

# Supply and Demand of Health Workers in an Economic Downturn

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## Executive Summary

This paper was asked to review the literature and provide insight on the following questions:

- What was the impact of an economic downturn on the supply and demand of health workers (physicians and nurses) in Canada?
- Did demand (in the form of utilization rates) increase during the 1990-1992 recession?
- How did supply of Health Human Resources (HHR) change over this time period? What were the drivers for this change?

From the viewpoint of demand, because non-medical determinants of health often affect the need for care, an economic downturn may have mixed impacts. On the one hand, since poverty is associated with poorer health, need might increase, particularly for those who lose employment. On the other hand, there may be a decrease in occupational-related injuries. Insurance coverage may also affect access, particularly for services where there is not universal coverage. Beyond the obvious implications of financial barriers deterring visits for uncovered services, particularly for vulnerable populations, there may also be spillover effects. An example is the finding by some researchers of a relationship between access to supplementary health insurance and the likelihood of using physician services, due in part to reluctance of individuals without such insurance to seek visits if they anticipate receiving prescriptions they would have difficulty in paying for. Most countries do ensure universal coverage for medically necessary hospital and physician services. However, an economic downturn that causes people to lose employment-based prescription drug coverage may have the unintended consequence of slightly reducing their use of physician services. Nonetheless, the studies reviewed suggest that that these factors are not a major driver of demand for health services, particularly if the focus is on total health expenditures.

Supply is another story. Our review clarified that estimates of how many providers are needed are complex, and dependent upon the assumptions made. Historically, there have been switches from perceptions of surplus to perceptions of shortage. These boom-bust cycles can be expensive, and counterproductive. The impact also varies depending on how providers are paid, with those working fee-for-service as relatively independent providers (e.g., physicians) more able to withstand government cutbacks than those downsized because they worked for organizations whose funding was constrained during economic difficulties. Indeed, Canada has experienced this, particularly for nurses. Tight budgets may lead hospitals to lay off nurses and/or defer hiring; this disproportionately affects younger nurses. In Ontario in the 1990s, managers attempted to save money by casualizing the workforce and replacing full-time and regular

part-time staff with staff employed on a part-time basis. In Ontario, in 1986, 66% of registered nurses (RNs) were working full time; by 1998, 32.2% were part-time and another 18.6% working on a casual basis. Many leave the profession. The costs of attracting them back are often high. In 2002, there was a net loss of over 2000 nurses; by 2004, they were back in the system, but at higher costs.

Three main conclusions resulted.

The first is that projections are heavily dependent upon the data and assumptions used. Good data is essential, but so is sensitivity analysis to test the implications of varying assumptions.

The second is the importance of looking at what work is done, and what services are needed, which in turn implies going beyond looking at single professions in isolation and recognizing the importance of health teams.

The third is the major conclusion of our review—the key impact of an economic downturn is on ability/willingness of governments to maintain and pay for the health workforce. Rather than create boom-bust cycles, wise management would seem to imply creating attractive, and stable, work environments to retain these needed professionals at a manageable cost.

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The original request, which has been modified following consultation with the committee, is enclosed as Appendix 1.

Note that, as requested, no original data analysis has been done for this paper. It reviews available literature, with a focus on the impact of the 1990-92 recession, and suggests possible lessons that might be drawn. Some additional lessons were drawn from the subsequent economic downturn of 1999-2001. A brief discussion of data issues is included as Appendix 2. A bibliography of the material reviewed, including abstracts if available, is included as a separate file (Appendix 3). Note that not all papers reviewed have necessarily been cited in this report.

The paper will briefly consider: what theory suggests the relationship between supply and demand for health human resources (HHR) might be; how one measures supply and demand; what the literature found; and the policy implications. To place the findings in context, we will briefly note key characteristics of health care financing and delivery in Canada. We will also review some information about utilization of health care services in Canada, noting the implications of the distribution of health care expenditures. The discussion of supply will focus on physicians and nurses, with some brief comments on other health care providers. Because the literature reviewed drew largely (but not entirely) from Canada, we next briefly describe some key aspects of the Canadian health care “system” important to place the findings in context.

### **Context: The case of Canada**

Canada does not have a national health care system; constitutional responsibility for health care rests at the sub-national (provincial/territorial) level. However, to receive full federal funds, the provincial/territorial insurance plans must comply with a series of national conditions as specified in the *Canada Health Act*. These require universal coverage for all Canadian residents (“insured persons”) for all medically necessary physician and hospital costs (“insured services”); no copayments are allowed by insured persons for insured services. This translates into about 70% of health expenditures being paid from public sources – including almost all hospital and physician costs.<sup>1</sup> Even within

these publicly-funded sectors, Canada uses what the OECD calls a public-contract model,<sup>2</sup> meaning that services are almost entirely delivered by private providers, introducing the potential for substantial variation across providers in where and how they practice. The *Canada Health Act* is a floor, not a ceiling; provinces are able to fund beyond these requirements should they wish to do so. There is considerable variability across jurisdictions in the extent of publicly-financed coverage for out-of-hospital care delivered by non-physician providers. There is also considerable variability in how services are managed and delivered, albeit with many commonalities amid the variations.

Similarly, provinces/territories have responsibility for professional training and licensure; there are approximately 24 regulated professions, with the precise numbers depending on the province. Although there have been efforts to coordinate these activities within particular professions across jurisdictions, decisions about how many slots will be available in training programs, as well as on the rules surrounding recognition of credentials for foreign-trained professionals, still rest firmly with the provinces/territories.

As health economists have noted, health costs can be seen as the weighted average of service mix, cost for each service, and number of each service provided. Cost control levers may thus address a mix of services, cost, and utilization. Canada's reliance on a public contracting model for physician and, to a large extent, hospital services has implications for the policy levers available to payers. Physicians have considerable flexibility in where and how they choose to practice. Similarly, hospitals have much discretion in what they will do, although in all provinces except Ontario, formerly independent hospital boards have been replaced by quasi-public regional authorities.

Provinces/territories have been trying, with varied success, to constrain the growth of medical costs. Their success in doing so in the early 1990s caused inflation-adjusted spending per capita to decrease. Indeed, some have suggested that this success in turn led to subsequent perceptions of provider shortages and excessive wait times, and subsequently led to substantial reinvestment in numbers and costs (incomes) of providers. Note that during the period under consideration, a marked transformation of the hospital sector occurred in Canada, as well as in other countries. The number of beds was reduced, and care shifted from hospitals to home and community. Length of stay was reduced, and more use was made of outpatient care and day surgery. This search for efficiency placed a heavier burden on providers to manage care with reduced resources.<sup>3</sup> The de-emphasis of hospitals has also had a significant impact on how nurses and other health professionals are used.

### ***Supply and utilization: The implications of payment methods and employment status***

An additional complexity when trying to apply economic models is that a considerable proportion of health expenditures are paid for publicly in most health care systems, with another proportion paid through other third-party payers. In Canada, although only about 70% of health expenditures are paid for from public sources, this

varies by sub-sector; about 99% of physician expenditures and about 90% of hospital expenditures are paid publicly. Physicians who work Fee For Service (FFS) can be seen as self-employed professionals with guaranteed payment from the provincial health insurance plan. (Each province/territory can be seen as a single payer for all insured physician services paid on a FFS basis.) The fee schedule is commonly negotiated between the provincial health ministry and the provincial medical association. In Ontario, for example, the Ontario Health Insurance Plan (OHIP) covers most physician services. Depending on the province/territory, the provincial insurer may also pay for some services delivered by other health professionals (e.g., OHIP pays for limited services from optometrists, midwives, physical therapists, etc.).

Other providers (including many in rehabilitation) are also self-employed professionals, but without guaranteed payment from government, although their services may be covered by private insurers and/or paid for by care recipients out-of-pocket. Still others (including most hospital employees, and most nurses) are employees of organizations, and dependent on those organizations having the budget to pay them.

Since most nurses work in hospitals, physician offices, or other sectors where public payment represents the main funder, most nurses are paid through public sources. However, the proportion of nurses working in hospitals has been dropping, reflecting the significant drop in inpatient beds and a shift from hospital to home and community. With fewer beds, and fewer inpatient episodes, those in hospital tended to be sicker, increasing the workload for hospital-based providers, and possibly leading to problems with retaining workers.<sup>4</sup>

In contrast, other providers, such as dentists or much of rehabilitation, are paid privately. Use of their services thus follows supply-demand models more closely, and there may well be adverse health consequences from not receiving necessary care. Dental care, for example, has a definite socioeconomic status (SES) bias in most countries where it is not included as part of the publicly-paid basket of services; Curtis and MacMinn have found a similar bias for Canada.<sup>5</sup>

This in turn means that the *key impact of an economic downturn is on ability/willingness of governments to maintain and pay for the health workforce*. As we will see, the literature is clear; boom-bust cycles tend to be counter productive. Canada has experienced this, particularly for nurses. Tight budgets may lead hospitals to lay off nurses or defer hiring; this disproportionately affects younger nurses. In Ontario in the 1990s, managers attempted to save money by casualizing the workforce and replacing full-time and regular part-time staff with staff employed on a part-time basis. In Ontario, in 1986, 66% of registered nurses (RNs) were working full time; by 1998, 32.2% were part-time and another 18.6% working on a casual basis.<sup>6</sup> Many leave the profession. The costs of attracting them back are often high. In 2002, there was a net loss of over 2000 nurses; by 2004, they were back in the system, but at higher costs. Particularly given the issues around maintaining 'surge capacity' to deal with unexpected events,<sup>6</sup> wise management would seem to imply creating attractive, and stable, work environments to retain these needed professionals at a manageable cost.

We next turn to supply and demand in health care systems.

## **Relationship between supply and demand?**

One key issue is the applicability of economic models to health care. “In economics, price is the signal that ensures a balance between supply and demand. If demand exceeds supply, prices should rise until enough people are priced out of the market to balance supply and demand. Market forces thus ensure that the scarce goods go to those who value them most, as demonstrated by their willingness to pay the higher price. In contrast, reducing price would be predicted to increase demand. Cost containment would accordingly discourage models that insulated people from the true costs of their purchasing decisions in favour of requiring ‘consumers’ to pay for a greater share of the care they receive.”<sup>7</sup> In contrast, other theorists argue that utilization of health services differs from consumer goods in that it is (or at least should be) based on need rather than demand.<sup>7-16</sup> For example, if one accepts that someone with a ruptured appendix should be treated regardless of ability to pay, they cannot be priced out of the market. When this is true, price signals cannot control costs, because there will be a floor price (whatever charity or government will pay) but no ceiling price; those who cannot afford care will still be able to drop down to that public/charity tier. In turn, this erodes the ability to contain costs, since there is little disincentive to raise costs if providers are assured that they will, at minimum, receive what government/charity are willing to pay while being able to increase costs for others. Conversely, although market theory predicts that free care will, by definition, be abused, this does not appear to apply to many health care services, where few would want to receive services they do not need. One would expect a shoe store to advertise and market their products, and would not expect them to refuse to sell a potential customer a pair that they did not need. However, one would not expect a hospital to market half-price open heart surgery to anyone willing to pay for it, and few would argue that potential customers should be able to purchase open-heart surgery even if they were perfectly healthy.<sup>10,14,15</sup> If one accepts this view, receipt of care should be based on need and appropriateness (e.g., an expectation of benefit) rather than on consumer demand.<sup>17</sup>

To the extent that need is defined by experts rather than by consumers, determining the relationship between supply and demand becomes even more complex. For the most part, people may make decisions about seeking first contact care, but providers are the gatekeepers to the more expensive elements of the health care system.<sup>18,19</sup> Although this is beyond the scope of this paper, a number of the articles reviewed noted issues related to the effectiveness and opportunity costs of healthcare services (e.g., when might better health outcomes result from increasing resources devoted to other non-medical determinants of health, as opposed to increasing resources devoted to medical care services?) Certainly, the literature suggests that the variation in healthcare utilization and expenditures they find is not always reflected in improved health status (e.g., one study of Manitoba for 1990 to 1993<sup>20</sup>).

An influential theoretical approach to analyzing use of health care services has been that of Andersen.<sup>21</sup> His model identifies three types of factors. *Enabling* factors

(e.g., SES, knowledge of the health care system, insurance coverage) affect the ability to use the health care system. *Predisposing* factors (e.g., age, education, marital status) affect how much an individual might seek to use the health care system. Finally, *need* factors (e.g., general health status, presence of chronic conditions, etc.) would affect whether use of the system would be appropriate. Clearly, these categories of variables are not independent, and data to assess them is not always available.<sup>22</sup> Use of the Andersen model would suggest that economic downturns would primarily affect demand for health care through enabling factors, and/or through affecting need for care. For example, one analysis of Statistics Canada's National Population Health Survey (NPHS) data has found that the unemployed had poorer health status and used more healthcare services.<sup>23</sup> A review article confirmed this relationship, although it suggested that the relationship might be more complex than a straight causal one, given the number of mediating and confounding factors.<sup>24</sup>

However one defines the basis on which services should be received, it is clear that delivering healthcare services requires an adequate supply of HHR. Ensuring that supply and demand are aligned in turn requires the ability to project them.

### ***Projecting supply and demand***

Planning requires that indicators be projected to ascertain future supply and demand. Such projections are notably difficult, particularly since other things rarely remain equal. In general, the time horizons used by most predictive models are usually relatively short (e.g., 10 years), although both supply and demand operate over a far longer time period. The articles reviewed clarified that there is no single accepted approach. One review identified four main forecasting approaches, which they termed: supply projection; demand-based; needs-based; and benchmarking against health systems with similar populations and health profiles.<sup>25</sup> Another review discussed these four approaches, and added another; economic trend analysis.

Projecting future supply traditionally uses a stock and flow model. New providers are added to the existing stock through new graduates from training programs, immigration, and increased labour force participation (e.g., return to work). They are subtracted through death, retirement, emigration, and decreased labour force participation.<sup>26</sup> Other things being equal, one can thus project the future workforce, and simulate the likely impact of different policy levers.

Economic trend analysis projects future physician workforce requirements as a function of projected economic growth, and is based on the theory that economic expansion is the dominant factor driving health care use. Proponents note that an advantage of trend analysis is that it requires far less data than other approaches, and does not make any assumptions about what is needed. This, of course, can also be viewed as a disadvantage.<sup>27-30</sup> The key finding from this body of work is that physician supply across a variety of jurisdictions over time was correlated with differences in GDP or personal income,<sup>31-33</sup> with three main caveats. First, the relationship was lagged (5 years for health

employment, 10 years for physician supply), presumably because the economy affects the decision to train more or fewer HHR, but cannot speed up training time. Second, the relationship varied with specialty; it had little influence on GP/FP, and less influence on hospital-based specialties than on medical specialties. Third, the relationship varied by country; in particular, a graph of practicing physicians vs. GDP per capita for OECD countries 1960-1997 found the Canadian trend line a notable exception to the general pattern.<sup>32</sup> Although the authors argued that “the patterns that we observed are consistent with a demand for physician services that is casually related to antecedent economic expansion.” They also noted that “the majority of the decisions that determine the magnitude of health care spending are those that affect the resources or behavior of the responsible organizations and agencies, and most such decisions are made far in advance of spending.”

Thus, one could equally plausibly argue that these findings are compatible with fluctuations in the willingness of policy makers to fund expansions of the HHR supply, rather than being a simple response to the economy. If so, these findings stress the importance of wise decision making, particularly given the lags inherent in training. As the same authors note, “once made, it is often difficult to retreat from these decisions, which leads to periods of excessive spending followed by periods of re-equilibration.” Although trend analysis does note the importance of payers being willing to pay for increased resources; it also notes that such capacity, once in place, is difficult to remove, and is likely to result in increased future costs.<sup>32</sup>

Once supply projections are established, the planner must then try to align projections of supply, with projections of what would be “needed.” This can be remarkably complex and contentious.

As Murphy et al. have noted,<sup>34</sup> one approach is to assume that current levels of health care use are appropriate. This is what Maynard has called the “fixed coefficient approach.”<sup>26,35</sup> This may or may not be valid. Projections would thus estimate how many providers would be required to maintain existing ratios of providers to population. Often, these projections would adjust for projected changes in the size of various age-sex groups. Additional complexities might recognize that age and sex are “merely indirect proxies for the health problems that ultimately determine the need for health services, and the association between differences in age and needs for care may change over time.”<sup>34</sup> Models might adjust for cohorts (e.g., those born at different points in time), or for patterns of disease. They do not tend to account for less predictable events, including changes in patterns of disease and treatment.

While recognizing that supply and demand may not be independent of one another, we accordingly next consider what is known about demand for health care services and how it can be measured.

## Demand: Data sources, and how to measure it

To do so, it is important to distinguish between three related concepts: need, demand, and utilization.<sup>16</sup> They can be defined as follows: “In health economics, the term demand is the amount of a good or service consumers are willing and able to buy at varying prices, given constant income and other factors. Demand should be distinguished from utilization (the amount of services actually used) and need (which has a normative connotation and relates to the amount of goods or services which should be consumed based on professional value judgments).”<sup>36</sup>

A number of possible approaches have been used to assess demand, each with strengths and weaknesses. As one leading scholar has noted, predicting demand has been “a difficult challenge.”<sup>37</sup>

One approach to measuring demand is to *extrapolate from hypothetical populations*. For example, Denton has used this approach to make projections of demand under various sets of assumptions.<sup>38,39</sup> Note that this approach often makes such simplifying assumptions as postulating homogeneity within age categories. For some purposes (e.g., making overall projections) this approach may be adequate, but may be less useful if the distribution of demand, and its drivers, are important in setting policy.

Another approach is to *estimate demand based on survey data*. One common data source for national data for Canada is a series of Statistics Canada surveys, particularly the longitudinal National Population Health Survey (NPHS), and the cross-sectional Canadian Community Health Survey (CCHS). However, neither was in place during the 1990-92 period this review was asked to focus on. (See Appendix 2 for more details.)

One example of using survey data to attempt to analyze utilization was Curtis and MacMinn.<sup>5</sup> This paper used data from the 1994 and 1998 NPHS, and the 2000/01 and 2003 CCHS, as well as the 1978 Canada Health Survey, and the 1985 and 1991 General Social Surveys. Utilization was based on self-report. The authors used this data to attempt to estimate the relationship between household socio-economic status (SES) and utilization, as well as other variables. They found that the most important predictor of utilization was health status, although SES did seem to have some impact, particularly on the likelihood of seeing a specialist. The main difference was in the probability of initial contact; once a physician visit was made, SES did not appear to make much difference with respect to the number of visits. (Although the original request used data reported in the Curtis and MacMinn paper to suggest changes in utilization over time, it is not clear that the data was intended, or appropriate, for this purpose. See Appendix 2 for additional details.) Other studies, outside the suggested time frame, have found similar relationships between utilization and need; for example, a study examining the probability of seeing a physician using the 2005 CCHS.<sup>40</sup>

Another approach – in our view among the most useful to assess utilization - is to use *administrative data*. One must recognize that utilization is an imperfect measure of demand and does not capture unmet need. However, it does give some sense of what

services were actually used. Unfortunately, administrative data is not always available, although availability and data quality are improving. Certain provinces (e.g., Manitoba, Ontario, BC) have a longer history of use of such data, and, as noted below, we were able to find some analyses for the period of interest.

Another approach has attempted to incorporate *needs-based planning*.<sup>34,41–43</sup> For example, rather than just extrapolating observed levels of service utilization, these models attempt to use indicators of morbidity, mortality, and self-assessed health. This approach often allows a more nuanced understanding of potential drivers of demand.

The more sophisticated models recognize that patterns of use are unlikely to remain static over time, or across populations. For example, To and Ungar<sup>44</sup> examined OHIP data for 1991/92 to 1997/98. They found that, although the number of children increased by 7%, pediatric OHIP billing volume decreased by 11%, as did OHIP expenditures for outpatient health services (5.7% decrease, from \$677 million to \$638.2 million) and annual per capita OHIP expenditures (17%, from \$241 to \$212 per child). Much of this reduced expenditure came from a decrease in medical and surgical admissions (although they did not have data on emergency department visits), but others came from changes in patterns of service delivery, including a decrease in the volume of allergy tests and fewer outpatient assessments and visits to consultants. An additional complexity is that the different patterns of utilization may or may not result in better health outcomes.

A series of studies on Ontario data, although they examined data slightly outside the desired time frame, found similar variability in patterns of practice.<sup>45</sup> Manuel et al.<sup>46</sup> used data from OHIP, CIHI Discharge Abstract database, and Ontario Drug Benefit program database to look at primary care (GP/FP) services in Ontario between 1992/93 and 2002/03. Their study focused only on physicians; they didn't have data on other team members who also provide primary health care. The analysis looked at averages rather than distribution. Although on average, each Ontarian under age 65 had 4 visits/year, and those over 65 had 7/year, it changed over time. The population grew, but annual numbers of visits to GP/FPs did not. This meant fewer visits per person, with physicians doing more at each visit. Hospital visits also declined. The authors concluded that they didn't really know how to interpret the lack of growth in volume. It might be interpreted as suggesting that there were shortages, but quality continued to improve, as did health outcomes (life and health expectancy), and rates for most chronic diseases (except diabetes and obesity).

Another example examined survey data from the NPHS and CCHS to assess population indicators of morbidity, mortality, and self-assessed health by birth cohort in Canada for older persons between 1994 and 2005.<sup>34</sup> Although this study noted that changes in what survey questions were asked, and how they were worded, often made it difficult to assess change over time, they concluded that the relationship between age and health had changed over time, with those born more recently 'aging' more slowly. Their results clarify that approaches using simple extrapolations based on age-sex groups would be misleading. As they wrote: "Although the numbers within older age groups

may be increasing in an aging population this does not mean that the needs for health care resources to serve these age groups are increasing at the same rate.”

In contrast, they noted that subjective indicators of need (poor self-assessed health) seemed to be a less reliable indicator than the more objective indicators. One suggestion was that perception of poor health “may be capturing a sense of well-being beyond more objective measurements of health associated with the increase in service provision within needs groups by providers seeking to maintain workloads.” Their findings were confirmed by an analysis of Manitoba data for the years 1985 to 2000, which confirmed that seniors are healthier now.<sup>47</sup>

As these studies recognize, even utilization rates are an imperfect measure of demand. They may underestimate (if there is considerable unmet need) or overestimate (if there is inappropriate care) what care is required. Particular emphasis is placed on heterogeneity, both of needs within population age groups, and of service output across providers. The needs-based approaches tend to focus on four elements: demography (size, demographic mix of population); epidemiology (risks to health in the population); standards of care (services deemed appropriate to address health needs); and productivity (rate of service delivery by providers).<sup>42,43</sup>

Further reinforcing the importance of considering both under service and over service, Lin and Goering’s analysis of FFS core mental health services in Ontario found that those costs increased at a slightly higher rate (12.7%) than did total health expenditures (12%) or total physician billings to OHIP costs (11%). However, the growth was largely a function of more people using those services; there was very little change in average visits per user, or average cost per visit. The authors concluded that it was important to ensure that services were being used by those who need them.<sup>48</sup>

Because non-medical determinants of health often affect the need for care, an economic downturn may have mixed impacts. On the one hand, since poverty is associated with poorer health, need might increase, particularly for those who lose employment. On the other hand, there may be a decrease in occupational-related injuries. Insurance coverage may also affect access, particularly for services where there is not universal coverage. Beyond the obvious implications of financial barriers deterring visits for uncovered services, particularly for vulnerable populations, there may also be spillover effects. For example, researchers have found a relationship between access to supplementary health insurance and the likelihood of using physician services, which one study has suggested is in part due to reluctance of individuals without such insurance to seek visits if they anticipate receiving prescriptions they would have difficulty in paying for.<sup>49</sup> Most countries do ensure universal coverage for medically necessary hospital and physician services. However, an economic downturn which causes people to lose prescription drug coverage may have the unintended consequence of slightly reducing their use of physician services. Nonetheless, the studies reviewed suggest that that these factors are not a major determinant in driving demand for health services, particularly if the focus is on total health expenditures.

Two important elements affecting health care utilization will next be considered. The first is the implications of heterogeneity within categories of the population. The second is the implications of changing standards of care, which in turn is linked to the way in which health care services are organized and delivered.

### ***Distribution: Taking account of heterogeneity within categories***

Much utilization is based on need. The data clearly shows that small proportion of people account for high proportion of health expenditures, with most people using relatively few health care services.<sup>50</sup> This is particularly true for hospital care. In well functioning primary care systems, most people are likely to have at least one GP/FP visit, but this accounts for a very small proportion of health expenditures. In previous work, our group has found that this holds for Manitoba; in all age-sex groups, health expenditures are highly skewed.<sup>7,51,52</sup> Similarly, in BC, a study using the British Columbia Linked Health Dataset (which captured physician claims, hospital discharge, and vital statistics data for all people over age 18 enrolled in the province's universal health care plan) for 1996/97 partitioned the population into three groups: non-users, high users (defined as being in the top 5% of costs for physician services), and other users. Note that this omits the non-FFS reimbursements (which amounted to 6.8% of physician expenditures in that year). They found that the high users (top 5%) accounted for almost 30% of physician expenditures. They had more encounters, saw more physicians, and were more likely to be hospitalized. Although average costs did increase with age group, high users were similar in cost, regardless of age. The high users appeared to be so because of high needs.<sup>53</sup> Similar findings emerged in a study of hospital use in 1989/90 for the provinces of New Brunswick and Saskatchewan.<sup>54</sup>

It is worth noting that many of the ways of analyzing demand do not capture such distributional effects. Often, they assume homogeneity within age-sex categories, and would not capture the impact of the high users. As an example of how misleading a reliance on means can be, a Manitoba study noted that, in 1999, 38% of inpatient hospitalizations, and nearly 2/3 of hospital days, were used by seniors. However, 78% of these hospital days were used by 5% of seniors. Most of the rest were quite healthy, and used relatively few services. They cautioned against extrapolating, instead concluding that with appropriate alternatives to acute care, the cost impact of the aging population was likely to be highly manageable.<sup>47</sup>

Another example can be extrapolated from the results of an analysis of 1992/93 to 2002/03 data in Ontario.<sup>55</sup> Although the authors focused on average numbers of visits, it did note that "one in four Ontarians did not show any physician visit billings through OHIP in 2002/03." A related study examining ambulatory physician care for adults for the same 1992/93 to 2002/03 period could also be interpreted as suggesting that use of health care was skewed. They examined average numbers of visits in particular age-sex groups, but the numbers hint at a skewed distribution. For example, 33% of males age 20-39 had no physician office visit billings in 2003/04, although the average number of visits for those seeing only GP/FPs was 3, and the average for those seeing GP/FPs plus other

specialists was 9. Another key finding in that study was that there did not seem to be any influence of SES on access to office-based primary physician care.<sup>56</sup>

One implication of such skewed distributions in systems that rely on competing insurers, rather than a single payer, is the challenges to access resulting from incentives for risk selection. One way for insurers to maximize return to their shareholders is to avoid those likely to be high cost.<sup>57</sup> Similar issues may arise if providers are paid through capitation, and incented to avoid high cost patients. A study of Manitoba primary care clinics for 1994/95 indeed found wide variations in how sick their patients were, and how costly they were likely to be.<sup>58</sup>

One conclusion is that demand is a complex concept, and varies somewhat, depending on the population, the jurisdiction, and on what services are available.

### **Supply: How to measure it?**

There are similar complexities in measuring the supply of HHR. Although much of the analysis has concentrated on physicians, with some analysis of nurses, there are a wide variety of workers required to provide health care services. HHR represents a sizeable proportion of health expenditures<sup>59</sup> and of the total labour force.<sup>60</sup> There is considerable variability in how these workers are paid, and how (and by whom) they are counted.

There is ongoing controversy as to how many workers are “needed.” Perceptions of the ‘right’ number have varied widely. In some years, there is a belief that there are too many; at other times, there is a belief that there are too few.<sup>61</sup> As will be noted, estimates depend on a broad assortment of assumptions about who will do what. Chan quotes the observation by Barer and Stoddart: “An ‘optimal’ number of physicians cannot be defined for policy purposes by technical means; this is ultimately a social rather than a technical judgement.”<sup>37</sup>

One question is how to define supply. One can examine *numbers* (head counts), *numbers per capita*, or *full time equivalents* (FTEs), defined in various ways. In turn, attempting to define an FTE generates problems in defining what the expected workload of a provider would be. For example, older physicians tended to see more patients per day than did younger physicians.<sup>62,63</sup>

The analysis could also look at what they do. Some focus only within a particular profession (e.g., analysis of physicians tends to examine the mix between GP/FPs and specialists, and sometimes by type of specialist; analysis of nurses may examine the sub-sector where they work), while others recognize that multidisciplinary teams allow for a variety of ways of providing services and consider the potential for substitution and greater attention to the skill mix in the workforce.<sup>64-66</sup>

A background paper for the Government of Canada’s work in developing a physician human resource strategy for Canada (Task Force Two) reviewed literature from

1990 to 2002.<sup>60</sup> It noted some major data, information, research and policy gaps at the time, including gaps in being able to estimate both supply and demand during that period. There were gaps in the availability of data about head counts, and variations in data quality across the provinces. In particular, there was minimal data about physicians not working FFS. They also highlighted the lack of consensus on how best to estimate physician supply. Other issues – also arising in the other papers reviewed – were in knowing what physicians and other providers did, and how services were delivered, particularly the implications of changing scopes of practice.<sup>67</sup> As noted in Appendix 2, in partnership with the provincial regulatory bodies, the Canadian Institute for Health Information has worked to improve the data bases. Reliable data bases are now available for physicians, nurses, and rehabilitation professionals, with work underway for other professions. In addition to drawing on some provincial studies (which presents further issues with respect to variation in how things were measured and defined), this report will accordingly note some limited conclusions from more recent time periods.

One could further the analysis by considering how these providers are *distributed*. One could look at distribution by geographic area (especially urban/rural),<sup>68</sup> as well as variation by where they work (e.g., sub-sector), and/or by the type of patient served (particularly issues related to socioeconomic status and other determinants of health). Again, there are problems with data, which did not always exist for the period of interest (especially for nurses, and even more for other health professionals).

## ***Supply: Physicians***

### *Physicians: Canada*

Chan reviewed some national policy strategies addressed at physician numbers in the 1980s and 1990s.<sup>37</sup> The tension between surplus and shortage was evident. Physician organizations had developed models of physician supply that predicted a massive physician shortage, while others argued that it was more critical to examine the mix of who would provide services, and diminish fragmentation within the system. Between 1964 and the early 1990s, supply had increased; the number of medical school places had expanded in anticipation of rapid growth in population, and when this projected growth didn't materialize, ratios of physicians to population increased. However, the growth in numbers did not appear to result in physicians going to underserved areas; one review from the 1970s on physician-population ratios concluded that increases in physician numbers had little impact on improving distribution, but that the increased supply did increase pressure to improve fee levels to ensure that physician incomes would not be adversely affected.<sup>69</sup>

One reaction to these trends was to move the dialogue from shortage to surplus; between 1980 and 1991, three separate Canadian reports had recommended decreasing the number of graduates from medical school.<sup>60</sup> The 1991 Barer Stoddart report<sup>70</sup> made a number of recommendations, including reducing medical school enrollments. Some of these were adopted; most were not.<sup>71</sup> In 1992, the Deputy Ministers of Health of the

Canadian provinces/territories signed the Banff Accord, which agreed to a 10% reduction in medical school enrollments. However, the result of other trends then moved perceptions to perceived shortages, which dominates the current discourse.

CIHI tried to define what was meant by “the practicing physician community in Canada.” One of their papers looked at the period 1989/90 to 1998/99. They noted that a number of methods could be used, including counting numbers, or counting full time equivalents (FTE). In return, FTEs could be defined in terms of those billing above a certain threshold (in money, or time). They analyzed billing profiles, arguing that the key focus should be on “the effective supply of physicians for clinical needs, not on a hypothetical available supply since many physicians have responsibilities outside of clinical care areas in administration, teaching, research and in other business ventures.”<sup>72</sup> They suggested that the data showed that, at any one time, “there may be up to 15 or 20% of FFS physicians who are “inactive” from provision of clinical services, either temporarily or permanently even though they do maintain FFS activities at other times.”<sup>72</sup> In turn, this would result in an overestimate of supply. However, as a number of the papers reviewed noted, to the extent that the datasets did not capture those working other than on a FFS basis, the supply would be underestimated. The importance of these factors clearly varies over time, and across jurisdictions. For example, one report noted both that the proportion working other than FFS was increasing, and that there was variation across provinces; at the time of their study, over 20% of physicians in some provinces were participating in Alternative Payment Plans (APPs), with the proportions highest in Newfoundland, Nova Scotia, and Manitoba (20-30% in 1999/2000) and lowest in Ontario and Alberta.<sup>73</sup> Physicians also worked in blended funding models, with varying proportions of their reimbursement coming from different sources, and hence being captured in different databases.

One estimate for 1984/85 was that there were approximately 39,400 physicians in Canada. By 1993/94, this had risen to just over 50,000 (their figure 5). It stayed stable to 1998/99. In the earlier period (1984/85 to 1989/90) physician growth was higher than population growth.<sup>74</sup> One study which examined physician supply across Canada between 1986 and 1994 found that supply had kept pace with population growth and aging, although there was considerable variation across specialties and across provinces.<sup>75</sup>

After 1993/94, however, the policies intended to adjust supply meant that population growth was higher than physician growth. Ratios changed accordingly. One key conclusion is that *change depends on the starting point*. In the Birch study cited above, the 1998/99 ratio was basically the same as 1989/90, and higher than the starting point of the study (1984/85), but less than the peak of 1993/4.<sup>74</sup> Whether the glass is said to be half full, or half empty depends in large part on the analyst.

The literature also stresses that physicians were not identical; physician workload, workflow, and output varied. Factors CIHI identified as influencing these included: “gender, age, specialty, size of community, place of graduation, clinical demands, number of physicians, as well as personal considerations.”<sup>72</sup>

Another study<sup>73</sup> found the decrease particularly pronounced among FFS physicians providing primary care. Between 1993/94 and 1998/99, number of FFS physicians per population decreased by 4.4%, but there were 7.8% fewer primary care physicians and 1.3% fewer specialists. Again, measurement difficulties may explain some of this, since those physicians on alternative practice plans were not captured by that study.

There were also some demographic trends that would be expected to influence supply over time. For example, Crossley's cohort analysis of Canadian GP/FPs for period 1982 to 2002, which defined cohorts in terms of their year of graduation from medical school, did not find a strong cohort effect for males, but there has been a secular decline in hours of direct patient care. Females on average work fewer hours than males; there was an age effect but no strong cohort effect. He accordingly concluded that the main reason for the decline in hours of direct patient care was changing behaviour of male GP/FPs.<sup>76</sup>

One excellent analysis of why perceptions of surplus turned to perceptions of shortage was Chan's analysis of the physician supply in Canada in the 1990s.<sup>77</sup> He found that physician supply peaked in 1993 and then dropped 5%, which meant that they reached the same level as in 1987. He concluded that 25% of the estimated decline in physician supply resulted from an increase in the amount of time doctors spent in postgraduate training. This was attributed both to the 1993 requirement of two years postgraduate training (rather than the former one year) for doctors wanting to enter family practice, and to a shift to a higher proportion of specialists (vs. family physicians) being trained. Another 22% of the decline was due to fewer foreign doctors entering Canada, and 17% was due to more physicians retiring. Contrary to much discussion about this topic, only 11% was due to the medical school enrolment cuts, although their impact would certainly be felt over time. His conclusions stressed the importance of looking beyond straight head counts. The press release on his findings summed up the following policy implications. First, "the proportion of Canadian graduates starting practice as a general or family practitioner (GP/FP) dropped sharply, from a high of 80% in 1992 to 45% in 2000. GP/FPs comprised 53% of the physician workforce in 1993, compared to 51% in 2000. The relative drop in GP/FP numbers may help explain why some patients report difficulties finding a family doctor." The smaller number of younger physicians, attributed to the increased training time, affected what was being done. "It is the young physicians, however, who are more likely to perform obstetrics, work in emergency departments, and provide locum relief for physicians who need a break." Workload was up "by 7 to 8.6% (depending on specialty) over the past decade, perhaps to compensate for the decrease in physician supply. A large proportion of doctors now report that they want more time for themselves or their families." Chan concluded that "A variety of different policies may have contributed to current perceptions and realities. 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." Evans and McGrail concur; they stress the importance of

distinguishing between the supply of services, and the supply of providers, noting the considerable variation in the number of hours physicians work now, compared to the hours they had usually worked in the past.<sup>71</sup>

Further highlighting the interdependence of these factors, note that, to the extent that adding training places would be producing more providers, Murphy has concluded that there was a probability that service levels would “expand to absorb this supply” with consequent implications for health costs.<sup>34</sup>

We next review some studies looking at physician supply in individual provinces; these provinces were selected because studies were conducted that analyzed data for the period of interest.

#### *Physicians: Ontario*

Chan<sup>37</sup> also examined supply of active physicians in Ontario; this analysis looked from 1991/92 to 1997/98. In addition to the reductions of training slots noted above, Ontario also put in place temporary restrictions on new billing numbers for out-of-province graduates between 1993 and 1996. In addition, between 1997 and 1999, the agreements between the Ontario Ministry of Health and the Ontario Medical Association incorporated financial penalties for recent graduates who wanted to establish their practice in areas designated as being overserved.

Chan’s analysis is based on Ontario Health Insurance Plan (OHIP) billing data. Note that, as in most provinces/territories, there is a standard fee schedule, which is negotiated between the provincial medical association (in Ontario, the Ontario Medical Association) and the provincial Ministry of Health. Accordingly, this database excludes physicians not billing on a FFS basis. Note that although this was not a major issue at the time, it is becoming more critical. Chan uses 3 methods for counting doctors:

1. A simple head count of doctors billing OHIP. Note that 15% of these doctors have very low annual billings (which he defines as <\$35,000); they account for 1.5% of total billings, and can be classified as a relatively inactive group, doing research or administration with a “modest clinical practice.”
2. Active physicians, defined as only those billing above a set threshold (here, \$35,000).
3. FTE physicians which weights physicians, depending on how their activity compares to physicians near the mid-range of physicians in the same specialty. In addition to adjusting for those doing fewer services, this approach allows very high billers to be counted as more than one FTE.

Chan found that, contrary to general impressions of shortages, there was a steady growth in physician supply between 1991/92 to 1997/98. However, if one adjusts for growth and aging of the population, the physician-population ratio peaked in 1993/94, before returning to close to the 1991/92 level which was the starting point for this paper. Again, this paper reveals the critical importance of the baseline year selected. Chan found that “among both GP/FPs and specialists, the active physician to population ratio was

almost identical in 1991/92 and 1997/98, to within one percent. Using the FTE measure, there is a slight drop of 1.3 per cent in GP/FPs and an increase of 5.2 per cent in specialists.” However, there were wide regional variations, which did not improve over the time frame analyzed. In consequence, physicians working in areas with relatively low physician supply tended to have a heavier workload.

He also found that the average age of Ontario’s doctors was increasing; the proportion of FTEs under age 35 declined from 16% in 1991/92 to 11% in 1997/98, and the proportion over age 65 rose from 6% to 8%. There were also more women, and they tended to have lower workloads (although it is important to recognize that this is not just a gender effect; other studies have found that younger men have tended to adopt similar workloads to those of women). There was a decreasing comprehensiveness of practice.<sup>78</sup> His conclusion bears emphasis:

“This analysis suggests, however, that the root causes of any perceived shortages cannot, and should not, be simply ascribed to an overall decline in the number of doctors. In actual fact, the physician supply has remained remarkably stable over the seven-year time period of this study. Physician supply actually grew faster than population growth from 1991/92 to 1993/94, before receding to the point where physician supply per patient is similar in both 1991/92 and 1997/98. This is the case for both specialists and GP/FPs. Furthermore, this stabilization of physician supply has come on the heels of a continuous rise over the preceding 25 years in the physician-population ratio across the country, from about 11 per 10,000 persons to its current level of 19 (using head counts for historical comparison).

Part of the controversy about whether or not there is a doctor shortage may arise from the method used to count physicians. An analysis conducted by staff of the Ontario Medical Association recently asserted there was a net loss of some 500 GP/FPs from the province between 1993 and 1997, using the head count method. This apparent loss can also be seen in Exhibit 1 of this study. This analysis, however, suggests that this was a net loss of primarily low-billing, or inactive, physicians who have a small impact on total utilization. The number of active physicians billing over \$35,000 per year actually rose during the same period. The net loss of these inactive physicians may in part be due to restrictions in access to billing numbers for out-of-province doctors, who may have previously been working in Ontario periodically as locums. Another possible explanation is that a change in licensing rules prohibited specialists- in-training from moonlighting occasionally as GP/FPs. Lastly, more low-billing older physicians may have decided to retire during that time period, which represented the height of the expenditure control era in Ontario.”<sup>37</sup>

Chan’s main point was that the issue was less a shortage (which he didn’t find) than maldistribution – they were not located in areas of greatest need. He also found that government policies could be influential; there was a modest increase in the Northern Ontario regions, which were targeted by specified policies aimed at increasing supply,

and less so in the Southern Ontario rural regions, which actually lost some providers. Chan's main conclusion is evident in much of the literature reviewed. It is more important to look at *what providers are doing*, not just *how many there are*.

Similarly, an analysis of trends in FFS billing patterns among Ontario physicians for 1989/90 to 1994/95<sup>79</sup> noted a complex series of policy changes affecting OHIP billings, including both retroactive payments for delayed implementation of price increases, and 'clawbacks' for utilization exceeding negotiated ceilings. The overall trends included an increase in the supply of active physicians (most rapid between 1989/90 and 1993/94), and some fluctuations in average billings per physician, and average gross payments to physicians. There were also differences by specialty, by location of practice, by age and sex of the physician, and by individual billing volume.<sup>3</sup> One clear conclusion is that government policy could have consequences (albeit not always those envisioned by policy makers). Ontario's 1993 Social Contract legislation set caps on total FFS expenditures for the province's physicians; coupled with the increase in physician supply, this led to a decrease in the average payments to each physician. The resulting dissatisfaction among physicians made the policy unsustainable, particularly since those physicians who voluntarily restrained their utilization suffered financially, whereas those who did not profited.<sup>80</sup> In the first year of the cap, billings declined, and the clawback was only \$16 million (0.4% of billings). However, 1994/95, billings increased considerably, which resulted in a fee holdback of 4.8%. Considerable conflict resulted between the government and physicians, who believed that they were being asked to work harder for less money. Less attention was being paid to the distribution across providers; a minority of providers accounted for a large and growing proportion of the billings. The analysts pointed out that there was a disconnect between two policies implemented by the provincial government; the FFS system continued to give individual providers an incentive to maximize their billings, whereas the fixed pot of funds disadvantaged those providers who attempted to limit their services to what they decided was needed by their patients. Additional problems arose because there were no incentives for quality, and no way to ensure that savings in one sub-sector could be used to cover costs generated in other sub-sectors (e.g., it was difficult to move resources from hospitals to the community even as patient care shifted).<sup>3</sup> These controversies led to the eventual termination of the policy.

A number of subsequent studies, focusing on data slightly after the desired period, found additional complexities in determining physician supply. For example, Schultz et al.<sup>81</sup> examined physician to population ratios for Ontario for 1993/94 to 2003/04. They found that these ratios were stable or declined slightly over that period. However, there was a shift in who did what work (e.g., decline in the number of GP/FPs who did obstetrics), which meant that the comparisons over time were not always valid. The ability to count providers was also complicated because GP/FPs were often affiliated with a variety of groups, and worked in different venues. The study expressed some concerns about the aging of the GP/FP workforce (although this paper did not reflect the increase in medical school places which subsequently occurred), and noted that there was considerable geographic variation, which showed some response to government policy initiatives, such as increases in Northern Ontario, where government tried to recruit and

retain physicians. Indeed, Ontario's expansion of undergraduate medical supply also attempted to address maldistribution; it started a northern medical school, and funded four distributed medical campuses.

Another study examining the 1992/93 to 2002/03 period in Ontario<sup>55</sup> revealed the importance of which metric was chosen. For example, they found that the total number of GP/FPs increased by about 10% over that period, while the number per 10,000 population fell slightly, and there was no change in the number of visits. The authors did express concerns about the aging workforce, and the tendency for medical students to prefer specialty medicine rather than primary care. They also noted some changes in how care is delivered (e.g., more interdisciplinary care, shared care).

Denton et al.<sup>82</sup> made similar points in their comparison of price indexes for physician services in Ontario, 1992 and 2004. They noted that total payments to FFS physicians rose by 31% overall during that period. In contrast, the population of Ontario increased by 17.5% during that period, although the growth rate differed by age group (e.g., 7% increase in those age 0-14, and 50% in those 75 and over). They found that price indexes (which are controlled by fee schedules) increased less rapidly than did indexes of general inflation. Accordingly, the greatest share of increases in physician expenditures they found came from quantity increases, both from a 15% growth in services per capita (especially for older adults – defined as those 50 and over, although the paper did not look at the distribution within the age categories), and also an “increase in labour productivity for physicians that is somewhat greater than the corresponding increase for the economy at large.”

The paper also examined perceptions of shortages. They concurred with Chan, observing that the population/physician ratio rose during the 1990s, increasing by about 8% between 1990 and 2003, or 13% if they adjusted for age distribution. At the same time, the quantity of services increased by 35%, translating into an increase in labour productivity (output per physician) of 25%, or 1.9% per year. Real GDP per person employed in Ontario rose 1.5% per year. They think “the per capita increase took the form of a higher standard of treatment for patients being treated rather than a wider distribution of treatment among the population – a deepening as opposed to a broadening, so to speak.” The extent to which this led to improvements in health status was not addressed.

#### *Physicians: British Columbia*

Barer et al.<sup>83</sup> examined BC data for 1985/86 to 1996/97 about all FFS payments to physicians in each year; analyzed at the level of the individual patient. This is an improvement on studies that just looked at aggregated patient groups (age-sex, etc.) They looked at: number of physicians seen by each patient, number of visits per physician, number of services rendered on each visits and average price of those services. The data was inflation-adjusted to 1988 fee levels, and controlled for demographic changes by using direct age-standardization. They found several partially-offsetting trends. “Although total expenditures nearly doubled (rising 86.3%), the explanation is simple.

Population growth, routinely built into budgets, accounted for over half the increase; the rest of the increase just matched the general rate of inflation. Use of services did rise modestly: 12.8%, or 1.1% per year on average. But this was almost exactly offset by the decline in the real value of fees. Population aging accounted for only about 0.2% of the growth in expenditures per year, or 2.1% over the 11 years.” The increase in the average cost of age-adjusted per capita services was more pronounced for medical specialists (31.8%) than for GP/FPs (3.3%), much of which they attributed to a decline in inflation-adjusted fees, and limits in the number of additional services which could be provided given a finite number of hours in a day. They did find a change in service mix. They did not find that patients were “abusing” the system.

### *Physicians: Manitoba*

Manitoba also showed a change in patterns of use of health care. Between 1985 and 1997, the number of physicians per 1000 residents increased by 6.5%. Over that period (1985 to 1998), there was a 6% increase in doctor visits per 1000 people (3% after adjusting for aging), and a 15% increase in prescriptions per resident.<sup>84</sup> Indeed, one attempt to do needs based planning, based on 1993/94 and 1994/95 data, concluded that Manitoba had more than enough generalist physicians, with the possibility of an oversupply in the major urban centres (Winnipeg and Brandon).<sup>85</sup> A companion study used three approaches to assessing the supply of specialist physicians: consideration of recommended population/physician ratios; benchmarking against other Canadian provinces; and looking at the level of care. The analysis also considered aging of both providers and patients, and special issues related to urban/rural distinctions, and high needs populations, particularly those in the rural North. In general, they found that supply was adequate, although they noted the many uncertainties associated with this sort of planning and called for careful monitoring to see where policy change might be required.<sup>86,87</sup> One key observation was that rates of service delivery varied; accordingly, the number of general surgeons ‘needed’ in rural areas was different, depending on whether they used a ratio or a population-needs based approach, and the extent to which services would be repatriated to local hospitals or delivered in other regions.<sup>88</sup> They also found a relationship between supply and utilization, with residents of the main city, Winnipeg, having double the number of doctors, and somewhat higher contact rates with ambulatory care in 1991/92 than did rural residents.<sup>89</sup>

A recent Manitoba study noted that use of a provider/population ratio was too crude a measure; it did not take into account characteristics of the population, or productivity of the providers. They accordingly separated the two and computed what they termed the Equivalent Services Measure (ESM).<sup>27</sup> Their projections used data for 1984 to 2006 (for GP/FP), or 1991 to 2006 (for paediatrics, general surgery, and orthopedic surgery). The models sought to incorporate such factors as: the changing age of the physician workforce, the proportion of women, the trend for younger physicians to work fewer hours, changes in reimbursement from FFS to alternative payment plans and the implications for their practice patterns, possibilities for variations in who provides particular services, and geographical distribution. Recognizing that it was difficult to determine the ‘right’ number of services, their predictions suggested a range of possible

values. In general, they predicted that more services would be needed, but noted the considerable uncertainty. As one example, at the time of their study, there were 71 general surgeons in Manitoba. Under one set of assumptions about productivity, by 2020 they would only need 63; under another set, they would need 80. Similar uncertainties existed about how many pediatric services would be needed. The study indicated that there was variation in how well the models predicted actual use (in most cases, actual use was less than that predicted by the models). Its emphasis on sensitivity analysis and clarification of assumptions is, in our view, a model for other modeling exercises.

### ***Supply: Nurses***

Nurses can be divided into registered nurses (RNs) and licensed practical nurses (called variously LPNs or RPNs, depending on the province). Because nurses must be registered with their provincial/territorial regulatory body (College of Nurses), registration data can be used to track supply. As noted (Appendix 2), data about numbers, employment status, and areas of employment are now available, although they tend to start from about 1996. Considerable efforts have also been made to standardize definitions across provinces/territories to allow better aggregation and comparison. This work is evolving, however, and longitudinal comparisons can still be tricky, even within provinces.

Nurses are essential to assuring a high quality of care, although there is some dispute as to the extent to which there are diminishing marginal returns with greater investment in highly trained workers.<sup>90</sup> Over 50% of nurses are employed in hospitals, with the others working in community care, long term care, etc. A series of studies by our group using College of Nurses of Ontario (CNO) registration data for Ontario found that sub-sectors varied in their ability to retain nurses. We defined “stickiness” as the probability that a nurse employed in a given setting in year  $t$  (where setting was variously defined as nursing, or as a particular sub-sector, but not as a particular workplace) was working in the same setting in year  $t+1$ . We found that hospitals were highly sticky; in contrast, in Ontario, the community sub-sector was not. Indeed, nurses displaced from hospitals were more likely to leave nursing than to move to the community.<sup>91-93</sup>

A number of studies have examined nursing supply forecasts.<sup>94-103</sup> One review of the nursing workforce in Canada found that the number of RNs decreased by 2.8% between 1992 and 1998, and the number of LPNs decreased by 8.4% over the same time period.<sup>104</sup> There was a substantial decrease in admissions to LPN training programs (over 35%). One key driver was that demand for LPNs decreased over time, as hospitals dealt with sicker patients, and the community sector and long-term care homes attempted to save money by replacing professional staff with personal support workers. In addition, casualization of the workforce decreased the proportion with full time work (it was estimated that only half of nurses were working FT in 1998). One consequence was an exodus of nurses, both to other jurisdictions, and from nursing. The study noted that over 10% of RNs who graduated in 1995 were practicing in the US in 1999. One estimate was that the downsizing of hospitals after 1993 had resulted in the layoffs of 10,000 nurses

and 20,000 other hospital workers.<sup>105</sup> A similar pattern was seen in the economic downturn of 1999-2001.<sup>91,106,107</sup>

The stock flow model was used in some studies to project nursing HHR requirements.<sup>108,109</sup> A considerable shortage was predicted. The model suggested that between 1993 and 2011, the population would be expected to increase by 15.8%, but the demand for nursing services by 40.6%. Projecting until 2016, population would increase by 19.6% and demand for nursing services by 53.4%. The model assumed that a number of trends would not change, including that care would remain largely in the acute care sector, and that the majority of nurses would continue to retire at age 55. Clearly, changing the assumptions would change the findings.

Another set of issues links supply and demand; it relates to what is sometimes called “health care production functions,” that is, how are services delivered?<sup>110</sup> Here, changes in how care is organized can have clear implications for the required supply. For example, the number of hospital beds has been cut in many jurisdictions, which in turn affects how doctors and nurses will be used. In Manitoba between 1985 and 1998, there were changes in standard of care, and reductions in the use of hospital beds. Hospital use fell by 20%, largely associated with shorter lengths of stay. Beds were closed. Those patients still in hospital were sicker, and on average required more care. Implications for employment of nurses were clear. Mortality rates fell, and the population was healthier. One exception was residents of Northern Manitoba. The overall conclusion is that the system was working well, despite a reduction in hospital use.<sup>84</sup>

One study – falling slightly outside the selected time frame – examined services delivered by Ontario acute care hospitals between 1994/95 and 1998/99. They found that although the number of beds was cut by over 20%, the number of inpatient episodes fell by only 12.6%, meaning more inpatient episodes per bed. Presumably, these patients were sicker. The number of registered nurses (RNs) fell by 10.9%, resulting in a drop of inpatient episodes per nurse. However, once allowance was made for the increase in case severity, they found that nurses faced an increased workload. In turn, this appears to have led to burnout, and challenges for nurse retention.<sup>110</sup>

The impact of the economic downturn was particularly pronounced for nurses. As noted, they tend to work as employees, and make up a large portion of a hospital’s human resource budget. The organizations for which they work tend to rely very heavily upon government funding. As Vujicic and Evans noted, “Beginning in 1992, governments throughout Canada began reducing expenditures in an effort to eliminate fiscal deficits and reduce their alarmingly high debt burden. As part of this deficit-fighting era, governments reduced hospital expenditure levels quite dramatically.” The result was large staff layoffs, which, in part because these workplaces tended to be unionized, had a disproportionate effect on those in the youngest age groups.<sup>111</sup> That study also noted that there was no audited data on RNs employed in hospitals prior to 1994, although they did find data for the provinces of Ontario, Alberta, BC, and Quebec. National data, however, showed a steady increase from the early 1980s to 1993. In 1993, there were 235,625 RNs employed in nursing. By 1998, this was 227,651. This translated into an average annual

increase 1980-93 of 4.0%, but a decrease 1993-98 of 0.6% (2.2%/year for hospitals). In 1998, this stabilized.<sup>111</sup> (The decrease around 2000 was even larger, although this is beyond the scope of the study.)

Ontario went through similar cuts.<sup>6</sup> Administrators seeking to manage within budgets will often focus on the flexible budget items; this often results in layoffs of nurses, who have to be added back in subsequent years at higher cost. The same pattern, however, is currently underway, with Ontario hospitals laying off nurses, cleaners, and medical laboratory technologists (MLTs), among others. History has shown this to be an often short-sighted approach.

One interesting possibility is that an economic downturn may have a positive impact on the ability to retain nurses. This would be related to what economists term “nonwage income” – often the earnings of a spouse. For example, a US study suggested that, to the extent that economic downturns caused an RN’s spouse to lose his or her job, the RN would have an economic incentive to spend more time working.<sup>112</sup> They indeed found that, as overall unemployment rates rose, hospital RN vacancy rates declined. This held for the early 1980s, as well as for the 1990-91 period of interest. However, pressure to increase ‘efficiency’ by reducing nurse hiring and restraining nurse wages soon reversed the trend.

### ***Supply: Other health professionals***

Much health care is delivered by teams, and planning cannot be done in isolation. Interdependence is common, yet good data is harder to obtain once one moves beyond physicians and nurses.

There are certainly examples of boom-bust cycles in other professions. As one example, a perceived oversupply of MLTs led to closure of MLT training programs, and subsequent problems in maintaining quality laboratory services. Ongoing work by our team using the Ontario MLT database is demonstrating that the majority of them still work in the hospital sector, even though nearly 50% of lab tests are done in community based for-profit labs. Planning is complicated because so little information is available on who is delivering these services, and the extent to which labour substitution is compatible with quality care. For the most part, non-regulated providers are difficult to track, and health care is making increasing use of allied health/assistants. Good data about how best to use HHR is often elusive (although note one extensive review on different ways to use HHR.<sup>113</sup>).

Landry et al. have stressed the need to ensure that planning also apply to other health professions; their article focuses on physical therapy.<sup>114</sup> One analysis of the supply of registered physical therapists (PTs) found that the supply rose from 4.3 PTs per 10,000 population in 1991, to 5.0 in 2000. However, the supply varied considerably across jurisdictions, and the average dropped by 4.0% between 2000 and 2005.<sup>115</sup>

## Policy options

There are also a variety of ways in which policy can respond to ensure that health needs are met; these are not mutually exclusive. Indeed, Pong's review of a series of policies attempted in Ontario to overcome physician shortages in Northern Ontario over the period from 1969 to 2004 found that government has used many strategies; he likens physician maldistribution to a chronic condition, which must be managed, rather than to an acute condition subject to cure.<sup>116</sup>

The easiest solution is to provide *more* of everything. Supply can be increased by combinations of increasing training, affecting recruitment and retention (including retirements), and changing productivity.

Canada has indeed done this; since 1999, there have been increases in first year medical school enrollments, and the number of training positions for nurses, medical laboratory technologists, medical radiation technologists, midwives, among others have also increased. Canada has also increased the number of foreign-trained providers licensed to practice; there has also been a decline in the number of Canadian physicians leaving the country.<sup>117</sup>

A short-run possibility is to take advantage of labour mobility. For example, as of 2005/06, more than 22% of the doctors in Canada were foreign-trained (and 37% were foreign-born). The figure for nurses was less, with 7.7% foreign-trained and 20% foreign-born.<sup>118</sup> Note that a substantial proportion of Canada's population consists of immigrants, so this does not necessarily represent 'poaching' foreign workers.

Supply can also be targeted. For employees of organizations, this can be reflected in modifying budgets. For independent FFS providers, this may include setting requirements affecting where doctors can practice, or modifying payments depending on where physicians are located. The UK has used this approach.<sup>119</sup>

Coupled with this, policy makers may also wish to decrease demand and/or improve efficiency. A healthier population should require fewer acute care services, and ensuring that care is high quality and appropriate may involve the recognition that more is not always better. Certainly, the variations in utilization found in the literature were not always associated with corresponding differences in outcomes.

Regardless of the policy choices, they can always benefit from being based on evidence. In turn, that requires good data. One review conducted for the Romanow Commission by the Canadian Policy Research Networks stressed the need to improve coordination and begin integrated planning. It emphasized how much its review showed was still not known.<sup>120</sup> Similar comments about the absence of a comprehensive approach to HHR in Canada were made in a review by Mable and Mariott for Health Canada in 2001.<sup>121</sup> Similarly, an environmental scan of views of key stakeholders on HHR in Canada, conducted by the Health Council of Canada for the 2005 National Health Human Resources Summit analyzed current views and initiatives, categorized into: education and

training, scopes of practice, workplace practices, and health human resources planning.<sup>122</sup> The review reflected a strong sense that data gathering for all professions other than physicians and nurses was primarily limited to tracking the numbers of personnel, although CIHI was working on creating a minimum dataset. Information was also more limited, both for certain professions (they noted pharmacists, midwives, and chiropractors), and particularly for unregulated workers. Although most providers unsurprisingly suggested a need for more HHR and a wider scope of practice, it is worth noting that the Canadian Medical Association also stressed the importance of avoiding boom-bust cycles through better integrated planning. Similar comments were made by Birch et al. in their analysis of nursing.<sup>110</sup>

### **Conclusions: Likely impact of the economic downturn?**

As Birch et al. have noted,<sup>73</sup> the earlier approach to HHR planning was to assume a direct connection between demography and the number of professionals needed. In turn, projections of shortfall or surplus were made, and translated into training needs. These have proved less than helpful.<sup>74</sup>

One key problem is that they ignore both need and delivery. Care can be delivered in multiple ways, and this in turn affects what resources will be needed. Birch does note that if care is allocated on the basis of need, epidemiology will indeed be key. Conversely, should funding be private and access based on ability and willingness to pay, economic factors may be determining.

The literature suggested several possible implications of economic downturns. One possibility was that it may increase supply through a variety of mechanisms. HHR may be willing to work more. Physicians may delay retirement<sup>117</sup> Nurses may return to work. A second possible implication was that demand may change – although the literature reviewed does not suggest this as a major factor. However, the most important impact evident in the material we reviewed was that payers may be less willing and/or able to pay providers, and that this may have negative long-term consequences if not done carefully. It further suggest that short-term savings from layoffs may instead greatly increase long-run costs, particularly if the HHR lost to the system must subsequently be replaced, usually at higher cost. It also suggest that the boom-bust swings from perceived shortage to perceived surplus are inefficient.

Health care is usually delivered by highly trained professionals. This means that it takes many years to train workers. Ramping up supply does not happen quickly; conversely, losing supply can be extremely wasteful in the long term. A common theme in this literature is that methods of forecasting HHR needs are still subject to uncertainty. Projections are highly variable. Another recommendation is that improvement is both necessary and desirable. Data should be available and comparable; the ongoing efforts to improve data quality are a valuable step in that direction. Uncertainty should be recognized, ideally through transparency about the assumptions being made, and the clarity as to the impact of variations in those assumptions (e.g., sensitivity analysis). Rather than focusing on particular numbers, planning should focus on health needs, and

incorporate such factors as promoting health and managing demand, changing modes of treatment (including new technologies), new service delivery models, changing scopes of practice, and changing practice patterns.<sup>117</sup> The policy implication is that planning must recognize a long-run steady state, rather than focus on short-term cycles. Given the many uncertainties, incorporating sensitivity analysis explicitly is a crucial way of transparently accounting for the uncertainties in so many of these variables.<sup>25</sup>

## **Appendix 1: Original Request**

**What was the impact of an economic downturn on the supply and demand of health workers (physicians and nurses) in Canada?**

**Did demand (in the form of utilization rates) increase during the 1990-1992 recession?**

**How did supply of HHR change over this time period? What were the drivers for this change?**

Determining the relationship between the economy, the health of the population, and the effect(s) on the supply of health care workers in Canada poses unique methodological challenges given that key indicators, such as physician visits, fall almost exclusively under this country's publicly funded system. As such, they are not subject to rationing behaviours and other changes in service utilization patterns by patients should they lose their jobs and thus be unable to pay for these services privately.

Past research on this issue has suggested that economic forces do influence demand (as measured by physician utilization rates) in Canada. Curtis and MacMinn (2007) found that in 1991, at the height of an economic recession, 84.6% of Canadians contacted an MD, a 5.1% increase from 1978 (baseline), then decreased as recession ended. Despite higher proportion of Canadians visiting a GP, however, the number of physicians remained relatively constant during this period. Moreover, in 1991, at the height of the recession and amid record levels of physician visits, medical schools cut enrolment by 10% in response to a perceived surplus, and measures were undertaken to reduce the number of IMGs practicing in Canada (CIHI, 2004). In relation to other health professions, such as nursing, the number of RNs in Canada increased steadily from 1966 to 1992, followed by a steady decline. Again, despite greater demand, the number of practicing nurses remained steady during this period, the number of nursing graduates and admissions declined significantly (an average of 6% decline in admissions in both 1990 and 1991), and the numbers of RNs working in casual employment situations increased (CAN, 2004). Thus, it would seem that within the context of Canada's publicly funded health care system, greater utilization associated with economic downturns may not necessarily translate into greater supply or perceived need for more practitioners.

A significant literature exists suggesting that the impact of the 1990-1992 recessionary period on Canada's health human resource supply may be attributed not to demand, but to the fact that jurisdictions, who have primary responsibility for the financing, organization and delivery of health services were also struggling with escalating costs and burgeoning deficits. In response, virtually every jurisdiction responded by restructuring existing health systems. A central feature of this process was to reduce costs associated with HHR through lay-offs, downsizing and changing the way that care was organized and delivered. Thus, unlike market-based health systems, which may be more

sensitive to consumer demand and spending patterns, the effect of economic forces on HHR supply may be more strongly influenced by macroeconomic forces.

This research proposes to examine existing literature examining the impact of the 1990-1992 recession on 1) physician utilization rates; 2) supply of HHR in Canada; and, 3) policy responses, and their longer term implications, to these economic forces.

## Appendix 2: Data issues

In Canada, health care is under provincial jurisdiction. The Canadian Institute for Health Information (CIHI) has attempted to build national data sets, but is often dependent upon what data is collected and supplied by provincial governments. There is considerable variation by province, particularly for earlier years, although more recently there have been commendable efforts to improve data collection.

The Canadian Institute for Health Information is now a major source of information about HHR in Canada, particularly physicians and nurses.<sup>72,123–133</sup> More recently, it has done considerable work in ensuring comparability of data across the provinces.<sup>134–138</sup> It has also augmented its studies of physicians and nurses with analyses of other health professions, including occupational therapists,<sup>139</sup> pharmacists and<sup>140</sup> physical therapists.<sup>141</sup>

However, most efforts to use data for analysis has found that there are also issues surrounding definitions, and data is not always defined in a comparable matter. In some cases, no data is available. In others, attention to fine print is essential. These caveats were even more important for the period under discussion.

As one example, the Registered Persons Database for OHIP is known to overestimate the number of people living in Ontario, in part because it may be slow to delete those who died or moved. In turn, this means that estimates of service use based on this denominator need to be adjusted.<sup>46</sup> The bottom line is that CIHI did not have good administrative data available for much of the earlier recession period, although there was some good evidence from selected provinces (including British Columbia, Manitoba, and Ontario).

There are also some minor variations associated with differences in methodology across studies. Many studies are based on the National Physician Data Base, which in turn is based on physician FFS claims data submitted to CIHI by provincial medical care plans. This underestimates the number of FTE physicians, since it excludes those paid by approaches other than FFS. When the data is broken down, coding differences may also present some problems. For example, some provinces classify public health specialists with family medicine while others don't.<sup>74</sup>

Note that there are some problems in using administrative data, particularly for the earlier recession period. For example, another study by Denton, falling slightly outside the time frame, computed price indexes for physician services in Ontario, 1992 and 2004. They used two data sets from CIHI. One was FFS billing to OHIP, which included the type of service, and the age and sex of the patient. The second had similar information, but by category of physician rather than physician age/sex. They noted that fiscal year 1992/93 is “the earliest year available on a consistent basis” for the billing data. Indeed, CIHI only published the data starting in 1996, but gave them some unpublished FFS series for the earlier years.<sup>82</sup>

Use of billing data must also recognize that fee schedules change. Katz et al. noted that only 37% of the services provided by Manitoba GP/FPs in 2004 were recorded in their data base using tariffs which had been used consistently over the previous 20 years. The authors attempted to adjust for this by developing an Equivalent Services Measure (ESM), but not all studies follow suit.<sup>27</sup> Cross-national comparisons must also deal with differences in what services are provided by GP/FPs, by specialists, or by other providers.

Some of the papers reviewed used the National Population Health Survey (NPHS), and the Canadian Community Health Survey (CCHS), which replaced the NPHS in 2001. However, neither was in place during the 1990/92 period this review was asked to focus on. The NPHS survey had both cross-sectional and longitudinal components, but first collected data in 1994/1995. Following new surveys in 1996/97, 1998/99, and 2000/01, it was replaced by the CCHS. Note that as of 2000/01, it became longitudinal only, following the same 17,276 persons from all ages identified in 1994/1995. The CCHS for 2001 had 130,000 observations, but the samples for 2003 (44,000) and 2005 (32,000) were smaller. Accordingly, some analyses will weight this data using Vital Statistics information from Statistics Canada.<sup>34</sup> Surveys also have some recall bias, but most importantly they are less suited to look at extent of use, as opposed to whether or not services were used. They are unlikely to have captured many of the really high users of care. Other problems with studying change over time include changes in how questions are worded, however, they are very helpful for some purposes.

There are also some issues in the comparability of survey data. For example, request for this paper noted “Curtis and MacMinn (2007) found that in 1991, at the height of an economic recession, 84.6% of Canadians contacted an MD, a 5.1% increase from 1978 (baseline), then decreased as recession ended.” However, as the following excerpts from their Table 1 show, there are no clear trends, and numbers seem relatively stable. Note that Curtis and MacMinn do not deal with overall population trends; indeed, Table 1 is not even referenced in their paper. Their purpose was to analyze the implication of such factors as SES and health status on utilization. Indeed, in their paper, they note that these data sources should be used with caution in comparing numbers of visits over time, since there are differences in how observations with very high utilization are handled. For example, the 1985 and 1991 files were truncated to suppress observations with very high utilization. Sample sizes are also relatively small, particularly for high users. For those reasons, we suggest that examination of utilization should be based on administrative data rather than extrapolation from these surveys.

**Means, full sample, selected variables, by year. Source: Curtis MacMinn<sup>5</sup>**

	1978	1985	1991	1994	1998	2000	2003
MD contacts	79.53	77.76	84.63	80.93	82.11	82.37	81.62
MD visits	4.78	4.63	4.88	5.86	5.34	5.46	5.17
Spec Contacts	--	30.72	29.25	27.12	27.63	30.10	28.96
Spec visits	--	3.05	3.13	3.84	3.22	3.40	3.20

Admissions	11.14	11.02	11.26	9.97	7.99	8.65	8.33
Hospital Nights (given admission)	11.15	6.21	8.90	11.37	8.91	9.01	8.29
N (sample size)	16,043	6,961	8,655	14,394	10,900	83,703	80,468

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See separate file for the material reviewed, with abstracts where available.

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