



From Perceived Surplus to Perceived Shortage:

What Happened to Canada's Physician Workforce in the 1990s?

Benjamin TB Chan,
MD MPH MPA

June 2002



Canadian Institute
for Health Information

Institut canadien
d'information sur la santé

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ISBN 1-55392-023-6 (PDF)

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Acknowledgements

The Canadian Institute for Health Information (CIHI) wishes to thank Dr. Ben Chan for authoring this report. Dr. Chan is a Senior Scientist with the Institute for Clinical Evaluative Sciences in Toronto and is cross appointed to the Departments of Health Policy, Evaluation and Management; Family and Community Medicine; and Public Health Sciences, in the Faculty of Medicine at the University of Toronto. Correspondence to ben@ices.on.ca

In addition we would like to express our appreciation to the following individuals who reviewed the report and provided insightful feedback:

Ms. Lynda Buske, Canadian Medical Association
Mr. Steve Slade, formerly of the College of Family Physicians of Canada
Ms. Diane Thurber, Canadian Post-MD Education Registry
Dr. Joshua Tepper, Canadian Association of Internes and Residents Physician Resource Secretariat (Past Chair)
Dr. Mamoru Watanabe, University of Calgary
Prof. Morris Barer, University of British Columbia
Ms. Caroline Abrahams, Ministry of Health and Long-term Care of Ontario
Mr. Vern Hicks, Health Economics Consultant

It should be noted that the analyses and conclusions in this report do not necessarily reflect those of the individual reviewers or their affiliated organizations.

The following CIHI staff also contributed to the development of this report:

Jill Strachan, project management
Sarah Gregory and Robert Kyte, literature review and assistance with the National Physician Database
Brent Barber, technical assistance with the Southam Medical Database
Paul Sajan, preliminary analyses of the Southam Medical Database

Executive Summary

Since the late 1990s, physician groups have been claiming that there is a shortage of physicians in Canada. Increasingly, this is becoming the consensus view and policy-makers and governments have recently taken measures to increase the supply of doctors. Medical school enrolments are rising and more international medical graduates are being allowed into the system. Yet, in the early 1990s, the consensus was that Canada had a physician surplus and policies were aimed at controlling physician supply growth.

How did common perception change so radically in such a short period of time? This report dissects the various trends affecting the physician workforce in the 1990s, in order to shed light on this question. First, it examines the overall balance between supply and demand for physician services, taking into account aging and growth of the patient population and the fact that the physician workforce now comprises more females who work fewer hours. Second, it analyzes the different ways in which physicians enter and leave active practice and how these movements changed over time. Third, it engages the reader in a discussion of what policies were implemented during this time period and how they may have accounted for the observed trends. Lastly, it offers a variety of possible explanations as to 'why it feels like there is a physician shortage', given the findings in this study.

Methods

This study used data from the Southam Medical Database (SMDB) and the National Physician Database (NPDB). The SMDB provided information on the 'practice pool' (the head count of active physicians in any given year) between 1981 and 2000. The database also tracked physicians as they flow from one career stage to the next (e.g. postgraduate training, active practice, moving abroad and retirement). The NPDB was used to examine differences in use of health services by patients in different age-gender groups and the differences in the volume of services provided by physicians in different physician age-gender groups. The Janus 2001 survey of family physicians, carried out by the College of Family Physicians of Canada, provided additional information on family physician work hours, job satisfaction and access to services.

1. What Happened to the Balance Between Physician Supply and Demand in the 1990s?

In the 1990s, the Canadian population rose steadily and the proportion who are elderly increased. Also, the elderly used health services more heavily than younger individuals. This study estimates that demand for services increased by 1.1% per year due to population growth and an additional 0.4% per year due to population aging. The supply of physician services was influenced by the fact that the proportion of women in the physician workforce rose steadily, from 13% in 1981 to 29% in 2000. However, women practiced about one-fifth less intensely than males, as measured by health service billing data and self reported work hours. The proportion of physicians over age 65 also rose and these individuals also tended to work less intensively.

A measure called the 'real' physician-population ratio was created, which adjusts for aging of the population and changing physician demographics. This ratio peaked in 1993 and has been in decline since then. ***The total drop in the 'real' physician-population ratio from 1993 to 2000 was 5.1%. In 2000, this ratio was at the same level as in 1987.***

2. How Did this Drop in the 'Real' Physician-Population Ratio Occur?

From 1994 to 2000, the net inflow of physicians into the practice pool (entries minus exits) dropped to 313 physicians per year, compared to 1,040 per year from 1990 to 1993. This resulted in 5,093 fewer physicians entering the practice pool, compared to what would have been expected if this inflow rate had not dropped. The causes for this decline in physician inflow are listed below in order of impact:

1. An increase in the length of time spent in postgraduate training, from 1993 onwards.

This factor accounted for one-quarter of the total decline in net physician inflow. There were at least three components to this trend. First, the rotating internship was eliminated in 1993. This program previously allowed physicians to enter practice as a general practitioner after just one year of postgraduate training. A two-year family medicine residency became the prerequisite for primary care practice. Second, the ratio of specialist to family physician trainees rose in 1993. This resulted in a substantial increase in the number of physicians spending longer years in training. Third, there was a decline in the number of physicians returning to postgraduate education after being in active practice. However, this phenomenon kept more physicians in the practice pool and, hence, mitigated the decline in physicians due to increased length of training.

2. A decreased intake of international medical graduates. The decreased intake accounted for 22% of the total decline in net physician inflow.

3. The net inflow rate would have dropped by 21%, even without any policy changes.

This reduction was due to a dynamic effect created in 1987, when the rotating internship experienced a surge in enrolment. This created a temporary increase in the inflow rate between 1987 and 1992, which would have naturally subsided by 1993.

4. An increase in retirements, accounting for 17% of the decline in net physician inflow.

The retirement rate rose slowly and steadily over the past two decades. Losses from retirement were also influenced by the fact that the average age of physicians has been rising.

5. Medical school enrolment decreases had only a modest impact on the decline in physicians. There was a 5% drop in output from Canadian medical schools beginning with the class of 1991 and a further 10% reduction beginning with the class of 1997. The former accounted for 9% and the latter 2% of the decline in net physician inflow.

6. Loss of physicians to the United States, other countries and for other reasons had little impact. In any given year during the decade, there was a net loss of Canadian physicians due to migration. However, this annual loss was only slightly greater from 1994 to 2000 than it was from 1990 to 1993. Hence, this phenomenon accounted for only 3% of the decline in net physician inflow.

3. What Policies Were in Place in the 1990s Which May Have Contributed to the Drop in Physician Supply?

Various policies may have contributed to the trends noted above. In this type of observational analysis, one cannot 'prove' that any particular policy 'caused' a particular trend to occur. The reader is encouraged to draw his or her own conclusions about the strength of the evidence linking the policy and the impact.

Direct policies to limit physician supply growth include:

- 1. The 10% reduction in medical school enrolment from the graduating class of 1997 onwards.** This reduction accounted for a very small portion of the decline in physician inflow, but its full effect will be felt in future years.
- 2. Downsizing of medical school enrolment in the 1980s.**
- 3. Restrictions on international medical graduates, implemented in the mid-1990s.**
- 4. Retirement incentives, such as buyout packages or attempts at mandatory retirement.**

Indirect policies are policies not intended to reduce physician supply, but which may have inadvertently had such an effect. They include:

- 1. The elimination of the rotating internship.**
- 2. The deliberate decision in some provinces to increase the ratio of specialist to family medicine residency positions.**
- 3. The decline in opportunities for physicians to return to postgraduate training.** This decline may have also encouraged some physicians to go abroad for further training.
- 4. General economic and social policies which may have encouraged physicians to leave Canada or retire early.** Examples of these policies include:
 - expenditure control policies in the mid-1990s
 - limits on the right of new physicians to migrate to other provinces
 - financial penalties for new physicians wanting to practice in 'overserved' areas
 - conflict between younger and older physicians about the fairness of policies targeted at new physicians
 - changes to the hospital sector (closures, mergers)

4. Why Does It 'Feel Like' We Have a Physician Shortage?

1. **The hysteresis effect.** Physician supply peaked in 1993 and physicians and patients may have set their *minimum* expectations for access to care at this level. As a result, it may then be difficult for either group to adjust to a lower level of service.

2. **Increased practice activity.** The average practice activity of each physician has risen by 5-6%, from 1989 to 1999. Physicians may have been providing more services because of productivity improvements, but this trend may also reflect heavier workloads to compensate for the decline in the 'real' physician-population ratio.

3. **The decline in family practice training positions relative to specialists.** There are fewer young family physicians available to open new practices and this may have contributed to recent reports of patients having difficulty finding family physicians accepting new patients.

4. **Reduced flexibility in the physician pool.** In the past, there was a reservoir of general practitioners who could return to postgraduate training. These individuals, who had the benefit of clinical experience, may have been more certain of, and ultimately more satisfied with, their career choice. They may also have served as a potential reservoir of physicians to fill gaps in different specialties.

5. **Fewer young physicians in the workforce.** This is primarily a consequence of the increased length of postgraduate training. The loss of young physicians may have created problems in certain services such as emergency medicine and obstetrics, which tend to rely on young physicians for staffing. Furthermore, young physicians are traditionally the ones who provide locums and their reduced numbers may have meant less relief for established physicians. Lastly, research suggests that, in some instances, young physicians provide better quality of care.

6. **Changes in the comprehensiveness of care.** Fewer GP/FPs are electing to work in emergency departments, hospital inpatient wards, obstetrics and nursing homes. This trend coincides with the general decline in physician supply. This raises concern about access to these services in the future.

Conclusion

Policy-makers in the early 1990s were concerned about the growth of the physician supply in excess of population growth. Key policies enacted to control this growth included a cut in medical school enrolment and restrictions on the entry of international medical graduates into Canada. However, a series of other policies whose *unintended consequences* were to reduce the supply of physicians may have had a far greater impact than these direct policies to control physician supply. In the future, policy-makers need to monitor, on a regular basis, the impact of a broader range of policies which may affect physician supply and demand, when conducting physician human resource planning.

Key Messages

1. After accounting for the increased demands of an aging population and the entry of more female physicians into the workforce who work fewer hours, the 'real' physician-population ratio declined by 5.1% between 1993 and 2000. The 'real' physician-population ratio is the same in 2000 as it was in 1987.
2. Much of the decline in physician supply can be traced to a sharp drop in Canadian postgraduates entering practice from 1994 to 2000. This decline was due mainly to longer training requirements, such as the elimination of the rotating internship and the increase in the ratio of specialist to family medicine residency positions.
3. Other factors contributing to lower physician supply include fewer international medical graduates entering Canada and a rising retirement rate. Increased net migration abroad played a minor role and the 10% cut in medical school positions in 1993 accounted for 2% of the decline.
4. These findings help explain why it 'feels like' Canada has a physician shortage. Lower physician supply is associated with rising workloads. Reported shortages in emergency departments and obstetrics (areas which traditionally depend on young physicians) may be attributable to the reduction in the number of recent postgraduates. Difficulties for patients in finding a family physician may be due to the reduced production of family physicians.
5. A variety of different policies may have contributed to the current situation. When analyzing what happened in the 1990s, one should consider not only those policies aimed directly at managing the physician supply, but also policies on training, physician remuneration and expenditure control which may have had unintended consequences for the supply of doctors.

1. Introduction

There is a growing consensus that Canada is facing a physician shortage of unprecedented proportions since the inception of medicare. This viewpoint was first proposed by the medical profession in the late 1990s^{1,2,3,4,5}. The evidence cited by these groups included growing lists of communities with family physicians not accepting new patients⁶, cancelled surgeries¹, difficulties staffing emergency departments^{7,8} and waiting lists for specialist services⁶. Physicians also reported increasing dissatisfaction with rising workloads^{4,9} and concern over an exodus of physicians to the United States¹⁰. Physicians claimed that the problem was only going to get worse, given the aging population and the imminent retirement of 'baby-boomer' physicians¹, and made urgent appeals to policy-makers to increase the supply of physicians as rapidly as possible¹.

The claim of a physician shortage was met with initial skepticism from both governments and health policy analysts¹¹. Only a few years prior, the national consensus was that Canada had a physician surplus. This viewpoint was encapsulated in the landmark 1991 Barer-Stoddart report on physician human resources¹². This report synthesized the views from a hundred stakeholders and key informants across the country, including physicians and other health professionals, academics, administrators and policy-makers. The Conference of Deputy Ministers of Health agreed with this analysis and implemented one of its recommendations, a 10% reduction in medical school positions. Upon its release, the report even received cautious support from groups such as the Canadian Medical Association¹³ and the Canadian Association of Interns and Residents¹⁴. Although these groups expressed some unease with the specific recommendation on medical school enrolment cuts, they agreed with the broad principles of the report and the proposition that the Canadian health system had to learn to do more with less.

More recently, however, policy-makers have accepted the argument of a physician shortage. Most provinces have now made substantial increases in medical school enrolments^{15,16,17,18,19} and have stepped up efforts to license international medical graduates^{20,21}. Physicians are reported to be coming from impoverished nations such as South Africa, which claim to have significant physician shortages themselves^{22,23}. Numerous jurisdictions are making significant increases to physician remuneration^{24,25} and concern has been raised that provinces and individual communities are engaging in 'bidding wars' in order to attract and keep their physicians^{25,26}.

How did we move from a perceived physician surplus to a perceived shortage in such a short period of time? The purpose of this report is to dissect the various trends affecting the physician workforce in the 1990s, in order to shed light on this question. The report is divided into four sections corresponding to four key questions:

1. What happened to the balance between physician supply and demand in the 1990s?

This section examines factors that influence demand, such as aging of the population and factors that affect supply, such as the growing number of female physicians within the workforce who work fewer hours than men.

2. How did changes in physician supply occur? This part of the analysis traces the movement of physicians in and out of active practice and searches for key areas where physician exits or entries have changed significantly during the past decade.

3. What policies may have contributed to changes in physician supply? Policies may be either 'direct', in that they aim specifically to control physician supply, or 'indirect', in that they have some other main purpose but an unintended consequence is to change the physician supply. This report attempts to itemize all such policies in effect in the 1990s and provide context for interpreting the trends discovered under questions 1 and 2.

4. Why does it 'feel like' we have a physician shortage? This section attempts to identify relationships between the key trends found under questions 1 and 2 and common complaints being voiced by providers and patients about access to care and delivery of care.

2. Methods

2.1 Data Sources

This study explores national physician supply from 1981 to 2000. Table 1 lists the different databases used in this analysis. The Southam Medical Database (SMDB) is a national registry of physicians developed for commercial purposes (e.g. mailing lists) and served as the main source of data on physician counts in this study. Southam draws on information from provincial licensing authorities as well as postgraduate training programs. Information is updated yearly through a questionnaire sent to each physician on current practice activity and location.

Table 1: Data Sources

Data Source	Content	Use
Southam Medical Database	Physician age, gender, location, specialty, practice status (e.g. intern, resident, active practice, retired) over time	<ul style="list-style-type: none"> • Physician demographics • Physician entry from Canadian training programs and international medical schools • Physician exit due to retirements, emigration
National Physician Database, age-gender file	Physician billings on different services for each patient age-gender group	<ul style="list-style-type: none"> • Calculate utilization weights for each patient age-gender group
National Physician Database, full-time equivalent physician file	Full-time equivalent (FTE) measure for each fee-for-service physician in Canada	<ul style="list-style-type: none"> • Calculate physician workload by physician age-gender group and overall changes in workload over time
Statistics Canada	Population by age-gender group in Canada from 1981 to 2000	<ul style="list-style-type: none"> • Population estimates, used in denominators for physician-population ratios and per capita physician utilization measures
The 2001 Janus Survey ²⁷	Workload and work satisfaction among family physicians and general practitioners	<ul style="list-style-type: none"> • Verify physician time weights • Examine physicians with closed practices • Examine physician workload satisfaction

For further information regarding the raw data used for this report, please contact the Consultant Physician Databases, CIHI.

2.2 Who is Included in this Study?

This study examines "active" physicians who hold a license to practice in Canada and are coded in the SMDB as 'active practice', 'military' or 'semi-retired.' * They may be engaged in clinical practice, administration, research, teaching or other activities. The SMDB cannot identify to what degree physicians divide their time between these different pursuits. Their clinical work may be paid on a fee-for-service basis or an alternate arrangement such as salary or capitation. The 'practice pool' is defined as all physicians who are "active" at any given point in time.

Physicians in postgraduate training can also be identified in the SMDB. Such physicians are not included in the definition of "active", but their numbers and movement are tracked in this study.

2.3 Evaluating Changes in Overall Physician Supply and Demand

Describing the supply and demand for physician services is difficult and analysts have struggled for decades with both definitions and conceptual frameworks. Demand for medical services depends on factors such as the size of the population, prevalence of disease and public expectations. The latter two, in turn, are influenced by factors such as the age and gender of the population, education level and socioeconomic status.

The supply of medical services is a function of how many doctors are available, their workload (how many hours they work) and their productivity (the amount of service provided per hour worked). Furthermore, there are inputs into the production of a medical service besides physicians (e.g. technology, other health providers, equipment and buildings) and one must consider if any changes in the combination of these inputs led to efficiency gains (i.e. produced the same medical service at lower cost or with fewer physicians).

The physician-population ratio is perhaps the crudest, yet most widely known measure of the balance between supply and demand. It considers just one demand and one supply factor, among the multitude of such factors listed above. The most common criticisms of this measure is that it does not account for the increased demands of an aging population, nor the relative reduction in supply due to the growing number of women in the workforce who practice fewer hours²⁸.

This study does not attempt to account for all of the demand and supply variables listed above, but does at least consider the impact of these two critical factors. Two techniques analogous to direct standardization were employed. The first is the concept of a 'weighted patient'. An individual belonging to a particular age-sex group is assigned a weight based

* This "active" definition differs slightly from that used in previous CIHI publications, in that semi-retired and military physicians are included, while excluding those that don't have a license to practice in their current province/territory of residence. Because physicians are assigned weights based on the typical workload for the physician's age group in physician supply calculations, it was felt that inclusion of this group would provide a more complete picture of the actual physician supply.

on the ratio of the average per capita physician expenditures for the age-sex group, divided by the average per capita physician expenditures for all patients. Hence, a 70 year old female may be considered to be equivalent to two weighted patients while a 30 year old male may be considered to be equivalent to one-half of a weighted patient, because of the different intensity at which they use physician services. The base year for the standardization calculations was 1996. The National Physician Database (NPDB) contains information on national physician expenditures in each patient age-gender group and per capita expenditures were calculated by dividing by the Statistics Canada population estimate for the age-sex group.

The second standardization technique involves the concept of a 'weighted physician'. Physicians of different ages and genders vary in their practice activity. The average female physician provides fewer services than the average male, particularly during child-rearing years. Older physicians practice less intensely. This study weights physicians based on their practice output, as measured by the amount of fee-for-service billings reported within the NPDB. The weight for a particular age-gender group is equal to the average practice output for the age-gender group, divided by average practice output for all physicians. Hence, a 30 year old female physician may provide 0.85 times the service of the average physician, while a 50 year old male physician may have a weight of 1.2 and a 70 year-old male a weight of 0.67.

Practice activity can be measured in different ways. As such, two data sources were used to carry out a sensitivity analysis. The NPDB allows for the calculation of the average practice activity for each physician age-gender group, equal to the number of full-time equivalent (FTE) physicians within the group divided by the number of physicians. The definition of an FTE is based on a formula which takes into account how an individual physician's billings compare to those of typical peers within the same specialty (see Technical Appendix for more details). These weights are derived from information about fee-for-service physicians in clinical practice only and it is assumed that the same age-gender weights apply to physicians paid on salary or who are in non-clinical practice. The base year for these calculations is 1996. As a further sensitivity analysis, physician age-gender weights based on 1989 and 1999 were also examined.

The second method draws on data from the 2001 Janus Survey of family physicians, in which the average number of hours worked is calculated for each age-gender group. The advantage of this data source is that it includes information on both salaried and fee-for-service physicians. However, the data are self-reported and exclude specialists. A key difference between the two sources is that Janus provides a pure measure of workload, whereas the NPDB measures the billable output from each physician, which is a function of not just workload but also productivity.

Borrowing a term from economics, we define the 'real' physician-population ratio as the ratio after adjusting for both patient demographics and physician demographics. Increases in physician workload and productivity over time (for reasons other than changing physician demographics) may also affect the supply of physicians. For example, all physicians may be working harder over time. For the purpose of this study, changes due to physician supply for this reason are not included in the real physician-population ratio, but are discussed in a later section.

2.4 Measuring Exit and Entry into the Practice Pool

The practice pool is in a continual state of flux. Physicians first enter the system either as recent graduates from Canadian training programs or international medical schools. They may then leave the system to pursue further training or job opportunities abroad, or exit due to death, retirement, or unknown reasons. They may remain out of the system or return after a period of time. Figure 1 describes how these flows are connected to the practice pool. Table I in the Technical Appendix describes how these flows are defined and measured in the SMDB.

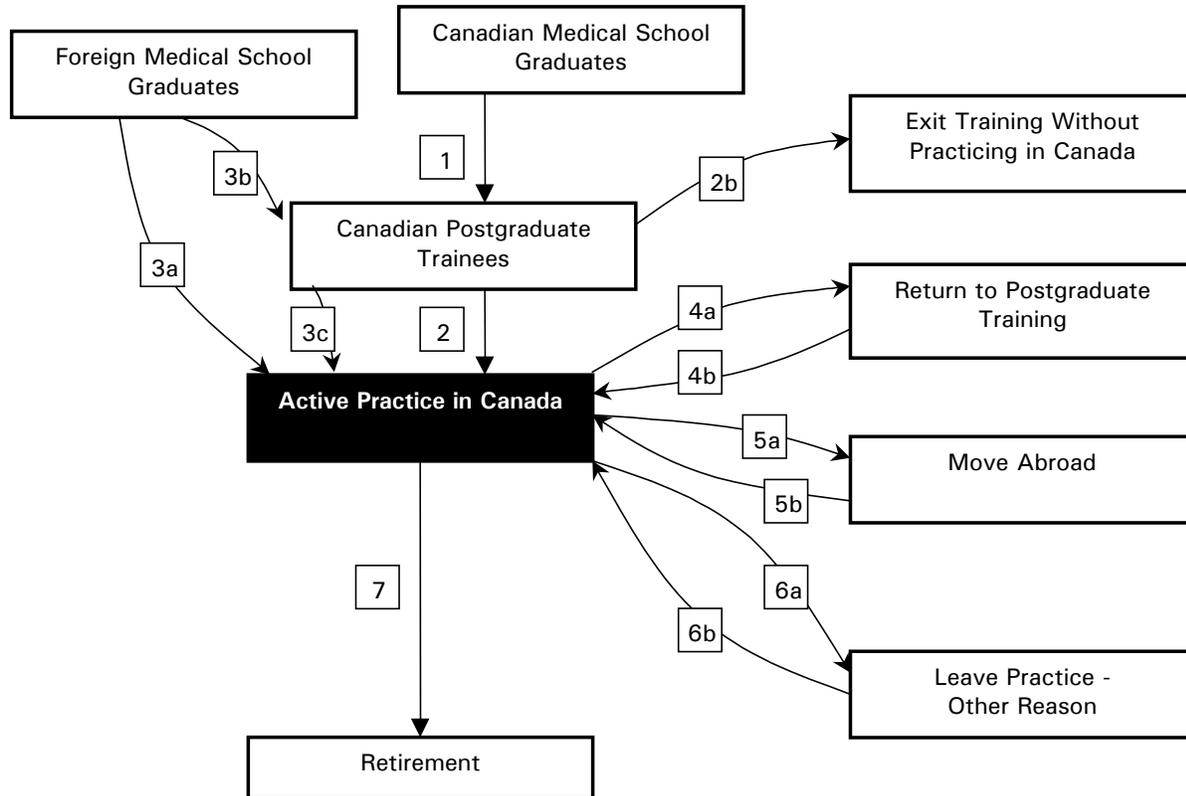


Figure 1: Physician Flows Into and Out of Active Practice in Canada

2.5 The Policy Environment

An extensive literature search was conducted using MedLine. This search was supplemented with a review of policy documents from the files of the Canadian Institute for Health Information, the Canadian Medical Association, the Conference of Deputy Ministers of Health, the Royal College of Physicians and Surgeons of Canada and the College of Family Physicians of Canada.

2.6 Interpretive Cautions

The SMDB has a number of limitations. First, it does not specify how much time a physician devotes to non-clinical duties, such as research and administration. Second, there may be a lag between when a physician changes activity (e.g. from active practice to retired) and when this change is recorded in the database. This may occur if the physician does not return his or her annual survey and time elapses before Southam is able to verify the information through other means. Such lags may result in the inaccurate timing of a particular event, but eventually, the information is recorded. This error is suspected to be more noticeable in the tracking of retirements and current estimates of retirement rates may err on the low side. Third, there may be occasional coding errors in any of the variables analyzed in this report.[†]

As noted above, there are a host of other factors affecting the supply and demand of physician services, other than those analyzed in this study. Overall demand may rise or fall, depending on whether new technologies add to the complexity of medical care or eliminate the need for certain services. Demand may also be affected by the fact that the Canadian population is now living longer in better health. This trend may reduce demand, but it is also possible that a high level of access to medical services is needed to sustain such increases in health. Furthermore, some would argue that need (as defined as the potential for an individual to benefit from a medical service) should be considered instead of demand. Patients may inappropriately demand services that are of little benefit and some individuals may have important needs yet not demand them. Future research should be targeted at refining these measures of demand or need.

A third limitation is that there is little information on the activity of physicians in non-fee-for-service practice. The activity weights for different age-gender groups derived for fee-for-service physicians are assumed to apply to non-fee-for-service physicians, and this assumption needs to be tested. Secondly, it is possible that non-fee-for-service physicians overall may work more or less intensely than fee-for-service physicians. This hypothesis needs further investigation.

[†] For a full description of the SMDB and its data limitations, please contact the Consultant, Physician Databases, CIHI.

3. Results

3.1 What Happened to the Balance Between Physician Supply and Demand in the 1990s?

3.1.1 Changes in Demand for Medical Services: The Impact of Population Growth and Aging

Population Growth

From 1981 to 2000, the Canadian population grew by 24%, from 24.8 to 30.8 million (Figure 2a). The proportion who were elderly (over age 65) rose steadily, from 10% to 13% (Figure 2b). The upper middle age category (40-64 years of age) exhibited the fastest growth, from 24% to 32% of the population.

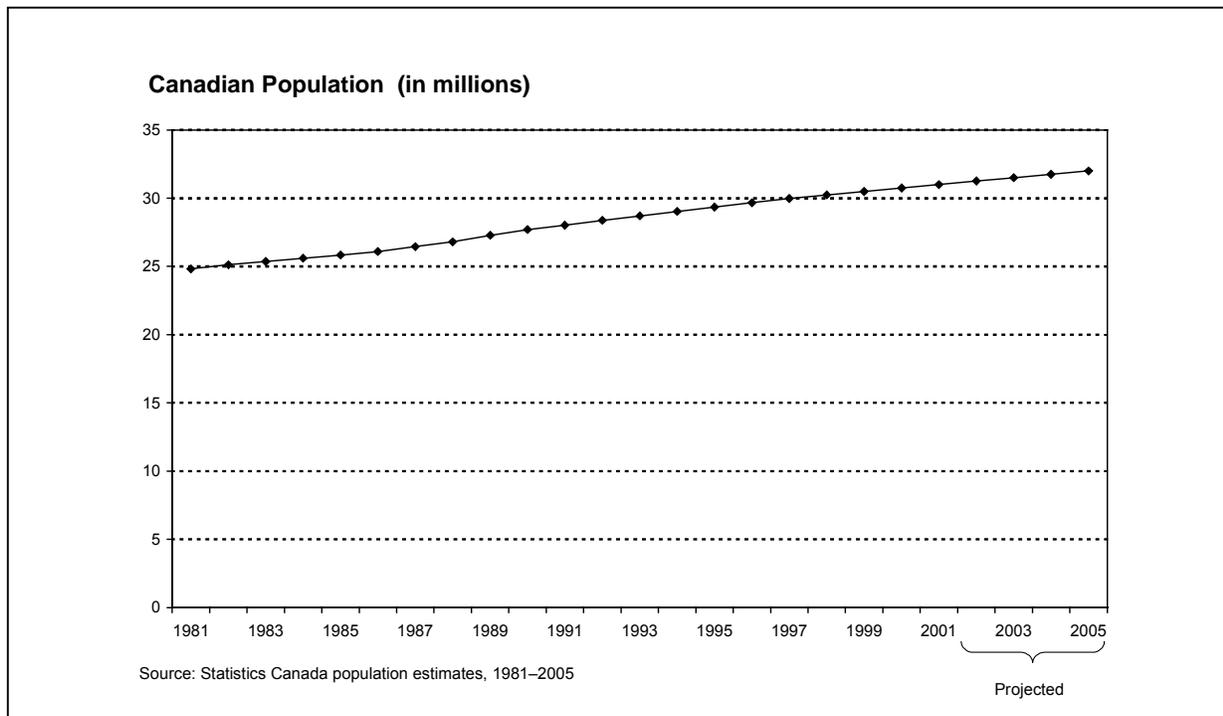


Figure 2a: Canadian Population Growth, 1981 to 2005 (projected)

Key Message: Canada's population has grown steadily over the past two decades.

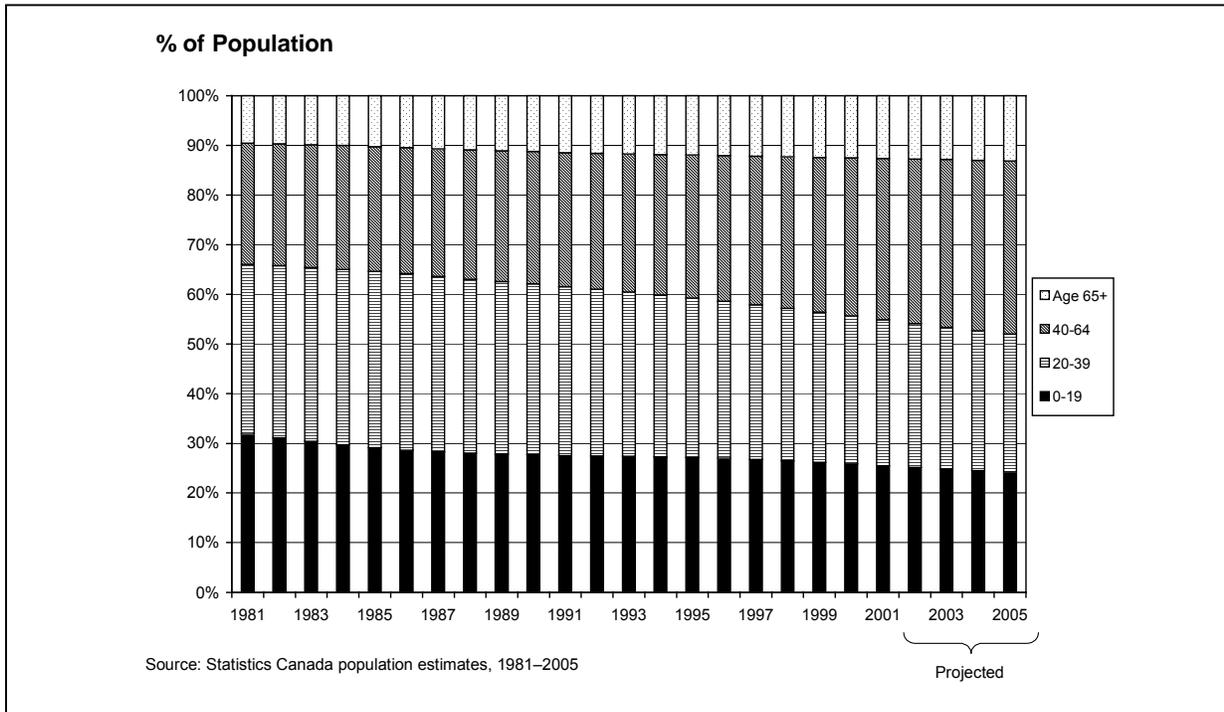


Figure 2b: Canadian Population by Age Group, 1981 to 2005 (projected)

Key Message: Canada's population has been aging steadily over the past two decades.

Use of Health Services by Patients by Age and Gender

Figure 3 shows the use of health services by patients at different ages and genders in 1999. Patients 80–89 years of age had the highest per capita use of physician services, while those aged 10–14 had the lowest. Individuals over age 65 had physician expenditures of \$748 per capita, almost twice the level for those aged 40–64 years (\$386) and over three times the level for those under age 40 (\$225).

Females at child-bearing ages (20 to 39) used almost two times more physician services than males. From age 65 onwards, however, males used more services than females.

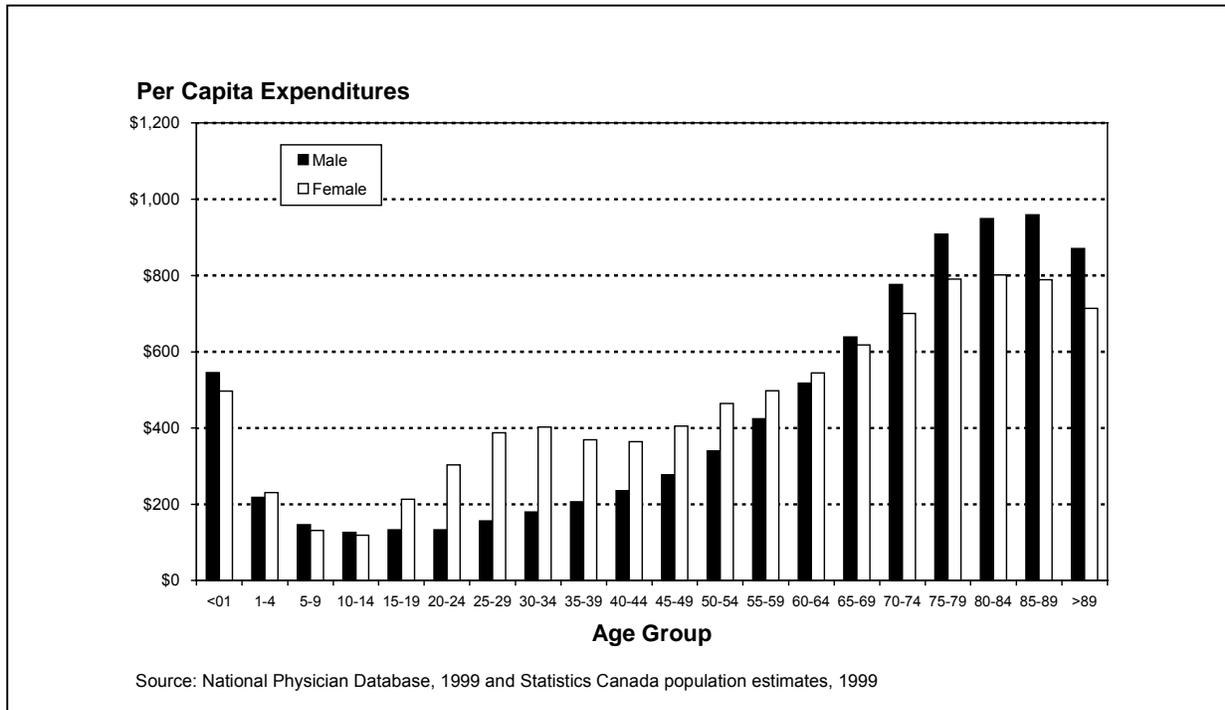


Figure 3: Physician Expenditures by Patient Age Group and Gender, Canada, 1999

Key Messages:

1. Older people are the heaviest users of health services.
2. Women use health services more than men during child-bearing years.
3. Men use health services more than women in the elderly years.

Weighted Population Growth

As noted previously, this study employs the use of “weighted patients”. Patients are weighted based on per capita health expenditures within age-gender groups. After applying weights for each age-gender group, the weighted Canadian population grew by 34%, from 23.3 million in 1981 to 31.3 million in 2000. Between 1981 and 2000, population growth alone increased the demand for health care services by 1.1% per year. Population aging increased demand by an additional 0.4% per year.

3.1.2 Changes in Supply of Medical Services: The Impact of Physician Demographics

Changes in Physician Demographics

The proportion of women entering medicine has risen steadily over the past two decades, from 13% in 1981 to 29% in 2000 (Figure 4). Women have increased their presence in all specialty groups. However, higher proportions of women were found in general and family practice (GP/FPs) compared to medical specialties. Surgical specialties had the lowest proportion of women in practice.

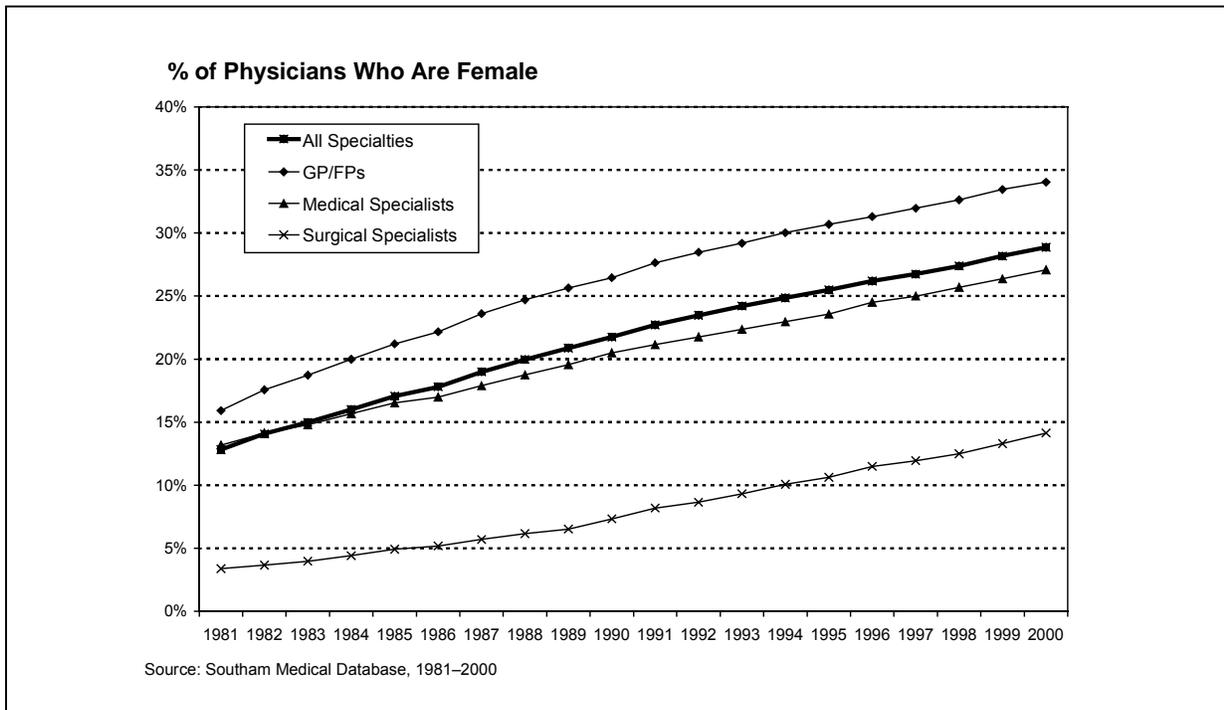


Figure 4: Female Physicians in Canada, 1981 to 2000

Key Messages:

1. More and more women are entering medicine.
2. Women are more likely to practice family medicine and less likely to choose surgical specialties.

Figure 5 demonstrates the age structure of the physician workforce over time. The physician workforce was at its most youthful point in 1988, when 22% of the workforce was under 35. There was a gradual decline in the proportion of physicians under age 35 from 1988 to 1993 and a steeper decline from 1993 onwards. By the year 2000, only 13% of the workforce was under age 35. At the same time, the proportion of physicians age 65 and over rose steadily, from 7.0% in 1981 to 11% in 2000.

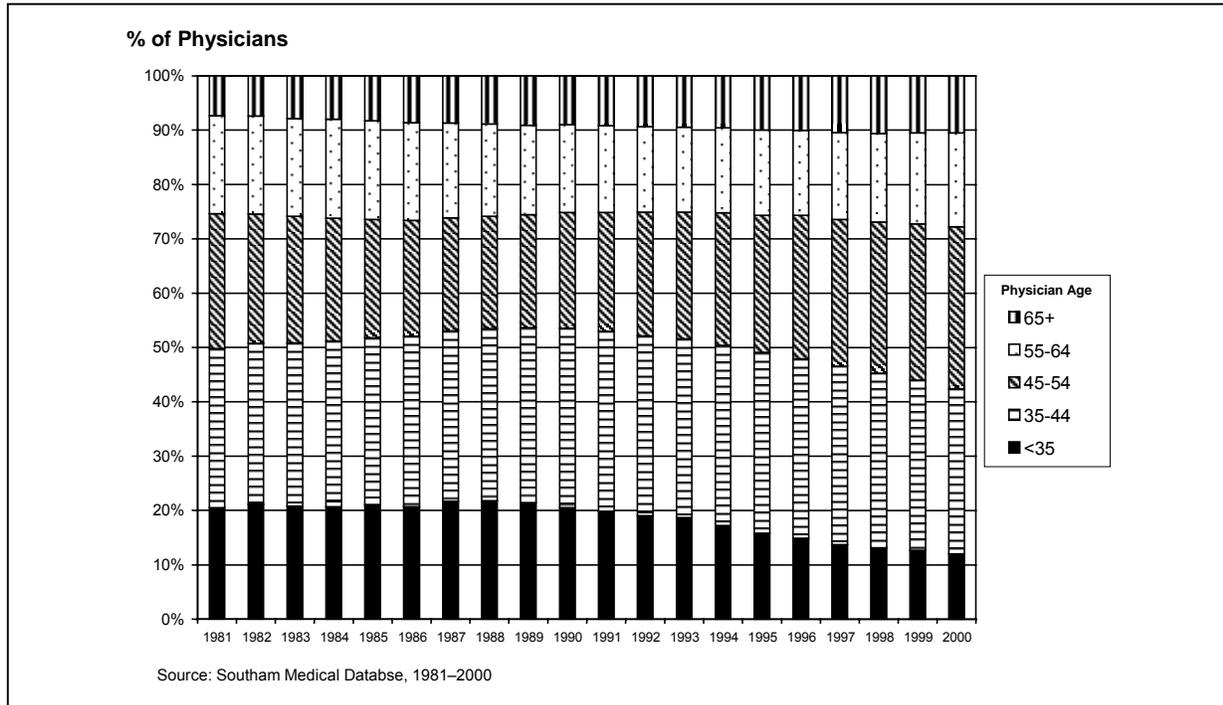


Figure 5: Age Structure of the Physician Workforce, Canada, 1981 to 2000

Key Message: From 1988 onwards, the physician pool has been aging. There are fewer physicians under age 35 and more aged 65 and over.

Activity by Physician Age and Gender Groups

Figure 6a shows the differences in practice activity for physicians at different ages and genders in 1996, using the NPDB method. Overall, female physicians had a practice activity that was 21% lower than for men. The difference between men and women was lowest at age 25–29 (female-male ratio 0.92) and greater during the child-rearing ages of 35–44 (ratio 0.77). Male physicians reached their peak workload at age 45–49 and females slightly later, at 50–54. Physicians over age 65 had a workload of 0.66 times the average.

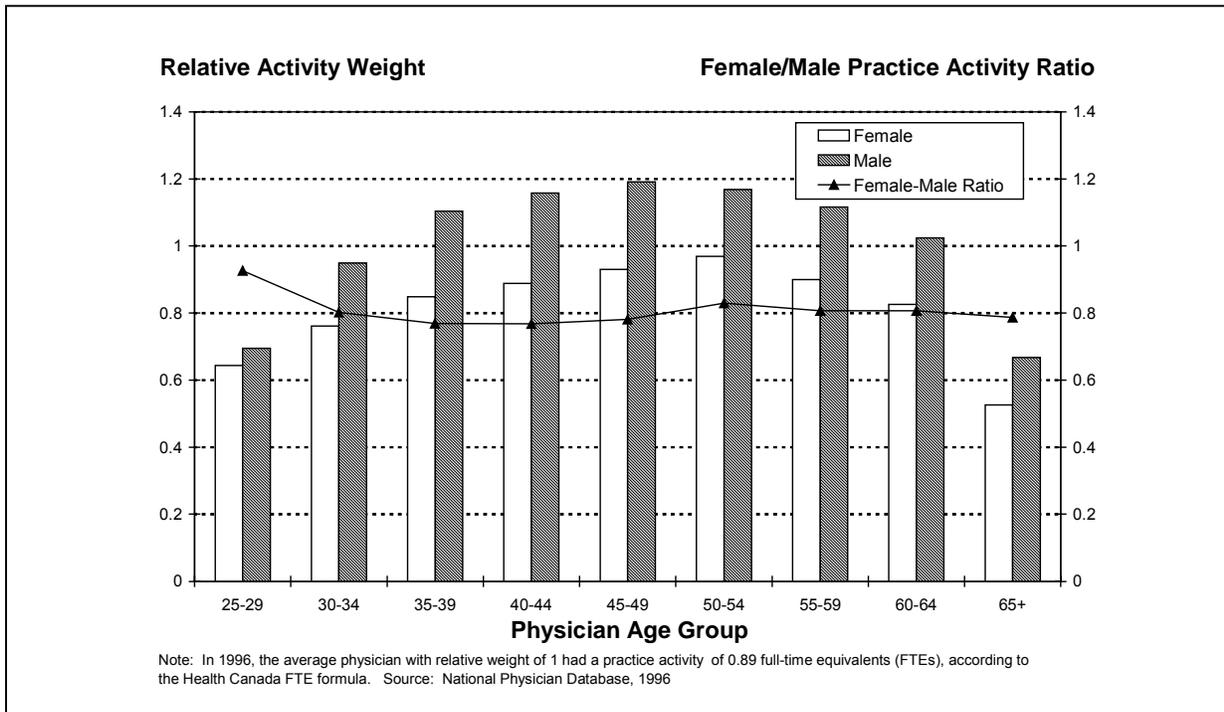


Figure 6a: GP/FP Practice Activity by Physician Age and Gender Groups, Canada, 1996

Key Messages:

1. Female physicians work less than males, particularly during the child-rearing ages of 35 to 44.
2. Physicians over age 65 work less than those under age 65.

Figure 6b shows differences in workload for family physicians at different ages and genders in 2001, using the Janus method. The differences between male and female physicians is comparable to those observed from the NPDB method. However, the NPDB results suggest that practice activity is low among physicians under age 35, while Janus does not suggest this trend.

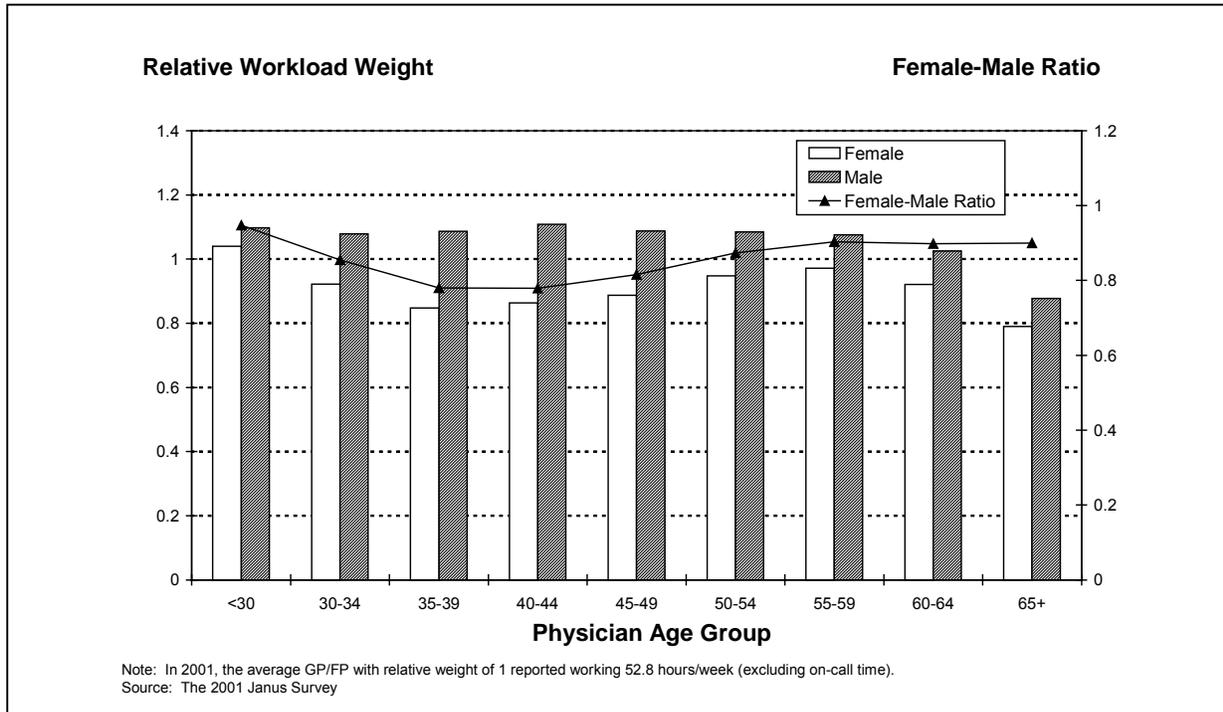


Figure 6b: GP/FP Workload by Physician Age and Gender Groups, Canada, 2001
(measured by self-reported work hours, excluding on-call time)

Key Messages:

1. Female physicians work less than males, particularly during the child-rearing ages of 35 to 44.
2. Physicians over age 65 work less than those under age 65.

The Number of Available Physicians

The head count of physicians in the SMDB rose by 54%, from 37,612 in 1981 to 57,960 in 2000. The NPDB and Janus methods were used to calculate the number of weighted physicians, a measure which adjusts for the growing proportion of female and older physicians in the workforce and their tendency to practice less intensely. Using the NPDB method, the growth in the number of weighted physicians from 1981–2000 was slightly less than the growth in head counts, at 50%. Using the Janus method, the growth rate was 48%.

3.1.3 Measuring Physician Supply Relative to Demand: Unadjusted, Patient-Adjusted and 'Real' Physician-Population Ratios

The unadjusted physician-population ratio rose steadily in the 1980s before reaching a peak in 1993 (Figure 7). This ratio then dropped steadily, reaching a low point in 1997, before rebounding upwards, but not to the same level attained in 1993.

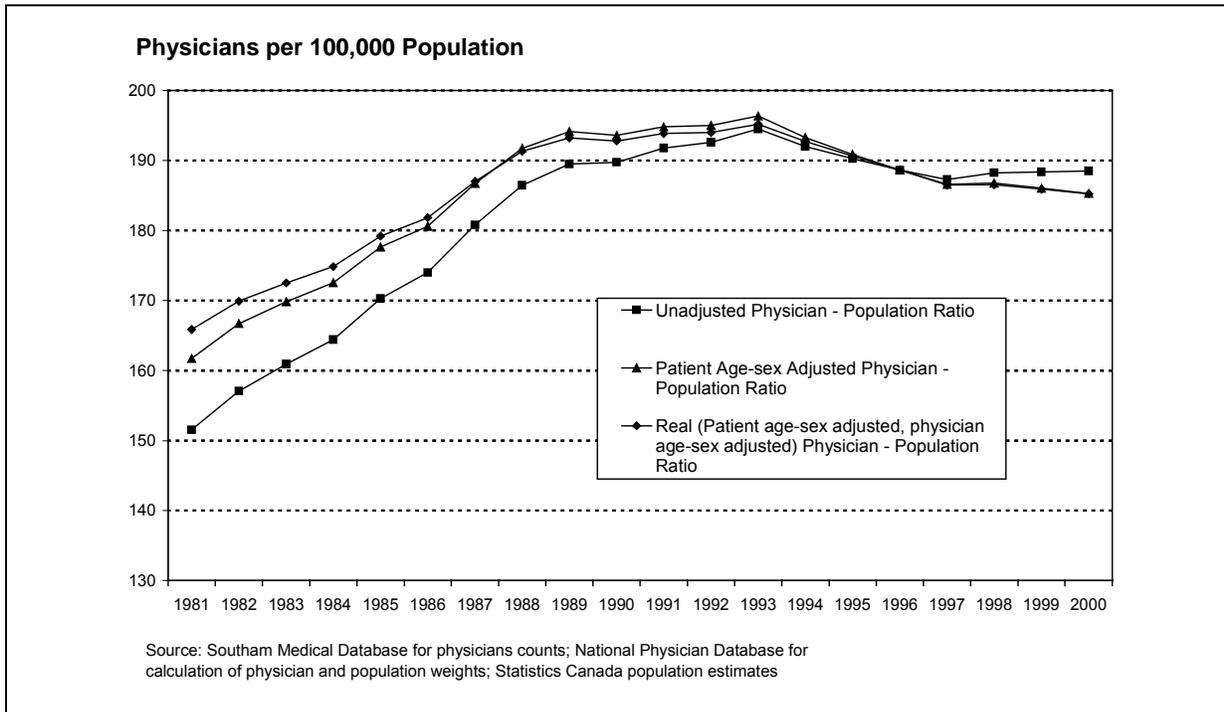


Figure 7: Physician-Population Ratios, Canada, 1981 to 2000

Key Messages:

1. The population is aging and growing in size and the elderly use more services.
2. The physician workforce has more women and elderly physicians, who tend to work less.
3. After taking into account these factors, the supply of doctors rose steadily in the 1980s, peaked in 1993 and fell thereafter.
4. Physician supply in 2000 was 5.1% below its peak in 1993 and at the same level as in 1987.

Accounting for aging of the population and changes in physician demographics makes the physician-population ratio appear not to grow as quickly during the 1980s. For example, the unadjusted ratio rose by 27% from 1981 to 1993. Adjusting for population aging decreased this growth rate to 21%. After further adjusting for physician workforce changes, this growth rate was 17%. Furthermore, the post-1997 rebound in the unadjusted physician supply changed into a slight decline in the adjusted analysis. The 'real' physician-population ratio was 185 physicians per 100,000 population in 2000. This was equivalent to the level in 1987 and represented a 5.1% decline from the 1993 peak.

The 'real' physician-population ratio reported in Figure 7 used the NPDB method for adjusting for physician demographics, using 1996 as a base year. Similar results were obtained using NPDB weights derived from 1989 and 1999 data and the Janus 2001 data.

KEY MESSAGES:

Elderly patients use more health services, and a growing proportion of patients are elderly.

Female physicians and older physicians tend to have reduced workloads, and a growing proportion of physicians are female and elderly.

After accounting for the aging of the population and changing physician demographics, the 'real' physician-population ratio in the year 2000 was 5.1% below its peak attained in 1993, and at the same level as in 1987.

3.2 How Did Changes in Physician Supply Occur?

3.2.1 Analyzing Inflows and Outflows Into the Practice Pool

The entries and exits into the practice pool are carefully examined in this section, in order to gain a better understanding of how the "real" physician-population ratio declined during the 1990s. The reader is once again referred to Figure 1 for a visual description of these flows.

Flow 1: Canadian Medical Graduates Entering Postgraduate Training in Canada

The first flow occurs when Canadian medical students graduate and enter a residency or internship program. Figure 8 shows that this flow has decreased over time. There is considerable year to year variability, but the first decline occurs in approximately 1991. From 1981 to 1990, the average yearly flow was 1,879; from 1991 to 1996, this yearly flow had decreased by 5% to 1,786. The second decline occurred in 1997, the first year in which the 10% reduction in medical school positions took effect. In 1997–2000, there were 1,628 entrants per year on average, 9% lower than the 1991–1996 level.

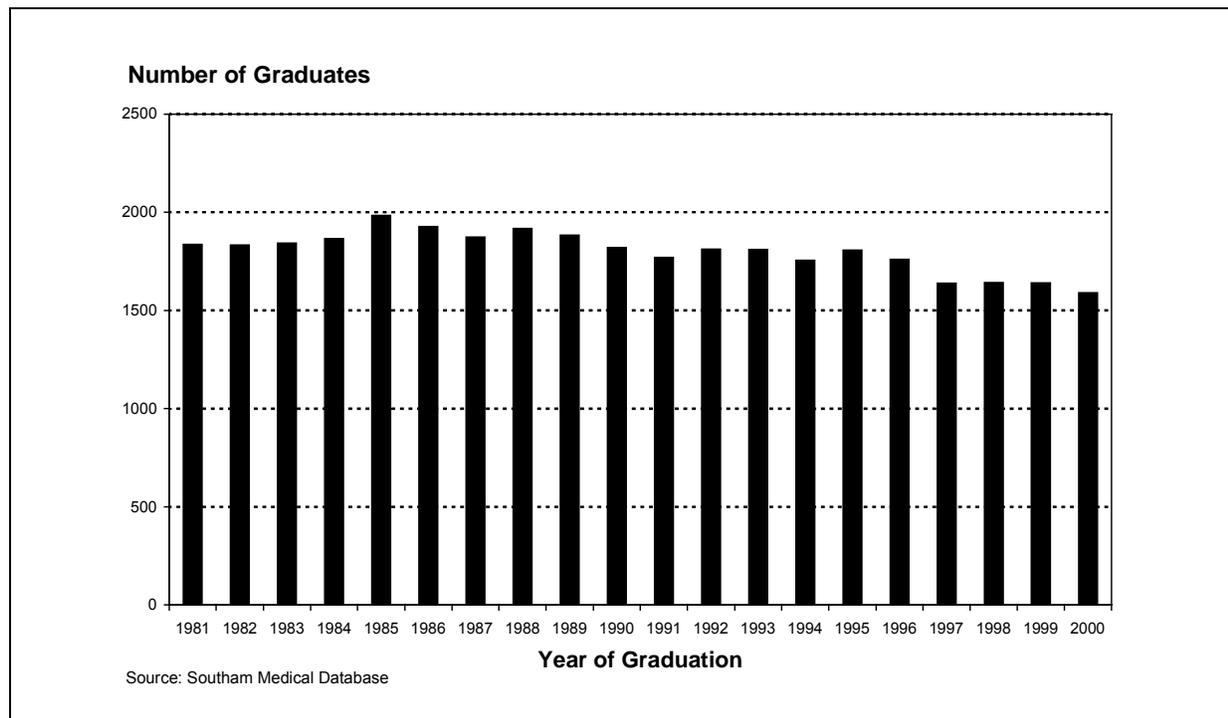


Figure 8: Number of Canadian Medical School Graduates per Year Entering Postgraduate Training in Canada for the First Time, 1981 to 2000

Key Message: The flow of medical school graduates into postgraduate training fell by 5% in 1991 and an additional 9% in 1997.

Flow 2: Canadian Postgraduate Trainees Entering Active Practice in Canada

From 1981 to 1993, there was considerable year-to-year variability in the flow into active practice from postgraduate training (Figure 9). From 1994 to 1997, there was a sharp drop in the flow. From 1998 to 2000, the flow rose, but not to the level prior to 1994.

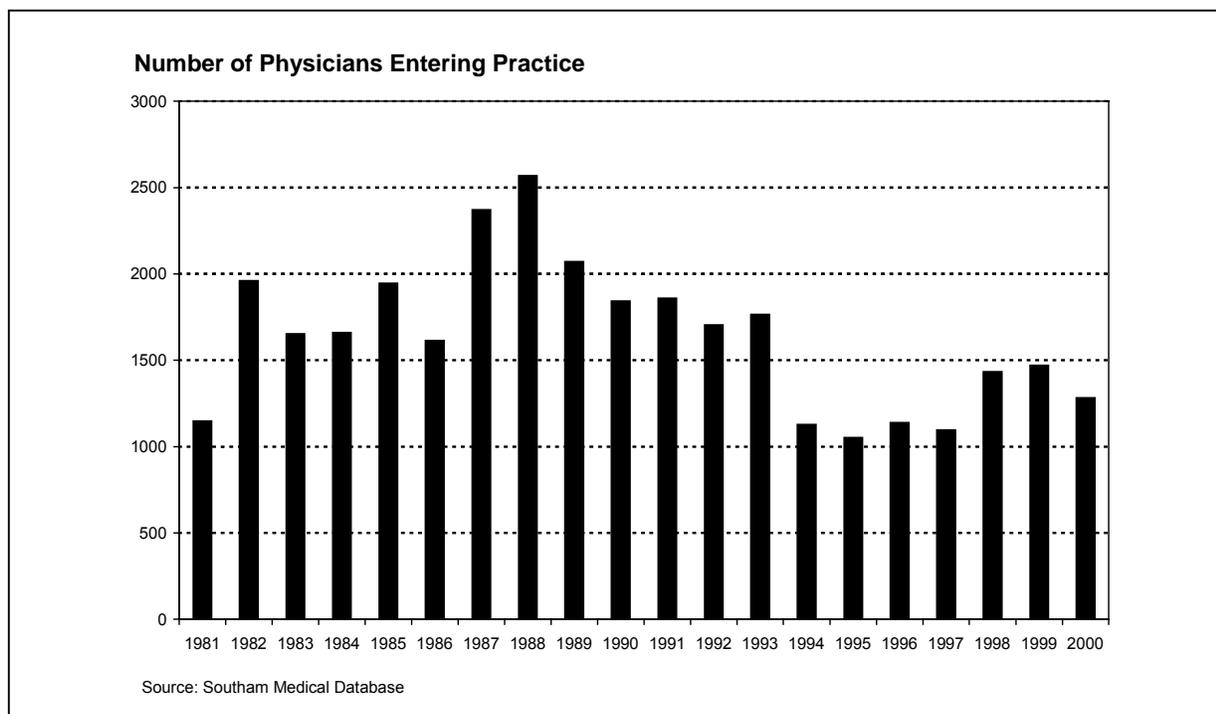


Figure 9: Canadian Postgraduate Trainees Entering Active Practice in Canada, 1981 to 2000

Key Messages:

- 1. The flow of postgraduate trainees into practice in Canada for the first time fell sharply in 1994 and remained at this level until 1997.**
- 2. From 1998 to 2000, there was an increase in this flow, but not to the same levels found prior to 1994.**

To determine the cause of this sudden drop in outflow from the Canadian postgraduate pool, we examined the length of time elapsed between graduation from medical school and entry into active practice. When the length of training for a group of physicians in a particular training program is permanently increased, two things happen: first, there is a transient decrease in the flow of new graduates into active practice, which resolves over time. Second, there is a permanent decrease in the active physician pool, equal to the number of physicians affected in each year times the number of years by which the program is increased. Simulation exercises demonstrating these phenomena are presented in the Technical Appendix.

Figure 10 shows, for each graduating medical class, the proportion of the class that enters practice at different times after graduation. Physicians who practice after one year are assumed to have done a rotating internship, which in the past, allowed them to work as general practitioners (GPs). Physicians starting after two or three years are probably family physicians (FPs) who completed a two-year residency and may have done an extra residency year in an area of interest, such as emergency medicine. Physicians who started practice four to nine years after medical school are most likely specialists who have completed a lengthier residency program. Exceptions to the above descriptions may occur if a physician takes longer to complete a program for personal reasons or switches programs during training. Physicians who have not appeared in active practice within 9 years after medical school graduation are assumed to have left Canada permanently.

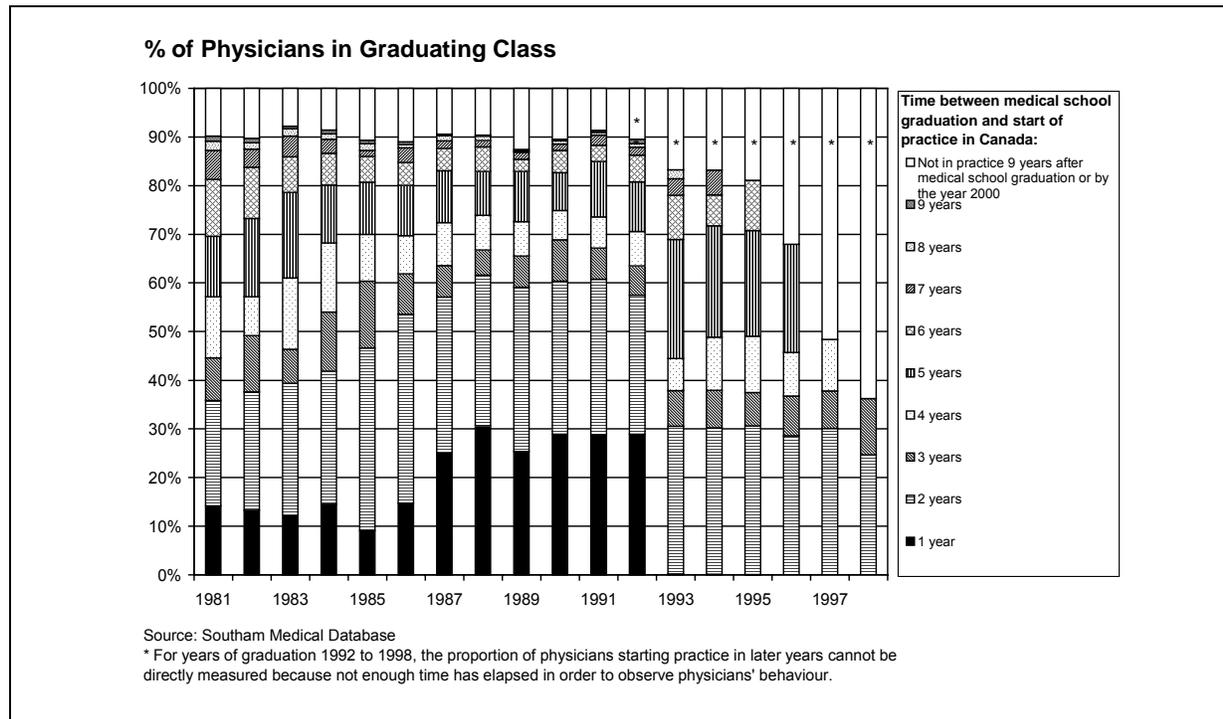


Figure 10: Number of Years in Postgraduate Training Before Appearing in Active Practice, Canada, 1981 to 1998

Key Messages:

1. This graph examines the length of time physicians spend in postgraduate training prior to starting active practice in Canada. There are three distinct periods of interest:
 - A. 1981–1986: Rotating interns (those who do 1 year of postgraduate training) and family physicians (2–3 years) account for just over half of all trainees.
 - B. 1987–1992: There is a sudden rise in the number of physicians entering practice after a rotating internship.
 - C. 1993–2000: Rotating interns disappear. There is a large increase in the proportion who enter practice after four or more years (mostly specialists).
2. The average time elapsed between medical school graduation and start of practice was longest in 1993–2000 and shortest in 1987–1992.

Three distinct time periods can be identified from Figure 10. For the classes of 1981 to 1986, just over half of trainees eventually entered practice as GPs or FPs. For the classes of 1987 to 1992, almost two-thirds entered practice as GPs or FPs, with a large increase in GPs. From 1993 to 1998, there was a sudden reversal: GPs virtually disappeared, the number of FPs remained almost the same and there was a large increase in specialist trainees. The average number of years between medical school graduation and starting practice was 3.3 for graduating classes 1981–1986, 2.5 for 1987–1992 and 3.7 for 1993–1998[†].

The net impact of these changes is also illustrated in Figure 11. The proportion of Canadian graduates who start practice as a GP or FP dropped sharply, from a high of 80% in 1992 to only 45% in 2000. This trend is associated with a decline in the overall proportion of physicians who are GP/FPs, from 53% in 1993 to 51% in 2000.

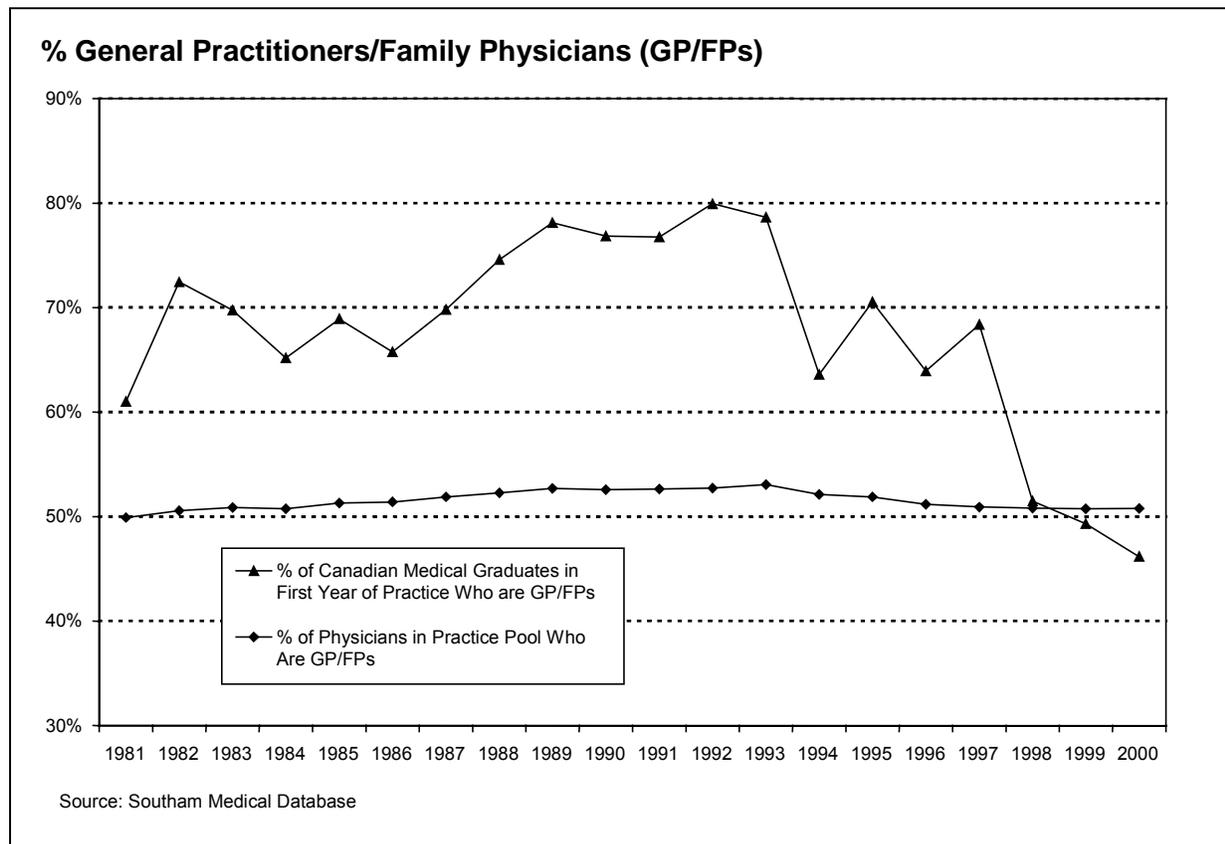


Figure 11: Specialty Mix, Canada, 1981 to 2000

Key Message:

- 1. In the early 1990s, almost 80% of physicians started practice as GP/FPs. By the year 2000, this percentage plummeted to 45%.**
- 2. As a result, the overall proportion of doctors who are GP/FPs has declined modestly.**

[†] For this calculation, imputed values were used where the proportion of postgraduate trainees starting practice at a given year after graduation could not be observed because not enough time has elapsed. For example, for the class of 1996, the proportion of the class starting practice five years after graduation was imputed to be the average proportion practicing after five years, calculated for the classes of 1992 to 1995.

Flow 2b: Exit Postgraduate Training Without Practicing in Canada

From 1981 to 1992, the number of Canadian postgraduates who never practiced in Canada was fairly constant at about 10%, with some random variation from year to year. In 1993 and 1994, this exit rate appeared to increase to 13% and 12% (using imputed values to estimate the number starting practice 8 and 9 years after medical school; see Figure 10). Inferences about this trend beyond 1994 were not attempted due to lack of data on future physician behaviour.

Flow 3: International Medical Graduates Entering Practice For the First Time in Canada

Figure 12a shows the yearly intake of international medical graduates (IMGs) into active practice in Canada. There is considerable year-to-year variation and the inflow of IMGs appeared to peak in the late 1980s and decline thereafter, particularly from the mid-1990s onwards.

IMGs may enter practice without any Canadian postgraduate training (flow 3a), or may spend a certain period of time in an internship or residency program (flows 3b and 3c). Figures 12a and 12b demonstrate that there has been a diminution in all three flows in the latter part of the 1990s.

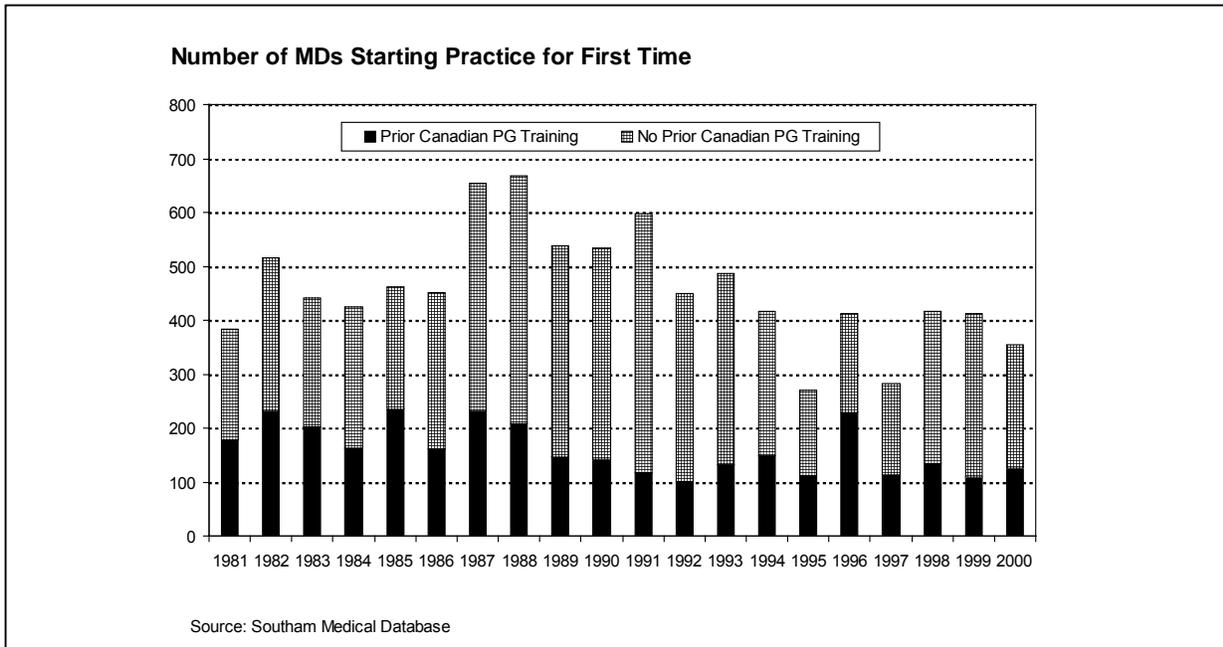


Figure 12a: Entry of International Medical Graduates into Canada, 1981 to 2000

Key Message: The number of international medical graduates (IMGs) starting practice in Canada for the first time fell from 1995 onwards.

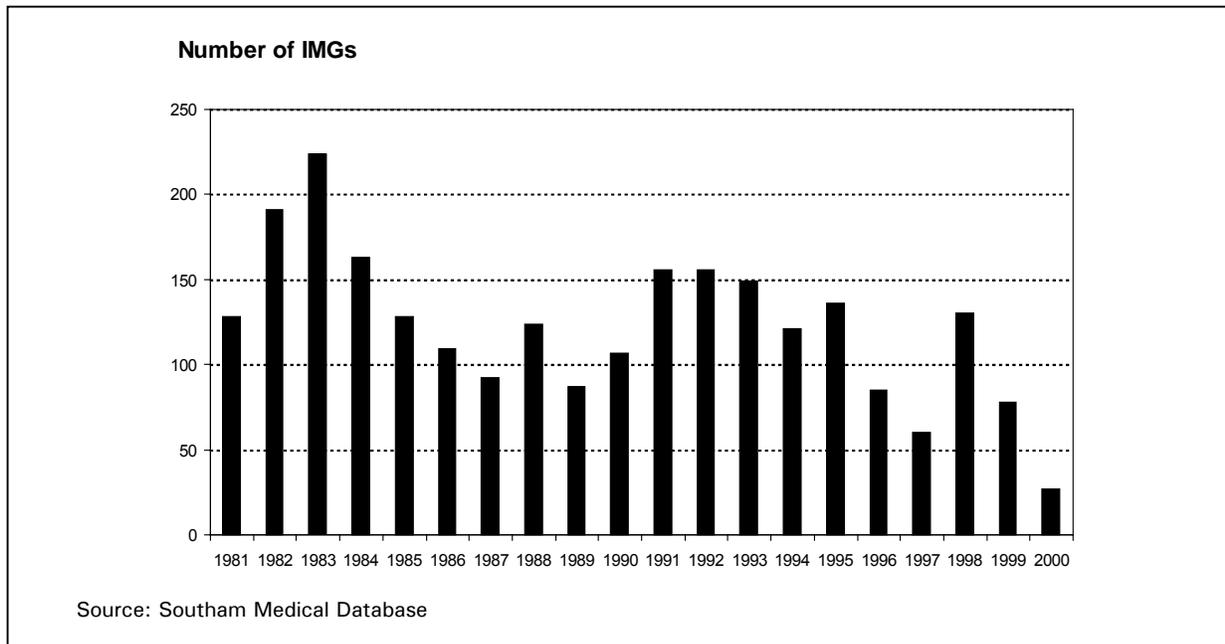


Figure 12b: IMGs Entering Postgraduate Training in Canada, 1981 to 2000

Key Message: In the late 1990s, there were fewer IMGs starting postgraduate training programs in Canada.

Flow 4a and 4b: Exits for Further Postgraduate Training and Returns to the Workforce

Figure 13 shows the outflows from the physician pool for additional postgraduate training and returns from training to the workforce. Over the time period of 1981 to 2000, there was a perfect equilibrium where average exits per year equalled average returns to the workforce (165). From 1988 to 1992, however, there was a substantial rise in exits for further training and there was a net outflow from the physician pool. From 1993 to 1998, the trend was reversed: there was a sudden reduction in exits for further training and there was a net inflow of physicians back into the workforce. From 1999 to 2000, the equilibrium was re-established, but the number of physicians leaving or returning from retraining was at an all-time low.

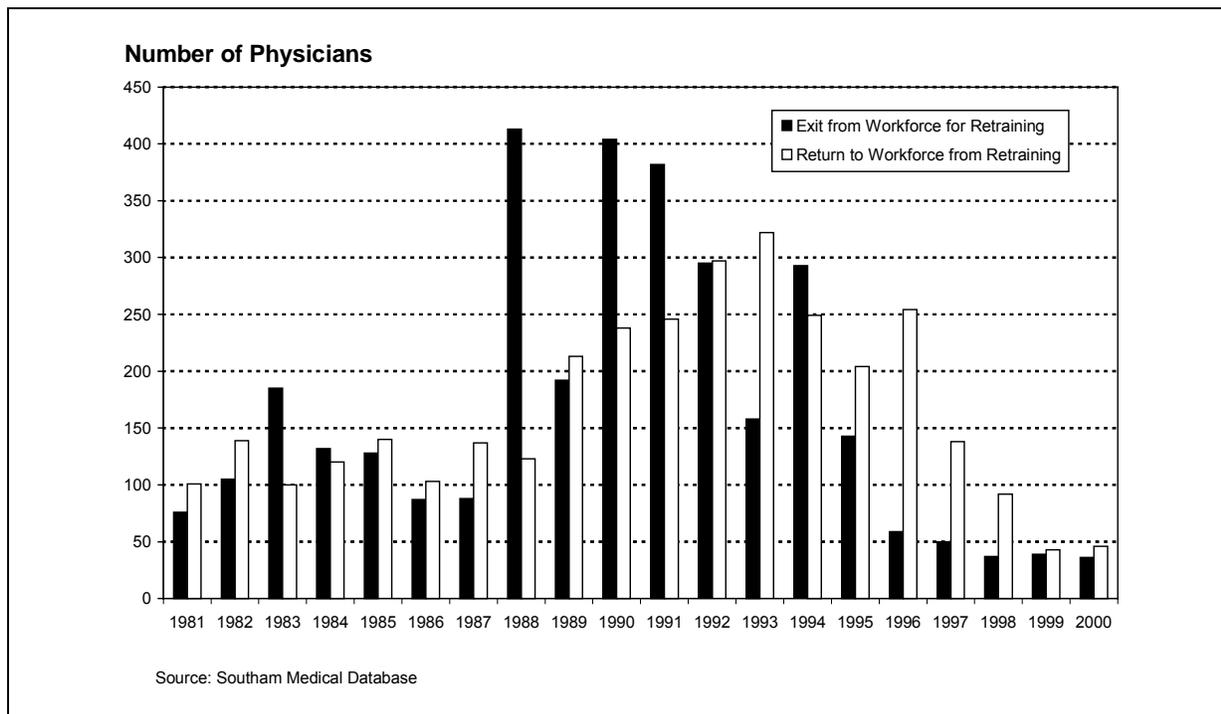


Figure 13: Exits from Active Physician Workforce For Further Postgraduate Education and Returns to Practice, Canada, 1981 to 2000

Key Messages: Four periods can be identified.

- 1. 1981–1986: the number of doctors exiting practice to do more training is about the same as the number returning**
- 2. 1987–1992: there is a sharp increase in doctors exiting for extra training**
- 3. 1993–1998: there is a sharp decrease in doctors exiting for extra training and a net inflow into the physician pool due to doctors returning from training**
- 4. 1999–2000: the number of doctors exiting for training and returning is roughly equal. The number exiting for extra training is at its lowest point ever.**

Of interest is the fact that the surge in physicians exiting for retraining in 1988 coincided with the increase in the number of physicians entering practice after doing rotating internships in 1987 (Figure 10). Likewise, the decrease in exits for retraining in 1995 coincided with the end to rotating internships in 1993.

Flow 5a and 5b: Physicians Moving And Returning from Abroad

Figure 14 shows the number of physicians previously practicing in Canada who move abroad and the number of such physicians who return to Canada. There was a net outflow of physicians in each year. The number of physicians leaving Canada varies widely from year to year and follows a cyclical pattern. This outflow was lowest in 1986 and highest in 1994. It appears that in 2000, the trend in physician exits was heading towards a low period. Interestingly, there was less fluctuation among physician returns than physician exits (coefficient of variation 0.19 vs 0.32).

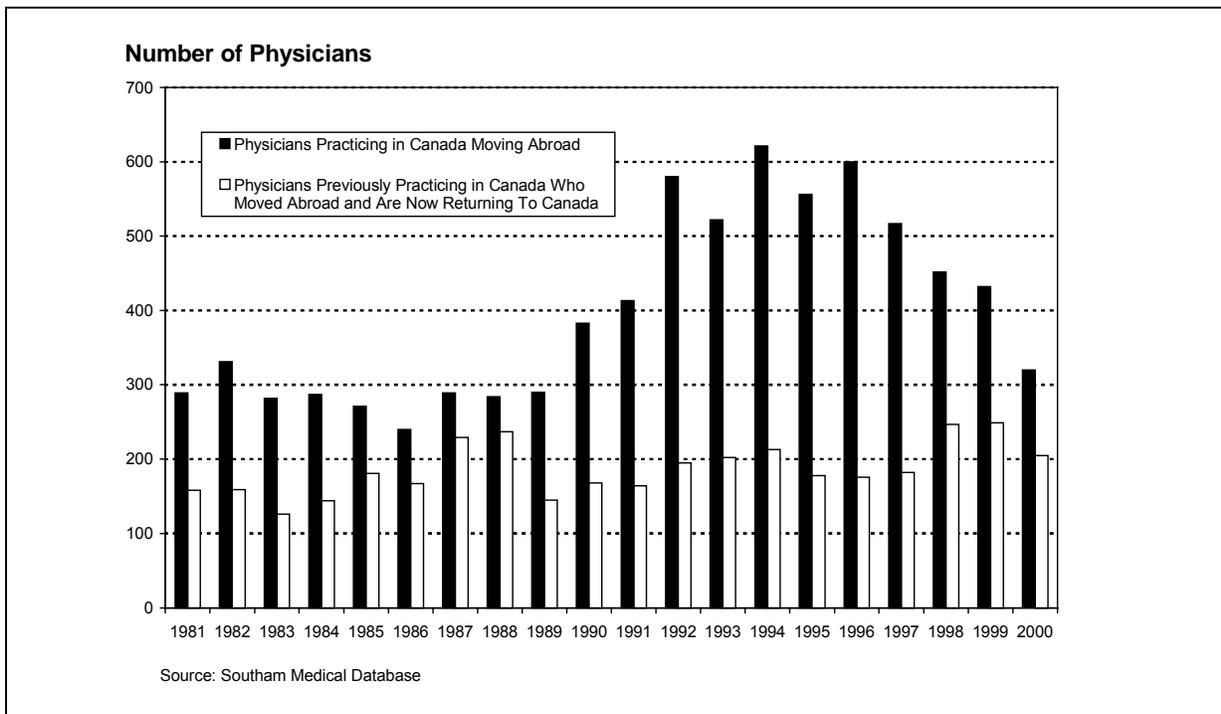


Figure 14: Physicians Moving and Returning From Abroad, Canada, 1981 to 2000

Key Messages:

- 1. There is always net loss of doctors leaving for other countries in any given year.**
- 2. The number of doctors leaving Canada follows a cyclical pattern. A peak occurred in 1994. Low points were at 1986 and 2000.**
- 3. The number of doctors returning to Canada each year does not vary as much as the number leaving.**

Flow 6a and 6b: Physicians Leaving Active Practice for Other/Unknown Reasons and Returning to Practice

This category mostly includes physicians who were removed from the SMDB without any explanation. Such physicians may have left for a foreign country without informing Southam, or may have left the practice of medicine. The category also includes a small number of physicians on sabbatical, deaths and early retirements before age 60.

Figure 15 shows the flow of these physicians out of and back into active practice. The exits also followed a cyclical pattern, with peaks at 1990 and 1996. There was a marked increase in returns to active practice between 1997 and 2000. As with movement abroad, there was a net loss of physicians in each year.

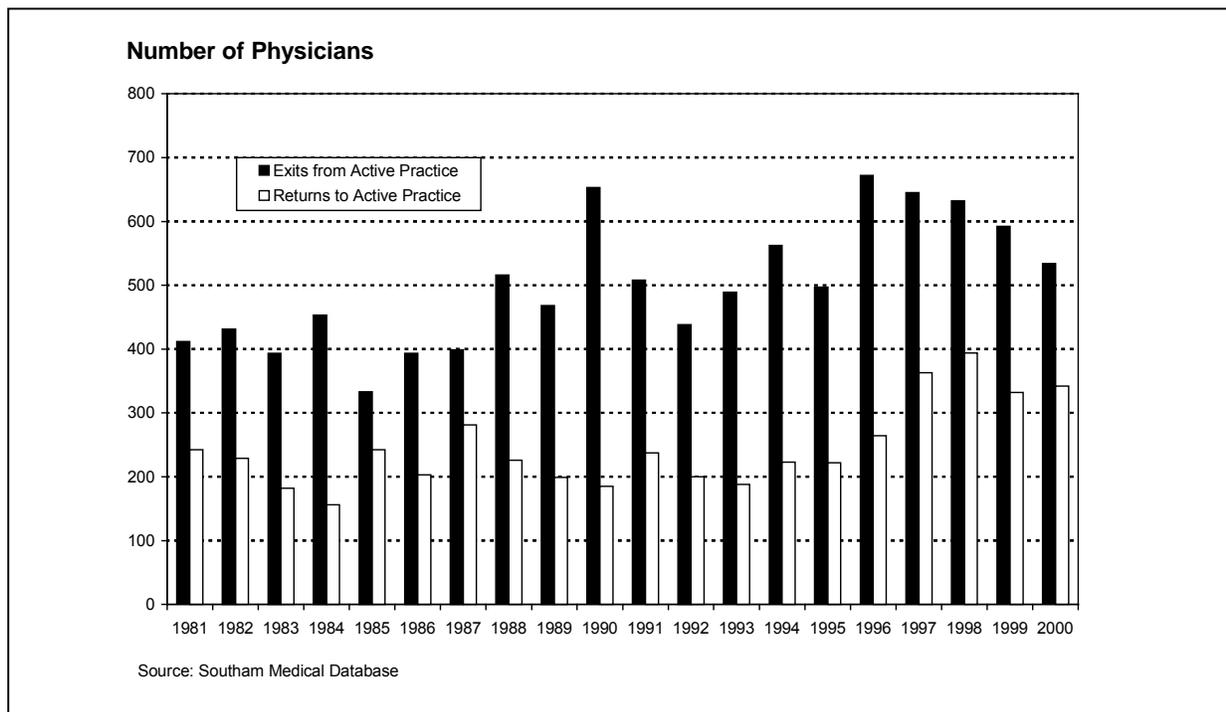


Figure 15: Exits from and Returns to Active Practice for Other/Unknown Reasons, Canada, 1981 to 2000

Key Messages:

1. The number of doctors leaving practice for other reasons also follows a cyclical pattern. Peaks occurred in 1990 and 1996.
2. There is always a net loss of doctors in any given year.
3. There was a marked increase in returns to active practice from 1997 to 2000.

Flow 7: Retirement

Physicians are considered retired in the year after they were last active. Only physicians over age 60 are included in this definition. Physician deaths are included in the definition of retirement.

The number of physicians retiring in Canada has almost tripled, from 295 in 1981 to 832 in 2000 (Figure 16). This increase has occurred in a linear fashion, although with large year to year variability. Most of this increase occurred because the size of the physician pool has increased substantially over the past two decades. However, the crude retirement rate (retirements divided by physicians in practice) has almost doubled, from 0.8% in 1981 to 1.4% in 2000 (Figure 17).

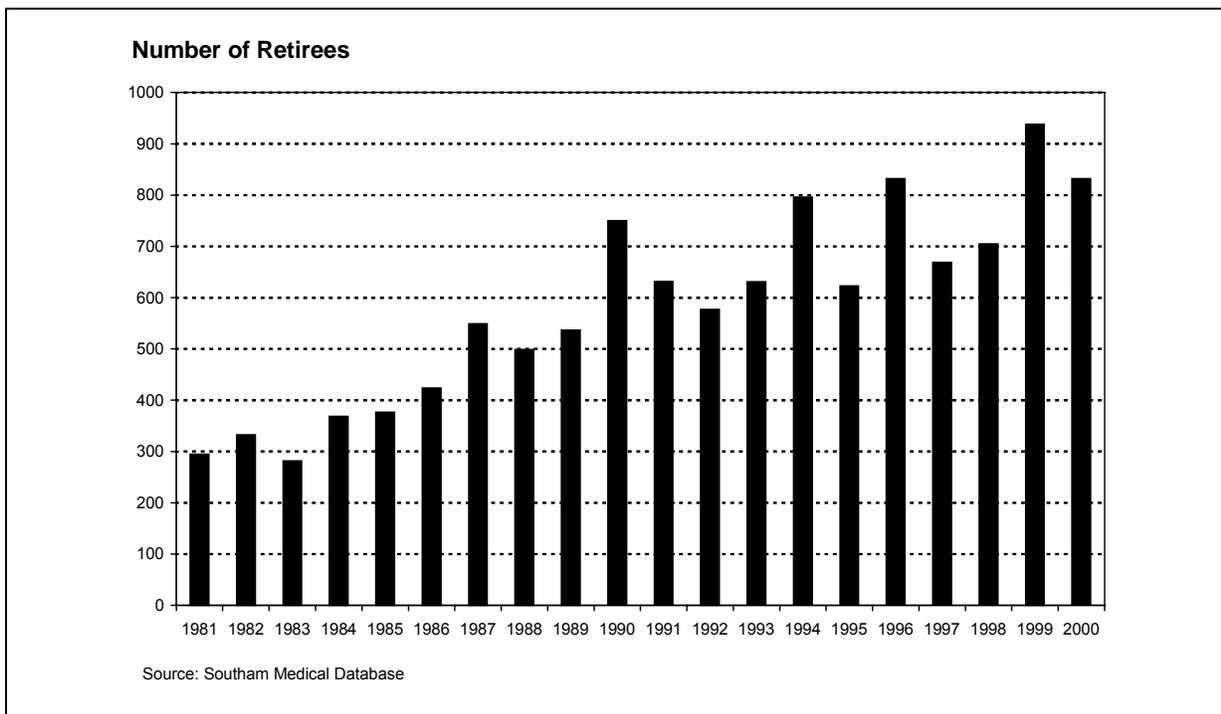


Figure 16: Number of Retirements per Year, Canada, 1981 to 2000

Key Message: The number of retirees has almost tripled from 1981 to 2000.

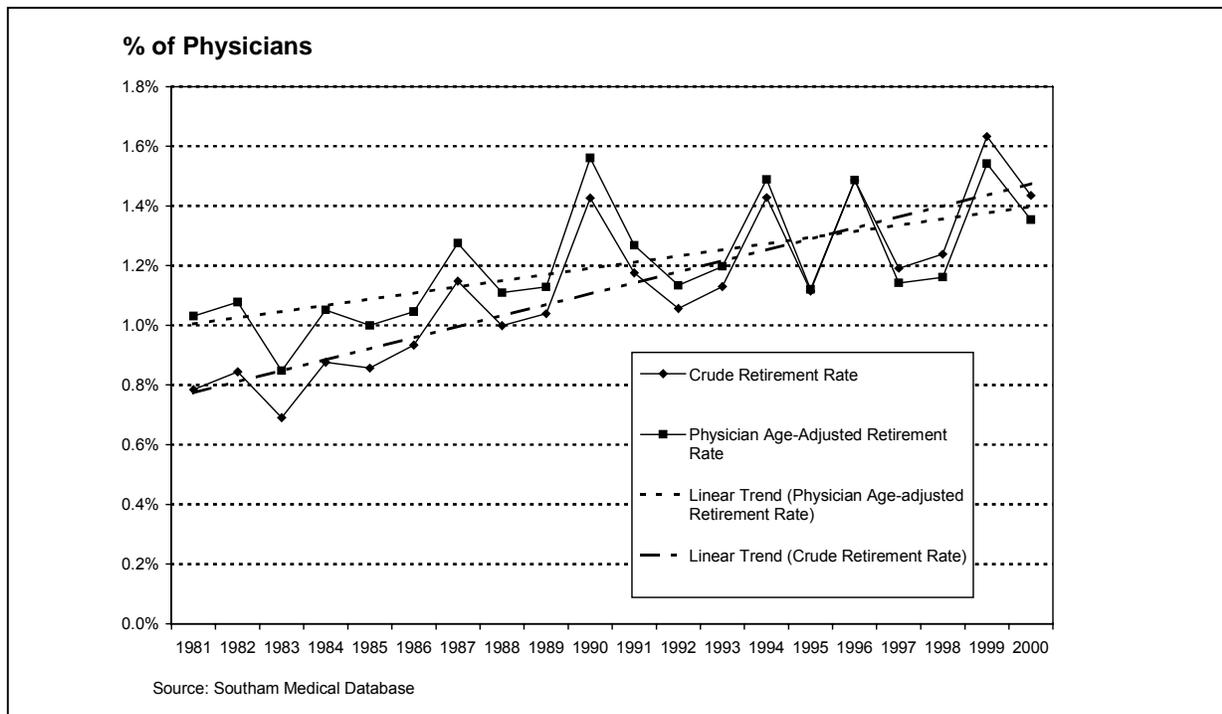


Figure 17: Crude and Physician Age-Adjusted Retirement Rates, Canada, 1981 to 2000

Key Messages:

1. The crude rate of retirement has increased steadily over time.
2. The age-adjusted retirement has also increased, but not as steadily as the unadjusted rate.
3. The increased number of retirees noted in Figure 16 is due to:
 - more physicians over time
 - the aging of the physician population
 - other factors which have increased the physician's intrinsic threshold for retiring over time

Another factor affecting the retirement rate is the aging of the physician pool, as noted previously. The rate of retirement increases as physicians grow older (Figure 18). As the proportion of older physicians increases, the retirement rate will rise. To estimate the impact of this effect, the physician age-adjusted retirement rate was calculated. Direct standardization techniques were used and 1996 was chosen as the base year. Even the standardized retirement rate showed a steady increase of 30% over the past two decades (Figure 16), although not as steep as the crude retirement rate.

The average retirement age from 1981 to 2000 was 70.8 years and the retirement age remained constant over time. The retirement age may remain constant despite a rise in the retirement rate, if the age-specific retirement rates for each age group rise in a roughly uniform fashion.

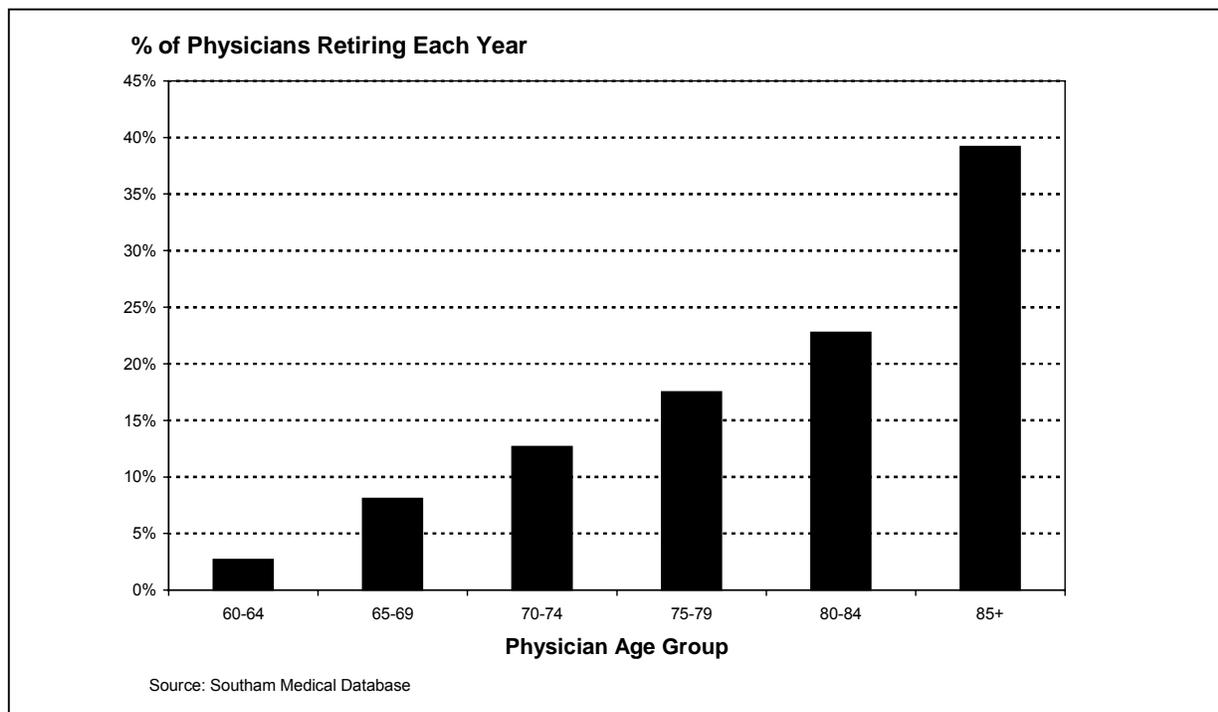


Figure 18: Physician Age-Specific Retirement Rates, Canada, Average Between 1998 and 2000

Key Messages: Physicians are more likely to retire the older they become.

3.2.2 Measuring the Impact of Changes in Flows in the 1990s on the Practice Pool

The average yearly flow rate for each of the above categories was calculated for two time periods: 1990 to 1993 and 1994 to 2000. 1993 to 1994 was chosen as the dividing line between these time periods because it marked the point at which the physician-population ratio began to decline. The relative reduction in the physician pool resulting from any flow changes was also calculated. For example, if an inflow into the physician pool changes from 1200 to 1000 per year, then by year 2000, there would be $200 \times 7 \text{ years} = 1400$ fewer physicians in the pool, compared to what the pool size would have been if the flow had not changed.

The results of this analysis are summarized in Table 3. The net impact of all of the changes in flows into and out of active practice during the 1990s was a relative decline of 5,093 physicians. The single largest contributor to this decline was the large decrease in Canadian medical graduates entering active practice. Reductions in the intake of international medical graduates and increases in retirement were also significant contributors. Although there is a continual loss of physicians from migration abroad or for other reasons, the rates of these flows did not change dramatically between the two time periods. Hence, these factors had a minor impact on the drop in physician supply.

Table 3: Entry and Exit Trends in the 1990s

Category of Entry/Exit	Average Inflow into Physician Pool Per Year (Outflows are negative)		% Change, 1990–1993 to 1994–2000	Cumulative Impact of Change on Physician Pool by Year 2000*
	1990–1993	1994–2000		
Flow 2: Canadian medical school graduates entering practice for first time in Canada	1,793	1,229	-31%	- 3,946
Flow 3: International medical school graduates entering practice for first time in Canada	541	379	-30%	- 1,132
Flow 4: Net flow of physicians leaving practice for retraining opportunities	-34	53	255%	+ 607 **
Flow 5: Net flow of physicians moving abroad	-292	-293	0%	- 2
Flow 6: Net flow of physicians leaving practice - other reasons	-320	-285	11%	+ 243 **
Flow 7: Retirements	-648	-771	-19%	- 863
Total Entries Minus Exits	1,040	313	-71%	-5,093

* compared to hypothetical case where rates of entry and exit into the physician pool in 1994–2000 do not change from 1990–1993.

** the positive flows indicate that a previous outflow from the physician pool either slowed down or turned into an inflow.

Note: Flows 1 and 2b are not included in this table because they do not immediately connect to the active physician pool (Figure 1). The eventual impact of changes in these flows on the active physician pool is described in Table 4.

Estimating the impact of changes in flows which take place prior to completion of postgraduate training (i.e. flows 1 and 2b and changes in the time gap between medical school graduation and active practice) is more difficult, because of the staggered impact of these changes on the physician pool. For example, if the graduating class of 1990 were cut by 100 students, there would be fewer GPs and FPs entering practice between 1991 and 1993 and fewer specialists from 1994 onwards. To examine these impacts, a simulation model was constructed which allows for the estimation of the change in physician supply by the year 2000 due to each of the different changes noted above. This model is described in greater detail in the Technical Appendix.

The results of this simulation analysis are summarized in Table 4. The most important factor behind the decline in entry of postgraduate trainees into active practice was the increase in physician training time from 1993 to 2000. Training time increased due to a rise in the proportion of physicians pursuing specialty programs and the elimination of the rotating internship. These two factors accounted for almost half of the decrease in flow 2.

The physician pool also declined as a result of an unusual phenomenon: the dynamic effect of decreased physician training time in 1987–1992, due mostly to a temporary surge in the popularity of the rotating internship. As noted previously, a decrease in physician training time will result in a transient increase in flow rate, as well as a permanent increase in the physician pool. This increase in the physician pool took place mostly in 1988–1992. From 1993 onwards, the transient increase in flow rate would have disappeared (see Figure 19). The significance of this finding is that *physician supply growth would have appeared to diminish from 1993 onwards, even if no other flow changes took place.*

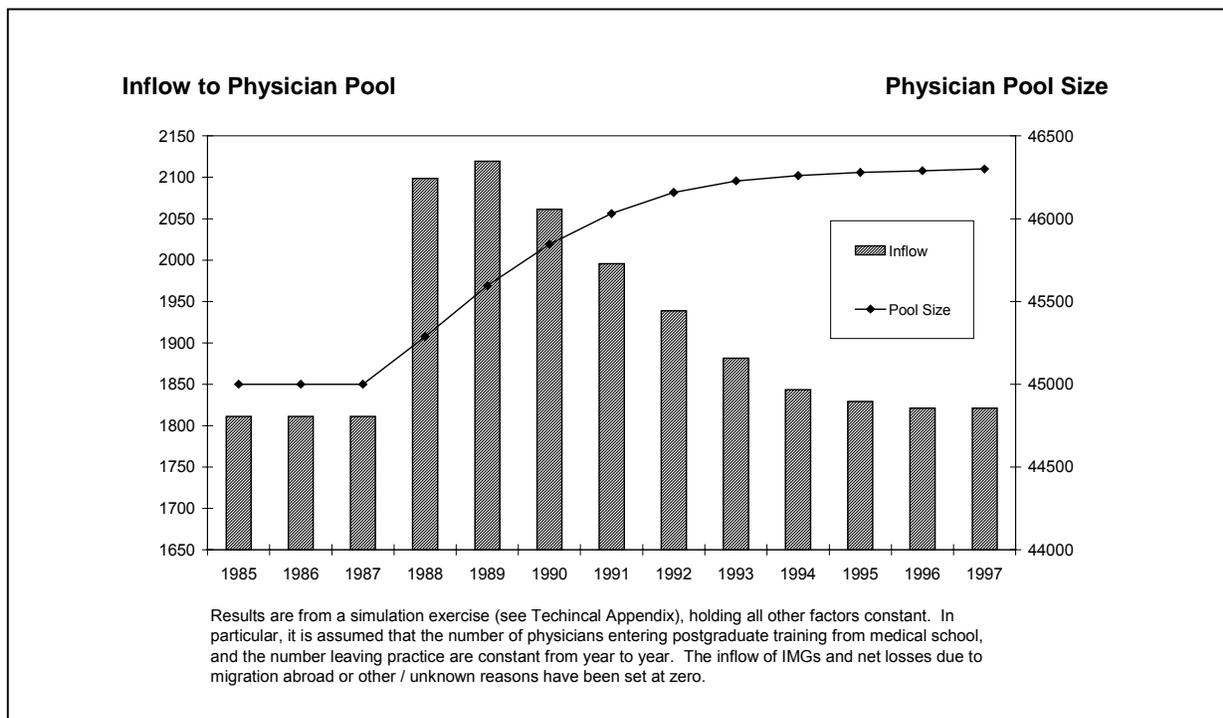


Figure 19: Estimated Impact of Decreased Length of Postgraduate Training in 1987 on the Physician Pool

Key Messages: The increased popularity of the rotating internship in 1987 and decreased length of time between medical school graduation and start of practice had a number of dynamic effects:

1. The flow into the active physician pool sped up temporarily, from 1988 to 1993
2. The physician pool experienced a gradual, permanent increase in size
3. The flow rate into the physician pool appears to drop from 1990–1992 to 1993–2000.

Other factors had a relatively minor effect. There was an estimated 10% decline in postgraduate entries into the physician pool from an increase in postgraduates who never practice in Canada (flow 2b), but this finding should be treated with caution because data on this trend were available only for 1993 and 1994. The decrease in physician supply due to reductions in medical school enrolment had relatively minor impacts.

Table 4: Relative Effect of Changes in Physician Training on the Decline in Postgraduate Entrants into Active Practice (Results from Simulation Exercise)

Physician Training Change (In Order of Occurrence)	% Of Decline in Flow from Postgraduate Training to Active Practice from 1994–2000 Attributable to Physician Training Change	Impact on Physician Pool by Year 2000 (Estimate Only)
Dynamic effect of decreased physician training time (brief rise of the rotating internship from 1987 to 1992)	27%	- 1,080
First decrease in medical school enrolment, from the class of 1991 onwards	11%	- 438
Elimination of the rotating internship, 1993	13%	- 526
Further increases in physician training time, 1993 onwards	35%	- 1378
Second decrease in medical school enrolment, from the class of 1997 onwards	3%	- 117
Increase in postgraduate trainees who never practice in Canada in the mid-1990s	10%	- 407
TOTAL	100%	- 3,946

Table 5 summarizes the impact of changes in flows into and out of the active physician pool. Changes to length of postgraduate training and reductions in undergraduate medical enrolments had the largest impact, even after accounting for the mitigating effect of reduced positions for further postgraduate training in the 1990s.

Table 5: Impact of Changes in Flows Into and Out of Active Physician Pool

Changes in Flows Affecting Physician Pool	Effect on Physician Pool	Impact on Physician Pool by 2000	% of Total Decline in Physician Pool
Changes to postgraduate training in 1993			
Elimination of rotating internship	- 526		
Increased proportion of residents in specialty programs, relative to family practice	- 1,378		
Mitigating impact of reduced positions for further postgraduate training	+ 607		
Total Impact of postgraduate training changes		-1,297	25%
Fewer IMGs entering Canada		-1,132	22%
Dynamic effect of surge in rotating internship from 1987-1992		- 1,080	21%
Retirements		-863	17%
Changes to medical school enrolment			
Enrolment decrease in 1991	- 438		
Enrolment decrease in 1997	- 117		
Total impact of medical school enrolment changes		-555	11%
Other exits from practice pool			
Physician migration abroad	-2		
Physician exits, reasons unknown	+ 243		
Physician exits from postgraduate system, reasons unknown	- 407		
Total impact of other exits		-166	3%
TOTAL		-5,093	100%

KEY MESSAGES: Physician supply experienced a relative decline from 1994 onwards because of the following (listed in order of impact):

1. An increase in the length of time spent in postgraduate training
2. Fewer international medical graduates entering practice
3. A dynamic effect created from other changes in postgraduate training in the 1980s
4. Increased retirements
5. Fewer graduates from Canadian medical schools entering postgraduate training
6. Increased physician migration abroad and other causes of physicians leaving practice in Canada

4. The Policy Environment—What Policies May Have Contributed to the Drop in Physician Supply in the 1990s?

Two types of policies are discussed in this section: a) direct policies to limit growth in physician supply; and b) other policies not directly related to physician human resource management, but which may have indirectly affected physician supply.

4.1 Direct Policies to Limit the Growth in Physician Supply

4.1.1 The 10% Reduction in Medical School Enrolment from the Graduating Class of 1997 Onwards

The 1991 Barer-Stoddart report recommended a 10% reduction in medical school enrolment. This policy was aimed directly at limiting physician supply growth and was first implemented in the medical school class beginning study in the fall of 1993. In some provinces (Alberta and Quebec), there was a gradual phase-in period²⁹. This trend corresponds closely with the finding in this study of a 9% decline in Canadian graduates entering postgraduate training for the first time, starting with the graduating class of 1997. The fact that the decline was slightly less than the planned 10% reduction may be due to the phase-in period in the two provinces.

This policy has been blamed by some analysts for causing the current physician shortage^{1,30}. However, this study suggests that this policy could have accounted for no more than 2% of the total decline in inflows into the physician pool from 1994 onwards. Nonetheless, it is important to acknowledge that the full impact of this policy will be felt over the next several years.

4.1.2 Downsizing of Medical School Enrolment in the 1980s

Prior to Barer-Stoddart, downsizing of medical school enrolments took place in the three Quebec medical schools, Dalhousie and Manitoba³¹. This occurred gradually, beginning with the first year class of fall 1981. By the fall of 1987, the first year class size was 1,769 students, 96 students (5%) less than in the fall of 1980. This trend corresponds closely with the finding in this study of a 5% drop in Canadian medical graduates entering postgraduate training for the first time, starting with the graduating class of 1991.

This study suggests, however, that this policy accounted for only 9% of the total decline in inflows into the physician pool. Again, it should be acknowledged that the cumulative effects of this policy will continue to be observed for the next several years.

4.1.3 Restrictions on International Medical Graduates

The management of international medical graduates (IMGs) generated intense debate throughout the 1980s and 1990s and was also examined by Barer and Stoddart in 1991¹². A variety of measures were taken to try to reduce the intake of IMGs. Some measures discussed included requiring immigrants to sign a stronger declaration agreeing that there is no guarantee of medical practice in Canada and closure of the Medical Council of Canada's overseas testing facilities³². The most important measure, however, was aimed at reducing the recruitment of 'visa trainees'. These IMGs entered Canada on special visas for postgraduate training and were often used to fill less popular residency positions or to provide service work in teaching hospitals³². Many of these physicians remained in Canada after training, even though the original intent was for them to return to their home country. By 1993/94, the number of such visa trainee positions funded by Ministries of Health dropped to 77 from 210 in 1990/91²⁹.

This study shows that there was indeed a significant decline in IMGs entering Canada from the mid to late 1990s. From Figures 12a and 12b, it appears that IMG entry into Canada was limited at a number of points, although the reduction in inflow was greatest among those IMGs entering postgraduate training, perhaps as a result of the restrictions on visa trainees. Further research is needed to clarify which of these policies had the greatest impact on declining IMG entry, or if there were other factors which may have influenced this trend.

4.1.4 Retirement Incentives

A number of provinces implemented policies to encourage older physicians to retire. In New Brunswick, as early as 1993, the provincial government could buy out a retiring physician's practice in areas of over-supply at a set rate³³. Quebec and Nova Scotia implemented optional retirement buyout packages in 1995³⁴. British Columbia attempted to implement a mandatory retirement policy in 1997 for physicians over age 75³⁵. However, any physician wishing to maintain his practice could appeal each year to keep his billing number and at press time the matter is currently before the courts³⁶.

Did these policies have any impact on the retirement rates? This observational study cannot make any conclusions on this question. There was a linear rise in the retirement rate which started well before these retirement buyout packages became available. It is not clear to what extent these packages increased retirement rates and it is possible that the retirement rate would have continued to rise, even in the absence of such incentives. Other factors affecting the overall practice environment (see below) may have also had an impact on retirement rates.

4.2 Indirect Policies That May Have Unintentionally Reduced Physician Supply

4.2.1 The Elimination of the Rotating Internship

In the late 1980s, several key organizations conducted discussions on eliminating the rotating internship, including the Association of Canadian Medical Colleges, the Medical Council of Canada and the Federation of Medical Licensing Authorities of Canada. The rationale for such a policy was that making a two-year family residency the minimum requirement for a primary care practice would enhance quality, ensure portability and promote a national standard³⁷. Alberta already had such a requirement as of 1976. Quebec dropped the rotating internship in 1988, followed by Saskatchewan in 1989 and all other provinces by 1993[§].

This study demonstrates near perfect compliance with this policy. The number of physicians starting practice one year after graduation dropped to zero in 1993 (Figure 10). This policy had an important impact on the increased length of training noted from 1993 to 2000, which in turn, contributed strongly to the decreased inflows into the physician pool. This policy is 'indirect', because its impact on physician supply was not an intended consequence.

4.2.2 The Increase in the Ratio of Specialist to Family Medicine Residency Positions

In the early 1990s, some provinces had slightly more GP/FPs than specialists and wanted to restore the balance to 50/50. This was accomplished by maintaining a higher number of specialist residency positions relative to family practice³⁸, even as the rotating internship was phased out in 1993. In 1992, Quebec, Ontario, British Columbia and Alberta were planning for a 60:40 ratio of first year specialist to family physician trainees, while Manitoba planned for a 55:45 ratio³⁹.

This study clearly demonstrates the impact of this policy (Figure 10). The proportion of physicians entering practice four years or more after medical school rose suddenly with the class of 1993. This study confirms the finding, reported elsewhere, that most of the rotating internship positions were converted into specialist residency positions and there was little change in the number of family practice positions⁴⁰. This policy had a strong impact on the increased length of training in 1993–2000, which contributed greatly to the reduced growth in the physician pool.

[§] Manitoba and Newfoundland implemented this policy on January 1st, 1994, but this affected postgraduate trainees from July 1993 onwards.

4.2.3 The Decline in Opportunities for Physicians to Return to Postgraduate Training

In the past, physicians who were already practicing in Canada had the opportunity to leave their practice to do more training. Such physicians were often GPs with a one-year rotating internship. The length of additional training could vary from an extra year of family medicine training to a full 4 to 7 year specialty program.

The literature search did not uncover any specific rationale for the decline in the number of physicians returning to postgraduate training that occurred during the 1990s. Some analysts believe that this occurred because, as the rotating internship was phased out, priority for residency positions had to be given to new graduates³⁸. There were no new residency positions created specifically for retraining. In fact, discussions in the early 1990s focused on *reducing* postgraduate training positions by 10% to match the 10% decline in medical school enrolment³⁷. This reduction never materialized, due to the increase in specialist residency positions³⁸.

This study suggests that this policy led to a net increase in the physician pool, as the flow of physicians exiting practice for retraining was curtailed in 1993 and the return flow from retraining back into active practice continued for several years afterwards. One potential consequence of this policy, however, may have been that some physicians who had done rotating internships prior to 1993 with the intention of eventually returning to postgraduate training may have been denied the opportunity to do so. Future research should examine whether this took place and whether such physicians went to the United States or other jurisdictions in order to change specialties. Such a phenomenon, in theory, could have contributed to the peak in migration abroad noted in 1994 (Figure 14).

Another theory recently proposed is that the reduction in retraining opportunities may have discouraged medical students from choosing family medicine residencies. These individuals may have felt that choosing family practice would eliminate the option to train later as a specialist⁴¹. Such a phenomenon would, in theory, contribute to the increase in the ratio of specialist to family medicine residents noted in this study, and the average time spent in postgraduate training prior to starting practice. Further research is needed to determine if this phenomenon actually occurred.

4.2.4 General Economic and Social Policies

Two important trends are of particular interest. One is that net physician migration abroad peaked in the mid-1990s. The second is that there was a brief and modest increase in physicians who did not start practice at all in Canada in the graduating classes of 1993 and 1994 and such individuals may have left for practice abroad. These periods coincide with a period of considerable turbulence in physician-government relations. Across Canada, provincial governments had implemented a number of expenditure control policies^{29,42}. Expenditure caps were set, such that any increase in total billings by physicians above the cap would be recovered through end-of-year adjustments or decreases in the fee schedule. High volume physicians were subject to threshold reductions, whereby billings above a certain amount were subject to penalties. Young physicians in numerous provinces faced restrictions limiting their right to migrate to other provinces⁴³, or work in certain communities deemed to be overserved⁴⁴. Young physicians also faced financial penalties for working in urban areas, in selected provinces⁴⁵.

Other changes in the health care system occurring in the 1990s may have affected physician migration rates. Hospital closures and mergers may have had adverse effects on some physicians' work patterns or scope of practice. Another potential factor is the degree of conflict within the medical profession, particularly between young and old physicians. At certain times during the 1990s, young physicians voiced strong disapproval or disagreement with the older generation for signing agreements with governments on restrictions to medical practice which applied only to them and not the whole profession^{44,46,47}. Such sentiments may have contributed to the increased outmigration of postgraduates among the classes of 1993 and 1994.

The observed increase in lag time between medical school graduation and first year of practice in Canada may be due to factors other than those mentioned in 4.2.1 and 4.2.2. The increased participation of women in the physician workforce may mean that more women are interrupting their training for childbirth or childrearing. Second, there is some evidence that residents in specialty programs are choosing to spend more time training in subspecialty programs⁴⁸, and the reason for this trend deserves further research. Third, physicians may have been more likely to make a wrong career choice at the outset of their postgraduate education⁴⁹ and, therefore, were more likely to change specialty streams during training. This may have occurred because the elimination of rotating internships and opportunities for retraining may have forced them to make such decisions earlier in their studies, when they may have had less knowledge of where their interests lay. A fourth possibility is that some physicians may have delayed their entry into active practice in Canada during the turbulent period of the mid-1990s, either by taking leaves of absence or practicing first in the United States.

It should be emphasized that all of the hypotheses presented here are speculative and further research is needed to examine whether any of these above policies influenced physicians' decisions to practice in Canada.

KEY MESSAGES:

The following policies *likely contributed* to a decreased inflow of physicians:

- The decision to eliminate the rotating internship
- The increase in specialty residency positions relative to family medicine
- Restrictions on international medical graduates (particularly visa trainees)
- The 5% reduction in medical school enrolment, class of 91 onwards (small effect)
- The 10% reduction in medical school enrolment, class of 97 onwards (small effect)
- The reduction in the number of retraining opportunities (net short-term *increase* in physician supply)

The following policies *may have had* some impact on the outflow of physicians:

- Retirement incentives
- Expenditure control policies (expenditure caps, clawbacks, threshold reductions)
- Restrictions on where new physicians could practice
- Other health system changes (e.g. hospital restructuring)
- Restricted retraining opportunities in Canada
- Intergenerational conflicts between younger and older members of the medical profession

Further research is needed to examine the relationship between these policies and physicians' practice decisions.

5. Why Does It "Feel Like" There is a Physician Shortage?

This section examines areas of medicine which have been reported as being affected by physician shortages, and considers how key findings in this study are consistent with these reports.

5.1 The Hysteresis Effect

The fact that physician supply peaked in 1993 before dropping to its current level raises the possibility of a hysteresis effect. Once physicians and patients are accustomed to a particular level of service, their minimum expectations for care are set at this level and it may be difficult for either group to adjust to a lower level of service. This effect may be important, particularly in cases where there are no clear indications on when a patient should receive a medical service and there is significant discretion on the part of the physician to provide the service or the patient to demand it. Further research should examine to what extent the hysteresis effect exists.

5.2 Physician Practice Activity

Figure 20 shows physician practice activity over time, as measured by the average FTE units per physician. The drop in physician supply has coincided with a rise in practice activity for all specialties. Increasing practice activity may be an important compensatory mechanism for the decline in physician supply. Past research has demonstrated that practice activity is highest in areas where the physician-supply ratio is lowest⁵⁰. From the patient perspective, the impact of the decline in real physician-population ratio on access to care may be mitigated by the fact that individual physicians are providing more service than before.

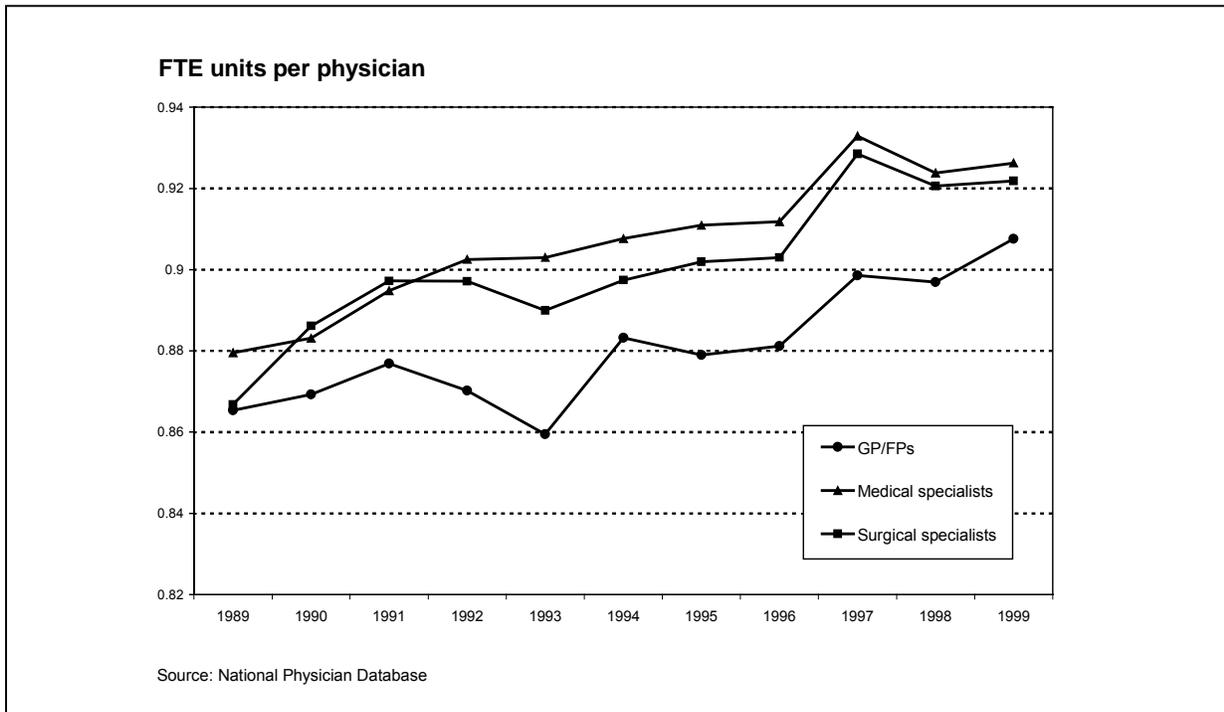


Figure 20: Physician Practice Activity, Canada, 1989 to 1999

Key Message: Physician practice activity has been increasing steadily for all specialties.

From 1989 to 1999, practice activity (FTE to physician ratio) rose by 4.9% for GP/FPs, 5.3% for medical specialists and 6.3% for surgical specialists. This increase is roughly the same magnitude as the decline in real physician supply from its peak and suggests that patients were at least receiving a comparable level of service throughout the past decade. However, the findings raise the question of whether reliance on increased physician practice activity is sustainable in the long run. The activity increases occurred despite the fact that more women, working reduced hours, have entered the workforce. Applying a physician age-gender adjustment to the workload levels reveals that adjusted workload has risen by 7.0%, 7.7% and 8.6% for GP/FPs, medical specialists and surgical specialists respectively.

Physicians could have increased their practice activity by increasing their workload, their productivity, or both. While further research is needed to determine to what extent physicians have increased their work hours, results from the 1999 Canadian Medical Association Physician Resource Questionnaire Survey suggest that physicians are concerned about the size of their workloads⁹. More recent Janus Survey data suggest that the majority of family physicians would prefer to adjust their career in order to have more time with their families or for themselves (Table 6). The Janus Survey also shows that physicians who felt their workload was too heavy were more likely than others to not accept new patients. This suggests that heavier physician workloads may have a negative effect on access to care.

Table 6: Workload Satisfaction

Workload Preferences	% (#) of GP/FPs	% (#) of GP/FPs in Workload Preference Group with Completely or Conditionally Closed Practices
More time needed for career	0.5 (64)	52 (33)
Balance between personal and professional commitments is about right	27 (3,547)	57 (2,013)
More time for family or for self	72 (9,414)	70 (6,579)
Missing data	1 (141)	56 (79)
TOTAL	100 (13,166)	66 (8,704)

Source: 2001 Janus Survey

5.3 The Decline in Family Practice Graduates

From 1993 onwards, the ratio of family medicine to specialty postgraduates has declined substantially (Figure 10) and the overall proportion of physicians who are GP/FPs has declined (Figure 11). Furthermore, the proportion of physicians who are women and who work fewer hours is highest in family medicine (Figure 3), compared to other specialties. These factors, combined with the overall lower inflow of young physicians into the physician pool, has resulted in a particularly small increase in the number of new family physicians starting practice. This finding may help explain one of the key concerns being voiced at present, that a growing number of patients cannot find family physicians⁶.

5.4 Reduced Flexibility in the Practice Pool

In the early 1990s, it was much more common for physicians to begin their careers as a GP and then specialize after a brief period in practice. There were a number of advantages to this career path, in theory. First, physicians may have been more certain of their interests after doing general practice. Further research should be conducted to see if dissatisfaction among residents with their choice of specialty program was lower among physicians who re-entered postgraduate training after general practice and whether this dissatisfaction resulted in a higher incidence of residents switching programs and therefore foregoing more years of practice.

Second, having a pool of recently graduated GPs in practice may allow the system more flexibility to respond to acute shortages in specific specialties. When such specialties arise, new recruits can be drawn from either the graduating medical class or the pool of GPs. At present, with the ratio of GP/FPs to specialists being close to 1, any attempt to recruit specialists from the GP/FP pool may exacerbate any perceived shortages in family medicine.

5.5 The Decline in Young Physicians

This study documents a decline in young physicians, which appears to be related to at least two factors. First, the increase in length of postgraduate training slowed the entry of new physicians to replenish the practice pool. Second, although there was relatively little change during the 1990s in net exits out of the system due to migration abroad or for unknown reasons, the one group where these exits did increase were the postgraduate trainees who never end up practicing in Canada.

The fact that young physicians have been in greatest decline raises a number of concerns. Young physicians are the ones most likely to be providing emergency department and obstetrical services⁵¹, and these areas have been cited recently as being areas in shortage.⁶ Young physicians also play a significant role in providing locum coverage and their reduced numbers may have meant less relief for established physicians. The decrease in young physicians also has implications for quality of care. Numerous studies suggest that young physicians provide more health promotion and disease prevention services^{52 53,54,55}, adhere more closely to practice guidelines⁵⁶ and are better at avoiding inappropriate drug prescribing⁵⁷.

5.6 Changes in the Comprehensiveness of Care

Fewer GP/FPs are electing to work in emergency departments, hospital inpatient wards, obstetrics and nursing homes. This trend has progressed steadily since 1989⁵¹. The fact that this phenomenon has coincided with the general decline in physician supply raises concern that it may become increasingly difficult to maintain an acceptable level of access to these services.

6. Future Directions for Research and Policy-Making

This report identifies key trends behind recent changes in the supply of physicians in Canada. These findings improve our understanding of the complex dynamics which shape the physician workforce and underscore the need to understand the multitude of interactions between policies made and the environment in which they are implemented. The key lesson for physician human resource planners is that it is important to look not only at policies targeted at managing physician supply, but also other policies and events which may affect supply in an indirect way.

This lesson is very evident when analyzing changes to the training of physicians. Much criticism and blame has been levelled at the 10% reduction in medical school enrolment, a direct policy intended to reduce physician supply. Yet, this policy had a miniscule impact during the time period of the study (although its full effect remains to be seen). The indirect effects of changing postgraduate training had a far greater impact. Furthermore, if policy-makers believe that there is an absolute shortage of physicians, then they should be extremely wary of any policies that may further prolong the length of postgraduate training programs, at least in the short-term.

This study has not examined the critical issue of physician maldistribution. Even when physician supply increased dramatically in the 1980's, shortages in rural areas persisted. This is an area of intense public policy activity and a variety of incentives have been attempted in recent years, such as financial bonuses, loans in exchange for future service in underserved areas, billing number restrictions in urban areas, and training initiatives in remote areas⁵⁸. The most significant example of the latter include the new medical schools for Northern Ontario⁵⁹ and British Columbia⁶⁰, recently announced in 2001. Future research should document physician distribution on a national level and how this has evolved in light of recent policy changes.

This study identifies a 'relative shortage' of physicians in 2000 compared to 1993. Declaring an 'absolute shortage', however, is beyond the scope of this exercise. To make such a declaration, one must consider important societal questions, such as society's willingness to pay for a given level of service. Future research could provide some assistance to policy-makers in making these societal decisions. First, research could be directed towards quantifying the benefits to the population, in terms of improved health status, from adding more physicians. Second, research could uncover opportunities to reduce inappropriate care and increase access to care where access is currently limited. Third, research could examine opportunities to increase the efficient use of existing physician human resources. Expanded use of alternatives to physicians, such as nurse practitioners, midwives, physician assistants and anesthesia technicians should be considered, as well as information technologies to improve physician productivity.

References

- ¹ P Sullivan. Concerns about size of MD workforce, medicine's future dominate CMA annual meeting. CMAJ 1999;161:561-2.
- ² W Rosser. Where have our family doctors gone? #1 - a brief history of the family physician shortage in Ontario. Toronto: Ontario College of Family Physicians, May 1999.
- ³ BKE Hennen. Fixing the doctor shortage: working together to achieve success. Can Fam Phys 1999; 45: 2017-2019.
- ⁴ HR Wexler. Workload strain mounts among Ontario physicians. Ontario Medical Review 1999 (September); 7.
- ⁵ H Scully. "I believe in that mission." CMA News. Ottawa: Canadian Medical Association, September 21, 1999; 2.
- ⁶ R McKendry. Physicians in Ontario: Too many? Too few? For 2000 and beyond. Report of the fact-finder on physician human resources in Ontario. Ontario Ministry of Health (Toronto): December 1999.
- ⁷ C Morris. N.B. health care on critical list after infant's death. Canadian Press news article, January 30, 2002.
- ⁸ AM Owens. Sault Ste. Marie to lose its night-time ER unit. Doctors overburdened: staffing shortage spreads from towns to midsized cities. National Post, January 14, 2002.
- ⁹ S Martin. "Is everyone as tired as I am?" The CMA's physician survey results, 1999. CMAJ 1999;161:1020-1.
- ¹⁰ C Gray. How bad is the brain drain? CMAJ 1999;161:1028-9.
- ¹¹ M Rachlis. The doctor is (already) in. Ottawa Citizen, August 25, 1999; A13.
- ¹² ML Barer, GL Stoddart. Toward integrated medical resource policies for Canada. Prepared for the Federal/Provincial/Territorial Conference of Deputy Ministers of Health, June 1991.
- ¹³ Canadian Medical Association. Let's get it right - the CMA's action plan: response to the Barer/Stoddart report. Ottawa, 27 Jan 1992. ISBN 0-920169-54-6.
- ¹⁴ The Response of the Canadian Association of Internes and Residents to the Report "Toward Integrated Medical Resource Policies for Canada" by Morris L. Barer and Greg L. Stoddart. Canadian Association of Internes and Residents (Ottawa), January 1992.

- ¹⁵ S Pinker. Quebec med schools up enrolment for second year in row. CMAJ 2000;163(5):582.
- ¹⁶ H Kent. Medical school enrolment to increase at UBC. CMAJ 2000;163(6):753.
- ¹⁷ D Square. Manitoba increases med school enrolment in attempt to fight doctor deficit. CMAJ 2001;164(3):395.
- ¹⁸ P Sullivan. Medical school enrolment growing too slowly? CMAJ 2001;164(9):1334.
- ¹⁹ L Buske. Medical school enrolment rebounds. CMAJ 2001;165(11):1526.
- ²⁰ G Basky. Saskatchewan hopes to ease MD shortage by easing licensing requirements. CMAJ 2001; 164(9):1336.
- ²¹ D Spurgeon. Canada waives examination rules for foreign cancer specialists. BMJ 2000 Nov 18;321(7271):1243.
- ²² P Sullivan. Canada a prime destination as MDs flee South Africa. CMAJ 1999;160:1615-6.
- ²³ South Africa appeals to Canada to stop recruiting its MDs. CMAJ 2001;164(3):387-8.
- ²⁴ G Basky. Alberta invests \$10-million to attract, keep specialists. eCMAJ news, Jan. 30, 2001.
- ²⁵ P Sullivan. Large fee increase in hand, Alberta goes courting Canada's MDs. CMAJ 2001;164(11):1607.
- ²⁶ D Moulton. Will new NS law lead to bidding wars for MDs? CMAJ 2001;165(3):327.
- ²⁷ The CFPC National Family Physician Workforce Survey Database. Part of the Janus Project, College of Family Physicians of Canada. Mississauga, Ontario, Canada, 2001.
- ²⁸ Should Canadian Faculties of Medicine Reduce the Number of Places For The Study of Medicine? APMC Forum 1991: 25(1 and 2): 1-31.
- ²⁹ National Action Plan for Canadian Physician Resource management. Status Report, September 1993. Prepared for the Conference of Deputy Ministers of Health, September 16, 1993.
- ³⁰ GL Stoddart, ML Barer. Will increasing medical school enrolment solve Canada's physician supply problems? CMAJ 1999;161:983-4.
- ³¹ E Ryten. Enrolment in MD programs at Canadian universities in 1996/97: just how much down-sizing has occurred? APMC Forum 1997 Jan: 30(1); 3-7.

- ³² Report of the national coordinating committee on postgraduate medical training to the conference of deputy ministers of health. December 16, 1995: 4.
- ³³ Overview of National and Provincial/Territorial Developments in Physician Resource Planning: Canada, 1991-1993. Canadian Medical Association, Health Policy and Economics Dept. Nov 1993.
- ³⁴ N Robb. Interest in physician-buyout packages grows as more doctors contemplate retirement. CMAJ 1997;156:882-5,888.
- ³⁵ British Columbia Physician Supply Measure: Physicians' Guide. November 19, 1996. BC Ministry of Health, Victoria.
- ³⁶ Verbal communication, Sharron Wickens, BC Ministry of Health, March 2002.
- ³⁷ Report of the national coordinating committee on postgraduate medical training to the conference of deputy ministers of health, *ibid.*: 15.
- ³⁸ D Dauphinee, D Thurber. What are the facts concerning the number of residency positions in Canada? CMAJ 1997;156:665-7.
- ³⁹ Report of the National Coordinating Committee on Postgraduate Medical Training (*ibid.*), Appendix IV.
- ⁴⁰ AD Thurber, N Busing. Decreasing supply of family physicians and general practitioners. Can Fam Phys 1999;45: 2084-2089.
- ⁴¹ Canadian Medical Association. Principles for a Reentry System in Canadian Postgraduate Medical Education. Ottawa, February 2002. Also available at: http://www.cma.ca/staticContent/HTML/NO/12/where_we_stand/2000/07-19.pdf.
- ⁴² ML Barer, J Lomas, C Sanmartin. Re-minding our Ps and Qs: medical cost controls in Canada. Health Aff (Millwood) 1996 Summer;15(2):216-34.
- ⁴³ 1993 Interim agreement on economic arrangements. Toronto: Ontario Ministry of Health, August 1997; 30.
- ⁴⁴ H Kent. BC appeals court decision on billing numbers. CMAJ 1997;157:1008.
- ⁴⁵ Ontario Health Insurance Plan, Bulletin # 4298. Toronto: Ontario Ministry of Health, March 3, 1997.
- ⁴⁶ N Robb. Quebec residents say province's retirement agreement took from young to pay old. CMAJ 1997;156:882-5,888.
- ⁴⁷ An open letter to all OMA members. Professional Association of Internes and Residents of Ontario (Toronto): October 26, 1996.

- ⁴⁸ D. Thurber. The age and length of training of recent cohorts of new physicians. *ACMC Forum* 2001; 34(4): 6.
- ⁴⁹ Canadian Association of Internes and Residents. Resident switching survey. Ottawa, June 2001.
- ⁵⁰ B Chan. Atlas Reports 1: The Supply of Physicians' Services in Ontario. Institute for Clinical Evaluative Sciences (Toronto). 1999.
- ⁵¹ BTB Chan. The declining comprehensiveness of primary care in Ontario. *CMAJ* 2002; 166(4):429-434.
- ⁵² JS Schwartz, CE Lewis, C Clance. Internists' practices in health promotion and disease prevention. *Annals of Internal Medicine* 1991; 114(1): 46-53.
- ⁵³ SJ Zyzanski, KC Stange, R Kelly et al. Family physicians' disagreements with the US preventive services task force recommendations. *Journal of Family Practice* 1994; 39(2): 140-7.
- ⁵⁴ CJ Herman, EJ Lengerich, G Stoodt. Variations in recommendations for breast and cervical cancer screening among primary care physicians in North Carolina, 1991. *Southern Medical Journal* 1996; 89(6): 583-90.
- ⁵⁵ CS Weisman, DD Celentano, MA Teitelbaum, AC Klassen. Cancer screening services for the elderly. *Public Health Reports* 1989; 104(3): 209-214.
- ⁵⁶ SJ Kenny, PJ Smith, MG Goldschmid, JM Newman, WH Herman. Survey of physician practice behaviours related to diabetes mellitus in the US. Physician adherence to consensus recommendations. *Diabetes Care* 1993; 16(11):1507-11
- ⁵⁷ MH Beers, SF Fingold, JG Ouslander. Characteristics and quality of prescribing by doctors practicing in nursing homes. *Journal of the American Geriatrics Society* 1993; 41(8):802-7.
- ⁵⁸ ML Barer, L Wood, DG Schneider. Toward improved access to medical services for relatively underserved populations: Canadian approaches, foreign lessons. Centre for Health Services and Policy Research, University of British Columbia (Vancouver): May 1999.
- ⁵⁹ Harris government announces new northern medical school and increased medical school enrolment. Government of Ontario press release, Sudbury, 17 May 2001. Available at www.newswire.ca/government/ontario/english/releases/October2001/25/c0571.html
- ⁶⁰ UNBC and UBC create the northern medical program to expand rural training opportunities for new doctors. University of British Columbia press release, Vancouver, 18 January 2001. Available at www.publicaffairs.ubc.ca/mr/mr01/mr-01-08d.html.

Technical Appendix

1. Southam Medical Database

The Southam Medical Database (SMDB) is a commercial database maintained for the purpose of allowing paying customers to develop mailing lists to physicians for marketing purposes. It has an important secondary use by researchers for developing mailing lists for surveys and, in the case of CIHI, for tracking the supply of physicians.

The SMDB incorporates information from a variety of data sources, including licensing authorities and postgraduate training programs. Once a physician is in the database, he or she receives a notice in the mail each year requesting that information stored in the directory be updated.

For the purposes of this report, an 'active' physician is defined as one who meets the following criteria:

- has an MD degree
- not in post-graduate training
- belongs in the categories of 'active', 'military', 'active but not in private sector', or 'semi-retired'
- holds a current valid license to practice

This definition explicitly excludes physicians who are confirmed to have retired, deceased, moved abroad, do not have a license to practice in their current province of residence or who report a temporary leave of absence (e.g. temporary retirement or sabbatical).

Physicians in postgraduate training are identifiable in the database and are treated as a separate category. However, a physician who has obtained specialty certification, is billing a provincial medical plan for health services, but is doing a clinical fellowship in some discipline, would be considered to be an active physician.

The SMDB contains information about each physician's age, gender, school and year of graduation from medical school and specialty. For the purpose of this study, three groupings of physician specialties are defined: general practitioners and family physicians (GP/FPs), medical specialists and surgeons. Surgeons include the following:

- general surgery
- cardiovascular/thoracic surgery
- neurosurgery
- obstetrics/gynecology
- orthopedics
- ophthalmology
- otolaryngology
- plastic surgery
- urology

Medical specialists include:

- internal medicine and recognized subspecialties (e.g. cardiology, neurology, etc.)
- anesthesia
- dermatology
- emergency medicine specialists
- psychiatry
- radiology
- laboratory medicine (e.g. pathology, clinical biochemistry, etc.)

The GP/FP category includes family physicians with additional emergency medicine certification (CCFP(EM)).

2. Measurement of Physician Flows

As noted in Figure 1, physicians may pass through different stages in their career: postgraduate training, active practice, practice abroad or other interruptions in their practice in Canada and eventual retirement or death. Table T1 describes the criteria used for defining each of these flows.

Table T1: Definitions of Physician Entry and Exit into Practice Pool

Physician Flows	Criteria
1. Canadian medical school graduates entering postgraduate training for the first time	<ol style="list-style-type: none"> 1. Graduated from medical school in Canada 2. Year of event = first year in SMDB in which physician appears as intern or resident
2. Canadian medical school graduates entering practice in Canada for the first time	<ol style="list-style-type: none"> 1. Graduated from medical school in Canada 2. Year of event = first year in SMDB in which physician appears as 'active'
2b. Canadian medical school graduates who enter postgraduate training but never practice in Canada	<ol style="list-style-type: none"> 1. Graduated from medical school in Canada 2. Physician does not appear in SMDB as 'active' within 10 years of medical school graduation
3a. International medical school graduates entering practice in Canada for the first time without prior postgraduate training in Canada	<ol style="list-style-type: none"> 1. Graduated from international medical school 2. Year of event = first year in SMDB in which physician appears as 'active' 3. No preceding years of postgraduate training
3b. International medical school graduates entering postgraduate training in Canada for the first time	<ol style="list-style-type: none"> 1. Graduated from International medical school 2. Year of event = first year in SMDB in which physician appears as intern or resident 3. No preceding years of active practice
3c. International medical school graduates in postgraduate training in Canada entering practice in Canada for the first time	<ol style="list-style-type: none"> 1. Graduated from International Medical School 2. Year of event = first year in SMDB in which physician appears as 'active' 3. Previously listed in SMDB as intern or resident

Physician Flows	Criteria
4a. Physicians previously practicing in Canada returning to postgraduate training	<ol style="list-style-type: none"> 1. Previously listed in SMDB as 'active' 2. Year of event = year in which activity becomes listed as 'intern' or 'resident'
4b. Physicians who previously practiced in Canada, returned to postgraduate training in Canada and are now returning to practice in Canada	<ol style="list-style-type: none"> 1. Previously listed in SMDB as 'active' 2. Listed in immediately preceding year as 'intern' or 'resident' 3. Year of event = year in which activity reverts back to 'active'
5a. Physicians previously practicing in Canada moving abroad	<ol style="list-style-type: none"> 1. Previously listed in SMDB as 'active' 2. Year of event = year in which activity becomes listed as working in USA or other foreign country 3. Age < 60, or Age > = 60 and the physician has returned to practice in a later year
5b. Physicians who previously practiced in Canada, moved abroad and are now returning to practice in Canada	<ol style="list-style-type: none"> 1. Previously listed in SMDB as 'active' 2. Listed in immediately preceding year as 'abroad' 3. Year of event = year in which activity reverts back to 'active'
6a. Physicians previously practicing in Canada exiting practice prior to retirement for other/unknown reasons	<ol style="list-style-type: none"> 1. Previously listed in SMDB as 'active' 2. Year of event = year in which physician becomes no longer active, abroad, intern nor resident (typically, the physician's record is missing or labelled 'removed') 3. Age < 60, or Age > = 60 and the physician has returned to practice in a later year
6b. Physicians who previously practiced in Canada, stopped active practice for other or unknown reasons and are now returning to practice in Canada	<ol style="list-style-type: none"> 1. Previously listed in SMDB as 'active' 2. Not listed in immediately preceding year as active, abroad, intern or resident (typically, the physician's record will be missing or labelled 'removed' in SMDB) 3. Year of event = year in which activity reverts back to 'active'
7. Retirement or death	<ol style="list-style-type: none"> 1. Previously listed in SMDB as 'active' 2. Year of event = year in which activity becomes not 'active' 3. Age > = 60 4. Physician has not returned to practice in a later year

3. Calculation of Full-time Equivalents

The National Physician Database was used to determine the number of full-time equivalent (FTE) physicians in Canada and the average practice activity for physicians in different age-gender groups. Practice activity is defined as the total number of FTEs divided by the head count of physicians. This analysis is based only on physicians billing fee-for-service.

Each physician was assigned a FTE activity level based on the following formula:

FTE	=	B / B_{40}	if the physician's total billings (B) are below total billings at the 40 th percentile for the physician's specialty (B_{40})
		1	if the physicians total billings are between total billings at the 40 th and 60 th percentiles
		$\log (B / B_{60})$	if the physician's total billings (B) are above total billings at the 60 th percentile for the physician's specialty (B_{60})

This methodology, currently used by CIHI in its Full-Time Equivalent Physicians Report, was originally developed in 1984 by a working group comprised of representatives from National Health and Welfare, provincial medicare agencies and academic consultants.

For the purpose of these calculations, the billings represent price-adjusted billings. A standard price has been developed for each medical service in each province. As a result, the FTE activity level of a physician should not change if prices increase, or if he or she provides the same basket of services in a different province.

4. The Dynamic Effect of an Increase in Length of Postgraduate Training

When the length of time spent in postgraduate training is increased (and this increase is maintained in future time periods), there is transient decrease in the flow from postgraduate training into active practice and the total impact on the physician pool is a drop equal to the increase in time spent in training times number of physicians affected.

The following example illustrates this point. In Table T2, there are 200 medical school graduates in each year, half of which do rotating internships and half of which do a two-year family practice residency. In 1994, the rotating internship is eliminated. The following year (1995), there is a brief drop in the flow into active practice and this drop resolves by the next year. Total physician supply drops by 100.

Table T2: Simulated Effect of the Elimination of the Rotating Internship

Graduating Class Year	1990	1991	1992	1993	1994	1995	1996	1997
Medical School Graduates	200	200	200	200	200	200	200	200
	↓	↓	↓	↓				
Rotating Interns	100	100	100	100	↓	↓	↓	↓
Family Medicine Residents	100	100	100	100	200	200	200	200
Year of Active Practice			1992	1993	1994	1995	1996	1997
Entrants			200	200	200	100	200	200
Previous Pool Size			1000	1000	1000	1000	900	900
Exits			-200	-200	-200	-200	-200	-200
New Pool Size			1000	1000	1000	900	900	900

5. Simulation Exercise for Measuring the Impact of Changes to Postgraduate Training

In this exercise, different scenarios were constructed where physicians exit medical school into postgraduate training, filter through the postgraduate training (and complete their training at different times in the process) and enter active practice. The key variables in this simulation are the number of medical school graduates entering postgraduate training and the frequency distribution for the number of years before they enter active practice.

As noted in section 3.2.1 under the description of flow 1, there are three distinct time periods for undergraduate medical education: from 1981 to 1990, the average yearly flow was 1,879; from 1991 to 1996, 1,786; and from 1997 to 2000, 1,628. Each of these time periods corresponds to policy decisions aimed at reducing enrolments. As noted under the description of flow 2, there appear to be three distinct time periods in the history of postgraduate training: 1981–1986; 1997–1992, when the rotating internship experienced unprecedented popularity; and 1993–2000, when the rotating internship abruptly ended and the ratio of specialist to family physician trainees increased dramatically.

Table T3 describes a series of different scenarios aimed at simulating what would have happened to the entry of physicians from postgraduate training to active practice, if certain events had not taken place (such as the medical school enrolment decreases or changes to postgraduate training). The sequence in which events are added or removed from the scenarios follows the temporal sequence in which the events unfolded in reality.

Table T3: Assumptions for Simulation Analysis

Scenario	Medical School Class Size	Distribution of Number of Years After Graduation When Postgraduates Enter Practice	Policy Change Modelled
0	<ul style="list-style-type: none"> • 1,879 	<ul style="list-style-type: none"> • 1981–1986 distribution used from 1981–2000 	Baseline for comparison
1	<ul style="list-style-type: none"> • 1,879 	<ul style="list-style-type: none"> • 1981–1986 distribution used from 1981–1986 • 1987–1992 distribution used from 1987–2000 	Increase in popularity of rotating internship in 1987
2	<ul style="list-style-type: none"> • 1,879 from 1981–1990 • 1,786 from 1991 to 2000 	<ul style="list-style-type: none"> • 1981–1986 distribution used from 1981–1986 • 1987–1992 distribution used from 1987–2000 	5% decline in medical school graduates, starting with class of 1991
3	<ul style="list-style-type: none"> • 1,879 from 1981–1990 • 1,786 from 1991 to 2000 	<ul style="list-style-type: none"> • 1981–1986 distribution used from 1981–1986 • 1987–1992 distribution used from 1987–1992 • 1987–1992 distribution used from 1993–2000, except that physicians previously doing rotating internships assumed to do two years of postgraduate training instead 	Elimination of rotating internship in 1993
4	<ul style="list-style-type: none"> • 1,879 from 1981–1990 • 1,786 from 1991 to 2000 	<ul style="list-style-type: none"> • 1981–1986 distribution used from 1981–1986 • 1987–1992 distribution used from 1987–1992 • 1993–2000 distribution used from 1993–2000, except that the % of postgraduate trainees who never practice in Canada set at its previous average of 10% 	Increased length of postgraduate training in 1993, due to increase in specialist to family physician trainee ratio and other factors
5	<ul style="list-style-type: none"> • 1,879 from 1981–1990 • 1,786 from 1991 to 2000 	<ul style="list-style-type: none"> • 1981–1986 distribution used from 1981–1986 • 1987–1992 distribution used from 1987–1992 • 1993–2000 distribution used from 1993–2000 	Increase in proportion of postgraduate trainees who do not practice in Canada, noted in mid-1990s
6	<ul style="list-style-type: none"> • 1,879 from 1981–1990 • 1,786 from 1991–1996 • 1,628 from 1997–2000 	<ul style="list-style-type: none"> • 1981–1986 distribution used for 1981–1986 • 1987–1992 distribution used for 1987–1992 • 1993–2000 distribution used for 1993–2000 	10% decline in medical school enrolment, first noted in the class of 1997

The results of this analysis are reflected in Table 4. The total decline in flow 2 (from postgraduate training to actual practice) due to all of the above measures (scenario 6 minus scenario 0) as measured in the simulation was very close to, but not exactly equal to, the actual decline in flow of 3,946. The minor discrepancy was likely due to the effect of averaging across time periods (e.g. 1981–1986, 1987–1992, etc.). Hence, the percentage contribution of the total decline in flow 2 due to each policy change (see second column, table 4) was applied to the total of 3,946 to estimate the impact on the physician pool (column 3, table 4) of each policy change.