

A Prescription for Growth: The Demographic and Economic Context for Sustaining British Columbia's Health Care System

by David Baxter

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A Prescription for Growth:

The Demographic and Economic Context for Sustaining British Columbia's Health Care System

by David Baxter, November 2000

Preface

There is no need to have a two-tier, privatized health care system in British Columbia, although we may choose it. As the following report shows, future economic growth that is well within the range that the province achieved over the 1961 to 1989 period will ensure that resources are available to sustain, and improve, the current publicly funded universal access system. This report does not advocate any particular system of health care, nor does it suggest that the current system cannot be made more efficient or equitable: it simply shows that if we have healthy economic growth, we will have the opportunity to choose the kind of health care system we want. If we do not have healthy economic growth, we will not have the choice.

The opportunity to choose brings with it choice, either by design or by default. The recent history of health care in British Columbia has largely been one of choice by default. For example, the shortage of nurses that caused the loss of a liver transplant opportunity last week and the closure of operating rooms this past summer is the cumulative result of decisions made over the past decade, decisions which ignored the warnings of an impending shortage given by nursing associations in 1994. The current crisis in the health care system is the result not of inherent flaws, but rather of piece-meal, ad hoc decisions being made without consideration of systematic or long run consequences: it is the logical consequence of not having a plan.

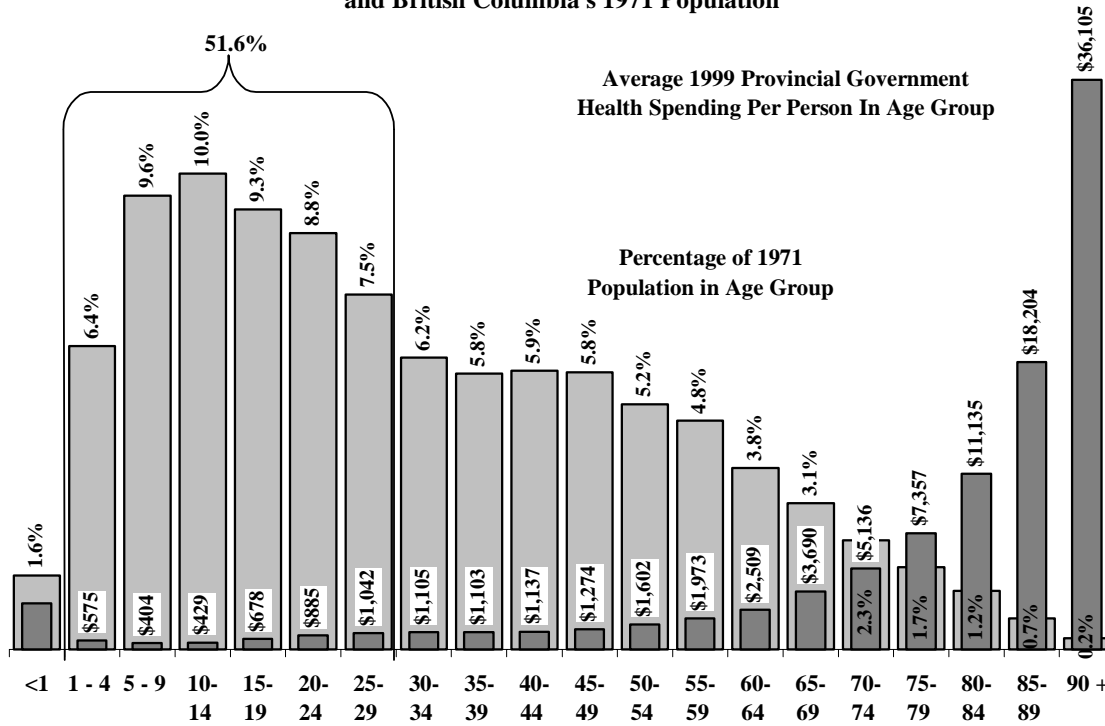
The first step in overcoming the crisis will be to articulate a realistic, long run, system wide strategic plan for health care delivery in the province. Such a plan will, effectively, express the choice of the kind of health care system we want and what we must do to attain it. To make the choice, it will be necessary to determine the consequences of each of our alternatives by both projection of the future under different scenarios and research into the relative success of other models of health delivery. In this latter regard, it is likely that we will find that other places have no better handle on the problem than we have, particularly when much of the increase in health care demand is driven by population aging. For example, infatuation with the US health care system will likely pale when it is acknowledge that health care spending in the United States is projected (by the Office of the Actuary of the U.S. Health Financing Administration) to increase by 42% over the next 5 years compared to a 5% increase in population.

If British Columbia's economic growth returns to that of the 1960 to 1989 period, it can afford to choose the health care system it wants. The choice should be informed and by design.

A Note on Growth Scenarios: Two scenarios for economic and demographic change are presented in the report: both are based on empirical evidence of change that the province has achieved in the past. The critical economic assumptions concern employment growth that facilitates declining unemployment and increasing productivity, labour force participation and labour force mobility. Clearly, other scenarios can be created by using different combinations of values for these variables. For example, in the second scenario it is assumed that employment growth will lead to a long run unemployment rate of 3.7% and employment productivity increases of averaging 0.49% per year. Both of these have been achieved in the past in British Columbia. It might be argued that unemployment rates in this range can no longer be achieved in

B.C. (although they do prevail in the United States, Britain and Ireland): this in no way denies the fact that economic growth in the province can sustain the current health care system. For example, if the long run unemployment rate in B.C. was 5% (the current rate in Alberta, Saskatchewan, Manitoba and Ontario), all other things equal, annual increases in employment productivity of 0.55% (the average of the past four decades) would sustain the current health care system with less required labour force growth than the 3.7% unemployment rate scenario, as would a 0.77% annual increase in productivity (the 1961 to 1989 average) and a long run unemployment rate of 6%. Investment in increases in employment productivity is critical to the economic growth that will sustain health care. It is the spirit of ensuring that economic growth is sufficient to sustain health care, rather than the letter of any one scenario, that this report seeks to convey.

Figure I: The Age Pattern of B.C. Provincial Government Health Care Spending and British Columbia's 1971 Population



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Summary

Can British Columbia's health care system be sustained in its current form in the future? Given the present environment of crisis within and about the system, it is tempting to simply assume that it cannot be, and hence must be changed. Upon careful examination, however, such a reactionary assumption is wrong: the current system can be sustained, and even improved, by economic growth of a level achieved in the past.

The demands placed on the system in the future by an aging population will be enormous, as health care demand is largely driven by changes in the age composition of the population. The extent of the challenges the system will face in the future is shown on the accompanying charts. Figure I shows the age pattern of provincial government per capita health spending in each age group of the population. It also shows the age profile of the province's 1971 population, the year when all provinces in Canada first had health care plans. What a wonderful time to introduce universal health care: 51.6% of the province's population was in the 1 to 29 years of age groups where per capita health care cost are lowest, with only 13.1% in the most expensive 60 and older age groups where annual health care spending is above the \$2,000 per person annual average.

In the past 30 years, the province's population has middle aged. The low cost 1 to 29 age groups accounted for only 37.6% of the 1999's population, while the still below average cost 30 to 59 age group's share increased from 33.7% to 44.3%, and the 60 plus population increased to 17.0% (Figure II). Along with significant increases in the consumption and cost of health care, this aging led to an increase in provincial government health care spending from 4.4% of GDP in 1975 to 6.8% in 1999. The increases in health care demand already experienced are insignificant compared those that the health care system will face in the future as the current residents of the province age into the high cost 60 and older age groups (Figure III).

Figure III: The Age Pattern of B.C. Provincial Government Health Care Spending and British Columbia's 2030 Population Without Migration

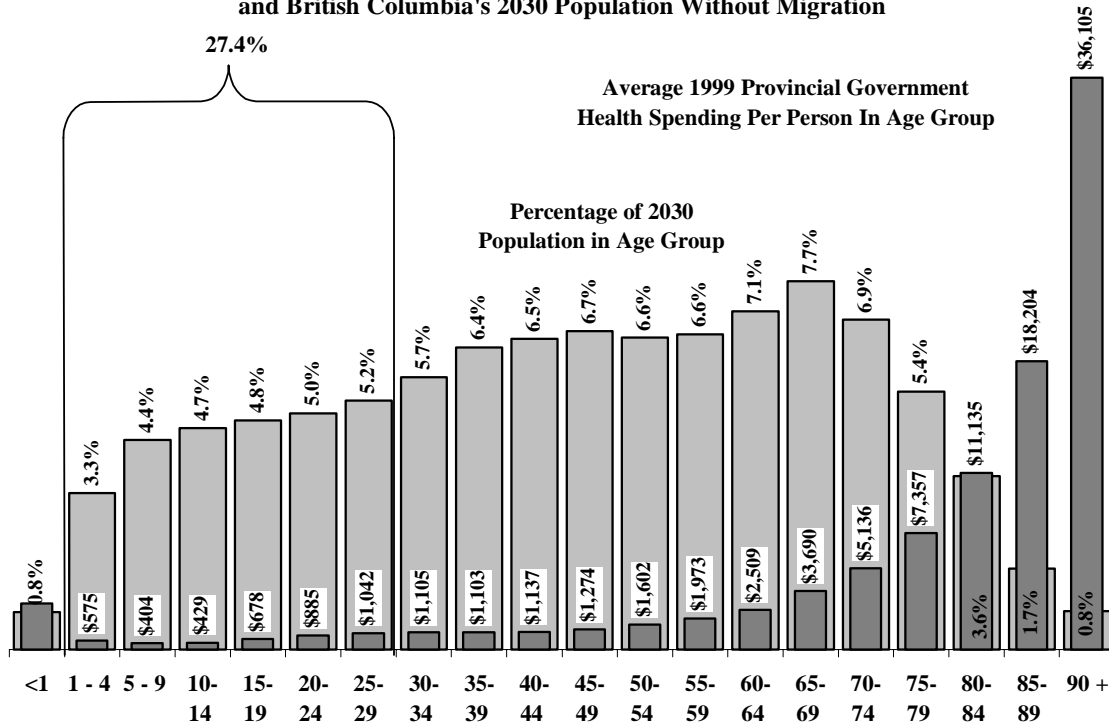


Figure III shows the age profile of the province three decades from now ignoring the migration to and from the province: the reason for considering a no-migration scenario, apart from it being close to the current situation, is that it identifies the contingent future health care costs latent in the age profile of the current population. The demographic wedge, the 40% of British Columbia's current population that is in the 35 to 64 age groups, will be 65 or older in 30 years. Given the province's below the replacement level birth rate (an average of 1.5 children per woman during her lifetime) and long life expectancies (80 years and increasing), without net immigration of younger people, the province's population will both decline and get much older. Without migration, only 27.4% of 2030's population will be in the low cost 1 to 29 age groups, and only 38.5% will be in the medium cost 30 to 59 age groups. The high cost 60 and older age groups, in contrast, will increase their share of the population to 33.4%, twice the current share of 17.0%.

Today there are 188 people 65 years of age and older per 1000 people of working age (15 to 64): given the age specific pattern of health spending, change in this elderly dependency ratio is a good measure of the change in demand for health care. Without migration, the elderly dependency ratio in B.C. in 2030 would be 433 people 65 years of age and older (today's 35 plus population) per 1000 people of working age, representing a 2.3 times increase in the support required from the working population for the health care system. There is no realistic way the health care system could be sustained under this increase in demand: change would be not only required, but inevitable.

The choice will be what changes should be made. While some may be interested in changing the health care system, it will be hard to find a better system in the context of dealing with the demands on health care that result from an aging population. For example in the United States, where 90% of seniors' hospital bills are already paid by the public sector, recent experience indicates that their model has not worked particularly well in this context, as this quote from

Business Week indicates:

“In the nation’s epic battle against the rising costs of Medicare and other health programs, it was conventional wisdom that only the marketplace could save us. Entice seniors and other Americans into health-maintenance organizations and other private-sector plans, and the invisible hand of competition would tame health care inflation. ... But now the marketplace doesn’t seem so smart. Health-care costs are nearing double digit annual growth again ... health-care insurers with so-called Medicare+Choice plans are dropping seniors in droves, claiming they can’t make money on the business. ... they will cut loose an estimated 750,000 seniors at the end of the year ... others are raising premiums.”
(John Carey, “Managed Health Care Isn’t Healthy After All” Business Week, July 24, 2000 page 40, emphasis added)

This report shows that rather than focus on change within the health care system, the source of sustainability will be found outside of it. This is not to say that change within the system is not necessary for other reasons (to make it better in terms of service delivery, health outcomes, efficiency, or equity), but rather that the key to sustaining the health care system, in terms of both per capita spending and as a percentage of real gross domestic product, will be found in economic change, specifically in employment growth.

Today’s health care system can be sustained if, at a minimum, economic policy ensures that investment and employment growth occur at a level that will permit the following economic and demographic change (as compared to the change that occurred over the past 40 to 50 years, Figure IV):

1. The unemployment rate declines to 3.7% (the 1950’s average compared to 1999’s 8.3%);
2. Employment productivity increases at an average annual rate of 0.49% (lower than the 0.55% average annual increase of the past 4 decades);
3. The labour force as a percentage of the total population (overall labour force participation) increases at an average annual rate of 0.1% (which averaged 0.6% over the past 5 decades);
4. Real GDP per capita increases by 0.7% per year (averaged 1.6% over the past 4 decades);
5. Employment increases average 1.5% per year (3.1% average over the past 5 decades);
6. The labour force increases by an annual average of 1.4% (3.2% over the past 5 decades);
and
7. The population increases by an annual average of 1.3% (2.6% over the past 5 decades).

In each case, the required change in the future is less than it has been over the past 4 to 5 decades: these are attainable goals that will sustain health care.

Figure IV: Required Demographic and Economic Change to Sustain British Columbia's Current Health Care System

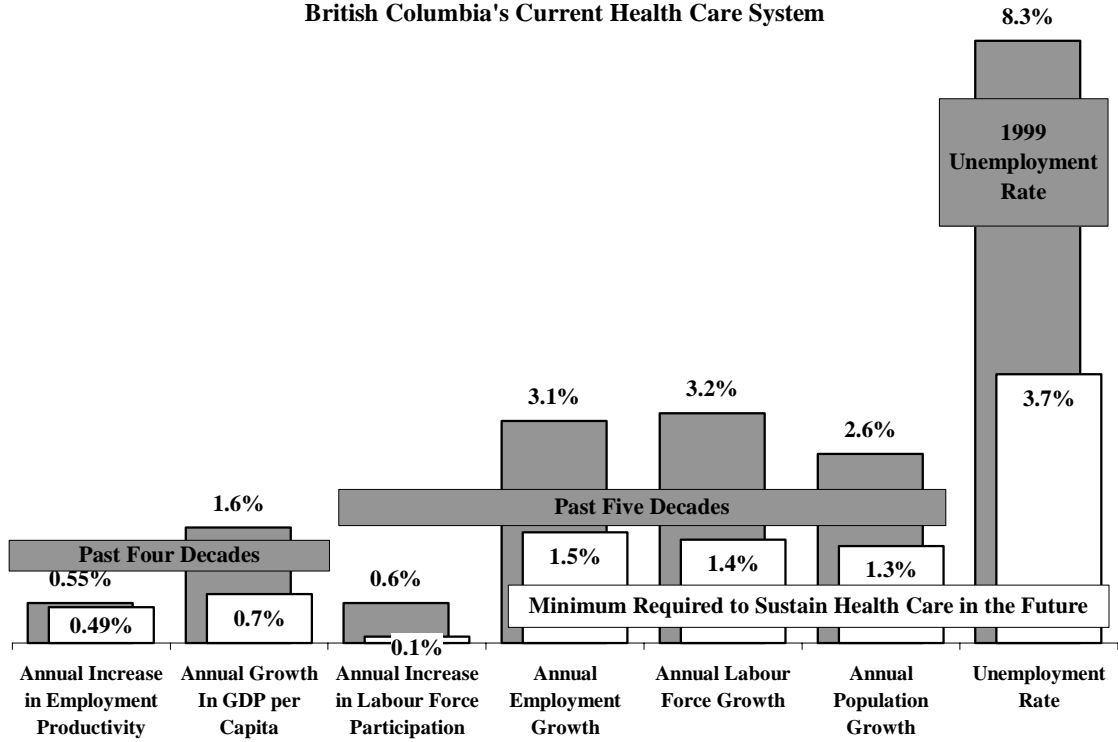
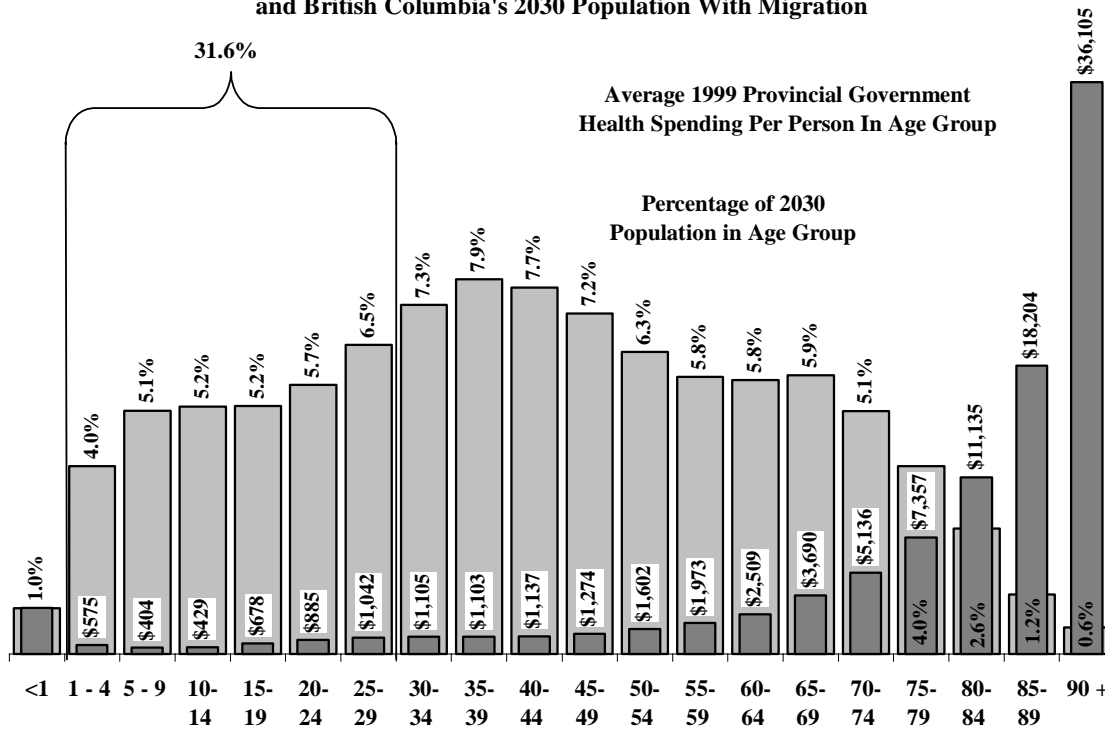


Figure V: The Age Pattern of B.C. Provincial Government Health Care Spending and British Columbia's 2030 Population With Migration



This economic change will be supported by migration and its accompanying demographic change, which will make B.C.'s population younger than it otherwise would be (Figure V). The

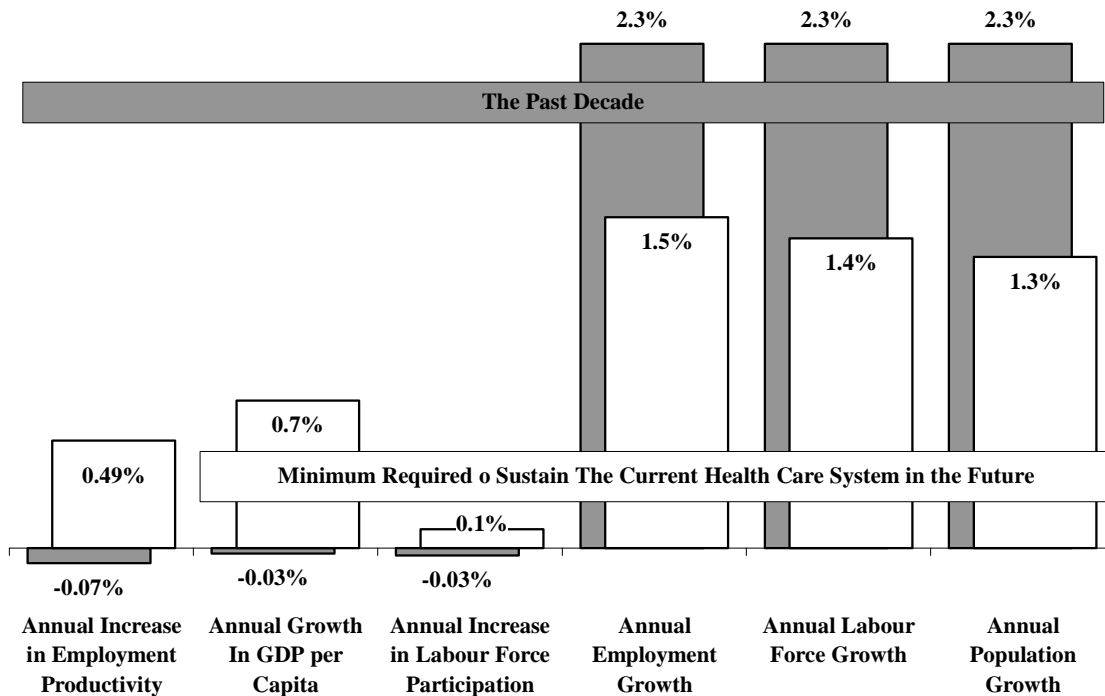
minimum growth required would mean that in 2030 31.6% of the population was in the low health care cost 1 to 29 age groups (compared to only 27.4% without migration), 43.2% in the medium cost 30 to 59 age group (only 38.5% without migration) and only 25.1% in the high cost 60 plus age groups (33.4% without migration).

Note that in order to sustain the current health care system, it is not necessary to have migration that ensures that the current age profile is maintained: if the required economic changes occur, the 60 plus age group can increase to 25.1% of the population, compared to today's 17.0%.

Investment in increasing employment productivity and labour force participation and reducing unemployment, together with increasing the number of people of working age in the province and ensuring that there is work for them, will sustain the health care system in the context of an aging population.

In order to do so, however, will require economic change that is greater than it has been over the past decade (Figure VI). It will be necessary for employment productivity to increase by 0.49% per year, not to decline by 0.07% per year as it has over the past decade; it will be necessary for labour force participation to increase by 0.1% per year, not decline by 0.03% per year; and it will be necessary for real GDP per capita to increase by 0.7% per year, not decline by 0.03% per year as it has over the past decade. If these changes occur, then the level of employment (1.5% per year), labour force (1.4% per year) and population growth (1.3% per year) in the future can be lower than they averaged over the past decade

Figure VI: Required Demographic and Economic Change to Sustain British Columbia's Current Health Care System



Change must, and will, occur: the question is where? If sufficient economic and demographic change occurs, then the level of health care in the province need not be reduced. To the extent that these changes do not occur, the level of health care in the province will be reduced.

The choice is ours to make. We can work to ensure that the required investment and employment

growth and change occur, and welcome their benefits, the sustaining of our health care system, and population growth and change in our communities. If we do not, the current crisis of confidence in the sustainability of our health care system will become as self-fulfilling prophecy, and we will have to accept the currently unknown consequences of a dramatic change in our health care system.

The health care system in British Columbia can be sustained – if we pursue the investment and economic growth necessary to provide the resources it requires. It can be done, but it will require every policy that affects investment and employment growth to be considered in a sustaining health care context. Let's do it.

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I. Introduction.

There is unquestionably a sense of crisis in, and about, British Columbia's health care system. Over the past months widespread concerns have been expressed about everything from shortages of doctors and nurses; to wages, fees and payments for medical practitioners; obsolete equipment and facilities; growing waiting lists for surgery and the associated patient risks; the emergence of a two- (and in fact multi-) tier system; privatization of health care; increases in the number of BC patients being treated out of province; and the increasing limitations on health care here.

As each one of these concerns has been raised, it has been replaced, unresolved, by the next. This lack of resolution, combined with the widespread awareness that as the population ages, demands on the health care system will increase significantly, has led to the crisis of confidence in the system and to widespread discussion of reforming (i.e., changing) it. The discussion of change itself has contributed to the sense of crisis, as it has increased knowledge of the extensive challenges that the health care system already faces, of the uncertainty about the consequences of changing it, and of the fact that there is no long term plan for health care in British Columbia.

The current sense of crisis is engendering an acceptance that change to the health care system must, and will, occur. This report argues that, before reaching this conclusion and before changing the system, it should be demonstrated that change is, in fact, required and/or inevitable.

There are two dimensions to the issue of change in the health care system, one internal and the other external. Internal factors that may necessitate change are those that would make the system work better in achieving social and economic goals such as improved health, equity and efficiency. Changes made in this regard may be characterized as "if its broken, fix it, but if not, leave it alone". External factors that may necessitate change are those that exist even if the system is not "broken", arising because something outside of the system is in conflict with its current characteristics. For example, external conditions may mean that while it is a good and efficient system, we won't be able to afford it in the future. Change in this context is not motivated by internal performance criteria, but rather by external resource availability.

This report is about not changing the health care system. It asks what it would take, in terms of economic growth, to keep the system unchanged – as it is today, warts and all – during the coming prolonged period of rapid increase in demand that will result from the aging of the province's population. Specifically, it measures the level of economic and demographic change required to maintain the current relative level of provincial government health care spending (which accounts for 6.8%¹ of provincial gross domestic product and 36%² of the provincial government's budget) as the population ages from its current composition of 1 in 8 people being 65 years of age and older to a situation³ in three decades where 1 in 4 will be in this golden age. If it can be shown to be economically feasible to maintain the health care system, then any change would have to be justified on internal criteria, to improve health care, equity and/or efficiency, rather than out of desperation, driven by a lack of resources to sustain the system.

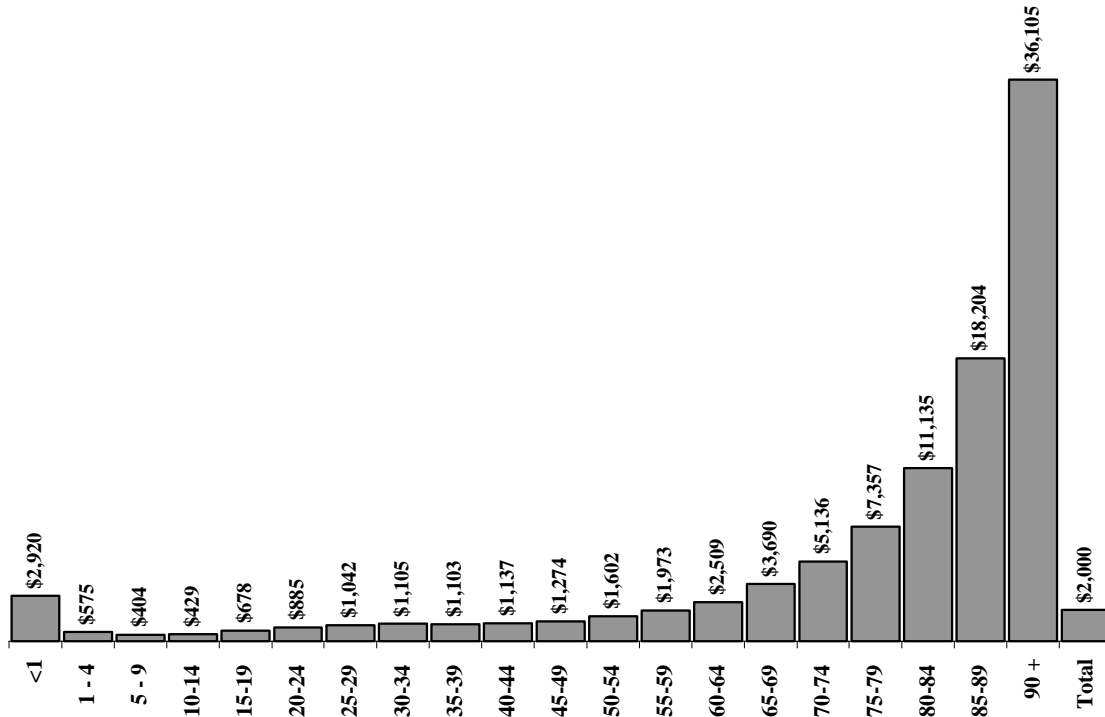
This report shows that if the province's economy performs as well as it did, on average, from 1960 to 1990, the current health care system is sustainable: it also shows that it must perform much better than it did during the 1990s if the current system is to survive.

II. Representing the Current Health Care System

There is a significant life cycle pattern to both public and private spending on health care⁴. Both are highly correlated with age: the older people are the greater the average amount that is spent by and on them each year for health care. As a result, when a population ages (the result of the number of people in the older age groups increasing faster than the number in the younger age groups), all other things equal, health care spending increases faster than the population: an aging population means increasing real per capita health care spending.

The majority (68.3%⁵) of health care spending in British Columbia is that of the provincial government, which currently accounts for 6.8% of the provincial gross domestic product, and 36% of the provincial budget. Provincial government health spending demonstrates the age specific pattern, in this case one of exponential growth in per capita spending with increasing age (Figure 1). In 1999, the provincial government spent an estimated⁶ average of \$2,000 per person in British Columbia on health care: this ranged from an low of \$404 for people in the 5 to 9 age group to a high of \$36,105 per person in the 90 plus age group.

Figure 1. Estimated Per Capita Provincial Government Spending on Health Care By Age Group, British Columbia, 1999

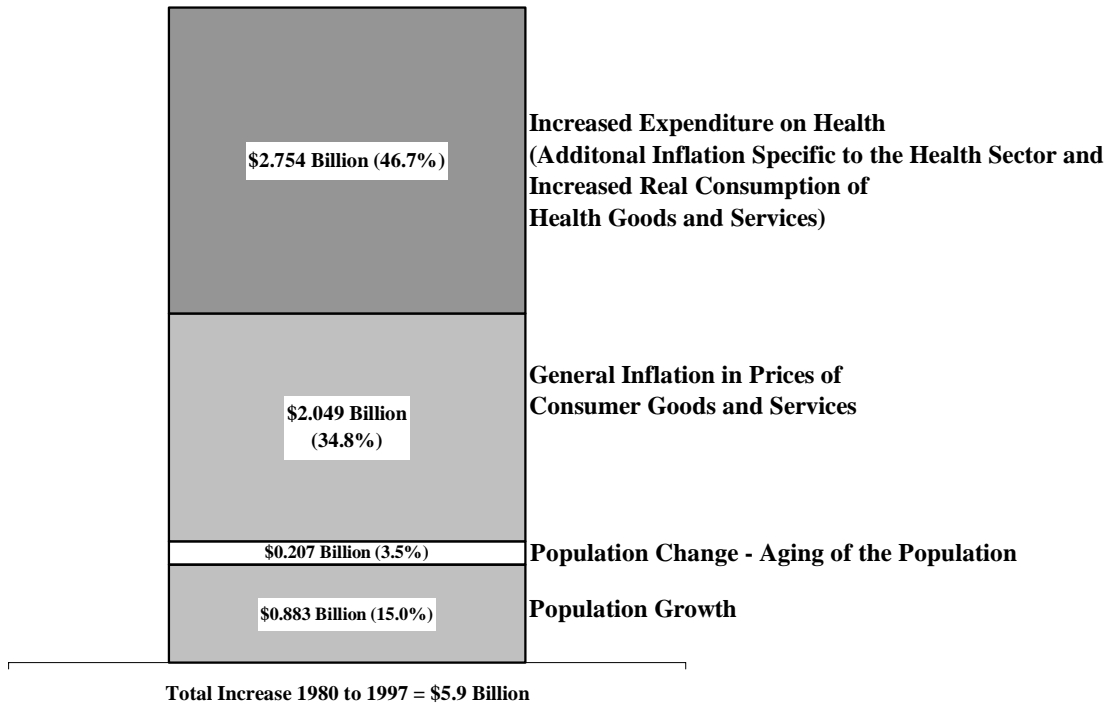


Please note two things about the pattern of spending described by Figure 1. First, per capita spending increases steadily from age group 5 to 9 on: one of the reasons for the increasing cost of health care system in Canada over the three decades since provincial health care plans were introduced is that the population has changed from being primarily in the young, low health care cost, age groups to being in the middle aged, medium cost, age groups. The second is that while the per capita spending on persons aged 80 plus are dramatically higher than those of younger age groups, in a demographic context it is the per capita costs of the under 80 age groups that are most relevant, as life expectancy at birth is currently 80 years⁷.

This age specific pattern represents our current health care system, explicitly in terms of a) how provincial health care spending is distributed by age groups and b) what forms of health care provincial spending provides, and implicitly in terms of what is left over (direct federal and private spending). To determine what keeping the health care system as it is today requires that this pattern of spending remain as it is, in constant dollars, in the future.

This is not to argue that the age pattern of health care spending has remained unchanged in the past: it has changed, and substantially. The changes, however, have been of increasing real costs per capita in all age groups (Figures 2⁸ and 3⁹), with the greatest increases recorded for the oldest age groups (Figure 3). Assuming that provincial health spending remains constant in real dollars is, therefore, to say that it will be possible to stop the trend to increasing real per capita age specific health costs that has been observed over the past three decades. It is an optimistic assumption with respect to funding health care in the future.

Figure 2: Sources of Increase in BC Provincial Health Expenditure 1980 to 1997

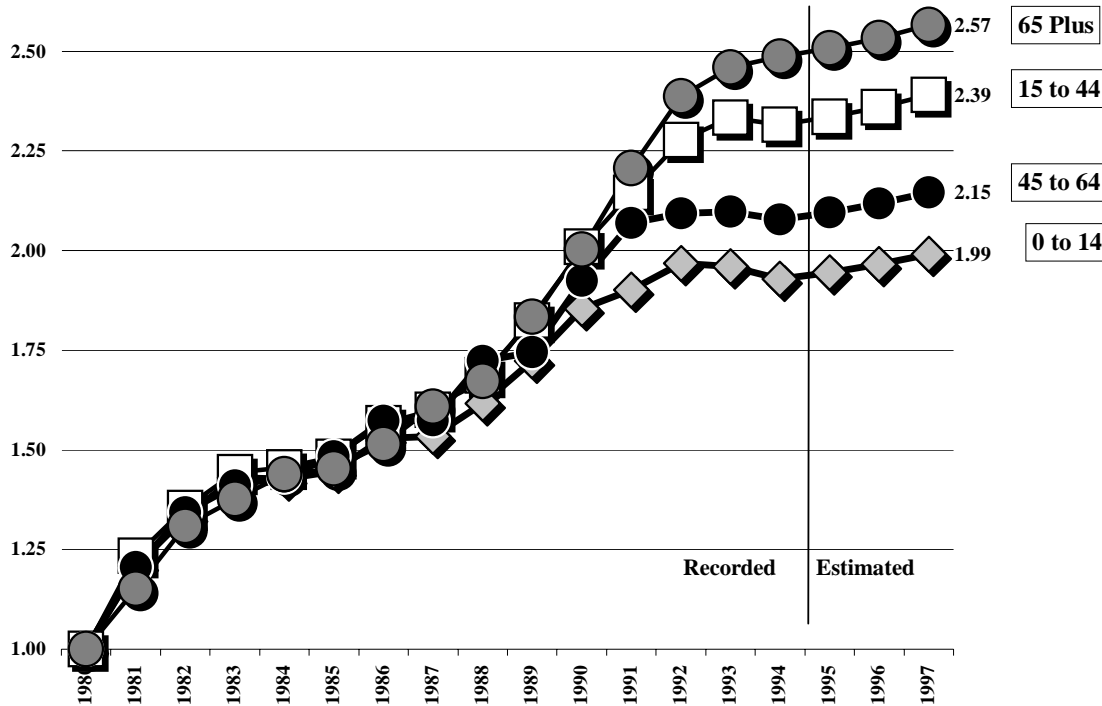


Nor is this to argue that the current level or allocation of spending is either adequate or efficient: the current environment of crisis is evidence that it is not. It is simply to say that this is what it costs to produce what we have today, not necessarily what we would like to have, and hence is the index of what an unchanged system would cost.

The reference point for the measurement of the preserving the health care system unchanged is that provincial spending is to be kept at its current 6.8% of provincial gross domestic product. Again, there is nothing magical about this level, slightly above both the Canadian and OECD¹⁰ averages: it describes today. This is also an optimistic assumption, as provincial government health spending has increased as a percentage of GDP, from 4.4% in 1975 to 6.8% in 1999¹¹, another factor that has contributed to the current concerns about the sustainability of health care. If it rises above this level, it means that a smaller portion of GDP is coming from economic

activities such as exports or education. In this context, while the internal characteristics of the provincial health care system may be maintained by keeping the spending pattern constant, by permitting these to account for an increasing share of GDP would mean a “crowding out” other economic activity, and hence the overall health care system would be changed.

Figure 3: Per Capita Age Specific Provincial Health Expenditures, Indexed to 1980



Note that this also assumes that provincial government spending covers the same relative share of the spectrum of health care activities as it does today. Provincial spending as a percentage of GDP can fall as a result of the provincial government spending relatively less, and individuals and other levels of government spending more. This too would involve a change in the system, and hence would not answer the question of what it would take, in terms of economic growth, to keep today's system unchanged.

This report presents two scenarios for the future of health care and economic growth in British Columbia. The first is a status quo scenario: it holds everything constant, both within and outside the health care system, at today's levels. This scenario demonstrates the extent to which the aging of today's population will drive the demand for increases in health care spending in the future and the reality that everything cannot be held constant.

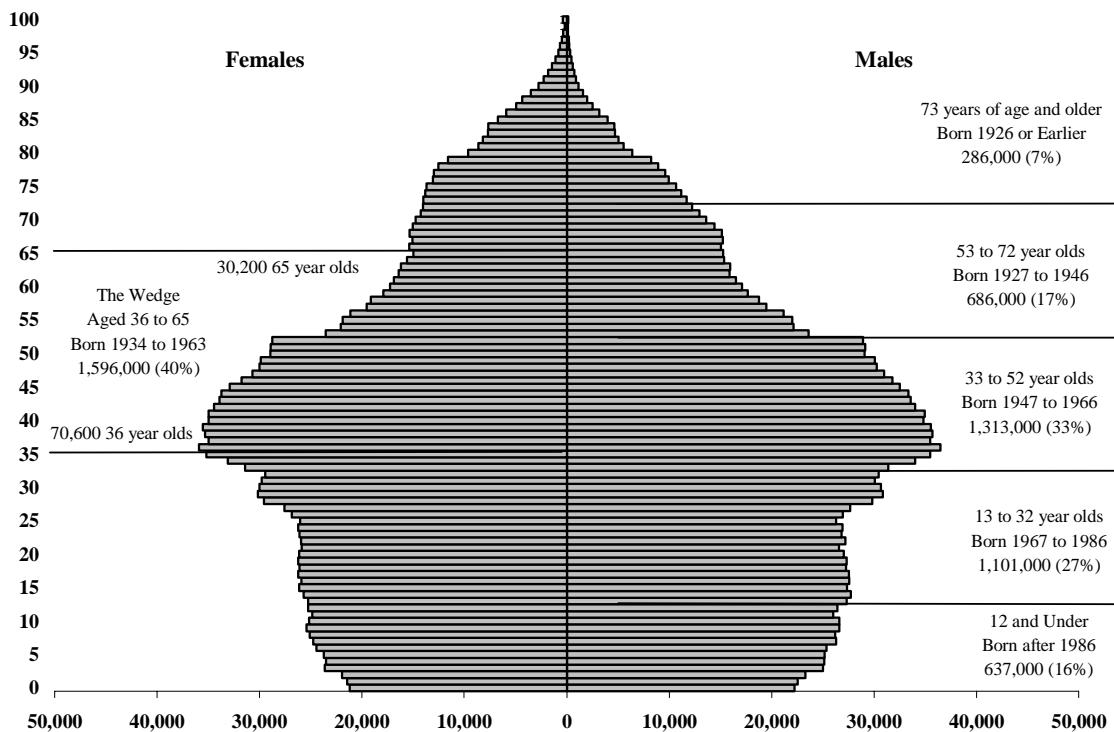
The second scenario considers the range of changes external to the health care system that would be required to sustain the system in its present form. It shows that reasonable and relatively modest economic and demographic changes external to the health care system will permit it to remain essentially as it is today. The starting point for both scenarios is us, the current population of the province.

III. British Columbia's Current Population.

Given the age related pattern of health care expenditures, demand for health care will clearly be affected by how the age composition of the province's population changes in the years to come. Even passing acknowledgement of the age profile of its current 4,023,000-person population¹² (Figure 4) leads to the conclusion that an aging population will be a significant issue for health care in British Columbia (and elsewhere in Canada) over the next four decades.

Conventional population analysis uses standard twenty-year generations for age structure comparisons. On this basis, the so-called baby boom generation, the 1,313,000 people in the province in 1999 born between 1947 and 1966, stands out as it accounts for one third of the population, the single largest generational group in the province's population. The generation older than the baby boom, 1999's 53 to 72 year olds, accounts for only 17%, and the generation younger than the baby boom accounts for only 27%. In the generational context, the issue that must be addressed is what will happen to health care costs over the next two decades when, given current mortality rates, almost all of the 1,313,000 people currently aged 33 to 52 age into the 53 to 72 age group to replace the 686,000 people currently aged 53 to 72 (resulting in a 91% increase in the number of people of this age), many of whom will have aged into the 73 plus age group.

Figure 4. Population Age Profile by Age and Sex, British Columbia, 1999

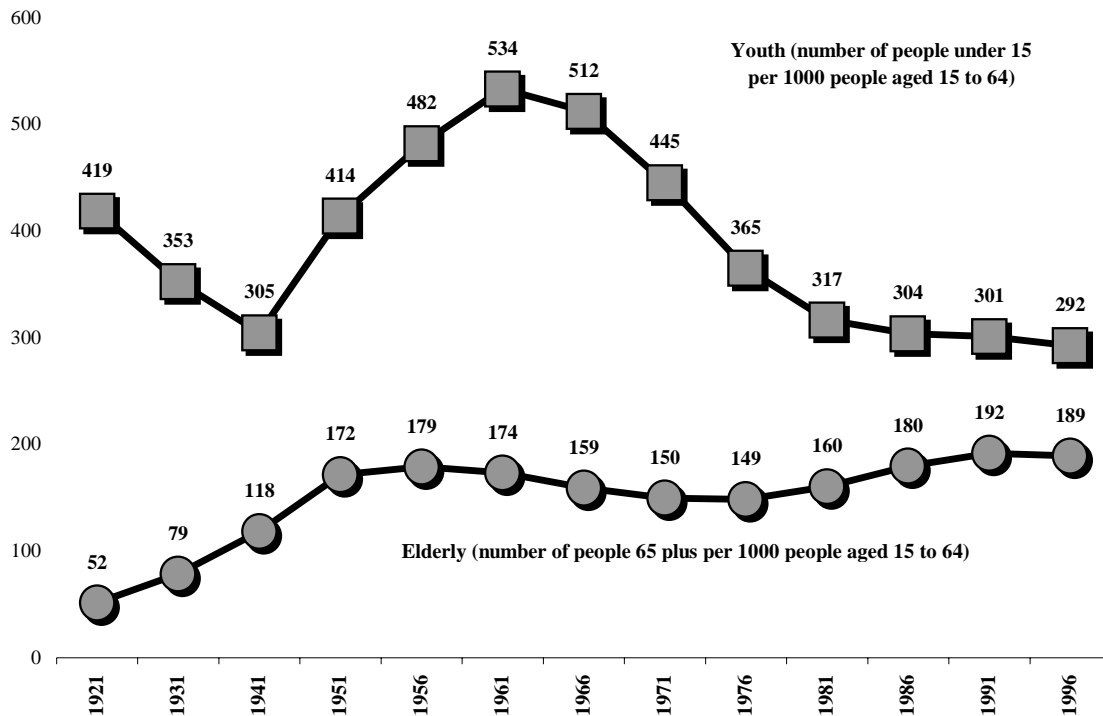


From a health care perspective, such generational analysis may lead to a false sense of security about how much time there is before the health care system has to deal with demographically driven increases in per capita health care spending, as it suggests that such will not occur until the baby boom generation ages into the high health care cost age groups sometime in the future. Two points in this regard. First, the baby boom generation has been aging into older and progressively more expensive health care age groups since 1975, when the last of them left the minimum cost 5 to 9 age group. This explains part (a small part, 3.5% from 1980 to 1997, Figure 2) of the increasing real per capita health costs, health care's increasing share of GDP, and the sense of impending crisis in the health care system experienced in the past.

More importantly, generational analysis ignores the fundamental shape of the age profile. From a health care perspective, the most important aspect of the age profile is that it starts to expand rapidly at the current 65 years of age group (30,200 in 1999) to reach its maximum size of 70,600 at 1999's 36 year olds, reflecting the downstream effects of the steadily increase in the number of births in Canada from 1934 to 1963. This 30-year wedge of 1,595,000 people (40% of the population) has already begun to enter the stage of the life cycle where per capita spending increases most rapidly. The health care consequences of an aging population are being felt now, and will have to be dealt with long before the crest of the baby boom reaches older age groups.

Another approach to the analysis of age structures is the use of dependency ratios. These indices that measure the number of people in the age groups where people are primarily beneficiaries of transfer payments and services (education, health care, pensions, etc.) relative to the number in the age groups where people are primarily contributors to such transfers. The simplest form of dependency (or beneficiary) ratios uses as its base the working aged population, traditionally defined as the 15 to 64 age group. The youth dependency ratio is the number of people under the age of 15 to the number of working age: in 1999, there were 269 young people per 1000 people of working age in B.C., continuing the trend to historical¹³ record setting lows that has occurred in the province since 1986 (Figure 5; the baby boom bulge is shown in the record youth dependency ratio of the 1951 to 1971 period). The elderly dependency ratio is the number of people 65 years of age and older per 1000 people of working age: in 1999, this ratio was 188 per 1000 persons of working age, a ratio that is in the record high range for the ratio that has prevailed since 1986.

Figure 5. Population Dependency Ratios, British Columbia, 1921 to 1996



These ratios are not precise: rarely do people enter the work force at age 15, a lot of people aged 15 to 64 are not working, and a few work after age 65. The ratios, therefore, most likely underestimate the extent of the beneficiary relationship. However, given the age specific pattern of relatively low health care costs in the under 15 population, and the relatively high costs in the 65 plus population, they still serve as useful indices of the relative pattern of demand that the age composition of a population places on the health care system

III. Can We Care for Ourselves?

The status quo scenario considers the consequences of not changing anything, inside and outside the health care system: it considers only the current resident population of the province (and hence excludes migration), and the current rates for births, deaths, labour force participation, productivity, and health care spending.

There are two ways to describe this first scenario, one polite and one not. The polite description is that it asks, "What is the contingent health care liability inherent in our current population?" or "What are the future health care consequences of the aging of the population that is currently resident in British Columbia?" This is the same as asking, not politely "What happens to health care in the future if we are only concerned with caring for the people who are here now?"

There are two reasons for considering this maintaining the status quo scenario. The first is that it shows, and only shows, the impact of the demographic change that will affect the current residents of the province on health care by holding everything but aging, births to and deaths of, current residents and their descendents constant. The second reason is that such isolationist scenarios are advocated by many exclusionary groups, be they cultural or environmental, who see keeping others out as a way of avoiding change¹⁴. Stopping migration is advocated as either as a goal in itself or to preserve the status quo for the advocating group: it is important to measure the costs of such exclusion. Add the goal of having no changes in the health care system to having no changes in the neighbourhood, and a status quo scenario that asks "Can we afford health care for ourselves?" emerges.

A no-migration population scenario would mean closing the door to in-migrants from other provinces and immigrants from other countries: to retain the ideological purity of this scenario, it must also be assumed that other regions would do the same, and hence that there is no out-migration from B.C. to other provinces and no emigration to other countries. As this section shows, closing the doors to migrants will certainly stop population growth, and in fact will ensure population decline, but that it will also dramatically accelerate the demand placed on the health care system by the aging of today's population.

a. Aging and Mortality

Given the starting point of the current (1999) population, aging and its logical counterpart mortality provide a logical starting point for the analysis of demographic factors affecting the future of health care in the province. There is a clear age related pattern to mortality (Figure 6¹⁵), a pattern of rates declining from the first year of life to the ninth, steeply increasing in the teens (especially for males), holding relatively steady until age 35, and then increasing steadily. Three aspects of this pattern of mortality are relevant to the health care discussion. First, the demographic wedge is now in the stage of the life cycle of steadily increasing mortality rates: to the extent that deaths involve the health system, the demands of mortality on the system will increase steadily as the wedge ages over the next 40 years. Second, the fact that the wedge is moving into the higher mortality rate age groups means that the number of deaths each year will increase, removing an ever increasing number of people from the population. Finally, the wedge, and the majority of the rest of the population, is in age groups where mortality rates that are still well below 100%: this means that most of today's population will be around in not only one decade or two, but in three, thereby increasing the number of people in the older age groups.

For a status quo projection, it is necessary to assume that mortality rates remain at the 1999 level of Figure 3. This implies a break from the historical pattern of declining mortality rates in British Columbia, which showed, for example (Figure 7¹⁶), an almost 50% decline in age standardized mortality rates between 1950 (1,143 deaths per 100,000) and 1997 (612 per 100,000).

Figure 6: Age Specific Mortality Rate (Logarithmic Scale), British Columbia, 1999
 Annual Number of Deaths to Persons of Each Age Per 100,000 Persons of That Age

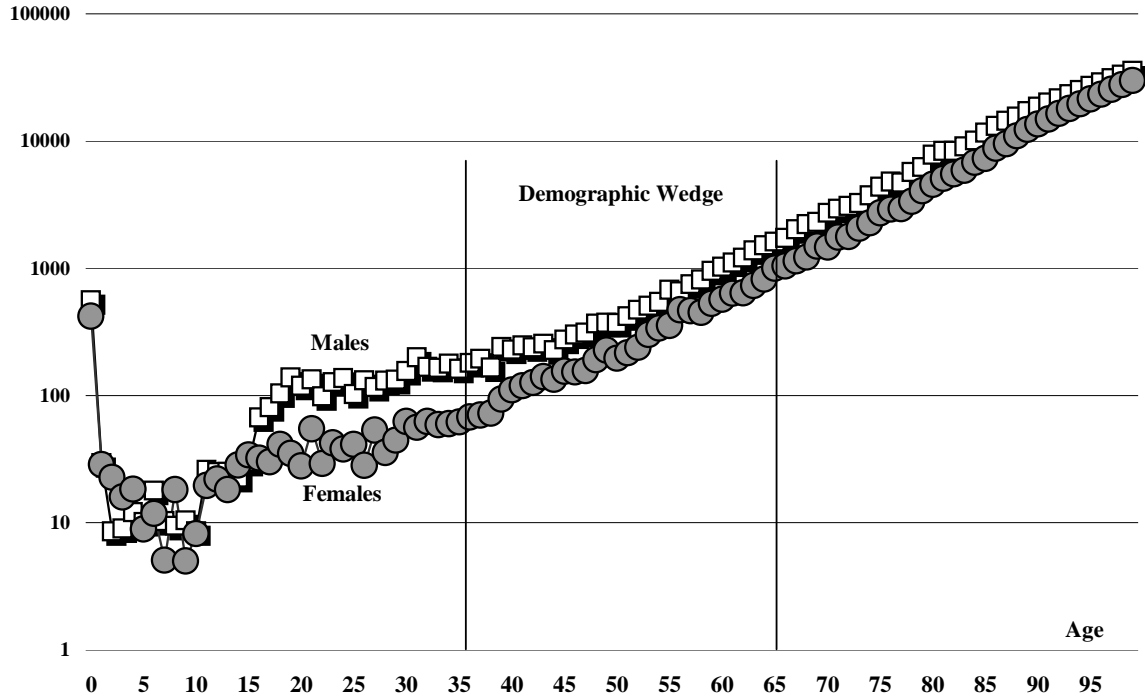
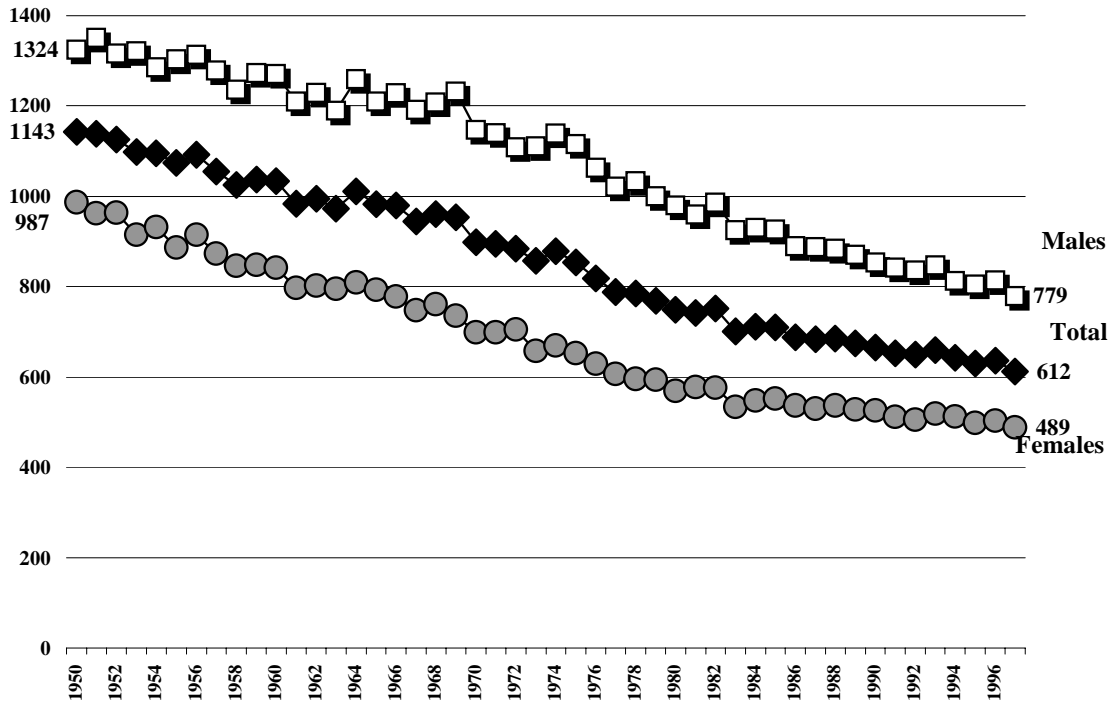


Figure 7: Age Standardized Mortality Rates, British Columbia, 1950 to 1997
 Death Per 100,000 People, Standard Age Profile



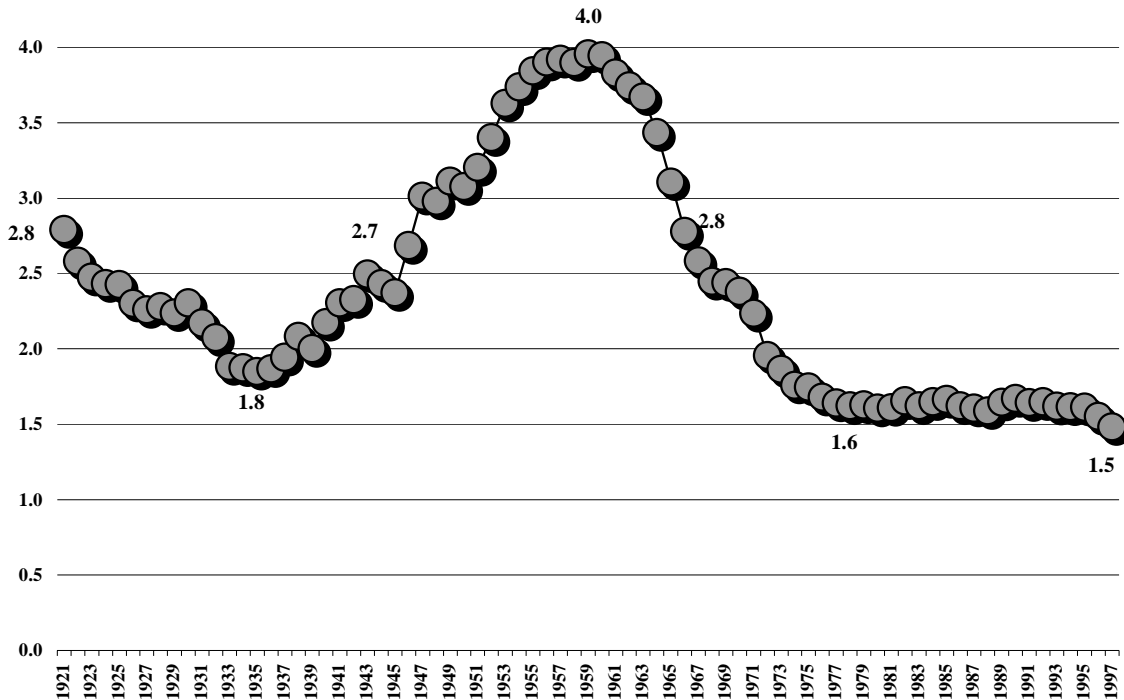
Declining mortality rates are equated with increasing life expectancy, and hence with a relative increase in the number of people in the older, high health care, age groups. To assume that mortality rates remain at their current level will underestimate the relative size of older age groups in the future, thereby underestimating the effect of current trends on health care spending: this is an optimistic assumption with respect to the extent that health care spending will increase.

b. Birth Rates

Births are the only source of young people in a no-migration population: this gives a dramatic emphasis to both how many and when women have children. The number of births women have during their lifetime, in this context, determines whether a no-migration population grows or declines in the long run: when they have them determines how long it takes to get to the long run.

British Columbia has a below the replacement level birth rate (Figure 8¹⁷): in 1997, women in British Columbia averaged 1.5 children during their lifetime, compared to the baby boom peak in 1959 when fertility rates were such that women averaged 4.0 children during their lifetime, and the pre-war low of 1.8 during the Great Depression of the early 1930s. This is a below the replacement level, as it requires an average of slightly more than 2 children per woman during her lifetime to replace herself and one male: with fertility rates of 1.5 children per woman, British Columbia's population will decline in the long run without migration. It will also get older (an increasing percentage of the population in older age groups) as 2 older people contribute only 1.5 younger people to the population during their lifetime.

Figure 8: Total Fertility Rate, British Columbia, 1921 to 1997
Average Number of Children Born Per Woman During Her Lifetime

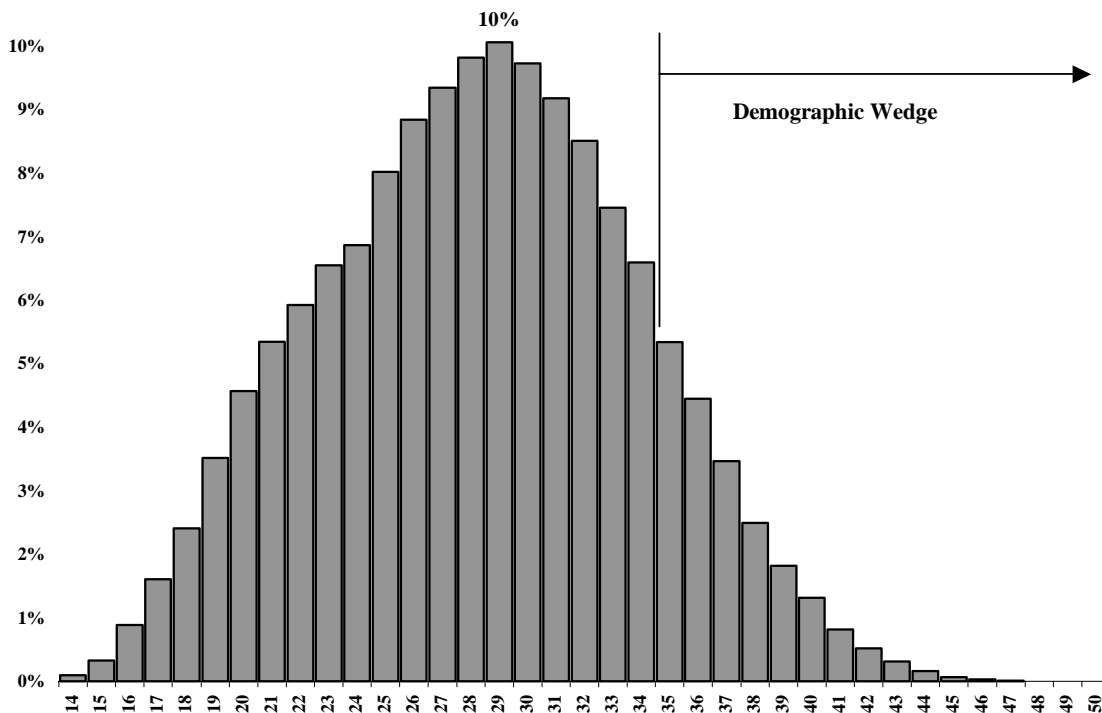


There is nothing unusual about British Columbia's declining and below the replacement level birth rate. It is slightly below the national average of 1.6, above the 1.4 of the Maritimes, equal to that of Ontario and Quebec, and below the 1.8 rates on the Prairies¹⁸. The below the replacement level birth rates of Canada and its provinces means that without immigration, they would all experience both declining and continuously aging populations. The birth rates in Canada are

generally at par with those in Europe (for example, Germany 1.4, Spain 1.2, United Kingdom 1.7, Denmark 1.8 and Italy 1.2), urbanized South East Asia (Japan 1.4, Singapore 1.7, Taiwan 1.6, and Hong Kong 1.3) but below that of the United States of America (which is a replacement level 2.1) and well below those of rural South East and South Asian countries such as Indonesia (2.6), The Philippines (3.6), India (3.1) and Pakistan (5.2)¹⁹.

Compounding the effect of below the replacement level births rates on the population composition is the timing of births: the later births occur during women's lives, the greater both the rate of population decline and of aging. In British Columbia, for example, the most common age of a woman giving birth is 29 (Figure 9²⁰), with 10% of the women in this age group having a child in 1999. Currently less than a quarter of all mothers are under the age of 25, compared to half of the births in the mid 1960s being to women under 25: in 1996, the median age of a woman who gave birth in British Columbia was 29, 4 years older than the median of 25 in 1966²¹. This increase in generation span means that it takes longer for replacements to arrive, and hence that the population is both older and smaller when they do.

Figure 9: Age Specific Fertility Rate, British Columbia, 1999
Percentage of Women Giving Birth During a Year

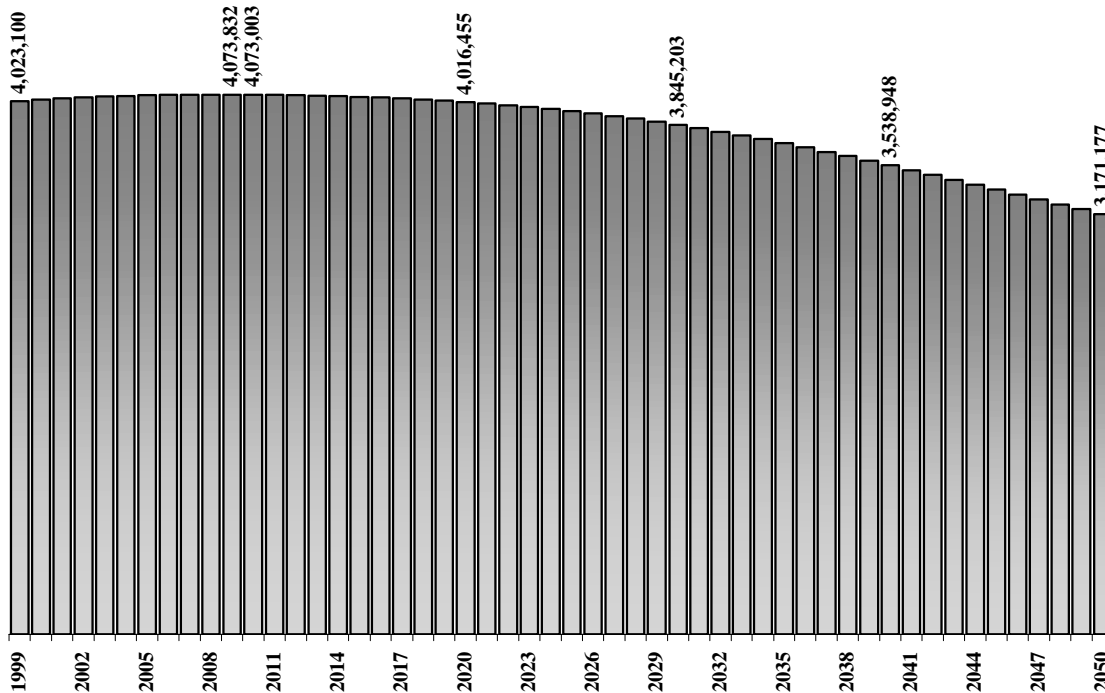


While the trends have been of both declining fertility rates and increasing mother's age at time of child's birth, these are ignored in the status quo scenario: for this projection, it is assumed that age specific birth rates remain at the 1999 level shown on Figure 9. This is again an optimistic assumption with respect to future health care expenditures, as it will overestimate the annual number of births (compared to what trends would produce), and hence result in relatively larger population in the low health care costs age groups. As with the assumption of constant mortality rates, the assumption of constant natality rates will underestimate the size of the older age groups relative to what a trend projection would indicate.

c. No Migration Population Projection²²

Without migration, current mortality and birth rates in British Columbia would result in a 31% decline in population over the next 50 years (Figure 10). Under this scenario, British Columbia would see ever slowing growth from 4,023,100 persons in 1999 to a peak in 2009 of 4,073,800 (50,700 more, a 1% increase over 10 years for an average of 0.1% annual increase). The province's population would then begin to decline, reaching 4,016,500 by 2020, 3,845,200 by 2030, 3,538,900 by 2040, and to 3,171,200 by 2050. As the following figures show, the decline will be primarily in the younger age groups, the result of the below replacement birth rate.

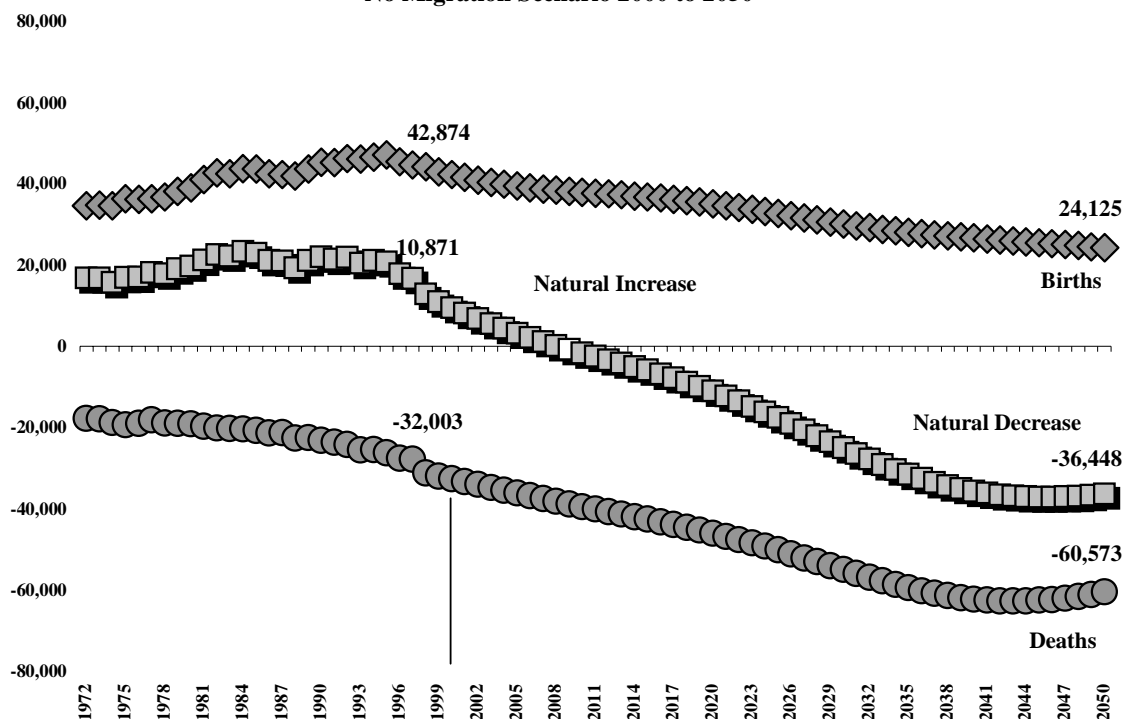
Figure 10. Population of British Columbia, No Migration Scenario, 1999 to 2050



While in the long run a below the replacement level birth rate will guarantee a declining population, in the short run the age profile of the current population means a slight increase in the population. The reason is that while the number of births is below the replacement level, the bulk of the existing population has not yet reached the high mortality age groups: at current mortality rates, 75% of the people resident in British Columbia in 1999 will be alive in 2024 (but will be 25 years older), and 40% will be alive in 2049 years. Thus the number of births in the province, while continuing to decline each year, will be above the increasing number of deaths until the end of this decade (Figure 11). After 2009, the front edge of demographic wedge will be facing age specific mortality rates that are twice those it currently faces: increasing deaths will pass declining births, and the population of the province will begin the steady decline that no-migration and a below the replacement level birth rate bring in the long run.

Note that the focus on the consequences of the current age profile on future health care expenditures necessitates the use of a 50-year time frame for projections. The widest part of the demographic wedge was 36 years of age in 1999, and the back of the wedge was 30: with life expectancy of 80 years, it will take another 50 years for the consequences today's population age profile to be fully expressed in health care spending.

**Figure 11: Components of Natural Increase, British Columbia, 1972 to 1999 Actual
 No Migration Scenario 2000 to 2050**



Under the surface of the gentle decline in total population is a significant shift in its age structure (Figures 12, 13, 14, and 15). With the demographic wedge pretty well through the child bearing stage of the life cycle and a below replacement level birth rate, the number of young people in the province will continue to decline. The 0 to 14 age group, for example, will decline from 1999's 743,400 people to 629,900 in 2009, 505,000 in 2030, 437,300 in 2040 and 389,700 in 2050 (almost half of today's number). The most rapid decline will occur in the next two decades as the current population in the childbearing stage of the life cycle ages through it.

In contrast to the 0 to 14 age group, the number of people aged 15 to 64 will initially increase. There were, in 1999, more people of every age from 3 to 14 than there were from 53 to 64: over most of this decade, there are enough people now under 15 to replace people aging out of the 15 to 64 age group. Ignoring mortality, for the next 12 years the 15 to 64 age group could grow as a result of the current age profile: it would decline continuously from then on. Acknowledging mortality means that it would start to decline sooner. Of the 48,900 people 5 years of age in 1999, 48,800 will survive to enter the 15 to 64 age group in 2009, replacing the 40,800 survivors of the 42,300 who were 55 in 1999 who will enter the 65 plus age group in 2009, but not fully replacing the 8,500 people aged 15 to 64 who will die in 2009. As a result, after increasing from 2,760,900 people in the 15 to 64 age group in 1999 to 2,853,500 in 2008, it will decline to 2,853,000 in 2009, and continue to decline to reach 1,877,286 people in 2050, two thirds of its 1999 number.

The same pattern of change, but of a different magnitude and timing, will occur in the 65 plus age group. The aging of the demographic wedge into the 65 plus age group will continuously increase its size for the next 35 years, from 1999's 518,800 persons to 1,028,700 people in 2035. As all of the wedge will be in the 65 plus age group in 2035, both mortality and the declining size of the 15 to 64 age group will ensure that it declines in size from 2035 on, reaching 904,200 persons in 2050 (75% more than in 1999). With 80-year life expectancies, the last of the wedge will be leaving the 65 plus age group sometime in the 2050s.

Figure 12. Population Composition, British Columbia, No Migration Scenario, 1999 to 2050

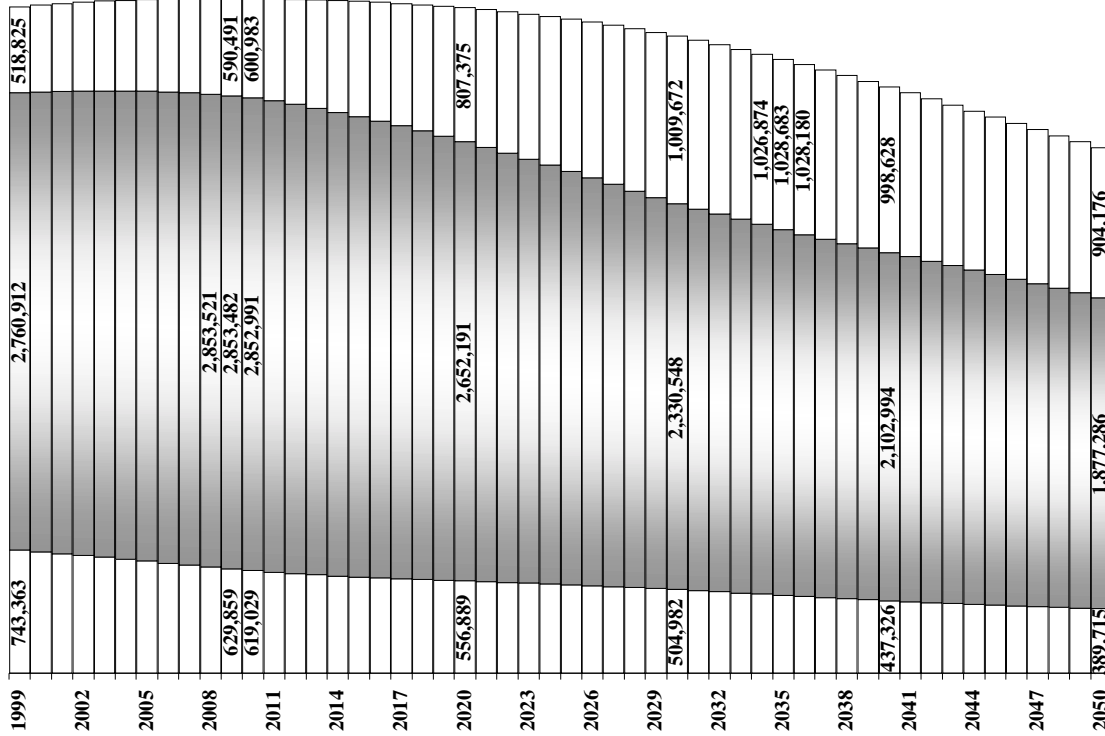
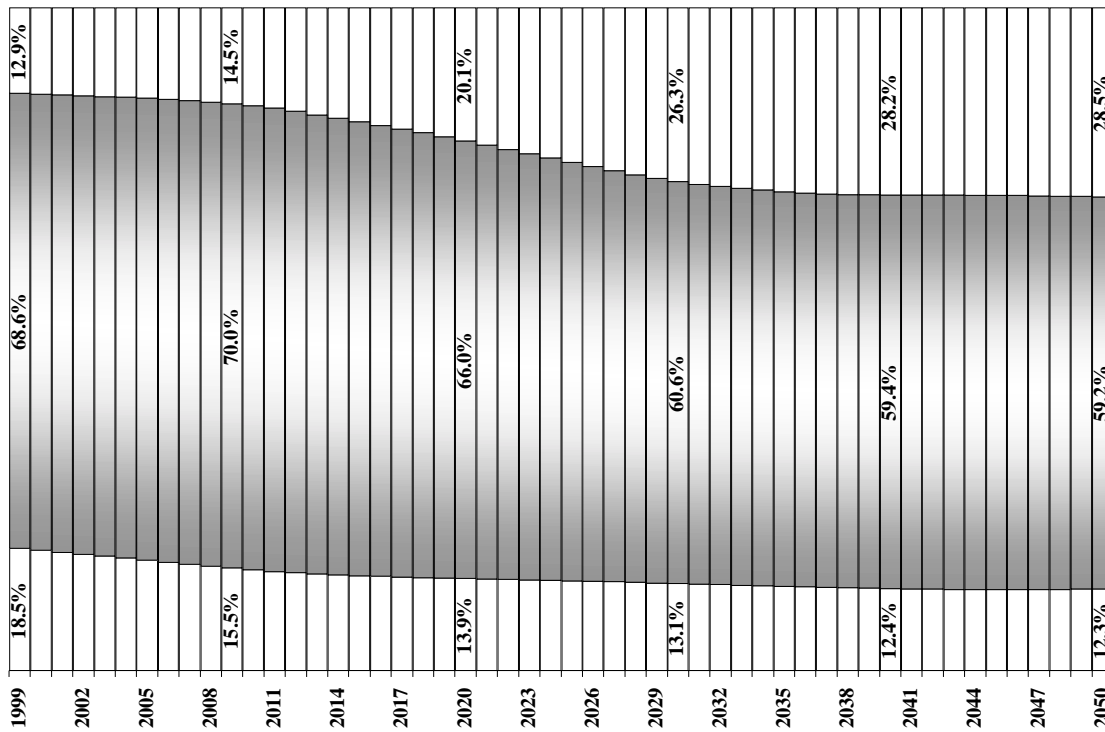


Figure 13. Population Composition, British Columbia, No Migration Scenario, 1999 to 2050



A no-migration scenario would significantly alter the age composition of the province's population (Figure 13). Today slightly more than 1 out of 6 people (18.5%) in the province are under the age of 15: in the absence of migration, with today's birth and deaths rates, this would decline to 1 in 8 (12.3%) by 2050. After increasing from 68.6% of the population in 1999 to 70.0% in 2008, the share of the 15 to 64 age group would also decline, to reaching 59.2% of the population in 2050. In contrast, the 65 plus age group would increase from 1 in 8 in 1999 (12.9%) to almost one in three (28.5%) by 2050. The most rapid growth in the 65 plus population's share will be over the next 35 years: 28% of the population will be in the 65 plus age group by 2035 under the no migration scenario, with the age group's share gradually increasing thereafter.

For every 100 people in the province in 1999, a no-migration constant birth and death rate scenario would mean that there would only be 79 in 2050 (Figure 14). This overall decline of 21% would be an average of the 32% decline in the 15 to 64 age group (for every 100 people in this age group in 1999 there would only be 68 in 2050), the 48% decline in the 0 to 14 age group (for every 100 today there would only be 52 in 2050), and the 74% increase in the number aged 65 plus (for every 100 today there would be 198 in 2035 and 174 in 2050). The number of people aged 0 to 14 per 100 people of that age in 1999 would decline continuously from 1999 on) and the number of people aged 15 to 64 per 100 people of that age in 1999 would increase to 103 in 2008, before declining steadily for the rest of the period. Following the demographic wedge through the age profile means that for every 100 people aged 65 and older today, there would be a continuous increase to 198 people aged 65 and older in 2036 for every 100 there are today, before following the other age groups in decline.

The first question that a no migration scenario would present to the health care system in British Columbia would be "Are you ready for the number of people aged 65 plus in the province to double in the next 35 years?" The second is "Are you ready to do so while the working aged population declines by 20% over the same period?"

The source of these two questions is shown in the population dependency ratio (Figure 15). There are currently 269 people under the age of 15 per 1000 people of working age (15 to 64) in the province of British Columbia: the below the replacement level birth rate means a steady but modest decline in this youth dependency ratio to reach 213 per 1000 in 2011 and 208 per 1000 in 2050. Thus the relative demand on the health care system from the younger population, assuming a constant spending pattern, would decline slowly over the coming decades to approximately three quarters of its current level.

The pattern for the elderly dependency ratio provides a dramatic contrast to that for youth. The number of people 65 years of age and older would increase gradually for the next decade, from the current level of 188 person aged 65 and older per 1000 people of working age, to 213 in 2011. It would then skyrocket to reach 466 persons aged 65 plus per 1000 of working age in 2035: after this date, with all of the demographic wedge in the 65 plus age group, the elderly beneficiary ratio would increase more slowly, reaching 482 per 1000 by 2050. A 156% increase in the number of people in the highest health spending age group per 1000 people of working age is what the health care system will have to deal with if there is no migration and current birth and death rates: if the trend to declines in both these rates continues, the increase in the elderly dependency ratio will increase by even more than this 2.56 times increase. As the next section shows, the current health care system could not be sustained under these conditions.

Figure 14. Population Growth by Age Group, BC, No Migration Scenario, 1999 to 2050

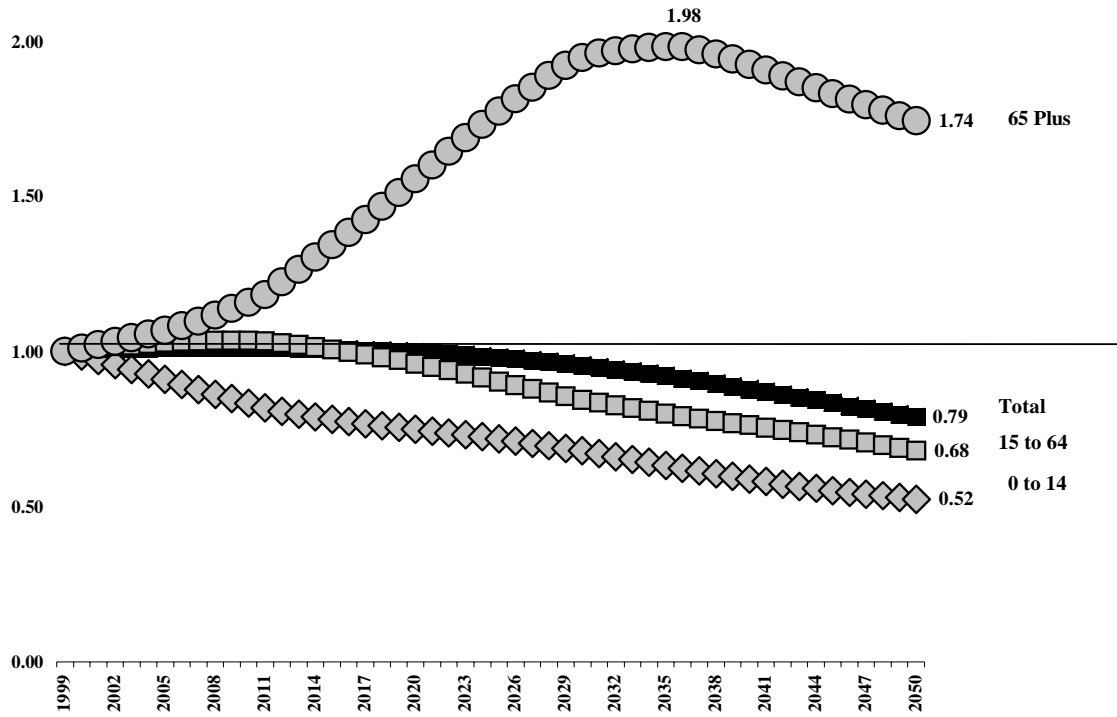
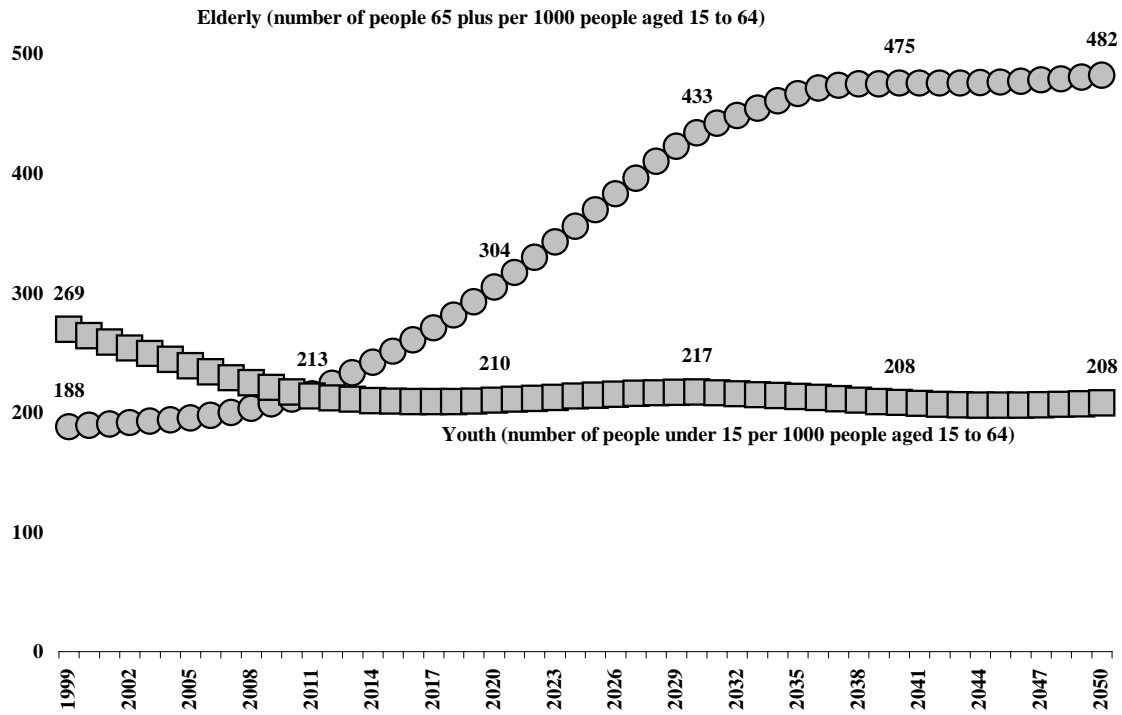


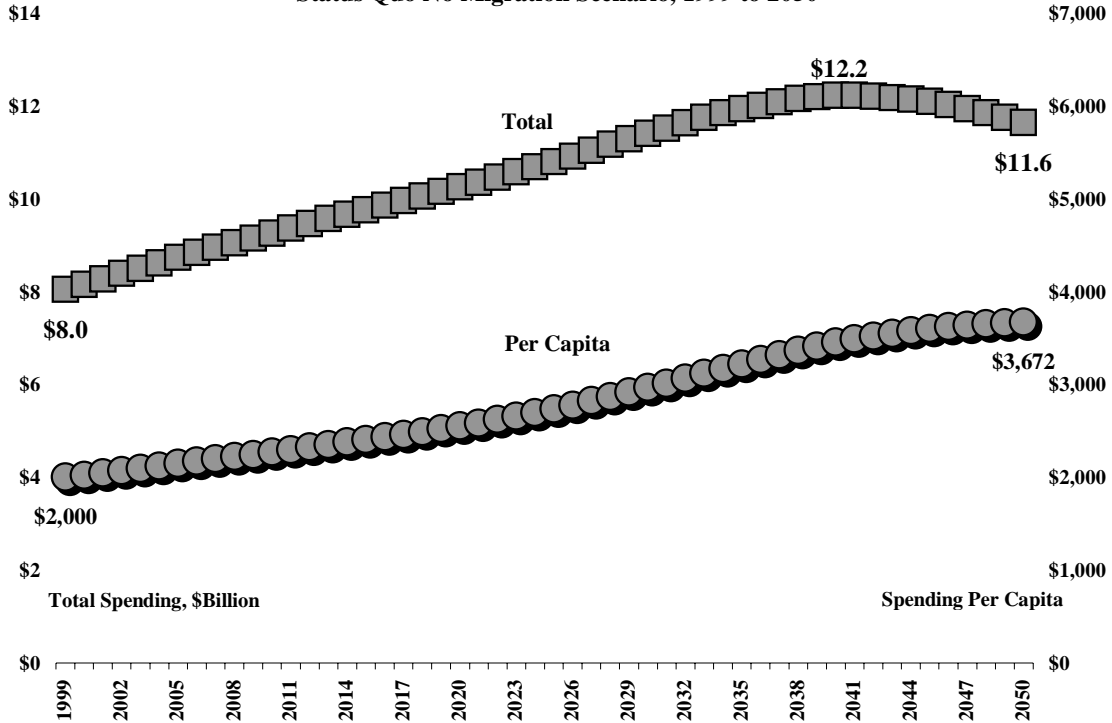
Figure 15. Population Beneficiary Ratios, BC, No Migration Scenario, 1999 to 2050



d. The Health Care Consequences of a No-Migration Scenario.

With an aging population and today's pattern of health care spending (as shown on Figure 1), total and per capita provincial government health care spending will increase significantly. In the status quo no-migration scenario, total provincial government spending (in constant dollars) would increase from the 1999's \$8.0 billion to \$12.2 billion in 2041 (a 52% real increase over four decades, Figure 16), before declining to \$11.6 billion in 2050. The peak in total spending would be 6 years after the peak in the size of the 65 plus age group, the result of the continued aging of the widest part of the demographic wedge into the over 70 high health cost age groups.

**Figure 16. Total and Percapita Provincial Health Spending in Constant 1999 Dollars
 Status Quo No Migration Scenario, 1999 to 2050**



With a shrinking population from 2008 onward and increasing total provincial government health spending, per capita real health spending will increase continuously under this scenario, from 1999's \$2,000 per person to \$3,672 per person in 2050, an 84% increase in the real resources per capita required by the provincial government to maintain health care at today's level. The health care implications of this scenario are summarized on Figure 17: the province's population would decline by 21%, total provincial government health care spending would increase by 45%, and per capita spending would increase by 84%. The turndown in total spending in 2042 slows, but does not stop, the increase in per capita real spending, because while the older, higher cost, age groups will decline, they will do so at a rate slower than that of the population as a whole.

If provincial health care spending is to remain at its current 6.8% of provincial GDP, then in order to support the increase in health care spending, a proportionate increase in GDP would be required (Figure 18). In the no-migration status quo scenario, this would involve an increase of provincial GDP from 1999's \$118.8 billion to \$180.5 billion (constant dollars) in 2041: the decline the older population after that year would mean that require GDP could also decline, to \$171.9 billion in 2050. To achieve this would require real growth in the range of 1.0% to 1.5% per year over the next 30 years: after that date, required economic growth could slow, as total health spending slows, and even decline from 2041 to 2050.

Figure 17. Indices of Change in Population and Provincial Government Health Spending
Status Quo No Migration Scenario, 1999 to 2050

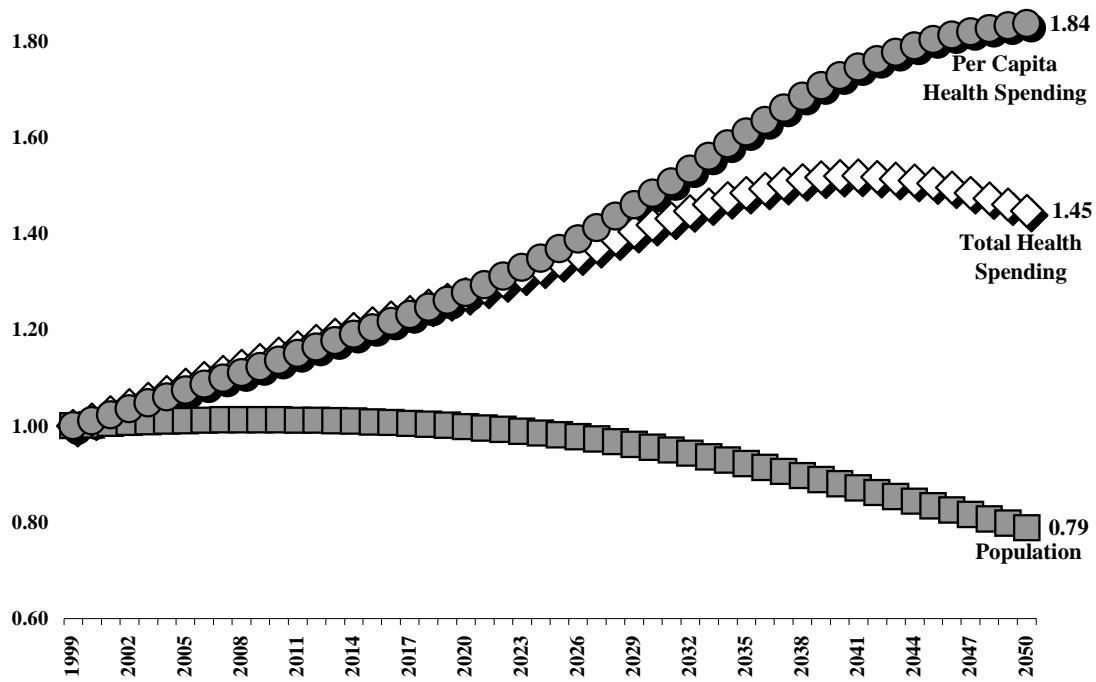
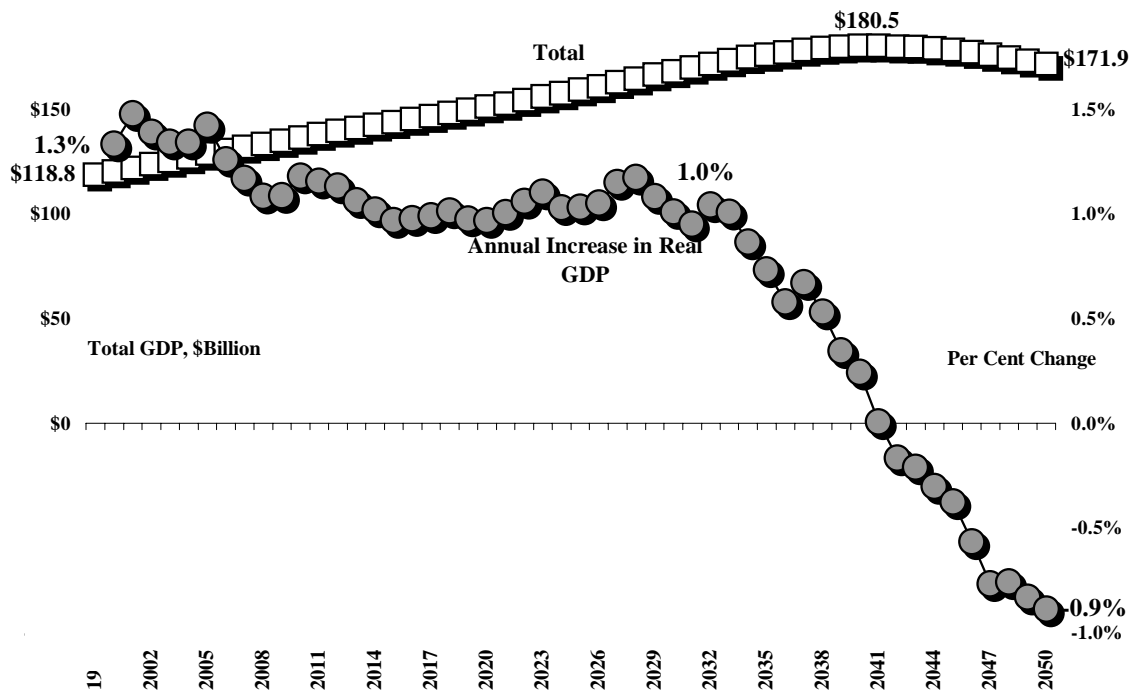


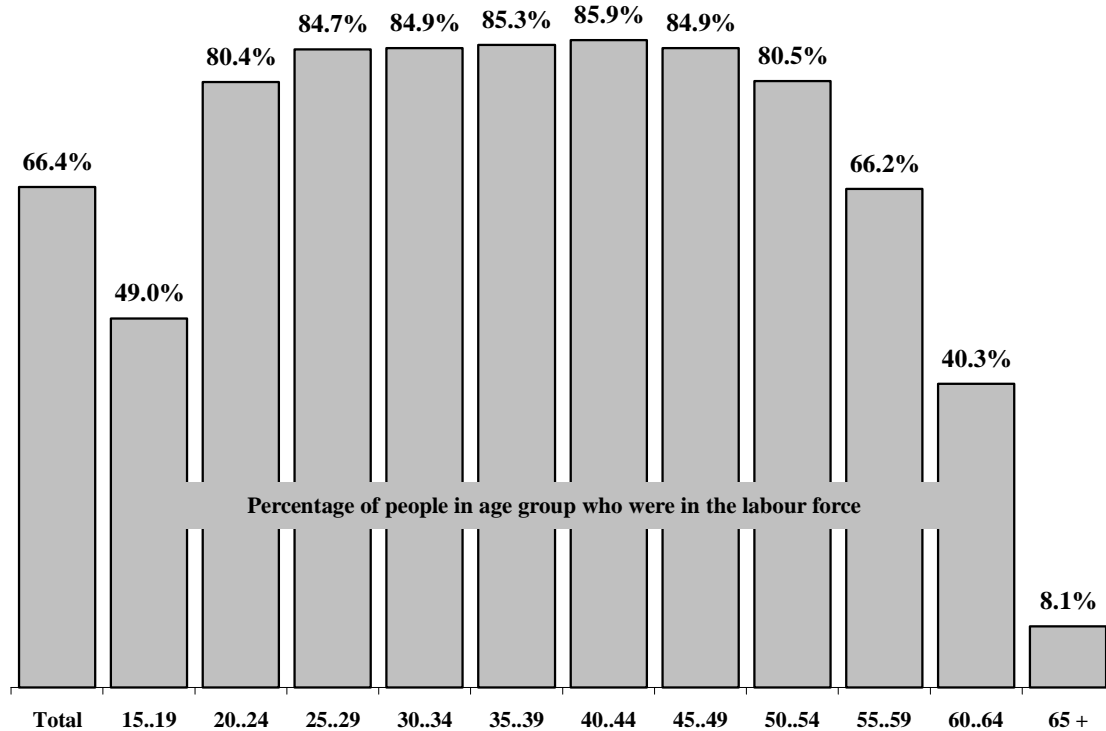
Figure 18. Real Gross Domestic Product Required to Keep BC Provincial Government Health Care Spending at 6.8% of GDP, No Migration Scenario, 1999 to 2050



The economic question is “Can the BC economy grow fast enough – without migration - to support the increase in health spending?” To answer this question requires consideration of further aspects of the links between demographics and economics. People produce gross domestic product, and hence the first step in answering this question is to consider the size of the labour force that will be available in future to form the contribution side of the dependency ratio. The future size of the labour force will be of particular relevance in the health care context, given the labour intensive nature of the health care industry.

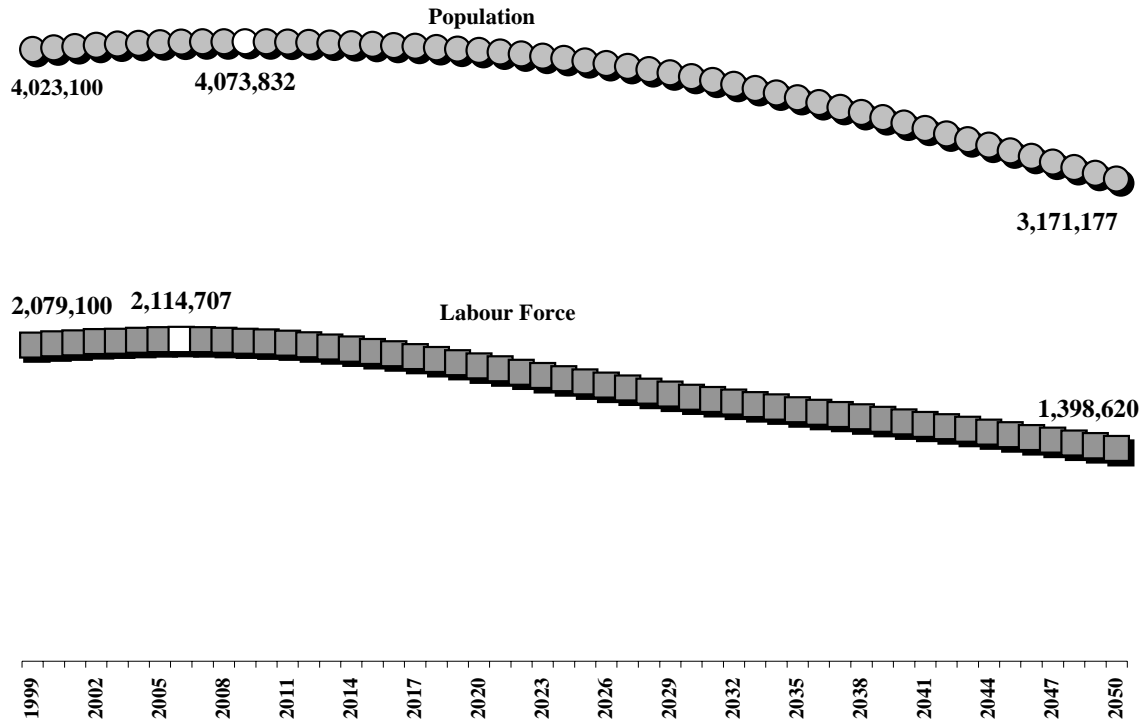
Following the status quo theme of this first scenario, it is assumed that labour force participation rates remain constant at their 1996 level (Figure 19²³) rather than continue the historical pattern of decline in the case of male rates, and of constancy in the case of female rates. Participation rates demonstrate as strong an age specific pattern as health spending. They increase rapidly (with the completion of K to 12 education) from 49% of the 15 to 19 population to 80.4% in the 20 to 24 age group, and then gradually rise to a peak of 85.9% in the 40 to 44 age group, then decline slowly with the onset of retirement in the 50 to 54 age group, and then significantly with full retirement to reach 8.1% in the 65 plus population.

Figure 19. Age Specific Labour Force Participation Rates, British Columbia, 1996 Census

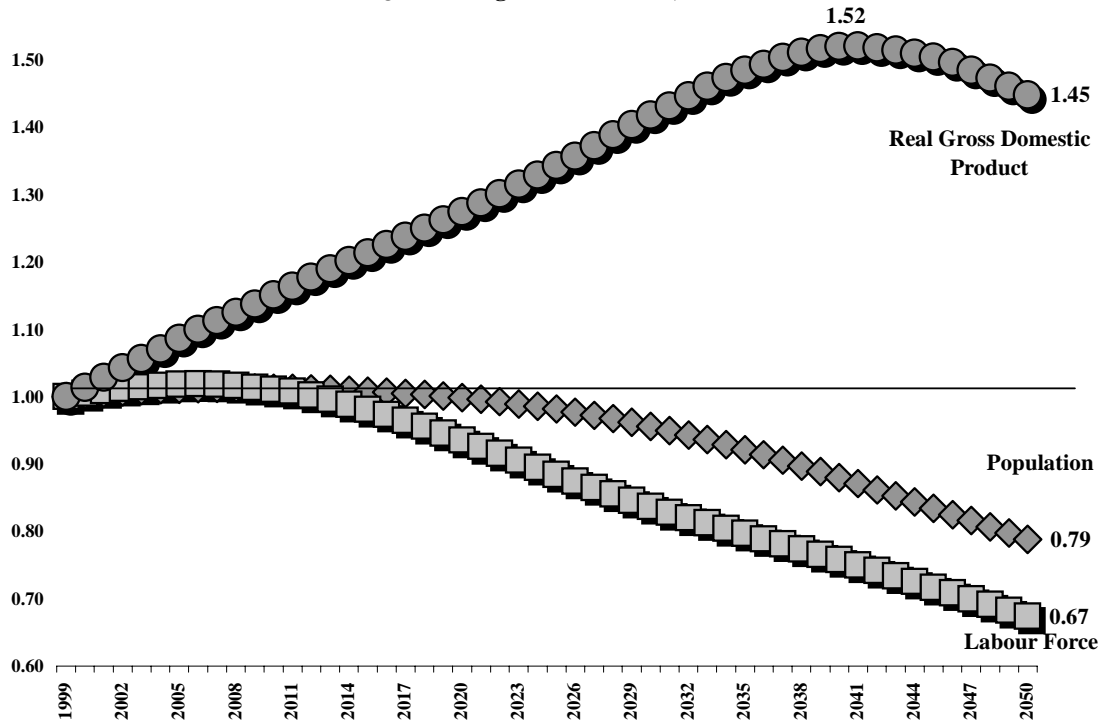


The pattern of labour force participation rates means that an aging and declining population will be more than matched by a declining labour force (Figure 20²⁴): in the absence of migration with constant participation rates, the size of the labour force will grow slightly over the next decade, from its 1999 level of 2,079,100 to reach 2,114,700 in 2006 (following the increase in the 15 to 64 age group), and then decline steadily to reach 1,398,600 in 2050. The extent of the difference in the paths of change in the population and labour force in a no-migration status quo scenario and that required of GDP to support health care for this aging and declining population are clearly shown on Figure 21. With a below replacement birth rate, without migration the province's population would decline by 21%; because of this rate and aging, the labour force would decline 33%; because of aging the economy would have to increase by 45% to keep today's health care system unchanged.

Figure 20. Labour Force & Population, BC, Status Quo No Migration Scenario, 1999-2050



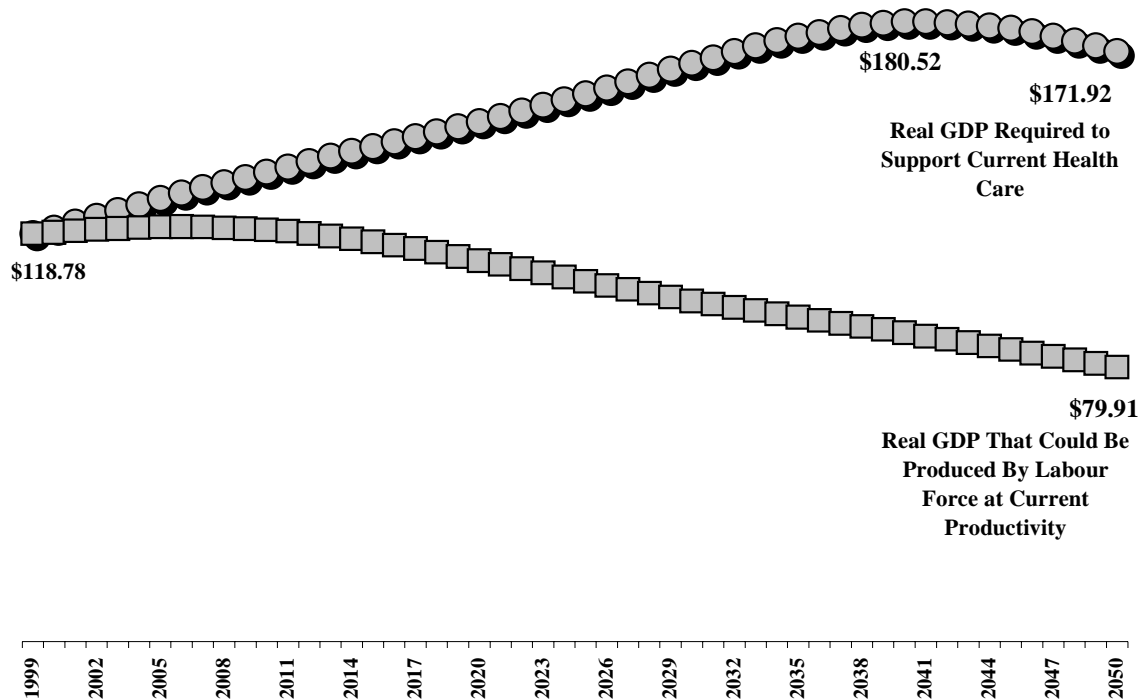
**Figure 21. Indices of Change in Provincial GDP and Labour Force
 Status Quo No Migration Scenario, 1999 to 2050**



Following the logic of a status quo scenario requires a consistent approach to all aspects of the scenario, which include assuming no change in labour force productivity. For a declining labour force to produce an increasing real GDP would require increasing productivity, something that did not happen over the past decade. Assuming constant labour force productivity (\$GDP per labour force participant) is therefore not only consistent with the terms of the status quo scenario, but also optimistic compared to what happened over the past decade.

Assuming that average labour force productivity remains constant at 1999 level of \$57,132 of GDP per labour force participant (a labour force of 2,079,100²⁵ and an GDP of \$118.8 billion), the labour force that would be associated with a no-migration status quo scenario would have the capacity of producing a total GDP of \$79.91 billion constant 1999 dollars in 2050: this is less than half of the \$171.92 billion GDP that the population of 3,171,200 that this labour force supports would require if today's health care system was to be sustained (Figure 22).

**Figure 22. GDP Capacity and Required, BC, Constant 1999 Dollars, \$Billions
1999 to 2050, No Migration Scenario**



The current health care system cannot be sustained under a status quo no-migration scenario: it is not economically feasible to maintain the current health care system (as represented by current provincial health spending per capita and as a share of provincial GDP) without demographic and economic change. Without demographic and economic change, it would be necessary to dramatically reduce either health care or other economic and social service activity in the province. If health care is to be sustained, change will be required: the next section address the question of “What is the minimum economic and demographic change that are necessary to support the health care system as we know it today?”

IV. How Much Change Do We Need?

Continuing to work with the assumption that the current health care system in the province is to be maintained in its present form, the next step is to determine how much change must occur to ensure that the necessary economic resources are available. This section does so in a stepwise fashion, picking up on the productivity aspects of the economy considered at the close of the previous section, and then moving to consideration of the demographic factors of demographic factors of migration, birth and death rates that opened that section.

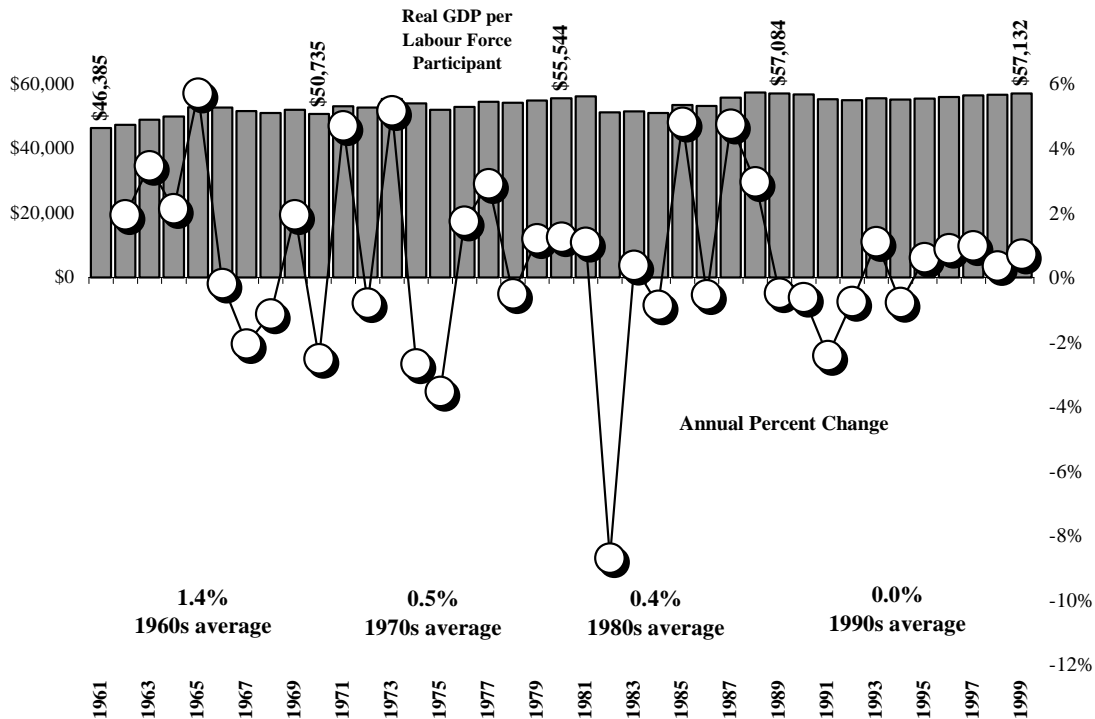
A. Economic Change

This section continues with the no migration and constant birth and death rates population scenario presented in the previous section, focusing on changes that might be brought about in the economy to increase the rate of growth of the province's GDP. It therefore considers the question "Can the future health demands of the current population be supported through changes in the province's economy alone?"

1. Increasing Labour Force Productivity

Average labour force productivity in 1999 was \$57,132 of GDP²⁶: for the labour force of the status quo no migration scenario to be able to support today's health spending pattern, each labour force participant in 2050 would have to contribute \$122,920 (in constant dollars), representing a more than doubling of labour force productivity. This would require productivity increases averaging 1.5% per year for the next 5 decades. Over the 1961 to 1999 period, the real productivity of the labour force increased by an average of only 0.55% per year, from \$46,385 in 1961 to \$57,132 in 1999 (Figure 23²⁷). Most of this growth occurred in the 1960s, when productivity increased by an average of 1.4% per year. In the 1970s, it increased by an average of 0.5% per year, in the 1980s by an average of 0.4%, and in the past decade it did not increase.

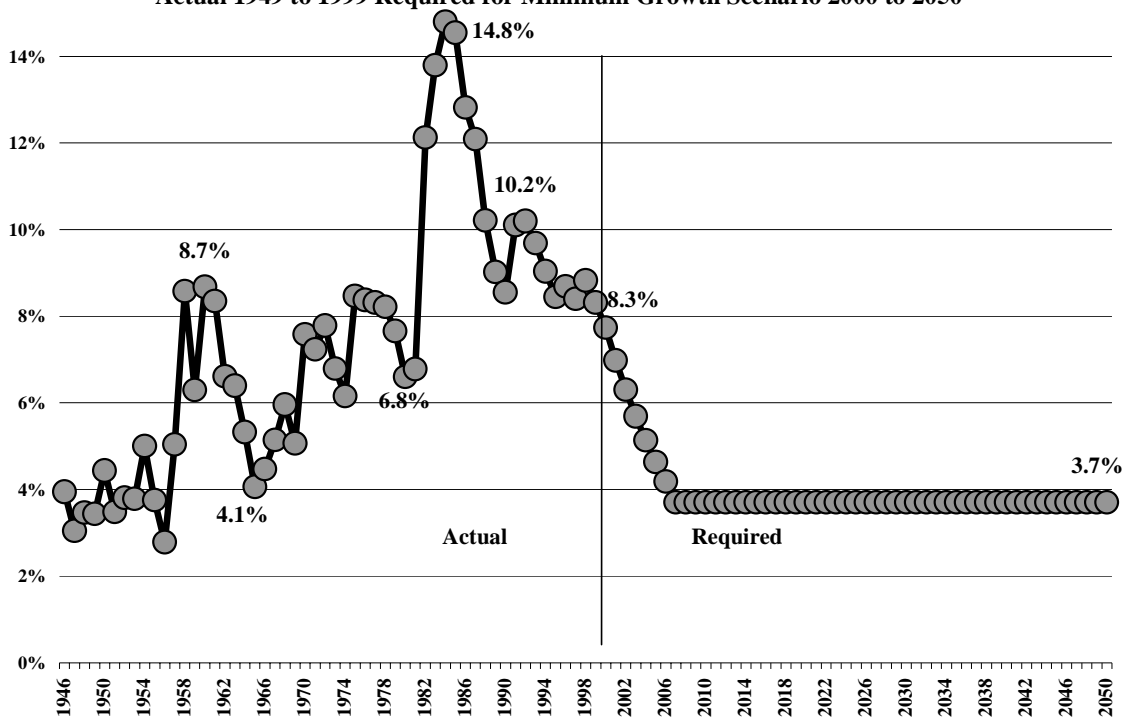
Figure 23: Labour Force Productivity, BC, 1961 to 1999



a. Reducing Unemployment.

One economic change that would help in sustaining today's health care system into the future would be to increase the average amount of GDP produced by labour force participants: there are two ways this could happen. The first is by reducing unemployment: more people working out of the same labour force will increase GDP relative to the size of the population and its health care requirements. With a 1999 unemployment rate of 8.3%, and an average over the past five years of 8.5% (Figure 24²⁸), there is certainly room for improvement. In the current context, reducing unemployment will involve economic policies that increase employment, rather than reducing the size of the labour force, as the goal is not to reduce unemployment per se, but rather increase the ability of the economy to support the health care needs of the population. Further it will require economic policies that will increase employment faster than the labour force, something that has not occurred in the past decade, with 1990's unemployment rate of 8.6% matching 1999's 8.3%.

Figure 24: Unemployment Rate, British Columbia
Actual 1949 to 1999 Required for Minimum Growth Scenario 2000 to 2050

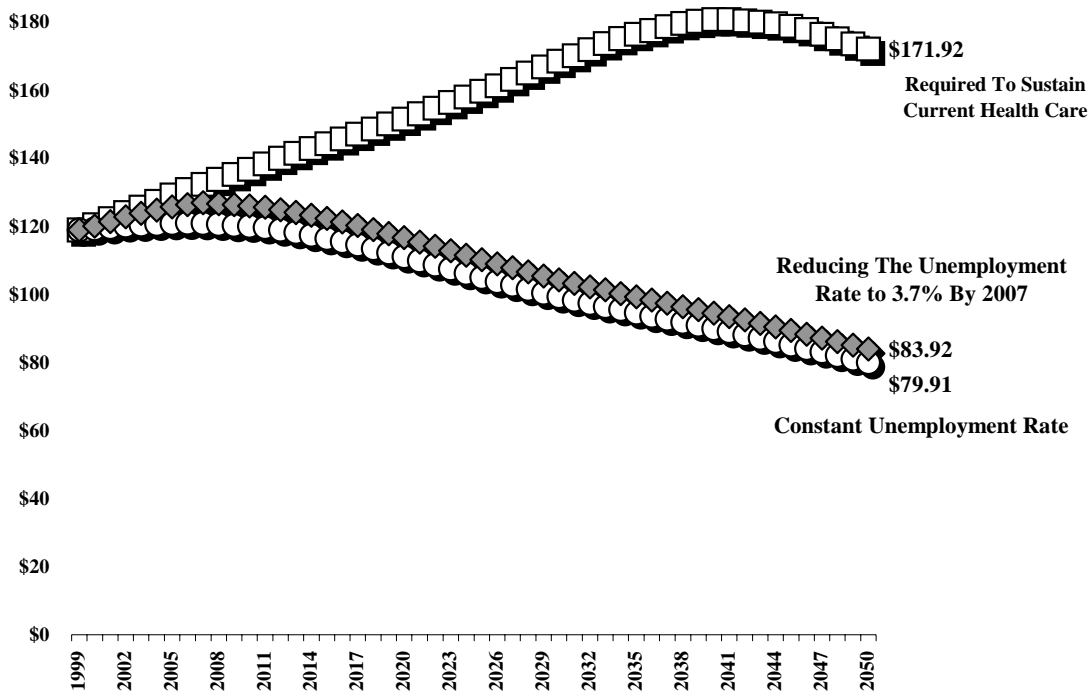


The first change considered here is to assume that policies are immediately put in place that will increase employment so as to reduce unemployment not only in the short term, but the long run as well. It is here assumed that the long run minimum unemployment rate in British Columbia is 3.7%. There are a number of reasons for choosing a 3.7% as the minimum. The first reason is empirical: 3.7% is the average of the unemployment rates of 1946 to 1956, the period in which the lowest unemployment rates of the post-war era were experienced. The second reason is also empirical: evidence from elsewhere that indicates that it is very difficult for modern economies to move much below a 4% unemployment rate: even with the continuous economic boom of the US and British economies over the past decade, they have not been able to move below a 3.7% unemployment rates. The third is theoretical: 3% is a widely used measure of the structural unemployment that is inherent in modern postindustrial economies, where there will always be some unemployed person as a result of changing skill requirements. Given the social services available in British Columbia, and the seasonal nature of many of its industries, the minimum structure level of unemployment here is likely to be above the 3% theoretical level.

It is also necessary to make an assumption about when this minimum rate might be attained: again, the poor performance of the B.C. economy over the past decade does not offer any guidance, as unemployment rates did not decline. An optimistic assumption would be to assume that reduction in unemployment could occur at the same 10% rate of decrease as it did coming out of the early 1980s recession. This would take the unemployment rate from the current 8.3% to 3.7% by 2007. To do this would require employment in the province to increase at more than twice the rate of growth of the labour force, something that has not happened in the past decade.

Having sufficient employment growth to reduce unemployment to 3.7% by 2007 will move the province's GDP toward the level required to sustaining the current health care system for its present residents – but it won't move it far. Even with a 3.7% unemployment rate, the shrinking labour force of status quo no migration scenario would be able to produce a GDP of \$83.92 billion (constant 1999 \$), 5% more than the \$79.91 billion it would produce at 1990s unemployment rates. The shortfall between the capacity of the workforce to produce GDP and that required to sustain the health care system would remain enormous, with the required \$171.92 billion GDP being more than twice the labour force productive capacity of \$83.92.

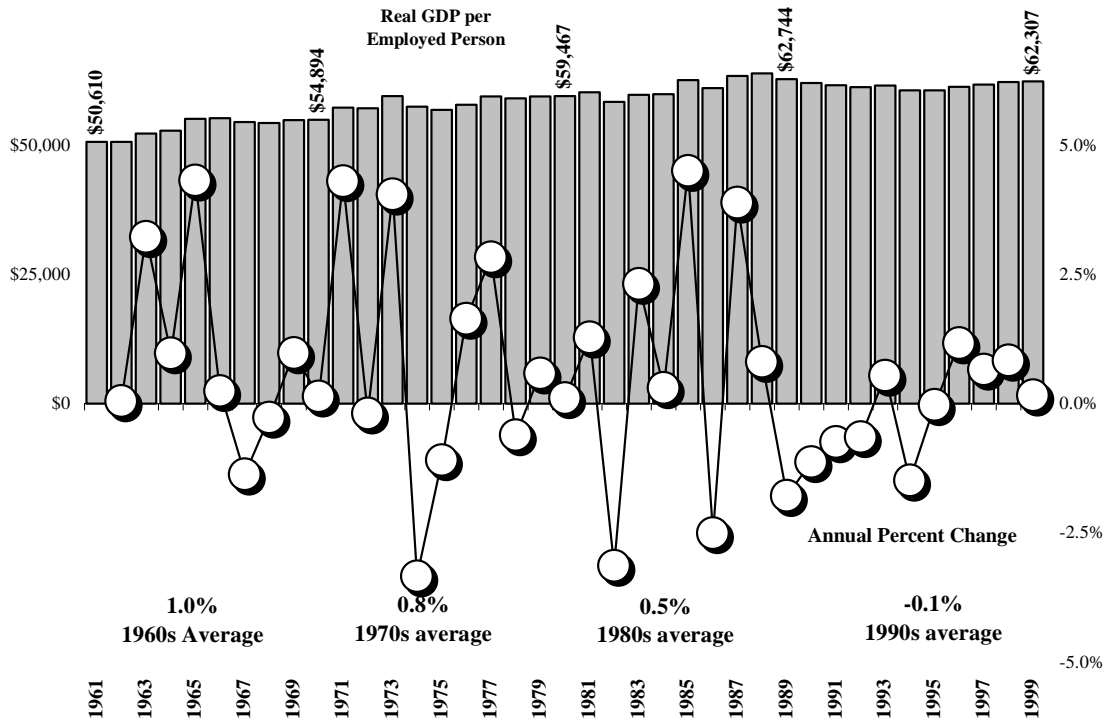
**Figure 25. GDP Capacity and Required, BC, Status Quo No Migration Scenario, 1999-2050
 Declining Unemployment Rates, Constant 1999 Dollars, \$Billions**



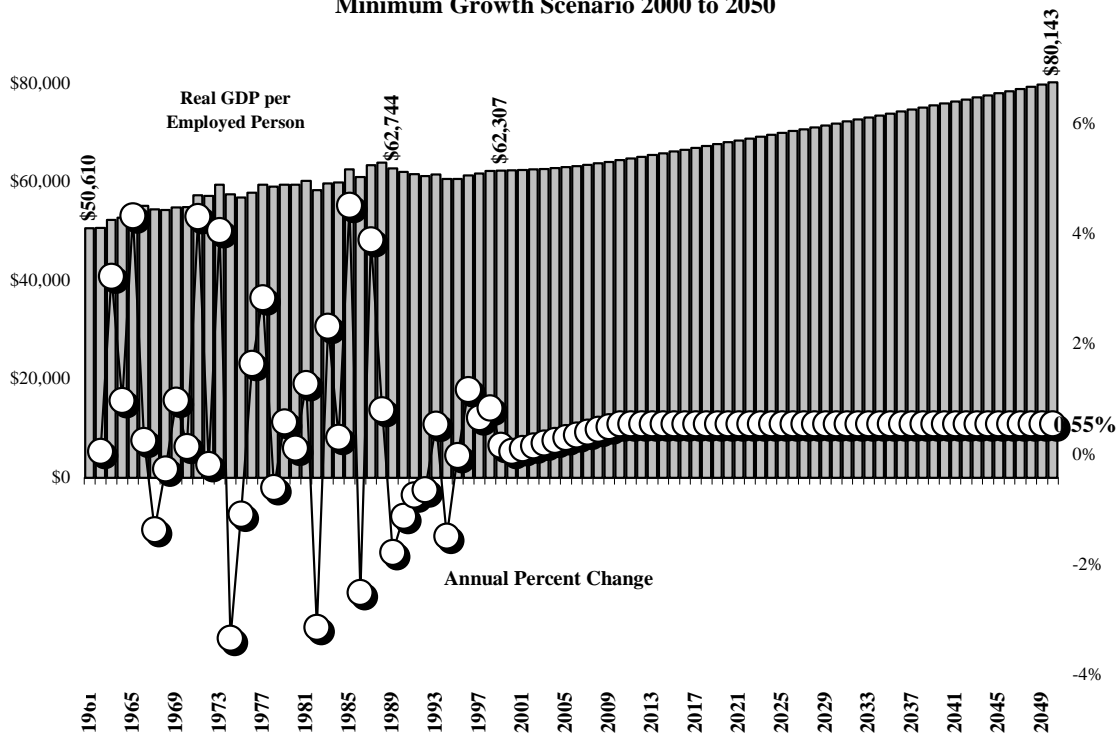
b. Increasing Employment Productivity

The second way to increase labour force productivity is to increase the GDP contribution of people who are employed. Two main ways that this employment productivity is increased are windfall gains and investment. There has been a dramatic growth in the productivity of workers in Alberta in the past year simply because of the increase in world oil and gas prices: a long hot air conditioned summer in the United States does the same thing for B.C. with respect to its electricity exports. A longer term and less serendipitous way to increase productivity is investment, providing workers with more assets to work with in production, and hence increasing the output of each of them. Again, the past decade in B.C. does not provide any guidance with respect to the extent to which employment productivity can be increased, as it declined.

Figure 26: Employment Productivity, BC, 1961 to 1999



**Figure 27: Employment Productivity, BC, Actual 1961 to 1999
 Minimum Growth Scenario 2000 to 2050**

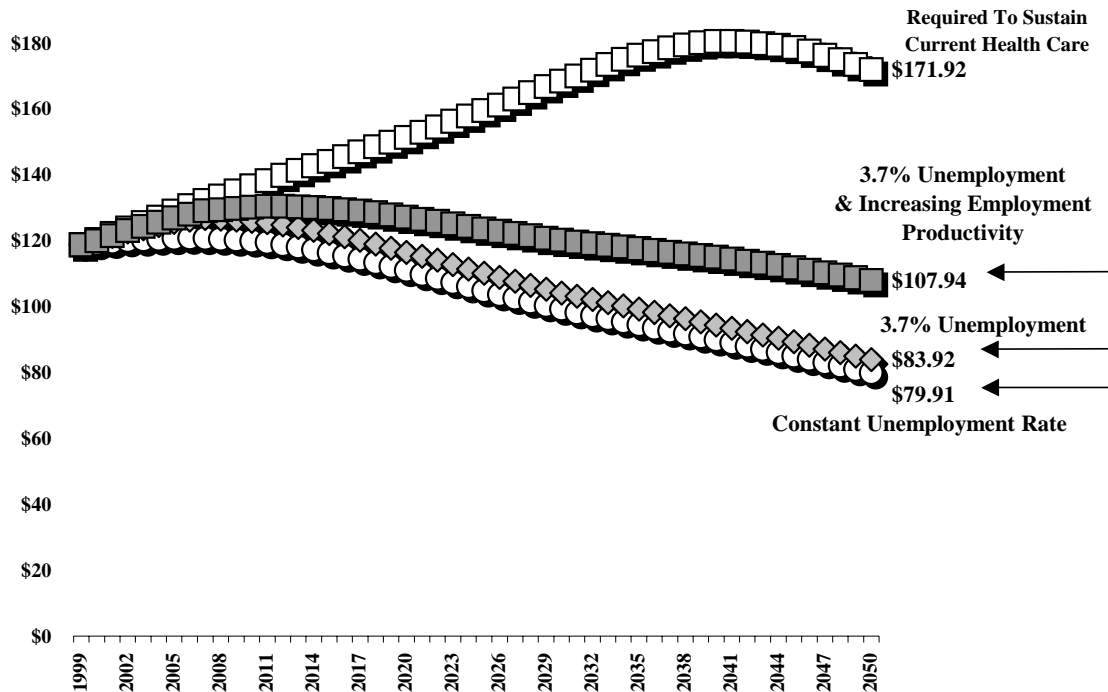


Over the 40 years for which data are available, real employment productivity in B.C. increased by an annual average of 0.55%, from \$50,610 real GDP per employed person in 1961 to \$62,307 in 1999 (Figure 26²⁹). The greatest average increase was in the 1960s, with an average of 1.0% increase in employment productivity each year. In the 1970s, productivity increased by an average of 0.8% per year, while in the 1980s it increased by an average of 0.5% per year. In the 1990s, employment productivity declined by an average of 0.1% per year. In 1989, GDP per employed person was \$62,744 constant dollars: in 1999, the average was only \$62,307.

The goal of sustaining the province's health care system necessitates the assumption that economic policies will be put in place that encourage investment in the province to increase employment productivity. As investment, and the returns thereto, take time, it is assumed that these policies will lead to gradual annual increases in productivity, reaching the historical long-term average of 0.55% per year by the end of the next decade. If the required investment occurs, real employment productivity would increase from 1999's average of \$62,307 GDP per employed person in the province to \$89,143 in 2050 (Figure 27), a 29% increase over the next five decades.

This investment in employment productivity, combined with investment that generates more employment to ensure the decline in unemployment rates to 3.7%, will be another step towards sustaining the current health care system. The resultant increase in labour force productivity will expand the capacity of the economy to a constant dollar GDP in 2050 of \$107.94 billion, 35% greater than the \$79.91 billion capacity that it would have without such investment.

Figure 28. GDP Capacity and Required, BC, No Migration Scenario, 1999 to 2050
Declining Unemployment Rates Increasing Productivity, Constant 1999 Dollars, \$Billions



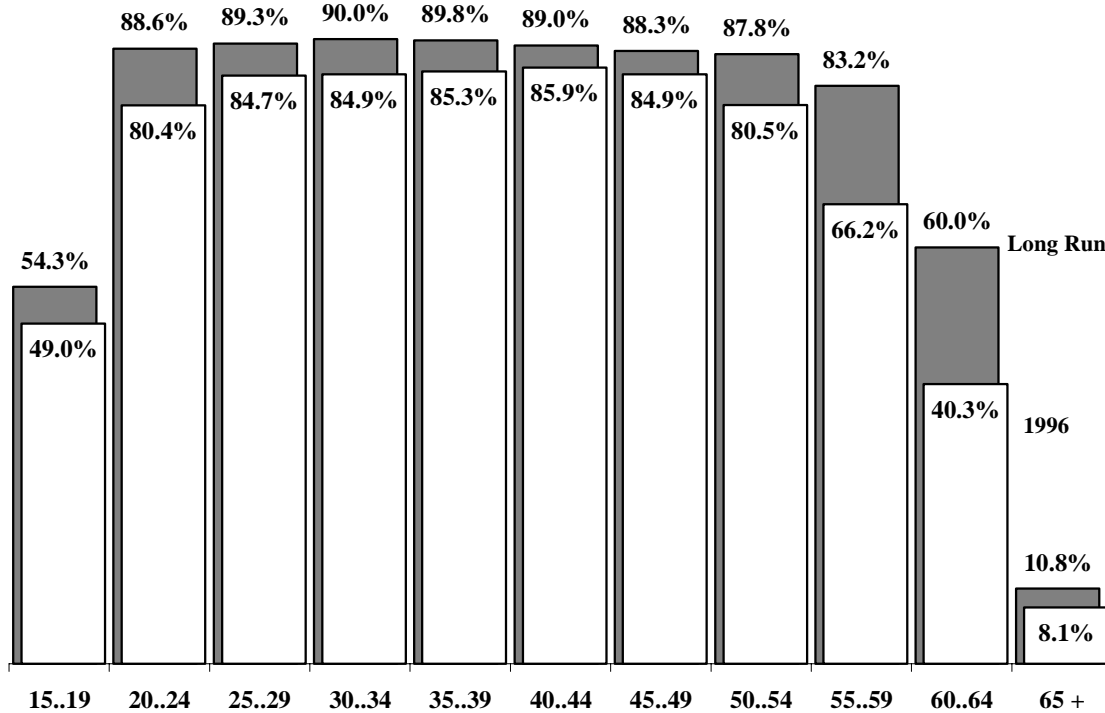
Even with this productivity increase, the capacity of the economy would still be 38% below the \$171.92 billion necessary to support the health care demands of the currently resident population and their descendants. Another economic change would be to invest to increase the number of people in the labour force relative to the population. Increasing labour force participation rates, if facilitated by employment growth, would both increase the productive capacity of the economy and the number of contributors in the dependency equations.

2. Increasing Labour Force Participation

If long term policies that encourage economic growth and expansion of employment are put into place, it may be possible to increase the economic contribution of the population towards their health care further by facilitating increased labour force participation rates³⁰. There is no empirical basis to support an assumption of increasing labour force participation rates, in either British Columbia or Canada, as these rates have declined slightly over the past decade. Incarceration, disability, pensions, RRSPs, educational requirements and alternative (non-labour force) lifestyles, as well as high unemployment rates, have seen male participation rates decline over the past thirty years. Female rates, which increased steadily up to 1991, did so at a slowing rate: from 1991 to 1996 they remained essentially constant.

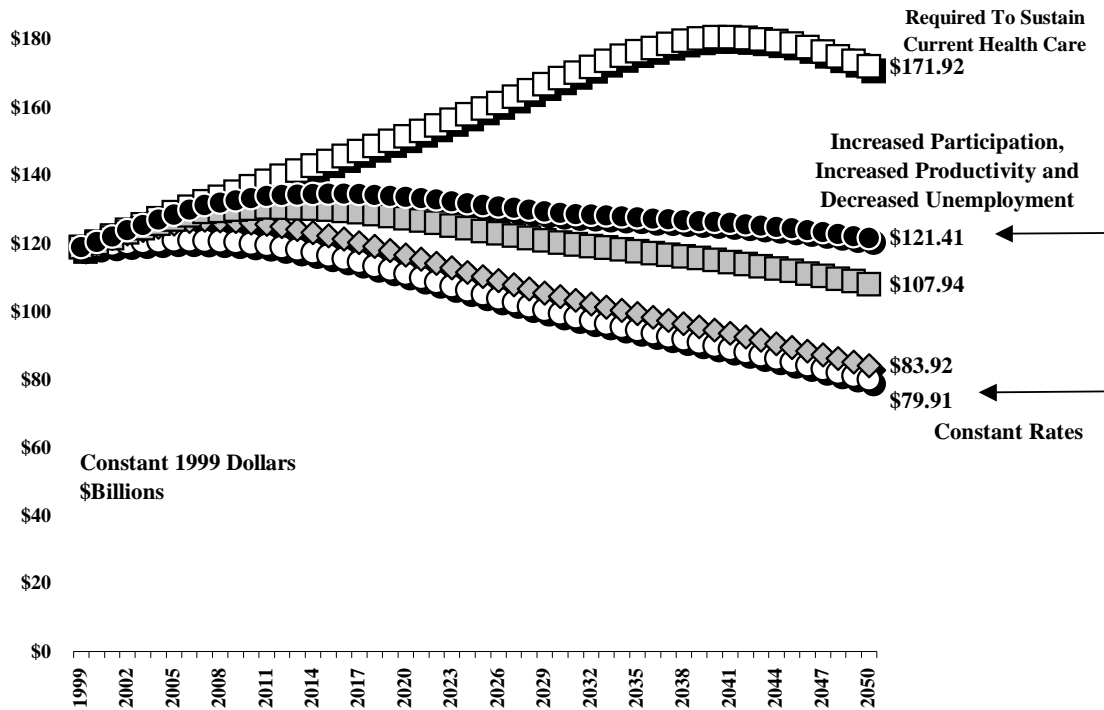
In spite of this evidence to the contrary, it is assumed that labour force participation rates will increase over the next five decades, with male rates reversing their postwar decline to return to their 1981 level and female rates beginning to increase again to reach levels 10% below male rates in every age group (Figure 29). The result is a record high level of labour force participation, with increases of 25% to 50% in the rates for the pre-retirement age groups. Although the participation rate for the 65 plus age group is assumed to increase by 33%, it would still remain the lowest of all age groups: this is appropriate, as the age group includes everyone from age 65 to 100 plus, most of whom (89%) will not be in the labour force. The overall result of this change will be a 17% increase in labour force participation over the next 50 years.

Figure 29. Labour Force Participation Rates, BC, 1996 & Assumed Long Run Rates



Assuming that the economy can change sufficiently to reduce unemployment to 3.7%, to increase productivity by 29%, and to accommodate a 17% increase in labour force participation, its capacity will expand further towards the goal of meeting the contingent health care liability that is intrinsic to the age profile of British Columbia's current population (Figure 30). These changes would result in a 2050 real GDP in British Columbia of \$121.41 billion, 52% higher than the \$79.91 changes that would result without them.

Figure 30. GDP Capacity and Required, BC, No Migration Scenario, 1999 to 2050
Declining Unemployment, Increasing Productivity and Participation



The economic change that would be necessary to get this 52% increase, while dramatic in the context of the past decade, is not unrealistic in the context of the 3decades that preceded it. These increases can be brought about with appropriate economic policies, and would take B.C. a long way towards being able to meet the health care liability that its current age profile represents.

They would go a long way – but the would not take it all the way. Even with these changes, the \$121.41 billion GDP capacity of the economy would be 29% below the \$171.92 billion GDP required to maintain the current health care system in terms of spending pattern and share of GDP. We cannot take care of ourselves! Even with record low unemployment and record high productivity and participation, the economy would not be large enough to support the future health care demands that the demographic composition of its current population represents.

In order to sustain the current health care system in British Columbia, it will be necessary not only to change its economy, but to change its demography as well. The fundamental demographic issue is that the strongly age specific pattern of current provincial health care spending cannot be maintained in an environment where the elderly dependency ratio, the number of people 65 plus per 1000 people of working age, increases 2.53 times, from 188 people 65 plus per 1000 of working age in 1999 to 475 per 1000 in 2040. Even with unprecedented improvement in the province's economy, the choice, simply put, is to change the health care system or change the demographics. As the goal in this research is to maintain the health care system, demographic change, in addition to economic change, is the avenue to be explored.

Improving the demographic balance means reducing the elderly dependency ratio: this can be done by either reducing the relative number of people 65 years of age and older or increasing the relative number of people of working age. With the goal of maintaining the current health care system, increasing the relative size of the working age population – through net in-migration to the province – is the only feasible strategy.

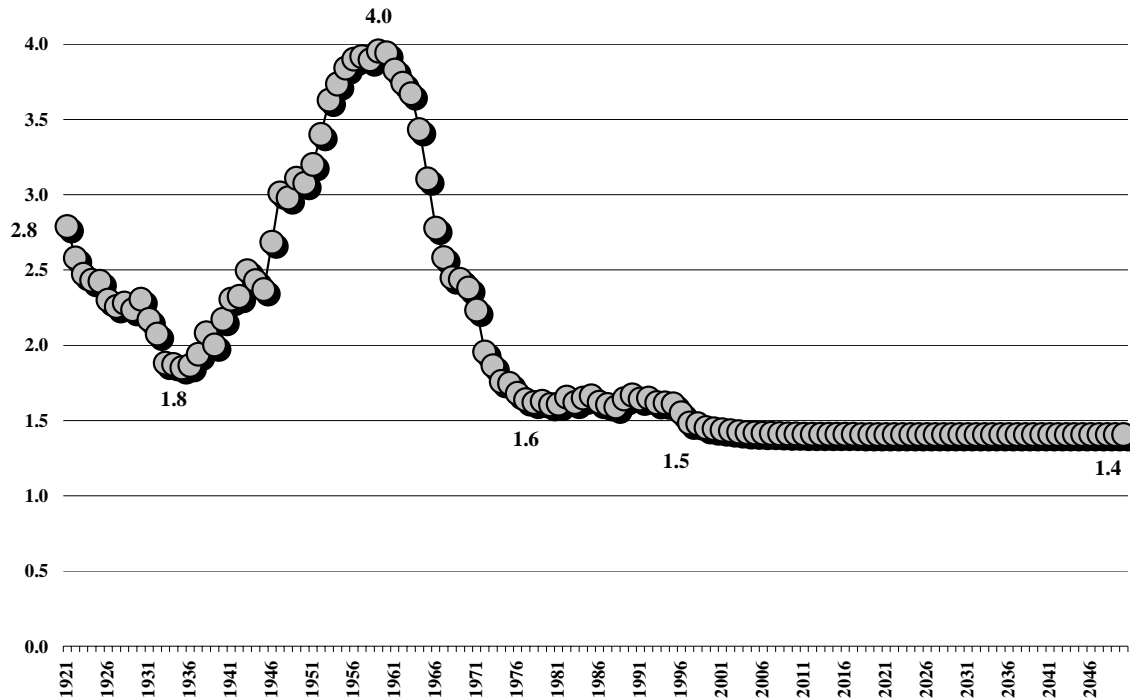
3. Increasing Population.

A massive increase in the productive capacity of the labour force, record high participation rates, and record low unemployment rates, and still we could not take care of ourselves. In order for the province's economy to grow enough to support the health care requirements of the current residents and their descendants, the economy and employment must grow by more than is possible with this population alone. The current residents are going to need help in the future to pay for their health care: sharing the load means sharing the neighbourhood. As with the economic change scenario, the relevant question is not "Should change occur?", but rather "How much change must occur to preserve the current health care system?". In this section, the minimum level of demographic change that is required, in addition to declining unemployment, increasing productivity, and increasing labour force participation, to maintain the current health care system (in terms of both spending pattern and share of the economy) is estimated.

a. Changing Vital Rates

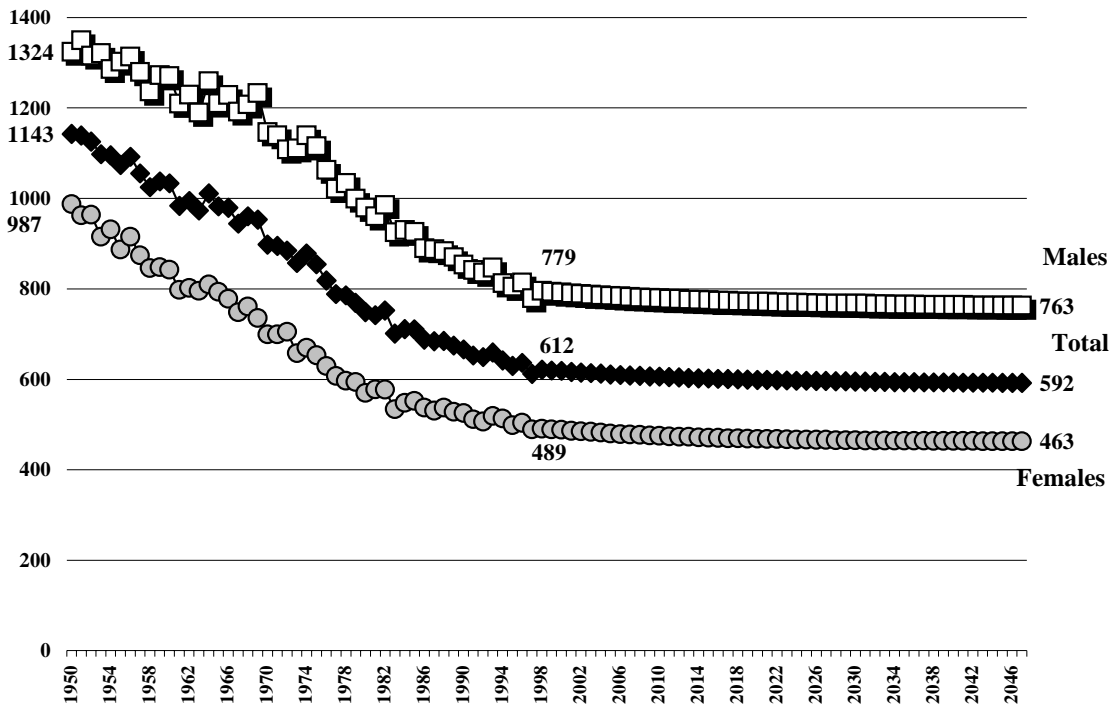
Removing the constraint of constant current rates permits acknowledgement not only of migration, but also of trends in birth and death rates. As noted in Section III, both of these rates have demonstrated declining trends in the past four decades, trends that if they continued would result in a relatively smaller younger population and a large older population, due to both declining births and increasing life expectancies. In the case of births, it was assumed that the historical pattern of decline in age specific birth rates continued, but at rapidly slowing rate. The result would be a continued decline in the total fertility rate from 1998's 1.5 births per woman during her lifetime to 1.4 by 2050 (Figure 31). This would leave the future fertility rate in British Columbia above that which currently exists in most of Europe. In terms of adding workers to the future population of B.C., this is an optimistic assumption, as trends in B.C., in Canada, and Europe suggest even greater declines may occur.

Figure 31: Total Fertility Rate, British Columbia, 1921 to 1997, Projected to 2050
Average Number of Children Born Per Woman During Her Lifetime



A similar assumption was made about age and sex specific mortality rates: it was assumed that the historical pattern of decline would continue, but at a slowing rate (Figure 32). In the case of male mortality, the assumed slowing of the pattern of decline in age specific mortality rates would lead to a decline in the age standardized rate from 1997's 779 deaths each year per 100,000 to reach 763 per 1000 in 2050. In the case of female mortality, the stabilizing of age specific rates would lead to a decline in the age standardized rate from 1997's 489 per 100,000 to reach an age standardized rate of 463 deaths per 100,000 in 2050.

Figure 32: Age Standardized Mortality Rates, B.C. 1950-1997 Projected to 2050
Deaths Per 100,000 People per Year, Standard Age Profile



While this projected pattern is a departure from the strongly declining rates of the past 50 years, there is some consistency between this slowing and keeping the health care system as it is today. The increases in real health care spending of the past have brought longer life expectancies as well as higher costs: without real increases in health care spending in the future, increases in life expectancies (i.e., declining mortality rates) may not occur. This assumed pattern is again optimistic with respect to the demographic balance, as it will result in a smaller older population than would result if the historical pattern of declining mortality rates continued unabated.

b. Characteristics of Migrants

In the absence of migration, the further below replacement level birth rate and increased life expectancy that trends dictate would mean an even greater increase in the elderly dependency ratio, and hence greater shortfall in resources to maintain health care, than was shown in the status quo no migration population scenario. Net migration to British Columbia, and the economic growth to accommodate it, is essential to sustaining health care. The next two pages show the age profiles of B.C.'s migration: in migrants from, and out migrants to, other provinces, and immigrants to, and emigrants from, the province³¹. In every case, the age profile of the migrant population is younger than the resident population. There is a double benefit to British Columbia from attracting more young migrants: the first that they will be in the workforce in the future and the second that they represent relatively low health care costs.

Figure 33: Age Distribution of In-migrants to British Columbia, 1988-1998 Average



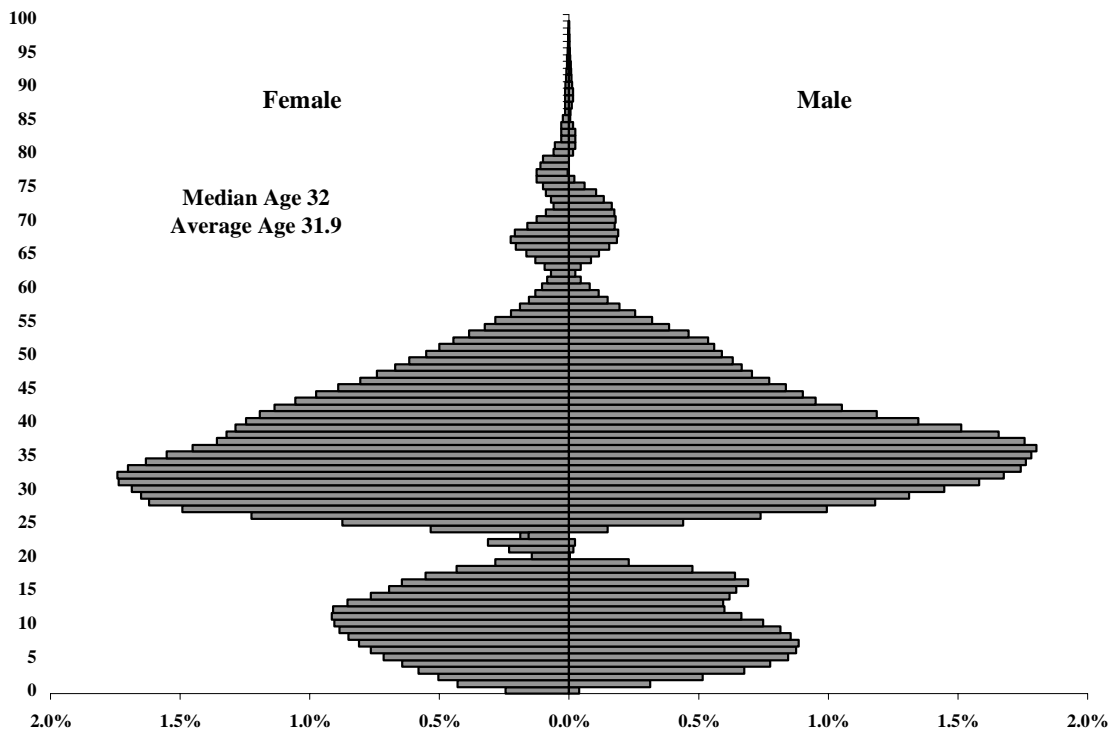
Figure 34: Age Distribution of Out-migrants from British Columbia, 1988-1998 Average



Figure 35: Age Distribution of Immigrants to British Columbia, 1988-1998 Average



Figure 36: Age Distribution of Emigrants from British Columbia, 1996-1998 Average



In 1999, the average (mean) age in British Columbia was 36.8 years of age and the median was 35 years of age: half the population was under the age of 35, and half was 35 years of age and older. In contrast, half of the in-migrant population was under the age of 26, half of the out migrant population was under the age of 25, half of the immigrant population was under the age of 28, and half of the emigrant population was under the age of 32. All of the migrant populations were markedly younger than the resident population. Note that emigrant and immigrant populations are older than the inter-provincial migrants because entry requirements of most countries require greater qualifications than inter-provincial mobility.

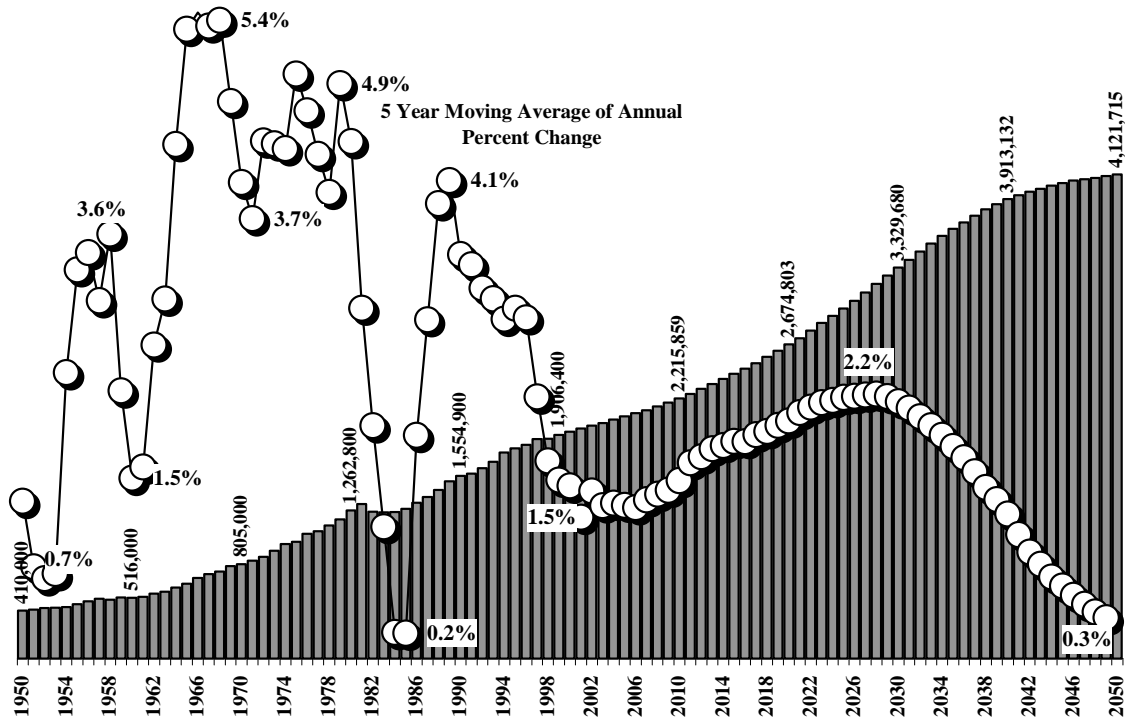
c. Minimum Required Level of Migration

In the “minimum demographic change to sustain health care” scenario, it is assumed the age profile of the migrant populations maintains the average demonstrated over the past decade. In this context, the task is to measure the minimum level of net migration (the combination of net international and net inter-provincial migration) to ensure that there are enough people in the labour force (assuming increased participation rates) and working (with 3.7% unemployment) to produce (with productivity increasing at 0.55% per year by 2010) the GDP required to support the current level of health care spending for the current population and the minimum number of new residents. Note that the distinction between net international migration and net inter-provincial is not significant, as all provinces in Canada face the same issues of below the replacement level birth rates and a demographic wedge currently aged 35 to 64: inter-provincial migrants will continue to be, as they have been in the past, immigrants and the descendents of immigrants.

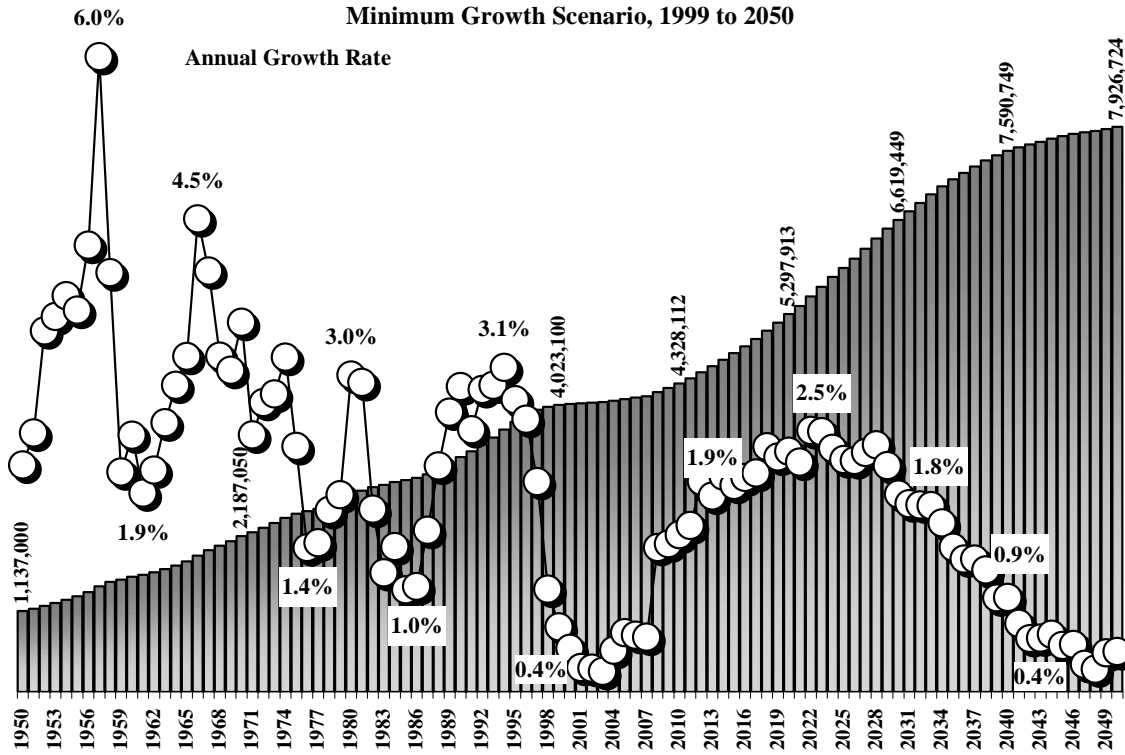
Economic and employment growth is the key to ensuring that the same relative level of resources are available for health care in the future as there are today: it is increased productivity and employment growth that reduces unemployment, increases participation and attracts young labour force migrants that will sustain the province's health care system. To produce the minimum required real GDP in the future, employment in the province will have to increase from 1999's 1,906,400 employed to 2,215,900 in 2010, 2,674,800 in 2020, 3,329,700 in 2030, 3,913,100 in 2040 and 4,121,700 in 2050 (Figure 37). This 116% increase over the next five decades is much less than the 365% increase in employment that occurred over the past five decades. The 4.5% annual employment growth rates of the 1960s and 1970s are not necessary to meet the employment requirements of the future: the 1.5% average of the past 5 years, however, is not enough. Annual employment growth rates must reverse the slowing trend of the past decade and start to steadily increase to reach a minimum of a five year average of 2.2% by the 2030s if B.C.'s economy is to be able to support the growing health care demands of its population.

The requirement of increasing employment growth, ultimately driven by the aging of the demographic wedge in today's population into the highest health care cost stage of the life cycle, combined with the retirement of the wedge over the same time period, means that labour force growth must also reach its peak in the early 2030s. Given the assumptions of unemployment rates declining to 3.7% and labour force participation rates increasing to record levels, finding enough workers to meet employment demand will in turn mean that population growth must peak in the mid-2020s (Figure 38). To meet the health care resource demands implicit in the age profile of the province's current population will require that annual population growth increase from its recent 0.4% - 0.6% range to reach 2.5% by 2020: after that date, the minimum annual required population growth can decline back to its current level. As with employment, the rate of population growth required in the future will be well below that which occurred in the past. From 1950's 1,137,000 people, the province's population increased by 254% to reach 4,023,000 in 1999: the required increase in population from 1999 to 7,926,700 in 2050 is only 97%. Given the larger base in 1999, the required 97% increase involves adding 3.9 million people to the province over the next five decades, compared to the 2.9 million added in the last five decades.

**Figure 37: Employment in British Columbia, Actual 1950 to 1999
 Required Minimum Growth Scenario 2000 to 2050**



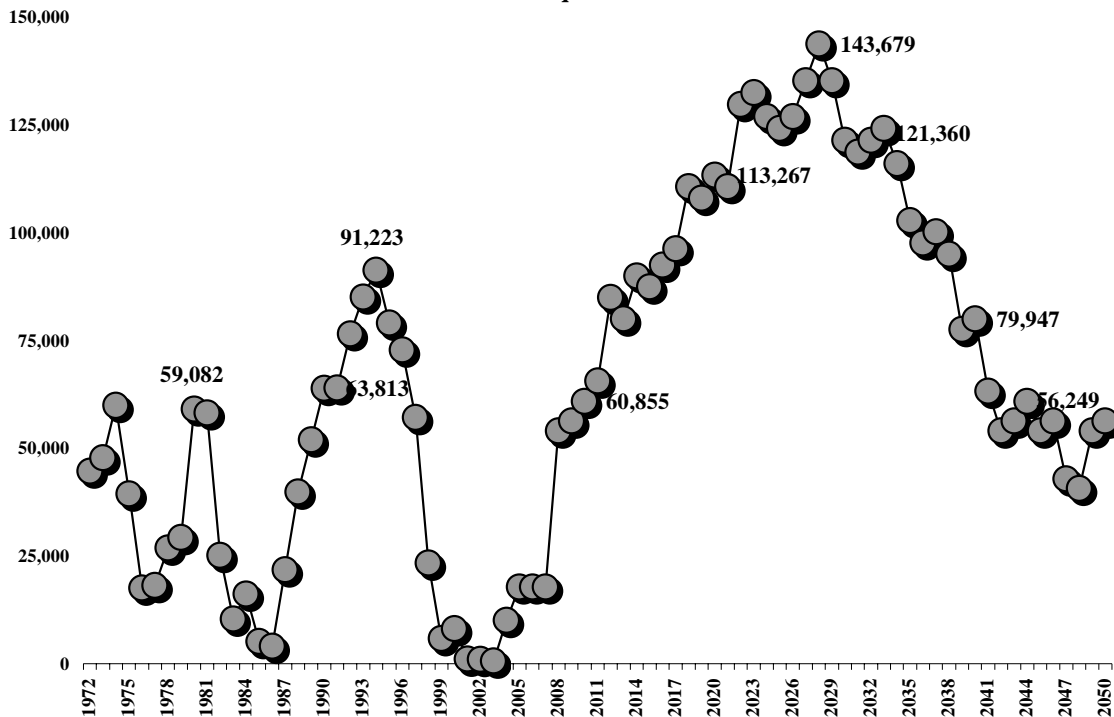
**Figure 38. Population of British Columbia, Actual 1950 to 1999
 Minimum Growth Scenario, 1999 to 2050**



The 2% range of annual population growth required over the next twenty-five years is well below the growth rates the province averaged in the 1950s, 1960s, 1970s and the first half of the 1990s. It must be above the slow population growth experienced during the recessions of the 1980s and second half of the 1990s. Note that the required minimum annual population growth is relatively low in the 2000 to 2005 period. This is the period when unemployment rates are assumed to fall by more than 50%, and labour force participation rates and employment productivity to increase. In this context, required population growth is lower than it will be after 2005, when these factors are not sufficient of offset the combination of escalating health cost and retirement associated with the aging of the demographic wedge. This means that meeting the expanding demand for workers to support health care expenditures will have to increasingly rely on population growth.

This population growth will come from two sources, natural increase and net migration. The minimum net migration required by the province will increase slowly from its current negligible level to reach 60,000 by 2010, 113,000 by 2020, to reach a peak of 144,000 by 2028, and then drop back through 121,000 in 2030, 80,000 in 2040, and 56,000 in 2050 (Figure 39). The peak coincides with the widest part of the demographic wedge turning 65, leaving the labour force and entering the high health care cost stage of the life cycle.

**Figure 39: Net Migration to British Columbia, 1972 to 1999 Actual
 Minimum Growth Requirement 2000 to 2050**



As migration flows are comprised mainly of young people, net migration has an impact on the number of births in the province (Figure 40). In the near term, with relatively low levels of net migration, the number of births will continue its decline from its 1995 record level of 47,000 births to 38,900 in 2007. From 2007 on, sufficient migration will have occurred to increase births steadily to 68,300 in 2040; the slowing of migration after 2028 will show up in a decline in the number of births after 2040. Migration will do nothing to slow the increase in the number of deaths in the province as its current demographic wedge ages into the high mortality rate age groups. As a result, natural increase will decline from its 1999 net contribution of 10,900 people to a slightly positive contribution from 2007 to 2030: from then on, death will out number births and natural decrease, rather than increase, will result.

**Figure 40: Components of Natural Increase, British Columbia, 1972 to 1999 Actual
 Minimum Growth Scenario 2000 to 2050**

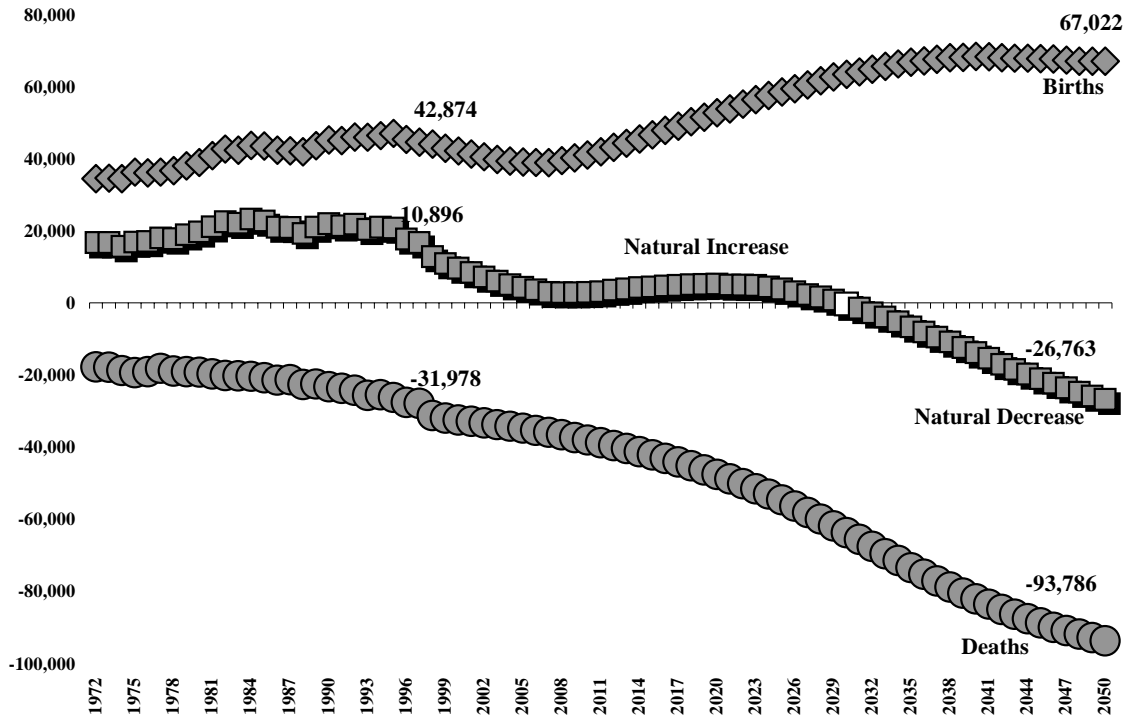


Figure 41. Population Composition, B.C., Minimum Growth Scenario, 1999-2050

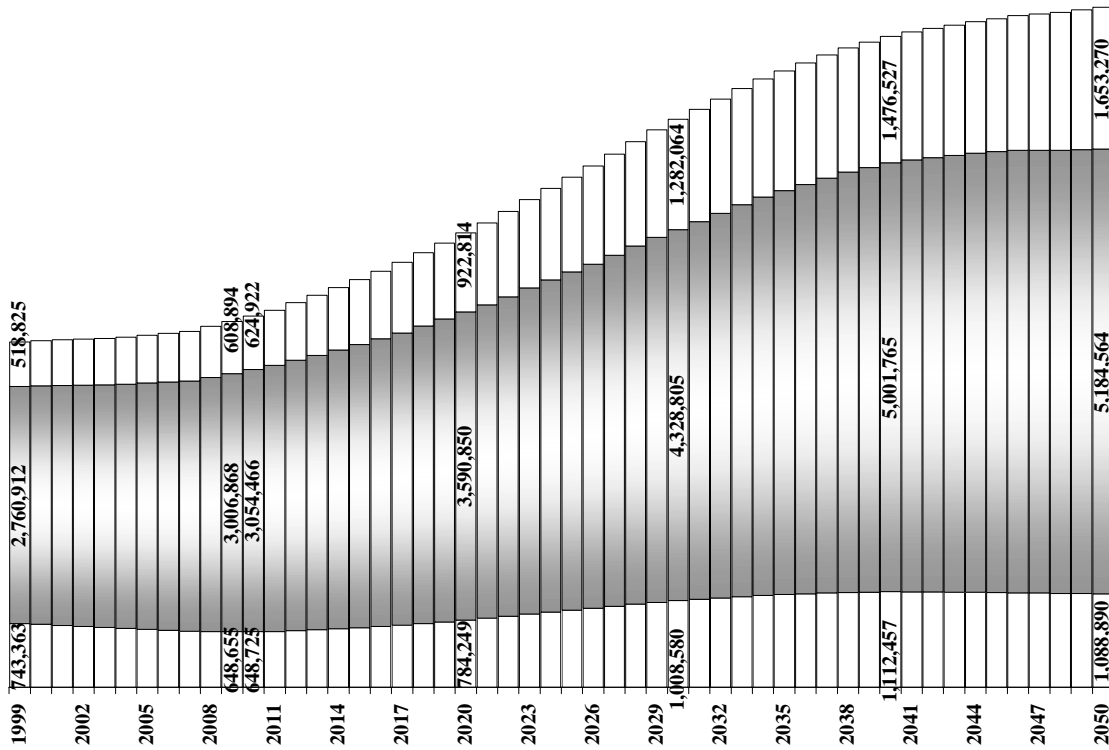
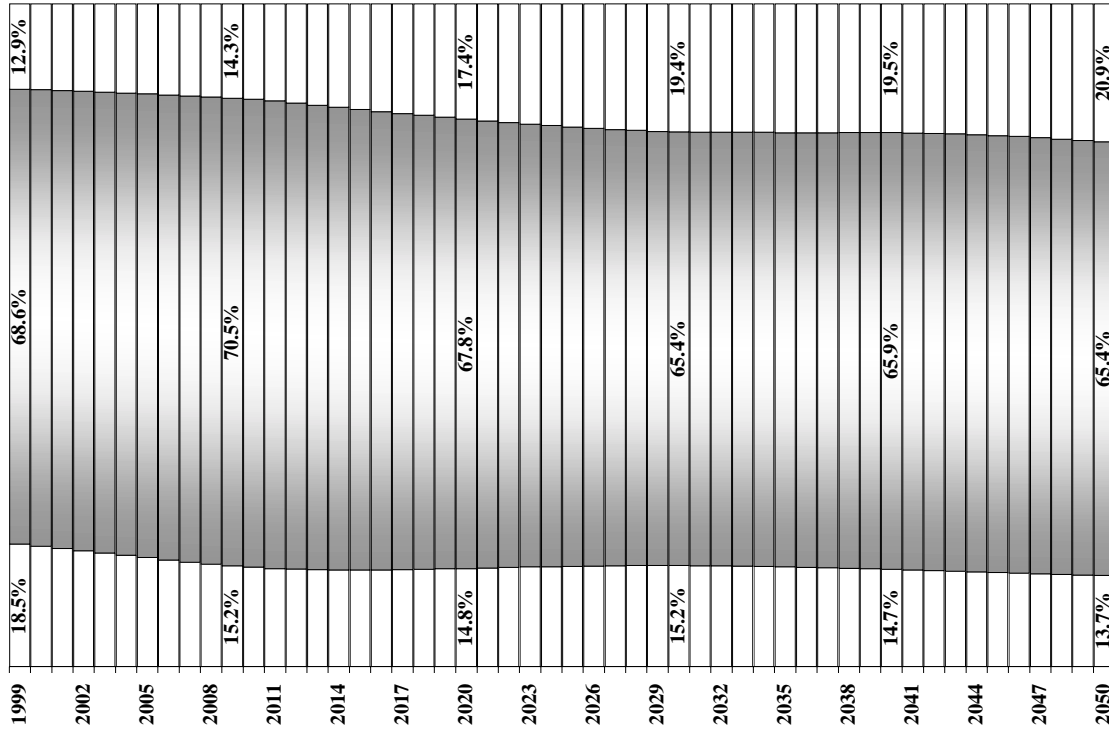
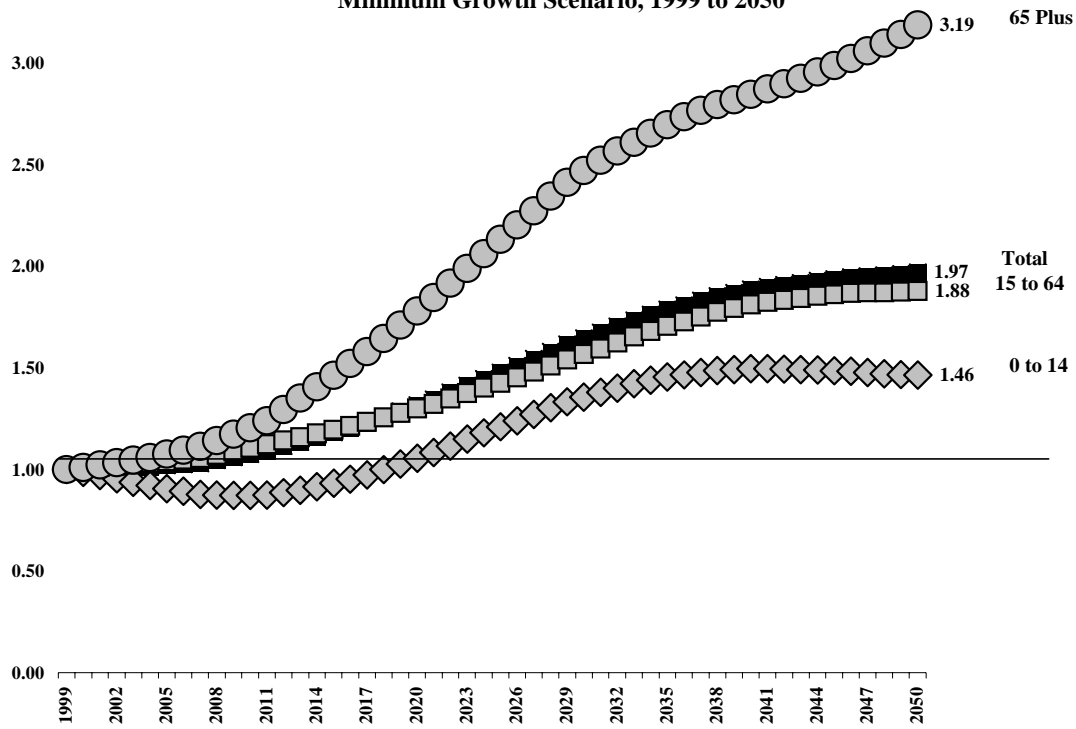


Figure 42. Population Composition, B.C., Minimum Growth Scenario, 1999-2050



**Figure 43. Population Growth by Age Group, British Columbia
 Minimum Growth Scenario, 1999 to 2050**



The effect of the required demographic and economic changes will be reflected in the future age composition: it is, unlike the no migration scenario, remarkably like that of today, which is not surprising given the goal of sustaining today's health care system. The young age profile of the migrant population would mean no decline in the number of people in the 15 to 64 age group, and only a short-term decline in the number in the 0 to 14 age group (Figure 41). This will generally maintain today's age distribution, with the 15 to 64 age group declining from 68.8% of the population to 65.4% by 2050 (Figure 42), compared to 59.2% in the no-migration scenario.

The increase of the 65 plus age group's share from 1 in 8 (12.9%) in 1999 to 1 in 5 (20.9%) in 2050 would result from this number of people in this age group increasing by 3.19 times (Figure 43) from 518,800 in 1999 to 1,653,300 in 2050, while the 15 to 64 age group would increase by only 1.88 times (from 2,760,900 in 1999 to 5,184,600 in 2050). The older age group's increasing share would be offset by the increased productivity of the labour force that would result from declining unemployment, increasing participation and increasing employment productivity.

The balance that economic change and migration would bring to the province's demographic structure would be reflected in the population dependency ratios (Figure 44). With or without migration, the youth dependency ratio would decline, and would be about the same. The reason is the direct link between the number of people aged 0 to 14 and the number in the 15 to 64 age group that is provided by the below the replacement level birth rate: more people aged 15 to 64, more kids: fewer people in the 15 to 64 age group, fewer kids. The growth of the 65 plus population over the next 35 years is the result of the aging of the demographic wedge already resident in the province: whether there is migration or not, we will grow older. What migration will do is increase the number of people of working age relative to the number of us old folks in the future (anyone in the province over the age of 30 today). The result will still be an increase in the elderly dependency ratio from 188 people 65 plus per 1000 of working age to 319 per 1000 in 2050, a 69% increase, compared to the 156% increase that would result without migration.

Figure 44. Population Dependency Ratios, BC, No Migration Scenario, 1999 to 2050

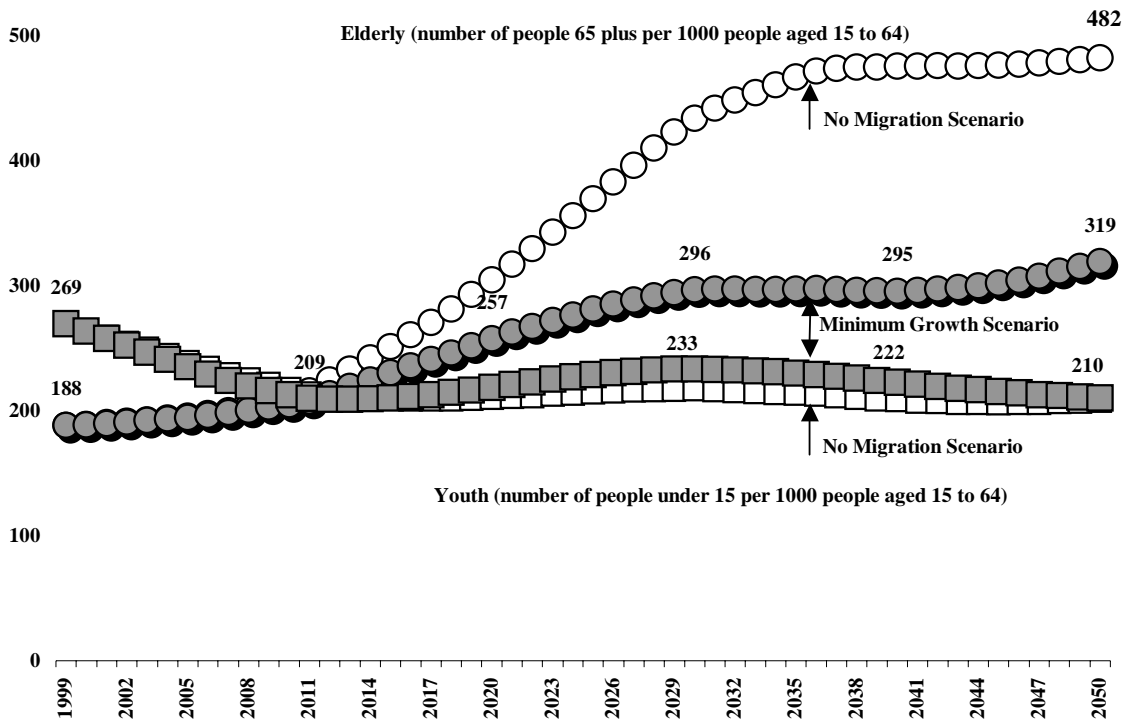


Figure 45. Total and Percapita Provincial Health Spending in Constant 1999 Dollars
Minimum Growth Scenario, 1999 to 2050

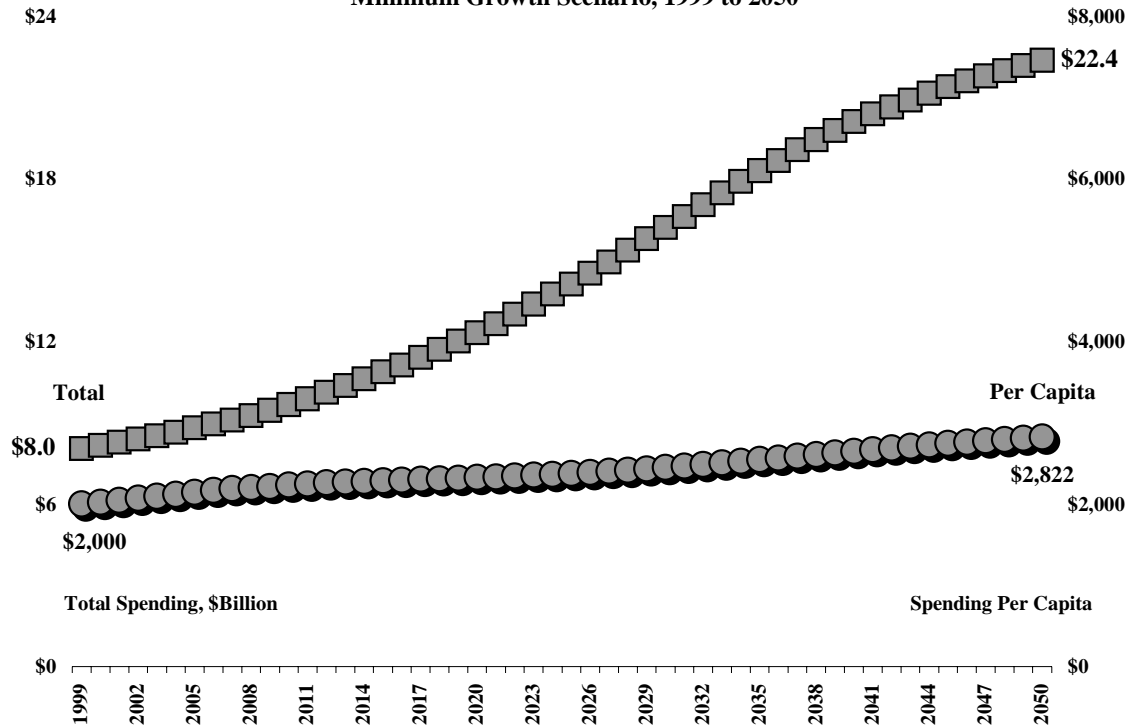
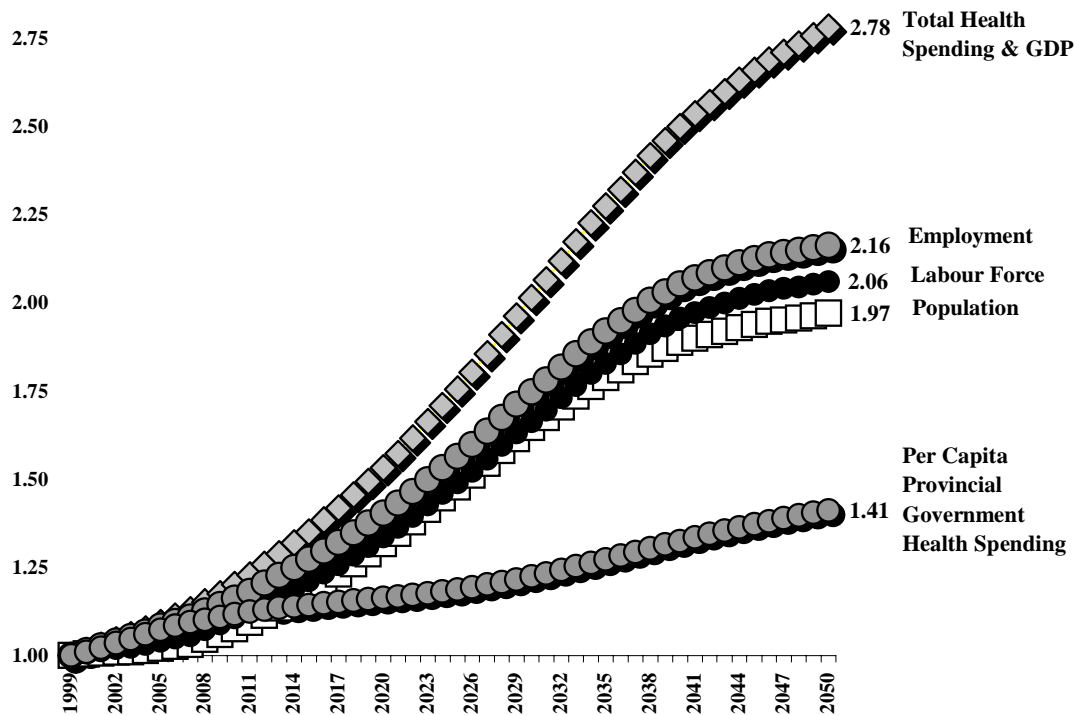


Figure 46. Indices of Change: Economic, Demographic, and Provincial Government Health Spending - Minimum Growth Scenario, 1999 to 2050

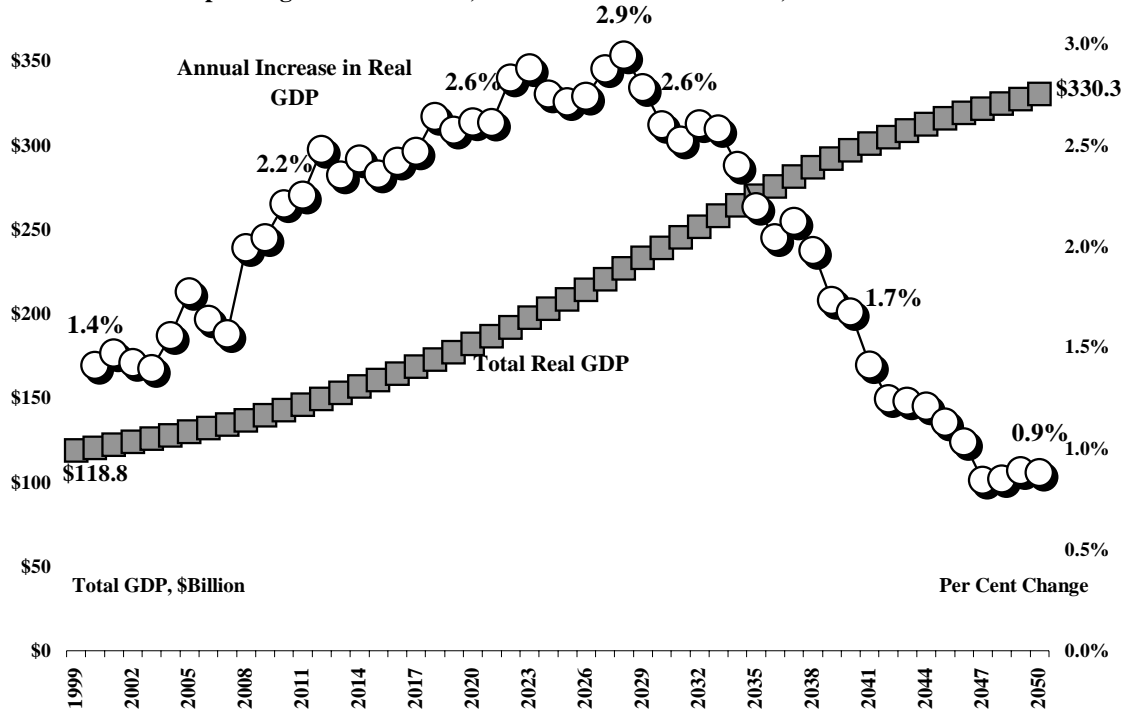


The required economic and demographic changes will sustain the current health care system during a period of time when demand for health care will increase rapidly. Total provincial government health care spending in constant dollars under this minimum growth scenario would increase from 1999's \$8.0 billion to \$22.4 billion in 2050 (Figure 45), a 2.78 times increase over a 50 year period (Figure 46). As maintaining today's health care spending involves not only maintaining its constant dollar pattern, but also keeping its share of GDP constant at today's 6.8%, this means that real GDP must also increase 2.78 times, from 1999's \$118.8 billion to \$330.3 billion in 2050 (Figure 47).

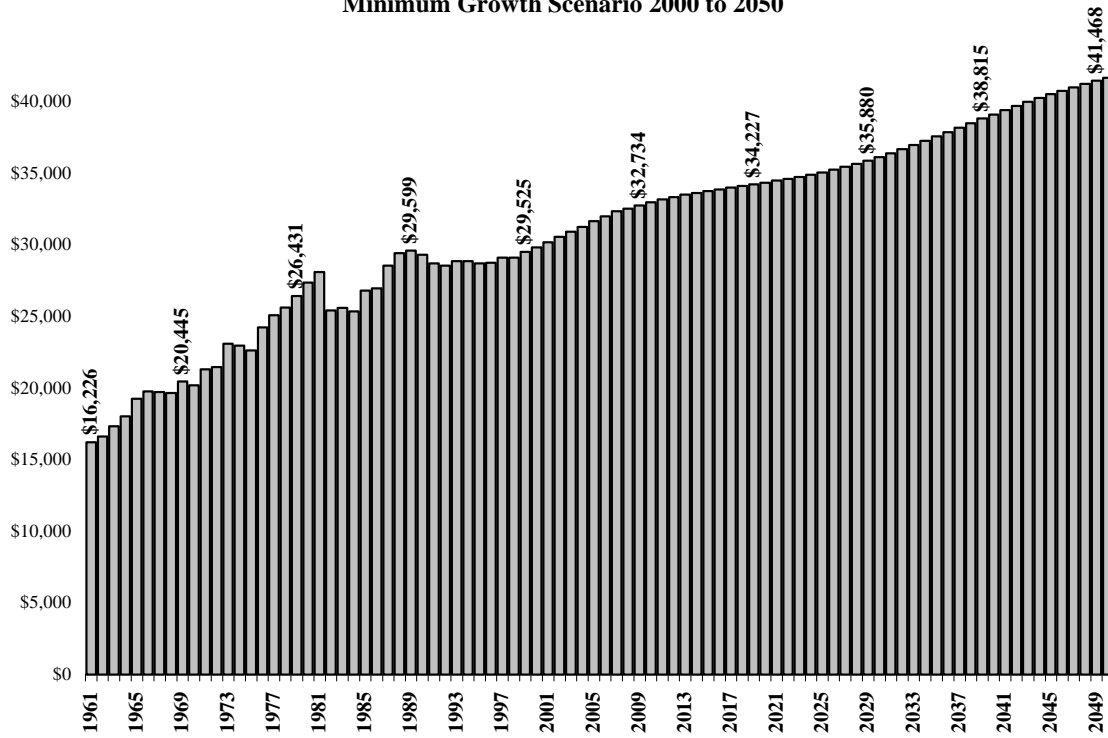
Investment and policies that lead to employment growth that will accommodate falling unemployment rates, increased participation rates, and productivity gains will mean that per capita health spending in constant dollars can increase from the current \$2,000 per person to \$2,822 in 2050 (a 41% increase) without increasing health spending as a share of GDP. This will require employment to increase faster than the labour force, and the labour force to increase faster than the population. The minimum required increase in employment will be 116%, in the labour force will be 106%, and in the population will be 97%, assuming that 3.7% unemployment, a 29% increase in employment productivity, and a 17% increase in labour force participation can be attained. If these economic and demographic changes do not occur, then the health care system cannot be sustained under the increased demands of the aging of the current population.

If these economic and demographic changes do occur, then the health care system can be sustained. The growth in real GDP must match the growth in real health care spending: thus in the year 2000 (assuming constant age specific health spending), GDP must increase by 1.4% to match the demographically driven 1.4% increase in health spending. By 2010, the minimum real increase in GDP must be 2.2%, and by 2028 it must increase by 2.9%. After 2028, with both all of the demographic wedge in the older age groups, the minimum required economic growth can slow, back to the current level as the age composition of the province's population stabilizes.

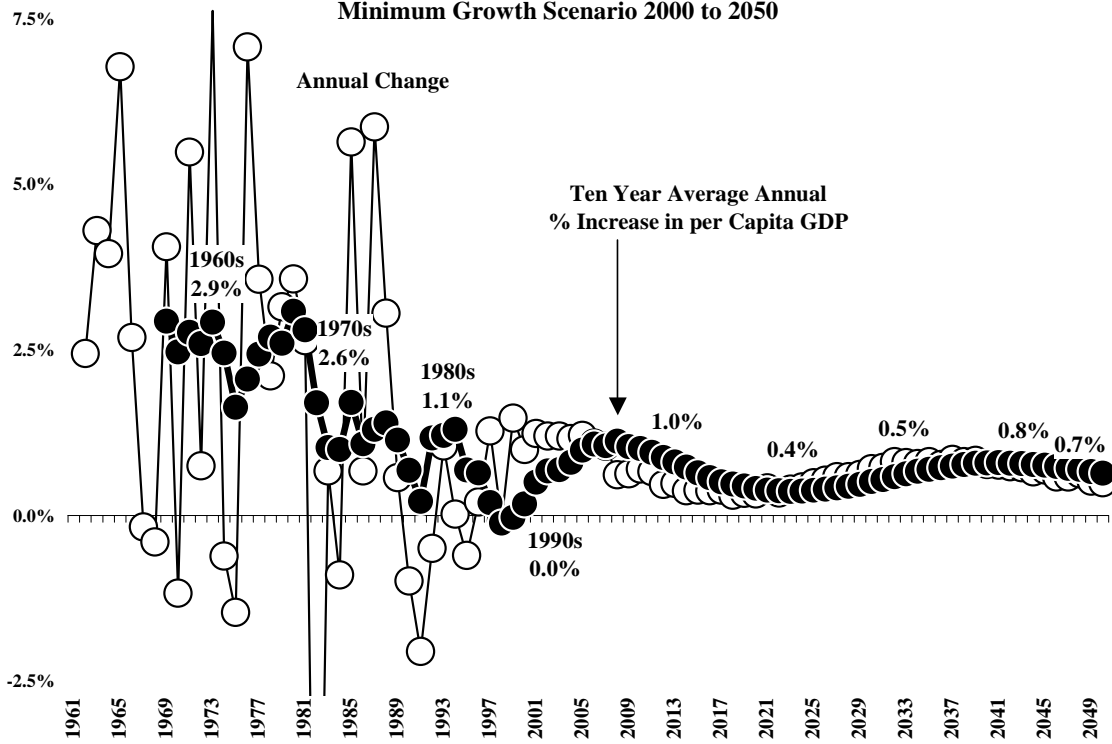
Figure 47. Real Gross Domestic Product Required to Keep BC Provincial Government Health Care Spending at 6.8% of GDP, Minimum Growth Scenario, 1999 to 2050



**Figure 48: Per Capita GDP in Constant Dollars, Actual 1961 to 1999
 Minimum Growth Scenario 2000 to 2050**



**Figure 49: Annual Change in Per Capita GDP in Constant Dollars, Actual 1961 to 1999
 Minimum Growth Scenario 2000 to 2050**

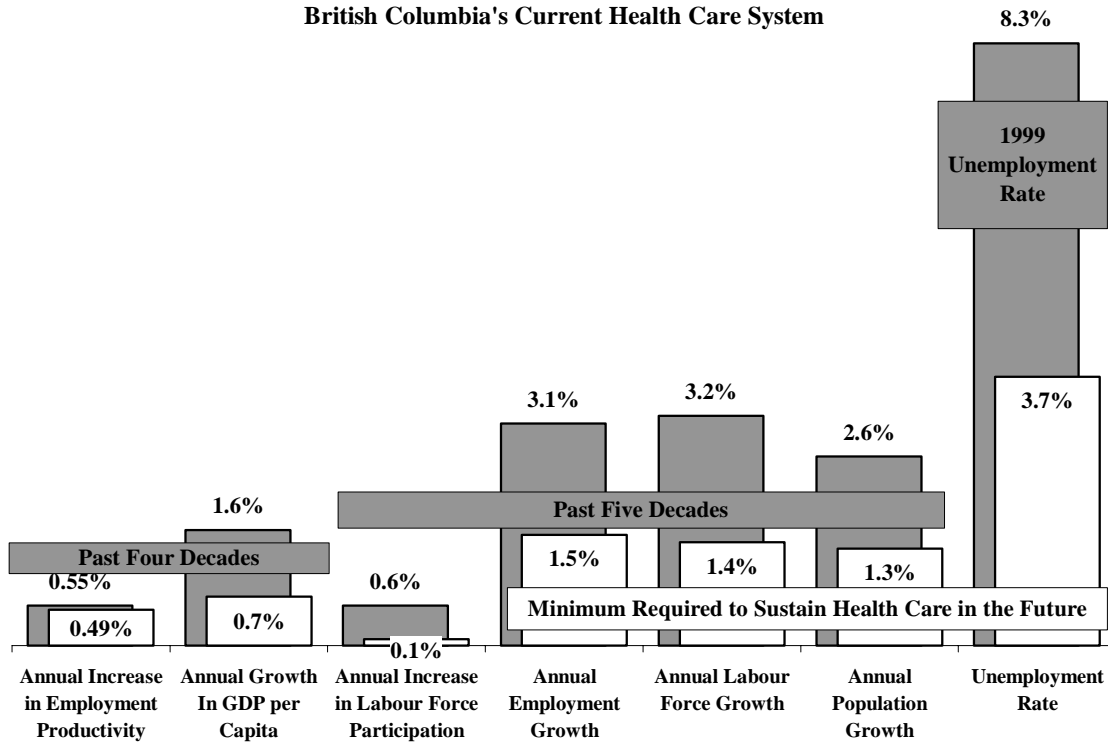


A final aspect of the nature of demographic and economic change that must occur to sustain the health care system is given by real GDP per capita. Historically real GDP per capita has grown in the province (Figure 48³²). In 1999, per capita GDP in British Columbia was \$29,525, 82% higher than 1961's per capita GDP of \$16,226 (1999 dollars), the result of a 1.59% average annual increase over the past 38 years. The economic and demographic change necessary to sustain the health care system would not require an increase of this magnitude: the \$41,468 real per capita GDP needed in 2049 is only 40% greater than that of 1999, requiring an average annual increase of only 0.68% per year. This is well below the 2.9% average annual increase in real per capita GDP that occurred during the 1960s (Figure 49), the 2.6% that occurred in the 1970s, and even the 1.1% that occurred in the recessionary 1980s. It is, however, way above what happened in the 1990s: for the first time in the 1961 to 1999 period for which data are available, there was no increase in per capita real GDP over a decade. In 1989, real per capita GDP in British Columbia was \$29,599 constant dollars, slightly higher than the \$29,525 of 1999. British Columbia's economy must do much better over the coming decades than it has over the past decade if its health care system is to survive.

V. Conclusion

If British Columbia's economy can be returned to its performance of the 1960 to 1989 period, it will be possible not only to sustain the health care system in its current form, but also to improve it. Economic and demographic change within the range that the province has experienced historically will provide the economic resources to sustain the age specific pattern of the current system unchanged, covering the same level, range and share of health care services that it currently provides, while maintaining provincial government spending (and by default assuming current spending patterns, spending by other sectors) as a constant share of GDP.

Figure 50: Required Demographic and Economic Change to Sustain British Columbia's Current Health Care System

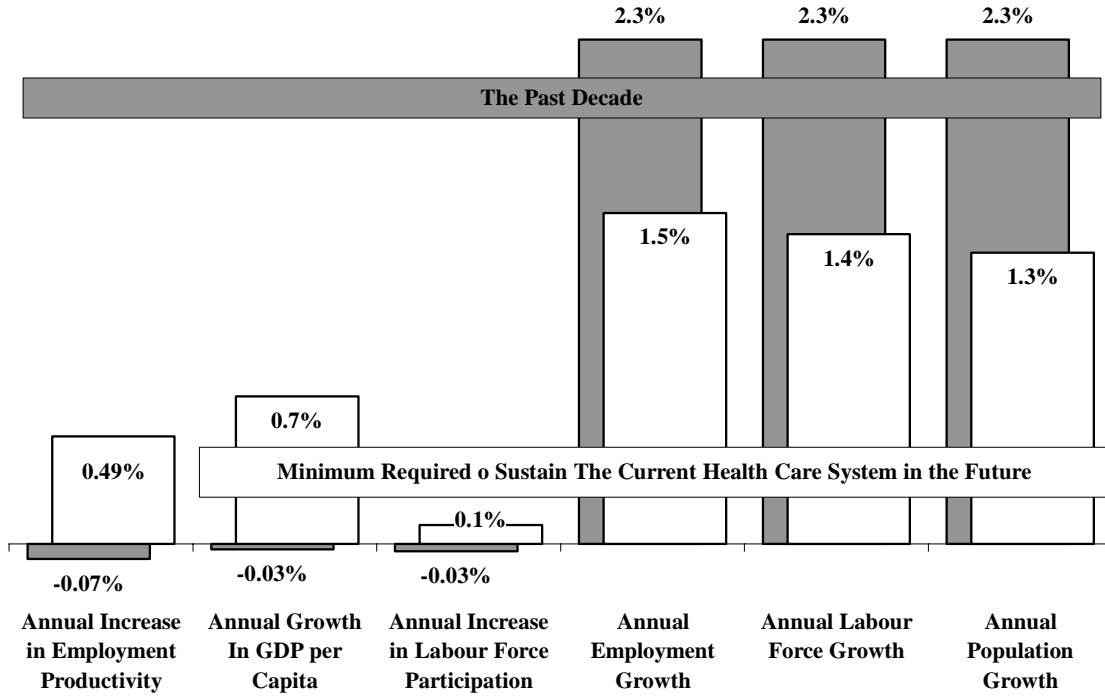


The health care system of the province can be sustained as it is today if, at a minimum, economic policy ensures that investment and employment growth occur at a level that will permit the following economic and demographic change (as compared to the change that occurred over the past 40 to 50 years, Figure 50):

8. The unemployment rate declines to 3.7% (the 1950's average compared to 1999's 8.3%);
9. Employment productivity increases at an average annual rate of 0.49% (lower than the 0.55% average annual increase of the past 4 decades);
10. The labour force as a percentage of the total population (overall labour force participation) increases at an average annual rate of 0.1% (which averaged 0.6% over the past 5 decades);
11. Real GDP per capita increases by 0.7% per year (averaged 1.6% over the past 4 decades);
12. Employment increases average 1.5% per year (3.1% average over the past 5 decades);
13. The labour force increases by an annual average of 1.4% (3.2% over the past 5 decades);
and
14. The population increases by an annual average of 1.3% (2.6% over the past 5 decades).

In each case, the required change in the future is less than it has been over the past 4 to 5 decades: these are attainable goals that will sustain health care. In order to do so, however, will require economic change that is greater than it has been over the past decade (Figure 51). It will be necessary for employment productivity to increase by 0.49% per year, not to decline by 0.07% per year as it has over the past decade; it will be necessary for labour force participation to increase by 0.1% per year, not decline by 0.03% per year as it has over the past decade; and it will be necessary for real GDP per capita to increase by 0.7% per year, not decline by 0.03% per year as it has over the past decade. If these changes occur, then the level of employment (1.5% per year), labour force (1.4% per year) and population growth (1.3% per year) in the future can be lower than they averaged over the past decade.

**Figure 51: Required Demographic and Economic Change to Sustain
 British Columbia's Current Health Care System**



Change must, and will, occur: the question is where? If sufficient economic and demographic change occurs, then the level of health care in the province need not be reduced. To the extent that these changes do not occur, the level of health care in the province will be reduced.

The choice is ours to make. We can work to ensure that the required investment and employment growth and change occur, and welcome their benefits, the sustaining of our health care system and population growth and change in our communities. If we do not, the current crisis of confidence in the sustainability of our health care system will become a self-fulfilling prophecy, and we will have to accept the currently unknown consequences of a dramatic change in our health care system.

The health care system in British Columbia can be sustained – if we pursue the investment and economic growth necessary to provide the resources it requires. It can be done, but it will require every policy that affects investment and employment growth to be considered in a sustaining health care context. Let's do it.

Endnotes:

¹ 1999 B.C. provincial government health spending from Canadian Health Information Institute web site, 1999 B.C. Gross Domestic Product from Statistics Canada Daily, October 30, 2000.

² Calculated from data on B.C. Government website, Ministry of Finance, Budget 2000 Review, Table H7.

³ The Urban Futures Institute, Six and A Quarter Million People: British Columbia's Population in the Next Three Decades (Vancouver, April 1999)

⁴ For further discussion of the age pattern of public and private health spending, see The Urban Futures Institute, Healthy Choices: Demographics and Health Spending in Canada, 1980 to 2035; The Urban Futures Institute, Without Care?: Demographics and Health Spending in British Columbia, 1999 to 2040; and Health Canada, National Health Expenditures in Canada, 1975 to 1994.

⁵ Calculated from Canadian Health Information Institute web site data.

⁶ This estimate is based on 1997 data provided to The Urban Futures Institute by the British Columbia Ministry of Health. The data provided was total spending by the provincial government by five-year age group, which when summed equaled 74% of the total provincial spending on health in 1997. The remaining 31% was allocated proportionately to the age groups, based on data Health Canada, National Health Expenditures in Canada, 1975 to 1994 for the 1975 to 1994 period showing total spending by age groups. The 1997 distribution was then fitted to 1998 and 1999 expenditures to arrive at an estimate of the 1999 per capita spending.

⁷ For further discussions of life expectancy, see The Urban Futures Institute, What Can You Expect? Life Expectancy in Canada, 1921 to 2021.

⁸ The Urban Futures Institute, Without Care?: Demographics and Health Spending in British Columbia, 1999 to 2040.

⁹ The Urban Futures Institute, Without Care?: Demographics and Health Spending in British Columbia, 1999 to 2040.

¹⁰ Calculated from data presented on Canadian Health Information Institute web site.

¹¹ Calculated from data presented on Canadian Health Information Institute web site and historical GDP data for British Columbia provided to the Urban Futures Institute by Statistics Canada and the B.C. Government Ministry of Finance.

¹² Data from Statistics Canada, Annual Demographic Statistics CDROM 1999.

¹³ Data from Statistics Canada, 1996 Census Nation Series CDROM.

¹⁴ For an example of the use of both cultural and environmental excuses for exclusion of other people, see "Discourage immigrants to curb population: Planner", The Vancouver Province, Monday, November 16, 1998, where planners and environmentalists are quoted as arguing that the lower mainland should be "sealed off" to avoid change. No mention is made of how health care would be funded in this isolation.

¹⁵ Based on data from Statistics Canada, Annual Demographic Statistics CDROM 1999.

¹⁶ Based on data from Statistics Canada, Health Statistics at a Glance CDROM 1999.

¹⁷ The Urban Futures Institute, Babes in Lotusland: Births, Birth Rates and Their Implications in British Columbia, 1921 to 2021, updated with data from Statistics Canada, Annual Demographic Statistics CDROM 1999, CDROM 1998, and Statistics Canada, Annual Demographic Statistics 1997 publication.

¹⁸ Based on data from Statistics Canada, Annual Demographic Statistics CDROM 1999.

¹⁹ Data from the World Health Organization web site.

²⁰ Based on data from Statistics Canada, Annual Demographic Statistics CDROM 1999.

²¹ Calculated from Government of British Columbia, Vital Statistics, 1966.

²² Projection by The Urban Futures Institute

²³ Data from Statistics Canada, 1996 Census Nation Series CDROM.

²⁴ The Census labour force participation rates are for June of 1996; these have been calibrated to the annual labour force estimates provided by Statistics Canada, in their monthly Labour Force Survey.

²⁵ Calculated from data in Statistics Canada, Labour Force Survey, and historical GDP data for British Columbia provided to the Urban Futures Institute by Statistics Canada and the B.C. Government Ministry of Finance.

²⁶ Calculated from data in Statistics Canada, Labour Force Survey, and historical GDP data for British Columbia provided to the Urban Futures Institute by Statistics Canada and the B.C. Government Ministry of Finance.

²⁷ Calculated from data in Statistics Canada, Labour Force Survey, and historical GDP data for British Columbia provided to the Urban Futures Institute by Statistics Canada and the B.C. Government Ministry of Finance.

²⁸ Statistics Canada, Labour Force Survey.

²⁹ Calculated from data in Statistics Canada, Labour Force Survey, and historical GDP data for British Columbia provided to the Urban Futures Institute by Statistics Canada and the B.C. Government Ministry of Finance.

³⁰ For detailed discussion of trends in labour force participation rates, see The Urban Futures Institute, Help Wanted: Projections of Canada's Labour Force Over the Next Four Decades.

³¹ Based on data from Statistics Canada, Annual Demographic Statistics CDROM 1999.

³² Calculated from data in Statistics Canada, Labour Force Survey, and historical GDP data for British Columbia provided to the Urban Futures Institute by Statistics Canada and the B.C. Government Ministry of Finance