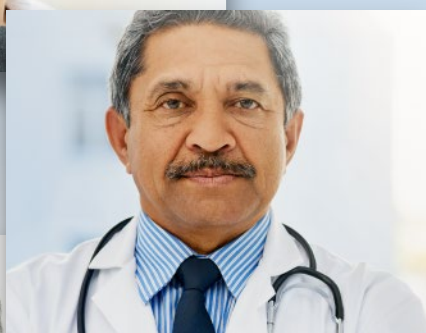


The Supply of Physicians in Canada

Projections and Assessment

Steven Globerman, Bacchus Barua, and Sazid Hasan



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Executive Summary

While the provision of health care involves the use of a considerable number of inputs, including medical equipment and pharmaceuticals, health-care services still draw largely on the expertise of health-care professionals. Physicians, in particular, play a prominent role. In this regard, while Canada has one of the most expensive universal health-care systems among developed countries, the number of physicians relative to the Canadian population ranks well below the average for developed countries. Indeed, Canada ranks 29th out of 33 high-income countries for number of practicing physicians per thousand population. Unless physicians in Canada are much more productive than physicians in other OECD countries, or patients in other OECD countries consume fewer services per visit to a physician than do Canadian patients, it would seem that Canada suffers from a relative scarcity of physician services.

Some additional evidence supporting the claim that Canadians would be better off, on balance, if the supply of physicians' services relative to the population increased is provided by the relatively long wait times Canadians endure for access to the services of specialist physicians, as well as media reports of Canadians who are actively—and unsuccessfully—looking for a regular physician. Also relevant is a Commonwealth Fund survey of adults in 11 countries that found that only 43% of Canadian respondents reported that they were able to get a same day or next-day appointment with a doctor or nurse when they needed medical attention—the lowest rank among all countries surveyed.

To be sure, some experts argue that a recent growth in domestically and foreign-trained physicians in Canada will reduce or even reverse Canada's seeming relative scarcity of physicians. This study provides a forecast of the number of physicians (including residents) per 1,000 population for Canada out to the year 2030 to assess whether, given a continuation of recent trends in the main factors that determine the supply of physicians, as well as estimates of population growth, the ratio of physicians to population will increase for Canada. Our main finding is that given current trends in medical school enrollments, the projected supply of Canadian-trained physicians will only result in a small increase in the physician-to-population ratio—rising from 2.74 physicians per thousand population in 2015 to 2.84 in 2030. Furthermore, even if the supply of foreign-trained physicians continues to follow the trend of the last five years, the ratio will only improve from 2.74 physicians per thousand population in 2015 to 2.97 in 2030.

To put these projections into perspective, the present-day ratio of physicians per thousand population for OECD countries equals 3.4, an average that might well increase in the future. Expected demographic changes, particularly

the changing gender and age profiles of the physician workforce, may also result in fewer hours worked by physicians. While this might also be the case for other OECD countries, it will worsen access to physicians' services in Canada. An aging population is likely to further exacerbate access problems.

The broad policy implication of this study is that reforms and innovations in the delivery of medical services should be a public-policy priority, as a continuation of the *status quo* will leave Canadians with less access to physicians' services than is arguably desirable. The study suggests a number of policy initiatives for consideration, primarily affecting supply conditions for health-care services, that might help address what our forecast identifies as a continuing shortfall of physicians' services.

1 Introduction

As the World Health Organization noted in 2000 “[t]he provision of health care involves putting together a considerable number of resource inputs to deliver an extraordinary array of different service outputs” (WHO, 2000: 75). In addition to physical capital (like hospitals and beds) and consumables (like medication), it is important to remember that “[h]ealth systems are labour intensive and require qualified and experienced staff to function well” (WHO, 2000: 75, 77). [1] Physicians, in particular, play a significant (and obvious) role in the delivery of medical services. Unfortunately, while Canada has one of the most expensive universal health-care systems in the OECD (Barua, Timmermans, Nason, and Esmail, 2016), there remains a persistent concern about the availability of physicians, and by extension, the rationing of their services. This publication examines indicators of the supply of physicians (and implicitly, their services) in Canada relative to its population, and discusses the effect of government control on the historical supply of physicians. It also estimates the number of full-time equivalent physicians in Canada through 2030, and discusses the potential implications of this forecast.

The paper proceeds as follows. The next section presents some statistical and anecdotal evidence concerning the current availability of physicians’ services in Canada. Section 3 offers a brief interpretation of the evidence. The fourth section reviews some historical data on the ratio of physicians to population for Canada and compares the Canadian data to those from other countries. The fifth section discusses the model we use to forecast the effective number of “full-time equivalent” physicians providing services in Canada over the period from 2016 to 2030. Section 6 reports our forecasts of full-time equivalent physicians per capita in Canada and, as a check on plausibility of our results, compares them to the forecast of the Canadian Medical Association (CMA). [2] The seventh section discusses the policy implications of our projections. A summary and conclusion follow.

Our main conclusion is that, given current trends in enrollment in medical schools, the projected supply of Canadian-trained physicians will result in a small increase in the physician-to-population ratio, rising from 2.74 physicians

[1] The degree to which this remains true over time may change with the development of new and innovative medical technology and pharmaceuticals.

[2] We are able to use our model to assess how sensitive forecasts of the supply of physicians’ services are to specific parameters, such as retirement rates of physicians, something that could not be done if we used only the CMA’s forecast, since we do not have access to their model.

per thousand population in 2015 to 2.84 in 2030. Furthermore, even if the supply of foreign-trained physicians continues to follow the trend of the last five years, the ratio will only improve from 2.74 physicians per thousand population in 2015 to 2.97 in 2030, and certainly will remain well below the present-day OECD average (3.4), let alone possibly higher values of that average in the future.

Further, if one makes plausible assumptions [3] about reductions in average hours worked by physicians going forward, the projected number of physicians per 1,000 population for the years 2016 to 2030 might well overstate the projected growth of physicians' services relative to the growth of the population over that period. However, even if one is content to use the ratio of physicians to population as a measure of the availability of physician services, Canada's ratio in 2030 will still be well below the 2015 average for most other developed countries.

These projections do not necessarily inform us as to whether the supply of physicians is sufficient or excessive given the potential for reform and innovation in the delivery of medical services. However, given a continuation of the *status quo*, our evidence supports the concern that Canadians would be, on balance, better off if the supply of physicians' services relative to the population increased.

[3] Presumably, it is the number of hours worked that is the relevant measure of the supply of physician services, so a reduction in average hours worked is a critical assumption in the projections of the future supply of physician services. In this study, average hours worked is a proxy for patient care; the authors acknowledge, however, that it may be an imperfect proxy.

2 Availability of Physicians

The Canadian Institute of Health Information [CIHI] reported that in 2015, there were more than 82,000 physicians in Canada. Approximately 60% of physicians were male, 40% female, and the average age was 50 years. More than 90% of physicians were registered in urban locations, and about one fourth of physicians were graduates of non-Canadian medical schools. The population of physicians is split evenly between general practitioners practising family medicine and specialists (including medical and surgical specialists); however, there are notable differences between the ratio of women to men and of international graduates to Canadian graduates in the two areas of practice (CIHI, 2016).

According to the Canadian post-MD education registry, there were also over 16,000 physicians pursuing residency training in 2015 (CAPER, 2017c). Though not fully licensed for unsupervised practice, residents provide medical services and are often included in indicators measuring the stock of physicians by the Organisation for Economic Co-operation and Development (OECD) for the purposes of international comparisons.

The availability of physicians' services relative to demand depends on a number of factors including the size and age distribution of the population, methods of reimbursement, organization of insurance systems, geographical distributions of physicians relative to patients, and the quantities of complementary inputs such as hospitals and medical capital equipment. The most common indicator of availability, however, is simply the ratio of the number of physicians to the population they serve. Esmail studied this extensively in his 2006, 2007, and 2011 papers, raising concerns about the relatively low physician-to-population ratio in Canada compared to other countries that provide universal health-insurance coverage. He also raised cautions about the future supply of Canadian-trained physicians, the advancing age of Canada's population, the advancing age of Canada's population of physicians, as well as the reduced number of hours that Canadian physicians seem willing to work. Others (CBC, 2016) have also pointed to a wave of retiring doctors as a major factor that will contribute to reducing the availability of physicians' services in the future.

More recent data from the OECD reveal that there were approximately 2.7 professionally active physicians (estimated 2.6 practising physicians) [4]

[4] The OECD presents data primarily for practising physicians. However, data for Canada refer to professionally active physicians, which include other physicians (managers, educators, researchers, and so forth), hence improving Canada's relative rank. The OECD also recently provided an estimate of the number of practising physicians in Canada (2013–2015) based on the *National Physician Surveys* of 2013 and 2014. However, because this

per thousand population in 2015, ranking Canada 28th (29th based on estimated practising physicians) out of 33 high-income OECD countries [5] and well below the OECD average of 3.4 practising physicians [6] per thousand population. There are, however, differences based on the field of practice. For example, Canada fares better in a comparison of the availability of generalist medical practitioners (ranking 8th out of 32), but ranks a dismal 30th out of 32 OECD countries for specialist medical practitioners per thousand population (OECD, 2017; calculations by authors).

There is also a palpable concern about the availability of physicians expressed by many Canadians. Indeed, numerous discussions can be found in the media about a shortage (or growing shortage) of physicians in Canadian provinces. Despite Canada's relatively favourable position in comparisons by the OECD of the availability of general practitioners per thousand population, Canadians have expressed concerns about the availability of family doctors. For example, in 2014, roughly 4.5 million Canadians aged 12 and older, or approximately 15% of Canada's 12 and older population, reported that they did not have a regular medical doctor (Statistics Canada, 2015). Of these, an estimated 2.4 million [7] indicated they did not have one because doctors were not taking new patients, or that doctors were retiring and leaving the area, or simply that no doctors were available where they lived (Statistics Canada, 2015; calculations by authors).

Hartnett (2016) (citing the Canadian Community Health Survey) reports that 11.1% of the population of Vancouver Island (in British Columbia) had no regular medical doctor in 2013/2014. Of those, the survey notes that 3.5% of the population was actively looking for a physician. The Survey does not indicate whether the remainder had given up their search or decided that they no longer needed a physician. The percentage without a regular doctor on southern Vancouver Island was reported as 15.9% with 5.1% actively looking. For British Columbia as a whole, 15.4% reported not having a regular doctor with 4.4% actively looking.

estimate is not available for years prior to 2013, and since the National Physician Survey has been discontinued, we follow the OECD's former practice of reporting the number of professionally active physicians in Canada throughout this text.

[5] Defined as countries with a gross national income (GNI) per capita of \$12,475 or more in 2015 (World Bank, 2017). Two OECD countries, Mexico and Turkey, do not meet this criterion.

[6] Data is for 2015, or the most recent year available. Data (or OECD estimates) for practising physicians is available (and used) for 28 countries. Data for professionally active physicians is used for Iceland and the Slovak Republic. Data for physicians licensed to practice is used for Chile, Greece, and Portugal.

[7] Respondents could choose more than one reason for not having found a regular medical doctor. The estimate above assumes that respondents who indicated that they had not looked for a doctor did not indicate any other reason for not having found one. In this regard, 45.9% of respondents reported that they had not looked for a regular doctor.

Other provinces are also reported to suffer from a scarcity of physicians. According to a recent report by the Canadian Community Health Survey, there are at least 800,000 Ontarians who do not have a family physician, although some of them did not register for one by choice (Subramaniam, 2016). Similarly, a survey commissioned by Communications Nova Scotia, and conducted by MQO Research, reported that 20% of those living in Halifax do not have access to a family doctor, and a Nova Scotian family doctor recently said that she could not name a single doctor in Dartmouth, Nova Scotia that was accepting new patients at the present time (Walsh and Pearson, 2017). [8]

International confirmation of the difficulty of obtaining access to family doctors in Canada is found in the Commonwealth Fund's recent survey of adults in 11 countries, [9] which found that only 43% of Canadian respondents reported that they were able to get a same or next-day appointment with a doctor or nurse when they needed medical attention. This was the lowest rank among all countries examined, and compares particularly unfavourably to the 77% reported by respondents in the Netherlands, which had the best performance (Commonwealth Fund, 2017)

Although similar data concerning access to specialist physicians are not readily available, several related indicators suggest that their services are not readily available to Canadians. One indicator of the limited access to services rendered by specialist physicians (and hence, a proxy for their general availability) is the time it takes to either book a consultation or to receive treatment. The Commonwealth Fund reported that Canada ranked last in terms of both: 56% of respondents reported that they waited four weeks or longer to see a specialist (compared to 22% in top-ranking Switzerland), and 18% reported that they waited four months or more for elective surgery (compared to 0% in top-ranking Germany). Even for emergency room services, there are indications that the supply of physicians (and their services) is relatively scarce: the same survey indicated that 29% of Canadians reported waiting four or more hours the last time they went to the hospital emergency department, again ranking Canada last compared to 1% in top-ranking France, which had the best performance for this indicator (Commonwealth Fund, 2017).

[8] Academic articles also discuss the shortage of physicians as a dilemma facing the Canadian health-care system. See, for example, Islam, 2014.

[9] Australia, Canada, France, Germany, the Netherlands, New Zealand, Norway, Sweden, Switzerland, the United Kingdom, and the United States.

3 Interpreting the Evidence

To be sure, conclusions about a shortage of physicians based on international comparisons of the physician-to-population ratio are qualified by the fact that Canada's health-care system is essentially a tax-funded government monopoly and therefore may ration the volume of services provided by physicians, thereby contributing to limited access to physicians' services. This might explain the observation in a recent report by the Royal College of Physicians that "[s]ixteen percent of new specialist and subspecialist physicians said they could not find work", [10] notwithstanding the evidence cited above of limited access to specialist physicians' services.

Certainly, not all agree that a shortage of physicians is a general problem facing the Canadian health-care system. For example, Plourde (2016) argues that while there may be a shortage of general practitioners in rural areas, this is rarely the case in urban areas. Others argue that the big challenge is the lack of doctors willing to work as general practitioners and not a lack of doctors more generally (Chan, 2002; CBC, 2017). Barer and Evans (2013) even caution that the growth in the number of domestically and foreign-trained physicians in Canada over the period from 1997/98 to 2012/13 will soon result in Canada having "too many" doctors.

Economists identify a shortage as an excess of demand relative to supply at the current price for the good or service in question. Therefore, to identify Canada as having a current (or emerging) shortage of physicians definitively would require formally estimating supply and demand curves for physicians in Canada and then comparing the quantity demanded to the quantity supplied of physician services at the relevant price for a "unit" of physicians' services. Since there is first-dollar coverage of physicians' services in Canada, there is no explicit price series to employ in order to estimate supply and demand curves for physician services. Hence, economists sometimes try to control for demand for physician services indirectly by using the age distribution of the population as a measure of demand. However, age is only one determinant of the demand for health care, and it is an imprecise determinant at that. Hence, reports of Canadians seeking out general practitioners without success are, at best, anecdotal evidence of a shortfall in the supply of physicians. Similarly, comparisons showing Canada with a lower physician-to-population ratio than

[10] Fréchette, Hollenberg, Shrichand, Jacob, and Datta, 2013: 15. Invitations to participate in the survey were extended to new certificants between 10 to 12 weeks following the final Royal College certification examination. The response rate was 32.4%.

many other developed countries is suggestive of a lower supply of physicians (and implicitly, their services) in Canada without necessarily documenting a shortage of those services.

Notwithstanding these caveats, changes in the supply of physicians undoubtedly influence the availability of those services to patients. This being the case, any understanding of the outlook for the Canadian health-care sector, particularly as it underlies policy decisions, needs to be informed by the outlook for the future supply of physician services. Before presenting our model and the resulting forecast of the future supply of Canadian physicians, section 4 presents historical data on the physician-to-population ratio for Canada, and discusses notable government policies affecting this ratio. It also compares Canadian historical data to that of other countries in the OECD by way of background to our forecast.

4 Historical Data on the Ratio of Physicians to Population

As noted above, some researchers, such as Barer and Evans (2013) and Plourde (2016), highlight recent growth in the ratio of physicians to population in Canada as a caution against inferring that Canada does not have a “sufficient” number of physicians. However, an historical analysis of trends in the supply of physicians in Canada reveals that any such recent growth has come after years of stagnation in the 1990s.

Growth of ratio of physicians to population in Canada

The average annual growth rates in the total number of physicians (not including residents) per 100,000 population for all of Canada, as well as for Canada’s three most populous provinces, are reported in table 1 for various time periods from 1980 to 2015. What is obvious from table 1 is that there was virtually no growth in the ratio for the period from 1990 to 2005. [11] More recently, there has been an increase in the ratio in Canada, as well as in each of the three largest provinces. The increase was particularly marked for Ontario over the period from 2010 to 2015, although that province had experienced decreases in the ratio for the 15-year period from 1990 to 2005. Because of the recent growth, the ratio of physicians (not including residents) per 100,000 population for all of Canada was 228 in 2015 compared to 188 in 2000. There is substantial variation in the ratio across provinces with Nova Scotia having the highest ratio (261) in 2015 followed by Newfoundland & Labrador (243), Quebec (242), and Alberta (237). The three largest provinces averaged around 231 physicians per 100,000 residents in 2015 (CIHI, 2016).

Table 2 also reports average annual growth rates, but the data are for general practitioners only. The behaviour of the ratio of general practitioners to the total population for Canada is quite comparable to the behaviour of the ratio of all physicians to the total population over the sample time period. The decline in the ratio of general practitioners to the total population for Ontario

[11] The stagnant growth in the ratio of physicians to population over the 1990s and early 2000s largely reflects concerns on the part of governments in Canada that the number of physicians was growing at a more accelerated rate than the general population, and that this would drive health-care costs upwards wastefully. This concern led to a cutback in medical school enrolments.

Table 1: Physicians, not including residents, per 100,000 population, average annual growth rate (%)

	Canada	Ontario	Quebec	British Columbia
1980–1985	2.4%	2.1%	3.1%	1.9%
1985–1990	1.8%	1.9%	1.8%	0.5%
1990–1995	0.1%	–0.6%	1.0%	–0.2%
1995–2000	0.1%	–0.6%	0.5%	0.5%
2000–2005	0.3%	–0.4%	0.1%	0.6%
2005–2010	1.4%	1.5%	0.8%	1.4%
2010–2015	2.3%	3.0%	1.6%	1.4%

Source: CIHI, 2016: table 23.0; authors' calculations.

Table 2: General practitioners, not including residents, per 100,000 population, average annual growth rate (%)

	Canada	Ontario	Quebec	British Columbia
1980–1985	2.8%	2.0%	4.6%	1.7%
1985–1990	2.3%	2.4%	2.5%	1.2%
1990–1995	–0.2%	–1.2%	1.1%	–0.1%
1995–2000	–0.5%	–1.7%	0.5%	0.1%
2000–2005	0.7%	0.0%	0.6%	1.0%
2005–2010	1.2%	1.7%	0.3%	1.4%
2010–2015	2.2%	3.3%	1.1%	0.7%

Source: CIHI, 2016: table 23.1; authors' calculations.

over the period from 1990 to 2000 is more pronounced than the decline in the ratio for Canada as a whole. For each of the three major provinces, the behaviour of the ratio in table 1 is similar to the behaviour of the ratio in table 2. One notable observation is that, for two of the three provinces (and Canada as a whole), the ratio of total physicians to the population increased faster from 2010 to 2015 than did the ratio of general practitioners to the total population. That is, the number of specialists has been increasing at a faster rate than the number of general practitioners in recent years. In the case of general practitioners, Nova Scotia again has the highest ratio of physicians per 100,000 population (131) followed by Newfoundland & Labrador (126) and British Columbia (124). The ratio for all of Canada in 2015 was 115 compared to 94 in 2000 (CIHI, 2016).

The average annual growth rates for the ratio of the number of specialist physicians per 100,000 population for Canada and for its three largest provinces are reported in table 3. Following a slump in the early 2000s, growth rates increased considerably after 2005. Over this period, the growth rate of specialists was considerably faster than the growth rate for general practitioners in the cases of Quebec and British Columbia. In the case of specialists, Nova Scotia again had the highest ratio in 2015 (129) followed by Quebec (125) and Newfoundland & Labrador (117). For all of Canada, the ratio in 2015 (113) was higher than in 2000 (93) (CIHI, 2016).

Table 3: Specialists, not including residents, per 100,000 population, average annual growth rate (%)

	Canada	Ontario	Quebec	British Columbia
1980–1985	2.0%	2.2%	1.8%	2.2%
1985–1990	1.3%	1.4%	1.1%	–0.4%
1990–1995	0.3%	0.1%	0.8%	–0.5%
1995–2000	0.8%	0.6%	0.5%	0.9%
2000–2005	–0.1%	–0.7%	–0.3%	0.1%
2005–2010	1.7%	1.2%	1.3%	1.6%
2010–2015	2.3%	2.6%	2.1%	2.2%

Source: CIHI, 2016: table 23.2.

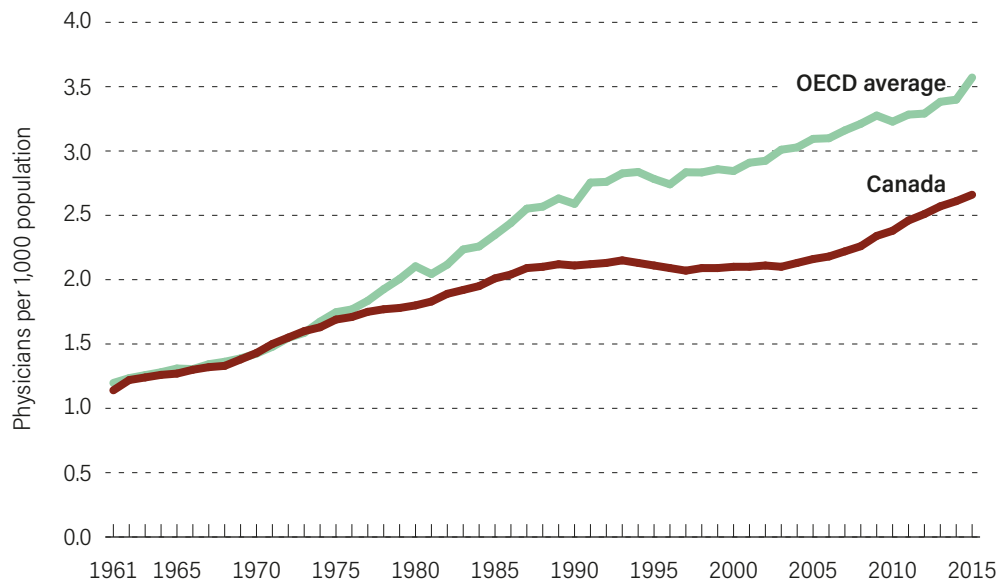
In short, the number of general practitioners and specialist physicians increased faster than the total population over the period from 2005 to 2015 with the relative growth in the number of physicians particularly marked from 2010 to 2015. However, a longer historical view of the physician-to-population ratio helps explain why Canada still ranks poorly in an international context, ranking 28th (29th based on estimated practicing physicians) out of 33 high-income OECD countries.

Comparison of ratios in Canada and the OECD

Figure 1 presents data from the OECD measuring Canada's ratio of physicians to population from 1961 to 2015 in comparison with the OECD average. [12] It is clear that Canada's current low ranking relative to the other high-income

[12] The OECD average is, of course, subject to the consistency and quality of data reported by individual countries, as well as the countries included in calculating the average. A sensitivity analysis confirms that the increase in the number of countries included in the OECD

Figure 1: Physicians per 1,000 population, Canada and OECD, 1961–2015



Sources: OECD, 2017; calculations by authors.

countries is the result of both an increase the OECD average and an overall poor rate of growth of physician supply in Canada. As a result, even though Canada's physician-to-population ratio has experienced a spurt of growth in recent years, it has been insufficient to catch up to the OECD average.

There have been three shifts in government policy affecting the supply of physicians in Canada that are worth noting for an understanding of the trend observed in figure 1. First, following an expansion of domestic physician training after 1964 (which helped Canada keep pace with the OECD average), the National Committee on Physician Manpower (in 1975) recommended that foreign-trained physicians no longer be given a preferred status for immigration. The net effect of this policy is not entirely clear. Buske and Strachan cite research showing that this policy resulted in “a 75–80 [percent] reduction in the number of graduates of foreign medical schools entering Canada”; however, “the number of landed immigrants indicating physician as their intended occupation averaged about 250 per year during the 1980s”, and “approximately 130 foreign physicians were actively recruited each year to meet the needs of

average from 1961 to 2015 does not affect the conclusion about Canada's declining ratio relative to the calculated average. Data for most countries correspond to practising physicians. Where data is unavailable, the authors incorporate OECD estimates of practising physicians, professionally active physicians, or physicians licensed to practice (in sequence, based on availability). Data for Canada corresponds to professionally active physicians for all years for consistency as mentioned previously (although OECD estimates for practising physicians are available for 2013–2015).

underserved areas of Canada” (2000: 19). In any event, while the physician-to-population ratio grew following this policy, it is clear that 1975 represents the beginning of a divergence in trends between Canada and the OECD average.

Next, in 1991, a report by Morris L. Barer and Greg L. Stoddart recommended a 10% reduction in medical school enrolment and provincially funded post-graduate training positions along with less reliance on foreign-trained doctors. Not only did governments accept these recommendations, but the effect on the physician-to-population ratio was also amplified by “increased emigration, increased retirement rates, and a correction of over-counting in the primary source of supply data at the national level” (Buske and Strachan, 2000: 19). The combined effect [13] is clearly visible in figure 1: the ratio of physicians to population in Canada plateaued (and in some years decreased) throughout the 1990s.

Finally, following concern about the relatively low physician-to-population ratio in Canada, the Canadian Medical Forum Task Force on Physician Supply (1999) recommended increasing medical school enrollment and post-graduate training positions, as well as the repatriation of Canadian physicians who had previously emigrated (Buske and Strachan, 2000). The effects of these policies can be seen by observing the uptick in the physician-to-population ratio in the mid-2000s (the lag being likely attributable to the time it takes physicians to train before entering the work force).

Table 4 reports the number of physicians per 1,000 population for Canada and a sample of 10 [14] other relatively high-income OECD countries for the years 2015, 2005 and 2000. These countries were examined in the Commonwealth Fund’s (2017) recent report comparing the performance of health-care systems. The data indicate that, in each of the three years, Canada is characterized as having a lower ratio than almost all of the other sample OECD countries. This is particularly notable because the ratio for Canada is likely biased upward if one is concerned with “practising” physicians, that is, doctors providing direct care to patients. This is because, unlike the case in most other OECD countries, the estimate of numbers of physicians for Canada includes doctors working in the health sector as managers, educators, researchers, and other non-practising roles. [15]

[13] Evans and McGrail (2008) dispute whether the Barer-Stoddart report is primarily to blame for encouraging cuts to medical school enrolment.

[14] Canada ranked 10th worst, out of the 11 countries included for each of the years reported in table 4. Importantly, all 10 other countries performed better than Canada for wait times in the emergency room, the wait to see a specialist, and the wait for elective surgery.

[15] As mentioned previously, only estimated data for the number of practising physicians in Canada is available for 2015 (and not presented in table 4). Data for most other countries correspond to practising physicians. Where data is unavailable, the authors incorporate OECD estimates of practising physicians, professionally active physicians, or physicians licensed to practice (in sequence, based on availability). See OECD, 2017 for further details.

Table 4: Physicians per 1,000 population in Canada and high-income OECD countries, 2015, 2005, and 2000

	2015 (or nearest)	2005 (or nearest)	2000 (or nearest)
Australia	3.5	2.8	2.5
Canada	2.7	2.2	2.1
France	3.1	3.3	3.3
Germany	4.1	3.4	3.3
Netherlands	3.5	2.7	2.4
New Zealand	3.0	2.1	2.2
Norway	4.4	3.6	3.4
Sweden	4.2	3.5	3.1
Switzerland	4.2	3.8	3.5
United Kingdom	2.8	2.4	2.0
United States	2.6	2.4	2.3
Mean	3.5	2.9	2.7

Sources: OECD, 2017; calculations by authors.

The data reported in figure 1 and table 4, of course, do not “prove” that there is a shortage of physicians in Canada; however, they do show that the Canadian health-care system has been functioning for some time with fewer physicians per capita than most other countries. Unless Canadian physicians are more efficient than physicians elsewhere, or work longer hours, or that Canadian patients have less demand for physicians’ services than patients in other wealthy countries (perhaps due to its relatively younger population), one can conclude that physicians’ services are relatively scarce in Canada compared to most other OECD countries. This conclusion is consistent with Canadians having longer wait times to see physicians than patients in other OECD countries (Commonwealth Fund, 2017). This conclusion is unlikely to change in the near future unless the growth rate of physicians (and implicitly, their services) increases substantially.

5 Methodology and Model

In this section of the report, we outline the methodology we employed to generate forecasts of the number of professionally active physicians in Canada over the period from 2016 to 2030. [16] The model uses the 2015 end-of-year stock of physicians as the base year, since it is the last full year for which data on the end-of-year stock of physicians is available. As noted earlier, the Canadian data for physicians includes physicians who are engaged in activities other than patient-care, such as administration or teaching. This paper does not assess if there has been any recent trend in the ratio of clinical to total activity for Canadian physicians to incorporate into our forecasting model. Hence, an implicit assumption of our model is that the distribution of physicians between those caring for patients and those engaged in other activities does not change over the forecast period.

Our forecast incorporates a definition of physicians that consists of two groups: 1. professionally active physicians who have completed their post-graduate training; 2. residents (physicians in post-graduate training). This definition accords with the definition of “professionally active physicians” used by the OECD (2017); using it enables us to make international comparisons. We forecast the number of physicians in two categories, general practitioners and specialists; each of these categories consists of the two groups, professionally active physicians who have completed their post-graduate training and residents, defined above. We then combine the two categories to arrive at the total number of physicians.

To forecast the 2016 end-of-year stock of physicians who have completed their post-graduate training, we start with the 2015 end-of-year stock estimate of physicians. [17] We then add a forecast of additions to the stock net of subtractions from the stock in 2016. Entry to the stock of physicians has three components: 1. exit from Canadian residency programs; 2. physicians who are Canadians returning from outside Canada; 3. immigration. By far, the largest source of new physicians entering the stock is the first component. [18] Exit from the stock of physicians also has three components: 1. retirement; 2. death; 3. emigration.

[16] Full details of the assumptions underlying the model, as well as the methodology and underlying data, are available upon request from the authors.

[17] The 2015 end-of-year stock of physicians is from CIHI, 2016.

[18] In 2016, exit from Canadian residency programs supplied 81.4% of forecast gross entry into the stock of professionally active physicians who have completed their post-graduate training.

Entry to the stock of residents comes from first-year enrollment in residency programs. The entrants may have earned their degree from a Canadian medical school (referred to as Canadian Medical Graduates or CMGs) or a medical school abroad (referred to as international medical graduates or IMGs). In addition, based on their legal status, they can be grouped into Canadian citizens and permanent residents (CCPR) and visa trainees. We forecast the number of first-year residents graduating from Canadian medical schools based on the number of medical school enrollees four years earlier. We assume the same number of enrollees every year in our sample starting in 2016. Of course, this assumes that the *status quo* will persist and does not take into account any plans government may have to increase enrollment in the future.

Our forecast of the number of graduates [19] of Canadian medical schools entering family medicine residencies is the product of the estimated number of Canadian medical school graduates and the 2011–2015 average proportion of M.D. graduates entering into family medicine residency programs. Similarly, our forecast of the number of graduates of Canadian medical schools entering specialized residencies is the product of the estimated number of Canadian medical school graduates and the 2011–2015 average proportion of M.D. graduates entering into specialist residency programs. We forecast the number of first-year residents with an international M.D. degree in family medicine and specialist residency programs as 198 and 352, respectively, based on 2011–2015 averages of those variables. [20]

We assume that exit from the stock of residents occurs upon completion of the relevant residency program and that the average time to complete the residency program is 2.4 years for family medicine and 5.5 years for specialized programs (CAPER, 2017a; calculations by authors). We also assume that all first-year entrants to residency complete their programs. We inflate the number of first year CCPR-IMG [21] residents in family medicine (196) and specialist (254) residency programs by a factor of 1.04 and 1.85, respectively, to forecast the number of CCPR-IMG residents exiting family medicine (204) and specialist (470) residency programs. These ratios are based on historical trends between 2011 and 2015 and account for the fact that many residents with international M.D. degrees begin training in Canada after the first

[19] The assumed graduation rate is approximately 98% based on the average rates observed between 2006 and 2015 (AFMC, 2016; calculations by authors).

[20] For the purpose of calculation, we assumed that, during every year in the 2011–2015 period, the ratio of Canadian medical graduates to international medical graduates among all first-year trainees who were Canadian citizens or permanent residents prevailed if they were disaggregated into general practitioners and specialists subgroups. We make a similar assumption for first-year trainees who were on visa status.

[21] Residents who are Canadian citizens or permanent residents and have an international M.D. degree.

year of residency. [22] Having completed their residency in Canada, the vast majority (93%) [23] of Canadian citizens and permanent residents who complete become additions to the previous year's stock of practising physicians in our model. We further assume that all residents on visas go back to their countries of origin after completion of their Canadian residency programs (CAPER, 2017b).

As noted above, the overwhelming source for additions to the stock of practising physicians in any year is the exit of residents from their family medicine and specialist programs. Two other minor sources are Canadian physicians returning to Canada and immigrants who qualify to practice in Canada. We estimate these two sources separately for family medicine doctors and specialists. Specifically, we assume that the average number of returning general practitioners and specialists in each year of the forecast period will equal the 2011–2015 annual average of returned general practitioners and specialists, respectively (CIHI, 2016). Likewise, we assume that the average number of general practitioners or specialists entering as immigrants in any forecast year equals the average annual number of immigrant doctors (422) over the period 2011–2015 (Tara S. Chauhan, Senior Advisor, Canadian Medical Association, personal communication via e-mail, July 19, 2017; calculations by authors). [24]

We then turn to forecasting exits from the stock of family medicine and specialist physicians. Exit can occur because of retirement, death, and emigration. [25] Over the sample forecast period of our model, the most important determinant of exit is retirement. [26] For both specialists and general practitioners, we take the 2015 end-of-year distribution of physicians by age group. We then apply an age-specific, combined exit rate resulting

[22] For example, out of 631 residents with international M.D. degrees who were Canadian citizens or permanent residents in the practice-entry cohort (that is, who exited the residency program) in 2015, only 459 were identified as first-year trainees in the residency program; 132 who trained in Canada in their first year reported to CAPER as Fellows, and 40 more started training at some point during the second and sixth year of the residency program.

[23] A 2014 report by Lynda Buske tracked cohorts exiting Canadian post-graduate residency programs in order to estimate the retention of physicians (in Canada) after completing post-graduate training. The retention rate after two years of residency completion was 93% for 2005's practice-entry cohort. A similar retention rate was found for the 2010 practice-entry cohort (Buske, 2014).

[24] Averages are used because rates vary year to year, and the authors did not note any clearly observable trend during the 2011-to-2015 period.

[25] We assume exit due to retirement, death, and emigration does not occur for residents during their post-graduate training period.

[26] Our calculations indicate that, in 2016, retirement and death supplied 91.3% of forecast gross exits of professionally active physicians who had completed their post-graduate training.

from retirement and death based on 2013–2015 data, [27] and calculate exit resulting from retirement and death in 2016 for general practitioners and specialists. We subsequently subtract age-specific exit numbers from the corresponding age segments of the 2015 stock, increase the age of each remaining physician by one year (assuming a uniform distribution within each age group) and add age-specific entries to, and subtract exit as a result of emigration from, the remaining stock. [28] This gives us the 2016 end-of-year distribution of general practitioners and specialist physicians. We then repeat the process to estimate exits from retirements and deaths in 2017 and all subsequent years to 2030.

It should be noted that we do not take into account projected changes in the shares of male and females in the total population of physicians over our forecast time period. Unpublished data provided to us from the Canadian Medical Association (CMA) (Chauhan, pers. comm., July 19, 2017) indicate that the CMA anticipates a significant increase in the percentage of total physicians who are female. To the extent that females live longer than males, our projected death rates for the 2016–2030 period based on 2013–2015 data will likely be overestimated. On the other hand, to the extent that female physicians retire earlier than male physicians, [29] the data we use to estimate retirement rates might understate actual future retirement rates. In short, while some bias may be introduced in our projections of death and retirement rates by not disaggregating physicians by sex, these biases may arguably be largely offsetting, and the total bias is likely small in any case.

The projected exit from the stock of physicians as a result of emigration is quite small in each of our forecast years. We use the annual average emigration rate for Canadian specialists and general practitioners over the period from 2011 to 2015 to project the annual emigration rate in each year from 2016 to 2030. That is, we multiply the end-of-year stock estimates for specialists and general practitioners for the preceding year by the calculated average emigration rate for specialists and for general practitioners to arrive at estimates of emigrating specialists and general practitioners for each year from 2016 to 2030. [30]

[27] Data on retirement and death (Chauhan, pers. comm., July 13, 2017) was not disaggregated by general practitioners and specialists. The authors assume the same rates apply to family medicine and specialist physicians.

[28] The age groups used to estimate retirement and death rates were: 34 and younger; 35–44; 45–54; 55–64; 65–80; and over 80. We included physicians under 30 in the age group 30–34 for the purposes of calculation, and assume that all physicians retire (or die) when they reach the age of 80.

[29] In 2015, the average retirement age of male physicians was 70 years, whereas the average retirement age of female physicians was 63 years (Chauhan, pers. comm., June 13, 2017).

[30] The estimated emigration rate for specialists over the period from 2011 to 2015 was 0.3%. It was 0.2% for general practitioners (CIHI, 2016; calculations by authors).

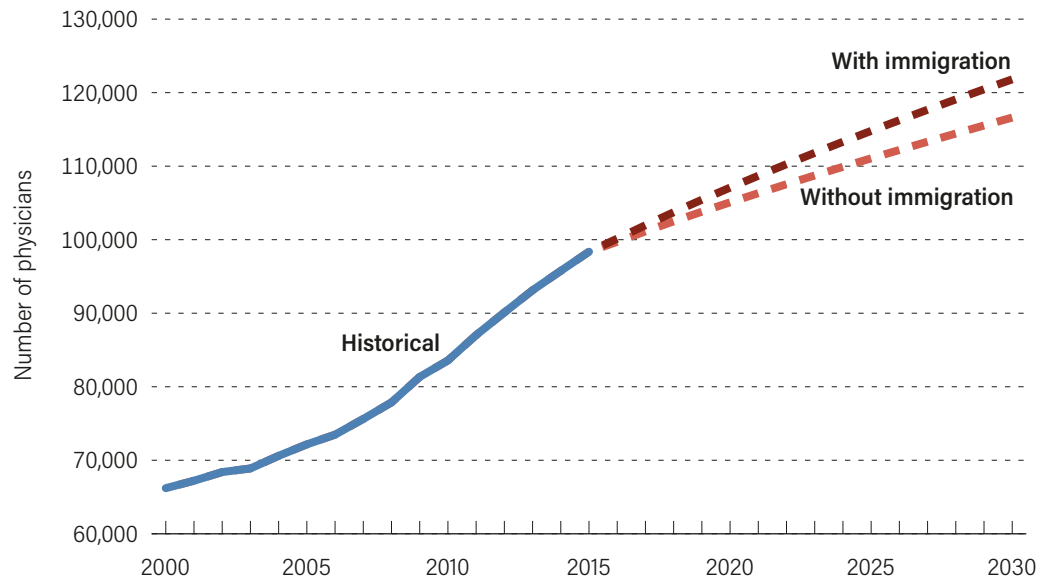
In sum, we estimate the number of physicians by focusing on the factors affecting entry and exit rates from the existing stock of physicians in 2015. The main factor influencing entry rates is the exit from residency programs of residents, of whom the vast majority have graduated from Canadian medical schools. The main factor influencing exit rates from the existing stock of physicians in 2015 is retirement rates. We also account for Canadian physicians returning to Canada, as well as immigration in forecasting entry rates, while we account for deaths and emigration in forecasting exit rates.

In the next section of the paper, we present our forecasts of the future supply of physicians in Canada and compare them to estimates made by the Canadian Medical Association.

6 Forecast for 2016–2030

Figure 2 shows historical estimates of the total stock of physicians in Canada from 2000 to 2015 and the forecasts of the total stock of physicians estimated from our model for the years 2016 to 2030, both including and excluding the forecast number of immigrant physicians. [31] Figure 2 shows that the stock of physicians with and without immigration is expected to increase consistently over the period from 2016 to 2030. The increase during the first half of this period in the stock of physicians exceeds the increase in the second half. [32] Specifically, the increase in the stock of physicians including immigrants is 11.7% from 2016 to 2023, whereas it is 8.9% from 2023 to 2030. Figures in Appendix A show disaggregated forecasts for general practitioners (figure A1) and specialists (figure A2).

Figure 2: Total number of physicians, Canada, 2000–2030



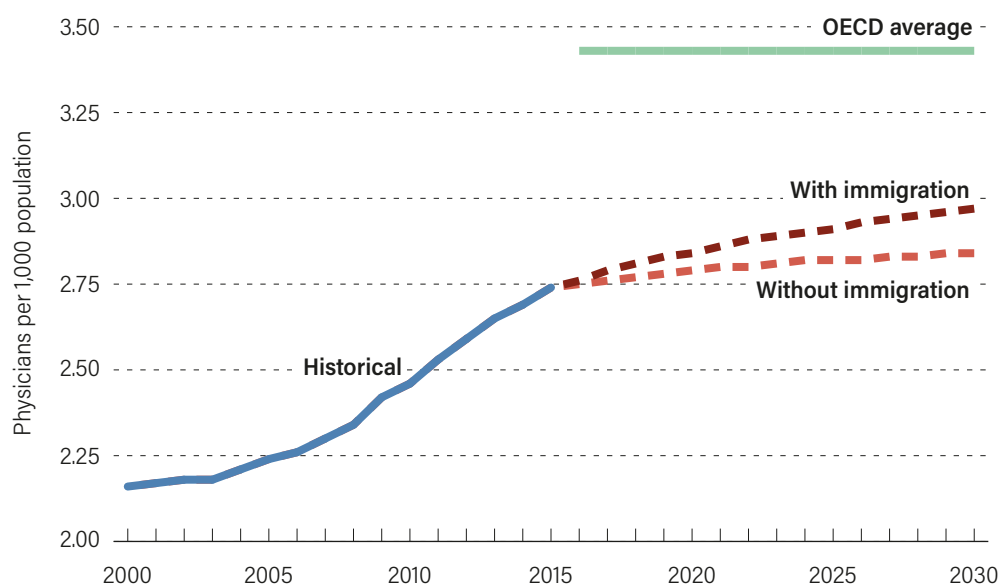
Sources: CIHI, 2016; Statistics Canada, 2017; CAPER, 2017c; authors' forecasts.

[31] We remind the reader that our estimates and forecasts of the total number of physicians include residents, who provide medical services. The inclusion of residents also allows us to make comparisons to OECD countries.

[32] A number of growth factors are fixed numerically, which would tend to slow growth rates in later forecast years as the number of physicians overall is expanding.

Figure 3 reports the number of physicians per thousand population [33] for Canada excluding and including immigrant physicians. The historical physician-to-population ratio is reported for 2000 to 2015, while our forecast values are reported for 2016 to 2030. Over the forecast period, there is a modest increase in the physician-to-population ratio—from 2.74 in 2015 to 2.97 in 2030—when immigrant doctor entrants are included. [34] However, we project much lower growth (2.74 in 2015 to 2.84 in 2030) in the physician-to-population ratio in the absence of immigration—that is, if Canada were to rely only on Canadian-trained physicians—and given our assumptions that enrollments in Canadian medical schools remain constant. It is also relevant to note that, even given the projected increase in the physician-to-population ratio for Canada, by 2030 both ratios are still below the 2015 (or nearest year) average physician-to-population ratio for wealthy OECD countries (3.4). As discussed earlier in the report, Canada’s having a lower physician-to-population ratio than most other wealthy countries does not necessarily mean a shortage of physicians in Canada; however, it certainly suggests a relative scarcity of

Figure 3: Physicians per 1,000 population, Canada and OECD, 2000–2030



Sources: CIHI, 2016; Statistics Canada, 2017; CAPER, 2017c; authors' forecasts.

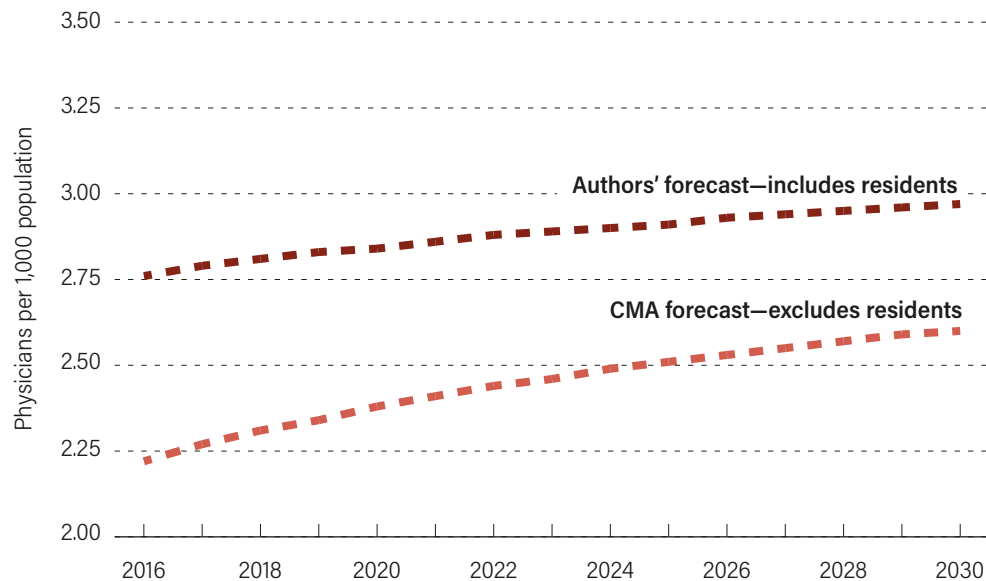
[33] Population estimates are derived from Statistics Canada’s (2014) M1: medium-growth projection.

[34] The series with and without immigrant physicians are shown primarily because international competition for trained physicians arguably makes the number of entering immigrant doctors less reliable than the number of Canadians entering medical schools. This might be especially true as income levels for physicians in developing countries, such as India and China, increase at a faster rate than they likely will in developed countries such as Canada.

physicians in Canada; and, unless other factors of production, such as capital or paramedicals, become more abundant in Canada than elsewhere, or demand for health care in Canada grows more slowly than in other wealthy countries, Canadian patients will experience increasing difficulty obtaining physicians' services over time compared to consumers of health care in most other countries. Figures in Appendix B show disaggregated forecasts for general practitioners (figure B1) and specialists (figure B2) per thousand population.

For purposes of comparison, figure 4 reports our projection “with immigration” of the physician-to-population ratio along with projections provided by the CMA for the years 2016 to 2030. Since the CMA's forecasts implicitly include estimates of future immigration of physicians to Canada (Chauhan, pers. comm., July 19, 2017), we compare only our “with immigration” series to the CMA projection. The CMA anticipates a steady increase in the ratio of physicians to population over the period from 2016 to 2030, as does our forecast, although our forecast values are higher in every year than those of the CMA, primarily because we include residents in our forecasts of total physicians, while the CMA does not. [35]

Figure 4: Physicians per 1,000 population, Canada, 2016–2030, as forecast by authors and Canadian Medical Association (CMA)



Sources: Chauhan, pers. comm., July 19, 2017; CIHI, 2016; Statistics Canada, 2017; CAPER, 2017c; authors' forecasts.

[35] There may also be a number of other differences in assumptions about graduation rates, post-graduate practice entry rates, retirement rates, and other parameters. While some of these may be identified by comparing the details contained in the methodology section of this paper with previous reports by the CMA, a detailed comparisons of differences is not possible, as we do not have access to the CMA's Physician Resource Evaluation Tool [PRET].

As discussed in an earlier section of this report, it has been suggested that one contributing factor to the perceived shortage of physicians in Canada is a decline in the hours worked, on average, by physicians. To the extent that physicians will continue to work fewer hours, [36] on average, in the future, it makes sense to adjust forecasts of the physician-to-population ratio to reflect this phenomenon. In effect, if average hours of work per physician decline in the future, the number of effective full-time physicians will be lower than the estimated stock of physicians in any future year. No correction was made to the forecasts of numbers of physicians in figure 4 for expected changes in average hours worked.

While we do not have explicit forecasts of the expected average hours of work by physicians in Canada over our forecast period, average hours of work may be expected to decline to the extent that females become a larger part of the stock of physicians, since female physicians work fewer hours per week, on average, than male doctors. [37] The CMA projects that the percentage of female physicians in the total stock of Canadian physicians will increase consistently from around 40.4% in 2016 to around 50.1% in 2030. Hence, unless past differences in average hours worked by male and female physicians do not persist in the future, the estimated stock of physicians in any future year will overstate the stock of physicians adjusted for average hours worked (that is, the effective stock of physicians).

Average hours worked by physicians will also depend upon the age distribution of the population of physicians, as older physicians work fewer hours, on average, than younger physicians. [38] In this regard, the CMA projects a decline in the percentage of physicians older than age 55 over the period from 2016 to 2030, presumably because of “baby-boomer” physicians retiring. Specifically, for all physicians, the CMA projects the percentage older than 55 to be around 37.7% in 2016 compared to approximately 35.6% in 2030. The projected decrease in average age primarily reflects specialist physicians becoming younger, on average, whereas the projected average age of general practitioners is essentially the same in 2030 as in 2016. [39]

While the CMA does not provide projections of average hours worked per physician, it does provide forecasts of full-time-equivalent (FTE) physicians, as well as FTEs per 1000 population. We infer that the differences

[36] For example, average hours worked per week by physicians decreased from 53.2 in 1997 to 48.7 in 2014 (CMA, 2017).

[37] According to the *National Physician Survey 2014*, average weekly work hours, excluding on-call activities, are 50.1 for male physicians, and 46.3 for female physicians (CMA, 2014).

[38] According to the *National Physician Survey 2014*, average weekly work hours, excluding on-call activities, are 40.9 hours among physicians aged 65 years or older, compared to 48.7 hours for all physicians (CMA, 2014).

[39] The projected percentage of general practitioners older than 55 increases from 37.9% in 2016 to 39.5% in 2021 and then declines to 37.6% in 2030.

between their forecasts of physicians and FTE physicians reflect projected changes in average hours worked from all sources, such as, for example, changes in the average age of physicians and changes in the distribution by sex of physicians. Table 5 reports the CMA's forecasts of physicians per 1,000 population and FTE [40] physicians per 1,000 population. It also reports our forecast of physicians per 1,000 population using the data underlying figure 4. We adjust this forecast to obtain a forecast series for FTE per 1,000 population by multiplying our forecast of physicians per 1,000 population by the ratio of column

Table 5: Physicians and FTE physicians per 1,000 population, 2016–2030

	CMA's forecasts		Authors' forecasts (includes residents)	
	[1] Physicians	[2] FTE physicians	[3] Physicians	[4] FTE physicians
2016	2.22	2.21	2.76	2.75
2017	2.27	2.25	2.79	2.76
2018	2.31	2.28	2.81	2.77
2019	2.34	2.32	2.83	2.80
2020	2.38	2.34	2.84	2.80
2021	2.41	2.37	2.86	2.81
2022	2.44	2.40	2.88	2.83
2023	2.46	2.42	2.89	2.84
2024	2.49	2.45	2.90	2.86
2025	2.51	2.47	2.91	2.87
2026	2.53	2.49	2.93	2.88
2027	2.55	2.50	2.94	2.88
2028	2.57	2.52	2.95	2.89
2029	2.55	2.54	2.96	2.95
2030	2.60	2.55	2.97	2.91

Source: Chauhan, pers. comm., July 19, 2017; authors' estimates.

[40] The CMA presents two FTE calculations. The results here are for Method 1: “The model applies an average FTE value to projected future supply head counts to create future FTE counts, by age/sex/broad specialty. It is based on workload data from the 2014 National Physician Survey. The total hours worked per week by each respondent is divided by the overall average (49 hrs/wk excluding on call) to create an FTE value for each physician. Aggregate average FTE values are then calculated for age, sex and broad specialty groups. These averages are applied to the supply projections in each future year” (Chauhan, pers. comm., July 19, 2017).

2 to column 1 in table 5. Essentially, we scale down our forecast of physicians per 1,000 population by the CMA's ratio of FTE per 1,000 population to total physicians per 1,000 population in order to obtain a FTE per 1,000 population using our projections of total physicians.

Given the dominant influence of increases in the female share of the physician population, one might expect forecasts of FTE physicians as a share of the population to rise more slowly than forecasts of total physicians as a share of the population for reasons discussed earlier. This is, indeed, the case as reported in table 5; however, the differences are quite small and do not change the general conclusion that the effective supply of physicians' services per capita is expected to increase over the period from 2016 to 2030, albeit modestly.

7 Policy Implications

An obvious question raised by our analysis and forecast of physician supply is what, if anything, should be done about the relative scarcity of physicians in Canada compared to most other wealthy countries. Answering this question depends, in part, upon the interpretation of the data and projections we present in this report. After all, the data we present might be interpreted as showing that many other wealthy countries have “too many” physicians relative to the sizes of their population rather than Canada having “too few”. A related concern is that we hold too many factors constant in generating and interpreting our forecasts, particularly factors related to changing patterns of demand for physicians’ services.

What we could not do in this study is identify directly whether there is excess demand for physicians’ services in Canada. However, there is certainly anecdotal evidence that Canadians spend time and money trying to secure the services of general practitioners. Furthermore, it has been documented elsewhere that Canadians wait much longer than patients in other developed countries for appointments with specialists and, further, for medical procedures carried out by specialist physicians (Commonwealth Fund, 2017). This type of information certainly points towards a scarcity, if not an outright shortage, of physicians’ services in Canada. [41]

Our analysis has focused primarily on the “supply-side” of the market for physicians’ services. Basically, the only factor on the demand side that we assumed would change over time is the population of Canada. Hence, we focused on the ratio of physicians to population, since an increase in the population of Canada can be expected to increase the demand for physicians’ services taken by itself. If population increased faster, in one case, or slower, in a second case, than the supply of physicians, the scarcity of physicians’ services is presumed to increase in the first case and decrease in the second case. It is certainly possible that demographic changes, particularly the aging of Canada’s population, will affect the future demand for physicians’ services. In this regard, Denton, Gafni and Spencer (2003) argue that the effects of population growth on physician “requirements” are substantially more important than the effects of aging. Even if this argument is accepted, aging certainly plays an important role in determining how future requirements are distributed

[41] Again, for economists, a shortage equates to excess demand at the existing price of the good or service in question. Wait times are an instrument to equate supply and demand for physicians’ services when market pricing is not used, although it is arguably not an efficient instrument.

among categories of physicians. Since our forecasts of the ratio of physicians to population focused on the broad categories of general practitioners and specialists, it is certainly possible that the scarcity of physicians' services implied by our projections differs across more narrowly defined physician categories. Indeed, Denton, Gafni, and Spencer (2003) suggest that the demand for general practitioners increases at more advanced ages, while the demand for surgical specialists declines. Hence, if we took the changing age distribution of Canadians into account, it might provide additional insight into our assessments of the scarcity of general practitioners relative to specialists. It would not, however, affect our main conclusion that there is an overall scarcity of physicians (and by extension, their services) in Canada when compared to most other developed countries.

It is also possible that changes in technology will affect the demand for physicians' services in the future. For example, new biopharmaceuticals may eliminate specific diseases, as in the case of new drugs that cure hepatitis, eliminating the need for physicians to treat those diseases. Precision medicine based on artificial intelligence and machine learning may result in much improved accuracy in diagnosing and treating diseases, so that the number of required "contacts" between patient and physician is reduced. In effect, technology might facilitate more efficient delivery of medical services such that the effective diagnosis and treatment of a wide range of medical conditions may require fewer interactions between patients and physicians. All other things constant, this would imply less scarcity of physicians' services given any ratio of physicians to population. On the other hand, it is possible that new technology, such as "wearable" health monitoring equipment, might alert patients to emerging health problems of which they would otherwise be unaware. As another example, new drugs and medical procedures that can cure previously incurable diseases could increase the demand for physician services. This, in turn, could result in technology increasing the demand for physicians' services which, in turn, would exacerbate scarcity problems. Clearly, whether future technological changes will, on balance, increase or decrease the demand for physicians' services is a matter for speculation and well beyond the scope of this study. One might also argue, as do Emery and Zwicker (2017) that significant changes in provincial government health-care policies are required if new technology is to be an increasingly efficient substitute for physicians' services. Whether such changes will occur is also a matter of speculation and beyond the scope of our focus.

In short, while Adams, Chauhan and Buske (2017) assert that any judgment as to whether too many or too few physicians are being trained in Canada requires consideration of all of the drivers and mitigators of both supply and demand, we maintain that there is sufficient evidence to support the assertion that Canadian policy makers should be concerned about a relative scarcity of

physicians as described in this report. The issue then turns to what are the appropriate policy responses. In the absence of any significant policy changes in Canada's current health-care system, there are many initiatives that might be implemented to reduce a scarcity of physician services. Here are some suggestions.

1. increase the supply of domestically trained physicians by expanding the seats available for medical school enrollments, and residency positions, in Canada;
2. promote increased immigration of foreign-trained physicians to practice in Canada;
3. encourage an increased supply and use of substitute health-care providers like nurse practitioners and physicians' assistants;
4. improve the productivity of physicians by stimulating the adoption of new technologies, such as telemedicine, and investing in complementary capital inputs like improved scanning machines and advanced diagnostic equipment;
5. increase fee-for-service payments to physicians to encourage them to work longer hours and to remain in the work force longer than they otherwise would;
6. expand the availability of specialist residencies and provide more billing numbers for specialist physicians;
7. improve patients' real-time access to information about the availability of general practitioners within "reasonable" commuting distances of where they live and work.

A potential initiative that has raised controversy in the past about "two-tier" medicine is a greater role for the private sector for "necessary" health-care services. This initiative would allow for current and future physicians in Canada to deliver more fee-for-services without the necessity of increased government funding. It might also encourage foreign doctors to immigrate to Canada to provide services in an expanded private sector. Increased competition from the private sector might also improve productivity in the public sector.

These suggested policy initiatives can be seen as effectively acting upon the supply side of the relevant market by directly or indirectly increasing the quantity of services supplied. Clearly, there would be different levels of cost associated with each initiative. The benefits would also differ and, in some cases such as stimulating adoption of new productivity-enhancing technology, the magnitude of the benefits are very difficult to forecast. Other possible initiatives would require substantive changes in licensing and regulations governing qualifications to deliver specific medical services. How feasible such changes are is also uncertain. Since the mandate of the study did not include undertaking

benefit-cost analyses of alternative policies to increase the supply of health-care workers' services, we are unable to assess, or even rank, the various possible initiatives listed above. [42] This effort is perhaps a matter for future research.

Initiatives might also be implemented that affect the demand-side of the market for physicians' services. Perhaps the most obvious is the implementation of deductibles and co-pays in provincial health-insurance plans. Canada is actually an outlier among wealthy countries that provide universal access to health insurance by having first-dollar coverage (no cost-sharing) for health care. The available evidence finds that cost-sharing insurance plans that include deductibles and/or co-payments reduce the use of physicians' services. [43] There is no consistent evidence that cost sharing results in adverse health outcomes, although this latter result may reflect the fact that exemptions and subsidies are typically granted for specific services and for low-income and other "vulnerable" patient groups. As a result, risks that cost sharing will discourage the consumption of necessary medical treatments and procedures are reduced.

It is again well beyond the scope of this study to identify whether and how alternative cost-sharing schemes in Canada might mitigate the scarcity of physicians' services relative to the population; however, it can be reasonably argued that Canadian policy makers should seriously consider the implementation of a cost-sharing insurance regime to at least reduce demand for physicians' services while protecting low-income and other vulnerable groups against socially unacceptable cost burdens.

[42] Moreover, we are unaware of any available studies that undertake benefit-cost analyses of policies to increase access to physicians' services.

[43] For a discussion of some developed countries with universal coverage for health-care services that do not mandate first-dollar coverage and a review of some of the literature on the topic, see Globerman, 2016. Also, see Kil and Houlberg, 2014; and Brot-Goldberg, Chandra, Handel, and Kolstad, 2017.

8 Conclusions

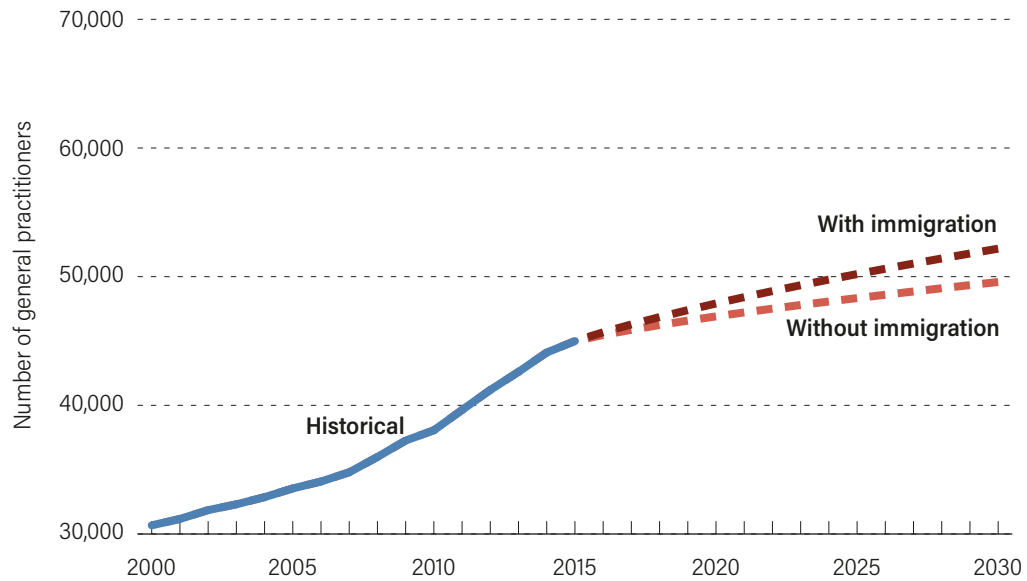
Although there have been great advances in medical technology and pharmaceuticals over the past few decades, health-care systems are still remarkably labour intensive, and physicians play a key role in providing services to patients in need. One measure of the relative availability of physicians (and, by extension, their services) is the ratio of the stock of physicians to the population they serve. In the 1960s and mid-1970s, the physician-to-population ratio in Canada did not differ significantly from the average ratio of high-income countries in the OECD. However, since that time, a combination of demographic changes and government control of education, training, and immigration and, hence, of the supply of physicians has led to Canada falling noticeably below the OECD average (which increased significantly over the same period of time). This, in combination with the fact that many Canadians struggle to find a family doctor and the fact that Canada performs poorly on a variety of indicators measuring wait times for consultations with specialists and for eventual treatment, has led to persistent concern about the current and future ratios of physicians to population.

The model used in this paper presents annual forecasts of the physician-to-population ratio in Canada to 2030. Given current trends in medical-school enrollments, the projected supply of Canadian-trained physicians will only result in a small increase in the physician-to-population ratio—rising from 2.74 physicians per thousand population in 2015 to 2.84 in 2030. Even if the supply of foreign-trained physicians continues to follow the trend of the last five years, the ratio will only improve from 2.74 physicians per thousand population in 2015 to 2.97 in 2030, and will fall well short of the present-day OECD average of 3.4, an average that may well increase in the future.

Expected demographic changes, particularly the changing sex and age profiles of the physician workforce, may also result in fewer average hours worked by physicians. In the absence of a significant increase in physicians' productivity, our projections suggest that the current problems that Canadians are experiencing in accessing physicians' services (partly as a result of Canada's system of first-dollar coverage for medical services) will likely continue in the future without significant policy changes. Indeed, it is possible that access will worsen in the future as a result of an aging population and provincial budget constraints (among other factors). To the extent that a relatively low ratio of physicians to population signals an existing shortfall of physicians (and, implicitly, their services), current trends suggest that the future supply of physicians will continue to be lower than Canadians desire and certainly below ratios in other high-income countries.

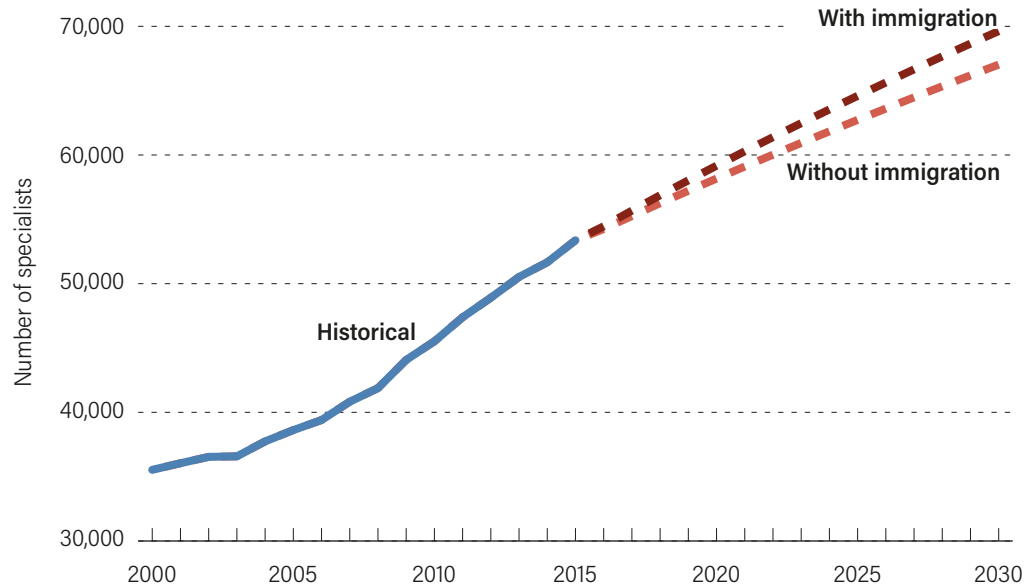
Appendix A—number of general practitioners and specialists

Figure A1: Total number of general practitioners, Canada, 2000–2030



Sources: CIHI, 2016; Statistics Canada, 2017; CAPER, 2017c; authors' forecasts.

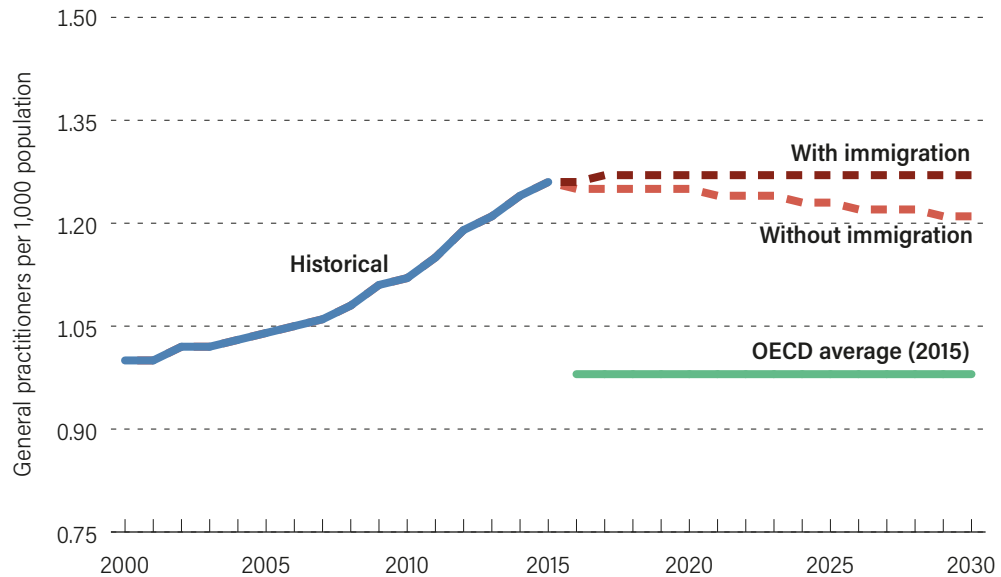
Figure A2: Total number of specialists, Canada, 2000–2030



Sources: CIHI, 2016; Statistics Canada, 2017; CAPER, 2017c; authors' forecasts.

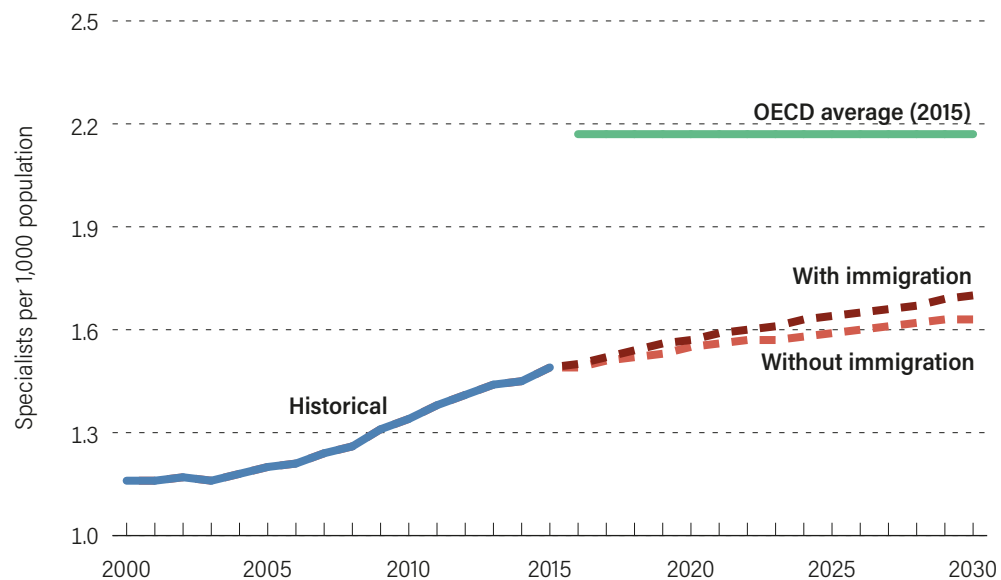
Appendix B—number of general practitioners and specialists per 1,000 population

Figure B1: General practitioners per 1,000 population, Canada, 2000–2030



Sources: CIHI, 2016; Statistics Canada, 2017; CAPER, 2017c; authors' forecasts.

Figure B2: Specialists per 1,000 population, Canada, 2000–2030



Sources: CIHI, 2016; Statistics Canada, 2017; CAPER, 2017c; authors' forecasts.

References

- Adams, Owen, Tara Chauhan and Lynda Buske (2017). Assessing the Prospects for Physician Supply and Demand in Canada: Wishing It Was Rocket Science. *Healthcare Management Forum* 30, 4: 197–199.
- Association of Faculties of Medicine of Canada [AFMC] (2016). Canadian Medical Educations Statistics. <<https://afmc.ca/sites/default/files/CMES2016-reduced.pdf>>.
- Barer, Morris, and Robert Evans (1991). *Toward Integrated Medical Resource Policies for Canada*. Centre for Health Services and Policy Research, UBC.
- Barer, Morris, and Robert Evans (2013). *What Doctor Shortage?* Evidence Network (October). <<http://evidencenetwork.ca/archives/13501>>.
- Barua, Bacchus, Ingrid Timmermans, Ian Nason, and Nadeem Esmail (2016). Comparing Performance of Universal Health Care Countries, 2016. Fraser Institute. <<http://www.fraserinstitute.org>>.
- Brot-Goldberg, Zarek, Amitabh Chandra, Benjamin Handel, and Jonathan Kolstad (2017). *What Does a Deductible Do? The Impact of Cost-Sharing on Health Care Prices, Quantities and Spending Dynamics*. <https://em.berkeley.edu/~bhandel/wp/utilization_BCHK_Web.pdf>.
- Buske, Lynda (2014). *Tracking Postgraduate Practice Entry Cohorts—a Good News Story for Canada*. Canadian Medical Association. <https://www.cma.ca/Assets/assets-library/document/en/advocacy/43-Bulletin_tracking_postgraduate_practice_entry_cohorts_e.pdf>, as of August 29, 2017.
- Buske, Lynda, and Jill Strachan (2000). Medical Workforce and Policy Update-Canada. Fifth International Medical Workforce Conference, Sydney, Australia (November).
- Canadian Institute for Health Information [CIHI] (2016). *Supply, Distribution and Migration of Physicians in Canada, 2015*. <https://secure.cihi.ca/free_products/SMDB_2015_EN.zip>.

Canadian Medical Association [CMA] (2014). National Results by FP/GP or Other Specialist, Sex, Age and All Physicians. *National Physician Survey, 2014*. <<https://www.cma.ca/Assets/assets-library/document/en/advocacy/32-MeanHrsWorked.pdf>>, as of August 29, 2017.

Canadian Medical Association [CMA] (2017). *Average Hours Worked per Week by Physicians, 1997-2014*. <<https://www.cma.ca/Assets/assets-library/document/en/advocacy/34-TrendData.pdf>>, as of August 28, 2017.

Canadian Post MD Education Registry [CAPER] (2017a). *Fact Sheet: Average Time to Complete Canadian Postgraduate Training*. <https://caper.ca/~assets/FactSheet_Average_time_to_complete_Canadian_PG_training_en.pdf>, as of August 28, 2017.

Canadian Post MD Education Registry [CAPER] (2017b). *Fact Sheet: Visa Trainees in Canadian Postgraduate Medical Training*. <<https://caper.ca/~assets/FactSheetonVisaTrainees.pdf>>.

Canadian Post MD Education Registry [CAPER] (2017c). *CAPER Annual Census of Post-M.D. Trainees* (2000/01 to 2015/16 reports). <<https://caper.ca/en/post-graduate-medical-education/annual-census/>>, as of June 26, 2017.

CBC (2016). Wave of Retiring Doctors Expected to Worsen Doctor Shortage in BC (April 26). *CBC News*. <<http://www.cbc.ca/news/canada/british-columbia/doctor-shortage-bc-retiring-doctors-1.3553015>>.

CBC (2017). We're Graduating More Doctors than Ever, So Why Is It So Hard to Find a GP? (May 4). *CBC News*. <<http://www.cbc.ca/news/canada/british-columbia/bc-doctor-shortage-medical-fees-1.4100251>>.

Chan, Benjamin (2002). *From Perceived Surplus to Perceived Shortage: What Happened to Canada's Physician Workforce in the 1990s?* Canadian Institute for Health Information. <https://secure.cihi.ca/free_products/chanjun02.pdf>.

Commonwealth Fund (2017). *International Profiles of Health Care Systems, 2016*. <http://www.commonwealthfund.org/~media/files/publications/fund-report/2017/may/mossialos_intl_profiles_v5.pdf>.

Denton, Frank, Amiram Gafni, and Byron Spencer (2003). Requirements for Physicians in 2030: Why Population Aging Matters Less than You May Think. *CMAJ/JAMC* 168, 12: 1,545–1,547.

Emery, J.C. Herbert, and Jennifer Zwicker (2017). Innovation, Productivity and Pricing: Capturing Value from Precision Medicine Technology in Canada. *Healthcare Management Forum* 30, 4: 181–186.

Esmail, Nadeem (2006). *Canada's Physician Shortage: Effects, Projections, and Solutions*. Fraser Institute.

Esmail, Nadeem (2007). Demographics and Canada's Physician Supply. *Fraser Forum* (December/January): 16–19.

Esmail, Nadeem (2011). Canada's Physician Supply. *Fraser Forum* (March/April): 12–18.

Fréchette, D., D. Hollenberg, A. Shrichand, C. Jacob, and I. Datta (2013). *What's Really Behind Canada's Unemployed Specialists? Too Many, Too Few Doctors? Findings from the Royal College's Employment Study*. Royal College of Physicians and Surgeons of Canada.

Globerman, Steven (2016). *Cost Sharing and Universal Health Care: Are They Compatible?* Fraser Institute.

Hartnett, Cindy (2016). Growing Shortage of Family Doctors a Crisis. *Times Colonist* (April 24). <<http://www.timescolonist.com/growing-shortage-of-family-doctors-a-crisis-1.2238283>>.

Islam, Nazrul (2014). The Dilemma of Physician Shortage and International Recruitment in Canada. *International Journal of Health Policy and Management* 3, 1: 29–32.

Kil, A., and K. Houlberg (2014). How Does Copayment for Health Care Services Affect Demand, Health and Redistribution? A Systematic Review of the Empirical Evidence from 1990 to 2011. *European Journal of Health Economics* 15, 8: 813–828.

Organisation for Economic Co-operation and Development [OECD] (2017). *OECD Health Statistics 2017*. <<http://www.oecd.org/els/health-systems/health-data.htm>>.

Plourde, Marc-Emile (2016). Why Is There Still a Shortage of Doctors in Canada despite the Increase in Med School Graduates over the Past Few Years? <<https://www.quora.com/Why-is-there-still-a-shortage-of-doctors-in-Canada-despite-the-increase-in-med-school-graduates-over-the-past-few-years>>.

Statistics Canada (2014). CANSIM table 052-0005: Projected Population, by Projection Scenario, Age and Sex, as of July 1, Canada, Provinces and Territories, Annual (Persons). <<http://www5.statcan.gc.ca/cansim/a26?lang=eng&id=520005>>, as of July 24, 2017.

Statistics Canada (2015). *Access to a Regular Medical Doctor, 2014*. Health Fact Sheets 82-625-X. <<https://www.statcan.gc.ca/pub/82-625-x/2015001/article/14177-eng.htm>>.

Statistics Canada (2017). CANSIM table 051-0001: Estimates of Population, by Age Group and Sex for July 1, Canada, Provinces and Territories, Annual (Persons unless Otherwise Noted). <<http://www5.statcan.gc.ca/cansim/a26?id=510001>>, as of September 1, 2017.

Subramaniam, Radha (2016). *The Doctor Shortage in Ontario*. <<https://www.visitdoctor.ca/article/doctor-shortage-ontario>>.

Walsh, Marieke, and Heide Pearson (2017). Nova Scotia Doctor Calls Family Doctor Shortage a Crisis. *Global News* (February 24). <<http://globalnews.ca/news/3270444/nova-scotia-doctor-calls-family-doctor-shortage-a-crisis/>>.

World Bank (2017). How Does the World Bank Classify Countries? <<https://datahelpdesk.worldbank.org/knowledgebase/articles/378834-how-does-the-world-bank-classify-countries>>, as of August 29, 2017.

World Health Organization [WHO] (2000). *The World Health Report: Health Systems: Improving Performance*. <http://www.who.int/entity/whr/2000/en/whr00_en.pdf>, as of September 7, 2017.

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