Canada, 1921 to 2000
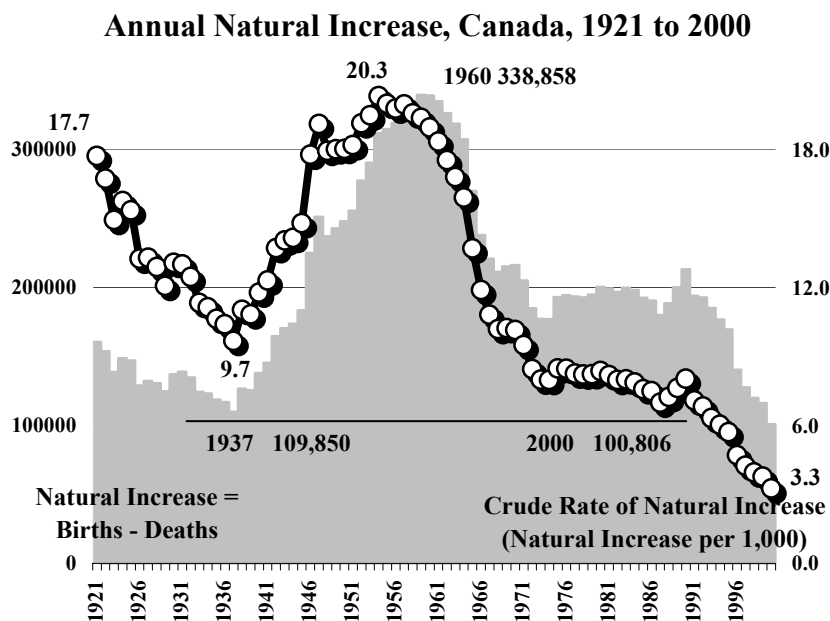
In 2000, there were 327,882 births in Canada, and 227,076 deaths, for a natural increase of 100,806 (3.3 persons added to the population for every 1000 people). This is below the previous absolute low of 109,850 more births than deaths in 1973 (which was a natural increase rate of 9.7 per 1000, three times the rate of 2000). It was also less than a third of the record net difference between births and deaths of 338,858 of 1960, and less than one-sixth of 1957's 20.3 per 1000 contribution of natural increase to population growth.

If the decline in births and the increase in deaths Canada has experienced over the past decade continue, natural increase will soon become natural decrease. When this will occur will depend upon the level of net-immigration: without migration, given the age profile and the current age specific profiles of natality and mortality, this will occur within 15 years, as an aging population moving into ever higher mortality rate age groups will increase the annual number of deaths in Canada.

The correlation of higher mortality rates with increasing age is dramatic, with the probability of adults dying with each successive birthday increasing exponentially over the life cycle. This exponential pattern requires the use of logarithmic scales to show mortality rates for all age groups on a single chart (Figure 9). However, having made this dramatic statement, it must also be noted that the base for such increases is very low.

Figure 9

Age & Sex Specific Mortality Rates, Canada 1998-2000 Average
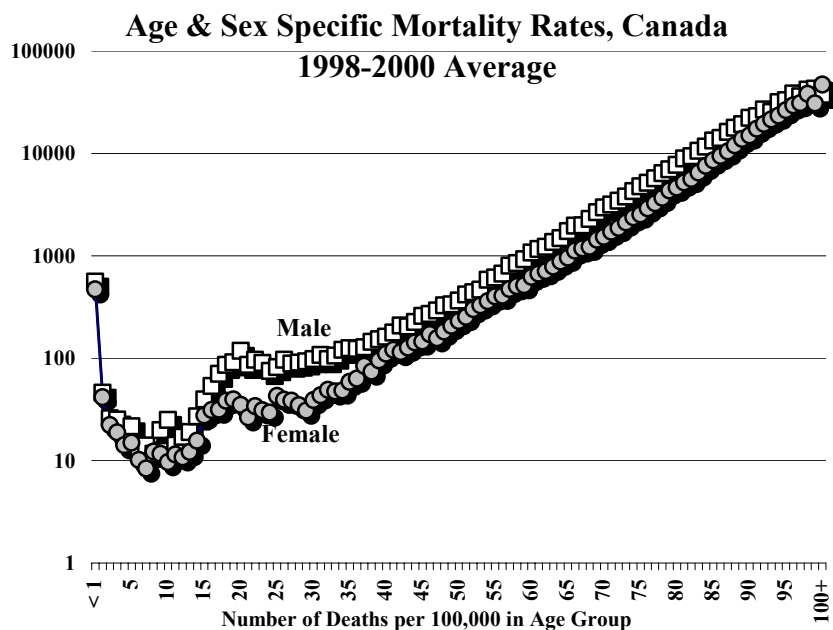
Currently, the demographic wedge of people born between 1938 and 1967 is in the 34 to 63 age group. In this age group women experience annual mortality rates of between 49 deaths each year per 100,000 women aged 34 to 785 per 100,000 aged 63. The rates for males in the corresponding age groups are between 120 deaths each year per 100,000 aged 34 to 1,363 per 100,000 aged 63.
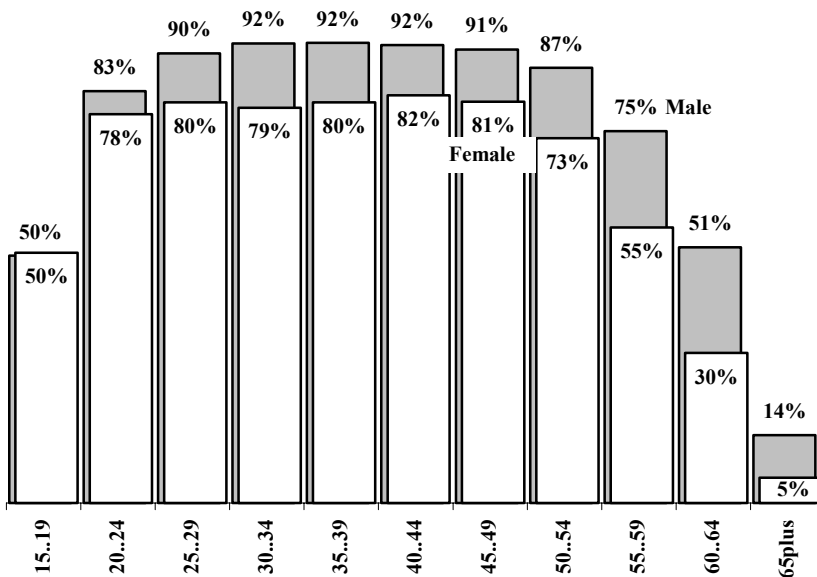
In a decade, this cohort will have aged into the 44 to 73 age group, and will, at today's rates, experience mortality rates that are two to three times higher than they are in there current age range. These will have increased from the 1 in 1000 range for the 34 year olds to 2 in 1000 by the time they reach 44, and from the 1 in 100 range for the 63 year olds to the 3 in 100 by the time they reach 73.

3. Current Labour Force Participation

As the focus of this research is on the relationship between the future potential beneficiary and contributory populations, there is one further aspect of lifecycle behaviour to consider, the age specific labour force participation rate. Labour force participation is here used as a proxy for the magnitude of intergenerational transfers between the working population and the 65 plus population, with the labour force representing contributory, and the population 65 plus representing the beneficiary, population.

The ratio of the population 65 plus to the labour force is used here not only to indicate the relative magnitude of the beneficiary to contributory population (the beneficiary ratio), but also as an indication of changing relative magnitude of other intergenerational transfers, most particularly that which is implicit in Canada's taxpayer financed health care system.

Figure 10

Age & Sex Specific Labour Force Participation, Canada,

Additionally, projected changes in the size of the labour force will provide some indication of the degree to which levels of immigration may change in response to challenges presented by changing labour market conditions.

There is a strong lifecycle pattern to labour force participation, with increasing participation through labour force entry in the 15 to 24 age group, high and relatively constant participation through in the 25 to 49 age groups, and declining participation in the 50 plus age groups as people retire (Figure 10).

With the front edge of the demographic wedge currently aging out of the high labour force participation age groups, and the large bulge of it in the middle of them, future demographic change holds very significant implications for labour supply in Canada, particularly over the next 15 years as all of the 1938 to 1967 cohort enter the retirement stage of the lifecycle.

C. The Future Consequences of the Current Population and Its Behaviour.

The comparative baseline for population projection is established by assuming that the behaviour of the current population – current age specific birth, death and labour force participation rates – prevail in the future and apply these rates to the current population. Once this baseline is described, the relative magnitude of the co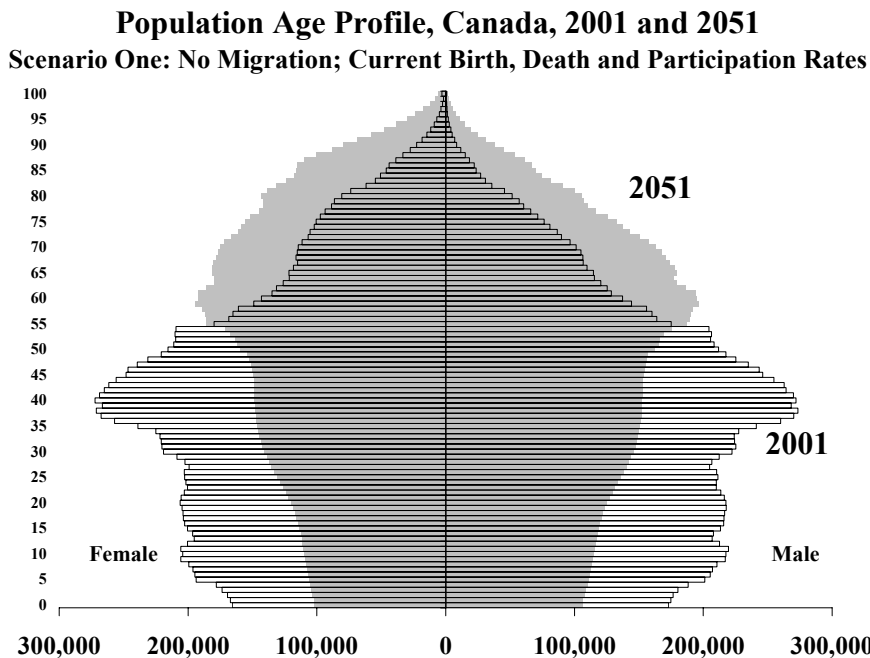nsequences of changes in behaviour and of people migrating into and out of this population can be measured and a trend based projection prepared.

Population and Labour Force in Canada, 2001-51
Scenario One: No Migration; Current Birth, Death and Participation Rates

As anticipated, long life expectancies mean that, in spite of a below the replacement level birth rate, Canada's population would continue to grow (albeit by less than 0.015% per year) for the next 15 years, reaching a population of 31,471,000 by 2016: after that, deaths will exceed births and the population will decline, reaching 25,695,600 by 2051, 16 % of 2001's population (Figure 11).

Under these status quo conditions, the labour force will also grow in the near term, but by very little and not for very long. The labour force would grow to a peak of 16,620,200 in 2008, 301,200 more than 2001's 16,319,000 labour force participants. It would then decline to 11,443,000, with 2051's labour force being 31% smaller that of 2001.

Population Age Profile, Canada, 2001 and 2051
Scenario One: No Migration; Current Birth, Death and Participation Rates


A 17% decline in the total population and an associated 30% decline in the labour force is indicative of the dramatic change in the age structure of the population that the status quo would produce (Figure 12). At current birth rates, without net immigration, the number of births and the number of young people in Canada would decline every year: at current death rates, the number of older people and the number of deaths would increase every year. Overall, there would be

Figure 13

9,243,270 fewer people (a 38% reduction) under the age of 55 in Canada in 2051 and 4,162,710 more (a 62% increase) 55 years of age and older than there were in 2001.

Ratio of 65 Plus Population to Labour Force, Canada, 2001-51
Scenario One: No Migration; Current Birth, Death and Participation Rates
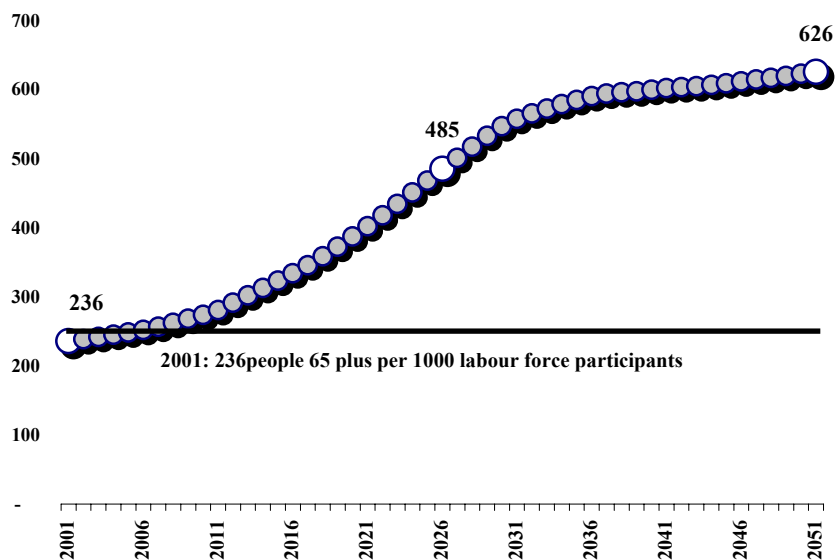
The shrinking of the base of Canada's population will have profound implications on the number of people 65 plus relative to the size of the labour force. Currently, the beneficiary ratio is 236 people 65 plus per 1000 people in the labour force (Figure 13). Without net immigration, the continuation of the status quo will double this ratio from today's 1 person 65 plus for every 4 people in the labour force to a 1 to 2 ratio by 2026, and to a 2 to 3 ratio by 2051. The most rapid increase will be during the 2001 to 2031 period as the 1938 to 1967 baby boom cohort leaves the labour force and enters the 65 plus age group.

This is not a projection of what will happen – it is a statement of the logical consequences of the continuation of current behaviour given the age profile of Canada's current population. This will serve as a measure as the future impact of the trends in behaviour are introduced to produce a trend based population projection for Canada to 2051.

III. The Vital Dimension: Canada's Current Population and Changing Behaviour

Figure 14

Average Number of Births Per 1000 Women Aged 15 to 49, Canada, 1921 to 1999 Actual, 2000 to 2051 Trend
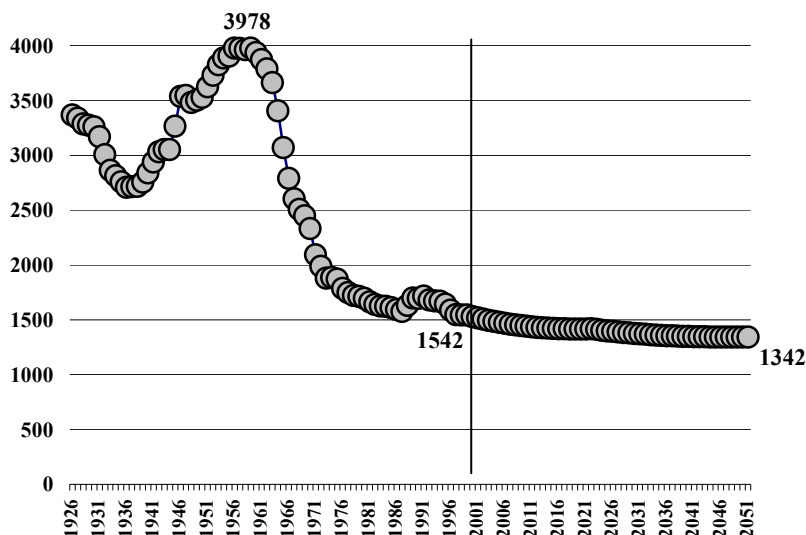
A. The Changing Pattern of Births.
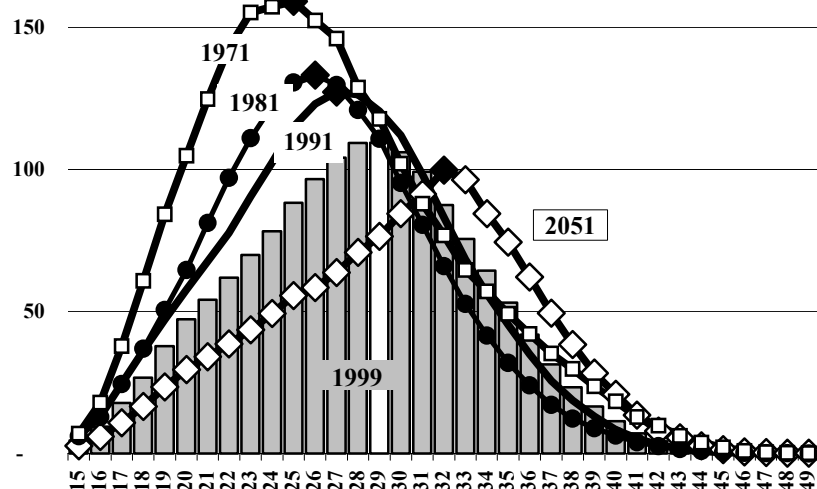
As was pointed out in the preceding section, the propensity of women to have children changed dramatically over the second half of the past century. The magnitude of this change was indicated in the average number of births per 1000 women aged 15 to 49 which declined from 3978 children born per 1000 women 1959 to 1542 in 1999. Most of the decline happened within the 1960 to 1970

period: in the post 1970 period the decline generally continued, but at a slowing rate (Figure 14). If this slowing pattern of decline continues over the next fifty years, the birth rate will reach 1342 births per 1000 women by 2051. While this would see Canada to set record low birth rates each year, the final rate itself has already been achieved in Japan, Spain and Italy, and is being approached in many others.

Figure 15

**Births per 1000 Women in Age Group
1971 to 1999 Actual, 2051 Trend**

Not only would current trends take Canada to a lower average number of births per 1000 women, they would also lead to women having children later in their lives (Figure 15). Over the past thirty years, the age at which women were most likely to give birth during a year has increased as their overall propensity to have children declined. In 1971, the highest propensity was the 159 births per 1000 women aged 25; in 1981 it was 133 per 1000 women aged 26; in 1991 it was the 127 births per 1000 women aged 27; and in 1999 it was the 109 births per 1000 women aged 29.

The aging in the peak of the propensity to have children has been accompanied by a significant reduction in the propensity of women under the age of 30 to have children: some of this was the result of postponement of childbearing, and hence there was a modest increase in the propensities of women over the age of 30 to have give birth. However, the increase in the older age groups has not equaled to the decrease in the younger age groups, and hence the total number of children born per woman declined.

A continuation of these trends would result in a shifting of the highest propensity age group to age 32 and a decline in the propensity for the peak childbearing age group to 99 per 1000 women aged 32. Slightly higher birth rates would also be seen for women over that age of 30, although once again not significant enough to offset the continued decline in the younger age groups. Combined, these changes would result in the decline of the total number of births per 1000 women aged 15 to 49 to 1342 by 2051.
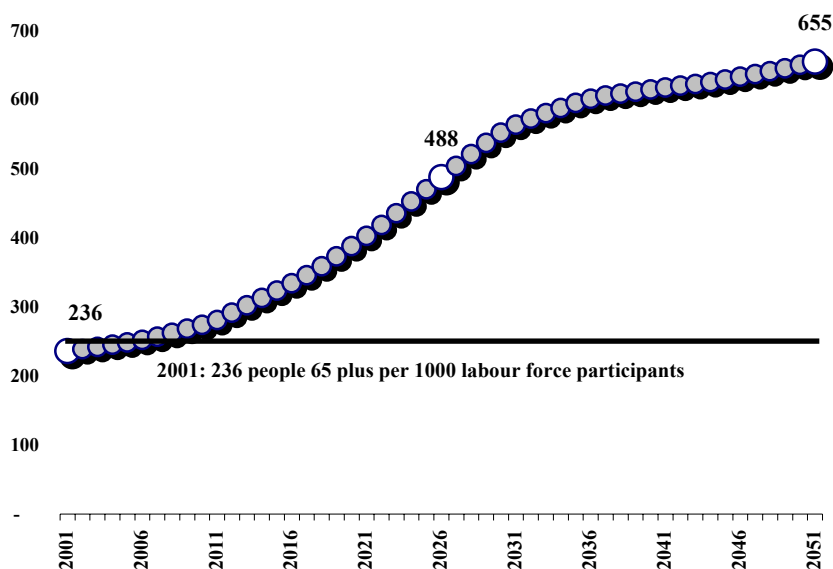
The consequences of continuing historical trends in birth rates would be fewer children born each year, as a result of both lower rates and continued postponement, and hence a smaller younger population in the future than would result from maintenance of current birth rates. All other things equal, this would mean a smaller labour force in the future, and hence a higher beneficiary ratio in the labour force in the future, reaching the level of 655 people 65 plus per 1000 people in 2051, compared to the 626 level for this year in the constant birth rate scenario (Figure 16).

Figure 16

Ratio of 65 Plus Population to Labour Force, Canada, 2001-51
Scenario One: No Migration; Trend Birth, Current Death and Participation Rates

While decreasing birth rates do have an impact on the beneficiary ratio, the impact is relatively small, less than 5% over the 50 year period. There are four reasons for this small impact. The first is that the rate of decrease in births rates is relatively slow, and hence does not have its greatest impact until late in the projection period. Second, the impact of current births on labour supply is lagged the 20 years to labour force entry. Third, in the very long term sense, fewer births today mean a smaller labour beginning in 20 years, and a smaller 65 plus population beginning in 65 years. Finally, but most significantly, the majority of women in Canada today are 36 and older, and have already effectively aged out of the childbearing stage of the life cycle: assumptions about changes in birth rates relate to an ever diminishing portion of the Canadian population.

A similar pattern would follow from any gradual increase in birth rates: it would have an impact, but it would be relatively minor and a long time coming. Certainly a dramatic increase in birth rates, such as occurred in the 1938 to 1953 period would have a significant long term impact (20 years out), but there is no evidence, nationally or internationally, to suggest that such an increase will occur.

Figure 17

Age Standardized Mortality Rates
1926 to 2000 Actual, 2001 to 2051 Trend
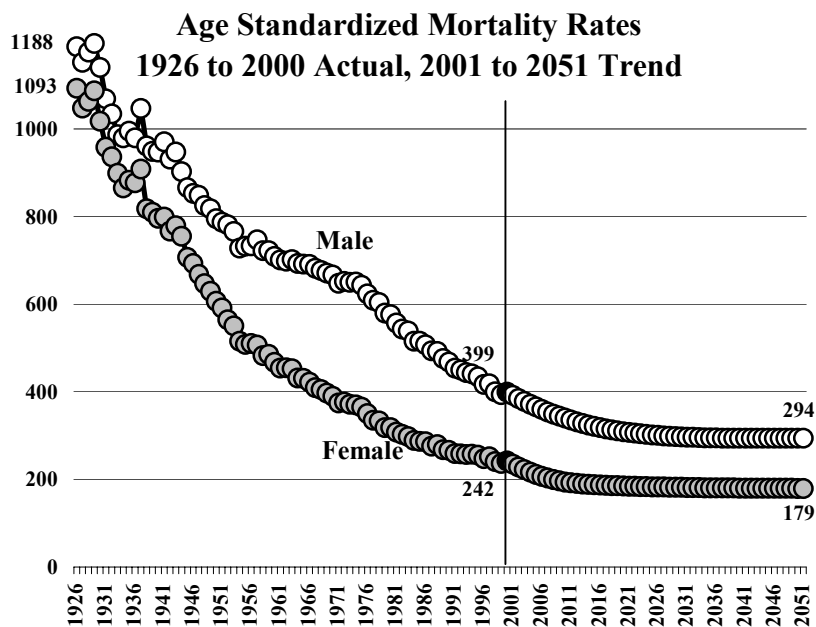
### B. The Changing Pattern of Death Rates.

Death rates have also demonstrated a long run pattern of decline over the past century, with male age standardized mortality rates in 2000 being one third, and female rates being one fifth, of their 1926 level (Figure 17). While these overall declines are impressive, they too have demonstrated a pattern of diminishing returns, with the biggest declines occurring in the 1926 to 1966

period. The age standardized mortality rate changes as a result of changes in the age and sex specific rates for each age group: if these continue their historical trend pattern of a gradual slowing decline, mortality rates for both males and females will have stabilized at three quarters of their current level by 2051.

Future declines in mortality rates will have their greatest impact on the older age groups. There are two reasons for this. The first is that mortality rates in younger age groups are already so low that future declines will not have significant impact on the number of younger people surviving a year: the labour force will be larger, but not noticeably so. In contrast, even small percentage changes in the higher rates for older age groups increase the number of people surviving to the next age significantly. The second reason is the effect of increased survivorship is to carry more people forward from each and every age group to the next older age group: the cumulative effect of a decline in mortality rates is a more than proportionate increase in the size of the older population.

Figure 18

Ratio of 65 Plus Population to Labour Force, Canada, 2001-51
Scenario Three: No Migration; Trend Birth & Death Rates, Current Participation
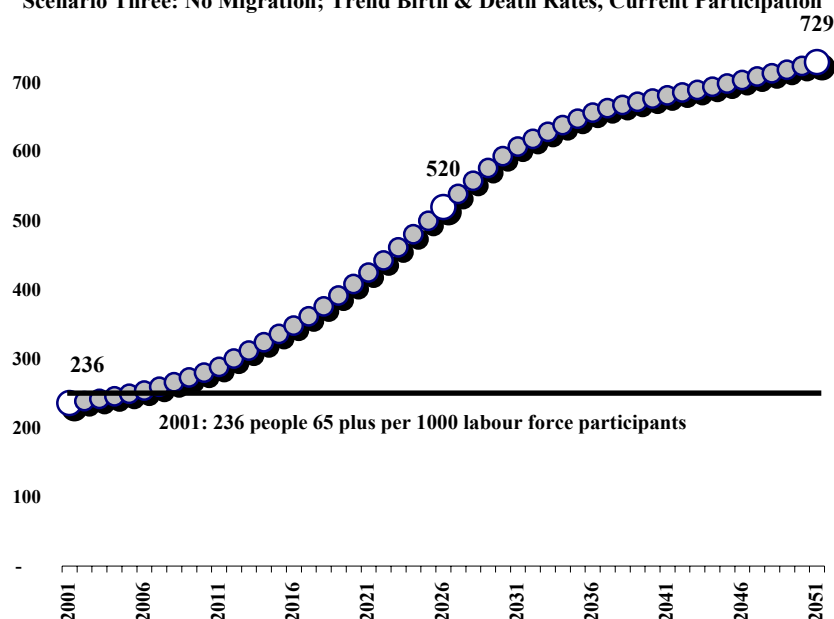
This impact is clearly shown on the projected beneficiary ratio under a trend birth and death rate with constant current participation rate scenario (Figure 18). By 2051, there would be 729 people aged 65 plus per 1000 people in the labour force, 10% more than the 655 per 1000 ratio that would result at today's mortality rates. The magnitude of the impact of trends in mortality rates is much greater than trends in birth rates, largely the result of the current age profile of the population and the cumulative effect of declines in age specific mortality.

**C. The Changing Pattern of Labour Force Participation.**

As with the other age and sex specific rates, Canada has experienced significant historical changes in labour force participation rates, with general declines in the rates for males in all age groups (with marked declines from males in the 50 plus population) and strong increases for women in all age groups.

Having said this, the past two decades have shown a moderation in these long run trends (Figure 19). The rates for males in the 20 to 49 and 65 plus age groups all declined slightly from 1981 to 1996, and then remained essentially constant. The rates for males

Figure 19

Change in Labour Force Participation, Canada 1981-01
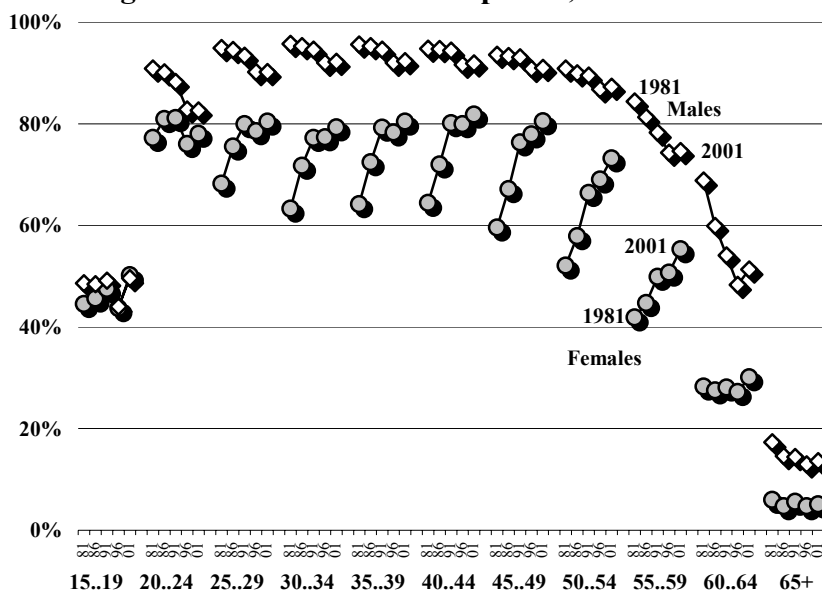
in 50 64 age groups all declined significantly from 1981 to 1996 and then remained essentially constant to 2001.
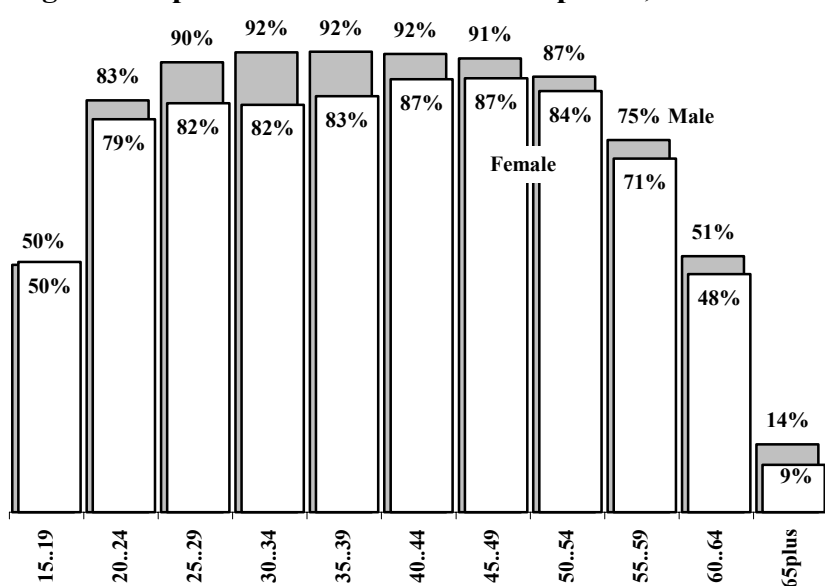
Rates for women in the 25 to 44 and 60 plus age groups all increased significantly from 1981 to 1991, and then slightly from 1991 to 2001. Rates for women aged 45 to 59 all increased significantly from 1981 to 2001, although the greatest increases were generally observed over the first part of the period.

While both the long and short term trends for male age specific participation rates point in a slowly declining direction, given the stabilization of rates from 1996 to 2001 and projected external factors influencing labour supply, education requirements, and investment yields, it was decided to assume that labour force participation rates for males would remain essentially constant at the 2001 level. For female labour force participation rates, the trend that prevailed over the past two decades was continued into the future. This was done by comparing the level of labour force participation of each five year cohort as they moved through the labour force participation life cycle to that of the preceding cohort at the same stage of the life cycle. This approach permitted trend projection of age specific rates assuming that each successive cohort carried its participation propensities forward with it as it moved through the life cycle.
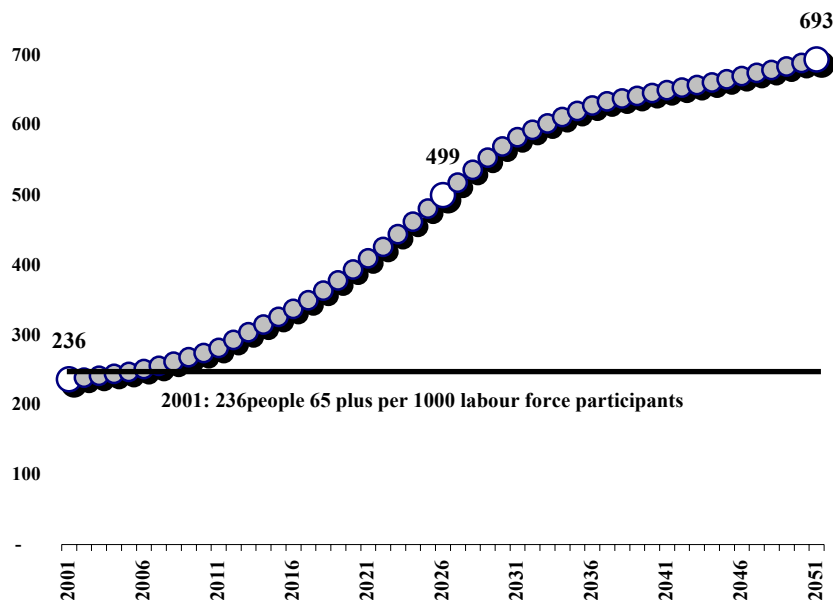
Figure 20

The result was a projection of female labour force participation rates that continued to increase over the next half century, albeit at a declining rate (Figure 20). Rates in the

Age&Sex Specific Labour Force Participation, Canada 2051

younger population remain below those for males of the same age, the result of both the pattern of increase over the past twenty years and the projected pattern of age specific birth rates peaking for women in their early thirties. The gap between male and female age specific rates begins to narrow in the 35 to 39 age group, with only a 3% to 4% difference between them by the time people reached their fifties and sixties.

Figure 21

Ratio of 65 Plus Population to Labour Force, Canada, 2001-51
Scenario Three: No Migration; Trend Birth, Death and Participation Rates

2001: 236people 65 plus per 1000 labour force participants

The consequences of what is effectively an overall increase in labour force participation rates is to reduce the beneficiary ratio by 5% from the 729 people 65 plus per 1000 people in the labour fore with constant participation rates to 693 per 1000. With the current population and trends in both vital and participation rates, the number of people aged 65 plus per 1000 labour force participants would triple over the next 50 years, from 236 per 1000 today to 693 per 1000 in 2051.
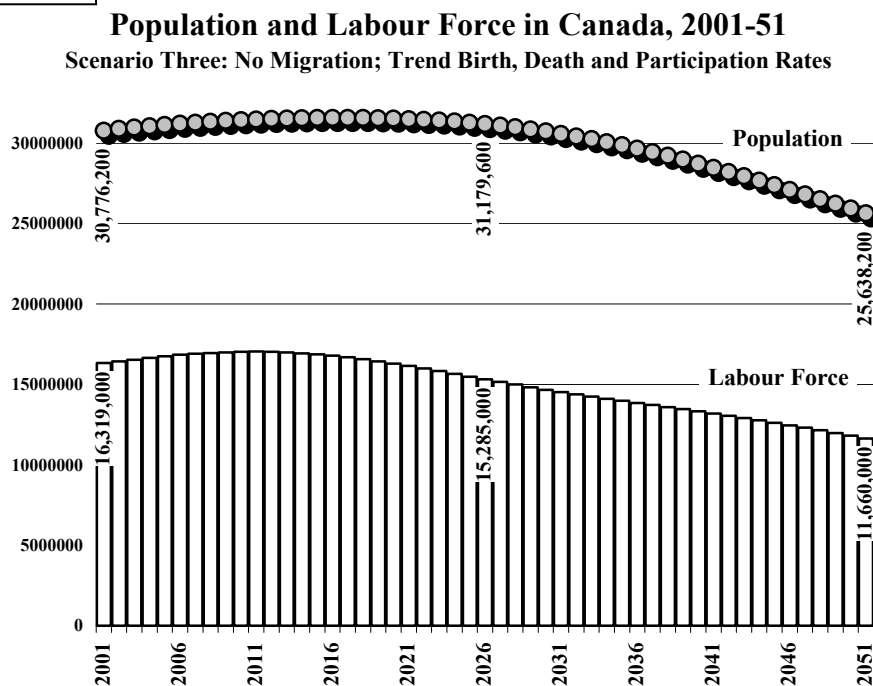
Given the significant increases projected (between 7% for women aged 45 to 49, 60% for women aged 60 to 64 and 80% for women aged 65 plus), the small impact on the beneficiary ratio of changing participation rates may be surprising. Again, it is important to acknowledge that such changes will occur only gradually in the future, that the rates are already at very high levels for most of the population, and that the large demographic wedge is at the cusp of retirement. Without net immigration, there will be a lot fewer people of working age for increasing labour force participation rates to be applied to.

Figure 22

Population Age Profile, Canada, 2001 and 2051
Scenario Three: No Migration; Trend Birth, Death and Participation Rates

2051

2001

Female

Male
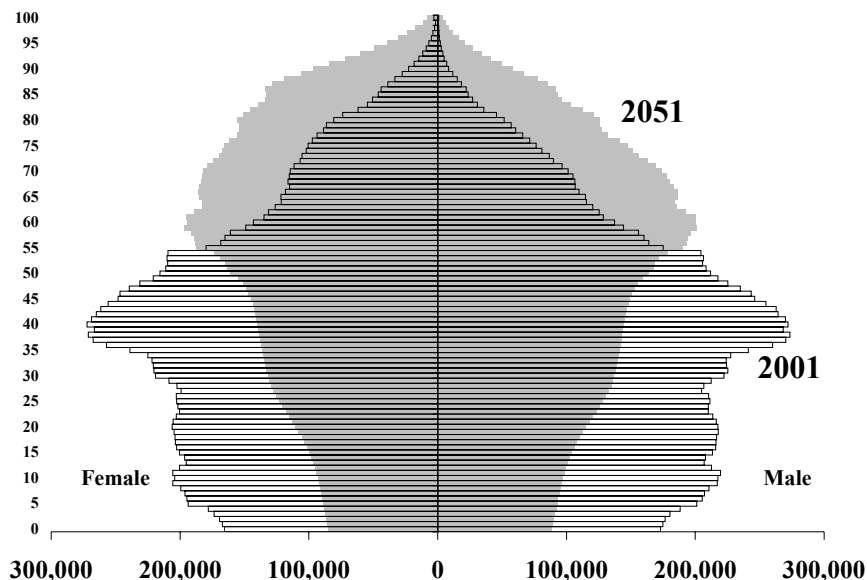
It is important to note the dramatic aging of Canada that would occur without migration given its current population and trends in natality and mortality (Figure 22). All of the 55 plus age groups, would increase, with a total gain of 5.2 million people (76% increase) aged 55 plus, while all of the under 55 age groups would decline, for a total 10.3 million (43%). With health care expenditures overwhelmingly concentrated in the 55 plus age groups, the need to ensure economic growth to pay the bills, but ensuring

labour force growth to provide the workers, both to support economic growth in general, and to provide health care delivery in specific, will become the focus of attention for decision makers in both the public and private sector.

Figure 23

Population and Labour Force in Canada, 2001-51
Scenario Three: No Migration; Trend Birth, Death and Participation Rates

It is in this context that the total size of the labour force also becomes of concern (Figure 23). Without net immigration, the current age profile of Canada's population, and trends in birth, death and labour force participation rates would produce a population in Canada of 25,638,000 (17% smaller than today) and a labour force of 11,660,000 (29% smaller).

If intergenerational transfers from a working aged population to a 65 plus population are to be maintained, more working shoulders to help carry the burden will be required. When contemplating this picture, it is necessary to ask where the nurses and doctors required by this aging population and where the teachers and professors necessary to train the skills that an economy that can pay for the care and services this population requires will be found. Following not only trends, but the very foundations of Canada's development as a country and a community, many of the additional workers will be found outside of Canada.

Net immigration is required not only to keep us supplied with workers, but to sustain funding for intergenerational transfers. The relevant questions are how much we should, and can, attract, and on how many of our current workers we can afford to lose. In the following section, the impact of immigration and emigration on the composition of Canada's population, and on the resultant relationship between contributory working aged population and the beneficiary 65 plus population is measured.

IV. The Role of Immigration and Emigration in Canada's Demographic Change

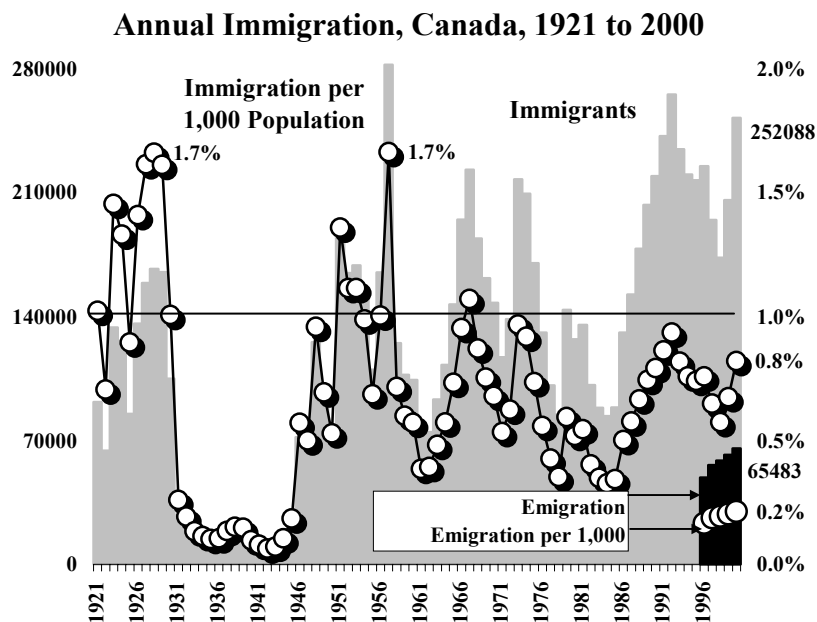### A. Historical Levels and Age Composition of Immigration and Emigration.

Figure 24
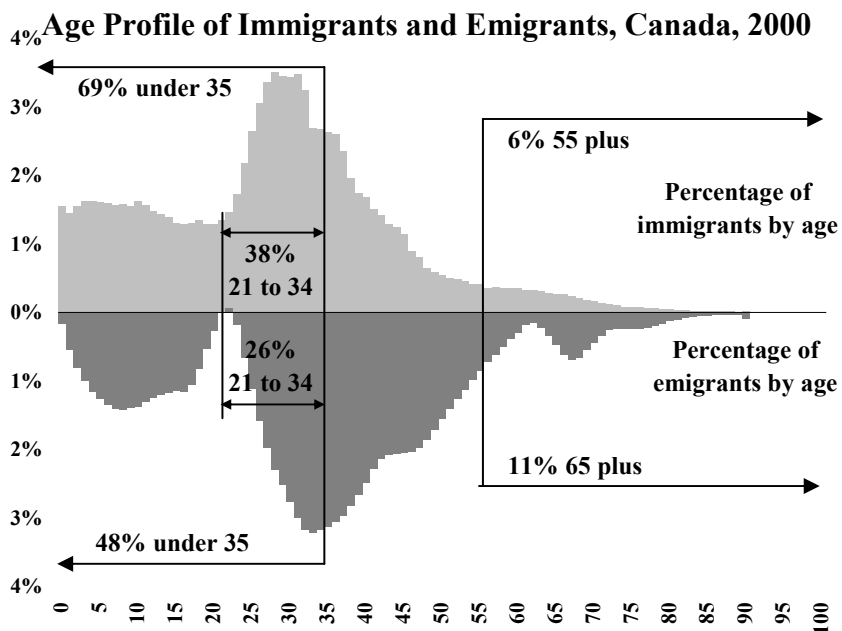
As with total population growth, much of the superficial discussion of immigration focuses on the total level of immigration and its contribution to population change, without giving any consideration to the age composition of the international migration flows into and out of Canada. Yet, as with the total population, it is the age composition of net migration that matters most, it provides an option to supplement births as a source of future young contributors, not only to the Canada Pension Plan, but to other publicly funded expenditures such as health care which rely on intergenerational transfers from a younger to an older population.

Age Profile of Immigrants and Emigrants, Canada, 2000

The immigration flow to and from Canada is, and always has been, overwhelmingly comprised of young people. For example, 69% of the 2000 immigration flow to Canada was under the age of 35, compared to only 48% of the resident population (Figure 24). The immigrant population is concentrated in the young adult stage of the life cycle, with 38% in the 21 to 34 age group, compared to 18% of the resident population. Only 6% of the 2000 immigration flow was 55 or older, compared to the 22% that this age group accounted for in the resident population.

Figure 25

Annual Immigration, Canada, 1921 to 2000

The age profile of the emigrant population is older than that of the immigrant profile, although it is still considerably younger than the age profile of the resident population. Only 48% of the emigrants in 2000 were under the age of 35 while 11% were 65 plus. [The unusual pattern of few emigrants in the 19 to 21 age group is the result of the flow in and out of Canada of students, long term

vacationers and the like – the data on emigration is most correctly described as net emigration data.]

It is this youthful profile that makes the level of both immigration and emigration of demographic significance. The 252,088 people who immigrated to Canada in 2000 equated to an immigration rate of 0.8%, 8 immigrants for every 1000 people in the population. While this was the third highest absolute immigration flow to Canada in the 1921 to 2000 period, the rate was within the 0.5% to 1.0% range generally experienced during the Post World War Two period (Figure 25).

A consistent time series of data on net emigration is only available for the past five years: nonetheless is shows two very significant aspects of the emigration flow. The first is that the emigration rate has increased substantially over the past five years, from 1.65% in 1996 to 2.13% in 2000. The second is that the magnitude of emigration, with 65,483 people emigrating from Canada in 2000, is at a level sufficient to offset a significant portion of immigration: for every four people who immigrated to Canada in 2000, one person emigrated.

Of all of the variables, the future levels of immigration and emigration are the most difficult to project. There is no discernable trend observable in the data, and hence statistics serve little use in the estimation of future levels. A wide range of conditions both in Canada and in other countries influence the flows both into and out of the country. Further, national policies in Canada, in the countries Canada competes with for immigrants, and in the countries that Canada competes with to retain its own population, often impart a variance that cannot be predicted by analysis of demographic variables.

In establishing the levels for future immigration and emigration for purposes of projection of a trend population for Canada, consideration was given to a number of factors, including:
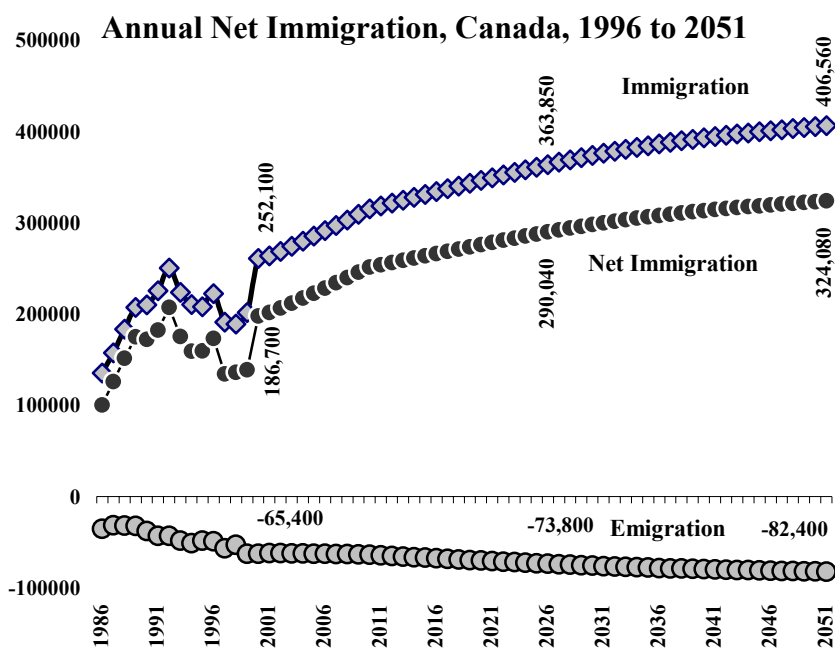
o Canada is facing shortages of skilled trades, educators and health care professionals due to both growing demand and retirement of current workers. For example, in order to maintain the current number of nurses in Canada, over the next decade recruitment will have to be 75% higher than it was over the past decade; recruitment will have to be tripled to maintain the current number of registered nursing assistants over the next decade; increased by 10% to maintain the number of educators; increased by 60% to maintain the number of crane operators; and increased by 25% to maintain the number of firefighters. This suggests that there will be serious consideration given to programs intended to increase immigration to, and reduce emigration from, Canada to help solve labour supply problems.

o The United States of America and many countries in Europe are facing similar shortages of skilled trades, educators and health care professionals due to growing and changing populations. This will increase the competition for immigrants, and

hence set an upper limit on the number of immigrants that Canada is able recruit and retain each year.

- o These same shortages will increase the pressure for emigration from Canada, particularly to the United States, the United Kingdom, Oceania and France.

On the basis of the consideration of these factors and the historical data, it was assumed that Canada would generally remain at the top end of the historical range in immigration, achieving a long run average immigration rate of 0.94% of the population by the end of the decade and maintain this level thereafter. As in the past, there will be short term variance about this level, but this is anticipated to be the long run level that is achieved.

Figure 26

Given the tightening of the labour market that will occur in Canada in spite of this level of immigration, there will be greater efforts made at retention of Canadian workers, even as the global demand for them increases. In this context, it was assumed that the rate of emigration would decline slightly from the current level of 0.21% to stabilize at the 0.19% average established over the past five years. Further, it was assumed that the age composition of both flows would be constant at the average demonstrated over the past decade.

The resulting levels of immigration and emigration will establish records throughout most of the next half century (Figure 26). For immigration, the historical record for immigration was set in 1957, with 282,100 immigrants arriving in Canada: projected immigration will return to this level by 2005. The long run pattern (at a constant 0.94% of the population) is annual immigration increasing to reach 363,850 in 2026, and to reach 406,560 by 2051. The increasing number of deaths resulting from the aging of the resident population will offset the some of the growth due to immigration, and hence both population growth and immigration will slow throughout the projection period.

Under this scenario, emigration will remain relatively constant at the 65,000 level until 2009, and then increase as the population grows, reaching 73,800 by 2026 and 82,400 by 2051. Net immigration, net difference between immigration and emigration, will increase from its current 188,000 range to reach 290,000 by 2026 and 324,080 by 2051.
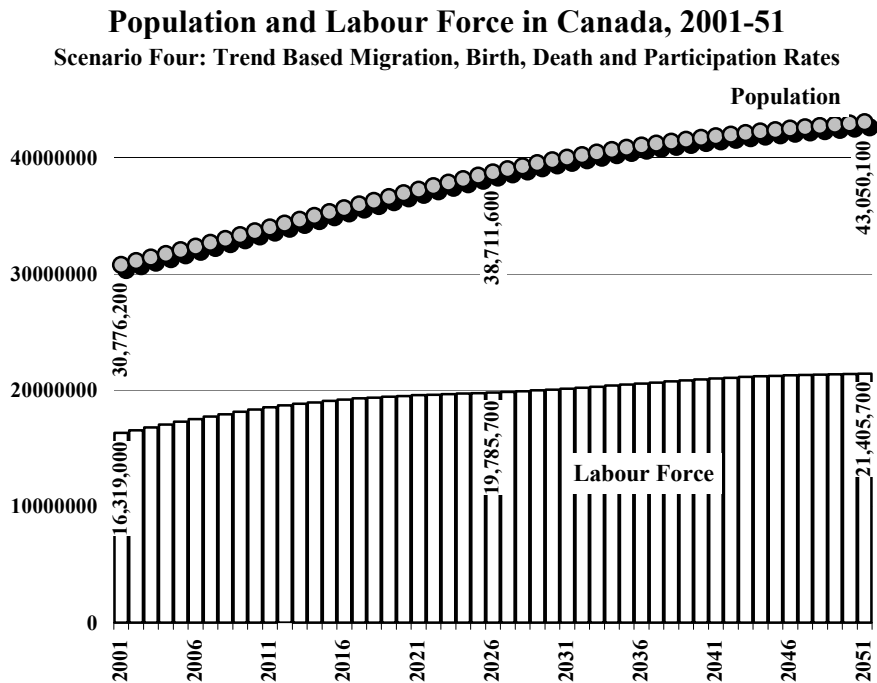
B. A Trend Projection of Canada's Population and Labour Force.

These rates and composition of immigration and emigration, the trended rates of natality, mortality and labour force participation, and the current age profile of Canada's population, would result in a slowly growing population and labour force over the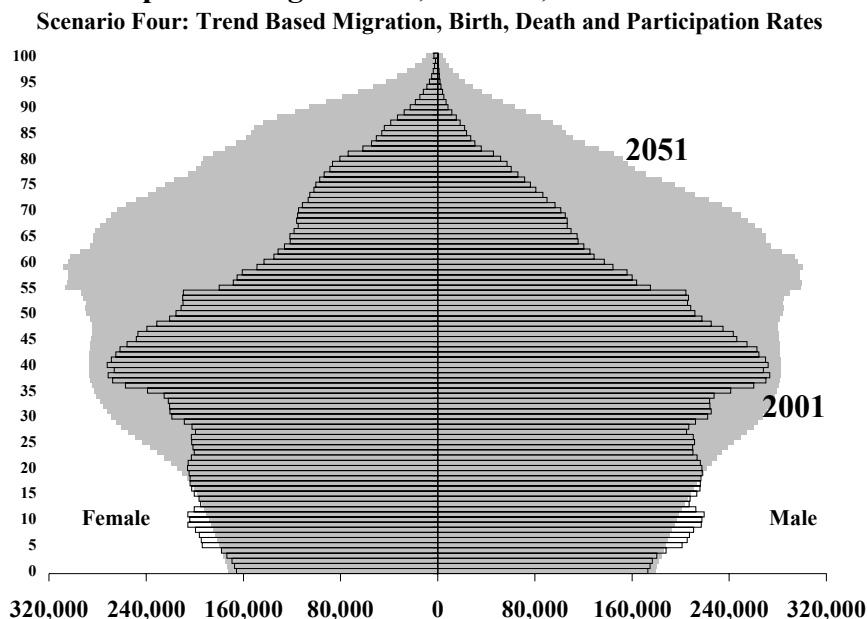 next fifty years (Figure 27). The total population would grow from its current 31 million through 39 million in 2026 to 43 million in 2051. This 40% increase in Canada's population, the result of adding 12.3 million people to the population, would involve an annual growth rate of 0.67% per year, half of the annual growth rate of the past fifty years.

Figure 27

Population and Labour Force in Canada, 2001-51
Scenario Four: Trend Based Migration, Birth, Death and Participation Rates

Even with increasing labour force participation rates and immigration averaging 355,000 per year (net immigration of 280,000 per year), retirement and mortality will result in the labour force growing very slowly over the coming decades. Starting with the current labour force of 16.3 million, a trend projection passes through a labour force of 19.8 million in 2026 to reach a 21.4 million labour force by 2051. Adding 5.1 million people to the workforce over the next fifty years implies at 0.55% average annual increase in labour supply. Clearly, for economic growth in Canada to exceed half a percent per year, given this trend based projection, will require substantial increases in labour force productivity.

Figure 28

Population Age Profile, Canada, 2001 and 2051
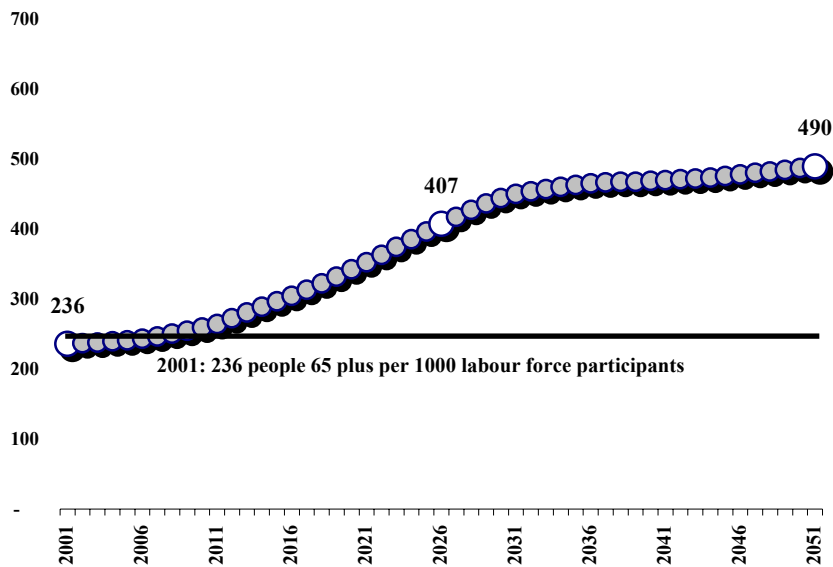**Scenario Four: Trend Based Migration, Birth, Death and Participation Rates**

The contribution of immigration increasing the size of the labour force is the direct result of the younger age profile of the immigrant population. The cumulative

result is a younger population that is slightly larger than it is today, and much larger than it would be without immigration (Figure 28). Under the trend rate and immigration scenario, the population under the age of 55 in Canada will grow by 2.6 million persons (11%) from its current 24 million people to 26.6 million in 2051. Under the trend rate and no migration scenario, this younger population would decline by 10.3 million people (43%). While immigration slows the aging of Canada's population, it does not stop it: the 55 plus population would increase by 9.6 million people (143%) over the next 50 years with immigration, compared to 5.2 million people (76%) without it.

Figure 29

This better balance of growth rates between the older and younger populations is reflected in the beneficiary ratio: with trended rates and immigration, the ratio would increase to 490 persons 65 and older per 1000 people in the labour force, compared to the 693 level that would occur without immigration. Immigration at the 0.94% level will the reduce ratio from more than 2 people aged 65 plus for every three labour force participants to 1 for 2. Presuming that Canada's demand for labour grows at more than 0.55% per year, immigration will not only ensure a growing labour supply, but will reduce the relative load of an aging population on the contributory labour force.

Ratio of 65 Plus Population to Labour Force, Canada, 2001-51
Scenario Four: Trend Based Migration, Birth, Death and Participation Rates

490

407

236

2001: 236 people 65 plus per 1000 labour force participants

Reduce, yes: stop it growing, no. Even with increased participation and immigration, the current age profile of the population combined with decreasing birth and death rates means that the ratio of the number of people 65 plus per 1000 people in the labour force will still double from its current 1 person 65 plus for every 4 people in the labour force to 1 person 65 plus for every 2 in the labour force. Clearly the demography of Canada will require substantial productivity gains throughout the entire economy, in terms of both those making contributions to support social programs and those delivering them, if it is to fund social services in the future even with increased participation and immigration.

V. Conclusions and Strategic Considerations

The current age profile of Canada, created primarily by a 60 year history of first high and then low birth rates compounded by declining mortality rates, will define the context for demographic change in Canada over the next 50 years. Specifically, the aging of the demographic wedge, the 42% of the Canadian population currently between the ages of 34 and 63, will cause the population in the older age groups – where the greatest *utilization* of health care, pension plans, and seniors' discounts are found – to increase much more rapidly than the population in the age groups that overwhelmingly comprise the *contributory* population. Thus, the need to have an economy that can grow to provide the resources to fund these programs, and to have people working to deliver the services, means that both the absolute and relative future size of the labour force are of critical importance.

A number of suggestions have been made on how to deal with this increasing relative burden on the contributory population, many of which are demographic in nature. As illustrated, a continuation of trends in both birth and death rates would both increase, but only marginally, the size of the beneficiary population relative to the labour force.

In the policy context, it is occasionally suggested that increased birth rates will help solve the problem. As illustrated, birth rates offer little in the way of a solution over the next fifty years as a) these rates change very slowly, b) they are lagged by 20 years in terms of labour force contribution, c) they reduce labour force participation during the child bearing years, and d) apply to a diminishing portion of Canada's age profile. Further, increasing birth rates would constitute such a social change, both nationally and internationally, that they are not reasonable in trend projection (although they certainly could be used as inputs to a model). For projection purposes, the practical choice falls between current and trended rates: evidence suggest using the trended rates, although there is only a 5% difference between the result of current and constant rates.

No one is seriously advocating policy to increase death rates, so the projection question is the degree to which they will continue to decline. All other things equal, the impact of going from constant to trended death rates is a 10% increase in the beneficiary ratio, from 626 people 65 plus per 1000 people in the labour force in 2051 at constant death rates to 697 per 1000 with trended (i.e., declining) mortality rates. For planning purposes, it is prudent to use the trend rates, particularly with the health dividends of the human genome and related biomedical research anticipated in the next two decades.

Non-demographic approaches to moderating the shifting balance between an older beneficiary and a younger contributory population generally focus on increases in labour force participation rates. While trends would dictate a continuing decline in all male age specific rates, current circumstances warrant the more conservative assumption that they maintain their current levels. Female labour force participation rates are projected to follow their historical increasing trends, subject to the constraint of effect on participation of childbearing on women both in the childbearing and subsequent child rearing age

groups. It should be noted that the 2001 Census data do not reflect the impact of increasing the maximum EI maternity leave from 6 to 12 months.

Of some interest is the pattern that may be followed in the 65 plus age groups. It is currently popular to argue that people will not be able to retire because of current investment market conditions and/or the sustainability of private pension plans. As with all long term projections, it is important to consider the recent past as it fits into the long term picture: while stock market prices have fallen over the past five years, they currently fit well on a long term growth pattern.

More significantly, the labour force participation rates for the 65 plus population are not yet available on a disaggregated basis: the projected increase in rates for females in the 65 plus population is applied to all women 65 plus, and hence represents a very significant increase in the number of women 65 and older in the working population. Further, the increases in life expectancy that have occurred over the past half century have increased the number of people reaching old age, but they have not increased the maximum number of years humans live: more people are reaching the goal posts, but the goal posts have not been moved. Thus retirement between the ages of 55 and 65 will likely remain an objective for most of the population.

Additionally, the market demand for increased skills and knowledge on the part of both labour force entrants and participants would push full time labour force participation rates down and bring part time rates up, with a net effect of a smaller future labour supply. Finally, but in this context, the rates for both male and female participation in the major working age groups are already quite high, and any reasonable increase in them is likely to be marginal. It is these factors that have shaped the pattern of change in participation in the past, and are likely to do so in the future. Holding male participation rates constant and trending female rates upwards results in a 5% reduction in the beneficiary ratio compared to constant rates. As is discussed further at the close of this section, the projected pattern of change in participation rates is a prudent trade off between the long term and recent pattern in labour force participation rates.

The analysis in the preceding sections showed that trends in immigration levels have the largest impact on labour supply and the beneficiary ratio. As immigration levels are subject to policy, and policy is increasingly reflecting awareness of labour supply issues in Canada, the upper range of the immigration rate was used as the long run pattern for the future. This keeps the rate within that of historical experience, while reflecting the growth in the rate of immigration over the past five years.

The annual number of emigrants per year from Canada is also likely to grow, given the recruitment requirements of the economies of the United States and Europe (particularly in the education and health care sectors). Having said this, to some extent the emigration rate over the 1996 to 2000 period was affected by the high tech bubble and low unemployment rates in the United States during this period, and hence some moderation in the rate may be reasonably anticipated in the near term. For this reason, the

assumption of the emigration rate declining from 0.21% in 2000 to its five year average of 0.19% is reasonable.

Given the sensitivity of labour supply to immigration, three alternative levels of immigration were tested. The first asked the consequence of maintaining immigration constant at its current level of approximately 255,000 immigrants per year: the result would be a 2051 beneficiary to labour force ratio of 538 people aged 65 per 1000 labour force participants, 10% higher than the 490 per 1000 that would result from the 0.94% of population immigration (average of 355, 000 immigrants per year) level used in the trend projection.

The second asked the consequence of immigration at a lower level, in the range of 155,000 immigrants per year: the result would be a beneficiary ratio of 591 persons 65 plus per 1000 labour force participants in 2051, 100 more (20% above) the trend immigration rate ratio of 490. From these two alternatives, it is apparent that there is a reduction in the beneficiary to contributor ratio of approximately 50 people age 65 per 1000 labour force participants for every additional 100,000 immigrants per year.

The third alternative asked the consequence of attempting to maintain the labour force beneficiary ratio at its current 236 people aged 65 plus per 1000 labour force participants: in order to do so would require an unrealistically high level of immigration. The conclusions that can be drawn from this result is that the historical demography of Canada – a very high birth rate in the 30 year period from 1938 to 1967 and a very low birth rate from 1971 to 2001 – imposes on the future the reality of significant increases in the number of people aged 65 plus per 1000 people in the labour force. Trends in birth and death rates will speed the growth of this ratio, while trends in labour force participation and immigration rates will slow its growth – but grow it will.

No single strategy will deal with the consequences of this demographic change for social programs that involve, explicitly or implicitly, transfers from a younger working aged population to an older population. Fundamental to all approaches to deal with these consequences will be a requirement for robust economic growth to provide the resources to devote to the programs, the workers to work in them, and to provide the jobs and payrolls for the labour force who overwhelmingly pay for these programs through taxation and contributions. On this basis, programs will be required that focus on increasing the *participation* of all Canadians in the work force, increasing the *productivity* of all workers, and increasing the *population* of younger workers. In this latter regard, programs that attempt to significantly increase birth rates would have only marginal impact, and death rates will unquestionably continue to decline.

This leaves immigration and emigration: the level of net immigration that Canada seeks will be determined by the degree to which it can support the growth in the beneficiary ratio and labour shortages. The level of net immigration it can attain will depend upon this economic growth, the level of international competition for the workers of both Canada and other countries, and the willingness of Canada to respect the commitment of workers, both newly arrived and home grown, to Canada.

To move from the prosaic to the pragmatic, closing comments with respect to use of projections in determining the sustainability of pension plans are appropriate. Projections should be used in the context of strategic risk management; they describe **a future** that is a reasonable projection of the present and the past, and hence provide a sense of direction about the future.

A sense of direction is not precision, and hence finding ways of dealing with the uncertainty that the future presents is as important as developing reasonable projections of it. Part of this strategic approach to risk is to consider a range of alternatives in order to map out the conditions within which programs are viable, and, more importantly, are not viable. Scenario analysis is a vital tool in the strategic planners tool kit. This provides decision makers with a more robust foundation on which to build successful programs.

Such an approach will encourage decision makers not to rely on assumptions that, while offering a rosier future, are at the edge of current evidence. In this context, prudent, conservative assumptions are that birth and death rates continue to decline at a decreasing rate, that participation increases but at a decreasing rate, that immigration will continue to grow but within the bounds of its historical scale. If a sustainable program evolves from these assumptions, then any positive change in these variables simply provides more options for the future. A program that is only sustainable if trends change dramatically holds much more projection risk, and hence may close out future options.

Data Sources

The historical data used in this analysis and presented here are derived from a large number of sources. In pulling the various sources together into consistent data series for projection and analysis, various adjustments to published values are necessary. As a result, the values presented here may not be precisely the same as those published in some of the source documents.

Historical values for both the size and age composition of Canada's population are derived from Statistics Canada's publications from 2001 Census of Canada (adjusted for the estimated census undercount by the authors), and preceding Census publication from 1921 to 1996, Statistics Canada's Annual Demographic Statistics for 2001 and selected preceding years, Statistics Canada's Population 1921 to 1971, unpublished population counts for Newfoundland prior to 1949 provided by Memorial University, and estimates of historical undercounts provided by Statistics Canada's Historical Statistics of Canada.

Historical values for the total number of births and births by age of mother are derived from Statistics Canada's Annual Demographic Statistics, Statistics Canada's Births, Statistics Canada's Births and Deaths, and Statistics Canada's and The Dominion Bureau of Statistics' Vital Statistics for the period of time covered by these various publications.

Historical values for the total number of deaths and deaths by age and sex are derived from Statistics Canada's Annual Demographic Statistics, Statistics Canada's Deaths, Statistics Canada's Births and Deaths, and Statistics Canada's and The Dominion Bureau of Statistics' Vital Statistics for the period of time covered by these various publications.

Historical values for the level and age composition of immigration and emigration are from Statistics Canada's Annual Demographic Statistics and Immigration Canada's Facts and Figures: Immigration Overview for the period of time covered by these various publications.

Labour force participation rates are from Statistics Canada's 2001 Census of Canada (for the 1981 to 2001 period) and from preceding census publications for the 1921 to 1981 period.