



**Supply of  
physician's services  
in Ontario**

**Research Atlas**

**ICES** Institute for Clinical  
Evaluative Sciences

# Supply of Physicians' Services in Ontario

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## KEY TERMS & CONCEPTS

- Physician Supply
- Alternative Funding Plan (AFP)
- Full-time Equivalent (FTE)

The opinions, results and conclusions are those of the author and no endorsement by the Ministry of Health or the Institute for Clinical Evaluative Sciences is intended or should be inferred.

## KEY MESSAGES

- ✓ The supply of active physicians increased steadily from 1991/92 to 1997/98 concurrent with the population rate growth.
- ✓ The geographic maldistribution of doctors in Ontario has increased. Doctors continue to practise in urban centres, while underserved areas continue to lose doctors.
- ✓ The comprehensiveness of primary care services has declined. Fewer general practitioners and family physicians are working in hospitals, nursing homes and obstetrics, opting instead to work more exclusively in their offices.
- ✓ Women physicians have made a significant entry into many fields of medicine, but have low participation in some specialty areas. This may represent either lifestyle choices or continued barriers.

## Background

The *Canada Health Act* aims to provide Canadians with access to a comprehensive range of essential medical services. A critical component to maintaining this ideal has been to ensure that there are enough physicians to provide these services, and that these physicians are located in areas where they are needed. Policymakers and leaders in the medical community have a responsibility to ensure that the proper financial incentives and regulatory mechanisms are in place to meet these demands.

Predicting the demand for physician services, however, has been a difficult challenge. From 1964 to the early 1990s, the supply of doctors has increased steadily, after health planners in the 1960s expanded the number of medical school places in anticipation of a rapid growth in the population. The expected rate of population growth never occurred, but the expansion of the physician workforce continued nonetheless.<sup>1</sup> In light of this finding, the Deputy Ministers of Health across the country signed the *Banff Accord* in 1992, in which they agreed to a 10 per cent reduction in medical school enrolment.

In Ontario, additional measures were implemented to limit the supply of doctors. Temporary restrictions on new billing numbers for out-of-province graduates were put in place between 1993 and 1996.<sup>2</sup> From 1997 to 1999, financial penalties were instituted for recent graduates who wanted to establish a practice in selected urban areas designated as "overserved."<sup>3</sup> These measures were part of a series of agreements negotiated between the Ministry of Health and the Ontario Medical Association (OMA) aimed at controlling health care costs.

The policies governing physician supply are controversial. Traditionally, physician organizations have argued that Canada does not have enough doctors. Recent policy papers by the Ontario College of Family Physicians<sup>4</sup> and editorials<sup>5-8</sup> by physician leaders reinforce this position. Physician organizations have also developed models of physician supply that predict a massive physician shortage in the next 10 to 20 years.<sup>9-11</sup> This diagnosis, however, is disputed by some analysts who believe that a significant proportion of physician services could be delegated to nurse practitioners, and that issues of fragmentation of services are more important than supply.<sup>12</sup> Competing models of physician growth developed by non-physician academics predict that physician supply will keep pace with the rate of population growth and aging,<sup>13</sup> and that even with the 10 per cent reduction in medical school enrolment, there will still be an accumulating surplus of physicians by the year 2010.<sup>14</sup>

There is no "right" formula for determining the number of doctors needed. As the authors of the influential 1991 Barer-Stoddart report on physician human resources put it:

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>1</sup>

Hence, it is beyond the scope of this report to proclaim a judgement as to whether or not Ontario needs more or fewer doctors. Such decisions should follow public debate on the effectiveness of adding more doctors and the public's willingness to pay for them. However, this study does aim to provide stakeholders with baseline information on the state of physician supply over the past six years. These data, in turn, can serve as a starting point for meaningful debate.

A second set of issues concerns the distribution of physicians and the mix of services provided. Where are doctors practising, and what are they doing? Such questions raise a number of important concerns regarding patient care and access. The Ministry of Health and the OMA have long recognized that there is a geographic physician maldistribution problem in the province, and have initiated a number of programs to address the issue. This study aims to shed light on what the impact of such policies may have been over time.

The specific research questions addressed in this study, therefore, are the following:

- How many doctors are practising in Ontario? Has the number of doctors gone up or down over time?
- Where are these doctors located? What is the extent of geographic maldistribution? Has this maldistribution increased over time?
- How old are Ontario's physicians? Is the physician population getting older or younger?
- What is the rate of entry of women into practice? What proportion are women, and how does that proportion vary by region or specialty?
- What is the practice mix of Ontario's general practitioners/family practitioners (GP/FPs)? How comprehensive are the services they provide, and how has this changed over time?

## Methods

### Where the Data Come From

Most of Ontario's physicians work on a fee-for-service basis. They submit a bill to the Ontario Health Insurance Plan (OHIP) for each insured service they provide, using the standard fee schedule developed through negotiations between the Ontario Medical Association and the Ministry of Health. OHIP maintains a database which records, for each service, a fee code describing the service performed, the date of service and number of services performed.

The OHIP database also has some limited data on the characteristics of each physician, such as gender, age and location of practice. Extra information on each doctor's subspecialty was added from the Southam Medical Database (SMDB). The complex methods for linking the SMDB and OHIP databases are described in detail in the Technical Appendix.

The OHIP billings database contains information only on fee-for-service physicians. The Ministry of Health and the Canadian Institute for Health Information provided additional information on estimates of the number of non-fee-for-service physicians.

Data from the Ontario Physician Human Resource Data Centre (OPHRDC) was used to validate estimates of physician counts. The Centre telephones physicians periodically to verify information on physician specialty and location. However, OPHRDC data was not used in this study because it does not contain information about varying workloads among physicians.

The total number of physicians in OPHRDC correlates well with estimates in this study, and counts of family physicians and surgical subspecialties agree to within five per cent. However, the number of subspecialty internists reported here is lower than OPHRDC estimates by approximately 20 per cent. This discrepancy occurred because a more stringent criteria for defining subspecialty was applied in this study; if a physician was coded as internal medicine in both the NPDB and SMDB but had a functional subspecialty, that physician was coded as internal medicine. In OPHRDC, an internist practising mostly cardiology would be classified as a cardiologist, even if he or she did not complete a cardiology certification.

### How to Count Doctors

This study uses three methods for counting the number of doctors. The first is a simple head count of doctors billing OHIP in a given year. However, previous research has shown that 15 per cent of doctors have very low annual billings (less than \$35,000), and these physicians account for only 1.5 per cent of total billings.<sup>15</sup> Such physicians may be spending the large majority of their time engaged in other activities (e.g. research or administration) and maintaining a modest clinical practice. This large group of relatively inactive doctors may distort the actual number of physicians in practice.

A second method is to count active physicians, who bill above some minimum threshold. In this analysis, annual billings of \$35,000 were arbitrarily selected as the cut-off point. The \$35,000 threshold has been adjusted for changes in prices from year to year.

The third method, the full-time equivalent (FTE) method, assigns a weighting to physicians depending on their billings. Thus, a part-time physician is counted as a fraction of a physician, depending on how his/her activity compares to those physicians near the mid-range of physicians in the same specialty. Physicians with very high billings are considered as having the workload of more than one physician (see the Technical Appendix for more details).

### Fee-for-service vs. Alternative Funding Plans

Approximately 94 per cent of practising physicians derive the bulk of their earnings by billing OHIP on a fee-for-service basis (Canadian Institute for Health Information, unpublished data). The remainder participate in alternative funding plans (AFPs), such as the following:

- Health service organizations (HSOs). Physicians in HSOs are paid by capitation, where they receive a set amount per year for each patient enrolled in their practice.
- Community health centres (CHCs). CHCs are multidisciplinary clinics which offer a comprehensive range of health services. CHC physicians typically receive a salary.
- Academic group practice plans. Physicians working in such plans typically receive a salary for their clinical, teaching, research and administrative duties. The two main plans in Ontario are at the Hospital for Sick Children in Toronto and the Southeastern Ontario

Academic Medical Organization (SEAMO) at Queen's University, Kingston.

- Other physicians on salary. Examples include psychiatrists in provincial psychiatric hospitals, pathologists in hospital labs and some oncologists working for Cancer Care Ontario.

The presence of physicians in AFPs may distort the analysis of fee-for-service physicians in two ways. First, there may be some regions that have a higher proportion of doctors in AFPs. In these regions, calculations of the physician supply based on fee-for-service data may appear to be artificially low. To counter this potential error, the location of HSOs and CHCs are listed by District Health Council (DHC), along with the estimated number of such physicians in each DHC in 1997/98.

Second, the creation of SEAMO in 1994/95 resulted in a major shift of physicians from fee-for-service to an AFP. This shift gives the appearance that a large number of fee-for-service doctors disappeared in 1994/95. Hence, when reporting trends in physician supply over time, corrections were made for this shift. This is described in greater detail in the Technical Appendix.

## Interpretive Cautions

This study pools data from many sources to provide the most comprehensive view of physician services possible. However, there were still some physicians whose activity was not captured, mostly in the salaried category. As alternative funding plans become more widely accepted, it is important that adequate utilization data be maintained in order to evaluate their impact.

The information on physician subspecialty and location has not been validated to the same extent as in the OPHRDC database. Future research projects could examine the feasibility of further linkages with OPHRDC. Such a project would require the development of expanded guidelines to ensure data confidentiality.

The physician's postal code, as reported to OHIP, was used to determine the physician's location. However, this postal code may not correspond exactly to where the physician practises, and where his/her patients reside. A physician may, for example, use a home address. Because the smallest region used in this study was the District Health Council, the magnitude of errors in exact location should be fairly small. The one situation in which there may be errors is when a physician travels a far distance to provide service (e.g. a locum or travelling specialist based in Toronto who serves Northern Ontario periodically). Furthermore, if patients seek services from physicians outside their DHC (e.g.

those patients living near DHC borders), this will create errors in the appropriate population base to be used for the calculation of physician/population ratios. Because of the relatively large size of DHCs, this error should be relatively small; nonetheless, measurement of this error is an area of research currently under way at ICES.

Lastly, it is important to acknowledge that no method of counting - head counts, active physicians or FTE - is without bias. There are also other methods for measuring FTE which could not be practically applied here. The aim of this report is to include a variety of measures and comment on the consistency of trends noted. Further research is under way at ICES to develop measures of activity which are more patient-centred, taking into account, for example, the volume of patients served.

## Findings

Exhibit 1 shows the growth in physician supply over time. Using either the FTE or active physician method, the number of physicians increased steadily from 1991/92 to 1997/98. After adjusting for growth and aging of the population, the physician-population ratio peaked slightly in 1993/94 before returning to close to the 1991/92 level. *Among both GP/FPs and specialists, the active physician to population ratio was almost identical in 1991/92 and 1997/98, to within one per cent. 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.*

## Use of Physician Services by Age and Sex of Patient

Exhibit 2 shows OHIP billings per patient in 1997/98 classified by age and sex. Use of medical services is relatively high in the first five years of life, when children receive frequent health maintenance checks and are prone to infectious diseases. Service use reaches its lowest point in adolescence before climbing steadily to a peak between ages 85 to 89. Use of medical services by men is half that of women in their childbearing years. Beyond age 65, the trend reverses and men use medical services more than women do.

## Geographic Distribution of Physicians

There are wide regional variations in physician supply in Ontario. Exhibit 3 shows physician supply by District Health Council. The supply of fee-for-service GP/FPs ranges from a high of 9.98 active physicians per 10,000 persons in Toronto to a low of 5.78 in Essex/Kent/Lambton. Specialists are heavily

concentrated in four of the DHCs that have teaching centres: Toronto, Champlain (Ottawa), Hamilton-Wentworth and Thames Valley (London).

Some of the apparent geographic maldistribution may be due to clustering of non-fee-for-service physicians in certain regions of the province. HSOs are found predominantly in Hamilton-Wentworth and Waterloo Region-Wellington-Dufferin. A large number of CHCs are found in Toronto, out of proportion to its population size (Exhibit 4). The Ministry of Health provided data on HSO physicians by DHC, and the Canadian Institute for Health Information (CIHI) had limited data on the total number of GP/FPs in CHCs. Making the assumption that the number of physicians in each CHC is similar across regions, the total GP/FP supply in each DHC was estimated (Exhibit 5a and 5b). Five of the top six DHCs had teaching centres.

Regional variations in physician supply have not improved over time. For each fiscal year, the systematic coefficient of variation (SCV) was calculated - a measure of the degree of geographic maldistribution in the province.<sup>16</sup> From 1991/92 to 1997/98, the SCV for active GP/FPs increased from 15 to 18. For specialists, this measure rose from 171 to 189. A similar increase in SCV was also noted when using the FTE method for counting physicians.

Physicians who work in areas with low physician supply tend to have a heavier workload. For every decrease in physician supply of two physicians per 10,000 population, the average workload tends to increase by one-tenth of a full-time physician ( $p=0.02$ ; Exhibit 6).

## Age Distribution of Physicians

The average age of Ontario's doctors is increasing (Exhibit 7). The proportion of FTEs under age 35 declined from 16 per cent to 11 per cent from 1991/92 to 1997/98, while the proportion of physicians over age 65 rose from six to eight per cent, and the proportion of physicians aged 55 to 64 rose from 16 to 18 per cent. This aging phenomenon is notable among both specialists and GP/FPs.

## Entry of Women into Medical Practice

Significant numbers of female physicians have made an entry into many sectors of medicine. The overall percentage of female FTEs rose from 15 per cent in 1991/92 to 21 per cent in 1997/98. Virtually all DHCs have seen an increase in the proportion of female physicians (Exhibit 8). However, female physicians have a stronger presence in certain areas, such as the Champlain region

(encompassing Ottawa) and Hamilton-Wentworth. Regions with lower physician supply (and higher workload) tend to have lower proportions of women in the workforce. For every increase in physician supply by one GP/FP per 10,000 population, the proportion of FTE physicians who are women increases by 2.4 per cent ( $p=0.02$ ).

Related to this finding is the fact that women tend to have lower workloads than men. The average workload for female GP/FPs is 0.76 FTE units, compared to 0.97 for men. Among specialists, the workload is 0.81 for women and 0.97 for men.

The entry of women into different specialties has been uneven (Exhibit 9). In terms of FTEs, women account for approximately one-quarter of GP/FPs, pediatricians, psychiatrists and obstetrician/gynecologists. Some 30 per cent of dermatologists are women. Among surgical subspecialties, the percentage of women is much lower, with ranges from one per cent in vascular surgery to 10 per cent in thoracic surgery. Within internal medicine, there is wide variation; women have a stronger presence in geriatrics, infectious diseases, endocrinology and rheumatology, and have low representation in cardiology, gastroenterology and general internal medicine.

## Physician Supply by Specialty

Exhibit 10 shows physician supply by specialty. There has been a trend to increasing subspecialization in the practice of medicine. The number of active internal medicine subspecialists has risen by almost one-third, while there has been a very slight decline in the number of general internists. The number of general surgeons has actually declined by one-tenth, while the number of subspecialty surgeons has changed little.

## Comprehensiveness of Practice Among GP/FPs

The proportion of active GP/FPs practising in practice settings outside of their office is declining. These settings include hospital inpatient wards, nursing homes and emergency rooms, as well as in the areas of anesthesia and obstetrics (see Exhibit 11). At the same time, the proportion of GP/FPs who have no billings at all in any of these non-office settings has increased from 9 to 14 per cent.



## Discussion

Much discussion has taken place recently in Ontario regarding a physician shortage and an impending crisis for patient care. A number of physician groups have made this claim in recent months, including the Ontario Medical Association<sup>6</sup> and the Ontario College of Family Physicians.<sup>4</sup> Numerous anecdotal reports have also appeared regarding increasing shortages in selected communities.<sup>17-19</sup>

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,<sup>20</sup> 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.<sup>8</sup> 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.

The question of how many doctors are needed to serve the population has plagued policymakers since the dawn of medicare in Canada. As noted above, there is no technical formula for determining the number of doctors needed. Even though physician supply has been stable over the time period studied, other factors must still be taken into account. These factors include changes in disease patterns, the advent of new technologies, the introduction of physician

substitutes (such as nurse practitioners and midwives), changing patient expectations, the size of the public debt and the willingness of the public to spend tax dollars on physician services. The latter three items in particular are societal issues that can only be addressed through public debate, not more data analysis. Therefore, *it is impossible, in a technical report such as this one, to proclaim any overall shortage or surplus, based solely on the doctor-population ratios reported here.*

However, the trends over time described in this report raise a number of important concerns regarding patient care and access. What is apparent is not that there is a shortage of doctors, but that these doctors are not located in areas with the greatest need. Despite a variety of incentives and, most recently, penalties for recent graduates who start their practice in areas that already have higher numbers of doctors, *the geographic maldistribution problem has worsened.* The DHCs with teaching centres have maintained their supply of physicians, while Essex/Kent/Lambton, which already had the lowest physician supply in 1991/92, lost both GP/FPs and specialists.

Interestingly, there has been some shift in which regions are the most underserved (in relative terms). All of the Northern regions - Northwestern Ontario, Algoma/Cochrane/Manitoulin/Sudbury, and Muskoka/Nipissing/Parry Sound/Timiskaming - experienced a modest increase in the supply of active GP/FPs per population, while a number of Southern rural regions - Essex/Kent/Lambton, Grand River and Niagara Region - lost GP/FPs per capita.

One possible explanation for this observation is that differences in incentives may be pulling some physicians northwards. All rural regions in Ontario are eligible for benefits under the Underserved Area Program (UAP) of Ontario. However, Northern regions still receive preferential treatment. Northern Ontario now has its own family practice residency program which provides prospective primary care physicians exposure to rural practice and rural communities. In terms of remuneration, physicians starting practice in the North receive \$40,000 in incentives over four years, while those in the South receive \$15,000.<sup>21</sup> Furthermore, Southern regions must wait one year after receiving underserved designations before they can be eligible for incentive grants.<sup>22</sup>

More research is needed to map out more precisely the impact of increased incentive grants on physician supply. Policymakers also need to grapple with the question of how to treat rural Southern Ontario on an equitable basis with Northern Ontario. It will also be important to consider how to attract physicians into rural Southern Ontario, without inadvertently pulling them from Northern Ontario and reversing the modest gains made over the past few years.

As a first step, policymakers might consider an expansion of the types of policies enacted in Northern Ontario, including local training of residents and incentive grants. In one policy area, this extension of incentives to the South has already occurred. Most of the UAP's locum tenens program, which previously allowed Northern physicians respite for holidays and continuing medical education, has since been transferred to the OMA's rural locum program, which extends eligibility to all rural areas.

The Barer-Stoddart report<sup>1</sup> listed a number of possible long-term measures to improve geographic distribution, which have yet to be implemented in Ontario. Options include reserving places in medical school classes for students from rural areas or students who agree on a contractual basis to work in underserved regions after graduation. Such policies have been shown to be effective in the US.<sup>23</sup> Other options, which have been discussed elsewhere, include increasing the remuneration for physicians, although relying exclusively on this measure could be expensive.<sup>24</sup> A related option might include group practices in alternative funding arrangements, where the focus is more on making the workload manageable while maintaining a reasonable income. This focus helps address the workload preferences of recent graduates and women.

A complete discussion of the potential causes and solutions to the geographic maldistribution issue is beyond the scope of this report. As a basis for discussion, however, Exhibit 12 lists various policy options that policy-makers may wish to consider.

The reduction in comprehensiveness of practice among GP/FPs raises a number of concerns. Many commonly accepted definitions of primary care emphasize the importance of continuity and comprehensiveness of care.<sup>25,26</sup> If physicians themselves are not working in multiple settings, then this may result in an increase in the number of referrals to other physicians during the continuum of care. Furthermore, they may lose direct contact with different providers in the health care system and the skills that come with managing patients in acute settings.

The impact of the growing limitation in the scope of family practice is an area which deserves further research and debate in the province. The Ontario College of Family Physicians has already released a discussion paper outlining its concern about the exodus of family physicians from inpatient care settings.<sup>4</sup> There are numerous reasons why this reduction in comprehensiveness may be occurring, such as dissatisfaction with remuneration, institutional regulations or culture, administrative burden of working in multiple settings and a desire

among some GP/FPs to specialize in some area. If policymakers wish to reverse this trend, they may want to consider options to address these barriers.

The issue of aging of the physician population has the potential to lead to physician shortages if it is not addressed appropriately. Previous research by ICES has found that older GP/FPs tend to stop providing more technically difficult services such as emergency, obstetrics and minor surgery.<sup>27</sup> Hence, the burden of providing these services is gradually shifting to younger physicians.

However, the apparent aging phenomenon must be reviewed in its proper historical context. The Barer/Stoddart report<sup>1</sup> suggested a balanced approach to managing physician supply growth across the life cycle of the physician, including reductions in medical school enrolment, incentives to practice in areas of high need and funding of alternatives to clinical careers towards the end of the physician life cycle. In Ontario, however, physician supply management has focused primarily on limiting entry into the province for recent graduates (such as the ban on new billing numbers in 1996 for out-of-province graduates and penalties for young physicians in urban areas). As such, it is not surprising that the physician population in Ontario has stabilized, but at the expense of an increase in its average age.

The last of the physician supply restrictions targeted towards young physicians will expire at the end of 1999. With the lifting of these policies and recent increases in the physician services budget,<sup>28</sup> which may heighten the attractiveness of practising in Ontario, entry of young physicians into the physician pool may be at least partially restored, thereby lending greater age stability to the system.

Women continue to make important inroads into many fields of medicine. This is significant from the viewpoint of access and patient choice. A majority of patients report higher satisfaction with care offered by female physicians<sup>29,30</sup> and express a preference for female physicians.<sup>31</sup> Female physicians are noted to be better communicators,<sup>32</sup> more focussed on preventive health,<sup>33</sup> and have higher quality of care assessments.<sup>34</sup> Family medicine and obstetrics/gynecology are two disciplines with a specific emphasis on women's health; not surprisingly, these two specialties have relatively high proportions of women.

However, female participation in surgery remains chronically low. The reasons for this finding deserve further debate. One Canadian study found that although most female surgeons did not feel discriminated against in their selection for residency, a majority did encounter discrimination during training and reported that they did not have a female mentor.<sup>35</sup> Further research is needed to ascertain whether or not continued low participation rates in selected



specialties represent a lifestyle choice for women or some form of barrier to entry.

The increasing subspecialization of internists and surgeons raises issues for debate. One advantage of greater subspecialization is that it may help physicians tackle the increasing complexity of medicine. On the other hand, the loss of breadth in expertise may limit the availability of internists and general surgeons who may be more appropriate in medium-sized communities that cannot support the presence of a full complement of subspecialists. It is possible that the trend towards greater subspecialization may be contributing to the observation that geographic maldistribution of specialists is worsening over time.

## Conclusions

Ontario's physician supply has remained stable, in terms of the number of physicians available to serve a growing and aging population. However, significant concerns have been raised about the growing geographic maldistribution in the province as well as a reduction in the comprehensiveness of services provided by GP/FPs. The declining availability of "general" specialists to serve rural areas may be contributing to the maldistribution problem. The very small number of women in some specialties deserves further research, as it may be an indicator of barriers to entry into these specialties.

The priority for policymakers should be to enact incentives to encourage physicians to practise in areas of highest need and to provide the breadth of services required. The principle question to be addressed is "what" physicians are doing, not "how many" physicians there are. Increasing the physician supply, without considering how and where physicians should be practising, will not address the underlying concerns raised in this study.

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### Exhibit 1: Measures of Physician Supply in Ontario, 1991/92 - 1997/98

Fiscal Year	GP/FP			Specialists			Physicians per 10,000 Population			
	Head Count	Active MDs	FTEs	Head Count	Active MDs	FTEs	Active GP/FPs	FTE GP/FPs	Active Specialists	FTE Specialists
1991/92	10,031	8,175	8,832	10,104	8,442	8,718	7.87	8.50	8.12	8.39
1992/93	10,408	8,426	9,099	10,379	8,625	9,033	8.02	8.66	8.21	8.60
1993/94	10,953	8,675	9,236	10,466	8,791	9,151	8.19	8.72	8.30	8.64
1994/95	10,686	8,702	9,220	10,230	8,815	9,127	8.14	8.62	8.24	8.53
1995/96	10,553	8,751	9,328	10,224	8,879	9,399	8.11	8.65	8.23	8.71
1996/97	10,464	8,798	9,314	10,430	8,993	9,570	8.08	8.55	8.26	8.79
1997/98	10,386	8,835	9,445	10,418	9,113	9,934	7.85	8.39	8.09	8.82
<b>% Change 1991/92 - 1997/98</b>	3.5%	8.1%	6.9%	3.1%	7.9%	13.9%	-0.3%	-1.3%	-0.4%	5.2%

Data Source: National Physician Database

GP/FP = general practitioner/family physician

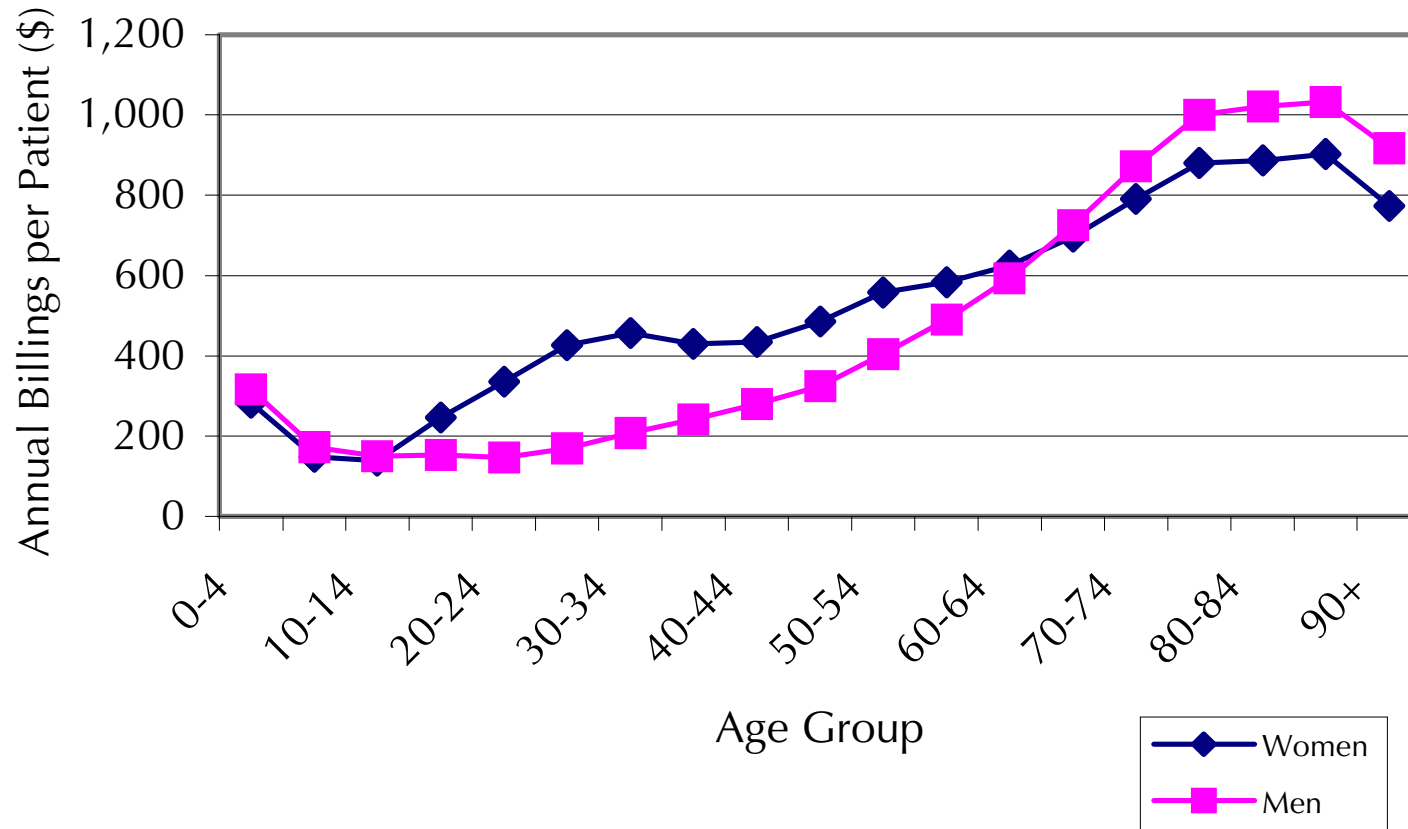
FTE = full-time equivalents

Active MDs = physicians who bill over \$35,000 per year

Data are for fee-for-service (FFS) physicians. The number of active and FTE specialists from 1994/95 to 1997/98 has been adjusted for the shift of specialists out of FFS due to the creation of the Southeastern Ontario Academic Medical Organization (SEAMO) in 1994/95.

Physician-population ratios have been adjusted for aging of the population.

Exhibit 2: Age/Sex-specific Average Annual OHIP Billings per Patient, 1997/98



Data Source: National Physician Database  
 OHIP = Ontario Health Insurance Plan

### Exhibit 3: Physician Supply Measures by Ontario District Health Council, 1991/92 - 1997/98

1991/92 District Health Council	Population	GP/FP			Specialists			Physicians per 10,000 Population			
		Head Count	Active MDs	FTEs	Head Count	Active MDs	FTEs	Active GP/FPs	FTE GP/FPs	Active Specialists	FTE Specialists
Algoma, Cochrane, Manitoulin and Sudbury	435,030	344	285	363	238	214	220	6.55	8.34	4.92	5.06
Champlain	977,480	1,026	789	757	1,349	1,073	1,007	8.07	7.74	10.98	10.30
Durham, Haliburton, Kawartha and Pine Ridge	707,280	500	464	530	310	288	317	6.56	7.49	4.07	4.48
Essex, Kent and Lambton	584,740	388	350	436	344	315	357	5.99	7.46	5.39	6.11
Grand River	221,410	160	142	170	82	76	84	6.41	7.68	3.43	3.79
Grey, Bruce, Huron, Perth	286,680	242	221	240	98	88	94	7.71	8.37	3.07	3.28
Halton-Peel	1,081,690	850	770	875	565	512	577	7.12	8.09	4.73	5.33
Hamilton-Wentworth	465,850	446	279	287	710	586	550	5.99	6.16	12.58	11.81
Muskoka, Nipissing, Parry Sound and Timiskaming	216,870	201	171	186	91	82	94	7.88	8.58	3.78	4.33
Niagara Region	406,000	296	269	295	237	221	250	6.63	7.27	5.44	6.16
Northwestern Ontario	251,310	212	180	196	127	114	122	7.16	7.80	4.54	4.85
Quinte, Kingston, Rideau	466,880	479	406	411	459	381	356	8.70	8.80	8.16	7.63
Simcoe-York	820,560	655	594	665	397	356	403	7.24	8.10	4.34	4.91
Thames Valley	560,190	557	432	458	800	651	613	7.71	8.18	11.62	10.94
Toronto	2,349,940	2,857	2,393	2,555	3,598	3,090	3,276	10.18	10.87	13.15	13.94
Waterloo Region-Wellington-Dufferin (missing info)	596,490	461	376	398	341	321	332	6.30	6.67	5.38	5.57
<b>Ontario Total</b>	<b>10,428,400</b>	<b>10,031</b>	<b>8,175</b>	<b>8,832</b>	<b>10,104</b>	<b>8,442</b>	<b>8,718</b>	<b>7.82</b>	<b>8.47</b>	<b>8.10</b>	<b>8.36</b>

1997/98 District Health Council	Population	GP/FP			Specialists			Physicians per 10,000 Population			
		Head Count	Active MDs	FTE	Head Count	Active MDs	FTE	Active GP/FPs	FTE GP/FPs	Active Specialists	FTE Specialists
Algoma, Cochrane, Manitoulin and Sudbury	432,960	348	293	319	256	226	255	6.77	7.37	5.22	5.89
Champlain	1,043,520	1,162	921	870	1,400	1,200	1,171	8.83	8.34	11.50	11.22
Durham, Haliburton, Kawartha and Pine Ridge	782,660	566	520	581	350	328	381	6.64	7.42	4.19	4.87
Essex, Kent and Lambton	612,790	387	354	430	342	312	374	5.78	7.02	5.09	6.10
Grand River	231,220	156	144	167	82	75	84	6.23	7.22	3.24	3.63
Grey, Bruce, Huron, Perth	294,100	246	226	235	107	93	104	7.68	7.99	3.16	3.54
Halton-Peel	1,274,620	972	900	1,021	676	629	767	7.06	8.01	4.93	6.02
Hamilton-Wentworth*	486,640	430	299	309	727	628	660	6.14	6.35	12.90	13.56
Muskoka, Nipissing, Parry Sound and Timiskaming	218,210	214	200	207	94	79	91	9.17	9.49	3.62	4.17
Niagara Region	418,130	294	263	291	255	237	281	6.29	6.96	5.67	6.72
Northwestern Ontario	253,840	225	195	190	137	112	125	7.68	7.49	4.41	4.92
Quinte, Kingston, Rideau**	491,690	503	412	421	466	384	379	8.38	8.56	7.81	7.71
Simcoe-York	984,620	790	725	794	487	446	534	7.36	8.06	4.53	5.42
Thames Valley	589,360	521	456	473	785	683	685	7.74	8.03	11.59	11.62
Toronto	2,492,460	2,843	2,488	2,692	3,844	3,346	3,662	9.98	10.80	13.42	14.69
Waterloo Region-Wellington-Dufferin* (missing info)	654,630	509	418	423	350	311	354	6.39	6.46	4.75	5.41
<b>Ontario Total</b>	<b>11,261,450</b>	<b>10,386</b>	<b>8,835</b>	<b>9,446</b>	<b>10,559</b>	<b>9,119</b>	<b>9,937</b>	<b>7.82</b>	<b>8.39</b>	<b>8.10</b>	<b>8.82</b>

Data Source: National Physician Database  
 GP/FP = general practitioner/family physician  
 Active MDs = physicians who bill over \$35,000 per year  
 Head count = physicians who bill any amount in a fiscal year  
 FTE = Full-time equivalent

\* measures of GP/FP supply in these regions appear artificially low because they have a high concentration of non-fee-for-service physicians.  
 \*\* specialists who moved out of fee-for-service into the Southeastern Ontario Academic Medical Organization in 1994/95 have been included in these calculations.

Note: Table includes physicians billing on fee-for-service, in SEAMO, and who are on alternative payment plans with shadow-billing. Does not include physicians in CHCs, HSOs and other payment arrangements.

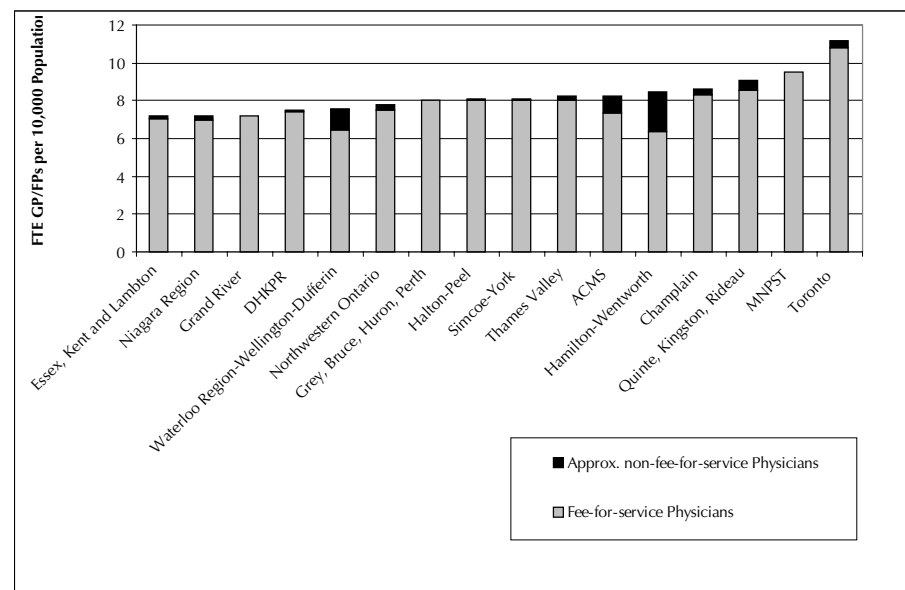


**Exhibit 4: Community Health Centres & Health Service Organizations in Ontario, 1997/98**

District Health Council	Community Health Centres	Health Service Organizations
Algoma, Cochrane, Manitoulin and Sudbury	3	2
Champlain	7	2
Durham, Haliburton, Kawartha and Pine Ridge	1	1
Essex, Kent and Lambton	3	1
Grand River	0	3
Grey, Bruce, Huron, Perth	0	0
Halton-Peel	0	0
Hamilton-Wentworth	2	41
Muskoka, Nipissing, Parry Sound and Timiskaming	0	0
Niagara Region	1	2
Northwestern Ontario	3	0
Quinte, Kingston, Rideau	5	5
Simcoe-York	1	0
Thames Valley	2	4
Toronto	23	5
Waterloo Region-Wellington-Dufferin	3	16
<b>Ontario</b>	<b>54</b>	<b>82</b>

Data Source: Ministry of Health and Association of Ontario Health Centres

**Exhibit 5a: General and Family Practitioner Supply by District Health Council in Ontario, 1997/98**



Data Source: National Physician Database (fee-for-service physicians).  
 Ministry of Health, Canadian Institute for Health Information and Association of Ontario Health Centres (non-fee-for-service physicians)

GP/FP = General practitioner/family physician

FTE = full-time equivalent

DHKPR = Durham, Haliburton, Kawartha and Pine Ridge

ACMS = Algoma, Cochrane, Manitoulin and Sudbury

MNPST = Muskoka, Nipissing, Parry Sound and Temiskaming

## Exhibit 5b: General/Family Practitioner Supply\* per 10,000 Population by District Health Council in Ontario, 1997/98

### Ontario District Health Councils

- 1 Essex, Kent and Lambton
- 2 Thames Valley
- 3 Grand River
- 4 Niagara Region
- 5 Hamilton-Wentworth
- 6 Halton-Peel
- 7 Waterloo Region-Wellington-Dufferin
- 8 Grey, Bruce, Huron, Perth
- 9 Simcoe-York
- 10 Toronto
- 11 Durham, Haliburton, Kawartha and Pine Ridge
- 12 Quinte, Kingston, Rideau
- 13 Champlain
- 14 Muskoka, Nipissing, Parry Sound and Timiskaming
- 15 Algoma, Cochrane, Manitoulin and Sudbury
- 16 Northwestern Ontario

\* includes fee-for-service and non-fee-for-service general/family practitioners.

Data Source: National Physician Database for fee-for-service physicians  
Ministry of Health, Canadian Institute for Health Information and  
Association of Ontario Health Centres for non-fee-for-service physicians.

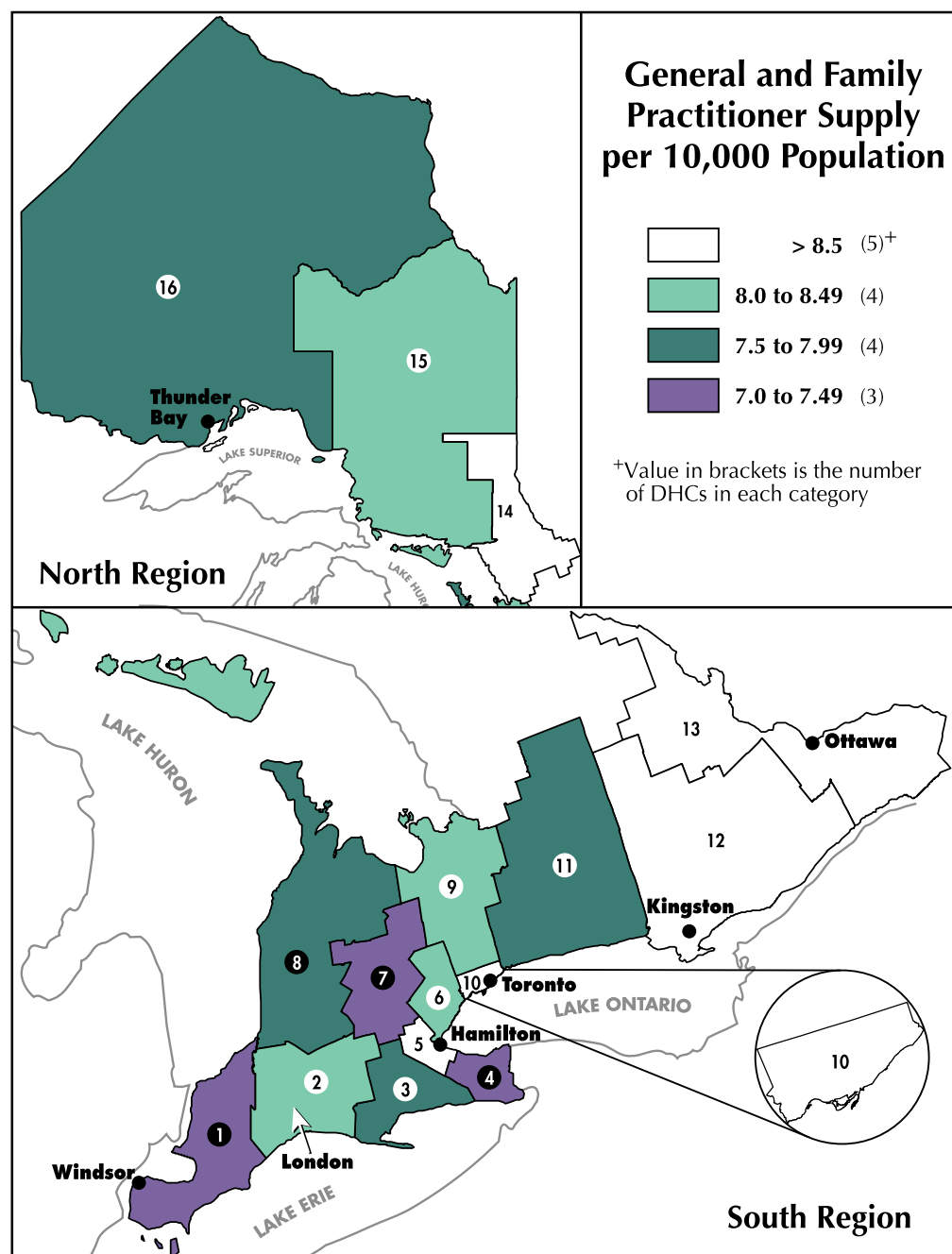
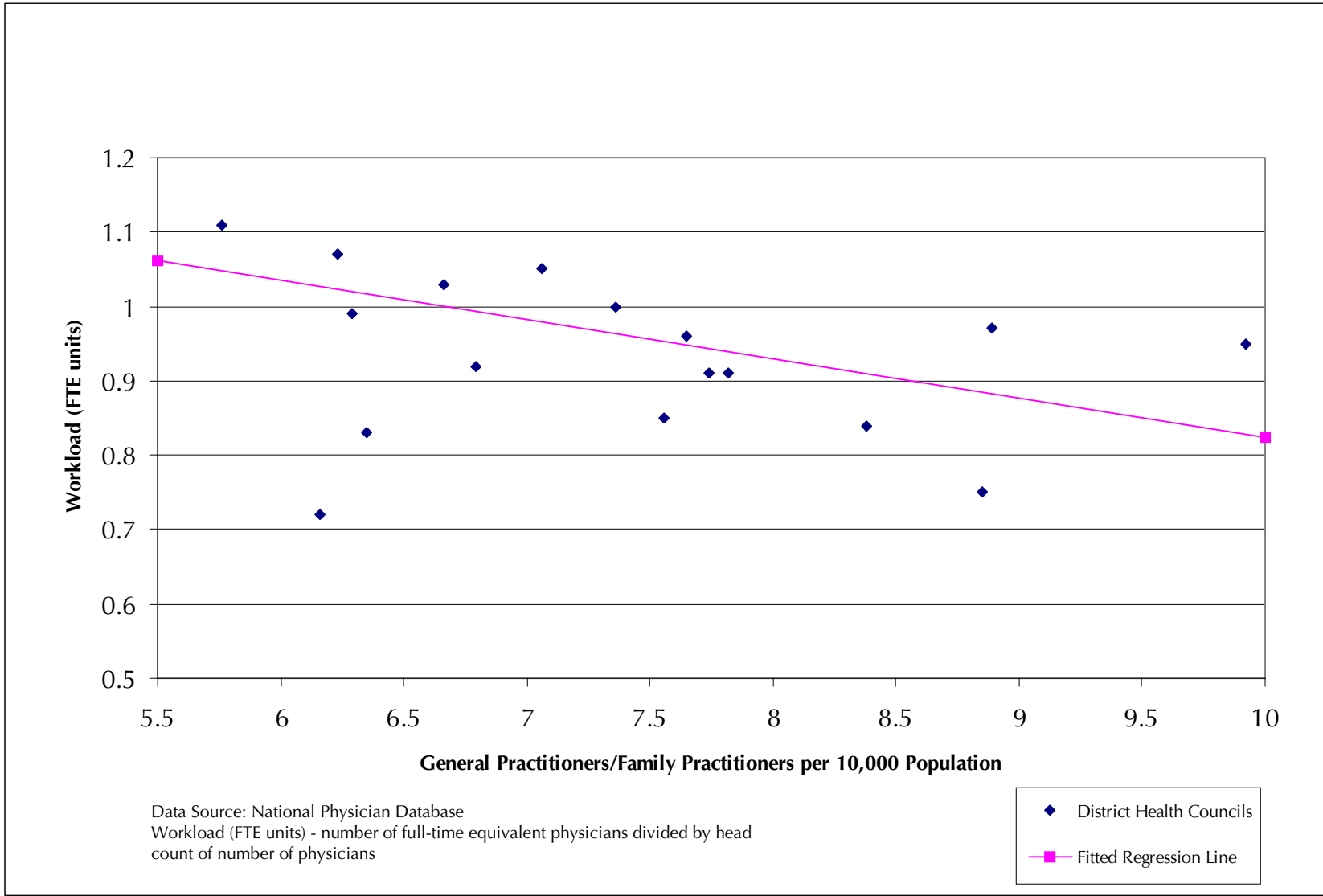


Exhibit 6: Workload and Physician Supply in Ontario, 1997/98



**Exhibit 7: Change in Age and Gender Composition of Ontario Physicians, 1991/92 - 1997/98**

Fiscal Year	Per cent of full-time equivalent physicians who are:				
	Women	Age (years)			
		<35	35-54	55-64	65+
1991/92	15.1	16.0	61.4	16.4	6.2
1992/93	16.0	15.2	61.9	16.5	6.5
1993/94	17.0	14.9	61.7	16.7	6.7
1994/95	18.8	14.1	62.0	17.0	6.8
1995/96	19.4	13.3	62.5	16.9	7.3
1996/97	20.1	12.4	62.8	17.0	7.8
1997/98	20.6	11.4	62.9	17.7	7.9

Data Source: National Physician Database

**Exhibit 8: Physician Demographics and Workload Measures by Ontario District Health Council, 1991/92 - 1997/98**

1991/92 by District Health Council	% of FTE physicians who are women	% of FTE GP/FPs 65+ years old	% of FTE specialists 65+ years old	Average Workload, GP/FPs (FTE)	Average Workload, Specialists (FTE)
Algoma, Cochrane, Manitoulin and Sudbury	9.3	2.6	3.3	0.94	0.93
Champlain	17.8	2.0	2.7	0.74	0.75
Durham, Haliburton, Kawartha and Pine Ridge	11.8	3.5	2.4	1.06	1.02
Essex, Kent and Lambton	7.9	4.9	3.6	1.12	1.04
Grand River	13.7	5.2	0.8	1.06	1.02
Grey, Bruce, Huron, Perth	9.4	4.5	3.5	0.99	0.96
Halton-Peel	19.9	1.7	1.7	1.03	1.02
Hamilton-Wentworth	17.8	2.6	3.3	0.64	0.78
Muskoka, Nipissing, Parry Sound and Timiskaming	8.8	3.2	0.4	0.92	1.04
Niagara Region	9.5	5.4	4.2	1.00	1.06
Northwestern Ontario	11.9	3.7	1.9	0.93	0.96
Quinte, Kingston, Rideau	13.6	3.8	4.3	0.86	0.78
Simcoe-York	15.3	2.2	1.0	1.02	1.01
Thames Valley	15.5	2.3	3.3	0.82	0.77
Toronto	16.5	3.2	4.1	0.89	0.91
Waterloo Region-Wellington-Dufferin	13.5	3.6	2.2	0.86	0.97
(missing info)	15.8	2.9	2.4	0.14	0.19
<b>Ontario Total</b>	<b>15.1</b>	<b>3.1</b>	<b>3.1</b>	<b>0.88</b>	<b>0.86</b>
<b>1997/98 by District Health Council</b>					
Algoma, Cochrane, Manitoulin and Sudbury	12.3	3.4	4.6	0.92	1.00
Champlain	27.2	1.4	3.7	0.75	0.84
Durham, Haliburton, Kawartha and Pine Ridge	17.7	3.2	3.6	1.03	1.09
Essex, Kent and Lambton	13.1	5.6	6.4	1.11	1.09
Grand River	15.8	6.3	1.3	1.07	1.03
Grey, Bruce, Huron, Perth	16.8	3.2	1.7	0.96	0.97
Halton-Peel	23.3	2.8	3.3	1.05	1.13
Hamilton-Wentworth	25.4	2.2	4.7	0.72	0.91
Muskoka, Nipissing, Parry Sound and Timiskaming	13.1	3.0	2.8	0.97	0.97
Niagara Region	13.6	6.1	6.8	0.99	1.10
Northwestern Ontario	17.8	5.7	2.7	0.85	0.91
Quinte, Kingston, Rideau	21.6	4.4	5.1	0.84	0.73
Simcoe-York	20.6	2.2	2.0	1.00	1.10
Thames Valley	20.1	2.0	4.4	0.91	0.87
Toronto	20.7	4.0	5.9	0.95	0.95
Waterloo Region-Wellington-Dufferin	19.6	3.9	3.5	0.83	1.01
(missing info)	19.8	2.7	4.1	0.11	0.15
<b>Ontario Total</b>	<b>20.6</b>	<b>3.4</b>	<b>4.5</b>	<b>0.91</b>	<b>0.94</b>

Source: National Physician Database

GP/FP=general practitioner/family physician

FTE=full-time equivalent

### Exhibit 9: Per cent of Ontario Physicians Who are Women (by Specialty), 1997/98

Specialty	% FTE Women	Specialty	% FTE Women
Anesthesia	19	Nephrology	12
Cardiovascular Surgery	6	Neurology	16
Cardiology	10	Neurosurgery	5
Clinical Biochemistry	28	Nuclear Medicine	21
Clinical Immunology	16	Obstetrics/Gynecology	23
Dermatology	30	Ophthalmology	10
Diagnostic Radiology	15	Orthopedics	4
Ear Nose & Throat	6	Pathology	18
Emergency	17	Pediatrics	27
Endocrinology	34	Physiatry	25
General Practice/Family Physician	24	Plastic Surgery	8
Gastroenterology	8	Psychiatry	26
General Surgery	7	Respirology	17
Geriatrics	38	Rheumatology	33
Hematology	24	Therapeutic Radiology	25
Infectious Diseases	43	Thoracic Surgery	10
Internal Medicine	9	Urology	2
Microbiology	30	Vascular Surgery	1

Data Source: National Physician Database

FTE = full-time equivalent



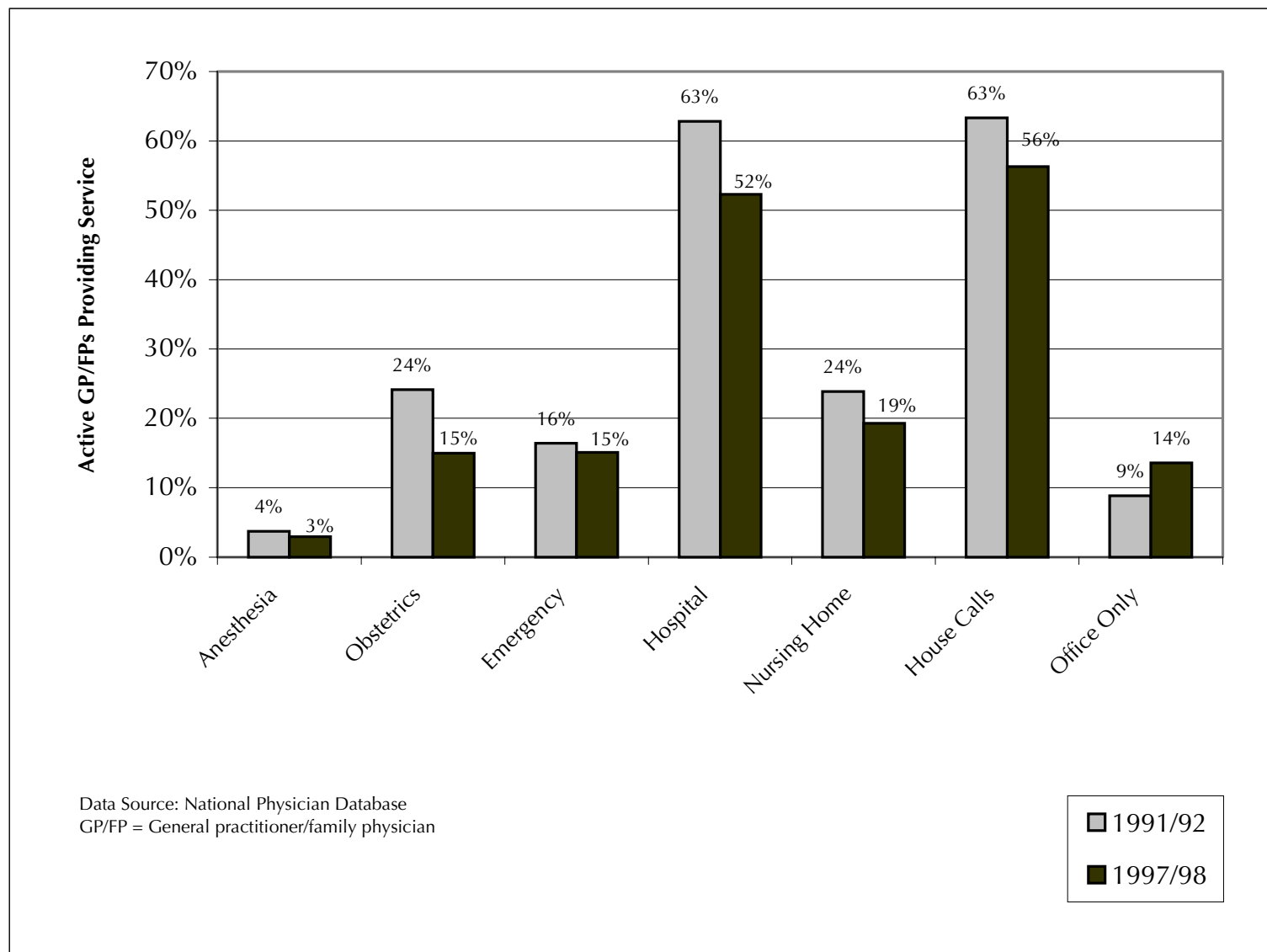
**Exhibit 10: Physician Supply by Specialty in Ontario, 1991/92 - 1997/98**

Specialty	1991/92			1997/98			% Change, 1991/92 - 1997/98		
	Head Count	Active MDs	FTE	Head Count	Active MDs	FTE	Head Count	Active MDs	FTE
Anesthesia	841	767	713	822	745	760	-2	-3	6
Cardiovascular Surgery	66	63	51	60	57	57	-9	-10	12
Cardiology	231	205	172	257	242	246	11	18	43
Clinical Biochemistry *	13	5	10	20	12	21	54	140	107
Clinical Immunology	20	18	19	22	20	24	10	11	23
Dermatology	213	188	199	215	192	192	1	2	-3
Diagnostic Radiology	735	649	539	713	686	674	-3	6	25
Ear Nose & Throat	240	212	213	225	203	205	-6	-4	-4
Emergency	179	84	102	89	68	83	-50	-19	-19
Endocrinology	44	41	41	74	64	69	68	56	69
General Practice/Family Physician	10,031	8,137	8,832	10,386	8,811	9,445	4	8	7
Gastroenterology	86	83	78	124	115	112	44	39	44
General Surgery	693	590	588	626	525	541	-10	-11	-8
Geriatrics	22	17	18	40	30	35	82	76	91
Hematology	111	90	96	171	145	168	54	61	74
Infectious Diseases	8	4	9	28	15	33	250	275	251
Internal Medicine	1,213	961	1,065	1,166	941	1,105	-4	-2	4
Microbiology *	22	11	20	34	23	34	55	109	65
Nephrology	42	39	31	68	64	63	62	64	104
Neurology	202	173	195	228	195	225	13	13	16
Neurosurgery	84	69	73	81	60	69	-4	-13	-5
Nuclear Medicine	60	55	33	73	72	65	22	31	95
Obstetrics/Gynecology	682	605	613	648	592	594	-5	-2	-3
Ophthalmology	437	378	347	444	390	401	2	3	16
Orthopedics	422	365	351	388	348	349	-8	-5	-1
Pathology *	285	85	299	306	114	419	7	34	40
Pediatrics	729	568	683	860	622	805	18	10	18
Physiatry	110	94	113	126	109	127	15	16	12
Plastic Surgery	165	143	140	159	137	137	-4	-4	-2
Psychiatry	1,611	1,374	1,436	1,726	1,480	1,602	7	8	12
Respirology	84	80	69	107	103	104	27	29	52
Rheumatology	78	69	68	93	83	90	19	20	33
Therapeutic Radiology	86	77	73	111	99	102	29	29	38
Thoracic Surgery	23	19	17	29	27	26	26	42	57
Urology	218	196	196	223	200	196	2	2	0
Vascular Surgery	49	49	48	62	60	61	27	22	28
<b>Special Comparisons</b>									
General Practice/Family Physician	10,031	8,137	8,832	10,386	8,811	9,445	4	8	7
All Specialists	10,104	8,426	8,718	10,418	8,838	9,794	3	5	12
General Internists	1,213	961	1,065	1,166	941	1,105	-4	-2	4
Subspecialty Internists	743	643	672	972	843	946	31	31	41
General Surgery	693	590	588	626	525	541	-10	-11	-8
Subspecialty Surgery	2,386	2,099	2,048	2,319	2,074	2,096	-3	-1	2

Source: National Physician Database and Southam Medical Database  
FTE = full-time equivalent

\* results for these specialities should be interpreted with extreme caution. Many of these specialists may work primarily in hospital labs on salary, and fee-for-service billings may represent a secondary activity for them. As such, minor fluctuations in their fee-for-service activity may result in major changes in measurement of head counts, active physicians and FTEs.

**Exhibit 11: Proportion of GP/FPs Providing Different Types of Services in Ontario, 1991/92 and 1997/98**



**Exhibit 12: Policy Options for Improving Regional Physician Distribution**

Commonly Cited Causes of Geographic Maldistribution	Policy Options
<ul style="list-style-type: none"> <li>• Heavy workload</li> <li>• Difficulty in getting time off for continuing education, vacations</li> <li>• Lack of training in skills needed for rural medicine</li> <li>• Lack of role models</li> <li>• Lack of exposure to rural communities</li> <li>• Lack of specialty backup</li> <li>• Professional isolation</li> <li>• Limited selection of cultural events, entertainment, places to shop, etc.</li> <li>• Limited spousal employment opportunities</li> <li>• Distance from family and friends</li> <li>• Weather</li> <li>• Lack of interest in rural lifestyle</li> <li>• Lack of professional recognition</li> </ul>	<p><b>Remuneration/Financial Incentives</b></p> <ul style="list-style-type: none"> <li>• expanded incentive grant program</li> <li>• bonuses for providing a comprehensive level of care (e.g. hospital, emergency, nursing home, etc.)</li> <li>• alternative funding plans (to allow for larger call group and lighter workload, at a level of income which fee-for-service would not sustain)</li> <li>• expanded bursaries and loans with return of service guarantees</li> <li>• rostering (may provide disincentive to work in high supply areas)</li> <li>• differential fees for urban and rural practice</li> </ul> <p><b>Workload Management</b></p> <ul style="list-style-type: none"> <li>• guaranteed vacation and continuing medical education leave</li> <li>• flexible scheduling for physicians with young families</li> <li>• locum tenens programs</li> <li>• alternative funding plan (as described above)</li> <li>• more specialty backup for primary care physicians (e.g. travelling clinics)</li> </ul> <p><b>Training</b></p> <ul style="list-style-type: none"> <li>• places in medical school reserved for students from rural areas or those willing to sign return of service contracts</li> <li>• dedicated rural medicine undergraduate programs</li> <li>• increased rotations in rural settings during medical school</li> <li>• increased community hospital rotations</li> <li>• residency programs for both GP/FPs and specialists in rural areas</li> <li>• structured opportunities for short-term skills upgrading (e.g. one month) at teaching centres</li> </ul> <p><b>Other</b></p> <ul style="list-style-type: none"> <li>• professional rewards for rural physicians to increase "prestige" of rural practice</li> </ul>

# Glossary

## **Active MD**

A physician who bills OHIP at least \$35,000 in price-adjusted dollars in a given fiscal year.

## **Alternative Funding Plans**

Physicians who received payment on plans other than fee-for-service. Examples of alternative funding plans include health service organizations, community health centres, academic group practice plans and other salaried physicians.

## **Full-time Equivalent**

A weighting is assigned to physicians depending on their billings. A part-time physician is counted as a fraction of a physician, depending on how his/her activity compares to those physicians near the mid-range of physicians in the same specialty. Physicians with very high billings are considered as having the workload of more than one physician.

## Technical Appendix

This section describes in detail the methods used for measuring physician supply.

### Data Sources

The following data sources were used:

1. The Ontario Health Insurance Plan (OHIP) database provides comprehensive information on the services provided by all fee-for-service physicians in Ontario. The database records each billable patient encounter, including the fee code for the service performed, the date of service and number of services performed. There are approximately 20 million claims per month.

2. The Corporate Provider Database (CPDB) contains information on each physician's birth date, gender, school of graduation, year of graduation, reported specialties and postal code of practice. This database is maintained by the Ministry of Health.

3. The National Physician Database (NPDB) is an aggregated version of OHIP. The NPDB gives quarterly tabulations of the number of services and the dollar amount billed by each physician, on each fee code. It also contains files, updated quarterly, on the characteristics of each physician, which are based on information in the CPDB.

4. The Southam Medical Database (SMDB) is a proprietary database constructed from a variety of sources, including survey data from each physician in the country, data from provincial registrars, the Royal College of Physicians and Surgeons of Canada, the College of Family Physicians of Canada, the Canadian Medical Association, provincial medical associations and Canadian medical schools.<sup>1</sup> It contains detailed information on each physician, including the same variables noted in the CPDB.

A fifth database, the Ontario Physician Human Resources Data Centre (OPHRDC) database, was not used in the analysis, but was used to validate the data in this study.

No database can be regarded as having perfect information. In this analysis, data from multiple sources have been combined to get the best possible picture

of physician service activity in the province. Exhibit TA.1 outlines the advantages and disadvantages of each database.

### 1. Definition of a Physician

There are three ways of counting physicians:

- Head Count - any physician billing OHIP any amount in a given fiscal year.
- Active physician - a physician who bills OHIP at least \$35,000 in price-adjusted dollars in a given fiscal year. (See below for a description of the method of price-adjustment.) Previous research has shown that a significant number of physicians (15%) have very low billings (below \$35,000) and account for only 1.5 per cent of billings.<sup>2</sup> Such physicians may have only a part-time practice in Ontario; for example, their primary activity may be research or administration. Inclusion of such physicians may distort the actual number of physicians in practice.
- Full-time equivalent (FTE) - to measure full-time equivalent, a modification of the Health Canada methodology<sup>3</sup> was used. Each physician was assigned a FTE activity level based on the following formula:

#### Formula 1:

$$\text{FTE} = \begin{cases} B / B_{40} & \text{if billings (B) are below the 40}^{\text{th}} \text{ percentile for the} \\ & \text{physician's specialty (B}_{40}\text{)} \\ 1 & \text{if billings are between the 40}^{\text{th}} \text{ and 60}^{\text{th}} \text{ percentile} \\ \log(B / B_{60}) & \text{if billings (B) are above the 60}^{\text{th}} \text{ percentile for the} \\ & \text{physician's specialty (B}_{60}\text{)} \end{cases}$$

The fiscal year 1997/98 was used as a base year for calculations of the 40<sup>th</sup> and 60<sup>th</sup> percentile. These percentiles were used in FTE calculations for other fiscal years in order to monitor changes in activity level over time.

The billings (B) used in these calculations were price-adjusted. There were multiple price changes during the study period as a result of cost containment efforts. For some high-billing physicians, prices varied even for the same service if physicians billed above a certain threshold, they faced a financial penalty. It is important to control for all of these price changes from year to year. Imagine, for example, that a physician's activity level did not change, but

prices went up over time. If there was no adjustment for price changes, there would be an increase in billings and a false impression that activity went up.

To adjust for prices, 1997/98 was selected as the standard year and a standard price was calculated for each fee code in the fee schedule, equal to:

### Formula 2:

Standard price of a selected fee code =  $\frac{\text{Total amount billed on that fee code in 1997/98}}{\text{Total \# of services billed for that fee code in 1997/98}}$

### Formula 3:

The price-adjusted billings for any given service, in any given year Y, are:

Price adjusted billings in year Y for a selected fee code =  $\frac{\text{Total number of services in year Y}}{\text{Standard price for selected fee code}} \times$

Over time, numerous adjustments are made to the fee schedule. New fee codes are added, fee codes for obsolete services are dropped and some fees are reorganized. Exhibit TA.2 itemizes the special adjustments made for these fee codes.

Billings (B) include all fee-for-service claims made by a physician. Laboratory services billed by commercial labs (fee codes L001 to L799) were excluded.

There are some physicians who are paid by the Ministry on a salary, capitation, or sessional (per diem or per hour) basis who must submit "shadow billings." These are claims in which all of the usual billing information is submitted (e.g. fee code, date of service and number of services), but zero dollars are billed. Examples include physicians billing the \$70/hr sessional fee for rural after-hours emergency department coverage and most physicians in the Hospital for Sick Children alternate payment plan. For these physicians, their activity will be recorded in the same fashion as physicians on fee-for-service. Even though their billings will be zero, their price-adjusted billings (number of services times a standard price) will reflect their level of activity.

In summary, therefore, there are four main reasons why modifications were made to the Health Canada formula for calculating FTEs:

1. The base year for activity benchmarks is more timely (1997/98 vs. 1986).
2. The specialty information on this database is more accurate.
3. Commercial laboratory billings have been excluded.

4. The method accounts for the activity of shadow-billing doctors.

## 2. Identification of Specialty

Information on a physician's specialty was available from the NPDB and the SMDB. The NPDB specialty information is derived from OHIP's CPDB.

The information on specialty designation on the NPDB/OHIP files is generally considered inaccurate when compared with other databases (see Exhibit TA.1). One reason is that physicians often provide only their broad specialty group to OHIP (e.g. internal medicine) instead of their subspecialty (e.g. cardiology). SMDB data draws information from a variety of sources such as licensing colleges, the Royal College of Physicians and Surgeons<sup>1</sup> and an annual questionnaire to all physicians asking for an update of each item of information.

For confidentiality reasons, ICES does not hold physician names in any database. However, it was still possible to conduct a probabilistic data linkage between all three databases: the NPDB, CPDB and SMDB. The NPDB lists only one specialty (the one under which physicians bill) while the SMDB has four fields available for coding multiple specialties. Matching was done on the following variables: physician gender, year of birth, school of graduation, year of graduation and postal code. The databases were also linked by checking if any of the following held true:

- NPDB specialty matched any one of the four SMDB specialties
- NPDB functional specialty matched any one of the four SMDB specialties
- NPDB specialty grouping matched any one of the four SMDB specialty groupings

The specialty grouping combines subspecialties (for example, cardiology and rheumatology belong to internal medicine, while plastic surgery belongs to surgery). The functional specialty describes the specialty with which typical billing patterns most closely resemble a particular physician's billings. For example, if an internist spent most of his or her time doing services commonly associated with gastroenterology, then that would be his/her functional specialty.

To calculate functional specialty the following process was used. For each fee code, the specialty billing the code most often, or the specialty most closely



associated on the code on clinical grounds was identified as "belonging" to a particular specialty category. For each physician, the percentage of billings attributable to a specific specialty category was calculated and the specialty category with the highest proportion of billings was selected. Using this algorithm, most subspecialties could be readily identified. However, some cognitive-oriented subspecialties, such as rheumatology and geriatrics, could not be easily distinguished from internal medicine.

After the matching process was completed, an algorithm was applied to select one specialty as the principal specialty. If a physician's NPDB specialty was general/family practice, then that physician was designated as a GP/FP, regardless of other reported specialties. Among specialists, the functional specialty was selected as the principal specialty in cases where multiple specialties were listed (e.g. neurology and psychiatry).

Exhibit 10 makes special mention of the difference in physician supply growth between subspecialists and general specialists. For these calculations the definitions for subspecialists are listed as follows:

Internal Medicine Subspecialties	Surgical Subspecialties
Cardiology	Cardiovascular Surgery
Clinical Biochemistry	Ear Nose & Throat
Clinical Immunology	Neurosurgery
Endocrinology	Obstetrics / Gynecology
Gastroenterology	Ophthalmology
Geriatrics	Orthopedics
Hematology	Plastic Surgery
Infectious Diseases	Thoracic Surgery
Nephrology	Urology
Neurology	Vascular Surgery
Physiatry	
Respirology	
Rheumatology	
Therapeutic Radiology	

### 3. Alternative Funding Plans

Limited data was available on Alternative Funding Plans (AFPs). The Association of Ontario Health Centres provided a list of all Community Health

Centres (CHCs), and the Canadian Institute of Health Information (CIHI) had data on the total number of FTE GP/FPs working in CHCs. The total number of FTE (134.4) was divided by the number of clinics (54) to obtain an average of 2.49 FTE per clinic. It was then assumed that each CHC had the same number of FTEs. The Ministry of Health provided data on the number of FTE GP/FPs in each HSO of the province, which was used to calculate totals by DHC. The totals for GP/FPs in HSOs and CHCs are included in Exhibit 5.

The creation of the Southeastern Ontario Academic Medical Organization (SEAMO), a large group of academic specialists at Queen's University, gave the appearance of a drop in fee-for-service billings in Kingston, beginning in 1994/95. In reporting time trends in physician supply, it is necessary to adjust for this exodus. First, all specialists located in Kingston and surrounding areas in 1993/94 were identified and followed forward. The apparent decline in head counts, active physicians and FTE in subsequent years was then calculated. During this period, some physicians lost all activity, some lost most, and some did not change at all. This likely corresponds to physicians who switched to alternate funding completely, who switched but retained some private practice as a secondary activity, or who never enrolled in SEAMO in the first place. The decline in apparent physician supply from 1994/95 onwards was added back to physician supply estimates for Exhibit 1 and Exhibit 3.

There are two limitations to this method. First, it is impossible to make any inference about what happened to physician supply from 1995/96 to 1997/98. Second, it is possible that the disappearance of a Kingston specialist from OHIP was due to some other reason (e.g. retirement). By the same token, it is possible that a recent graduate started at SEAMO, and his/her entry would not have been captured.

When manually adjusting fee-for-service data for non-fee-for-service activity, special attention is necessary to avoid double counting. HSO physicians, for example, are allowed to bill up to \$30,000 for services not covered by their capitation agreement; hence, they are counted under the head count method but register a slight amount of activity under the FTE method. There is some unavoidable double-counting in Exhibit 5, which examines total GP/FP supply by DHC as measured in FTE, but this amount is very small. In the case of SEAMO, double counting was avoided because the exact drop in head counts, active physicians and FTEs was determined before and after introduction of the plan. Some of these SEAMO physicians are expected to have some small amount of fee-for-service activity. This method attempts to measure the exact

difference of previous fee-for-service activity and that which remains after conversion to AFP.

Adjustments for other types of AFP physicians could not be made because of lack of data. Examples include physicians on salary in psychiatric hospitals and Cancer Care Ontario, salaried pathologists in hospitals and emergency physicians in eight AFPs for emergency departments.

## 4. Population Estimates

Census Canada data was used for the population denominators in calculations of physician-population ratios. Statistics Canada provides population estimates in years between the 1991 and 1996 census, at the level of county. DHCs are, in all cases, combinations of existing counties; hence, population estimates for DHCs can easily be derived.

Census Canada also maintains a postal code conversion file, last updated in 1996. This file was used to determine, from a physician's reported postal code, in which DHC he/she is located.

In Exhibit 1, physician-population ratios were age/sex-adjusted, using a form of indirect standardization. Exhibit 2 lists the expenditures per person in each age/sex group in 1997/98. For each fiscal year, the expected expenditures per capita, holding utilization patterns constant, were calculated as follows:

### Formula 4:

$$\text{Expected expenditures in year Y} = \frac{\text{Population in year Y}}{\text{for age/sex group k}} \times \frac{\text{Expenditures per capita in 1997/98 for age/sex group k}}{\text{in 1997/98 for age/sex group k}}$$

Thus, the expected expenditures in 1997/98 were \$388.64 and \$381.14 in 1991/92. This makes intuitive sense; because the population in 1991/92 was younger, it generates lower expenditures (assuming that the 1991/92 population was consuming medical services at exactly the same rate as patients in 1997/98).

The ratio of expected expenditures in different years was used to adjust the size of the population. For example, the 1991/92 population was decreased (multiplied by a factor of \$381.14/\$388.64), to reflect the fact that it consumes medical resources at a lower rate than the 1997/98 population because it is younger.

## 5. District Health Council (DHC) Analyses

The systematic coefficient of variation (SCV) was used to monitor changes in the level of variation over time. The SCV is a measure which represents the degree of variation between small regions and is an estimate of the amount of variation between DHCs after the variation within DHCs has been removed.<sup>4</sup> It is given by the formula:

### Formula 5:

$$\text{SCV} = \frac{\frac{\sum ((O_i - E_i)^2)}{E_i^2} - \sum (1/E_i)}{k} \times 10000$$

where k is the number of DHCs,  $O_i$  is the observed number of physicians in DHC 1, and  $E_i$  is the expected number (based on the provincial average and the DHC's population). It is important to note that this measure does not have an associated hypothesis test. Ordinary least squares regression analysis was used to examine the relationship between the DHC physician supply and proportion of females, and between DHC physician supply and workload. Each unit of analysis was the District Health Council.

## 6. Comprehensiveness of Practice

The following criteria were used to determine if a physician provides a given service:

Emergency Dept.	≥ 50 visits per year
Nursing Home	≥ 50 visits per year
Hospital Care	≥ 50 visits per year
House Visits	≥ 10 visits per year
Obstetrics	At least \$400 in billings per year for obstetrical procedures (corresponds to ≥ 2 deliveries/year)
Anesthesia	At least \$400 in billings per year (36 anesthetic units, or 9 hours of anesthesia time in OR)

The criteria for an "office-only" GP/FP were strict. A physician had to have zero billings for all of the above six categories to be considered an office-only GP/FP. Statistical significance of differences in proportion of physicians performing these services between 1991/92 and 1997/98 was tested using a two-tailed t-test (Exhibit 10).

**Exhibit TA.1 Comparison of Different Physician Databases**

<b>Database</b>	<b>Detailed subspecialty information</b>	<b>Able to account for functional specialty</b>	<b>Physician practice location</b>	<b>Accounts for activity level</b>	<b>Includes non-fee-for-service physicians</b>	<b>Excludes non-clinical physicians</b>	<b>Removes inactive physicians</b>
OHIP-based databases (includes NPDB, CPDB)	Limited (subspecialties not consistently reported)	Yes for most specialties	Yes with limitations (e.g. may represent home address)	Yes	No	Yes (but part-time clinical activity captured)	Yes
SMDB	Yes (but self-reported and some fields not standardized)	No	Yes with limitations (e.g. may represent home address)	No (headcount only)	Yes	No	Limited
OPHRDC	Yes (periodic telephone audits to validate data)	Yes (periodic telephone audits to validate data)	Yes with telephone validation	No (headcount only)	Yes	No	Yes
Linked NPDB-CPDB-SMDB database (used in this study)	Yes (validated against functional specialty)	Yes for most specialties	Yes with limitations (e.g. may represent home address)	Yes	No (but some analyses manually corrected for shifts due to non-FFS physicians)	Yes (but part-time clinical activity captured)	Yes

## Exhibit TA.2 Special Cases in Price Adjustment Calculations

Type of special adjustment	Method for price adjustment	Impact
New fee codes added for a new service (e.g. new technology, new procedure)	Same as outlined above in formula 2	Utilization increases in the year the new fee code is added.
Service delisted (fee code removed from Schedule of Benefits)	Standard price = amount billed ÷ number of services, in the last year in which the fee code was used	Utilization appears to decline because the service is no longer covered by OHIP.
New fee code is created to pay for a service which was previously paid for using a different fee code e.g. pronouncement of death used to be billed as an A001, for \$16.10. A new fee code, A777, was created in 1992 for this service, equal to \$24.80.	Standard price for the new fee code is set at the 1997/98 standard price of the fee code formerly used for the service e.g. the standard price for A777 is the 1997/98 standard price for A001.	The creation of a new fee code for a pre-existing insured service is treated as a price change and not as a change in utilization. In other words, if a doctor was doing the same number of pronouncements of death before and after the fee code changes, then price-adjusted billings would appear to stay the same.
Renaming of fee codes e.g. A845 is renamed A645 in 1992	Standard price for former code is set at calculated 1997/98 standard price for new code	If a physician is performing the same number of services before and after, then price-adjusted billings would stay the same.
Creation of sessional fees for rural emergency services e.g. previously, doctors might have billed H103, or \$26.55, for an emergency visit. Afterwards, doctors would shadow bill (submit a claim for H103, one service provided but paid at \$0.00) and bill H400, for \$70, for each hour worked	Standard prices for the sessional fees (H400-H408) are set at zero. Standard fees for the emergency visit codes (e.g. H103) are calculated using Formula 2	Again, the switchover to sessional fees is treated as a price change. If a doctor was doing the same number of emergency visits before and after the change, then price-adjusted billings would stay the same.

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