Issues in Physician Resources Planning in B.C.: Key Determinants of Supply and Distribution, 1991-96

A Report to the Post-Graduate Medical Education Advisory Committee

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Nino Pagliccia, Lars Apland, Laura Wood

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The HHRU's research agenda is determined through discussion of key current issues and available resources with the senior staff on the Ministry of Health. Various health care provider groups participate indirectly, through on-going formal and informal communications with Ministry of Health officials and the HHRU researchers. Arminée Kazanjian is the Associate Director and Principal Investigator for the Unit.

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Executive Summary

At the request of the Post Graduate Medical Education (PGME) Advisory Committee of British Columbia, this project was undertaken to describe the supply and distribution of physicians in British Columbia, including that of general practitioners/family physicians and specialists certified by the Royal College of Physicians and Surgeons of Canada (RCPSC). To meet this objective, the study had four specific aims: (1) to describe the supply and distribution of physicians in B.C. in 1991/92 and 1996/97 by region, sex, age, specialty and place of medical education; (2) to examine differences in the 'scope of practice' among B.C. physicians in relation to their specialty, geographic location, demographics, practice intensity, and place of medical education; (3) to examine the stability of the physician workforce in B.C. between 1991/92 and 1996/97 by socio-demographics, specialty and place of medical education; and (4) to examine how physicians' intensity of practice relates to the professional life cycle. The study did not examine issues relating to the appropriateness of the physician supply in relation to population health needs or demand for care. The following outlines the study's methodology and major findings.

Methodology

This study used administrative data from four sources: (a) the physician licensing database of the College of Physicians and Surgeons of British Columbia (CPSBC); (b) physician payment records from the British Columbia Ministry of Health; (c) physician certification records from the Royal College of Physicians and Surgeons of Canada (RCPSC); and (d) the Canadian Postgraduate Medical Education Registry (CAPER) databases. These data were supplemented with population estimates for British Columbia's 83 Local Health Areas (LHAs) and 20 Health Regions (HRs) based on the 1996 Canada census. No primary data collection was used.

To create a cross-sectional analytic file for each study year, B.C. Ministry of Health Fee-for-Service and Salary and Sessional payment data, were linked to the CPSBC licensing data, using deterministic linkage. For the longitudinal analysis, deterministic linkage was used to merge the three study years. The RCPSC/CAPER certificational data were linked to these from CPSBC using probabilistic data linkage procedures.

Two types of variables, and related appropriate measures, were developed for the analyses: Physician-Specific variables which pertain to individual physicians; and physician supply variables pertaining to the region in which physicians work.

Changes in the Supply of Physicians in B.C., 1991/92-1996/97

There were 7,732 physicians on the 'active' registers in 1996/97, accounting for approximately 6,930 physician full-time-equivalents (FTEs), or approximately 18 physician FTEs per 10,000 B.C. residents (560 residents per physician FTE).

Between 1991/92 and 1996/97, the B.C. physician population grew by about 511 GP/FP and 358 specialist FTEs. Over this period, this growth in physician FTEs was closely matched by the

population growth, yielding similar per capita supply (18 per 10,000) for the two study years. In addition, there was little change in the per capita supply of both GP/FPs and specialists, yielding a consistent primary care/specialist ratio of about 55:45.

Despite the negligible change in the overall per capita supply of GP/FPs and specialists, there were important differences in the patterns of growth among specialties. Most Royal College of Physicians and Surgeons of Canada (RCPSC) specialties reported a net increase in numbers except for four specialties (general surgery, otolaryngology, hematology, and orthopedic surgery) which reported a net decline. However, when specialist supply relative to the population growth was examined, more than half the specialties reported a net decline in FTE to population ratios over the study period. The appropriateness of these changes in the context of changing population health needs was not examined in this report.

Age, Sex, and Place of Medical Education of B.C.'s Physician Population

Over the study period, the average age of physicians increased by about 1 year from a mean age of 45.4 years in 1991/92 to 46.2 in 1996/97. Specialists were considerably older than their GP colleagues (15% vs 8% aged 61+ years) but there was considerable variability in age among specialty groups. RCPSC specialty groups with more than 20% of their physician supply aged 60+ years in 1996/97 included: community medicine, dermatology, medical microbiology, nuclear medicine, psychiatry; and general surgery. Women physicians comprised 21% of the total physician population but comprised a larger proportion of GP/FPs (24%) than specialists (18%). The sex distribution appears to be equilibrating over time: the female:male ratio for younger physicians (aged < 40 yrs) was 34:66, consistent with the increasing representation of women in Canadian medical schools. However, among RCPSC specialties, the variation by sex was substantial (range: 0 to 44%).

Of the total 1996/97 physician population, 26% were graduates of the University of British Columbia, 46% came from other Canadian medical faculties, and 29% originated from non-Canadian schools. GP/FPs were almost twice as likely to have obtained their medical degrees at U.B.C. than were specialist physicians. Over the period 1991/92-1996/97, there was a modest net increase in the proportion of physicians who completed their medical education at U.B.C. (24.7% to 25.9%) but this varied considerably by specialty. The proportion graduating from U.B.C. over time has increased substantially. For physicians graduating in or before 1970, 16% originated from U.B.C. compared to 21% and 35% of those physicians graduating between 1971-1980 and post-1980, respectively.

Geographic Distribution of GP/FP and Specialist Physicians, 1991/92-1996/97

During the 5-year period under study, the absolute number of GP/FPs increased in all regions except one. However, when examined in the context of population growth, the per capita supply of GP/FPs grew in 13 regions and declined in seven others. The regions with smaller GP/FP baseline per capita supplies (1991/92) tended to grow faster than did regions with greater supplies. While significant differences in the per capita supply by region continued to exist, this differential growth helped mitigate the regional disparities in GP/FP supply.

Over the study period, about two thirds of the health regions saw a net increase in their per capita supply of specialists. Parallel to the findings for GP/FPs, regions with smaller supplies in 1991/92 tended to grow faster than those with larger supplies. Further analysis is required to examine which (if any) of the physician workforce policies in place during this time period resulted in attenuating disparities in the supply of both GP/FPs and specialists among regions.

While differences in the regional distribution for specialists overall decreased over the study period, the disparities increased for some specialty groups (including internal medicine, the medical subspecialties, general surgery, and pediatrics) and decreased for others (the surgical subspecialties, psychiatry, obstetrics and gynecology, laboratory medicine, radiology, and anesthesiology). The number of FTEs increased in most regions over the range of specialties, yet the increases in many HHRU regions did not keep pace with population growth. General surgery showed the most consistent reductions in supply across regions; the FTE to population ratio declined in eight of nine HHRU regions. Conversely, psychiatry saw the most consistent increases across regions (in all but one).

Variation in the 'Scope of Practice' of B.C. Physicians

The boundaries of practice between different types of generalist and specialist physicians are fluid with little information on when one starts and another leaves off. To measure a physician's 'scope of practice', we assessed the proportion of the physician's billings that fell within each of the clinical 'domains' that make up the Medical Services Plan (MSP) fee schedule. The degree that GP/FP and specialists limited their practices to items within their 'own' domain was markedly different, reflecting important differences in their roles within B.C.'s health system. Most RCPSC specialists billed services almost entirely within their own clinical domain, suggesting that these physicians were almost uniformly highly specialized. However, we did identify a minority of RCPSC-trained specialists whose practices were comprised of services across the range of domains, resembling the practices of generalist physicians.

While the largest segment of most GP/FPs' practices was in the GP/FP domain, they also billed services in a range of other clinical domains. There was, however, considerable variability in the 'breadth' and 'balance' of GP/FPs billings across the other domains. On the whole, GP/FPs practicing in rural or semi-urban areas billed services in a wider variety of domains than did those in urban areas. The provision of a wider range of services by GP/FPs was related to lower supplies of both specialists and other GP/FPs.

GP/FPs at the beginnings of their careers (i.e., those aged <40 years) generally delivered a broader array of services than did GP/FPs who were nearing retirement (i.e., aged 60+ years). Female GP/FPs also delivered a wider array of services than did their male counterparts, but this finding was almost entirely related to the delivery of a greater share of services in obstetrics and gynecology. GP/FPs who graduated from U.B.C. delivered services across a wider array of clinical domains than did those trained at other schools. Finally, part-time GP/FPs (i.e., FTE < 1.0) appeared to have narrower practices than did full-time physicians and generally limited their practices to services that were within the GP/FP domain.

GP/FP 'Specialists' and the Delivery of Specialized Services in B.C.

We also examined how GP/FPs contributed to three areas of specialty practice (anesthesiology, surgery, and obstetrics and gynecology) in 1996/97. We examined the proportion of each GP/FP's practice in these areas and identified those physicians who appeared to deliver a greater proportion of these types of care than their peers. Most GP/FPs delivered no services in the anesthesiology fee item domain. We identified 79 GP/FPs, however, who concentrated more than 10% their practices in this area, functioning under our definition as GP/FP 'anesthesiologists'. These GP/FP 'specialists' were predominantly located in rural HHRU regions, complementing the geographic distribution of RCPSC-certified anesthesiologists (who were located largely in urban settings). GP/FP 'anesthesiologists' were more likely to be male and trained at non-B.C. medical schools, but were no more likely to be older or younger compared with other GP/FPs.

For surgery, most GP/FPs provided some services within the range of surgical domains, but relatively few (196) concentrated more than 10% of their practice in these areas. We identified these physicians as GP/FP 'surgeons'. They were no more likely to be located in rural HHRU regions than were other GP/FPs, complementing the more even geographic distribution of RCPSC-certified general surgeons. GP/FP 'surgeons' were significantly older than other GP/FPs (i.e., 20% were aged 60+ years) but no more or less likely to come from medical schools in other locales.

The vast majority of all GP/FPs (91%) delivered a significant proportion of their services in the obstetrics and gynecology 'domain'. Based on the delivery of 20% services in obstetrics and gynecology, we identified 175 GP/FPs who functioned as GP/FP 'obstetrician/gynecologists'. These GP/FPs appeared more likely to be located in urban locales than were other GP/FPs, mirroring the uneven distribution of RCPSC-certified obstetrician and gynecologists. GP/FP 'obstetrician/gynecologists' were overwhelmingly female (86%) and most were aged <40 years (55%). They were also more likely to be trained at U.B.C. than were other GP/FPs.

Stability of BC's Physician Supply 1991-1996

Only about two thirds of the physician workforce were 'actively' registered to practice medicine during the entire study period (1991-1996). Of the remainder, about 20% gained registration during the period and about 11% exited the registration rolls. While there were few differences in these proportions between GP/FPs and specialists overall, there were significant differences among RCPSC specialties. Specialties with particularly high in-migration included psychiatry, community medicine, nuclear medicine, and endocrinology and metabolism. Specialties with high out-migration included neurosurgery, general pathology, community medicine, general surgery, and otolaryngology.

The report also found large and important differences in physician stability by geographic region. The North and North Central HHRU regions had the highest proportion of new registrant GP/FPs with more than one third gaining registration during the study period. For specialists, in-migrants comprised more than one third of the North Central and South East physician pools. Most regions saw about 10-15% of their GP/FPs and specialist population move off the 'active'

registers during the study period. For GP/FPs the highest rates of out-migration (>15%) were seen in the South East and North regions. For specialists, 4 HHRU regions had >20% out-migration including the Capital, South East, North Central and North regions.

As expected, 'inflow' physicians were significantly younger and 'outflow' physicians significantly older than those in 'stable' practice, reflecting the natural lifecycle in physicians' practices. Mirroring the increased proportion of women in Canadian medical schools over the last several decades, 'inflow' physicians were more likely and outflow physicians less likely to be female than those in 'stable' practice. Overall, the proportions of in-coming and 'stable' physicians who received their medical degrees at U.B.C. were not statistically different. Thus, the increased representation of U.B.C.-trained physicians over the study period (discussed above) was largely due to the 'outflow' of physicians.

The Professional 'Life cycle' of a Physician's Practice

To examine how physician productivity changes in relation to the professional 'life cycle' of a physician's practice, we examined how gross income changed over the 5 year study period for those physicians in 'stable' practice for the entire period. In general, there were important age-related differences in physician income and changes in income over the study period. Overall, incomes were highest for physicians aged 40-54; incomes progressively increased with age before 40 years and progressively decreased with age after age 54.

Over the 5-year study period, the practices of physicians aged <40 years tended to grow in intensity (i.e., increased gross income), were relatively stable for physicians between 40-49 years, and then gradually declined after age 50 (with the largest declines occurring after age 60). These age-related changes in practice intensity were generally consistent regardless of sex, geographic location, place of medical school graduation, and full-time-equivalency (although there were some differences in what ages the peaks occurred). These findings suggest that current age of the physician pool in specific regions and/or for specialty groups can have important implications for future supply.

Discussion

While this descriptive study provides a comprehensive 'snapshot' of physician supply over the period 1991/92 – 1996/97, it does not consider issues related to population 'need' nor the extent to which such needs may be met with the current complement of physicians. The data and analyses provided in the study are framed from a policy perspective, to help policy makers understand the physician supply 'landscape' in B.C. However the report is only a small slice of the information required for comprehensive and integrated planning of the provincial physician workforce. The report highlights the degree to which planning for physicians in B.C. is constrained by the unrestricted migration patterns of physicians from other provinces, and the need for on-going national coordination.

1. Introduction

The supply, specialty mix, practise patterns and distribution of physicians in B.C. are topics of continuing interest and study (Kazanjian, A., Wong Fung, P., Wood, L. 1993; Kazanjian, A., Pagliccia, N. 1996; Hanvelt, R.A. *et al* 2000); recent studies at the national (Barer, M.L., Wood, L., Schneider, D.G. 1999; Evans, R.G. 1998) and international levels (Maynard, A. and Walker, A. 1997; Rivo, M.L. and Kindig, D.A. 1996) are also of interest to planners and policy makers seeking to develop national approaches to learn from other jurisdictions that which may be pertinent to them.

This study examines key factors affecting the current supply and distribution of physicians in B.C. from the longitudinal perspective of the last decade. An analysis of current supply by age and sex, both in number and full-time-equivalence, to explore issues of productivity across the professional life-cycle provides a demographic and practice profile of general/family practitioners and specialist physicians. The cross-sectional analyses compare the B.C. medical workforce in 1991/92 and 1996/97, delineating major changes in the mix and distribution of physicians by region and specialty, and describing the flows into and out of this workforce, including interprovincial and international migration.

The study also examines changes in physician supply relative to the B.C. population through the presentation of physician/population ratios. It should be noted that we have examined these ratios to better understand issues in physician supply and clearly not to allude to medical workforce requirements, which are often expressed simply (and misleadingly) as physician/population ratios without any due attention to the important details on physician practice style, setting and mode of remuneration.

Frequently, studies on the medical workforce use modeling and/or forecasting approaches to establish the current and future supply of physicians. We have not followed that path for two reasons: simple forecasting models are misleading, at best, and more complex models require a clear understanding of factors which affect supply and the quantification and measurement of such factors. We have, therefore, opted to deepen our understanding of the key determinants of physician supply, mix and distribution, rather than undertake projections of future supply, to identify where gaps exist in our knowledge pertaining to such determinants. We have paid particular attention to differences in practice intensity and in scope of practice (including that of family practice) and to regional variations. These analyses present our unique contribution to the knowledge base on post graduate medical education training, geographic location and scope of practice throughout the professional life-cycle.

This study was commissioned by the Post Graduate Medical Education Advisory Committee of B.C. The Committee is chaired by the B.C. Ministry of Health; the membership represent various stakeholders including the U.B.C. Faculty of Medicine, the College of Physicians and Surgeons of B.C., the B.C. Medical Association, the Professional Association of Interns and Residents of B.C., Regional Health Boards, and medical student representatives. Findings from the study will

assist in the discussions, deliberations, and decisions the Committee may make regarding the relative numbers and mix of residency seats at U.B.C.

The main focus of our study is to better understand the salient features of current supply with regard to the training and production of future supply in the province. Therefore, we have endeavoured to undertake as much analysis as possible by location of training. Data limitations regarding location of post graduate medical education have seriously hampered our attempt to produce timely analyses (see discussion in methods section).

2. Study Aims:

As discussed above, this project was undertaken at the request of the Post Graduate Medical Education (PGME) Advisory Committee, who were seeking information about the supply and distribution of physicians in British Columbia. More specifically, information was sought about the supply of general practitioners and Royal College of Physicians and Surgeons of Canada (RCPSC)-certified specialists in B.C. and its semi-autonomous health regions. The principal goal of this study was to examine the 'landscape' of B.C. physician supply in order to better inform decision-making about the allotment of positions across U.B.C.'s post-graduate training programs. The questions of concern to the committee included how many specialists there were, what specialties were represented, where they were located, what were their demographic and practice characteristics, and where the current stock of physicians had been educated. To address these general questions, four specific aims were identified for the project. A series of analyses were completed for each aim and these are presented in Section 4.0.

The study's specific aims were:

Aim I: Describe the Supply and Distribution of Physicians in B.C. by Specialty.

This aim was intended to inform policy makers about the current status of the B.C. physician workforce and the recent trends in supply for each physician specialty. The specialties were analyzed with respect to the numbers of physicians on the active rolls ratios in 1991/92 and 1996/97, estimates of the numbers of full-time-equivalents (FTEs) and FTE/population ratios. The changes in the geographic distribution of physicians within the province were also explored. The supply of physicians in each specialty category was analyzed in relation to age, sex, and the places of medical education.

Aim II: Describe the Variation in the 'Scope of Practice' Among Physicians in B.C.

Understanding differences in the range of services provided by physicians is an essential but often overlooked component of physician workforce planning. There are little data regarding variation in where the practice boundaries are set between and among specialties. This study aim was designed to examine differences in the scope of practice of B.C. physicians, particularly general practitioners and family physicians. We explored the variability in the range of services in relation to geographic location, age, sex, practice intensity, and place of medical education. We also focused on identifying and characterizing the provision of three types of services by general practitioners/family physicians: anesthesiology, surgery, and obstetrics and gynecology services.

Aim III:- Analyse the 'Stability' of Physician Human Resources in B.C.

This study aim concentrated on describing how 'stable' the B.C. physician supply has been and explored the patterns of migration both into and out of the province. Special attention was paid to characterizing the physicians who entered and exited the province with respect to a variety of demographic and practice characteristics. In addition to examining those who came and left practice in B.C., we also examined how physicians migrated between different geographic locales.

Aim IV: Examine the Age-Related Effects on Physician 'Output'

In addition to forecasting the number of physicians entering and leaving practice, medical human resource planning should also account for expected changes in the volume of physicians' practices over time. The analyses for this study aim described the typical 'life-cycle' of a physician's practice in B.C., spanning the time from when he or she entered practice after completing post-graduate training until retirement. The purpose of this section was to provide insight into how the practice intensity of physicians currently in practice might change as they age.

3. Methodology

3.1 Data Sources

This study used administrative data from four sources: (a) the physician licensing database of the College of Physicians and Surgeons of British Columbia (CPSBC); (b) physician payment records from the British Columbia Ministry of Health; (c) physician certification records from the Royal College of Physicians and Surgeons of Canada (RCPSC); and (d) the Canadian Postgraduate Medical Education Registry (CAPER) databases. These data were supplemented with population estimates for British Columbia's 83 Local Health Areas (LHAs) and 20 Health Regions (HRs) based on the P.E.O.P.L.E Project 24. No primary data collection was used. The following section includes a brief description of each data source.

3.1.1 College of Physicians and Surgeons of British Columbia Registration Data

Pursuant to the Medical Practitioners Act of British Columbia (RSBC 1996, Chapter 285), the CPSBC is responsible for establishing, monitoring, and enforcing standards of education and practice for all physicians in British Columbia. As such, registration with the CPSBC is required of any physician delivering clinical services in the province. The registration data collected by the College detail the demographic characteristics and educational qualifications of all physicians. Since our interest is in physicians actively practicing medicine, we concentrated on three College registers: the 'full' (i.e., unrestricted) register, the 'special' register[1], and the 'temporary' (in practice) register. For the remainder of this report, we refer to these three CPSBC registers jointly as the 'active' registers.[2] This definition is consistent with other research reports from the Health Human Resources Unit (HHRU).[3] Registration data relating to physicians not resident in B.C., non-practicing B.C. resident physicians, physicians-in-training, and honorary members were not included.

The CPSBC collects licensing data from each physician on his or her initial registration and updates this information annually upon renewal. Moreover, the database is continually updated for additions and deletions, physician address changes (i.e., physicians are required to promptly report address changes to maintain registration) and specialty status as certified by the RCPSC and the Canadian College of Family Physicians (CCFP).

The data used in this study comprise the College registration files for 1991, 1993, and 1996. These data contain one record for every physician on the 'active' register on the following dates: December 31, 1991; March 31, 1993; and September 15, 1996. The data therefore represent a

[1] The 'special' register is similar to the 'full' register with the exception that these physicians are subject to conditions imposed on their practice (e.g., limited to a particular field of medicine).

[2] The one physician with registration on the 'osteopathic' register was not included in this study.

[3] **HHRU 99:2** ROLLCALL UPDATE 98. A Status Report of Selected Health Personnel in the Province of British Columbia. May 99. ISBN 1-894066-97-9. ISSN 0828-9360.

point prevalence of physician supply on these dates. Since the College data are continuously updated, the data represent the most recent data as of the date extracted. The College data were linked to the other data from the B.C. Ministry of Health using the CPSBC unique identification number assigned to each physician. The data extracted from the CPSBC licensing data included age, sex, RCPSC specialty(ies), postal code, and date(s) and place of medical school graduation. Anonymity was maintained by grouping physician age into intervals and postal codes into regions. Unique identifiers were stripped after linking with other data sets, but before the data were made available to the research team.

3.1.2 Ministry of Health Physician Payment Data

To estimate the number of physician full-time-equivalents (FTEs) during the study years and other variables relating to physician practice style, we employed three sets of administrative data from the B.C. Ministry of Health for the study years. These databases included: (1) fee-for-service (FFS) payments from the B.C. Medical Services Plan (MSP); (2) salary and sessional payment data from the Ministry of Health's Alternative Payments Branch (APB); and, (3) 'service agreement' data describing payments for physician services made under contract with a variety of health care facilities and other organizations[4]. In sum, these data represent the totality of payments made by the Ministry of Health to physicians for insured clinical services. To match the date of record for these payment data to the CPSBC data as closely as possible, the data were extracted for the fiscal years (April 1st through March 31st) of 1991/92, 1993/94 and 1996/97. Because the data pertain only to services covered by the B.C. Ministry of Health's programs, data related to non-insured services (e.g., cosmetic surgery) and services insured by third parties (e.g., Workers' Compensation Board, Insurance Corporation of British Columbia) were not available. Payments made for non-B.C. residents were also excluded. The following provides a more detailed description of the Ministry of Health physician payment databases.

3.1.2.1 Medical Services Plan Fee-For-Service Payments

The Medical Services Plan (MSP) physician payments databases contain one record for each service paid under this mechanism. These data are housed for research purposes at the Centre for Health Services and Policy Research, as part of the B.C. Linked Health Data set (BCLHD) (Chamberlayne *et al* 1996). All physician payments (relating to patient consultations, examinations, clinical procedures, ambulatory laboratory services, and diagnostic imaging services) were extracted for the study years, regardless of setting (i.e., physicians' offices, clinics, hospitals, long term care facilities, patient homes, and others). For each year, the services and tariffs specified by these data reflect the negotiated schedule of benefits in effect at that time. Interest payments and other fees for non-clinical services (e.g., tray fees) were excluded. Since the submission of claims is vital to physician reimbursement, fee-for-service payments databases are generally thought to capture the vast majority of services paid through this mechanism (Roos *et al* 1983). Furthermore, those data fields critical to payment (e.g., physician and patient

[4] Payments for physician services through such contracts commenced in 1995.

identifiers, service item, and fee tariff) are generally regarded to be the most valid (Weiner *et al* 1990). The data fields extracted from the claims records included physician identifiers (i.e., the MSC and CPSBC identification numbers), service code, tariff amount, date paid and fee-item category. The physician identifier was used to aggregate all payments to each physician and to link with the other data sources. All identifiers were scrambled before data were released to the research team to maintain anonymity and confidentiality.

3.1.2.2 Alternative Payment Branch (APB) Salary and Sessional Payments

In addition to fee-for-service (FFS) payments, the British Columbia government pays approximately 8% of physician services by non-FFS methods (MOH Annual Report 1997). The inclusion of data for services provided through these mechanisms was vital to providing a complete picture of physician supply in the province. This was especially the case for certain physician specialties (e.g., emergency medicine, pediatrics and psychiatry) where non-FFS reimbursement comprises a large part of total payments. For physicians paid through salary and sessional arrangements with the Ministry of Health, the APB collects records of all payments made to enrolled physicians. Unlike the claims database, however, these data do not characterize the quantity or nature of the services provided. Thus, for this subset of physician services, we were precluded from examining the types of services provided to B.C. residents. For physicians paid solely under these mechanisms, we were able to characterize their gross income but not their patterns of practice. However, since many physicians who received these alternative payments also had FFS billings, we were able to characterize the FFS portion of their practices.

3.1.2.3 'Service Agreements' with Health Care Facilities and Other Organizations

Beginning in fiscal year 1995/96, the Ministry of Health began contracting directly with health care facilities, health regions, and other organizations to provide a defined set of physician services. The services specified under these contracts were varied and included primary, specialty, and sub-specialty care in both urban and rural locales. The contracting organizations in turn employed, or contracted with, individual physicians or physician groups to provide the specified services. In fiscal year 1996/97, these contract payments represented approximately 3% of the total physician services budget (excluding transplantation services). In contrast to the salary and sessional data, the Ministry collects payment information for the service agreements only as it relates to the contracting organization. The service agreement data specify neither which physicians were employed nor the services provided. For these agreements, therefore, we were only able to specify the contractor, the general nature of the services specified (e.g., primary care, intensive care), the total payments made for the study year, the locale (i.e., LHA) where the services were provided, and the number of full-time physician equivalents (FTEs) under contract to the Ministry. Since we could not attribute these payments to individual physicians, these services were aggregated at the Health Region level and used to supplement the cross-sectional physician supply analyses that follow. Table 3.1 outlines the key attributes and differences among the three Ministry of Health payment databases described above.

Table 3.1 Key Features of the Ministry of Health Physician Payment Database					
	Fiscal Years				
Database	91/92	93/94	96/97	Analysis Unit	Service Data
MSP Claims Database	✓	✓	✓	Physician	✓
Salary & Sessional Data	✓	✓	✓	Physician	✖
Service Agreement Data	✖	✖	✓	Organization	✖

3.1.3 Royal College of Physicians and Surgeons of Canada Certification Data and the Canadian Postgraduate Medical Education Registry[5]

Data from the registration files of the Royal College of Physicians and Surgeons of Canada (RCPSC) and Canadian Postgraduate Medical Education Registry (CAPER) were used to supplement the licensing data extracted from the CPSBC files. More specifically, these data related to the location and dates of postgraduate medical education training for physicians registered in the province in 1996/97. The RCPSC is responsible for accrediting all Canadian specialist training programs and for certifying all specialist physicians. In B.C., the CPSBC grants 'full' registration for physicians to practice as specialists *only* if they have obtained certification by the RCPSC.[6] CAPER was established in 1986 through the co-operation of a variety of national medical organizations with the mandate to provide accurate information for national medical workforce planning. To accomplish this task, an individual longitudinal file is maintained containing socio-demographic data and training details of each intern, resident or fellow under the supervision of the Canadian faculties of medicine.

For those physicians who obtained their RCPSC specialty certification in 1985 or later, data were extracted on specialty and post-graduate medical education using CAPER's electronic registration data[7]. The variables extracted for analysis included RCPSC certified specialty (or specialties), certification dates, and place of the post-graduate training program where the final year of training leading to certification was completed. For physicians who obtained their RCPSC specialty certification before 1985, these data were manually extracted from the physician's certification records at the RCPSC, since they were not available in electronic form.

[5] Since these data were unavailable for the release of this report, the analyses using these data will be released in a supplement on the post-graduate medical education characteristics of B.C. physicians.

[6] Subject to terms and conditions set by its Executive Committee, the CPSBC may grant 'special' or 'temporary' (in-practice) registration to specialists who have not received RCPSC certification.

[7] Electronic data were available from CAPER for 1985 and subsequent years.

3.1.4 Population Estimates

Mid-year population estimates for 1991, 1993, and 1996 were obtained from P.E.O.P.L.E. Projection #24[8] and used to calculate physician to population ratios for the study years. The population estimates were calculated for British Columbia's 83 Local Health Areas (LHAs) and then were aggregated for the province's 20 Health Regions, nine Health Human Resource Unit (HHRU) regions (see Table 3.2), and the provincial total. Since the LHA boundaries underwent changes, beginning in 1995, all analyses are standardized to the post-1995 boundaries (see Section 3.2.2.1).

3.1.5 Data Linkage

The analytic data set on which all analyses were based was constructed at the level of the physician by linking the CPSBC licensing data, the Ministry of Health FFS, salary and sessional payments data, and the RCPSC/CAPER certification data for each study year. Since CPSBC registration is required to practice medicine in British Columbia, we used CPSBC data to define the universe of physicians. All other data were matched to this database to create a cross-sectional analytic file for each study year. In order to study trends over time, a longitudinal file was also created by merging the data from the three study years. Deterministic linkage was used to link the CPSBC data to the Ministry of Health data using the CPSBC unique physician identifier. The data from the RCPSC and CAPER were linked to those from the CPSBC using a probabilistic procedure involving the physician's first name, last name, birth date, and sex. To maintain anonymity and confidentiality, the linkage was performed and identifiers stripped by computer analysts at CHSPR before the data were released to the research team.

3.2 Variables and Measures

The following section outlines the variables and measures used in one or more of the analyses. Each is specified as to the data sources used and the methods for variable construction. Because the analyses relate to different aspects of physician supply, the variables are grouped as those that relate to individual physicians (i.e., physician-specific variables) and those that relate to the regions in which physicians work (i.e., physician supply variables).

[8] Population Section, BC STATS, B.C. Ministry of Finance and Corporate Relations.

Table 3.2: Definition of Health Human Resource Unit (HHRU) Regions

HHRU Region	Health Region (HR)
1 Vancouver & District	7 South Fraser Valley 8 Simon Fraser 16 Vancouver 17 Burnaby 18 North Shore 19 Richmond
2 Capital	20 Capital
3 Fraser Valley	6 Fraser Valley
4 Okanagan	3 North Okanagan 4 South Okanagan - Similkameen
5 South-East	1 East Kootenay 2 West Kootenay - Boundary
6 Island Coast	9 Coast Garibaldi 10 Central Vancouver Island 11 Upper Island/Central Coast
7 Central	5 Thompson 12 Cariboo
8 North Central	13 North West 15 Northern Interior
9 North	14 Peace Liard

Source: Health Human Resources Unit, Centre for Health Services and Policy Research

3.2.1 Physician-specific Variables

3.2.1.1 Physician Specialty

The categorization of physicians used in this report is based on the general/family practice and RCPSC specialty designations reported by the CPSBC for physicians on the full, special, and temporary (in practice) registers. General practitioners and family physicians are eligible for full registration only if they have graduated from a recognized medical school, completed an approved period of recognized post-graduate medical education, obtained certification by the Medical Council of Canada, and have shown a satisfactory record from all other locales in which they worked prior to licensure in B.C. (CPSBC Policy Manual 1999). The CPSBC may also grant special or temporary registration, on a case-by-case basis, to general or family physicians not meeting these requirements but who agree to practice in a specified area of need. To be licensed as a specialist on the CPSBC's 'full' register, a physician must have graduated from a recognized medical school, be certified by the RCPSC, and have demonstrated a satisfactory record of medical conduct. As of June 1998, only physicians trained at recognized specialty training programs in Canada and the U.S. are eligible for RCPSC certification and certification is only granted after the successful completion of prescribed specialist examinations. Prior to 1998, physicians who trained at other locations (chiefly Commonwealth countries) may also have qualified for certification. As discussed above, when RCPSC specialty certification has not been attained or when the physician does not m*eet all* other requirements for full registration, the CPSBC may grant 'special' or 'temporary' registration in special circumstances, if the physician's qualifications are deemed suitable.

With some exceptions, the most recently obtained specialty, as reported on the CPSBC registration record for the study years, was used for all analyses in this study. This specialty was chosen on the assumption that it most accurately reflected the current field of practice for the majority of physicians. In most instances, the most recent specialty also reflected the most 'specialized' specialty, where two or more specialties were recorded. In some cases, however, the most recent and most specialized RCPSC specialties were not congruent. For some physicians, for example, the most recent specialty of the CPSBC was 'general internal medicine' while earlier specialties included 'cardiology', 'gastroenterology', or 'hematology'. For these physicians, the most 'specialized' specialty was used in the analysis (n=238). Furthermore, to provide a consistent point of reference, dates of record were chosen to match those used in other HHRU publications. Accordingly, the specialty data were extracted as of the following dates: December 31, 1991; March 31, 1993; and September 15, 1996. Because of their small numbers, some RCPSC specialty categories were grouped within larger categories. These specialties included: pediatric cardiology grouped with cardiology; occupational medicine grouped with community medicine; dermatology/syphilology grouped with dermatology; clinical immunology/allergy, geriatric medicine, and infectious disease grouped with internal medicine; bacteriology grouped with medical microbiology; neuropathology and hematological pathology grouped with pathology; medical genetics grouped with pediatrics; therapeutic radiology grouped with radiation oncology; and pediatric general surgery with general surgery.

All HHRU publications before 1996 used Medical Services Commission (MSC) specialty designations derived from physician billings instead of RCPSC specialties. Accordingly, the data presented in previous HHRU publications with respect to specialty numbers differ from those presented in this report. Because designations in previous HHRU reports are derived from physician billings, the number of physicians in general practice, for instance, is slightly inflated in these publications (by 50 in 1991 and 83 in 1996) due to RCPSC-certified specialists having billing patterns similar to those of general practitioners (i.e. in effect practicing as general/family practitioners).

For the purposes of this study, the specialties have been grouped at various levels of aggregation. The first level of aggregation includes eleven main specialty groups: general practice and family practice (GP/FPs); general internal medicine; medical subspecialties; general surgery; surgical subspecialties; pediatrics; psychiatry; obstetrics and gynecology; radiology and laboratory medicine; anesthesiology; and 'other' specialties. In other analyses, physicians are grouped into a binary grouping: GP/FPs and specialists.

3.2.1.2 Age and Sex

Each physician's age was calculated from the date of birth recorded on the CPSBC registration record. For each study year, age was calculated as of April 1 to be consistent with the commencement of the Medical Services Plan billing periods (see above). For the cross-sectional analyses, age was calculated at the time the data were extracted. For the longitudinal analyses, age was as of the end of the interval. The only exception to this rule is in the examination of "out-flow" physicians (Section 4.3) where age was specified at the beginning of the interval. For all analyses, physician age was grouped into five basic intervals: ages <40, 40-49, 50-59, 60-69, and 70+ years. In some cases, some of these categories were combined (e.g., ages 60+) because of small cell sizes.

Physician sex was ascertained from the CPSBC registration file.

3.2.1.3 Place of Medical School Education and Years Since Graduation

Place of medical school education was derived from the name of the medical school first recorded on the CPSBC registration file. The graduating institutions were categorized as the University of British Columbia (U.B.C.), other Canadian medical schools, and all non-Canadian medical schools.

Similarly, time since graduation estimated from year of graduation is from the CPSBC files.

Table 3.3: Aggregated Specialties

Aggregated Specialty	GP/FPs & RCPSC Specialties
General Practice / Family Medicine	General Practice Family Medicine
General Internal Medicine	Internal Medicine
Medical Subspecialties	Cardiology Clinical Immunology & Allergy Critical Care Medicine Dermatology Endocrinology and Metabolism Gastroenterology Geriatric Medicine Hematology Infectious Disease Medical Microbiology / Bacteriology Medical Oncology Nephrology Neurology Pediatric Cardiology Respiratory Medicine Rheumatology
General Surgery	General Surgery
Surgical Subspecialties	Cardiothoracic Surgery Cardiovascular Surgery Colorectal Surgery Neurosurgery Ophthalmology Orthopedic Surgery Otolaryngology Pediatric General Surgery Plastic Surgery Thoracic Surgery Urology Vascular Surgery
Obstetrics and Gynecology	Obstetrics and Gynecology Gynecologic Oncology Reproductive Endocrinology and Fertility Maternal and Fetal Medicine Perinatology
Pediatrics	Pediatrics Medical Genetics
Psychiatry	Psychiatry
Laboratory Medicine, Radiology and Radiation Oncology	Bacteriology Medical Biochemistry Neuropathology Nuclear Medicine Pathology Pathology – Anatomic Pathology – Hematologic Radiology Radiation Oncology Therapeutic Radiology
Anesthesiology	Anesthesiology
Other Specialties	Community Medicine / Public Health Emergency Medicine Occupational Medicine Physical Medicine

3.2.1.4 Geographic Location

The physician's geographic location was derived from the postal code specified on the physician's CPSBC registration file. The postal code served to locate each physician's practice within one of B.C.'s 83 LHAs, which were in turn aggregated into the 20 Health Regions and nine HHRU regions. The postal codes recorded by the CPSBC relate to the addresses published annually in the CPSBC Medical Directory. In most cases, this address specifies the physician's principal office address but in some cases may be a home address. Because physicians may specify either their office or home address on the College's registration file, these data may misclassify some physicians as to their practice address. Furthermore, address information on administrative files can quickly become outdated. However, the accuracy of CPSBC addresses is enhanced because, as mentioned earlier, physicians are required to immediately report address changes to maintain licensure and the CPSBC requests address updates as part of the annual registration process. It was beyond the scope of this project to validate the physician addresses at each of the intervals under study.

For some of the analyses, physicians were grouped into 'urban', 'semi-urban', and 'rural' practice locales based on population density in 1996. Population density was calculated by dividing the estimated 1996 population, as obtained from the P.E.O.P.L.E. #24 Projections, by the number of square kilometers in each LHA. The thresholds for constructing these units were determined by looking for natural 'break-points' in the observed frequency distribution. The LHA groupings are provided in Appendix A. Some LHAs may include areas with differing urban/rural make-up and, thus, some physicians may be misclassified. However, these misclassifications are infrequent and unlikely to affect aggregate-level analyses.

3.2.1.5 Patterns of Geographic 'Stability'

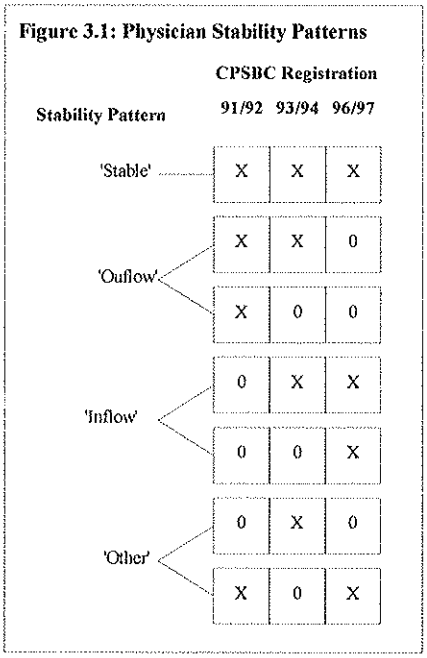
The longitudinal nature of the CPSBC files permitted the construction of variables specifying the geographic 'stability' of the study population of B.C. physicians. Using the location of practice specified by the CPSBC in 1991, 1993, and 1996, we were able to classify each physician as having a 'stable', 'inflow' or 'outflow' stability pattern. Physicians were classified with a 'stable' stability pattern if they were registered on the 'active' CPSBC registers in the three study years. Physicians were classified with an 'inflow' pattern if they were registered in 1996 but not in 1991, and with an 'outflow' pattern if they were registered in 1991 but not in 1996. An 'other' category was created for physicians who were: (a) on the active register in both 1991 and 1996 but not in 1993; or (b) on the active register in 1993 but not in 1991 and 1996. This latter pattern reflected those who both gained registration and dropped it during the study period. (See figure 3.1.)

For 'inflow' physicians, entry onto the 'active' CPSBC registry may indicate recent completion of postgraduate training, relocation from other provinces or other countries, or reactivation from a previous inactive status. For 'outflow' physicians, the reasons underlying their departure from the CPSBC registries may include relocation out of the province, re-entry into training programs,

retirement from clinical practice, death, or other extended absence. It was beyond the scope of this study to examine the reasons for entry or exit.

For 'stable' physicians, we also created a variable reflecting their regional mobility during this time. Physicians were classified as having an 'inter-regional' move if their Health Region was not the same in 1991 and 1996. For these physicians, we tracked the regions of entry and exit.

Figure 3.1: Physician Stability Patterns



3.2.1.6 Physicians' 'Scope of Practice'

Understanding differences in physician 'scope of practice' is an important, but often overlooked, component of workforce planning. To examine this issue (Section 4.2), two approaches were taken. First, we examined the range of services provided by each physician over the course of one year and constructed a measure (the 'Herfindahl index') to reflect both the 'breadth' and 'balance' of the physician's practice across the range of clinical services. Second, we focused on describing the practice characteristics of GP/FP 'specialists' who concentrated a significant portion of their practice in obstetrics and gynecology, anesthesiology, or general surgery. These measures are described briefly below.

Herfindahl Index

Using the methods developed by Baumgardner and Marder (1991), we used the Herfindahl index to measure a physician's 'specialization' in one or more areas of clinical practice.

Originally developed in the business literature to help identify violations of anti-trust statutes, Baumgardner and Marder adapted the index to measure the degree to which obstetricians and gynecologists 'concentrate' their practices in relation to certain diagnoses. We chose to modify this technique by looking at the range of services provided instead of the diagnoses encountered. To do this, we used the clinical 'domains' which form the basis of the MSP fee schedule. In general, a service (or 'fee-item') is grouped into a specialty 'domain' based on that specialty thought to be 'most responsible' for delivering the service. It was beyond the scope of this study to independently assign fee-items to specialty categories using rigorous scientific methods. Instead, we used these administrative groupings, validated them for our purposes, and made adjustments when warranted. The domains were validated by examining the proportion of claims for each fee-item made by physicians considered to 'own' that code (see Appendix B).

The Herfindahl index was used to measure the dispersion of the services provided by an individual physician in one year across the MSP fee-item domains. This index can be expressed as follows: $HI = \Sigma(S_i^2)$, where S_i is the share of the number of services billed in fee-item cluster *i* compared with the total number of services billed across all fee-item clusters by the physician. In other words, the Herfindahl index is equal to the sum of the squared share of each fee-item cluster from which a physician bills. We also used the decomposition of the Herfindahl index proposed by Adelman (1969) which examines both the 'balance' of the fee-items billed across domains and the 'breadth' in the number of domains where services are provided. This decomposition can be specified as follows: $HI=[(cv)^2+1] / N$, where 'cv' refers to the coefficient of variation of the share of each domain within a physician's practice and 'N' refers to the total number of possible domains. We did not examine the specific types of services provided by physicians.

GP/FP 'Specialists'

One dimension of physician deployment not often analyzed is the contribution of GP/FPs to specialty practice. We used MSP service claims to identify GP/FPs who deliver significantly more services than their peers in the fields of obstetrics and gynecology, anesthesiology, and surgery. More specifically, a physician's billings in these areas were calculated as a proportion of his or her total billings and the frequency distribution of this proportion was used to identify GP/FP 'specialists'. The frequency distribution and the threshold proportions used are presented in Section 4.2.3.

3.2.2 Physician Supply Variables

The physician supply variables in this study are specified on both a provincial and a regional basis. The following section describes the small areas used, the methods utilized for counting physicians and full-time-equivalents (FTEs), and the construction of physician to population ratios.

3.2.2.1 Geographic Small Areas

The physician supply statistics generated in this report (Section 4.1) are presented for three geographic aggregations: (a) the province as a whole; (b) the nine Health Human Resource Unit (HHRU) regions; and, (c) B.C.'s 20 Health Regions. For the provincial analyses, the supply of GP/FPs and each RCPSC specialty was examined in Fiscal Year (FY) 1991/92 and 1996/97. Since specialists are heavily concentrated in urban centres, physician supply at the Health Region level was specified for GP/FPs and for all RCPSC specialists combined. As an intermediate step, physician supply was also examined for the larger HHRU regions which permits a finer analysis of specialist supply at the regional level. These nine regions represent contiguous groupings of the 20 Health Regions based on regional patterns of health service use. (See Table 3.2 for definitions of the HHRU regions.) At this level, physician supply was examined for GP/FPs and for the RCPSC grouped specialty categories (see above). As the geographic boundaries of the health regions were redefined after 1995, all analyses were conducted using the post-1995 boundary definitions (see Section 3.1.4).

3.2.2.2 Physician Counts and Full-Time-Equivalents (FTEs)

For each of the geographic breakdowns (province, HHRU region, Health Region), two methods were used to count the physician population in 1991/92 and 1996/97: (1) a simple count of the physicians on the 'active' CPSBC registers; and, (2) an estimation of the number of physician FTEs. Counts were generated from the number of physicians on the CPSBC 'active' registers in each study year whose postal code was located in the geographic area of interest. The use of simple head counts implies that all physicians carry similar workloads and are equal in their capacity to provide services to patients. This is clearly not the case since some physicians may not be engaged in active medical practice (e.g., physicians involved in full-time administration or research), may work 'part-time,' or are 'semi-retired'. At the other end of the scale, some physicians provide services more than 'full-time'. In order to account for these differences, we estimated the number of full-time-equivalent (FTE) physicians.

To permit inter-specialty and time-series comparisons, we estimated physician FTEs based on the 'Health Canada method' - the recommendations of a working group from Health Canada, provincial health ministries, and academic consultants (Canadian Institute for Health Information 1998). This method uses specialty-specific percentile levels of earnings to define which physicians are 'full-time' and makes adjustments either up or down for physicians with greater or lesser earnings. Gross income was chosen to measure physician output since it is implicitly weighted by the service intensity and/or value. Furthermore, the use of percentiles is preferable to thresholds because it adjusts for price changes over time. The Health Canada method also has the advantage that it recognizes differences in income and workload among specialties. Accordingly, it facilitates the longitudinal comparison of FTE totals for particular specialties over time. While generally accepted, this method of calculating full-time-equivalence results in specialty-specific FTEs. As a result, the comparison of FTE totals between specialties, or the addition of FTEs across different specialties, is somewhat arbitrary in an absolute sense. In a relative sense,

however, where comparisons are made over time intervals, FTEs calculated in this manner are quite instructive.

The Health Canada method uses 40th and 60th percentiles of specialty-specific incomes as benchmark ranges within which to measure full-time-equivalence. Physicians with payments within this range are counted as one FTE, those below the 40th percentile are counted as fractions of an FTE, and those above the 60th percentile are counted as more than one FTE. For physicians with incomes below the 40th percentile, the FTE is calculated in direct proportion to their billings below this level. For instance, if the physician bills 50% of the 40th percentile billings, he or she is assigned an FTE of 0.5. For physicians with payments above the 60th percentile, the Health Canada method uses the logarithm of the ratio of the physician's billings to the 60th percentile billings to prevent very high incomes from translating into unrealistic numbers of FTEs. The steps in calculating the FTE are outlined in Table 3.4.

Table 3.4: Steps Used to Calculate Physician FTEs

1. Group physicians into RCPSC categories (based on most recent recorded specialty on CPSBC files.)
2. Sum FFS and Salary/Sessional payments for each physician for each year (based on date of payment).
   Only payments for B.C. residents included. Isolation payments and interest payments excluded.
3. Determine 40th and 60th percentiles of total payments for each specialty group.
4. Assign FTE=1 for physicians with total payments between 40th and 60th percentiles.
5. Assign FTE<1 for physicians with total payments below the 40th percentile. The FTE value is calculated as: FTE = (physician's total payments) / (40th percentile of total payments.)
6. Assign FTE>1 for physicians with total payments over the 60th percentile. The FTE value is calculated as: FTE= 1 + ln ([physician's total payments] / [60th percentile of payments]).

Several important modifications were made to the Health Canada formula because of limitations in the available B.C. physician payment data. We assigned physicians with the RCPSC specialties of pathology, medical microbiology, diagnostic radiology, and nuclear medicine an FTE=1 because billings associated with an MSP billing number do not necessarily reflect the services provided by a single physician. In B.C., services provided by several laboratory or radiology specialists may be billed through a single physician's billing number.

We also modified the calculation of FTEs to account for the use of 'service agreements' in FY 1996/97 in addition to FFS and Salary/Sessional payments. Estimates of physician 'output' would be biased downward without inclusion of FTE estimates from this form of payment. This is particularly the case in specialties where a substantial portion of payments was in the form of 'service agreements'. As discussed above, unlike the FFS or Salary/Sessional data, the 'service agreement' data did not permit the assignment of this income to particular physicians. Thus, we are limited in our ability to capture some (or all) of the income for specific physicians covered under these agreements. In addition, the service agreements only specify the types of physician services provided and not the specialties of those physicians contracted.

To assign these 'service agreements' to particular specialties, we assumed that the 'service types' specified under the contract were provided by physicians in the corresponding specialty. For instance, contracts for 'primary care' services were assigned to GP/FPs, 'maternal/newborn care' to obstetricians and gynecologists, 'general surgery' to general surgeons, and 'pediatric care' to pediatricians. We are cognizant of the fact some of the income relating to the service agreements may be mis-assigned in this manner since the contracting agencies may have contracted with physicians outside these specialty groups. However, it was beyond the scope of this study to validate (and adjust if necessary) these assignments.

Table 3.5 shows the proportion of payments in FY 1996/97 for each payment mechanism by specialty. In 1996/97, service agreements accounted for 2.9% of all payments for physician services (excluding transplantation services). These payments were matched to 10 of the 35 specialty groups. In six specialty groups, including general/family medicine, cardiology, internal medicine, psychiatry, general surgery, and obstetrics and gynecology, the agreements accounted for a small minority of total expenditures (0.9-5.5%). For these specialties, the number of FTEs covered under the service agreements was estimated by dividing the amount paid under the agreements by the median FFS and Salary/Sessional payment for physicians in those specialties. The FTEs were then assigned to the LHA where the contracting agency was located. To gauge the sensitivity of these estimates, we also used the 40^{th} and 60^{th} percentile billings to generate a range of FTE estimates. The validity of these estimates was also examined by comparing them with the number of FTEs specified under the service agreements (see Appendix C). While the estimates may be biased upwards (if physicians received payments under the service agreements and other mechanisms), we believe that this bias is minimal because of the relatively small size of the contracts in relation to the other income.

For pediatricians, 21.7% of payments in 1996/97 were made through agreements with the three Vancouver-area hospitals for pediatric services, including critical care, special care nursery, oncology and other services. We modified the above method to estimate full-time-equivalence for pediatricians because of the relatively large contribution of these service agreements. Without excluding physicians covered under these agreements from the calculation of the percentiles (since many also had some FFS billings), the number of pediatrician FTEs would be significantly overestimated. To account for this problem, we identified 81 physicians who were based at the B.C. Children's Hospital and were on faculty of U.B.C.'s Department of Pediatrics (Dr. Judith Hall, personal communication). These physicians were excluded from the pediatrician percentile calculations. While this adjustment is clearly not ideal (since we estimated the 'usual' physician output for less than 60% of pediatricians), we believe that it provides a reasonable estimate of pediatrician full-time equivalence.

Because of the relatively large service agreements with the B.C. Cancer Agency, Vancouver General Hospital, and St. Paul's Hospital for the provision of oncology and emergency services (relative to the FFS/Salary/Sessional earnings), we assigned FTE=1 for emergency medicine specialists, medical oncologists, and radiation oncologists in both study years.[9]

[9] Physicians in specialties other than those specified are also paid under these arrangements (e.g., other physicians are contracted by the B.C. Cancer Agency [B. Sealy, personal communication]). Because of this fact, the full-time equivalence of other physicians may be underestimated.

Since the 40th and 60th percentile cutpoints are relative to the billing patterns of all physicians within the specialty groups in each study year, there were differences between years in the absolute payments that these percentiles represented. Thus, there is the potential that any differences or similarities in the estimated full-time-equivalence between the study years may be biased by the choice of relative cutpoint. To analyze this potential bias, we examined our FTE estimates for physicians who were the most likely to be in 'stable' practice over this time, that is physicians at the mid-point of their 'professional life cycle' who were actively practicing FFS medicine during both study years. We hypothesized that for this cohort of physicians the FTE estimates at the beginning and end of the study period should be similar. Thus, we compared the FTE estimates in 1991/92 and 1996/97 for those in 'stable' practice (i.e., registered in 1991, 1993, and 1996), between the ages of 45 and 55 years, and in specialties where fewer than 10% of services were provided by 'service agreements' in 1996/97.

We found that overall the correlation between the two FTE estimates was substantial (r=0.87). Moreover, there were few differences in this finding among specialty groups. When we cateogorized FTEs into <1, 1, and >1 categories, we found no consistent pattern in whether the shifts were up or down. These findings suggest that comparing the FTE calculations between years is reasonable for the specialty types studied. Unfortunately, we are not able to generalize these findings with certainty to specialites with >10% of total payments in 1996/97 accounted for by 'service agreements'.

3.2.2.3 Physician to Population Ratios

For each geographic breakdown, physician to population ratios were calculated by dividing the estimated number of physician FTEs by the population estimates. These estimates are presented as either FTEs per 10,000 population (for GP/FPs and all specialists combined) or FTEs per 100,000 (for individual or grouped RCSPC specialties). Careful attention was paid to using the same geographic boundaries to estimate both physician and population estimates. In some cases, the ratio of the number of physicians to population is also presented.

It is important to state that by using FTE to population ratios, we are in no way implying the appropriateness of the ratios presented. Appropriateness of these ratios must be considered in the face of population health needs and changes in the practice in medicine. For this study, ratios are presented only to compare changes in supply over time.

Table 3.5: Distribution of Ministry of Health Payments for Physician Services by Payment Mechanism, 1996/97*

Specialty	No.	Total Payments FY 1996/97**	Payment Mechanisms: Fee-For-Service (%)	Salary & Sessional (%)	Service Agreements (%)	Contracting Organizations***
General / Family Practice	4,335	$619,159,553	95.9	3.2	0.9	12 Agencies
Anesthesiology	329	$55,994,727	99.9	0.1	-	
Cardiology	57	$23,309,074	98.4	0.5	1.0	Nanaimo General Hospital
Community Medicine	40	$278,996	-	100	-	
Dermatology	62	$15,045,137	98.4	1.6	-	
Endocrinology & Metabolism	14	$2,359,459	93.4	6.6	-	
Emergency Medicine	71	$13,661,717	59.8	0.4	39.8	Vancouver General, St. Paul's & B.C. Women's Hospital
Gastroenterology	28	$9,080,362	100	-	-	
Hematology	18	$2,022,050	80.7	19.3	-	
Internal Medicine	358	$63,753,274	89.3	5.6	5.1	Greater Victoria Hospital Society, Vancouver General Hospital & St. Paul's Hospital #
Medical Biochemistry	12	$7,472,848	100	-	-	
Medical Microbiology	25	$6,932,518	84.2	0.4	15.5	B.C. Children's, St. Paul's Hospital, U.B.C. Medical Microbiology & Greater Victoria Hosp. Society
Medical / Radiation Oncology###	49	$17,817,586	7.2	-	92.7	B.C. Cancer Agency
Nephrology	11	$3,575,842	96.1	3.9	-	
Neurology	69	$14,359,964	96.3	3.7	-	
Nuclear Medicine	19	$17,511,482	100	-	-	
Pediatrics	225	$32,904,588	66.0	12.3	21.7	B.C. Children's Hospital, Sunny Hill Children's Health Centre & Queen Alexandra Children's Health Centre
Pathology - General	103	$108,873,978	100	-	-	
Pathology - Anatomical	70	$55,093,083	100	-	-	
Physical Medicine	37	$3,412,606	52.5	47.5	-	
Psychiatry	488	$52,790,703	52.9	44.9	2.3	Juan de Fuca Hospital Society, St. Joseph's Gen. Hosp., Trail Regional Hosp. & West Coast General Hosp.
Radiology - Diagnostic	238	$96,973,940	99.8	0.2	-	
Respiratory Medicine	44	$10,440,124	94.4	5.6	-	
Rheumatology	27	$4,399,473	90.1	9.9	-	
Cardiovascular and Thoracic Surgery	33	$10,301,299	100	-	-	
General Surgery	189	$40,193,747	98.0	-	2.0	Prince George Regional Hospial
Neurosurgery	32	$8,109,026	99.3	0.7	-	
Obstetrics & Gynecology	182	$38,566,609	93.0	1.5	5.5	Greater Victoria Hosp. Society & B.C. Women's Hosp. ##
Ophthalmology	182	$58,324,949	99.4	0.6	-	
Orthopedic Surgery	148	$29,963,238	99.3	0.7	-	
Otolaryngology	69	$17,333,650	100	0.0	-	
Plastic Surgery	55	$11,854,346	99.4	0.6	-	
Urology	68	$20,237,671	99.5	0.6	-	
Vascular Surgery	25	$7,488,929	99.8	0.2	-	
All Physicians	7,712	$1,479,596,547	93.2	3.9	2.9	

* Includes physicians on the 'active' registers of the CPSBC in 1996.

** Excludes service agreement for transplantation services ($629,772).

*** Refers to organizations specified under service agreements for physician services in FY 1996/97. Agreements are specified by 'service type' not RCPSC specialty. Payments for service agreements are allocated to RCPSC specialty that best matches service type specified.

Medical and Radiation oncology RCPSBC specialties combined for this analysis. B.C. Cancer Agency payments attributed to these specialties.

##Agreements specified for intensive care services & geriatric home assessment.

###Agreements specified for maternal & newborn care.

4. Results

4.1 Aim I: Supply and Distribution of Physicians in B.C.

This section examines the supply of physicians (including general practitioners/family physicians and specialists) in British Columbia at two points in time: in 1991/92 and five years later in 1996/97 (the most recent year available at the start of this study). We present statistics on the supply of practicing physicians on the provincial rolls at these intervals and examine their specialty, age, sex, and place of medical school education.[10] We also explore the geographic distribution of physicians within the province and examine how this distribution changed over the 5-year study period. Finally, we examine differences in the demographic and practice characteristics of B.C. physicians by the regions in which they practice.

In order to provide a comprehensive examination of physician supply, three different levels of analysis are presented in this section of the report. At the most aggregate level, we present the overall provincial supply of the various Royal College of Physicians and Surgeons of Canada (RCPSC) specialists and of general practitioners /family physicians (GP/FPs) (Section 4.1.1). The provincial perspective is vital since many specialist and subspecialist physicians act as 'provincial resources', providing referral services to all B.C. residents. At the second level of disaggregation, we examine the distribution of 'grouped' specialties for B.C.'s nine Health Human Resource Unit (HHRU) regions (Section 4.1.2). These analyses are primarily intended to examine the regional distribution of important categories of specialty physicians within regional referral systems. In particular, the distribution of 'general' specialists across the HHRU regions (including pediatricians, general internists, psychiatrists, and obstetricians/gynecologists) is examined. For the final level of analysis, the distribution of physicians (GP/FPs and all specialists combined) is presented for B.C.'s 20 Health Regions (using the post-1995 boundary definitions) (Section 4.1.3). These analyses are intended to focus on the regional distribution of primary care physicians in the province. This finer geographic breakdown was chosen because of the community orientation of primary care, the more equitable distribution of GP/FPs across the province (compared with specialist and subspecialist physicians) and to assist medical services planning at the regional level.[11]

[10] Characteristics relating to post-graduate medical education will be examined in a future supplement to this report.

[11] The 20 Health Regions used in this study represent the Ministry of Health's geographic analysis units. The boundaries for these regions largely reflect those of B.C.'s Regional Health Boards (RHBs), Community Health Councils (CHCs), and Community Health Service Societies (CHSSs).

4.1.1 Physician Supply from the Provincial Perspective, 1991/92 and 1996/97

4.1.1.1 Physician Counts, Full-Time-Equivalents (FTEs), and FTE/Population Ratios

In 1996, there were 7,732 physicians registered to practice medicine on the 'active' registers (full, special and temporary [in practice] registers) of the College of Physicians and Surgeons of B.C. (CPSBC). Basing physician supply analyses solely on the numbers of licensed physicians is not advisable, however, given the facts that many licensed physicians may not be active in clinical practice (e.g., physicians holding administrative, research or teaching positions) and, for those in practice, may differ in their levels of practice intensity. For these reasons, we also calculated physician 'full-time-equivalents' (FTEs) using the Health Canada formula based on Ministry of Health physician payment records (including FFS, Salary/Sessional, and Alternative Payments). (See Section 3.2 for a description of this methodology.) For 1996/97, we estimated that 6,930 physician FTEs were in practice in B.C.[12] It is important to recall that since FTEs are estimated in different ways for different types of physicians, it is difficult to interpret the summation of FTEs across specialties in any absolute sense. This analysis is solely intended to permit comparisons of FTEs over time. We also found that 739 physicians on the 'active' CPSBC registers (9.6%) had no payments for clinical services (including fee-for-service, salary or sessional payments) from the B.C. Ministry of Health.[13] Using the P.E.O.P.L.E. 24 mid-year population estimates for 1996[14], we estimate that there were approximately 17.9 physician FTEs per 10,000 B.C. residents (or 558 persons per physician FTE) in this fiscal year.

Using similar estimation methods for 1991/92 (based on 1991 CPSBC registration data and 1991/92 Ministry of Health payment data[15]), 6,922 physicians, corresponding to 6,062 FTEs, were practicing in B.C during 1991/92. In this year, 688 physicians on the 'active' registers (9.9%) had no FFS or Salary/Sessional payments from the Ministry of Health. Using the mid-year 1991 population estimates, we estimate that the FTE/population ratio was 18.0 physician FTEs per 10,000 (556 persons per physician FTE).

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[12] Because of the difficulties in applying payments for laboratory and diagnostic imaging services to calculate FTEs for physicians with specialties in medical biochemistry, medical microbiology, nuclear medicine, pathology, and radiology, all physicians of these types were estimated at 1 FTE. Furthermore, specialists in emergency medicine, community medicine, medical oncology and radiation oncology were all specified as 1 FTE because of limitations in the physician-specific billing data for FY 1996/97. These adjustments are departures from the Health Canada formula. See Section 3.2 for details. It is important to note that payments from third party insurers (e.g., Workers' Compensation Board, Insurance Corporation of British Columbia) and out-of-pocket payments for non-insured services (e.g., cosmetic surgery) were not used in these calculations. These limitations may result in some over-or under-estimate of physician FTEs.

[13] This figure is likely an overestimate since no physician-specific identifiers were available on payments made through Service Agreements in 1996/97 (see Section 3.2). Thus, physicians paid only under these agreements would be counted incorrectly as having no Ministry of Health payments.

[14] Population estimates (P.E.O.P.L.E. #24) were supplied by the Population Section, BC STATS, Ministry of Finance and Corporate Relations, Government of British Columbia.

[15] The principal difference between the Ministry of Health's payment data for 1991/92 and 1996/97 was the addition of physician 'Service Agreements' in the latter year (see Section 3.1). Thus, the 1996/97 estimates include payments made through these agreements in addition to the fee-for-service and salary/sessional payments for the specialties of general practice, cardiology, internal medicine, pediatrics, psychiatry, general surgery and obstetrics and gynecology.

There was an approximate 11.7% growth in the number of physicians on the 'active' CPSBC registers over this five year period, corresponding to a growth in FTEs of about 14.3% (or about 2.3% and 2.9% per year respectively). Over the same interval, B.C.'s population grew by about 15.0% (or 3.0% growth per year). Thus, population growth out-paced the growth in the numbers of physicians (by about 0.7% per year), while closely matching the increase in physician FTEs over this period.

Table 4.1 displays the numbers of physicians, FTEs, and FTEs/10,000 population for 35 specialty groups (GP/FPs and 34 RCPSC specialties). For GP/FPs, the physician population grew by 488 physicians from a baseline of 3,847 in 1991/92. This increase corresponded to an addition of 511 GP/FP FTEs over this interval. However, the growth in FTEs translated into only a very slight change in the FTE/population ratio from 9.78 to 9.81 FTEs per 10,000 population (or less than 1% change per year). For specialists, the overall physician population grew by 322 physicians. Their FTE/population ratio fell very slightly from 8.19 to 8.03 FTEs per 10,000 population.[16]

In 1996/97, the largest RCPSC specialties (with more than 200 physicians each) were psychiatry (488 physicians), general internal medicine (358 physicians), anesthesiology (329 physicians), diagnostic radiology (253 physicians) and pediatrics (225 physicians). The specialty groups with the fewest physicians included nuclear medicine (19 physicians), hematology (18 physicians), endocrinology and metabolism (14 physicians), medical biochemistry (12 physicians), and nephrology (11 physicians). When the specialties were ranked from most to least numerous in both study years, the rankings remained remarkably consistent (Spearman correlation coefficient = 0.98), suggesting no large differences in the patterns of growth among specialties.

However, on closer inspection, some important differences were revealed. Over the 5 year interval, all but six specialties saw their numbers of physicians grow (ranging from a net gain of 106 physicians in psychiatry to one physician in rheumatology). Two specialties (medical biochemistry and nephrology) had no net change in physician numbers and four specialties showed a net drop, including general surgery (24 physicians), otolaryngology (7 physicians), hematology (2 physicians) and orthopedics (1 physician). In relative terms, the changes in the numbers of active physicians varied from a fall of 11.3% for general surgery to an increase of 133% for endocrinology and metabolism. The marked disparities in the growth patterns among specialties remain (although are somewhat diminished) when one considers changes in FTEs. The changes in the FTEs varied from a drop of 6.7 FTEs for general surgery to an increase of 104 FTEs for psychiatry; in relative terms, the changes ranged from a 12.2% drop in FTEs for hematology to an 85% increase in FTEs for psychiatry. (See Figure 4.1.)

[16] Sensitivity analyses for these estimates using 40th and 60th percentile billings to calculate FTEs contributed by service agreements in 1996/97 are presented in Appendix C.

Table 4.1: Supply of Physicians in B.C. by Specialty, Number, FTEs, and Population per FTE - 1991/92 and 1996/97*

	1991 - 1992			1996 - 1997			
Specialty	No.	FTEs	FTEs/10,000 Pop'n**	No.	FTEs	FTEs/10,000 Pop'n**	Average Annual % Change in FTEs/10,000 Pop'n**
General / Family Practice	3,847	3,299.36	9.78	4,335	3,809.92	9.81	0.07
Anesthesiology	301	260.44	0.77	329	287.13	0.74	-0.85
Cardiology	47	46.86	0.14	57	53.80	0.14	-0.05
Community Medicine***	33	33.00	0.10	40	40.00	0.10	1.04
Dermatology	57	51.12	0.15	62	56.42	0.15	-0.83
Endocrinology & Metabolism	6	7.37	0.02	14	13.66	0.04	10.00
Emergency Medicine***	59	59.00	0.17	71	71.00	0.18	0.90
Gastroenterology	22	21.29	0.06	28	27.35	0.07	2.23
Hematology	20	17.80	0.05	18	15.63	0.04	-5.27
Internal Medicine	339	266.64	0.79	358	319.71	0.82	0.82
Medical Biochemistry***	12	12.00	0.04	12	12.00	0.03	-2.77
Medical Microbiology***	23	23.00	0.07	25	25.00	0.06	-1.13
Medical Oncology	10	10.00	0.03	16	16.00	0.04	6.81
Nephrology	11	10.66	0.03	11	11.26	0.03	-1.70
Neurology	64	60.69	0.18	69	63.08	0.16	-2.02
Nuclear Medicine***	11	11.00	0.03	19	19.00	0.05	8.46
Pediatrics	192	183.58	0.54	225	207.14	0.53	-0.39
Pathology - General***	97	97.00	0.29	103	103.00	0.27	-1.60
Pathology - Anatomical***	64	64.00	0.19	70	70.00	0.18	-1.01
Physical Medicine	31	28.14	0.08	37	34.80	0.09	1.45
Psychiatry	382	344.40	1.02	488	448.10	1.15	2.49
Radiation Oncology***	28	28.00	0.08	38	38.00	0.10	3.35
Radiology - Diagnostic***	240	240.00	0.71	253	253.00	0.65	-1.74
Respiratory Medicine	35	33.33	0.10	44	38.93	0.10	0.30
Rheumatology	26	23.65	0.07	27	25.21	0.06	-1.52
Cardiovascular & Thoracic Surgery	31	29.10	0.09	33	29.23	0.08	-2.68
General Surgery	213	162.55	0.48	189	154.07	0.40	-3.81
Neurosurgery	29	23.33	0.07	32	27.97	0.07	0.82
Obstetrics & Gynecology	167	141.51	0.42	182	163.42	0.42	0.07
Ophthalmology	165	157.50	0.47	182	170.47	0.44	-1.22
Orthopedic Surgery	149	124.10	0.37	148	124.45	0.32	-2.71
Otolaryngology	76	67.66	0.20	69	64.47	0.17	-3.70
Plastic Surgery	49	42.99	0.13	55	50.46	0.13	0.40
Urology	63	58.52	0.17	68	63.70	0.16	-1.11
Vascular Surgery	23	22.06	0.07	25	23.04	0.06	-1.92
Total Physicians	6,922	6,061.65	17.97	7,732	6,930.41	17.85	-0.13

*For 1996, FTEs are based on Fee for Service, Salaried and Sessional, and most Service Agreement payments, excluding payments to the British Columbia Cancer Agency. For 1991, FTEs are based on Fee for Service and Salaried and Sessional payments. See discussion in Section 3.2.2.2.

**Based on 1991 BC Population = 3,373,399 and 1996 BC Population = 3,882,043. Population estimates supplied by Population Section, BC STATS, Ministry of Finance and Corporate Relations, are from the P.E.O.P.L.E. Projection Model - #24. All figures are as of July 1 of the year stated.

***As a more accurate representation of personnel, Community Medicine, Emergency Medicine, Laboratory/Radiology, Radiation/Medical Oncology specialtie are included as 1 person=1 FTE.

Figure 4.1: Changes in Physician FTEs in B.C. 91/92-96/97 by RCPSC Specialty

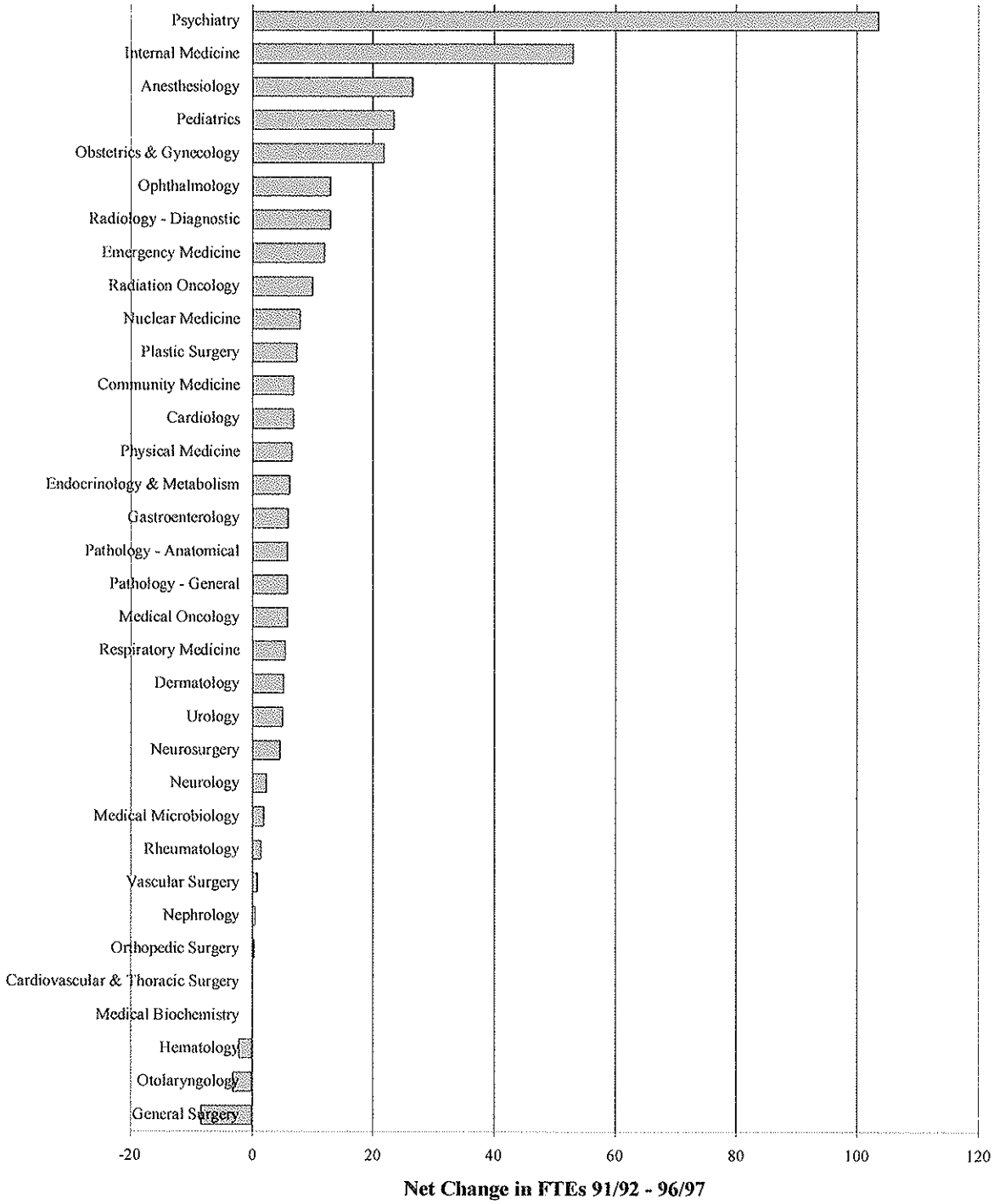


Figure 4.2 shows the changes in FTE/population ratios for GP/FPs and RCPSC specialists over the 5-year study interval. This analysis examines the dual dynamics of both changes in specialty supply and population growth. In addition to the four specialties that declined in their absolute FTEs (hematology, otolaryngology, orthopedic surgery and general surgery), the growth in FTEs for 14 specialty categories did not keep pace with population growth. In other words, a total of 18 specialties saw declines in their FTE to population ratios over this interval, ranging from -4.0% for dermatology to -23.7% for hematology. Conversely, 15 specialties saw an overall increase in their FTE/population ratios ranging from 1.5% for respiratory medicine to 61.1% for endocrinology and metabolism.

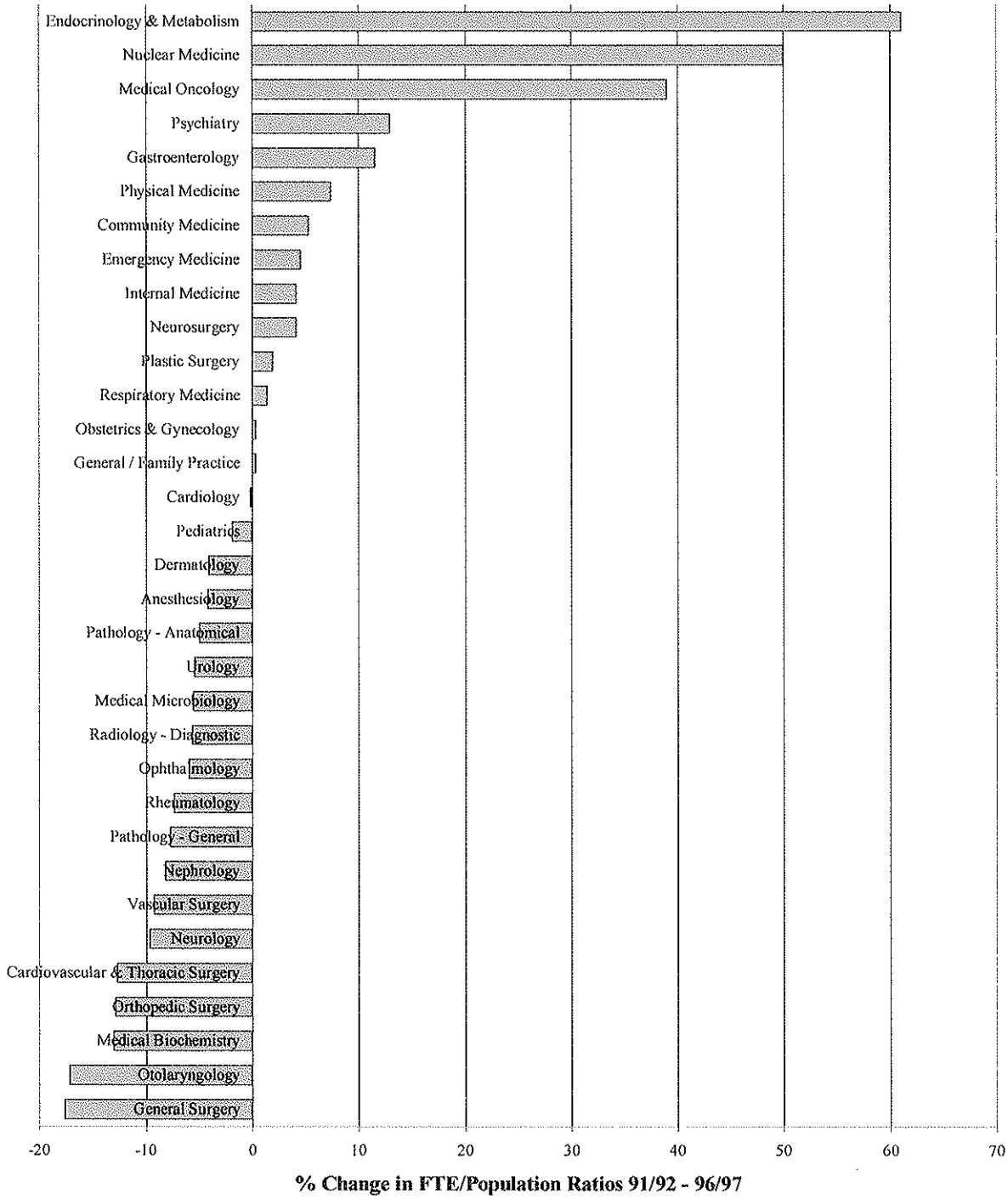
In summary, some specialties grew faster and others slower than the provincial population. The appropriateness of growth in either direction was not examined. Relative rates of growth are a function of many factors such as training, migration, and retirement. More importantly, factors pertaining to the practice of medicine and the population health needs would have to be taken into consideration when estimating appropriate GP/FP or specialist to population ratios.

Another critical (and often studied) aspect of physician supply is the 'balance' between GP/FPs and specialists. Based on the numbers of physicians on the active register in each of the two study years, the ratio of GP/FPs to specialists widened very slightly from 55.7:44.3 in 1991/92 to 56:44 in 1996/97. With respect to FTEs, there was also little change in the GP/FP to specialist ratio from 54.4:45.6 in 1991/92 to 54.7:45.3 in 1996/97.

Principal Findings: ***Overall Physician Supply 1991/92 and 1996/97***

- In 1996/97, 7,732 physicians were on the 'active' registers of the CPSBC. Using available data, this corresponds to approximately 6,930 physician FTEs.
- In 1996/97, there were approximately 18 physician FTEs per 10,000 B.C. residents (or about 560 persons per physician FTE).
- Between 1991/92 and 1996/97, there was a net increase of 511 GP/FP and 358 specialist FTEs. However, the per capita supply of physicians was relatively stable because of similar rates of population growth.
- Important differences in the overall patterns of supply existed among specialty groups. While most specialties saw a net increase in the numbers of physicians during this period, 4 specialties (general surgery, otolaryngology, hematology, and orthopedic surgery) saw a net decline.
- More than half of the specialty groups saw a net decline in their per capita FTE supply over the 5-year study period.
- The ratio of primary care physicians to specialist FTEs in 1996/97 was 55:45. Little change in this ratio was seen over the proceeding 5-years.

Figure 4.2: Percent Change in FTE/Population Ratios by Specialty 91/92-96/97



4.1.1.2 Age and Sex Characteristics of B.C. Physicians

In 1996/97, the mean age of all physicians on the 'active' CPSBC registries was 47.1 years (SD 11.5). When weighted by their FTE value, the average age was reduced marginally to 46.2 years (SD 9.2 years). In 1991/92, the unweighted mean age of all physicians on the 'active' registers was 46.3 years (SD 12.0) while the FTE-weighted mean age was 45.4 years (SD 9.44). Thus, the physician population showed an overall aging of about 0.8 years during this 5 year period (in both the unweighted and FTE-weighted analyses) (F-statistic=17.2 P<0.0001[17]).

Table 4.2 and Figure 4.3 show the age composition in 1996/97 of B.C physicians by their specialty classification. Overall, about 29% of the physician FTEs were aged <40 years, 60% were aged 40-59 years, about 11% were aged 60 years or older. This compares to data from 1991/92 where about 35% of physicians were aged <40 years, 55% aged 40-60 years and about 9% aged 60 years or more (data not shown). These analyses confirm the gradual upward shift in the age distribution of physicians over this interval.

There are also important differences in the physician age structure by specialty type. In comparing GP/FPs to all specialists (1996/97), a larger proportion of GP/FP FTEs were aged<40 years (35.5%) than were specialist FTEs (19.5%) (p<0.0001). This is not surprising, given the longer training requirements for specialist physicians. However, among RCPSC specialties, there were also substantial differences in age structures. The proportion of the FTEs aged 40 years or less ranged from a maximum of 43.9% in endocrinology and metabolism to only 4.4% in vascular surgery. In addition to endocrinology, 3 specialties had a particularly high proportion of younger FTEs: emergency medicine (32.4%), medical oncology (31.3%), and nephrology (40.9%).

Physicians aged 60+ years represented 15.7% of specialists, almost twice the proportion of GP/FPs (8.1%)(p<0.0001). Specialties with $\geq$ 20% of their physician FTEs aged 60 years or older included: community medicine (27.5%), dermatology (21.1%), medical microbiology (20%), nuclear medicine (26.3%), psychiatry (21.1%), general surgery (21.7%), general pathology (27.2%) and radiology diagnostic (20.2%). Conversely, less than 5% of cardiology, emergency medicine, anatomic pathology, respiratory medicine and plastic surgery was aged 60+.

Table 4.3 shows the distribution for the B.C. generalist and specialist physician FTE population by sex in 1996/97. While female physicians represented 20.9% of the physician FTE workforce overall they comprised a much larger proportion of FTEs <40 years (33.8%) compared with FTEs aged 40-59 years (17.7%) or FTEs aged 60+ years (7.3%) (p<0.0001) This finding is not unexpected as it mirrors the changes in the sex composition of medical school enrollment over the last several decades (ACMC, Canadian Medical Educator Statistics, 1998). For GP/FPs, women represented approximately 30% of the workforce, but made up more than 35% of the physician FTEs under 40 years of age and only 6.7% of the FTEs aged 60 years or older. For

17 One-way analysis of variance (unequal variance assumption) to test for difference in mean age between 1991/92 and 1996/97. Age weighted by FTE in this analysis. Normality assumption tested with Kolmogorov statistic (D=0.1).

Table 4.2: Age Distribution of B.C. Physicians by Specialty - 1996/97*

Specialty	Under 40 yrs			40 thru 49 yrs			50 thru 59 yrs			60 thru 69 yrs			70 yrs and Older			Totals	
	No.	FTEs	%	No.	FTEs	%	No.	FTEs	%	No.	FTEs	%	No.	FTEs	%	No.	FTEs
General / Family Practice	1,588	1338.09	35.5	1,442	1,378.92	36.6	797	751.99	19.9	375	259.20	6.9	133	44.33	1.2	4,335	3,772.53
Anesthesiology	75	71.11	24.8	123	120.23	41.9	83	72.21	25.1	39	22.68	7.9	9	0.90	0.3	329	287.13
Cardiology	15	12.43	23.4	25	24.95	46.9	16	14.85	27.9	1	1.00	1.9	0	0.00	0.0	57	53.23
Community Medicine**	4	4.00	10.0	13	13.00	32.5	12	12.00	30.0	9	9.00	22.5	2	2.00	5.0	40	40.00
Dermatology	8	6.10	10.8	22	23.39	41.5	16	15.05	26.7	11	10.84	19.2	5	1.04	1.8	62	56.42
Endocrinology & Metabolism	6	6.00	43.9	6	6.25	45.8	1	0.58	4.2	1	0.83	6.1	0	0.00	0.0	14	13.66
Emergency Medicine***	23	23.00	32.4	33	33.00	46.5	14	14.00	19.7	1	1.00	1.4	0	0.00	0.0	71	71.00
Gastroenterology	8	6.76	24.7	15	15.35	56.1	5	5.24	19.2	0	0.00	0.0	0	0.00	0.0	28	27.35
Hematology	3	2.59	16.6	10	7.86	50.3	5	5.18	33.1	0	0.00	0.0	0	0.00	0.0	18	15.63
Internal Medicine	57	45.62	15.2	110	104.88	34.9	95	92.23	30.7	62	47.66	15.9	34	9.70	3.2	358	300.09
Medical Biochemistry**	2	2.00	16.7	3	3.00	25.0	6	6.00	50.0	1	1.00	8.3	0	0.00	0.0	12	12.00
Medical Microbiology**	3	3.00	12.0	9	9.00	36.0	8	8.00	32.0	5	5.00	20.0	0	0.00	0.0	25	25.00
Medical Oncology**	5	5.00	31.3	6	6.00	37.5	5	5.00	31.3	0	0.00	0.0	0	0.00	0.0	16	16.00
Nephrology	5	4.61	40.9	4	4.35	38.6	2	2.30	20.4	0	0.00	0.0	0	0.00	0.0	11	11.26
Neurology	11	10.18	16.1	24	23.80	37.7	18	17.50	27.7	14	11.30	17.9	2	0.30	0.5	69	63.08
Nuclear Medicine**	6	6.00	31.6	5	5.00	26.3	3	3.00	15.8	4	4.00	21.1	1	1.00	5.3	19	19.00
Pediatrics***	46	46.00	20.4	79	79.00	35.1	56	56.00	24.9	31	31.00	13.8	13	13.00	5.8	225	225.00
Pathology - General**	15	15.00	14.6	29	29.00	28.2	31	31.00	30.1	22	22.00	21.4	6	6.00	5.8	103	103.00
Pathology - Anatomical**	17	17.00	24.3	33	33.00	47.1	18	18.00	25.7	2	2.00	2.9	0	0.00	0.0	70	70.00
Physical Medicine	5	3.57	10.3	15	16.06	46.1	12	11.78	33.9	4	3.37	9.7	1	0.02	0.1	37	34.80
Psychiatry	76	70.03	15.9	167	159.63	36.2	123	118.17	26.8	87	72.49	16.4	35	20.35	4.6	488	440.67
Radiation Oncology**	12	12.00	34.3	15	15.00	42.9	8	8.00	22.9	2	0.00	0.0	1	0.00	0.0	32	35.00
Radiology - Diagnostic**	60	60.00	23.7	70	70.00	27.7	72	72.00	28.5	37	37.00	14.6	14	14.00	5.5	253	253.00
Respiratory Medicine	8	6.98	17.9	25	22.91	58.8	10	8.04	20.7	1	1.00	2.6	0	0.00	0.0	44	38.93
Rheumatology	3	2.59	10.3	14	12.34	48.9	10	10.28	40.8	0	0.00	0.0	0	0.00	0.0	27	25.21
Cardiovascular & Thoracic Surgery	4	4.06	13.9	12	10.85	37.1	11	10.76	36.8	5	2.29	7.8	1	1.27	4.3	33	29.23
General Surgery	23	23.81	15.8	42	41.78	27.7	51	52.60	34.9	47	30.78	20.4	26	1.90	1.3	189	150.87
Neurosurgery	8	7.45	26.6	6	7.01	25.1	9	9.16	32.7	6	4.28	15.3	3	0.07	0.3	32	27.97
Obstetrics & Gynecology	41	36.36	23.6	50	45.10	29.3	43	43.79	28.5	31	24.14	15.7	17	4.50	2.9	182	153.89
Ophthalmology	37	33.06	19.4	56	65.09	38.2	52	53.76	31.5	23	14.19	8.3	14	4.37	2.6	182	170.47
Orthopedic Surgery	25	21.39	17.2	52	55.10	44.3	38	31.33	25.2	26	15.41	12.4	7	1.22	1.0	148	124.45
Otolaryngology	11	10.05	15.6	23	24.56	38.1	23	21.70	33.7	10	7.44	11.5	2	0.72	1.1	69	64.47
Plastic Surgery	13	11.94	23.7	22	23.33	46.2	17	14.04	27.8	2	1.03	2.0	1	0.12	0.2	55	50.46
Urology	15	14.53	22.8	17	19.26	30.2	16	18.09	28.4	12	10.84	17.0	8	0.98	1.5	68	63.70
Vascular Surgery	1	1.01	4.4	13	12.48	54.2	6	5.93	25.7	4	3.24	14.1	1	0.38	1.6	25	23.04
Total Physicians	2,239	1943.32	28.3	2,590	2,520.48	36.7	1,692	1,619.56	23.6	875	656.01	9.6	336	128.17	1.9	7,732	6,867.54

*FTE calculations are based on Fee for Service, Salaried and Sessional, and Service Agreement payments, excluding Service Agreement payments to the British Columbia Cancer Agency. See discussion in Section 3.2.2.2.

**As a more accurate representation of personnel, these specialties are included as 1 person = 1 FTE.

***A significant portion of these FTEs was accounted for through Service Agreements for which age breakdowns were unavailable. To provide a more accurate representation of personnel, actual personnel counts have been substituted for FTEs. As a result, these totals will not correspond with those in earlier tables which include FTEs accounted for through Service Agreements.

Figure 4.3: Age Distribution of BC Physician FTEs by Specialty, 1996/97

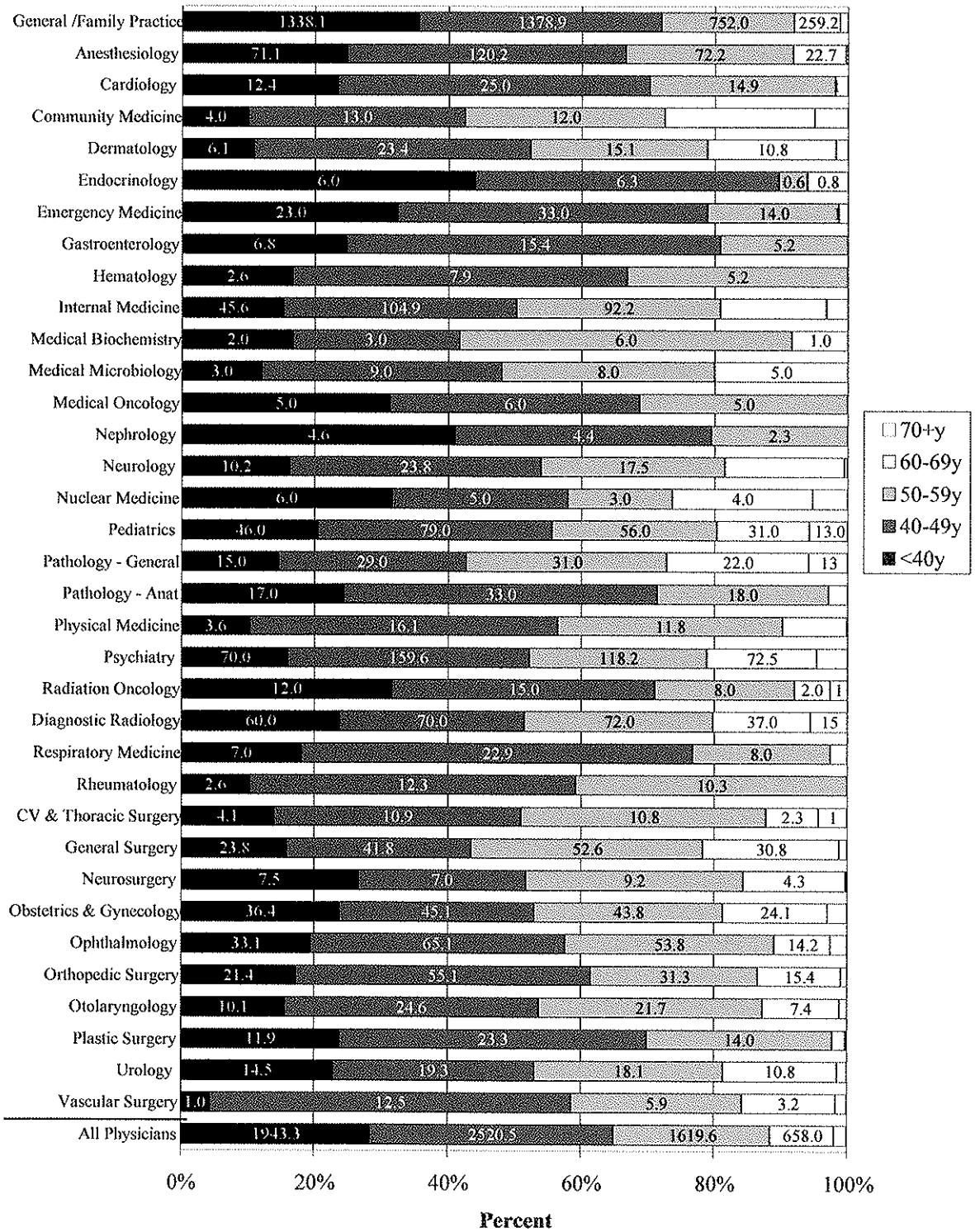


Table 4.3: Sex Distribution of Physician FTEs in B.C. by Age and Specialty - 1996/97*

Specialty	Totals		Under 40		40 thru 59		60 and Older	
	FTEs	% Female	FTEs	% Female	FTEs	% Female	FTEs	% Female
General / Family Practice	3,772.5	24.2	1,338.1	36.1	2,130.9	19.2	303.5	6.7
Anesthesiology	287.1	13.4	71.1	14.0	192.4	13.9	23.6	8.3
Cardiology	53.2	8.7	12.4	18.7	39.8	3.3	1.0	100.0
Community Medicine**	40.0	20.0	4.0	25.0	25.0	28.0	11.0	-
Dermatology	56.4	16.1	6.1	25.7	38.4	17.0	11.9	8.2
Endocrinology & Metabolism	13.7	14.6	6.0	33.3	6.8	-	0.8	-
Emergency Medicine***	71.0	12.7	23.0	26.1	47.0	6.4	1.0	-
Gastroenterology	27.4	15.8	6.8	31.7	20.6	10.6	-	-
Hematology	15.6	22.8	2.6	-	13.0	27.4	-	-
Internal Medicine	300.1	13.0	45.6	25.9	197.1	12.9	57.4	3.1
Medical Biochemistry**	12.0	41.7	2.0	100.0	9.0	33.3	1.0	-
Medical Microbiology**	25.0	44.0	3.0	33.3	17.0	58.8	5.0	-
Medical Oncology**	16.0	43.8	5.0	80.0	11.0	27.3	-	-
Nephrology	11.3	8.9	4.6	21.7	6.7	-	-	-
Neurology	63.1	4.9	10.2	10.1	41.3	4.7	11.6	0.6
Nuclear Medicine**	19.0	15.8	6.0	16.7	8.0	25.0	5.0	-
Pediatrics***	225.0	32.9	46.0	56.5	135.0	27.4	44.0	25.0
Pathology - General**	103.0	20.4	15.0	40.0	60.0	20.0	28.0	10.7
Pathology - Anatomical**	70.0	28.6	17.0	35.3	51.0	25.5	2.0	50.0
Physical Medicine	34.8	12.5	3.6	28.3	27.8	12.0	3.4	-
Psychiatry	440.7	27.1	70.0	38.5	277.8	28.8	92.8	13.5
Radiation Oncology**	38.0	23.7	12.0	25.0	23.0	21.7	3.0	33.3
Radiology - Diagnostic**	253.0	19.4	60.0	26.7	142.0	21.8	51.0	3.9
Respiratory Medicine	38.9	13.8	7.0	68.1	31.0	2.0	1.0	-
Rheumatology	25.2	22.1	2.6	24.7	22.6	21.8	-	-
Cardiovascular & Thoracic Surgery	29.2	4.6	4.1	-	21.6	6.2	3.6	-
General Surgery	150.9	4.0	23.8	8.6	94.4	4.2	32.7	-
Neurosurgery	28.0	0.0	7.5	-	16.2	-	4.4	-
Obstetrics & Gynecology	153.9	21.4	36.4	37.1	88.9	20.9	28.6	2.9
Ophthalmology	170.5	10.5	33.1	23.5	118.9	8.5	18.6	0.2
Orthopedic Surgery	124.5	0.7	21.4	-	86.4	1.0	16.6	-
Otolaryngology	64.5	7.1	10.1	9.7	46.3	7.8	8.2	-
Plastic Surgery	50.5	8.3	11.9	25.5	37.4	3.1	1.2	-
Urology	63.7	1.1	14.5	4.6	37.4	-	11.8	-
Vascular Surgery	23.0	5.3	1.0	-	18.4	6.7	3.6	-
Total Physicians	6,870.5	20.9	1,923.5	33.7	4,140.0	17.7	787.2	7.3

*FTE calculations are based on Fee for Service, Salaried and Sessional, and Service Agreement payments, excluding Service Agreement payments to the British Columbia Cancer Agency. See discussion in Section 3.2.2.2.

**As a more accurate representation of personnel, these specialties are included as 1 person = 1 FTE.

***A significant portion of these FTEs was accounted for through Service Agreements for which age and sex breakdowns were unavailable. To provide a more accurate representation of personnel, actual personnel counts have been substituted for FTEs. As a result, these totals will not correspond with those in earlier tables which include FTEs accounted for through Service Agreements.

specialist FTEs, women represented 18.3% of the workforce in 1996/97 and, as with GP/FPs, they were generally younger than their male counterparts (28% aged <40 years vs. 8.1% aged 60+ years). Among the RCPSC specialties, the contribution of female physicians to the workforce varied widely from less than 1% of the FTEs in orthopedic surgery to 43.8% of the FTEs in medical oncology. For most specialties, the age group <40 years of age had the largest proportion of female FTEs.

Principal Findings: ***Age and Sex Distribution of Physicians by Specialty***

- The mean age of all physicians in B.C. (weighted by their FTE values) was 45.4 years in 1991/92 and 46.2 years in 1996/97. Thus, there was an aging of the physician population of about 0.8 years over this period.
- In 1996/97, specialists were, on the whole, substantially older than were their GP/FP colleagues. Compared with GP/FPs, fewer specialist FTEs were aged <40 years (20% vs. 35%) and more aged 60+ years (15.7% vs. 8.1%).
- There were substantial age differentials in 1996/97 among the RCPSC specialty groups. Specialties with ≥ 20% of their physician FTEs in the oldest age group (60+ years) included: community medicine; dermatology; medical microbiology; nuclear medicine; psychiatry; general surgery, pathology-general and diagnostic radiology.
- Female physicians comprised 20.9% of the 1996/97 physician population overall. This proportion was greater for GP/FPs (24%) than specialists (18%).
- Female physicians comprised a much larger proportion of physicians <40 years (33.8%) compared with physicians aged 40-59 years (17.7%) or physicians aged 60+ years (7.3%).
- There was substantial variation in the contribution of female physicians to the specialist workforce by specialty (range: 0 to 44%).

4.1.1.3 Location of Undergraduate Medical Education

In 1996, 2,001 (25.9%) B.C. physicians were graduates of the University of British Columbia (U.B.C.) Faculty of Medicine while 3,520 (45.5%) were graduates of other Canadian medical schools, and 2,211 (28.6%) were from non-Canadian sites. (There were no significant differences from these figures when the percentages were weighted by physician FTEs.) Of Canadian-trained physicians (n= 5,521), the 16 Canadian medical schools were represented as follows in descending order: University of British Columbia (36.2%); University of Alberta (11.2%); University of Toronto (8.0%); University of Manitoba (6.7%); University of Calgary (6.0%); McGill University (5.8%); University of Saskatchewan (5.8%); University of Western Ontario (4.6%); Queen's University (4.2%); Dalhousie University (3.5%); McMaster University (3.0%); University of Ottawa (2.6%); Memorial University (1.6%); Université de Montreal (0.2%); Université Laval (0.2%); and Université de Sherbrooke (0.1%). When the medical schools were grouped by province, their representation was as follows:

British Columbia	36.2%	Ontario	22.3%
Alberta	17.5%	Quebec	6.4%
Saskatchewan	5.8%	Nova Scotia	3.5%
Manitoba	6.7%	Newfoundland	1.6%

The remaining 2,211 'non-Canadian' graduates originated from 303 different institutions worldwide. Institutions with more than 50 graduates included: the University of London (261 physicians), University of Cape Town (168 physicians), the University of Glasgow (91 physicians), University of Witwatersrand (73 physicians), University of Northern Ireland (72 physicians), University of Edinburgh (65 physicians), University of Hong Kong (63 physicians), Queen's University (Belfast) (59 physicians) and University of Manchester (55 physicians).

Tables 4.4 and 4.5 show the distribution of physicians by medical school of graduation by specialty in 1991 and 1996 respectively. In 1996, GP/FPs in B.C. were almost twice as likely as RCPSC specialists to have obtained their medical degree from U.B.C. than elsewhere (32.1% vs. 17.9%; $p<0.0001$). GP/FPs were also less likely than specialists to have obtained their degree at non-Canadian institutions (24.0% vs. 34.5%) in 1996. Among the RCPSC specialties, the contribution of the U.B.C. undergraduate medical training program to the B.C. physician workforce ranged from 43.6% in plastic surgery to 5.3% in nuclear medicine. (See Figure 4.4.)

Table 4.6 and Figure 4.5 display how the proportion of physicians graduating from different medical school locales changed from 1991 to 1996. Over this period, there was a modest net increase (1.2%) in the proportion of B.C. physicians graduated from U.B.C. (24.7% vs. 25.9%). The increase was more apparent for specialists (1.4%) than for GP/FPs (1.0%). Among RCPSC specialists, relatively large net increases in the contribution of the U.B.C. medical school were seen in cardiology (21.3% to 28.1%), medical biochemistry (16.7% to 25.0%), plastic surgery (32.7% to 43.6%) and endocrinology and metabolism (0% to 21.4%). The overall increase in U.B.C.'s contribution to physician workforce in B.C. was largely at the expense of non-Canadian graduates. The proportion of physicians in B.C. who had graduated from non-Canadian sites declined from 30.2% to 28.6%. Not all RCPSC specialties, however, saw an increase in the proportion of physicians who obtained their medical degrees from U.B.C. Otolaryngology, neurology, neurosurgery, and urology actually saw net declines in the proportion of physicians from U.B.C.

A key observation or reminder regarding the changes in proportions of active physicians in B.C. who were trained elsewhere is that they cannot, on the whole, be planned or managed. Not only does U.B.C. not control the proportion of its graduates who remain within the province, but also the inflow of physicians from other Canadian or foreign medical schools is not known in advance. At present, no restrictions are placed on licensure of physicians from other provinces, provided that they meet licensing requirements.

Table 4.4: Supply of Physicians by Place of Medical School Education - 1991*

Specialties	Totals	U.B.C. No.	U.B.C. (%)	Other Canada No.	Other Canada (%)	Non-Canada No.	Non-Canada (%)
General / Family Practice	3,847	1,198	(31.1)	1,654	(43.0)	995	(25.9)
Anesthesiology	301	79	(26.2)	124	(41.2)	98	(32.6)
Cardiology	47	10	(21.3)	20	(42.6)	17	(36.2)
Community Medicine	33	6	(18.2)	12	(36.4)	15	(45.5)
Dermatology	57	14	(24.6)	30	(52.6)	13	(22.8)
Endocrinology & Metabolism	6	0	(0.0)	3	(50.0)	3	(50.0)
Emergency Medicine	59	10	(16.9)	42	(71.2)	7	(11.9)
Gastroenterology	22	4	(18.2)	16	(72.7)	2	(9.1)
Hematology	20	5	(25.0)	9	(45.0)	6	(30.0)
Internal Medicine	339	48	(14.2)	177	(52.2)	114	(33.6)
Medical Biochemistry	12	2	(16.7)	6	(50.0)	4	(33.3)
Medical Microbiology	23	1	(4.3)	9	(39.1)	13	(56.5)
Medical Oncology	10	2	(20.0)	3	(30.0)	5	(50.0)
Nephrology	11	3	(27.3)	3	(27.3)	5	(45.5)
Neurology	64	13	(20.3)	29	(45.3)	22	(34.4)
Nuclear Medicine	11	0	(0.0)	8	(72.7)	3	(27.3)
Pediatrics	192	17	(8.9)	65	(33.9)	110	(57.3)
Pathology - General	97	20	(20.6)	40	(41.2)	37	(38.1)
Pathology - Anatomical	64	16	(25.0)	28	(43.8)	20	(31.3)
Physical Medicine	31	3	(9.7)	14	(45.2)	14	(45.2)
Psychiatry	382	55	(14.4)	162	(42.4)	165	(43.2)
Radiation Oncology	28	5	(17.9)	9	(32.1)	14	(50.0)
Radiology - Diagnostic	240	30	(12.5)	142	(59.2)	68	(28.3)
Respiratory Medicine	35	5	(14.3)	15	(42.9)	15	(42.9)
Rheumatology	26	5	(19.2)	9	(34.6)	12	(46.2)
Cardiovascular & Thoracic Surgery	31	5	(16.1)	20	(64.5)	6	(19.4)
General Surgery	213	22	(10.3)	121	(56.8)	70	(32.9)
Neurosurgery	29	4	(13.8)	17	(58.6)	8	(27.6)
Obstetrics & Gynecology	167	27	(16.2)	61	(36.5)	79	(47.3)
Ophthalmology	165	23	(13.9)	94	(57.0)	48	(29.1)
Orthopedic Surgery	149	26	(17.4)	76	(51.0)	47	(31.5)
Otolaryngology	76	10	(13.2)	41	(53.9)	25	(32.9)
Plastic Surgery	49	16	(32.7)	26	(53.1)	7	(14.3)
Urology	63	17	(27.0)	30	(47.6)	16	(25.4)
Vascular Surgery	23	6	(26.1)	9	(39.1)	8	(34.8)
Total Specialists	3,075	509	(16.6)	1,470	(47.8)	1,096	(35.6)
Total BC	6,922	1,707	(24.7)	3,124	(45.1)	2,091	(30.2)

*Includes physicians on the 'active' registers of the CPSBC in 1991.

Table 4.5: Supply of Physicians by Place of Medical School Education - 1996*

Specialties	Totals	U.B.C.		Other Canada		Non-Canada	
		No.	(%)	No.	(%)	No.	(%)
General / Family Practice	4,335	1,392	(32.1)	1,904	(43.9)	1,039	(24.0)
Anesthesiology	329	88	(26.7)	134	(40.7)	107	(32.5)
Cardiology	57	16	(28.1)	23	(40.4)	18	(31.6)
Community Medicine	40	9	(22.5)	22	(55.0)	9	(22.5)
Dermatology	62	16	(25.8)	34	(54.8)	12	(19.4)
Endocrinology & Metabolism	14	3	(21.4)	6	(42.9)	5	(35.7)
Emergency Medicine	71	12	(16.9)	53	(74.6)	6	(8.5)
Gastroenterology	28	6	(21.4)	19	(67.9)	3	(10.7)
Hematology	18	5	(27.8)	8	(44.4)	5	(27.8)
Internal Medicine	358	51	(14.2)	186	(52.0)	121	(33.8)
Medical Biochemistry	12	3	(25.0)	6	(50.0)	3	(25.0)
Medical Microbiology	25	2	(8.0)	11	(44.0)	12	(48.0)
Medical Oncology	16	4	(25.0)	8	(50.0)	4	(25.0)
Nephrology	11	3	(27.3)	3	(27.3)	5	(45.5)
Neurology	69	13	(18.8)	35	(50.7)	21	(30.4)
Nuclear Medicine	19	1	(5.3)	14	(73.7)	4	(21.1)
Pediatrics	225	20	(8.9)	81	(36.0)	124	(55.1)
Pathology - General	103	24	(23.3)	41	(39.8)	38	(36.9)
Pathology - Anatomical	70	19	(27.1)	26	(37.1)	25	(35.7)
Physical Medicine	37	6	(16.2)	16	(43.2)	15	(40.5)
Psychiatry	488	71	(14.5)	200	(41.0)	217	(44.5)
Radiation Oncology	38	9	(23.7)	7	(18.4)	22	(57.9)
Radiology - Diagnostic	253	36	(14.2)	150	(59.3)	67	(26.5)
Respiratory Medicine	44	7	(15.9)	19	(43.2)	18	(40.9)
Rheumatology	27	6	(22.2)	10	(37.0)	11	(40.7)
Cardiovascular & Thoracic Surgery	33	6	(18.2)	21	(63.6)	6	(18.2)
General Surgery	189	24	(12.7)	100	(52.9)	65	(34.4)
Neurosurgery	32	4	(12.5)	20	(62.5)	8	(25.0)
Obstetrics & Gynecology	182	31	(17.0)	73	(40.1)	78	(42.9)
Ophthalmology	182	30	(16.5)	105	(57.7)	47	(25.8)
Orthopedic Surgery	148	28	(18.9)	78	(52.7)	42	(28.4)
Otolaryngology	69	7	(10.1)	37	(53.6)	25	(36.2)
Plastic Surgery	55	24	(43.6)	24	(43.6)	7	(12.7)
Urology	68	18	(26.5)	36	(52.9)	14	(20.6)
Vascular Surgery	25	7	(28.0)	10	(40.0)	8	(32.0)
Total Specialists	3,397	609	(17.9)	1,616	(47.6)	1,172	(34.5)
Total BC	7,732	2,001	(25.9)	3,520	(45.5)	2,211	(28.6)

*Includes physicians on the 'active' registers of the CPSBC in 1996.

Figure 4.4: Percent of B.C. Physicians Graduating from U.B.C.'s Faculty of Medicine by Specialty, 1996/97

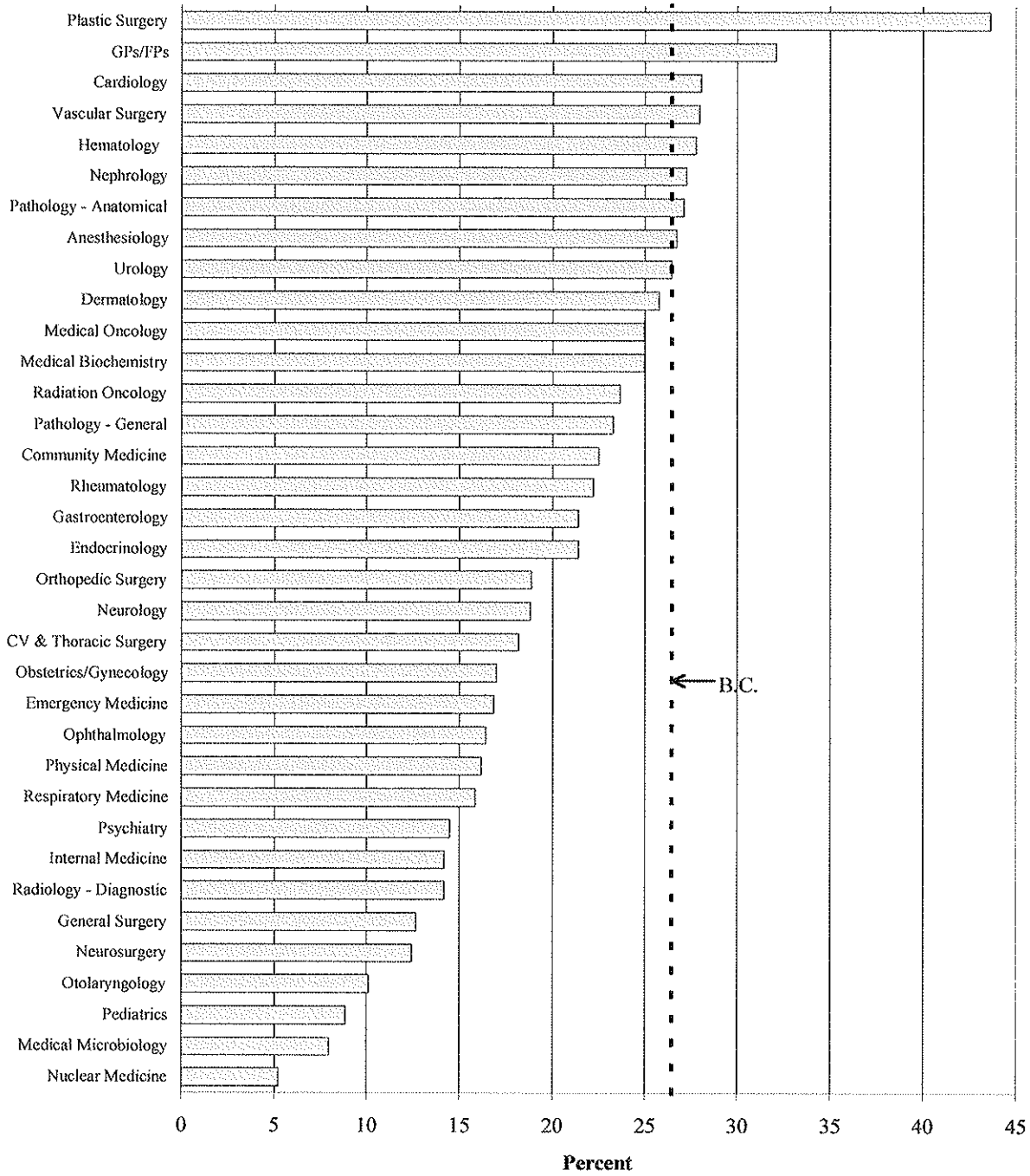
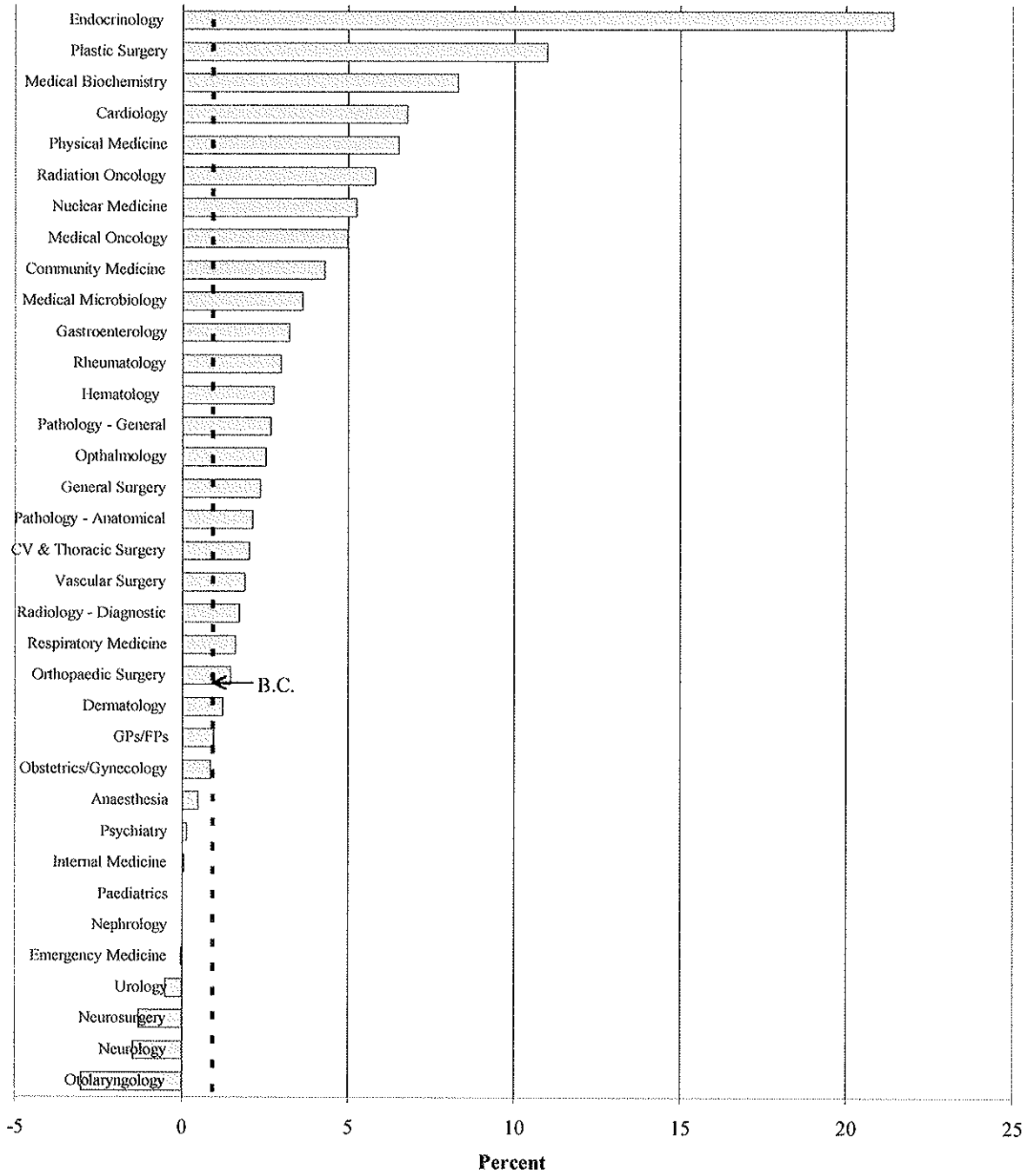


Table 4.6: Place of Medical School Education (%) by Specialty & GP/FP - 1991, 1996, and % Change

Specialties	U.B.C.			Other Canada			Non-Canada		
	1991	1996	% Change	1991	1996	% Change	1991	1996	% Change
General / Family Practice	31.1	32.1	1.0	43.0	43.9	0.9	25.9	24.0	-1.9
Anesthesiology	26.2	26.7	0.5	41.2	40.7	-0.5	32.6	32.5	0.0
Cardiology	21.3	28.1	6.8	42.6	40.4	-2.2	36.2	31.6	-4.6
Community Medicine	18.2	22.5	4.3	36.4	55.0	18.6	45.5	22.5	-23.0
Dermatology	24.6	25.8	1.2	52.6	54.8	2.2	22.8	19.4	-3.5
Endocrinology & Metabolism	0.0	21.4	21.4	50.0	42.9	-7.1	50.0	35.7	-14.3
Emergency Medicine	16.9	16.9	0.0	71.2	74.6	3.5	11.9	8.5	-3.4
Gastroenterology	18.2	21.4	3.2	72.7	67.9	-4.9	9.1	10.7	1.6
Hematology	25.0	27.8	2.8	45.0	44.4	-0.6	30.0	27.8	-2.2
Internal Medicine	14.2	14.2	0.1	52.2	52.0	-0.3	33.6	33.8	0.2
Medical Biochemistry	16.7	25.0	8.3	50.0	50.0	0.0	33.3	25.0	-8.3
Medical Microbiology	4.3	8.0	3.7	39.1	44.0	4.9	56.5	48.0	-8.5
Medical Oncology	20.0	25.0	5.0	30.0	50.0	20.0	50.0	25.0	-25.0
Nephrology	27.3	27.3	0.0	27.3	27.3	0.0	45.5	45.5	0.0
Neurology	20.3	18.8	-1.5	45.3	50.7	5.4	34.4	30.4	-3.9
Nuclear Medicine	0.0	5.3	5.3	72.7	73.7	1.0	27.3	21.1	-6.2
Pediatrics	8.9	8.9	0.0	33.9	36.0	2.1	57.3	55.1	-2.2
Pathology - General	20.6	23.3	2.7	41.2	39.8	-1.4	38.1	36.9	-1.3
Pathology - Anatomical	25.0	27.1	2.1	43.8	37.1	-6.6	31.3	35.7	4.5
Physical Medicine	9.7	16.2	6.5	45.2	43.2	-1.9	45.2	40.5	-4.6
Psychiatry	14.4	14.5	0.2	42.4	41.0	-1.4	43.2	44.5	1.3
Radiation Oncology	17.9	23.7	5.8	32.1	18.4	-13.7	50.0	57.9	7.9
Radiology - Diagnostic	12.5	14.2	1.7	59.2	59.3	0.1	28.3	26.5	-1.9
Respiratory Medicine	14.3	15.9	1.6	42.9	43.2	0.3	42.9	40.9	-1.9
Rheumatology	19.2	22.2	3.0	34.6	37.0	2.4	46.2	40.7	-5.4
Cardiovascular & Thoracic Surgery	16.1	18.2	2.1	64.5	63.6	-0.9	19.4	18.2	-1.2
General Surgery	10.3	12.7	2.4	56.8	52.9	-3.9	32.9	34.4	1.5
Neurosurgery	13.8	12.5	-1.3	58.6	62.5	3.9	27.6	25.0	-2.6
Obstetrics & Gynecology	16.2	17.0	0.9	36.5	40.1	3.6	47.3	42.9	-4.4
Ophthalmology	13.9	16.5	2.5	57.0	57.7	0.7	29.1	25.8	-3.3
Orthopedic Surgery	17.4	18.9	1.5	51.0	52.7	1.7	31.5	28.4	-3.2
Otolaryngology	13.2	10.1	-3.0	53.9	53.6	-0.3	32.9	36.2	3.3
Plastic Surgery	32.7	43.6	11.0	53.1	43.6	-9.4	14.3	12.7	-1.6
Urology	27.0	26.5	-0.5	47.6	52.9	5.3	25.4	20.6	-4.8
Vascular Surgery	26.1	28.0	1.9	39.1	40.0	0.9	34.8	32.0	-2.8
Total Specialists	16.6	17.9	1.4	47.8	47.6	-0.2	35.6	34.5	-1.1
Total Physicians	24.7	25.9	1.2	45.1	45.5	0.4	30.2	28.6	-1.6

Figure 4.5: Change in Percent of Physicians Graduating from U.B.C.'s Faculty of Medicine by Specialty, 1991/92 to 1996/97



Another way to examine how the contribution of the U.B.C. medical school has changed over time is to stratify the physician population by date of entry into practice (see Table 4.7). For this analysis, physicians who graduated in 1970 or before (n=2,975) were compared with those who graduated from 1971-1980 (n=2,456) and those who graduated in 1981 or later (n=3,462). These groupings were selected because they reflect major changes in the size of the entering medical class at U.B.C. For GP/FPs, 20.7% of the early cohort obtained their medical degree at U.B.C. while 25% and 39% of the middle and late cohorts graduated from U.B.C. respectively ($p<0.0001$). For specialists, we found a similar increase over time with 12.3%, 15.6% and 26.1% of the three cohorts graduating from U.B.C. respectively ($p<0.0001$). Conversely, there was a drop in the proportion of non-Canadian trained physicians over time. For GP/FPs, the proportion of foreign-trained physicians in the three cohorts was 43.2%, 27.8%, and 14.2%, while for specialists, the corresponding proportions were 45.1%, 36.4% and 16.1% (see Figure 4.6). Additional analyses on U.B.C.'s contribution to the physician workforce in B.C. are presented in Section 4.3.4. (i.e., the place of medical school education for 'inflow', 'outflow', and 'stable' physicians).

Principal Findings: ***Location of Graduating Medical School***

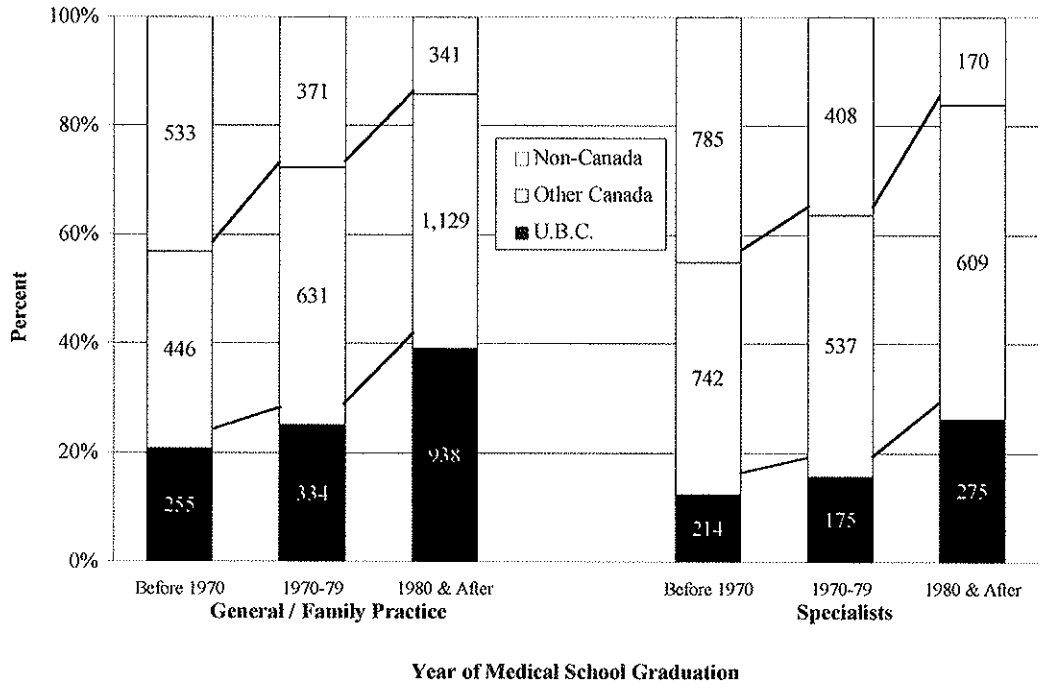
- In 1996, 26% of physicians on the 'active' CPSBC registers were graduates of the University of British Columbia's medical school. Graduates of other Canadian medical schools comprised 46%, while 29% of the total came from non-Canadian-schools.
- For all the Canadian graduates, 22.3% originated from Ontario and 17.5% from Alberta. Other than U.B.C., the Canadian medical school with the largest representation in the B.C. physician workforce was the University of Alberta (11.2%).
- GP/FPs were almost twice as likely to have obtained their medical degrees at U.B.C. than were specialists.
- There was wide variation in the contribution of the undergraduate U.B.C. medical school program among B.C.'s RCPSC specialties in 1996, ranging from 5-44%.
- There was a modest net increase in the proportion of B.C. physicians who had graduated from the U.B.C. medical school, from 1991/92 to 1996/97 (24.7% to 25.9%). Some specialties saw much larger net increases in this proportion than did others. While the contribution of other Canadian sites remained relatively constant, there was some decline in the contribution of non-Canadian schools.
- When stratified by their date of graduation, the proportion of B.C. physicians who graduated from U.B.C. has increased substantially over time. Of practicing physicians who graduated in or before 1970, 16% originated from U.B.C. compared with 21% and 35% of those physicians who graduated between 1971-1980 and post-1980 respectively.

Table 4.7: Place of Medical School Education by Year of Medical School Graduation, 1991-1996*

	Year of Medical School Graduation							
	Before 1970		1970-79		1980 & After		All Years	
General / Family Practice n (%)								
U.B.C.	255	(20.7)	334	(25.0)	938	(39.0)	1,527	(30.7)
Other Canada	446	(36.1)	631	(47.2)	1,129	(46.9)	2,206	(44.3)
Non-Canada	533	(43.2)	371	(27.8)	341	(14.2)	1,245	(25.0)
Total	1,234	(100)	1,336	(100)	2,408	(100)	4,978	(100)
Specialists n (%)								
U.B.C.	214	(12.3)	175	(15.6)	275	(26.1)	664	(17.0)
Other Canada	742	(42.6)	537	(47.9)	609	(57.8)	1,888	(48.2)
Non-Canada	785	(45.1)	408	(36.4)	170	(16.1)	1,363	(34.8)
Total	1,741	(100)	1,120	(100)	1,054	(100)	3,915	(100)
All Physicians n (%)								
U.B.C.	469	(15.8)	509	(20.7)	1,213	(35.0)	2,191	(24.6)
Other Canada	1,188	(39.9)	1,168	(47.6)	1,738	(50.2)	4,094	(46.0)
Non-Canada	1,318	(44.3)	779	(31.7)	511	(14.8)	2,608	(29.3)
Total	2,975	(100)	2,456	(100)	3,462	(100)	8,893	(100)

* Includes all physicians on the 'active' registers of the CPSBC in 1991, 1993 and/or 1996.

Figure 4.6: Place of Medical School Education by Year of Graduation, B.C. Physicians 1991-1996.



4.1.2 Distribution of B.C. Physicians by Health Human Resource Unit (HHRU) Regions and Grouped Specialty Categories, 1991/92 and 1996/97

4.1.2.1 Physician Counts, Full-Time-Equivalents (FTEs), and FTE/Population Ratios

Table 4.8 presents the geographic distribution of GP/FPs and RCPSC-certified specialists in B.C in 1996/97 and Table 4.9 presents similar data for 1991/92. In this section, we examine the distribution of 11 specialty groups across B.C.'s 9 Health Human Resources Unit (HHRU) regions. The HHRU regions represent contiguous groupings of the 20 Health Regions (which are based on the groupings of the 83 LHAs). The 35 physician specialties discussed in Section 4.1.1 are clustered into the following groups: GP/FPs, general internal medicine, medical sub-specialties, general surgery, surgical subspecialties, pediatrics, psychiatry, obstetrics and gynecology, laboratory and diagnostic imaging, anesthesiology, and other. Since many HHRU regions have limited (or no) specialists in individual specialty categories, we felt that this clustering of specialists provided a more informative picture of their geographic distribution. (See methods section for a complete specification of the groupings of health regions and physicians.) In the next section, we examine the physician supply characteristics of the 20 Health Regions, using larger units of specialty aggregation (two categories: GP/FPs and all specialists combined). Because GP/FPs are more equitably distributed across the province (and their supply overwhelmingly surpasses specialist supply in many rural Health Regions), discussion of the distribution of GP/FPs is left to this level of geographic disaggregation (Section 4.1.3).

From the perspective of each specialty group, Table 4.10 summarizes the data in Tables 4.8 and 4.9 to highlight the variation in supply among the HHRU regions. For each study year, the highest and lowest FTE/population ratios are presented (excluding the North region because of its comparably small supply of most specialist types.) The "high/low" ratio is presented as a measure of variation. We first examine the baseline (1991/1992) variation in specialist supply across regions and then inspect how this variation changed over the five-year study period.

In 1991/92, we found substantial regional variation in supply for most specialty groups. The specialties with the smallest disparities were general surgery and general internal medicine (high/low ratios of 2.17 and 1.33 respectively) which is consistent with the 'general' nature of these specialties. While the distribution was relatively equitable, general internists were somewhat more concentrated in the Vancouver and District (hereafter shortened to 'Vancouver') and Capital HHRU regions (9.52 and 7.65 FTEs per 100,000[18]). Among the other regions, supplies were fairly similar (4.39-6.41 per 100,000) except for the North HHRU region, with no FTEs. This pattern was reversed, however, for general surgeons. The Vancouver and Capital HHRU regions had among the fewest general surgeons per capita (4.68 and 4.26 FTEs per 100,000) while two of the more rural regions (North and Central) had the greatest supplies (7.15

[18] The supply of grouped specialists in this section is expressed as physician FTEs per 100,000 population.

Table 4.8: Geographic Distribution of Physicians in B.C. by HHRU Region and Grouped Specialty, 1996/97*

		General / Family Practice			General Internal Medicine			Medical Subspecialties			General Surgery			Surgical Subspecialties			Pediatrics		
HHRU Region	Population**	No.	FTEs	FTE / Pop. Ratio	No.	FTEs	FTE / Pop. Ratio	No.	FTEs	FTE / Pop. Ratio	No.	FTEs	FTE / Pop. Ratio	No.	FTEs	FTE / Pop. Ratio	No.	FTEs	FTE / Pop. Ratio
Vancouver & District	1,910,331	2,215	1,899.1	99.41	232	177.5	9.29	258	234.5	12.28	86	71.6	3.75	373	331.7	17.36	161	147.4	7.71
Capital	331,761	491	376.1	113.37	34	24.7	7.44	45	55.3	16.68	20	13.2	3.98	70	63.2	19.05	15	17.4	5.26
Fraser Valley	231,345	197	199.7	86.32	9	9.8	4.23	6	5.5	2.36	7	7.4	3.20	22	22.9	9.89	5	6.1	2.64
Okanagan	334,743	343	321.7	96.10	19	18.5	5.53	29	32.6	9.72	19	14.1	4.20	51	48.2	14.39	14	10.4	3.09
South East	160,708	184	157.8	98.21	10	9.1	5.67	3	2.6	1.61	12	9.0	5.58	10	10.1	6.29	4	4.6	2.87
Island Coast	425,368	444	403.5	94.87	21	21.2	4.99	9	8.2	1.92	21	19.0	4.46	47	43.4	10.21	11	8.7	2.04
Central	203,742	189	182.0	89.31	8	7.9	3.89	8	9.2	4.52	12	8.8	4.33	21	19.4	9.52	6	6.0	2.95
North Central	219,324	221	218.6	99.65	11	14.0	6.40	5	5.4	2.45	9	8.0	3.67	17	14.7	6.71	5	6.6	3.00
North	64,721	51	51.4	79.43	1	0.9	1.38	0	0.0	0.00	3	3.0	4.60	1	0.2	0.36	0	0.0	0.00
Unknown	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total BC	3,882,043	4,335	3,809.9	98.14	345	283.6	7.31	363	353.2	9.10	189	154.1	3.97	612	553.8	14.27	221	207.2	5.34

		Psychiatry			Obstetrics & Gynecology			Laboratory/Radiology***			Anesthesiology			Other****			All Specialists		
HHRU Region	Population**	No.	FTEs	FTE / Pop. Ratio	No.	FTEs	FTE / Pop. Ratio	No.	FTEs	FTE / Pop. Ratio	No.	FTEs	FTE / Pop. Ratio	No.	FTEs	FTE / Pop. Ratio	No.	FTEs	FTE / Pop. Ratio
Vancouver & District	1,910,331	339	321.8	16.85	107	102.1	5.34	335	335.0	17.54	200	171.7	8.99	100	97.7	5.12	2,191	1,991	104.23
Capital	331,761	65	48.3	14.55	15	10.9	3.27	55	55.0	16.58	42	35.7	10.75	29	27.9	8.40	390	352	105.96
Fraser Valley	231,345	12	10.1	4.35	6	6.2	2.66	19	19.0	8.21	10	9.9	4.30	0	0.0	0.00	96	97	41.83
Okanagan	334,743	22	21.6	6.46	14	11.5	3.42	27	27.0	8.07	24	23.2	6.94	7	8.4	2.51	226	215	64.33
South East	160,708	11	9.9	6.17	4	2.6	1.62	16	16.0	9.96	5	3.8	2.35	1	1.0	0.62	76	69	42.74
Island Coast	425,368	25	22.6	5.32	20	14.7	3.46	29	29.0	6.82	29	24.7	5.80	4	4.0	0.94	216	196	45.97
Central	203,742	7	6.9	3.39	7	7.0	3.42	17	17.0	8.34	10	10.1	4.98	4	3.8	1.86	100	96	47.20
North Central	219,324	7	6.9	3.12	8	7.6	3.45	19	19.0	8.66	9	8.0	3.65	3	3.0	1.37	93	93	42.47
North	64,721	0	0.0	0.00	1	1.0	1.55	3	3.0	4.64	0	0.0	0.00	0	0.0	0.00	9	8	12.52
Unknown	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total BC	3,882,043	488	448.1	11.54	182	163.4	4.21	520	520.0	13.40	329	287.1	7.40	148	145.8	3.76	3,397	3116.3	12.52

*FTE calculations are based on Fee for Service, Salary and Sessional, and most Service Agreement payments, excluding payments to the British Columbia Cancer Agency. FTE/Population Ratios are the number of FTEs per 100,000.

**Population estimates supplied by Population Section, BC STATS, Ministry of Finance and Corporate Relations, are from the P.E.O.P.L.E. Projection Model - #24. All population estimates are as of July 1, 1996.

***As a more accurate representation of personnel, Emergency Medicine, Laboratory Medicine, Radiology and Medical Oncology specialties are included as 1 person=1 FTE.

****"Other" category includes: Community Medicine, Emergency Medicine, Occupational Medicine, Physical Medicine, and Public Health.

Table 4.9: Geographic Distribution of Physicians in B.C. by HHRU Region and Grouped Specialty, 1991/92*

		General / Family Practice			General Internal Medicine			Medical Subspecialties			General Surgery			Surgical Subspecialties			Pediatrics		
HHRU Region	Population**	No.	FTEs	FTE / Pop. Ratio	No.	FTEs	FTE / Pop. Ratio	No.	FTEs	FTE / Pop. Ratio	No.	FTEs	FTE / Pop. Ratio	No.	FTEs	FTE / Pop. Ratio	No.	FTEs	FTE / Pop. Ratio
Vancouver & District	1,647,358	1,968	1,634.4	99.21	233	156.8	9.52	223	212.1	12.88	99	77.2	4.68	355	318.7	19.35	145	129.4	7.85
Capital	307,644	443	333.9	108.53	31	23.5	7.65	34	35.6	11.58	22	13.1	4.26	75	64.3	20.91	11	13.5	4.38
Fraser Valley	191,031	169	172.3	90.21	8	8.7	4.55	5	5.2	2.71	8	8.3	4.34	24	23.7	12.41	3	3.9	2.04
Okanagan	279,790	275	264.5	94.52	18	17.9	6.41	18	19.9	7.09	19	13.4	4.80	45	40.3	14.41	11	11.8	4.22
South East	145,167	179	156.8	108.00	10	9.0	6.22	2	2.5	1.75	8	7.0	4.83	8	6.9	4.77	4	4.6	3.19
Island Coast	361,145	372	341.2	94.48	15	15.9	4.39	8	7.7	2.13	20	18.4	5.09	35	33.7	9.32	8	9.4	2.60
Central	178,944	160	156.9	87.66	8	8.3	4.62	7	8.5	4.73	16	10.2	5.68	19	19.4	10.83	5	5.3	2.96
North Central	202,571	184	174.4	86.08	7	9.7	4.77	4	4.6	2.29	13	9.4	4.65	16	14.5	7.18	4	5.7	2.83
North	59,749	39	39.1	65.44	0	0.0	0.00	0	0.0	0.00	4	4.3	7.15	2	0.5	0.77	1	0.0	0.00
Unknown	-	58	26.0	-	4	1.6	-	2	2.0	-	4	1.3	-	6	3.2	-	-	-	-
Total BC	3,373,399	3,847	3,299.4	97.81	334	251.3	7.45	303	298.1	8.84	213	162.6	4.82	585	525.3	15.57	192	183.6	5.44

		Psychiatry			Obstetrics & Gynecology			Laboratory/Radiology***			Anesthesiology			Other****			All Specialists		
HHRU Region	Population**	No.	FTEs	FTE / Pop. Ratio	No.	FTEs	FTE / Pop. Ratio	No.	FTEs	FTE / Pop. Ratio	No.	FTEs	FTE / Pop. Ratio	No.	FTEs	FTE / Pop. Ratio	No.	FTEs	FTE / Pop. Ratio
Vancouver & District	1,647,358	289	264.4	16.05	100	85.6	5.20	305	305.0	18.51	192	162.8	9.88	87	83.5	5.07	2,028	1,796	108.99
Capital	307,644	46	33.6	10.91	18	13.0	4.24	54	54.0	17.55	41	35.8	11.64	19	18.8	6.10	351	305	99.23
Fraser Valley	191,031	8	8.7	4.57	4	4.2	2.19	16	16.0	8.38	10	10.6	5.53	0	0.0	0.00	86	89	46.72
Okanagan	279,790	16	17.4	6.21	14	11.8	4.23	24	24.0	8.58	18	17.1	6.12	7	8.2	2.92	190	182	64.99
South East	145,167	4	2.7	1.88	2	2.0	1.38	15	15.0	10.33	2	0.9	0.62	0	0.0	0.00	55	51	34.97
Island Coast	361,145	14	12.0	3.31	15	11.3	3.13	26	26.0	7.20	19	15.8	4.38	7	7.0	1.94	167	157	43.48
Central	178,944	3	3.8	2.10	7	6.7	3.74	17	17.0	9.50	10	9.6	5.35	3	2.7	1.49	95	91	51.00
North Central	202,571	2	1.9	0.93	5	5.5	2.71	13	13.0	6.42	5	4.7	2.30	0	0.0	0.00	69	69	34.06
North	59,749	0	0.0	0.00	1	1.0	1.59	3	3.0	5.02	0	0.0	0.00	0	0.0	0.00	11	9	14.53
Unknown	-	-	-	-	1	0.4	-	2	2.0	-	4	3.2	-	-	-	-	-	-	-
Total BC	3,373,399	382	344.4	10.21	167	141.5	4.19	475	475.0	14.08	301	260.4	7.72	123	120.1	3.56	3,075	2762.3	12.52

*FTE calculations are based on Fee for Service and Salary and Sessional payments. FTE/Population Ratios are the number of FTEs per 100,000.

**Population estimates supplied by Population Section, BC STATS, Ministry of Finance and Corporate Relations, are from the P.E.O.P.L.E. Projection Model - #24. All population estimates are as of July 1, 1991.

***As a more accurate representation of personnel, Emergency Medicine, Laboratory Medicine, Radiology, and Medical Oncology specialties are included as 1 person=1 FTE.

****"Other" category includes: Community Medicine, Emergency Medicine, Occupational Medicine, Physical Medicine, and Public Health.

Table 4.10: Summary of Regional Variation in Supply of Specialist FTEs, 1991/92-1996/97

	Gen. Int. Medicine	Medical Subspecialists	General Surgery	Surgical Subspecialists	Pediatrics	Psychiatry	Obstetrics & Gynecology	Laboratory & Radiology	Anesthesiology
FTE/Population Ratios 1991/92*									
Highest	9.52	12.88	5.68	20.91	7.85	16.05	5.20	18.51	11.64
Lowest	4.39	1.75	4.26	4.77	2.04	0.93	1.38	6.42	0.62
Ratio Highest/Lowest	2.17	7.36	1.33	4.39	3.86	17.29	3.77	2.88	18.78
FTE/Population Ratios 1996/97*									
Highest	9.29	16.68	5.58	19.05	7.71	16.85	5.34	17.54	10.75
Lowest	3.89	1.61	3.20	6.29	2.04	3.12	1.62	6.82	2.35
Ratio Highest/Lowest	2.39	10.35	1.74	3.03	3.78	5.40	3.29	2.57	4.57
Variation in the Growth in Physician Supply 91/92-96/97									
# HHRU Regions Growing in Supply**									
# Physicians	6	8	2	6	7	8	5	7	6
FTE/Population Ratios	2	3	1	2	3	7	4	1	4
Changes in FTE/Population Ratio***									
Highest	1.63	5.10	0.75	1.52	0.88	4.28	0.74	2.25	1.73
Lowest	-0.88	-0.60	-2.54	-2.52	-1.12	-0.22	-0.97	-1.16	-1.24

*Physician FTEs per 100,000 population. Excludes 'North' HHRU Region because of small supply of most specialty groups.

** Represents the number of HHRU regions (max. 9) with net increases in the number of physicians and FTE/population ratios.

***Highest and lowest net changes in the number of FTEs per 100,000 among HHRU regions, 1991/92 to 1996/97.

and 5.68 FTEs per 100,000). This is as expected, since the former have greater availability of sub-specialties. Laboratory medicine specialists/radiologists were also fairly evenly distributed across HHRU regions (high/low ratio = 2.88). The highest concentrations were in the Vancouver and Capital HHRU regions (18.51 and 17.55 FTEs per 100,000), while supply in the other HHRU regions ranged from 5.02 (North) to 10.33 (South East) FTEs per 100,000.

Compared with general surgery, internal medicine and laboratory medicine/radiology in 1991/92, there was somewhat more variation in the supply of pediatricians and obstetrician/gynecologists (high/low ratios of 3.86 and 3.77 respectively). Pediatricians were most highly concentrated in the Vancouver HHRU region (7.85 FTEs per 100,000) which is consistent with the fact that the tertiary pediatric care is centralized at the B.C. Children's Hospital (Dr. Judith Hall, personal communication). Among the other regions, the supply of pediatricians ranged from 2.04 (Fraser Valley) to 4.38 (Capital) FTEs per 100,000, except for the North which had no FTEs. Obstetrician/gynecologists were also more concentrated in the Vancouver region (5.20 FTEs per 100,000), but outside this region, there was still more than two-fold variation - ranging from 4.24 (Capital) to 1.38 (South East) FTEs per 100,000.

Not unexpectedly, the distribution of medical and surgical subspecialists showed greater disparities (high/low ratios of 7.36 and 4.39) than the specialties discussed above. The Vancouver and Capital HHRU regions had markedly higher concentrations of these subspecialists compared with any other region, which is consistent with the centralization of tertiary care in these sites. However, there was substantial variation in supply among the remaining regions, highlighting the role of regional secondary care centres and physician referral networks in the delivery of subspecialty care in the province.

Anesthesiology and psychiatry showed the greatest variation in regional supply (high/low ratios of 18.8 and 17.4). For anesthesiology, this large disparity was mainly due to the strikingly low supply in one region in 1991/92 (South East), at 0.62 FTEs per 100,000. The Vancouver and Capital HHRU regions had the greatest supply (again not surprisingly) with the remaining regions ranging from 2.3 (North Central) to 6.12 (Okanagan) FTEs per 100,000 - except for the North, with no RCPSC-certified anesthesiologists. For psychiatrists, the large disparities were more diffuse. Psychiatrists were overwhelming concentrated in the Vancouver HHRU region (16.0 FTEs per 100,000) - more than 75% of all psychiatrists. Except for the Capital HHRU region (10.9 FTEs per 100,000), all other regions had substantially smaller supplies (ranging from zero to 6.2 FTEs per 100,000).

By 1996/97, the regional disparities had increased for some specialty groups and had decreased for others. While general internal medicine and general surgery remained the most evenly distributed, the gaps increased marginally over the study period. For obstetrics and gynecology, pediatrics and the laboratory/radiology specialties, the distribution across regions remained intermediate among specialty groups and the disparities narrowed. For anesthesiology, the high/low ratio declined markedly (from 18.8 to 4.57) in 1996/97 due to the concurrent reduction in supply in the Vancouver and Capital regions and increased supply in most rural ones. Similarly, disparities for psychiatry were markedly reduced (from 17.3 to 5.4) owing to the significant net inflow of psychiatrists into many HHRU regions. For medical and surgical subspecialists, the

regional disparities appeared to increase and decrease respectively. We must be careful in interpreting these changes since these fluctuations were the result of changes of only one or two physicians in several of the more sparsely populated regions.

Table 4.10 also presents the number of HHRU regions (maximum 9) that increased both in physician numbers and per capita FTE supply. (For these analyses the North HHRU region is included.) For most specialty groups, there were consistent increases in the number of specialists across HHRU regions. All specialties except general surgery and obstetrics and gynecology increased in at least two-thirds of regions. The most consistent growth was seen in psychiatry where gains were seen in all regions except one - the North region had no permanent psychiatrists in either study year. These gains across regions corresponded to a concerted recruitment drive during this time (Dr. H.K. Sigmundson, personal communication). General surgery saw the fewest increases, with only the South East and Island Coast HHRU regions showing a net gain in general surgeons.

While most specialty groups increased in numbers across HHRUs, this growth often did not keep pace with population growth. Psychiatry was the only specialty group that saw gains in per capita supply (FTE/population ratio) in a majority of HHRU regions (seven). In fact, six specialty groups saw increases in per capita supply in one-third or fewer HHRU regions. For each of general surgery and the laboratory/radiology specialties, only one HHRU region witnessed per capita gains - the South East and North Central regions respectively.

Table 4.11 summarizes data from Tables 4.8 and 4.9 from the HHRU perspective. For each region, the changes in population, physician numbers and FTE to population ratios over the study period are presented. Seven regions saw relatively consistent gains in physician numbers across the nine specialty groups (for this analysis GP/FPs and other specialties are excluded). In the Central and North regions, net gains were achieved in fewer than two-thirds of the specialty categories. Conversely, the Island Coast HHRU region saw increases in physician numbers across all specialty categories. It is also apparent that the net changes in many HHRU regions were relatively small for the specialty categories – often three or fewer physicians. However, given the relatively small supply of many types of specialties across the regions, these small absolute changes can be proportionally quite large. This finding highlights the fact that a loss of just one or two physicians can have relatively significant consequences for regional specialist supply.

In addition to variations in regaining physicians, the HHRU regions witnessed an almost three-fold variation in population growth over this interval (ranging from 7.8% in the Capital region to 21.1% in the Fraser Valley). The marked differences in population growth resulted in some regions experiencing per capita growth for most specialties while some saw growth for only a few. The South East and North Central regions had the smallest population increases (10.7% and 8.3% respectively) and were among the regions with the most consistent per capita increases in supply across specialty groups (5 and 7 specialties). Conversely, regions with the greatest population growth (Vancouver, Fraser Valley, Okanagan) saw per capita increases in a minority of specialties. These findings highlight the enormous impact that changes in population can have on physician availability per capita.

Table 4.11: Change in Population, Physicians, and FTE/Population Ratios by HHRU Region, 1991/92-1996/97*

	Vancouver	Capital	Fraser Valley	Okanagan	South East	Island Coast	Central	N. Central	North
Population Growth 91-96 (%)	16.0	7.8	21.1	19.6	10.7	17.8	13.9	8.3	8.3
Change in # Physicians n (%)**									
General Internal Medicine	-1 -(0.4)	3 (9.7)	1 (12.5)	1 (5.6)	0 (0.0)	6 (40.0)	0 (0.0)	4 (57.1)	1 -
Medical Subspecialties	35 (15.7)	11 (32.4)	1 (20.0)	11 (61.1)	1 (50.0)	1 (12.5)	1 (14.3)	1 (25.0)	0 -
General Surgery	-13 -(13.1)	-2 -(9.1)	-1 -(12.5)	0 (0.0)	4 (50.0)	1 (5.0)	-4 -(25.0)	-4 -(30.8)	-1 -25.0
Surgical Subspecialties	18 (5.1)	-5 (16.0)	-2 -(8.3)	6 (13.3)	2 (25.0)	12 (34.3)	2 (10.5)	1 (6.3)	-1 -50.0
Pediatrics	16 (11.0)	4 (36.4)	2 (66.7)	3 (27.3)	0 (0.0)	3 (37.5)	1 (20.0)	1 (25.0)	-1 -(100)
Psychiatry	50 (17.3)	19 (41.3)	4 (50.0)	6 (37.5)	7 (175.0)	11 (78.6)	4 (133.3)	5 (250.0)	0 -
Obstetrics & Gynecology	7 (7.0)	-3 -(16.7)	2 (50.0)	0 (0.0)	2 (100.0)	5 (33.3)	0 (0.0)	3 (60.0)	0 0.0
Laboratory & Radiology	30 (9.8)	1 (1.9)	3 (18.8)	3 (12.5)	1 (6.7)	3 (11.5)	0 (0.0)	6 (46.2)	0 0.0
Anesthesiology	8 (4.2)	1 (2.4)	0 (0.0)	6 (33.3)	3 (150.0)	10 (52.6)	0 (0.0)	4 (80.0)	0 -
Change in FTE / Population Ratios (FTEs per 100,000)									
General Internal Medicine	-0.13	-0.22	-0.33	-0.88	-0.55	0.60	-0.73	1.63	1.38
Medical Subspecialties	-0.21	4.86	-0.35	2.63	-0.14	0.02	-0.21	0.16	0.00
General Surgery	-0.86	-0.28	-1.15	-0.60	0.75	-0.62	-1.35	-0.82	-2.54
Surgical Subspecialties	-1.99	-1.86	-2.52	-0.01	1.52	0.89	-1.31	-0.47	-0.41
Pediatrics	0.82	1.33	0.82	-0.98	-0.23	-0.41	0.19	0.52	0.00
Psychiatry	0.80	3.64	-0.22	0.24	4.62	2.03	1.29	2.20	0.00
Obstetrics & Gynecology	0.35	-0.97	0.47	-0.81	0.25	0.34	-0.33	0.74	-0.04
Laboratory & Radiology	-0.98	-0.97	-0.16	-0.51	-0.38	-0.38	-1.16	2.25	-0.39
Anesthesiology	-0.89	-0.97	0.47	-0.81	0.25	0.34	-0.33	0.74	-0.04

* Includes only physicians on the 'active' registers of the CPSBC.

** Percent change is calculated (# 1996/97 - # 1991/92) / (# 1991/92) *100

Principal Findings: ***Distribution of Specialist Physicians in B.C.'s HHRU Regions***

- In 1991/92, there was substantial variation across the HHRU regions in the supply of specialists in all specialty groups. The specialty groups with the least variation across regions (between 0.3- and 3-fold, excluding the North HHRU region) included general surgery, general internal medicine, and laboratory medicine/radiology. The largest disparities existed for psychiatry and the medical subspecialties.
- Between 1991/92 and 1996/97, the regional disparities in supply increased for some specialty groups (internal medicine, medical subspecialties and general surgery) while decreasing for others (surgical subspecialists, psychiatrists, obstetrics and gynecology, laboratory medicine and radiology, anesthesiology and pediatrics).
- There were substantial differences in the patterns of change in specialist supply over the study period. While most regional specialist populations witnessed a net increase in FTEs over the study period, the increases in many HHRU regions did not keep pace with population growth. General surgery showed the most consistent reductions: the FTE/population ratio declined in eight of nine regions. Conversely, psychiatry saw the most consistent increases across regions (in all but one).
- While many regions experienced a loss (or gain) of only a few specialist FTEs during this interval, these small changes often had a relatively significant influence on overall regional supply. This finding underscores the relatively unstable supply of various types of specialists that is faced by many health regions.

4.1.2.2 Variation in Specialist Demographics and Medical Schools of Training across HHRU Regions

Table 4.12 outlines the age, sex, and medical schools of origin for B.C. physicians by HHRU region in 1996. For the purposes of these analyses, we have further grouped the specialty categories into 'general specialties' (general internal medicine, general surgery, psychiatry, pediatrics, and obstetrics and gynecology); and 'all other specialties' (the medical and surgical subspecialties, anesthesiology, laboratory specialties, and radiology). Furthermore, the North Central and North HHRU regions have been grouped as the combined 'North and North Central' geographic area. These collapsed categories were necessary because of the small cell sizes. While included in this table for completeness, differences in the demographic and training characteristics of GP/FPs are discussed in relation to B.C.'s 20 Health Regions (see Section 4.1.3).

There was considerable variation in the population of 'general' specialists across the HHRUs. The median age of 'general' specialists ranged from 45 to 57 years ($p<0.001$).[19] Regions with

[19] Kruskal-Wallis Test (non-parametric chi-square approximation).

Table 4.12: Regional Distribution of BC Physicians by Age Group, Sex, and Place of Medical School Training, 1996

General / Family Medicine

	Vancouver		Capital		Fraser Vall		Okanagan		South East		Isl Coast		Central		N & N Cent		Totals	
Age median (IQR)	43	(16.0)	45	(14.0)	46	(16.0)	43	(15.0)	43	(15.0)	43	(13.0)	42	(14.0)	41	(13.5)	43	(15.0)
Age Group n (%)																		
< 40	859	(38.8)	136	(27.7)	66	(33.5)	121	(35.3)	66	(35.9)	153	(34.5)	77	(40.7)	110	(40.4)	1,588	(36.6)
40 to 64	1,208	(54.5)	315	(64.2)	109	(55.3)	206	(60.1)	106	(57.6)	265	(59.7)	107	(56.6)	151	(55.5)	2,467	(56.9)
65+	148	(6.7)	40	(8.1)	22	(11.2)	16	(4.7)	12	(6.5)	26	(5.9)	5	(2.6)	11	(4.0)	280	(6.5)
Sex n (%)																		
Male	1,466	(66.2)	343	(69.9)	163	(82.7)	262	(76.4)	130	(70.7)	337	(75.9)	145	(76.7)	213	(78.3)	3,059	(70.6)
Female	749	(33.8)	148	(30.1)	34	(17.3)	81	(23.6)	54	(29.3)	107	(24.1)	44	(23.3)	59	(21.7)	1,276	(29.4)
Medical School n (%)																		
U.B.C.	791	(35.7)	137	(27.9)	65	(33.0)	100	(29.2)	37	(20.1)	143	(32.2)	60	(31.7)	59	(21.7)	1,392	(32.1)
Other Canada	931	(42.0)	251	(51.1)	73	(37.1)	179	(52.2)	105	(57.1)	187	(42.1)	79	(41.8)	99	(36.4)	1,904	(43.9)
Non-Canada	493	(22.3)	103	(21.0)	59	(29.9)	64	(18.7)	42	(22.8)	114	(25.7)	50	(26.5)	114	(41.9)	1,039	(24.0)
Totals	2,215	-	491	-	197	-	343	-	184	-	444	-	189	-	272	-	4,335	-

'General' Specialties (General Internal Medicine; General Surgery; Psychiatry; Pediatrics; Obstetrics & Gynecology)

	Vancouver		Capital		Fraser Vall		Okanagan		South East		Isl Coast		Central		N & N Cent		Totals	
Age median (IQR)	50	(17.0)	57	(15.0)	46	(17.0)	50	(23.0)	48	(17.0)	53	(18.0)	49	(19.0)	45	(19.0)	50	(18.0)
Age Group n (%)																		
< 40	159	(17.4)	11	(7.4)	8	(21.1)	16	(18.4)	6	(14.6)	14	(14.3)	9	(22.5)	15	(34.1)	238	(16.9)
40 to 64	608	(66.5)	103	(69.1)	27	(71.1)	52	(59.8)	32	(78.0)	64	(65.3)	27	(67.5)	23	(52.3)	936	(66.3)
65+	147	(16.1)	35	(23.5)	3	(7.9)	19	(21.8)	3	(7.3)	20	(20.4)	4	(10.0)	6	(13.6)	237	(16.8)
Sex n (%)																		
Male	677	(74.1)	124	(83.2)	32	(84.2)	72	(82.8)	38	(92.7)	88	(89.8)	35	(87.5)	36	(81.8)	1,102	(78.1)
Female	237	(25.9)	25	(16.8)	6	(15.8)	15	(17.2)	3	(7.3)	10	(10.2)	5	(12.5)	8	(18.2)	309	(21.9)
Medical School n (%)																		
U.B.C.	141	(15.4)	12	(8.1)	8	(21.1)	12	(13.8)	4	(9.8)	5	(5.1)	2	(5.0)	5	(11.4)	189	(13.4)
Other Canada	384	(42.0)	73	(49.0)	11	(28.9)	50	(57.5)	19	(46.3)	54	(55.1)	21	(52.5)	16	(36.4)	628	(44.5)
Non-Canada	389	(42.6)	64	(43.0)	19	(50.0)	25	(28.7)	18	(43.9)	39	(39.8)	17	(42.5)	23	(52.3)	594	(42.1)
Totals	914	-	149	-	38	-	87	-	41	-	98	-	40	-	44	-	1,411	1.9024E+214

All Other Specialties (Medical Subspecialties; Surgical Subspecialties; Laboratory & Radiology; Anesthesiology)

	Vancouver		Capital		Fraser Vall		Okanagan		South East		Isl Coast		Central		N & N Cent		Totals	
Age median (IQR)	47	(15.0)	50	(14.0)	49	(12.0)	45	(14.0)	42	(11.0)	47	(16.0)	47	(14.5)	45	(16.0)	47	(14.0)
Age Group n (%)																		
< 40	245	(20.8)	25	(11.8)	9	(15.5)	43	(32.6)	13	(38.2)	23	(20.2)	9	(16.1)	14	(25.5)	381	(20.7)
40 to 64	834	(70.9)	157	(74.1)	43	(74.1)	79	(59.8)	20	(58.8)	80	(70.2)	44	(78.6)	36	(65.5)	1,293	(70.3)
65+	98	(8.3)	30	(14.2)	6	(10.3)	10	(7.6)	1	(2.9)	11	(9.6)	3	(5.4)	5	(9.1)	164	(8.9)
Sex n (%)																		
Male	958	(81.4)	193	(91.0)	52	(89.7)	122	(92.4)	29	(85.3)	101	(88.6)	54	(96.4)	49	(89.1)	1,558	(84.8)
Female	219	(18.6)	19	(9.0)	6	(10.3)	10	(7.6)	5	(14.7)	13	(11.4)	2	(3.6)	6	(10.9)	280	(15.2)
Medical School n (%)																		
U.B.C.	287	(24.4)	24	(11.3)	12	(20.7)	25	(18.9)	4	(11.8)	22	(19.3)	8	(14.3)	11	(20.0)	393	(21.4)
Other Canada	529	(44.9)	124	(58.5)	29	(50.0)	77	(58.3)	21	(61.8)	60	(52.6)	33	(58.9)	24	(43.6)	897	(48.8)
Non-Canada	361	(30.7)	64	(30.2)	17	(29.3)	30	(22.7)	9	(26.5)	32	(28.1)	15	(26.8)	20	(36.4)	548	(29.8)
Totals	1,177	-	212	-	58	-	132	-	34	-	114	-	56	-	55	-	1,838	-

Note: The 'North' and 'North Central' regions have been grouped. Physicians in emergency medicine, community medicine, physical medicine and public health are excluded from the analyses.
Includes only physicians on the 'active' register of the CPSBC. IQR refers to 'inter-quartile range'.

relatively low median ages included the North/North Central regions (45 years; interquartile range (IQR) 19) and the Fraser Valley (46 years; IQR 17). Conversely, regions with relatively high median ages included the Capital (57 years; IQR 15) and Island Coast (53 years; IQR 18) regions. It is noteworthy that the Capital region had both the smallest proportion of younger 'general' specialists (aged <40 years) and the highest proportion of older ones (aged 65+ years). The above findings persist when physician age is weighted by FTE values calculated for 1996/97. For the sake of simplicity, only the unweighted analyses are presented here.

For the remaining group of specialists, there was similar variation in median ages across regions ($p<0.001$) (range 42-50 years). Again, the Capital region had the highest median age (50 years; IQR 14.0) compared with all others. In this instance, however, the youngest median age was in the South East (42 years; IQR 11) region.

In relation to the sex distribution of specialists, the proportion of female 'general' specialists varied considerably from only 7.3% in the South East to 25.9% in Vancouver and District. For all other types of specialists, the proportion of women ranged from 3.6 to 18.6%. Again, the highest representation of women was in the Vancouver HHRU region. Since older physicians (particularly specialists) were largely male (see Section 4.1.1.2), these findings reflect differences in the specialist distribution among HHRU regions.

For 'general' specialists, it was also apparent that the contribution of U.B.C.'s undergraduate medical program was unevenly distributed across the regions - ranging from only 5.0% of specialists trained at U.B.C. in the Central region to 21.1% in the Fraser Valley. In all regions, less than one quarter of the 'general' specialist supply was U.B.C trained. In contrast, the contribution of foreign trained 'general' specialists was substantial in several regions. In the Fraser Valley and North/North Central HHRU regions more than 50% of physicians were foreign trained. It is noteworthy that the Fraser Valley had high proportions of both U.B.C. and foreign trained 'general' specialists. Interestingly, the U.B.C medical school was more heavily represented among the 'all other specialist' group with less variation among HHRU regions. Conversely, the representation of foreign medical schools for this mix of specialists was less prominent across all regions compared with 'general' specialists.

Principal Findings: ***Regional Differences in Specialist Age, Sex, and Training***

- There was substantial variation in the ages of 'general' specialists among regions, including internal medicine, general surgery, obstetrics and gynecology, pediatrics and psychiatry. Some regions had a much older supply of these specialists than did others. The Capital and Island Coast regions had the largest proportion of older 'general' specialists.
- The distribution of female 'general' specialists was uneven across the HHRU regions. In all regions, however, women represented less than one quarter of the total 'general' specialist supply.
- 'General' specialists who were trained at U.B.C.'s medical school were unevenly distributed across the province. In several regions, only 5% of 'general' specialists were U.B.C. trained. In no region was greater than one-quarter of these specialists U.B.C.-trained.
- Foreign-trained 'general' specialists represented more than one-quarter of the supply in all HHRU regions. In several regions, physicians with medical training outside Canada made up 50% or more of the 'general' specialist supply.

4.1.3 Physician Supply in B.C.'s 20 Health Regions, 1991/92 and 1996/97

The following section outlines the distribution of GP/FPs and specialist physicians for a finer unit of geographic disaggregation, B.C.'s 20 Health Regions. Because there are many regions with relatively few (or no) specialists in many of the specialty categories, we elected to report physician supply at the health region level for GP/FPs and all specialists combined. Thus, these analyses trade more precision in geographic specification for less precision in specialty differentiation.

A main purpose behind this analysis is to understand the distribution of primary care physicians (GP/FPs) across the province. GP/FPs are the point of first contact with the health care system for most British Columbians and serve to respond to the majority of their health concerns. While specialty care is directed at those individuals with specialized needs, primary care responds to a wide range of problems and diagnoses. Thus, this finer geographic specification permits greater precision in understanding regional differences in access to physician services which most British Columbians use - either periodically or on a regular basis. Moreover, we see these analyses as particularly helpful in understanding access to physician care in the rural and remote areas of the province.

4.1.3.1 Physician Counts, Full-Time-Equivalents (FTEs), and FTE/ Population Ratios

Tables 4.13 and 4.14 present the distribution of GP/FPs, RCPSC specialists (combined), and all physicians in 1996/97 and 1991/92 respectively. For GP/FPs, there was an almost 2-fold variation in the supply of physicians across regions. In 1996/97, the region with the largest supply of GP/FPs was Vancouver (13.4 FTEs per 10,000) compared with Peace Liard with the smallest supply (7.9 FTEs per 10,000), about a 1.7 fold difference. The average FTE/population ratio

among regions (unweighted for population size) was 9.52 FTEs per 10,000 (SD 1.31). In 1991/92, the average ratio was slightly smaller (9.22) but there was more variation among regions (SD 1.58). In this earlier year, supply ranged from a high of 13.8 FTEs per 10,000 in Vancouver to a low of 6.54 per 10,000 in Peace Liard. These disparities in the regional supply of GP/FPs are noteworthy as they suggest important differences in access to physician care throughout the province.

While the overall supply of GP/FP FTEs changed little during this 5-year period (9.78 to 9.81 per 10,000), there were important differences in the patterns of change among regions. The number of physicians on the 'active' registry of the CPSBC increased in all regions except one (West Kootenay-Boundary), as did the number of FTEs calculated using physician payment data. However, when combined with the differential patterns of regional population growth during this period, the GP/FP FTE/population ratios increased in 13 of the 20 regions (see Table 4.15 and Figure 4.7). For regions gaining in per capita GP supply, the increases ranged from a relatively small net change of 0.3 FTEs per 10,000 in the South Fraser Valley to a high of 2.6 FTEs per 10,000 in the North West region. For the seven regions where supply fell over this period, the reduction ranged from 0.9 (South Okanagan–Similkameen) to 1.8 FTEs per 10,000 (West Kootenay-Boundary). As discussed above, these analyses are purely descriptive and did not examine the appropriateness of these changes in regional physician supply.

Figure 4.8 shows the change in the supply over the five year study period (in FTEs per 10,000) compared to the baseline supply in 1991/92. A weak inverse linear relationship appears to exist between the regional GP/FP supply in 1991/92 and the rate of change in supply in the subsequent 5 years ($r=0.56$; $p<0.0001$). In other words, health regions with lower baseline supply in 1991/92 tended to grow faster in the subsequent five years than did regions with greater supply. Thus, this analysis reveals that the disparity in the regional supply of GP/FPs was *decreasing* during this period. The main outlier was the North West region which grew rapidly, from a region with a smaller supply than average in 1991/92 (8.95 FTEs per 10,000) to one with a relatively rich supply in 1996/97 (11.5 per 10,000). While the growth in the supply of GP/FPs in relation to the regional populations appears to have principally occurred in areas with smaller FTE/population ratios, it is clear, however, that the disparities among regions, for the most part, persisted at the end of the period.

In summary, although substantial regional disparities in GP/FP supply continued to exist in 1996/97, there was some reduction in these disparities over the preceding five years. We did not examine the appropriateness of these shifts in regional physician supply. Optimally, GP/FP supply should 'match' population health needs and, given the substantial differences in health status among B.C. regions, some regions should arguably be served by a richer supply of GP/FPs than others. Further analyses are required to examine how these changes 'matched' the population's needs for primary care.

Table 4.13: Distribution of General Practitioners/Family Physicians & Specialists in B.C. by Health Region, 1996/97*

		General / Family Practice			Specialists**			All Physicians		
Health Region	Population***	No.	FTEs	FTE/Pop'n Ratio	No.	FTEs	FTE/Pop'n Ratio	No.	FTEs	FTE/Pop'n Ratio
East Kootenay	79,083	86	76.7	9.69	37	31.0	3.91	123	107.6	13.61
West Kootenay-Boundary	81,625	98	81.2	9.95	39	37.7	4.62	137	118.9	14.57
North Okanagan	114,080	126	112.2	9.83	64	58.5	5.13	190	170.7	14.96
South Okanagan - Similkameen	220,663	217	209.5	9.50	162	156.8	7.11	379	366.4	16.60
Thompson	130,390	123	114.4	8.77	84	82.0	6.29	207	196.4	15.06
Fraser Valley	231,345	197	199.7	8.63	96	96.8	4.18	293	296.5	12.81
South Fraser Valley	542,707	432	444.6	8.19	234	232.3	4.28	666	676.9	12.47
Simon Fraser	302,550	275	271.3	8.97	243	239.0	7.90	518	510.3	16.87
Coast Garibaldi	73,323	81	70.7	9.64	21	15.4	2.10	102	86.1	11.74
Central Vancouver Island	233,459	240	220.4	9.44	140	130.6	5.59	380	350.9	15.03
Upper Island/Central Coast	118,586	123	112.5	9.49	55	49.6	4.18	178	162.1	13.67
Cariboo	73,352	66	67.6	9.22	16	14.2	1.93	82	81.8	11.15
North West	90,212	102	104.0	11.53	29	27.9	3.09	131	131.9	14.62
Peace Liard	64,721	51	51.4	7.94	9	8.1	1.25	60	59.5	9.19
Northern Interior	129,112	119	114.6	8.87	64	65.3	5.06	183	179.8	13.93
Vancouver	546,211	974	732.5	13.41	1,365	1,190.6	21.80	2,339	1,923.0	35.21
Burnaby	187,086	160	149.7	8.00	91	90.7	4.85	251	240.4	12.85
North Shore	176,772	212	170.8	9.66	151	142.1	8.04	363	312.9	17.70
Richmond	155,005	162	130.3	8.40	107	93.6	6.04	269	223.9	14.44
Capital	331,761	491	376.1	11.34	390	350.7	10.57	881	726.8	21.91
Unknown	-	-	-	-	-	-	-	-	-	-
Total BC	3,882,043	4,335	3,809.9	9.81	3,397	3,112.7	8.02	7,732	6,922.6	17.83

*FTE calculations are based on Fee for Service, Salary and Sessional, and most Service Agreement payments, excluding payments to the British Columbia Cancer Agency.

FTE/Population ratios represent the number of FTEs per 10,000. Includes only those physicians on the 'active' registers of the CPSBC in 1996.

**As a more accurate representation of personnel, Emergency Medicine, Laboratory/Radiology, and Medical Oncology specialties are included as 1 person=1 FTE.

***Population estimates supplied by Population Section, BC STATS, Ministry of Finance and Corporate Relations, are from the P.E.O.P.L.E. Projection Model #24.

Population estimates are as of July 1, 1996.

Table 4.14: Distribution of General Practitioners/Family Physicians & Specialists in B.C. by Health Region, 1991/92*

		General / Family Practice			Specialists**			All Physicians		
Health Region	Population***	No.	FTEs	FTE/Pop'n Ratio	No.	FTEs	FTE/Pop'n Ratio	No.	FTEs	FTE/Pop'n Ratio
East Kootenay	71,705	75	70.5	9.83	27	23.3	3.25	102	93.8	13.08
West Kootenay-Boundary	73,462	104	86.3	11.75	28	27.5	3.74	132	113.8	15.49
North Okanagan	96,837	91	89.0	9.19	47	42.5	4.39	138	131.6	13.58
South Okanagan - Similkameen	182,953	184	175.4	9.59	143	139.3	7.61	327	314.7	17.20
Thompson	113,136	102	106.5	9.41	78	78.8	6.96	180	185.3	16.38
Fraser Valley	191,031	169	172.3	9.02	86	89.3	4.67	255	261.6	13.69
South Fraser Valley	449,421	360	366.6	8.16	173	177.5	3.95	533	544.1	12.11
Simon Fraser	250,205	225	214.8	8.58	221	224.5	8.97	446	439.2	17.55
Coast Garibaldi	61,195	65	57.1	9.32	12	9.6	1.57	77	66.7	10.89
Central Vancouver Island	198,884	208	192.4	9.67	117	110.0	5.53	325	302.4	15.21
Upper Island/Central Coast	101,066	99	91.8	9.08	38	37.4	3.70	137	129.2	12.78
Cariboo	65,808	58	50.4	7.65	17	12.5	1.90	75	62.9	9.55
North West	85,380	89	76.4	8.95	17	14.9	1.74	106	91.3	10.69
Peace Liard	59,749	39	39.1	6.54	10	8.7	1.45	49	47.8	8.00
Northern Interior	117,191	95	98.0	8.36	52	54.1	4.62	147	152.1	12.98
Vancouver	491,726	917	677.1	13.77	1,321	1105.1	22.47	2,238	1782.2	36.24
Burnaby	163,409	133	124.9	7.64	76	81.0	4.95	209	205.9	12.60
North Shore	162,536	184	151.1	9.30	157	135.7	8.35	341	286.8	17.64
Richmond	130,061	149	99.9	7.68	80	71.8	5.52	229	171.7	13.20
Capital	307,644	443	333.9	10.85	351	305.3	9.92	794	639.2	20.78
Unknown	-	58	26.0	-	24	13.7	-	82	39.7	-
Total BC	3,373,399	3,847	3299.4	9.78	3,075	2762.3	8.19	6,922	6061.7	17.97

*FTE calculations are based on Fee for Service and Salary and Sessional payments.

FTE/Population ratios represent the number of FTEs per 10,000. Includes only those physicians on the 'active' registers of the CPSBC in 1991.

**As a more accurate representation of personnel, Emergency Medicine, Laboratory/Radiology, and Medical Oncology specialties are included as 1 person=1 FTE.

***Population estimates supplied by Population Section, BC STATS, Ministry of Finance and Corporate Relations, are from the P.E.O.P.L.E. Projection Model #24. Population estimates are as of July 1, 1991.

Table 4.15: Annual Rates of Change in Physician Supply by Health Region, 1991/92 to 1996/97*

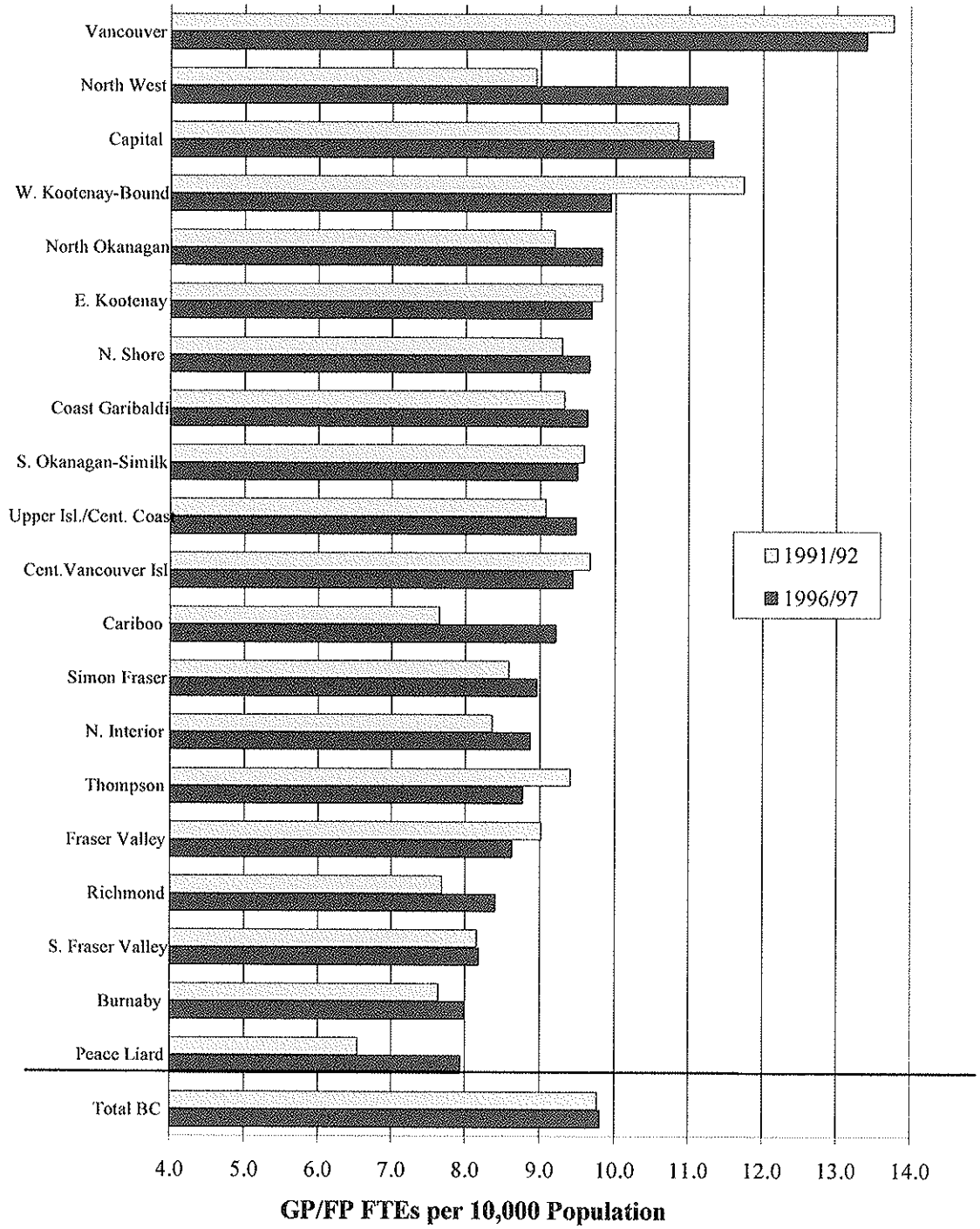
Health Region	1991 Population**	Average Annual % Change in FTE/Pop'n Ratio		
		GP/FPs	Specialists***	All Physicians
East Kootenay	71,705	-0.28	3.82	0.80
West Kootenay-Boundary	73,462	-3.27	4.32	-1.22
North Okanagan	96,837	1.36	3.15	1.95
South Okanagan - Similkameen	182,953	-0.20	-1.37	-0.71
Thompson	113,136	-1.40	-2.02	-1.66
Fraser Valley	191,031	-0.88	-2.19	-1.32
South Fraser Valley	449,421	0.09	1.62	0.60
Simon Fraser	250,205	0.88	-2.52	-0.80
Coast Garibaldi	61,195	0.66	6.02	1.51
Central Vancouver Island	198,884	-0.49	0.21	-0.23
Upper Island/Central Coast	101,066	0.88	2.47	1.35
Cariboo	65,808	3.78	0.37	3.14
North West	85,380	5.20	12.14	6.46
Peace Liard	59,749	3.95	-2.94	2.83
Northern Interior	117,191	1.20	1.83	1.42
Vancouver	491,726	-0.53	-0.61	-0.58
Burnaby	163,409	0.92	-0.43	0.40
North Shore	162,536	0.77	-0.74	0.07
Richmond	130,061	1.81	1.82	1.81
Capital	307,644	0.88	1.27	1.07
Total BC	3,373,399	0.07	-0.42	-0.15

*For 1996, FTEs are based on Fee for Service, Salary and Sessional, and most Service Agreement payments, excluding payments to the British Columbia Cancer Agency. For 1991, FTEs are based on Fee for Service and Salary and Sessional payments. Includes only those physicians on the 'active' registers of the CPSBC.

**Population estimates supplied by Population Section, BC STATS, Ministry of Finance and Corporate Relations, are from the P.E.O.P.L.E. Projection Model - #24. All figures are as of July 1, 1991.

***As a more accurate representation of personnel, Emergency Medicine, Laboratory/Radiology, and Medical Oncology specialties are included as 1 person=1 FTE.

Figure 4.7: Supply of GP/FP FTEs in 1991/92 & 1996/97 by Health Region



Tables 4.13 and 4.14 also show the distribution of specialist FTEs by their region of registration. As is apparent from Section 4.1.2, the supply of specialists in the Vancouver and Capital regions greatly exceeds all other regions and is in line with the fact that specialized care in many specialties is concentrated in large urban facilities. What is also apparent is that within HHRU regions, there was considerable variation in the supply of specialists among the constituent Health Regions. Figure 4.9 shows the distribution of specialist supply by Health Region, grouped into HHRU regions. Thus, inasmuch as HHRU regions reflect common resource units for specialist care, there also appears to be considerable regionalization of specialist supply outside the Capital and Vancouver Health Regions.

All regions (except Peace Liard) added specialist FTEs during the study period (ranging from 1.7 in the Cariboo to 85.5 in Vancouver). However, population growth outpaced the growth in physicians in many regions, resulting in declines in per capita supply in eight regions. (These results are consistent with those presented in Section 4.1.2) At the extremes, the North West gained 1.4 specialists per 10,000 population (or a gain of 13.0 FTEs from a baseline of 17 in 1991/92) while the Simon Fraser region lost 0.88 per 10,000, in spite of the fact that Simon Fraser gained 14.5 FTEs from a baseline of 224.5. Peace Liard was the only region to lose a net number of specialist FTEs during this period.

As with GP/FPs, we found a weak negative correlation between the 5 year change in regional specialist supply and the baseline number of specialist FTEs in 1991/92 ($r=0.70$; $p<0.0001$). The Vancouver and Capital regions were excluded from this analysis because of the centralization of tertiary care specialists in these regions. In other words, the regions with the smallest baseline supply of specialists were more likely to gain in supply during the study period (see Figure 4.10).

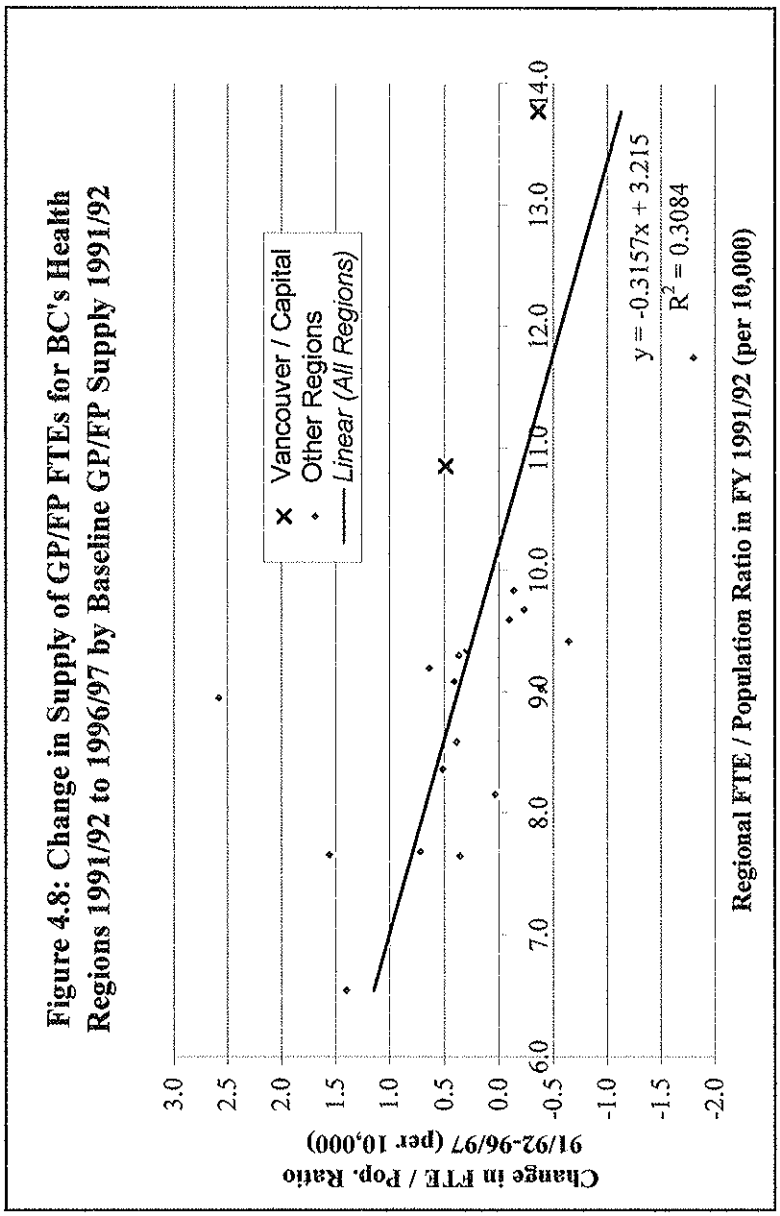
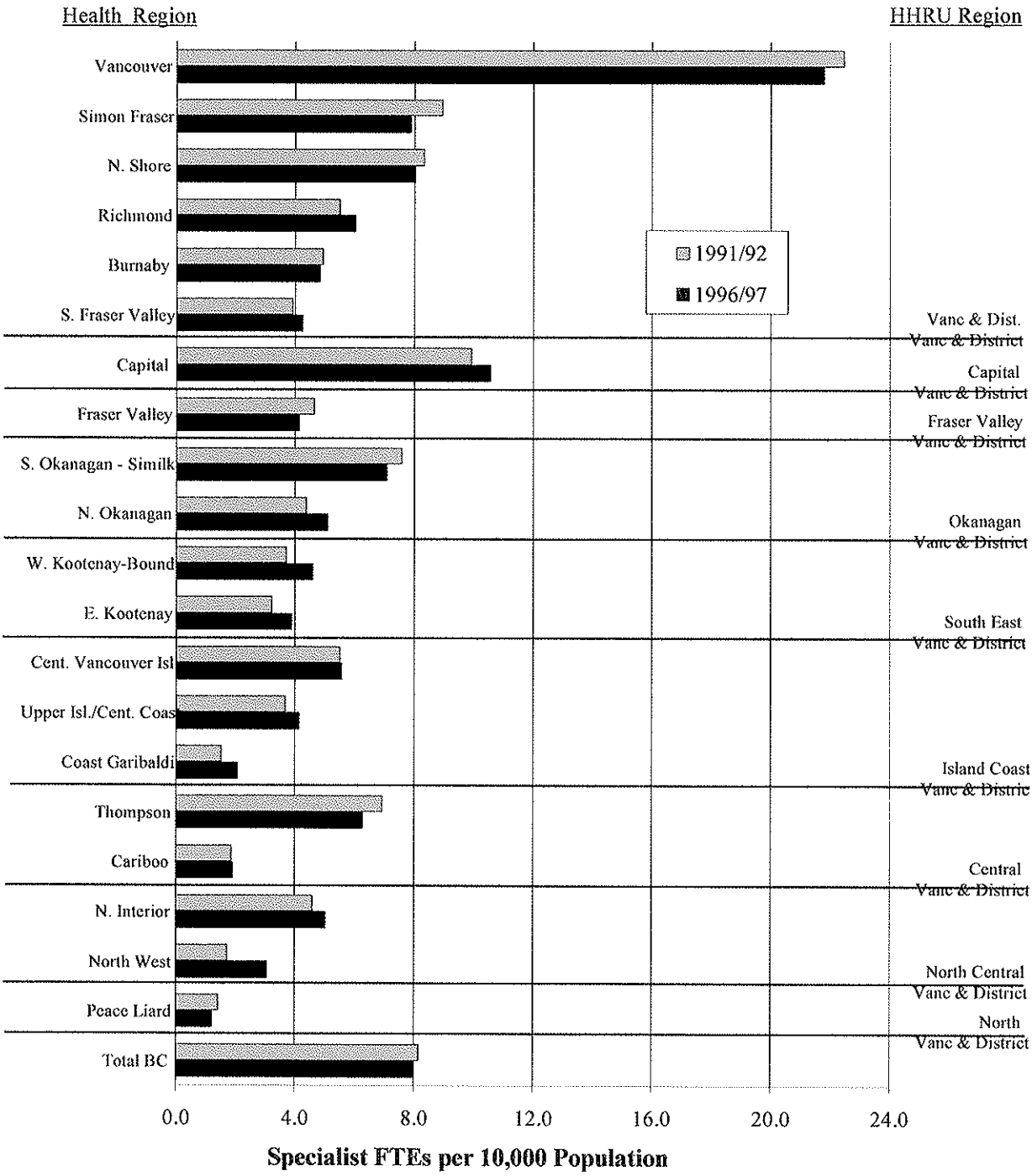


Figure 4.8: Change in Supply of GP/FP FTEs for BC's Health Regions 1991/92 to 1996/97 by Baseline GP/FP Supply 1991/92
Change in FTE / Pop. Ratio 91/92-96/97 (per 10,000)
Regional FTE / Population Ratio in FY 1991/92 (per 10,000)
Vancouver / Capital
Other Regions
Linear (All Regions)
y = -0.3157x + 3.215
R² = 0.3084
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
6.0
7.0
8.0
9.0
10.0
11.0
12.0
13.0
14.0

Figure 4.9: Supply of Specialist FTEs in 1991/92 & 1996/97 by Health Region



Principal Findings: ***Variation in Physician Supply among B.C.'s Health Regions***

- In 1996/97, there was approximately a 2-fold variation in the supply of GP/FPs among B.C.'s 20 Health Regions.
- Between 1991/92 and 1996/97, the number of registered physicians increased in all Health Regions as did the number of FTEs (except for one region). However, the GP/FP per capita supply grew in 13 regions while it declined in seven others.
- Health Regions with smaller GP/FP per capita supplies in 1991/92 tended to show greater supply increases in the subsequent 5 years than did regions with greater supplies. This differential growth helped mitigate the regional disparities in GP/FP supply.
- The supply of specialist FTEs per capita in the Vancouver and Capital region greatly exceeded all others. However, within HHRU regions, there was considerable variation in the supply among their constituent Health Regions. This suggests considerable regionalization of specialist services outside the Vancouver and Capital Health Regions.
- Most Health Regions gained specialist FTEs during the study period. About two-thirds also saw a net increase in per capita supply.
- As with GP/FPs, regions with fewer specialist FTEs in 1991/92 tended to grow faster in their supply of specialists than those with a greater FTE/population ratio.

4.1.3.2 Regional Variation in the Age, Sex, and Training Characteristics of GP/FPs

The demographic and training characteristics of GP/FPs by Health Region is given in Table 4.16. Among the 20 regions, significant differences in the age mix of the GP/FP workforce exist ($p<0.0001$), with median ages ranging from 39 to 46 years. The regions with the youngest supply of GP/FPs on the 'active' CPSBC registers were the Cariboo and Peace Liard regions, with 47% and 52.9% of physicians aged <40 years respectively. Conversely, the regions with the oldest GP/FP supply were the Fraser Valley, North Shore and Capital regions - with median ages of 46, 45, and 45 years respectively. These high and low rankings persist when physician age is weighted by their FTEs (data not shown). In general, the regions with the youngest physicians were located in the northern portions of the province. Few generalizations can be made, however, with regard to the types of regions with an older mix of physicians (see Figure 4.11).

In relation to sex differentials, there were significant differences in the percent of female GP/FPs among Health Regions ($p<0.001$). Regions with greater than 30% female GP/FPs included the North Shore, Vancouver, Burnaby, Capital, West Kootenay-Boundary, and South Fraser Valley regions. Less than 20% of GP/FPs were female in the Peace Liard, Fraser Valley, and Cariboo regions (see Figure 4.12). There were also significant differences in the originating medical schools for GP/FPs in different regions ($p<0.001$). Regions in the lower mainland (Vancouver,

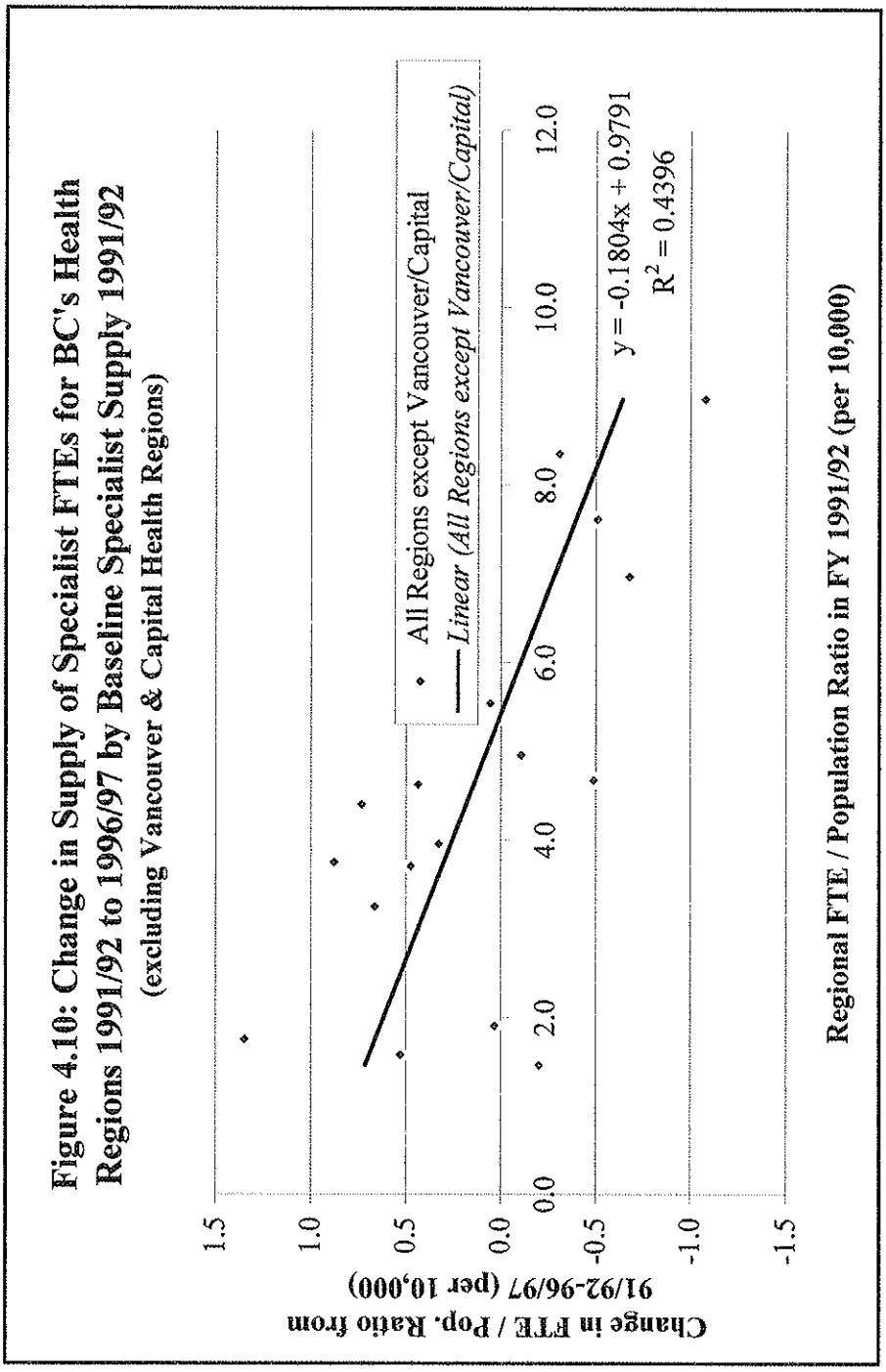


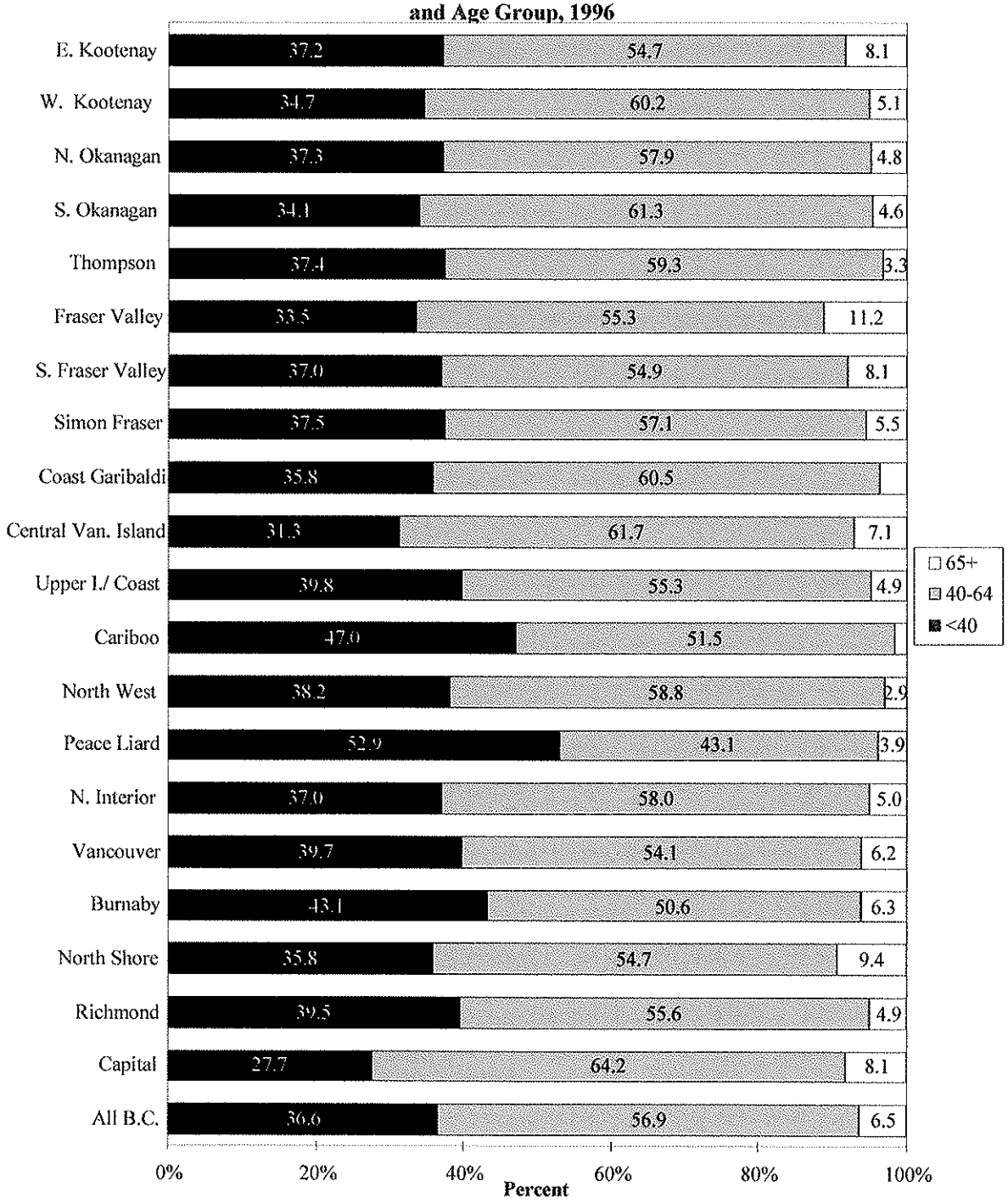
Figure 4.10: Change in Supply of Specialist FTEs for BC's Health Regions 1991/92 to 1996/97 by Baseline Specialist Supply 1991/92
(excluding Vancouver & Capital Health Regions)
Change in FTE / Pop. Ratio from 91/92-96/97 (per 10,000)
Regional FTE / Population Ratio in FY 1991/92 (per 10,000)
All Regions except Vancouver/Capital
Linear (All Regions except Vancouver/Capital)
y = -0.1804x + 0.9791
R2 = 0.4396
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
0.0
2.0
4.0
6.0
8.0
10.0
12.0

Table 4.16: General Practitioners / Family Physicians by Health Region, Age, Sex, and Place of Medical School Education, 1996

Characteristic	East Kootenay	West Kootenay - Boundary	North Okanagan	South Okanagan - Similkameen	Thompson	Fraser Valley	South Fraser Valley	Simon Fraser	Coast Garibaldi	Cent Vanc Island	Upper Island/ Central Coast
Age median (IQR)	42.5 (17.0)	43 (13.0)	44 (18.0)	43 (13.0)	44 (16.0)	46 (16.0)	44 (16.0)	43 (15.0)	42 (14.0)	44 (41.5)	42 (14.0)
Age Group n (%)											
< 40	32 (37.2)	34 (34.7)	47 (37.3)	74 (34.1)	46 (37.4)	66 (33.5)	160 (37.0)	103 (37.5)	29 (35.8)	75 (31.3)	49 (39.8)
40 to 64	47 (54.7)	59 (60.2)	73 (57.9)	133 (61.3)	73 (59.3)	109 (55.3)	237 (54.9)	157 (57.1)	49 (60.5)	148 (61.7)	68 (55.3)
65+	7 (8.1)	5 (5.1)	6 (4.8)	10 (4.6)	4 (3.3)	22 (11.2)	35 (8.1)	15 (5.5)	3 (3.7)	17 (7.1)	6 (4.9)
Sex n (%)											
Male	65 (75.6)	65 (66.3)	97 (77.0)	165 (76.0)	92 (74.8)	163 (82.7)	302 (69.9)	204 (74.2)	58 (71.6)	189 (78.8)	90 (73.2)
Female	21 (24.4)	33 (33.7)	29 (23.0)	52 (24.0)	31 (25.2)	34 (17.3)	130 (30.1)	71 (25.8)	23 (28.4)	51 (21.3)	33 (26.8)
Medical School n (%)											
U.B.C.	15 (17.4)	22 (22.4)	45 (35.7)	55 (25.3)	36 (29.3)	65 (33.0)	138 (31.9)	96 (34.9)	25 (30.9)	77 (32.1)	41 (33.3)
Other Canada	53 (61.6)	52 (53.1)	61 (48.4)	118 (54.4)	59 (48.0)	73 (37.1)	185 (42.8)	118 (42.9)	41 (50.6)	96 (40.0)	50 (40.7)
Non-Canada	18 (20.9)	24 (24.5)	20 (15.9)	44 (20.3)	28 (22.8)	59 (29.9)	109 (25.2)	61 (22.2)	15 (18.5)	67 (27.9)	32 (26.0)
Totals	86 -	98 -	126 -	217 -	123 -	197 -	432 -	275 -	81 -	240 -	123 -

Characteristic	Cariboo	North West	Peace Liard	Northern Interior	Vancouver	Burnaby	North Shore	Richmond	Capital	All Regions
Age median (IQR)	41 (11.0)	42 (16.0)	39 (10.0)	42 (15.0)	43 (16.0)	42 (15.5)	45 (18.0)	43 (15.0)	45 (14.0)	43 (15.0)
Age Group n (%)										
< 40	31 (47.0)	39 (38.2)	27 (52.9)	44 (37.0)	387 (39.7)	69 (43.1)	76 (35.8)	64 (39.5)	136 (27.7)	2,317 (53.4)
40 to 64	34 (51.5)	60 (58.8)	22 (43.1)	69 (58.0)	527 (54.1)	81 (50.6)	116 (54.7)	90 (55.6)	315 (64.2)	3,532 (81.5)
65+	1 (1.5)	3 (2.9)	2 (3.9)	6 (5.0)	60 (6.2)	10 (6.3)	20 (9.4)	8 (4.9)	40 (8.1)	386 (8.9)
Sex n (%)										
Male	53 (80.3)	77 (75.5)	42 (82.4)	94 (79.0)	608 (62.4)	103 (64.4)	132 (62.3)	117 (72.2)	343 (69.9)	3,059 (70.6)
Female	13 (19.7)	25 (24.5)	9 (17.6)	25 (21.0)	366 (37.6)	57 (35.6)	80 (37.7)	45 (27.8)	148 (30.1)	1,276 (29.4)
Medical School n (%)										
U.B.C.	24 (36.4)	25 (24.5)	8 (15.7)	26 (21.8)	345 (35.4)	61 (38.1)	88 (41.5)	63 (38.9)	137 (27.9)	1,392 (32.1)
Other Canada	20 (30.3)	48 (47.1)	12 (23.5)	39 (32.8)	416 (42.7)	67 (41.9)	87 (41.0)	58 (35.8)	251 (51.1)	1,904 (43.9)
Non-Canada	22 (33.3)	29 (28.4)	31 (60.8)	54 (45.4)	213 (21.9)	32 (20.0)	37 (17.5)	41 (25.3)	103 (21.0)	1,039 (24.0)
Totals	66 -	102 -	51 -	119 -	974 -	160 -	212 -	162 -	491 -	4,335 -

Figure 4.11: General Practitioners / Family Physicians by Health and Age Group, 1996



Richmond, North Shore, and Burnaby) as well as Cariboo and North Okanagan had the greatest proportion of GP/FPs graduating from the U.B.C. medical school (35.4-41.5%). (See Figure 4.13.)

Principal Findings: ***Regional Differences in GP/FP Age, Sex, and Training***

- The median age of GP/FPs located in B.C.'s 20 Health Regions varied from 39 to 46 years in 1996.
- In general, the most northern regions had the greatest proportion of physicians aged <40 years.
- Health Regions differed significantly in the gender distribution of their GP/FP workforce. Generally, regions in the lower mainland or lower Vancouver Island had a higher representation of female GP/FPs. Northern regions had the smallest representation.
- Health regions in the lower mainland had the greatest proportion of U.B.C.-trained GP/FPs (35-42%). Regions in the B.C. interior and north generally had the smallest proportion of U.B.C. graduates (18-24%).

4.2 Aim II: Variation in Physician Scope of Practice

As discussed in Section 2.1, understanding differences in physicians' scope of practice is an essential (but often overlooked) component of workforce planning. The boundaries between primary and specialty medical care are fluid, with little data on where primary care ends and specialized care begins. To provide their patients with access to a comprehensive array of services, primary care physicians can opt to provide the services directly (if they have adequate training, accreditation, and resources) or to refer to specialists when more advanced skills and technologies are required. Little is known, however, about variability in the scope of services provided by primary care physicians and specialists. The analyses that follow are intended to help fill that gap.

The analyses are divided into three parts. First, we discuss our measurement of a physician's 'scope of practice' and how we validated the administrative data used for this purpose (Section 4.2.1). Second, we describe the variability in physician's practice scope across the spectrum of clinical services that are paid by FFS in B.C. Given their differing roles within the health system, specialists and GP/FPs are considered separately. Multivariate models are also presented to identify demographic and practice characteristics that are correlates of a physician's scope of practice. Third, we focus on describing the practice characteristics of GP/FP 'specialists' who focus a significant proportion of their care on the fields of obstetrics and gynecology, anesthesiology, and general surgery.

Figure 4.12: General Practitioners / Family Physicians by Health Region and Sex, 1996

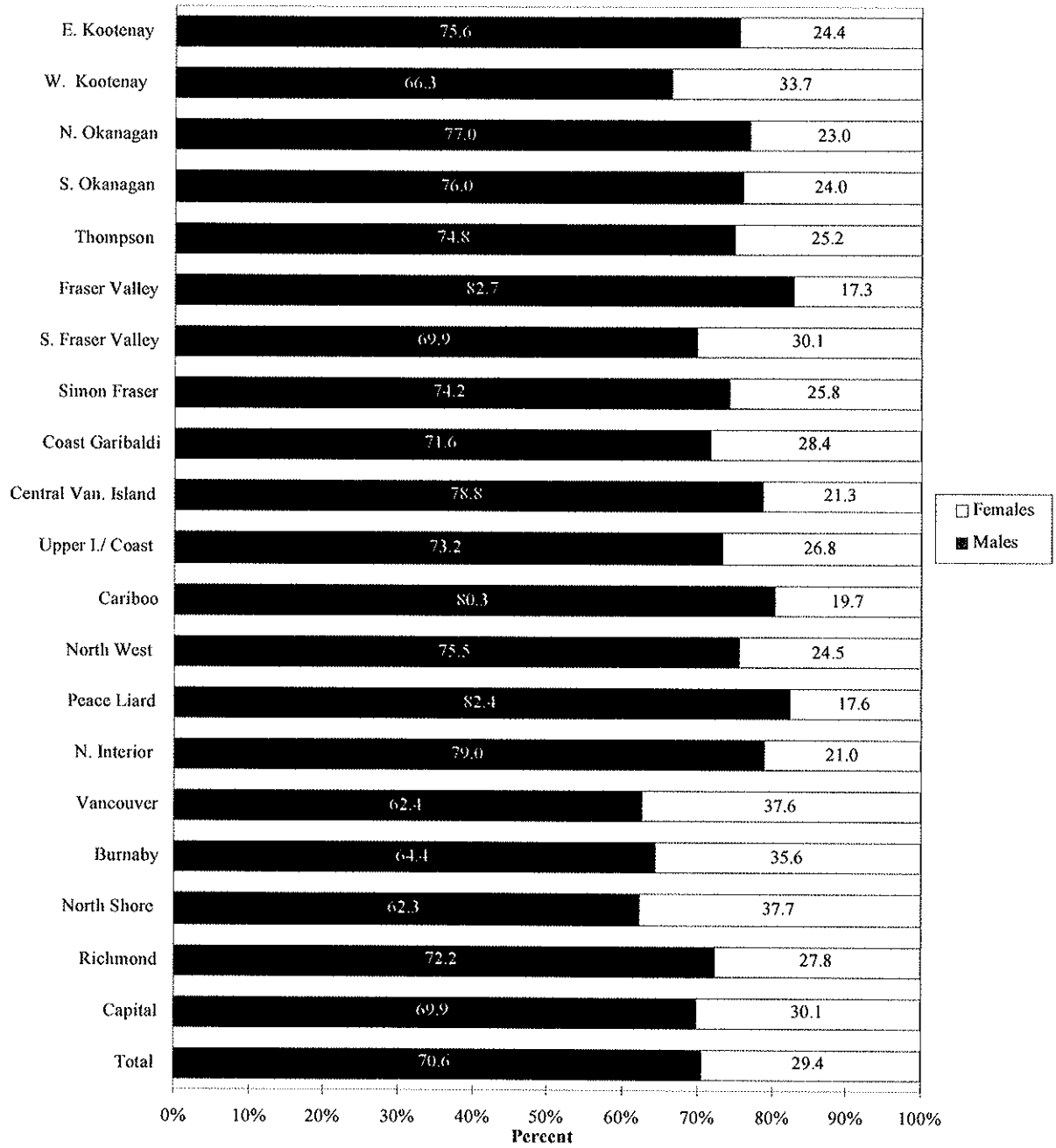
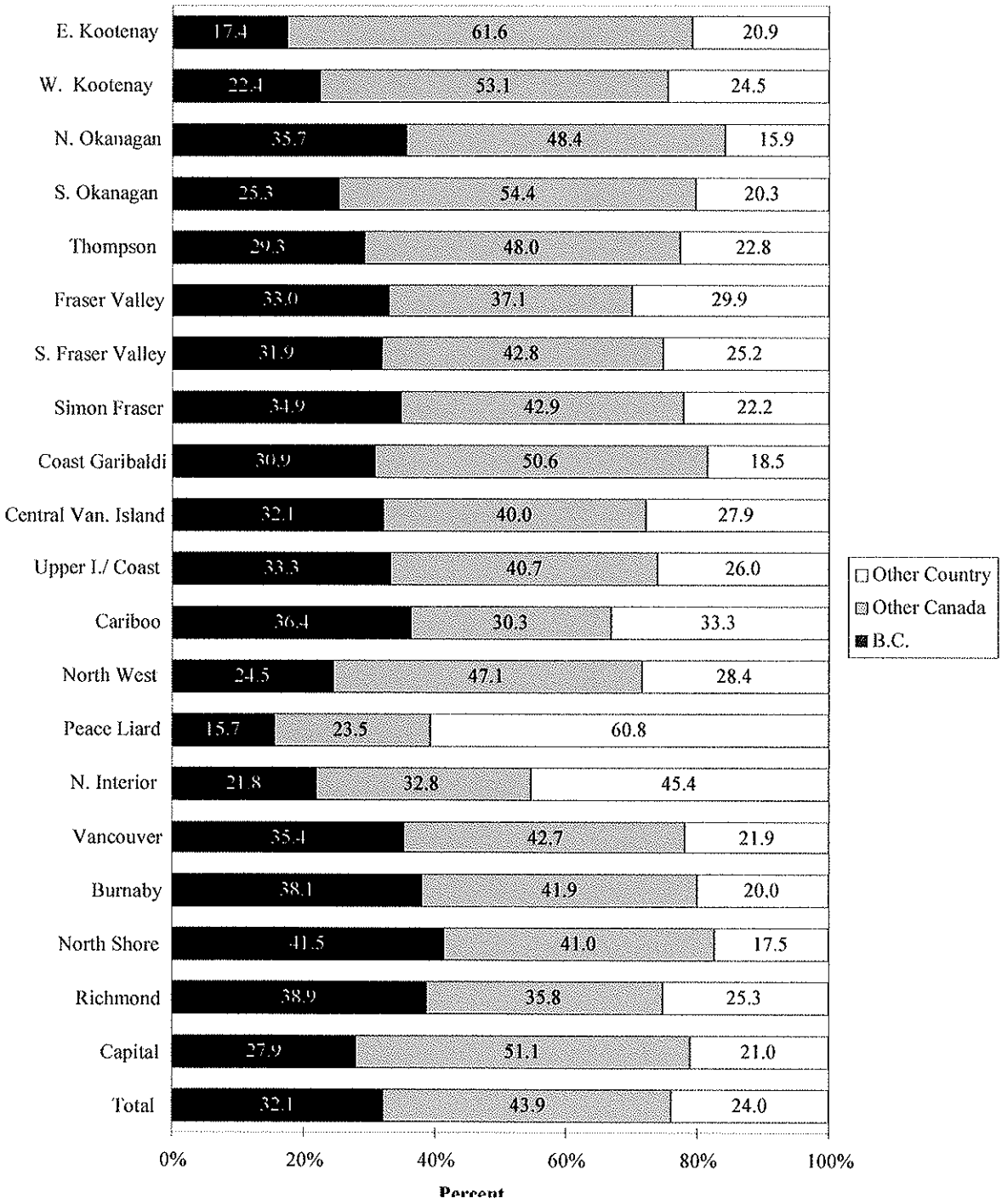


Figure 4.13: GP/FPs by Health Region and Place of Medical School Graduation,



4.2.1 Measuring Scope of Practice: Grouping Fee-items into Clinical Domains

As discussed in Section 3.2, our characterization of physicians' scope of practice is based on the distribution of FFS billings that physicians submit across the clinical 'domains' of the Medical Service Plan's FFS fee schedule (Medical Services Commission 1997). The fee-items (representing billable clinical services) are divided into 21 specialty 'domains'. The purpose behind separating fee-items on this basis is largely administrative in nature, assisting in the appropriate FFS reimbursement of physicians. In general, fee-items are assigned to specialty domains based on which physician group(s) are considered 'most responsible' for the delivery of these services. Although most physicians principally bill within their 'own' domains, they are also permitted to bill across the range of domains. Many fee-items, however, are restricted to a subset of eligible physicians (e.g., only specialists are permitted to bill specialist consultations). Furthermore, many services are limited to those physicians who have appropriate training/certification and/or who have access to accredited facilities (e.g., inpatient invasive procedures). There are also a variety of fee-items where no specialty is considered to 'own' the fee-item; these items are placed in an 'other' fee-item category. Fee-items may also be assigned two or more specialty domains when they are considered 'owned' by multiple specialties (e.g., tonsillectomy is assigned to both the general surgery and otolaryngology domains). It was beyond the scope of this study to independently assign fee codes to specialty categories using rigorous scientific methods. Instead, we used these administrative groupings, validated them for our purposes, and made adjustments when warranted. Our underlying goal was to provide a mechanism to group fee-items into clinically meaningful categories, spanning the spectrum of clinical services.

Since fee-items are placed into domains based on the specialty thought 'most responsible', our approach to validation of these groupings was to assess the proportion of claims made by physicians assumed to 'own' that code. We paid particular attention to the 'other' fee-items that were assigned to no specialty group. The results of this validation are presented in Appendix B. Overall, our findings suggest substantial validity of the MSP fee-item assignments. For over 85% of the fee-items, more than four-fifths of the services were provided by 'in-domain' physicians, suggesting significant face validity. We decided not to reassign any fee-item (except for some 'other' fee-items) domains because the items with the highest likelihood of domain misspecification (i.e., items where >20% of services were provided by 'out-of-domain' physicians) were, on the whole, infrequently used. We reassigned 67% of the 'other' fee-items to another specialty domain because they were overwhelmingly claimed by a single specialty group.

The distribution of a physician's billings across the 21 fee-item domains (excluding the 'other' domain) served as the basis to gauge the 'breadth' of a physician's practice (i.e., number of different domains in which he or she submitted billings) and the 'balance' of those billings across domains. As discussed in the methods section, we used the Herfindahl index (HI) to examine these two aspects of a physician's 'scope of care'. In other words, the HI was used to measure the degree to which physicians 'concentrate' the range of services they provide. The HI represents the sum of the squared shares of the physician's total services that were billed within each fee-item domain ($HI=\Sigma_i \{s_i^2\}$, where s_i refers to the share of fee-item domain i in the total

number of fee-item domains billed by the physician.) The measure ranges from 1 (most concentrated) when the physician bills all his or her services within a single domain to 1/ *I* (where *I* is the total number of fee-item domains) when the physician provides an equal number of services across all domains. In other words, as the Herfindahl index moves towards one, the physician can be said to be more 'specialized' (i.e., fewer billings in categories other than his or her 'own').

There are several important caveats, however, in our use of the fee-item domain approach to gauge a physician's scope of practice. Our measurement of a scope of practice is limited to only those services specified by the fee-item schedule. Specific clinical services that are provided as part of a larger 'global' fee-item (e.g., preventive counseling is often provided as part of a 'limited' or 'comprehensive' office visit) are not captured with this method. Furthermore, because the MSP fee schedule is dominated by 'procedural' services (rather than purely cognitive ones), our measure of scope of practice is dominated by these types of services. Finally, there may be a variety of other factors (e.g., tariffs) that influence a physician's choice of fee-item for which we could not control.

For the 'scope of practice' analyses that follow, we did not examine the provision of specific types of services by individual physicians.

4.2.2 Variation in Physicians' 'Scope of Practice'

4.2.2.1 Distributional Properties of the Herfindahl Index

Figures 4.14 and 4.15 show the distribution of the Herfindahl index for specialists and GP/FPs respectively based on their 1996/97 MSP billings. We excluded those specialties where a large proportion of billings occurred external to the FFS system (pediatrics, rehabilitation medicine, medical oncology, radiation oncology, community medicine/public health, and psychiatry) or where physician-specific billings are not known (laboratory medicine and radiology) (n=857). Physicians with less than <0.2 FTE were also excluded (n=864). These graphs show markedly different distributions for specialists and GP/FPs. For specialists (n=1,732), the HI is for the most part very high (median 0.97; IQR 0.13) and approaches unity for the majority of specialists. In other words, most specialists have relatively 'concentrated' practices and bill the vast majority of their services within a single fee-item domain. For 801 specialists, their Herfindahl index equals one with all services billed within their own domain. This finding suggests substantial face validity in this use of the Herfindahl index, since one would expect specialists to largely limit their practices to their fields of training. There is a tail of specialists, however, who have relatively low Herfindahl indices and appear to be practicing more as 'generalists' (minimum 0.26). Among specialty groups, the distribution of the HI is very consistent (data not shown). The main exceptions are obstetricians and gynecologists who have lower overall HIs (median 0.80).

Figure 4.14 Distribution of Herfindahl Index for Specialists, 1996/97 (n=1,732)

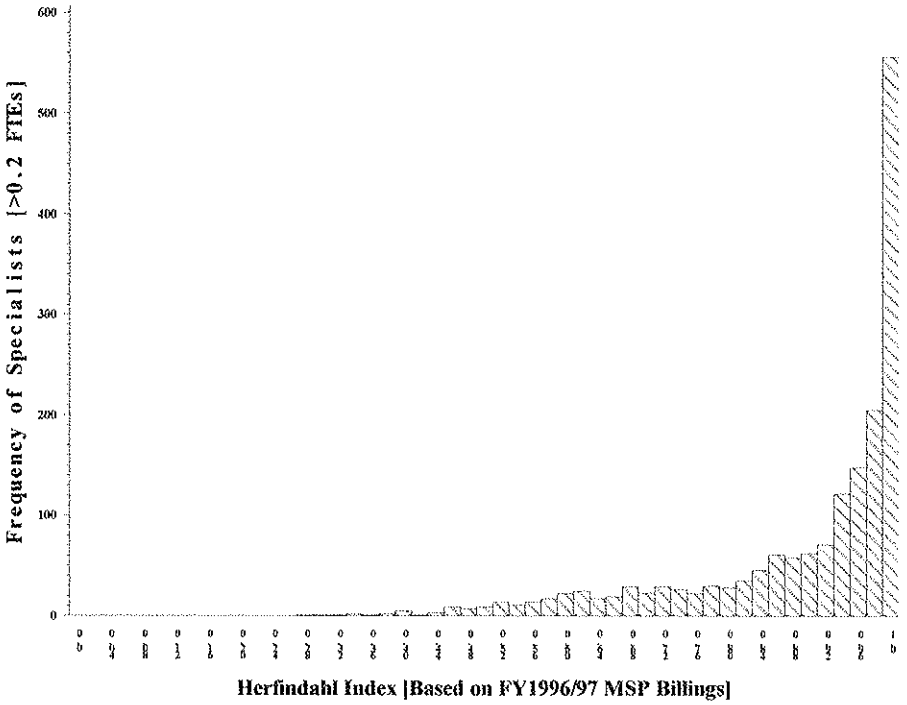
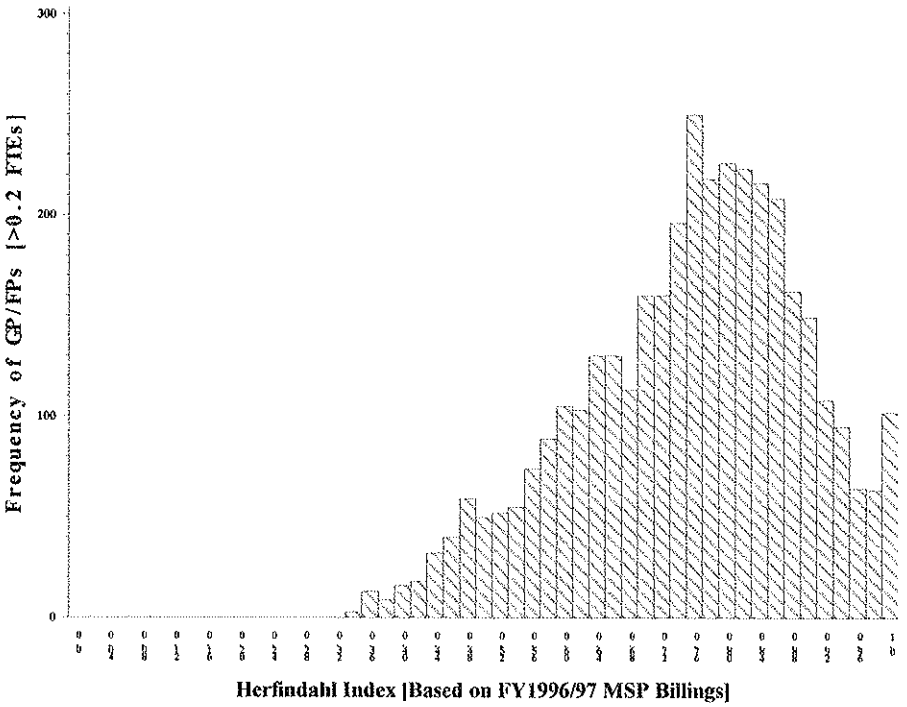


Figure 4.15 Distribution of Herfindahl Index for GP/FPs, 1996/97 (n=3,691)



For GP/FPs, the HI distribution appears quite different from that of specialists. Not only is the median lower (0.77), but there is more variation (IQR 0.20) (F-statistic 1366.18; $p<0.0001$[20]). These findings suggest that GP/FPs are much more likely to use domains other than their 'own' than are specialists. In fact, 25% of GPs have a Herfindahl index of below 0.66.[21] Thus, the HI is performing as expected with specialists and GP/FPs differing in anticipated ways. At the other end of the spectrum, 67 GP/FPs limited their practice to only one fee-item domain with no billings in any other (i.e., HI=1). While the majority of these GP/FPs (78.1%) limited themselves to only the 55 GP/FP (or osteopathy) services, 16 GP/FPs were billing exclusively within another domain (including anesthesiology, obstetrics and gynecology or one of the surgical domains). We consider these GP/FP 'specialists' in section 4.2.3.

Table 4.17 shows the regional differences in the HI by HHRU region for GP/FPs and specialists.[22] For specialists, although there appears to be variation among regions, the differences are not statistically significant (F-statistic=0.84; p=0.56). However, for GP/FPs there is significant variability among their regions of practice (F-statistic 9.95; $p<0.0001$). The median HI ranges from a high of 0.78 in Vancouver (GP/FPs with the most concentrated practices) to a low of 0.69 in the North (GP/FPs with the least concentrated practices). Both the North and North Central regions have significantly lower HI than all other regions combined ($p<0.0001$).

Principal Findings: ***Patterns in Physician Practice Scope***

- The majority of specialty physicians practiced almost exclusively within their own clinical domain. However, there was a minority of RCPSC-trained specialists who appeared to have practices resembling those of generalist physicians.
- For GP/FPs, there was substantial variation in the degree to which they concentrated their practices within a single domain of clinical services.
- For RCPSC-certified specialists, there were no significant differences in scope of practice among HHRU regions.
- For GP/FPs, substantial variability existed in the degree of practice concentration across HHRU regions. GP/FPs in the Vancouver and District HHRU region provided, on the whole, a narrower scope of services than did GP/FPs in other regions. GP/FPs in the North and North Central regions delivered the widest array of services.

[20] Because of the skewed distribution, significance testing is based on a one-way analysis of variance of the logarithmic (natural) transformation of the Herfindahl index.

[21] The minimum HI for GP/FPs (0.33) is much higher than the theoretical minimum of 0.05 (1/21). This is because a large proportion of billings for most GP/FPs relates to GP/FP 'limited consultations'.

[22] Specialties excluded from this analysis are pediatrics, rehabilitation medicine, community medicine/public health, psychiatry, laboratory medicine and radiology, medical oncology and radiation oncology (n=857) because of data limitations (i.e., high proportion of non-FFS payments or lack of physician-specific billing data). Physicians with less than <0.2 FTE were also excluded (n=932).

Table 4.17: Distribution of Herfindahl Index for GP/FPs & Specialists by HHRU Regions, 1996-97*

HHRU Region	General / Family Practice				Specialists			
	n	Mean	Median	SD	n	Mean	Median	SD
Vancouver & District	1,839	0.77	0.78	0.14	1,071	0.89	0.96	0.15
Capital	403	0.75	0.76	0.13	181	0.88	0.93	0.15
Fraser Valley	177	0.74	0.75	0.14	55	0.92	0.95	0.10
Okanagan	315	0.73	0.75	0.13	142	0.87	0.92	0.13
South-East	155	0.74	0.77	0.15	38	0.88	0.94	0.14
Island Coast	398	0.73	0.75	0.13	129	0.90	0.95	0.12
Central	170	0.73	0.76	0.14	58	0.88	0.93	0.13
North Central	187	0.71	0.73	0.14	52	0.89	0.95	0.12
North	47	0.68	0.69	0.15	6	0.83	0.81	0.09
Total Physicians	3,691	0.75	0.76	0.14	1,732	0.90	0.95	0.14

* Includes physicians on the 'active' CPSBC registers in 1996 except for pediatrics, rehabilitation medicine, community medicine/ public health, psychiatry, laboratory medicine and radiology, medical oncology and radiation oncology.
Also, excludes 644 GP/FPs and 288 specialists with <0.2 FTE in 1996/97 or who had no FFS billings.

4.2.2.2 Physician and Practice Correlates of GP/FP Practice Scope

Table 4.18 examines the HI for GP/FPs across age, sex, place of medical school graduation, and full-time-equivalency (FTE). The relationship between geographic location (urban, semi-urban, and rural) and practice scope is also presented, stratified by the physician and practice variables mentioned above. As discussed in the methods section, the 'geographical' variable is created by grouping B.C.'s 83 Local Health Areas (LHAs) based on population density, i.e., population per square kilometer. This variable represents an alternate way of examining geographic effects. In these analyses, age was positively associated with a physician's scope of practice ($p<0.0001$), with younger GP/FPs having a wider scope than older ones. Similarly, there was a statistically significant difference between the practice scope of male GP/FPs compared with that of female GP/FPs; women delivered a wider array of services than did men. This finding appears to relate to their greater likelihood of providing obstetrics and gynecology services (see below). The physician's place of medical school was also significantly associated with his or her scope of practice, with U.B.C.-trained physicians having the widest scope compared to those trained in other Canadian or non-Canadian sites. Finally, part-time physicians (FTE 0.2-0.5) were more likely to limit their practice to relatively few domains than were physicians with higher full-time-equivalency. It is important to note, however, that these findings are unadjusted for potentially important confounders.

In light of the high levels of statistical significance of these physician and practice characteristics, the remainder of the table examines the relationship between geography (i.e., rural/semi-urban/ urban) and practice scope in a series of analyses stratified for age, gender, location of medical school, and FTE status. In this way, we can 'remove' the effect of potential confounders in our examination of the relationship between geographic locale and practice scope. When stratified by age, geography appeared to be significantly associated with the HI for some age groups but not others. The effect of geographic location is statistically significant only for middle-aged physicians (aged 31-60 years). For this age range, the scope of practice was narrower for GP/FPs practicing in urban locales (the Vancouver and Capital LHAs) versus those in semi-urban or rural settings. No statistically significant differences between the three geographies were found for either younger ($\leq$30 years) or older (>60 years) GP/FPs. The relationship between geographic location and practice scope also appeared to be different for male and female physicians. Urban male physicians (but not female physicians) had significantly narrower practices than did their rural or semi-urban colleagues. For the remaining two variables (medical school location and full-time-equivalency), the relationship between urban status and practice scope was consistent across all levels. When stratified by medical school location, the Herfindahl index was higher for urban physicians than for semi-urban or rural physicians for all three locations of medical schools. However, when stratified by full-time-equivalency, statistically significant relationships were found between the Herfindahl index and geographic location for GP/FPs in the medium and high FTE ranges. These findings suggest a complex interplay between geographic location and other important confounders that are difficult to tease out in unadjusted or stratified analyses.

Table 4.18: Distribution of Herfindahl Index for GP/FPs* by Age, Sex, Place of Training and FTE Status, 1996-97

	All Regions					Urban			Semi-Urban			Rural				
	n	Mean	SD	Statistic**	P-value	n	Mean	SD	n	Mean	SD	n	Mean	SD	Statistic***	P-value
Age Group																
<30	122	0.73	0.13	37.7	<0.0001	65	0.73	0.13	42	0.70	0.13	15	0.74	0.12	0.50	0.605
31-40	1,248	0.72	0.14			536	0.73	0.13	583	0.70	0.14	129	0.74	0.12	6.0	0.003
41-50	1,284	0.74	0.14			548	0.76	0.14	631	0.73	0.13	105	0.68	0.15	29.4	<0.0001
51-60	688	0.79	0.13			290	0.80	0.14	347	0.77	0.13	51	0.78	0.12	5.7	0.003
61-70	286	0.81	0.14			133	0.81	0.14	135	0.80	0.13	18	0.82	0.08	0.36	0.698
70+	63	0.82	0.16			27	0.86	0.13	33	0.80	0.16	3	0.75	0.20	0.97	0.327
Sex	3,691															
Female	1,057	0.69	0.13	309.8	<0.0001	556	0.70	0.14	439	0.69	0.13	69	0.70	0.13	1.03	0.272
Male	2,634	0.77	0.13			1,043	0.80	0.13	1339	0.75	0.14	252	0.74	0.13	57.2	<0.0001
Medical School	3,691															
U.B.C.	1,250	0.73	0.14	21.4	<0.0001	615	0.74	0.14	579	0.71	0.13	56	0.73	0.11	6.08	0.002
In Canada	1,556	0.75	0.14			648	0.76	0.14	776	0.74	0.14	132	0.74	0.13	4.53	0.011
Non-Canada	885	0.77	0.14			336	0.80	0.14	416	0.76	0.14	133	0.72	0.15	14.3	<0.0001
Full-Time-Equivalency																
0.2-0.5	309	0.78	0.14	9.38	<0.0001	161	0.78	0.15	123	0.78	0.14	24	0.79	0.12	0.13	0.879
0.5-1.2	2,509	0.74	0.14			1,166	0.76	0.14	1112	0.73	0.14	231	0.73	0.13	7.4	0.001
>1.2	873	0.75	0.14			271	0.79	0.14	536	0.73	0.13	66	0.73	0.14	13.2	<0.0001

* Includes GP/FPs on the 'active' CPSBC registers in 1996. Excludes 644 GP/FPs with <0.2 FTE in FY 1996/97 or who had no FFS billings.

**F-statistic from analysis of variance to test for differences in log HI between levels of the covariate of interest.

***F-statistic from one-way analysis of variance testing for differences in log HI among urban, semi-urban and rural levels, stratified by age, sex, medical school, FTE or PGME location.

Given that the above factors achieved high levels of statistical significance in the unadjusted analyses, analyses that simultaneously adjust for other important predictors are appropriate. Without such analyses, it is possible to make erroneous conclusions about which characteristics of GP/FPs and their practices are associated with the breadth of practice that he or she chooses. The next section presents multivariate analyses (using multiple linear regression techniques) as a way to separate the independent effect of these physician and practice characteristics.

4.2.2.3 Understanding Differences in GP/FPs' Practice Scope using Multivariate Models

This section uses multivariate regression analyses to understand how the scope of services provided by GP/FPs differs by their demographic factors, practice characteristics, and supply of medical services in the local market. This is similar to the analyses of the specialization of obstetricians and gynecologists by Baumgardner and Marder (1991). We also use the decomposition proposed by Adelman (1969) that examines both the 'balance' of the fee-items billed across domains as well as the 'breadth' across the domains where services were provided. More specifically, Adelman's decomposition of the Herfindahl index is:

> **HI = [(cv)^2 + 1/ N]**, where '**cv**' refers to the coefficient of variation in the share of each domain in a physician's practice and '**N**' refers to the number of domains.

In the regression analyses that follow, we use logarithmic transformations of the HI and the Adelman components as the response variables.[23] Based on the conceptual framework proposed by Baumgardner and Marder, the empirical analyses focus on three types of factors thought to influence a physician's range of practice: (1) demographic factors (i.e., age, sex, location of medical school); (2) practice-related factors (i.e., full-time-equivalency); and (3) the supply of medical services in the local market (i.e., location of practice, regional specialist supply, regional GP/FP supply). As such, the regression analyses incorporate the following functional form:

> **log (HI)** = ***f*** **(**age, sex, full-time-equivalency, medical school, geographic location, GP/FP availability, specialist availability**)** + ***e***

Table 4.19 presents the least squares regression coefficients (as well as the standard errors and p-values) using the log (HI) and the Adelman's subcomponents described above. The overall model is statistically significant (F-statistic=40.5; P<0.001) but explains only a minority (r^2=0.12) of variation in the index across GP/FPs. Age had a strong relationship with the HI. On the whole, physicians aged ≤40 years had a 4% lower HI index than those aged 41-65 years, suggesting that younger physicians had less 'concentrated' practices. Moreover, the Adelman decomposition suggests that the lower HI were because these physicians practiced over a greater number of domains. Older GP/FPs (aged 66+ years) had about a 0.2% lower index than

23 It can be shown that the regression coefficient for the log (HI) is equal to the sum of the regression coefficient of Adelman's components, log [(cv) 2 + 1] and log [1/N].

Table 4.19: GP/FP 'Scope of Practice' Multivariate Linear Regression Model

		Dependent Variables					
		Log HI		**Log (cv)²+1**		**Log 1/ N**	
Covariates		Estimate *(SE)*	p-value	Estimate *(SE)*	p-value	Estimate *(SE)*	p-value
Intercept		-0.290	0.0001	1.605	0.0001	-1.896	0.0001
		0.014		*0.022*		*0.022*	
Age	≤40yrs	-0.041	0.0001	0.062	0.0001	-0.102	0.0001
		0.008		*0.013*		*0.013*	
	41-65yrs*	-	-	-	-	-	-
	66+yrs	-0.002	0.9138	-0.203	0.0001	0.201	0.0001
		0.020		*0.032*		*0.032*	
Sex	Male*	-	-	-	-	-	-
	Female	-0.126	0.0001	-0.182	0.0001	0.056	0.0001
		0.009		*0.014*		*0.014*	
Medical School	UBC*	-	-	-	-	-	-
	Other Can.	0.031	0.0001	0.008	0.4937	0.023	0.0458
		0.007		*0.012*		*0.012*	
	Non-Can.	0.042	0.0001	-0.019	0.1673	0.061	0.0001
		0.009		*0.014*		*0.014*	
Full time Equivalency (FTE)**	<0.5	0.072	0.0001	-0.151	0.0001	0.223	0.0001
		0.012		*0.019*		*0.019*	
	0.5-1.2*	-	-	-	-	-	-
	>1.2	-0.015	0.0550	0.058	0.0001	-0.073	0.0001
		0.008		*0.012*		*0.012*	
Geographic Location	Urban*	-	-	-	-	-	-
	Semi-urban	-0.039	0.0001	0.048	0.0006	-0.087	0.0001
		0.009		*0.014*		*0.014*	
	Rural	-0.055	0.0001	0.117	0.0001	-0.172	0.0001
		0.014		*0.022*		*0.022*	
GP/FP Availability#	Low	-0.075	0.0100	-0.022	0.6269	-0.052	0.2559
		0.029		*0.046*		*0.046*	
	Medium*	-	-	-	-	-	-
	High	0.013	0.2232	-0.062	0.0002	0.075	0.0001
		0.011		*0.017*		*0.017*	
Specialist Availability$	Low*	-	-	-	-	-	-
	High	0.031	0.0032	-0.014	0.3936	0.045	0.0074
		0.011		*0.017*		*0.017*	
Interaction Terms	Rural*≤40 yrs	0.014	0.3349	-0.037	0.1132	0.051	0.0304
		0.015		*0.023*		*0.024*	
	Rural*>65 yrs	0.067	0.0856	0.212	0.0005	-0.146	0.0177
		0.039		*0.061*		*0.062*	
	Rural*Female	0.052	0.0019	0.027	0.3095	0.026	0.3353
		0.017		*0.027*		*0.027*	
R-squared		0.120		0.176		0.209	

*Reference category

**Based on population density of Local Health Areas (LHAs)

*** FTEs calculated with Fee-for-Service and Salary/Sessional payments for FY 1996/97. FTE calculations based on Health Canada

#Based on 1996/97 supply characteristics of physician's Health Region (see section 4.1). 'High' ratios include health regions > 1.66 FTEs per 1,000, 'medium' supply includes regions at 1.29-1.66 FTEs per 1,000 and 'low' supply includes regions <1.29 FTEs per 1,000.

$High specialist supply is defined as Health Regions with specialist/GP ratios >0.65.

physicians aged 41-65, but this coefficient was not statistically significant. In relation to the sex of GP/FPs, we found that women had a significantly lower log (HI) than their male colleagues, suggesting that female GP/FPs had less concentrated practices. Moreover, the reduced 'concentration' of the practices for female GP/FP s appeared to be more driven by more 'balance' across the domains in which they practice (i.e., a reduced coefficient of variation). The regression results also indicate that a physician's practice intensity is an important correlate of the concentration of his or her practice. There was also a significant interaction term between female sex and rural practice. Women GP/FPs in urban locales appear to have less practice concentration than those in rural areas. On the whole, physicians with lower FTE values (<0.5) had more concentrated practices than physicians with FTEs of 0.5-1.2; this finding is driven by a reduction in the number of domains billed. Finally, the medical school of origin also appears to be an important predictor of practice concentration, with U.B.C.-trained physicians having significantly less concentrated practices than graduates trained at other medical schools.

In addition to physician and practice factors, local physician supply was also strongly related to the array of services that physicians chose to provide. In areas with low GP/FP supply, GP/FPs' practices were less concentrated than in areas of greater supply. Moreover, this reduced concentration was driven both by GP/FPs practicing in a greater number of domains as well as reduced 'balance' among domains. The local supply of specialists, however, had an opposite effect. In areas with high specialist-to-GP ratios, GP/FPs were more likely to concentrate their practices by delivering services in smaller numbers of domains. None of the remaining interaction terms were statistically significant using the log HI as the response variable.

Table 4.20 suggests that some of the findings above may be particularly related to GP/FPs practice in the obstetrics and gynecology domain. As discussed in Section 4.2.3.1 below, more than 5% of most GP/FPs' practices are composed of billable items in the obstetrics and gynecology domain. The regression in Table 4.20 used dependent variables calculated in exactly the same way as those in Table 4.19, except that the obstetrics and gynecology domain was omitted from the calculation. Several things are apparent from this table. First, there was a significant reduction in the explanatory power of the overall model (r-squared=0.06). Second, several regression coefficients were significantly reduced in magnitude. Most notable was the reduction from -0.108 to -0.015 in the coefficient for female physicians (although it remains statistically significant). This finding suggests that the less concentrated practices of female physicians are driven largely by their delivery of a larger share of obstetrics and gynecology services than their male colleagues. Similarly, the magnitude of the coefficients for low practice intensity (i.e., low FTE), low GP/FP availability and high specialist supply are reduced, suggesting that these factors in large part relate to the obstetrics and gynecology component of GP/FP care.

One limitation to the above analyses was our inability to measure the scope of practice for the component of GP/FP services paid for through Salary and Sessional payments, because no encounter records are submitted for these services. Thus, there is a hazard that the regression coefficients may be biased because some physicians delivered care under these arrangements which was significantly different in scope than their FFS practice (if they were paid by both mechanisms). As a sensitivity test for this bias, we repeated the above regressions after

Table 4.20: GP/FP 'Scope of Practice' Multivariate Linear Regression Model, excluding Obstetrics and Gynecology Fee Item Domain (n=3,691)

		Dependent Variables					
		Log HI		**Log (cv)²+1**		**Log 1/ N**	
Covariates		Estimate *(SE)*	p-value	Estimate *(SE)*	p-value	Estimate *(SE)*	p-value
Intercept		-0.238	0.0001	1.512	0.0001	-1.751	0.0001
		0.013		*0.0216*		*0.023*	
Age	≤40yrs	-0.036	0.0001	0.077	0.0001	-0.114	0.0001
		0.007		*0.0123*		*0.013*	
	41-65yrs*	-	-	-	-	-	-
	66+yrs	-0.008	0.6524	-0.185	0.0001	0.178	0.0001
		0.018		*0.0308*		*0.032*	
Sex	Male*	-	-	-	-	-	-
	Female	-0.026	0.0008	-0.116	0.0001	0.090	0.0001
		0.008		*0.0131*		*0.014*	
Medical School	UBC*	-	-	-	-	-	-
	Other Can.	0.023	0.0005	0.003	0.8121	0.020	0.0867
		0.007		*0.0112*		*0.012*	
	Non-Can.	0.030	0.0001	-0.028	0.0334	0.058	0.0001
		0.008		*0.0133*		*0.014*	
Full time	<0.5	0.046	0.0001	-0.171	0.0001	0.217	0.0001
Equivalency		*0.011*		*0.0181*		*0.019*	
(FTE)* **	0.5-1.2*	-	-	-	-	-	-
	>1.2	0.000	0.9593	0.067	0.0001	-0.068	0.0001
		0.007		*0.0120*		*0.013*	
Geographic	Urban*	-	-	-	-	-	-
Location**	Semi-urban	-0.041	0.0001	0.055	0.0001	-0.096	0.0001
		0.008		*0.0135*		*0.014*	
	Rural	-0.052	0.0001	0.135	0.0001	-0.187	0.0001
		0.012		*0.0210*		*0.022*	
GP/FP	Low	-0.044	0.0869	0.004	0.9239	-0.048	0.3053
Availability#		*0.026*		*0.0444*		*0.047*	
	Medium*	-	-	-	-	-	-
	High	0.009	0.3667	-0.078	0.0001	0.086	0.0001
		0.010		*0.0164*		*0.017*	
Specialist	Low*	-	-	-	-	-	-
Availability$	High	0.016	0.0862	-0.026	0.1088	0.042	0.0134
		0.009		*0.0163*		*0.017*	
Interaction	Rural* ≤40 yrs	0.017	0.1902	-0.038	0.0982	0.055	0.0209
Terms		*0.013*		*0.023*		*0.024*	
	Rural*>65 yrs	0.051	0.1396	0.181	0.0023	-0.130	0.0369
		0.034		*0.059*		*0.062*	
	Rural*Female	0.041	0.0069	0.018	0.4866	0.022	0.4079
		0.015		*0.026*		*0.027*	
R-squared		0.049		0.185		0.226	

*Reference category

**Based on population density of Local Health Areas (LHAs)

*** FTEs calculated with Fee-for-Service and Salary/Sessional payments for FY 1996/97. FTE calcuations based on Health Canada formula.

#Based on 1996/97 supply characteristics of physician's Health Region (see section 4.1). 'High' ratios include health regions > 1.66 FTEs per 1,000, 'medium' supply includes regions at 1.29-1.66 FTEs per 1,000 and 'low' supply includes regions <1.29 FTEs per 1,000.

$High specialist supply is defined as Health Regions with specialist/GP ratios >0.65.

excluding all physicians with payments under these alternative payment mechanisms (n=581). The results were relatively resistant to this potential bias as the differences in the coefficients and p-values were very small (see Appendix D).

Principal Findings: ***The Relationship of Physician, Practice, and Supply Characteristics to GP/FPs 'Scope of Practice'***

- Age was strongly related to the range of services provided by GP/FPs. Younger physicians (aged ≤40 years) delivered a wider array of services than older ones.
- Female physicians had less concentration of their practices across fee-item domains than did male physicians. This appears to be mostly related to their delivery of a greater share of obstetrics and gynecology services.
- Physicians with low FTEs had more concentrated practices than those with higher FTEs.
- GP/FPs who graduated from U.B.C.'s medical school delivered services across a wider array of fee-item domains than did those trained at other schools.
- Physicians practicing in rural or semi-urban areas billed for services in a wider variety of domains than did those in urban areas.
- Local supply characteristics had a strong effect on the concentration of GP/FP practices. Lower GP/FP supply was associated with less concentration of GP/FP practices while higher specialist supply was associated with significantly greater concentration.

4.2.3 Specialty Care Delivered by GP/FPs in B.C.

While RCPSC-certified specialists deliver the majority of specialized services to B.C. residents, some GP/FPs also act as 'specialists', concentrating some or all of their practice within one main specialty domain. For some specialist areas (e.g., emergency medicine, anesthesiology, general surgery), primary care physicians may receive supplemental training to provide services in regions where RCPSC-certified specialists are few, and which would not otherwise be serviced locally. In other cases, physicians take a special interest in these areas (e.g., in obstetrics and gynecology) and focus a substantial portion of their practice in these areas. In still other cases, specialty services may be provided by GP/FPs who have received residency training in a particular specialty but for a variety of reasons, have not obtained RCPSC certification. The latter scenario holds for non-RCPSC certified specialists who are granted 'special' registration by the CPSBC to function as specialists in areas of need.

The following analyses examine how GP/FPs deliver services in three clinical domains (anesthesiology, obstetrics and gynecology, and surgery). We focus our attention on physicians who concentrated their practices, as evidenced by their billing records, in these areas. It is important to note that we defined GP/FPs 'specialists' based on their patterns of practice rather than on self-report or evidence of additional training or licensure. We concentrated on anesthesiology, obstetrics and gynecology, and general surgery for the following reasons: (1) prior research has suggested that GP/FPs provide a substantial amount of these specialty

services, especially in rural areas (Iglesias *et al* 1999; Chiasson *et al* 1995); (2) payment largely occurs in the FFS system rather than through alternative payment schemes (i.e., Salary and Sessional, and Service Agreements); (3) the services are mainly 'procedure'-oriented where activity can be largely identified through physician claims; and, (4) U.B.C.'s medical school has had established training programs for family physicians in these areas. We chose not to focus on other specialty areas where GP/FPs may concentrate their practices (including pediatrics, psychiatry, emergency medicine, community medicine/public health, and internal medicine) because of substantial non-FFS payments in these areas or because the services are more 'cognitive' than 'procedural' and thus poorly captured by the MSP fee-item domains.

4.2.3.1 Identification of GP/FP 'Anesthesiologists', 'Surgeons', and 'Obstetrician/ Gynecologists'

Figures 4.16, 4.17, and 4.18 show the proportion of total billings made by GP/FPs during 1996/97 in anesthesiology, general surgery, and obstetrics and gynecology (n=3,688). For these analyses, we excluded GP/FPs who made no FFS billings or were less than 0.2 FTE (n=644). It is important to note that the *y*-axis on these graphs (i.e., the frequency of GP/FPs) is presented on a logarithmic scale.

In 1996/97, the vast majority of GP/FPs in B.C. (83%) made no billings in anesthesiology. The billing distribution reveals that for those who billed any anesthesiology services, the majority billed relatively few. Based on this distribution, we chose a cutpoint of 10% (the proportion of anesthesia services in relation to all services) to differentiate GP/FP 'anesthesiologists' from other GP/FPs. Using this cutpoint we identified 79 GP/FPs as GP/FP 'anesthesiologists' during 1996/97. Since most of these physicians billed substantially more than 10% of their claims in anesthesiology, the identification of GP/FP 'anesthesiologists' was relatively insensitive to the choice of cutpoint. (For example, when a 0.15 cutpoint was used, 65 GP/FPs were identified as GP/FP 'anesthesiologists'.) The distribution also reveals that 15 GP/FPs functioned almost entirely (i.e., > 90%) in anesthesiology. As discussed above, some physicians may actually have completed a RCPSC specialty training program but not obtained certification.

The pattern of delivery of surgical services by GP/FPs (Figure 4.17) shows some differences to that of anesthesiology services. As opposed to anesthesiology, the vast majority of GP/FPs (96%) made at least some billings within the surgical fee-item domains.[24] However, like anesthesiology, surgical services made up a small minority of the practices for most GP/FPs. The frequency distribution shows a tail of GP/FPs billing surgical fees for over 10% of their practices (n=196). While most of these physicians billed substantially more than 10% surgical services, the identification of GP/FP 'surgeons' was somewhat more sensitive to the choice of cut-point (i.e., when a 20% cutpoint was used, 110 physicians were identified as GP/FP 'surgeons'). As with GP/FP 'anesthesiologists', there were 26 GP/FP 'surgeons' whose practices were made up of more than 90% of surgical services.

[24] For this analysis, all the surgical fee-item domains are aggregated within a single 'surgical' domain.

Figure 4.16 Distribution of Anesthesiology Billings for GP/FPs, 1996/97 (n=3,688)

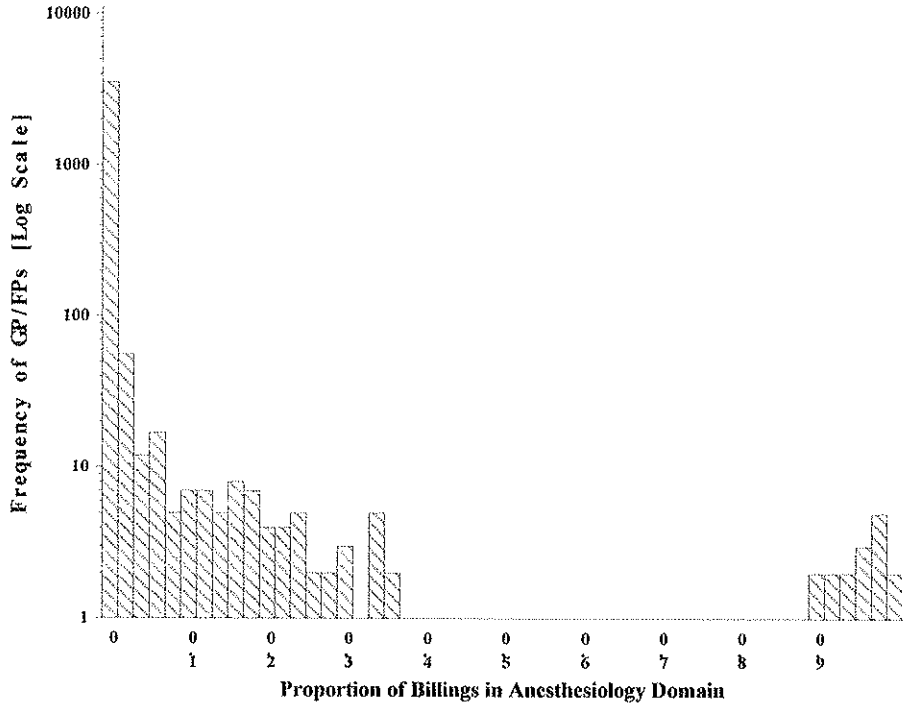


Figure 4.17 Distribution of Surgery Billings for GP/FPs, 1996/97 (n=3,688)

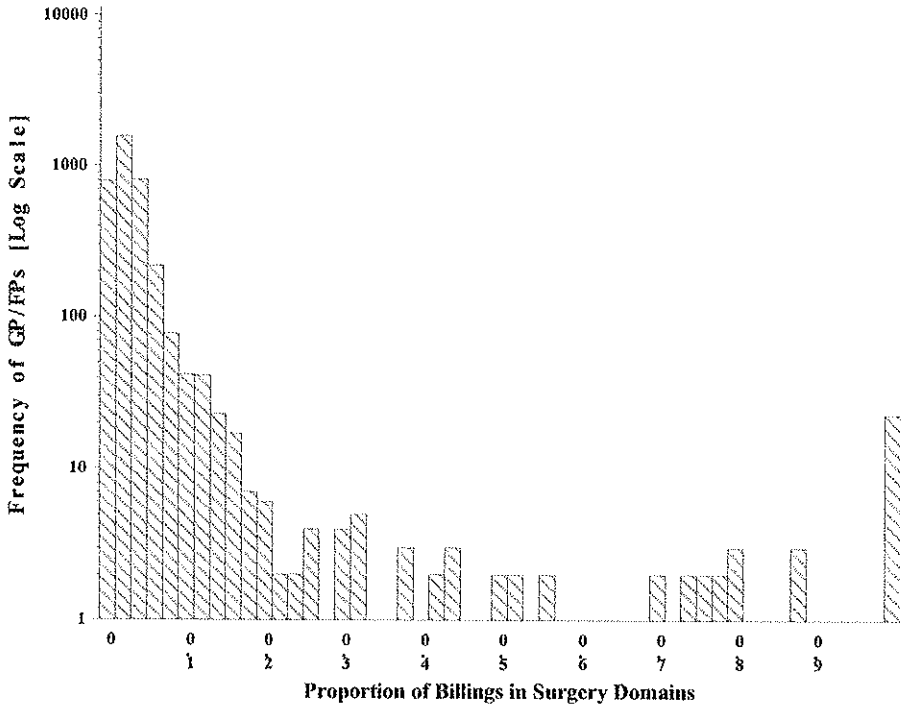
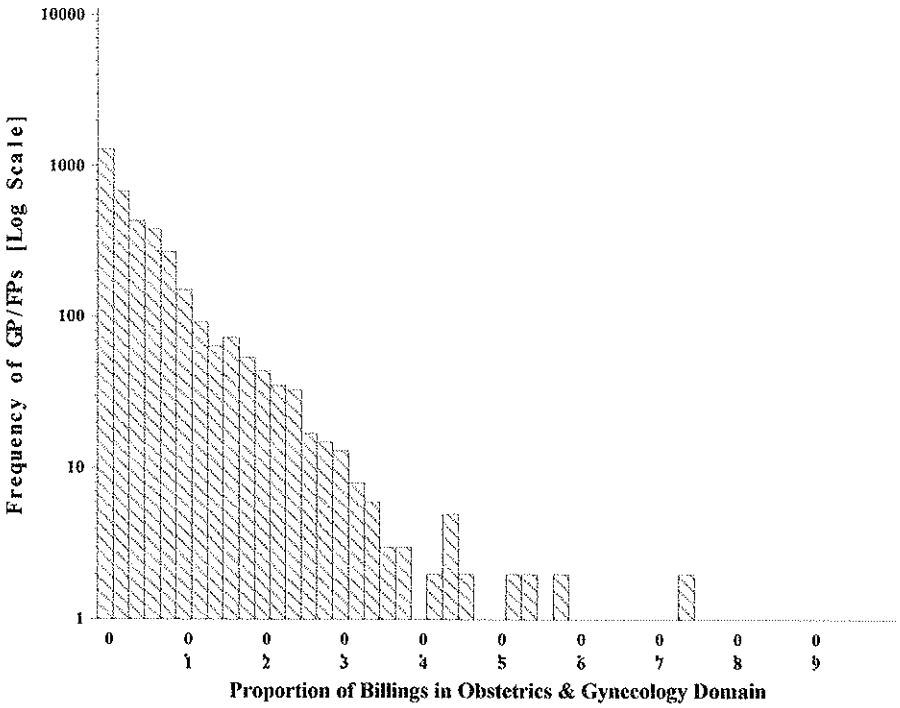


Figure 4.18 Distribution of Obstetrics & Gynecology Billings for GP/FPs, 1996/97 (n=3,688)



The delivery of obstetrics and gynecology services by GP/FPs was markedly different than the delivery of either surgical or anesthesiology services (see Figure 4.18). Not only did few GP/FPs exclude these types of services from their practices (8.6%), but for over one-third of GP/FPs, obstetrics and gynecology services represented more than 5% of their practices. Based on this distribution, we chose a higher cut-point (20%) to define GP/FP 'obstetrician/gynecologists', netting 175 physicians with this definition. Of all three GP 'specialist types' discussed here, the identification of GP/FP 'obstetrician/gynecologists' was the most sensitive to threshold selection. For instance, we identified 328 physicians as GP/FP 'obstetrician/gynecologists' with a 15% cutpoint and only 89 using a 25% cutpoint. We chose the 20% cutpoint as a way to balance both type I and type II errors (i.e., false negative and false positive). In trading off these errors, we aimed to maximize the specificity in our identification with the realization that this would come at some expense to sensitivity.

Principal Findings: ***Identification of GP/FP 'Specialists' in Anesthesiology, Surgery, and Obstetrics & Gynecology using Billing Records***

- In 1996/97, most GP/FPs delivered no services in the anesthesiology fee-item domain. However, we identified 79 physicians who concentrated more than 10% of their practices in this specialty area. Of these physicians, about one-quarter functioned almost exclusively as anesthesiologists.
- While most GP/FPs provided some services within the surgical fee-item domains, relatively few (196) concentrated more than 10% of their practice in surgery. Twenty-six GP/FPs concentrated more than 90% of their practice in surgery.
- The vast majority of GP/FPs delivered some services in the obstetrics and gynecology domain (91.4%). Based on the distribution of the proportion of obstetrics and gynecology fee-items billed, we chose a cutpoint of 20% to identify 175 GP/FP 'specialists'. Despite most GP/FPs delivering some services in this area, we found relatively few who concentrated more than 50% of their practices in obstetrics and gynecology.

4.2.3.2 Geographic Distribution of GP/FP 'Specialists'

Table 4.21 presents the geographic distribution of the GP/FP 'specialists' identified above. We found that GP/FP 'anesthesiologists' were overwhelmingly located in rural practice locales ($p<0.0001$). In fact, less than 1% of physicians in either the Vancouver and District or Capital regions were GP/FP 'anesthesiologists' by our definition. This compares with the North/North Central, Central, and South East regions where more than 5% of physicians tailored a significant proportion of their practices to anesthesiology. In light of the fact that RCPSC-trained anesthesiologists are located overwhelmingly in the Capital and Vancouver and District regions (see Section 4.1.2), these findings confirm the reported reliance of rural communities on the services of GP/FP 'anesthesiologists'.

For GP/FP 'surgeons' and GP/FP 'obstetrician/gynecologists', there are no clear urban/rural differences in the locations of these GP/FP 'specialists'. While the more remote regions (North/North Central and Central) had the largest representation of GP/FP 'surgeons' in relation to their total GP/FP pool, the contribution of these physicians to the supply in the Vancouver and District and Capital regions was not dissimilar. In fact, the proportion of GP/FP 'surgeons' as a component of the regional physician supply was not statistically significant. This distribution of GP/FP 'surgeons' appeared to parallel that of RCPSC-certified general surgeons who also appeared to be equitably distributed among regions (see Section 4.21). These findings persist when weighted by physician FTEs. For obstetrics and gynecology, the distribution of these GP/FPs appears even more heavily weighted in the Vancouver and District and Capital regions. Again, differences in the contribution of these GP/FP 'specialists' to the regional GP/FP supply were not statistically significant. None of the above findings were changed significantly when 5% alterations were made in the choice of cutpoint.

Table 4.21: Geographic Distribution of GP/FP 'Specialists' in Obstetrics & Gynecology, Anesthesiology, and Surgery, 1996/97*

HHRU Region	All GP/FPs	GP/FP ' Specialists' Obstetrics & Gynecology		Anesthesiology		Surgery	
	n	n	(%)	n	(%)	n	(%)
Vancouver & District	1,839	97	(5.3)	12	(0.7)	97	(5.3)
Capital	403	22	(5.5)	3	(0.7)	24	(6.0)
Fraser Valley	177	8	(4.5)	5	(2.8)	7	(4.0)
Okanagan	315	16	(5.1)	6	(1.9)	12	(3.8)
South-East	155	3	(1.9)	11	(7.1)	8	(5.2)
Island Coast	398	16	(4.0)	10	(2.5)	19	(4.8)
Central	170	3	(1.8)	10	(5.9)	14	(8.2)
North / North Central	234	10	(4.3)	22	(9.4)	15	(6.4)
All B.C.	3,691	175	(4.7)	79	(2.1)	196	(5.3)

* Includes all GP/FPs on the 'active' registers of the College of Physicians and Surgeons of B.C., excluding GP/FPs <0.2 FTE or who had no FFS billings in 1996/97 (n=644). GP/FP 'specialists' were defined by the proportion of billings within the respective specialty 'domains'. GP/FP 'anesthesiologists' and 'surgeons' were defined as GP/FPs with >10% of total billings in the respective domain. GP/FP 'obstetrician/gynecologists' were defined as GP/FPs with >20% of total billings in the obstetrics & gynecology fee-item domain. Percents given are relative to all GP/FPs.

Principal Findings: ***Geographic Distribution of GP/FP 'Specialists'***

- GP/FP 'anesthesiologists' (i.e., those GP/FPs billing >10% of their services in anesthesiology) were overwhelmingly located in more rural HHRU regions. This distribution complemented that of RCPSC-certified anesthesiologists who were located largely in urban settings.
- GP/FP 'surgeons' (i.e., those GP/FPs billing >10% of their services in the surgery domains) were no more likely to be located in rural HHRU regions than were other GP/FPs. This relatively even distribution mirrors that of RCPSC-certified general surgeons.
- GP/FPs billing >20% of their services in obstetrics and gynecology (i.e., our definition of GP/FP 'obstetrician/gynecologists') were no more likely to be located in one HHRU region than in any other.
- These findings were relatively insensitive to the choice of cut-point for defining GP/FP 'specialists'.

4.2.3.3 Demographic and Training Characteristics of GP/FP 'Specialists'

Table 4.22 presents the demographic and training characteristics of the GP/FP 'specialists' defined above. The proportion of GP/FP 'specialists' with each characteristic is presented as well as chi-square statistics to test for differences with non-specialist GP/FPs.

GP/FP 'anesthesiologists' were more likely male than were other GP/FPs ($p<0.0001$) but they were no more likely to be either younger or older. By sorting physicians according to the LHAs in which they practice, we again found that GP/FP 'anesthesiologists' were much more likely to practice in rural regions ($p<0.001$). These physicians were also significantly more likely than other GP/FPs to have been trained at non-B.C. medical schools.

We found that GP/FP 'surgeons' had different demographics than non-specialist GP/FPs. Age was strongly associated with being a GP/FP 'surgeon', with more than 20% of this population aged 60+ years. This finding is very similar to the age distribution of RCPSC-certified general surgeons (see Section 4.1.2). As with GP/FP 'anesthesiologists', GP/FP 'surgeons' were more likely male than were other GP/FPs. However, unlike GP/FP 'anesthesiologists', they were no more likely to practice in semi-urban or rural areas than were other GP/FPs. While this finding may be surprising to some, it is complementary to the relatively equitable distribution of RCPSC-certified general surgeons (see Section 4.1.2). As well, no significant differences were found with respect to medical school location.

Table 4.22: Demographic and Training Characteristics of GP/FP 'Specialists' in Obstetrics & Gynecology, Anesthesiology, and Surgery, 1996/97

	All GP/FPs*		GP/FP 'Specialists'**									
			Obstetrics & Gynecology				Anesthesiology			Surgery		
					Statistic***	P-value		Statistic***	P-value		Statistic***	P-value
Age median (IQR)	43	(24.0)	39	(11.0)	29.7	<0.001	43	(14.0)	0.13	0.717	45 (18.0)	14.5	<0.001
Age Group n (%)													
<40	1,373	(37.2)	96	(54.9)	37.6	<0.001	25	(31.6)	2.10	0.555	68 (34.7)	30.2	<0.001
40-49	1,283	(34.8)	62	(35.4)			33	(41.8)			61 (31.1)		
50-59	687	(18.6)	11	(6.3)			15	(19.0)			27 (13.8)		
60+	348	(9.4)	6	(3.4)			6	(7.6)			40 (20.4)		
Sex n (%)													
Male	2,634	(71.4)	24	(13.7)	298.8	<0.001	70	(88.6)	11.7	<0.001	169 (86.2)	22.3	<0.001
Female	1,057	(28.6)	151	(86.3)			9	(11.4)			27 (13.8)		
Medical School n (%)													
U.B.C.	1,249	(33.8)	74	(42.3)	8.70	0.013	19	(24.1)	16.2	0.001	46 (23.5)	2.59	0.273
In Canada	1,556	(42.2)	73	(41.7)			26	(32.9)			89 (45.4)		
Non-Canada	883	(23.9)	28	(16.0)			34	(43.0)			51 (26.0)		
Geographic Location n (%)													
Urban	1,599	(43.3)	93	(53.1)	7.83	0.020	9	(11.4)	98.5	0.001	80 (40.8)	0.473	0.789
Semi-urban	1,771	(48.0)	72	(41.1)			40	(50.6)			93 (47.4)		
Rural	321	(8.7)	10	(5.7)			30	(38.0)			15 (7.7)		
Totals	3,691	-	175	-			79	-			196 -		

* Includes all GP/FPs on the 'active' registers of the College of Physicians and Surgeons of B.C., excluding GP/FPs <0.2 FTE or who had no FFS billings in 1996/97 (n=644).

**GP/FP 'specialists' were defined by the proportion of billings with in the respective specialty 'domains'. GP/FP 'anesthesiologists' and 'surgeons' were defined as GP/FPs with >10% of total billings in the respective domain. GP/FP 'obstetrician/gynecologists' were defined as GP/FPswith >20% of total billings in the obstetrics & gynecology fee-item domain. Percents given are relative to all GP/FPs.

*** For categorical variables, chi-square test for homogencity is presented. For age (as a continuous variable), the F-statistic relating to one-way analysis of variance is presented.

The most distinguishing feature of GP/FP 'obstetrician/gynecologists' was that they were overwhelmingly female (86.3%) - very different from the overall GP/FP population (28.6%). These GP/FP 'specialists' were also more likely to be younger (54.9% were aged <40 years), which was consistent with the higher representation of female GP/FPs in the younger age groups (see Section 4.1.3). GP/FP 'obstetrician/gynecologists' were also more likely to have been trained at U.B.C. than were other GP/FPs. Our analysis shows significantly different practice locales between GP/FP 'obstetrician/gynecologists' and other GP/FPs (p=0.020). We found that GP/FP 'specialists' were actually more likely to be situated in urban areas than were their colleagues.

Principal Findings: ***Demographic and Training Characteristics of GP 'Specialists'***

- While GP/FP 'anesthesiologists' were overwhelmingly male, they were no more likely to be older or younger than other GP/FPs. These GP/FPs practiced primarily in rural locations and were more likely to have been trained at non-B.C. medical schools than were other GP/FPs.
- GP/FP 'surgeons' were significantly older than other GP/FPs (i.e., 20% aged 60+ years) but no more likely to be located in urban, semi-urban, or rural locales. Also, the medical school locations of these GP/FPs were not statistically different from other GP/FPs.
- GP/FP 'obstetrician/gynecologists' were overwhelmingly female (86%) and most were aged <40 years (55%). They were also more likely to have been trained at U.B.C. and located in urban locales than were other GP/FPs.

4.3 Aim III: Stability of B.C. Physicians 1991 - 1996

The purpose of this section is to examine the patterns that developed as physicians entered and exited from medical practice in B.C., by their specialty and geographic region. To shed some light on the potential reasons underlying these migration patterns, we attempted to characterize 'inflow' and 'outflow' physicians and contrast them with physicians in 'stable' practice. Through linking CPSBC registration files for 1991, 1993, and 1996, we were able to characterize physicians with four stability patterns: 'stable' (i.e., active registration in all three years); 'inflow' (i.e., registered in 1996 but not in 1991); 'outflow' (i.e., registered in 1991 but not 1996), and 'other' (i.e., acquired and withdrew registration status over the course of these three years). See Section 3.2 for a more detailed discussion of the construction of this variable. We also examined the demographic, specialty, and training characteristics of physicians who entered and exited practice within the province. By comparing these characteristics with those physicians in 'stable' practice, we sought to highlight some of the correlates important in these decisions. Our study was not designed to understand the reasons underlying physicians' arrival to the province (e.g., relocation, newly graduated) or departure from practice (e.g., retirement, death, re-entry into training programs, or migration out of the province). In addition to examining departures and arrivals to the province, we also examined the migration patterns of physicians between different geographic areas in B.C.

4.3.1 'Inflow' and 'Outflow' of Physicians to B.C. 1991-1996 by Specialty

Table 4.23 presents the stability status of all physicians who were on the 'active' registers of the CPSBC in 1991, 1993 and/or 1996, by their most recently recorded RCPSC specialty. As discussed in Section 4.1, all specialties (except otolaryngology, general surgery, hematology, and orthopedic surgery) had net gains in their physician numbers during this time. This analysis shows the interaction between 'inflow' and 'outflow' in producing these results. Overall, approximately 65.8% of physicians (n=5,855) were in 'stable' practice (i.e., 'actively' registered in all three years) while 20.3% gained CPSBC registration (n=1,802), and 11.2% withdrew from registration (n=992) during this interval. 'Other' physicians who both gained and withdrew from registration accounted for 2.7% (n=244). It is interesting that the 'net' gain of 810 physicians (excluding the 'other' stability pattern) was produced by both a large outflow and a very large inflow of physicians. There appeared to be relatively few differences in these proportions when GP/FPs were compared to all specialists. However, among the specialty groups, several important differences emerge. The proportion of 'stable' physicians over this five year interval among the specialties ranged 1.8-fold from a high of 85.7% to a low of 46.7%. Five specialties had particularly stable physician pools during this interval (i.e., more than 80% of physicians were registered in all three years) including rheumatology, medical biochemistry, medical microbiology, respiratory medicine and dermatology. Conversely, six specialties showed particular instability in their physician supply (i.e., fewer than 60% of physicians were 'stable') including radiation oncology, endocrinology and metabolism, otolaryngology, nuclear medicine, community medicine, and medical oncology. For these specialties, the instability was accounted for by a relatively high rate of inflow, outflow, or both. The inflow and outflow characteristics of the various specialties are discussed below.

For comparative purposes, the proportions of 'inflow' and 'outflow' physicians are discussed in relation to their 'stable' counterparts.

Among specialties, the ratio of 'inflow' to 'stable' physicians ranged from less than 0.1 in medical biochemistry (i.e., low intake) to a high of 0.90 in radiation oncology (i.e., high intake). In addition to radiation oncology, five specialties had a particularly high intake during this interval, including psychiatry (ratio 0.43), community medicine (0.46), nuclear medicine (0.73), endocrinology , metabolism (0.75) and medical oncology (0.78).

While some specialties had a relatively large gain in the number of registered physicians, some specialties saw a significant loss in physicians from the registration rolls. Six specialties had particularly large ratios of 'outflow' to 'stable' physicians including neurosurgery (0.26), general pathology (0.27), community medicine (0.31), general surgery (0.33), radiation oncology (0.33) and otolaryngology (0.40). It is interesting to note that the relative instability of community medicine resulted from both a relatively high inflow *and* a high outflow of physicians over the study interval.

Table 4.23: Stability of the Supply of B.C. Physicians from 1991 to 1996, by RCPSC Specialty

Specialty	All MDs	Stable		Outflow		Inflow		Other	
		n	(%)	n	(%)	n	(%)	n	(%)
General / Family Practice	4,978	3,241	(65.1)	516	(10.4)	1,053	(21.2)	168	(3.4)
Anesthesiology	378	260	(68.8)	45	(11.9)	64	(16.9)	9	(2.4)
Cardiology	61	42	(68.9)	4	(6.6)	15	(24.6)	0	(0.0)
Community Medicine	49	26	(53.1)	8	(16.3)	12	(24.5)	3	(6.1)
Dermatology	66	53	(80.3)	4	(6.1)	9	(13.6)	0	(0.0)
Endocrinology & Metabolism	17	8	(47.1)	1	(5.9)	6	(35.3)	2	(11.8)
Emergency Medicine	76	57	(75.0)	4	(5.3)	14	(18.4)	1	(1.3)
Gastroenterology	29	21	(72.4)	0	(0.0)	7	(24.1)	1	(3.4)
Haematology	20	15	(75.0)	2	(10.0)	3	(15.0)	0	(0.0)
Internal Medicine	416	285	(68.5)	53	(12.7)	71	(17.1)	7	(1.7)
Medical Biochemistry	13	11	(84.6)	1	(7.7)	1	(7.7)	0	(0.0)
Medical Microbiology	27	22	(81.5)	1	(3.7)	3	(11.1)	1	(3.7)
Medical Oncology	17	9	(52.9)	1	(5.9)	7	(41.2)	0	(0.0)
Nephrology	13	10	(76.9)	2	(15.4)	1	(7.7)	0	(0.0)
Neurology	77	58	(75.3)	7	(9.1)	11	(14.3)	1	(1.3)
Nuclear Medicine	19	11	(57.9)	0	(0.0)	8	(42.1)	0	(0.0)
Pediatrics	257	167	(65.0)	27	(10.5)	58	(22.6)	5	(1.9)
Pathology - General	125	78	(62.4)	21	(16.8)	24	(19.2)	2	(1.6)
Pathology - Anatomical	79	52	(65.8)	9	(11.4)	18	(22.8)	0	(0.0)
Physical Medicine	41	26	(63.4)	4	(9.8)	9	(22.0)	2	(4.9)
Psychiatry	541	339	(62.7)	47	(8.7)	145	(26.8)	10	(1.8)
Radiation Oncology	45	21	(46.7)	7	(15.6)	17	(37.8)	0	(0.0)
Radiology - Diagnostic	295	201	(68.1)	40	(13.6)	46	(15.6)	8	(2.7)
Respiratory Medicine	46	37	(80.4)	1	(2.2)	7	(15.2)	1	(2.2)
Rheumatology	28	24	(85.7)	1	(3.6)	3	(10.7)	0	(0.0)
Cardiovascular & Thoracic Surgery	36	27	(75.0)	3	(8.3)	5	(13.9)	1	(2.8)
General Surgery	243	160	(65.8)	53	(21.8)	26	(10.7)	4	(1.6)
Neurosurgery	38	23	(60.5)	6	(15.8)	9	(23.7)	0	(0.0)
Obstetrics & Gynecology	219	133	(60.7)	33	(15.1)	44	(20.1)	9	(4.1)
Ophthalmology	205	145	(70.7)	22	(10.7)	35	(17.1)	3	(1.5)
Orthopedic Surgery	179	122	(68.2)	27	(15.1)	26	(14.5)	4	(2.2)
Otolaryngology	92	55	(59.8)	22	(23.9)	14	(15.2)	1	(1.1)
Plastic Surgery	62	43	(69.4)	7	(11.3)	12	(19.4)	0	(0.0)
Urology	79	52	(65.8)	11	(13.9)	15	(19.0)	1	(1.3)
Vascular Surgery	27	21	(77.8)	2	(7.4)	4	(14.8)	0	(0.0)
Total Specialists	3,915	2,614	(66.8)	476	(12.2)	749	(19.1)	76	(1.9)
Total Physicians	8,893	5,855	(65.8)	992	(11.2)	1,802	(20.3)	244	(2.7)

* Includes all physicians on the 'active' CPSBC registers in 1991, 1993, and/or 1996. 'Stable' physicians refer to physicians on the registers in each of 1991, 1993, and 1996. 'Inflow' and 'outflow' physicians include physicians entering or leaving the CPSBC 'active' registers between 1991 and 1996 respectively. 'Other' physicians include those physicians who both entered and exited the registration rolls during this interval. Specialty designations refer to most recently recorded specialty from the CPSBC in 1996.

Principal Findings: ***Patterns of Stability by Specialty***

- During the period 1991 to 1996, only about two-thirds of the physician workforce were on the 'active' CPSBC registers for the entire study period.
- Of all physicians registered between 1991 and 1996, about 20% were new-entrants while about 11% exited from the 'active' registration rolls.
- There were few differences between GP/FPs and specialists in the percent of physicians entering and exiting the workforce. However, there were significant differences among specialties. Five specialties had more than 80% of physicians registered in all three years, including rheumatology, medical biochemistry, medical microbiology, respiratory medicine and dermatology. Conversely, six specialties had a high proportion of inflow and/or outflow physicians, including radiation oncology, endocrinology and metabolism, otolaryngology, nuclear medicine, community medicine, and medical oncology.
- Specialties with a particularly high inflow of physicians during this interval included psychiatry, community medicine, nuclear medicine, endocrinology and metabolism and radiation oncology. Specialties with a large outflow of specialists included neurosurgery, general pathology, community medicine, general surgery, radiation oncology, and otolaryngology.

4.3.2 Geographic Distributions of 'Stable', 'Inflow', and 'Outflow' Physicians

In Section 4.1.2, we discussed the supply of specialty physicians among the HHRU regions for 1991 and 1996. This section progresses from these cross-sectional analyses to delve more deeply into migration patterns. By linking the CPSBC records from 1991, 1993 and 1996 into a physician-specific longitudinal file, we were able to characterize the entry and exit patterns of physicians as well as the inter-regional moves during this interval. In other words, we progressed from performing single cross-sectional analyses in Section 4.1.2 to examining the trends in physician supply over time with a cohort analysis. The following analyses exclude the 244 physicians who both gained and withdrew from registration during this period. For the sake of simplicity, this section is organized as follows. First, we examine the regional distribution of new registrants between 1991-96 (i.e., 'inflow' physicians) and compare it to that for 'stable' physicians. Next, we examine the regional distribution of 'outflow' physicians (i.e., registered in 1991 but not 1996) and compare it to that for 'stable' physicians[25]. Finally, we examine the inter-regional mobility patterns for 'stable' physicians that occurred over this 5-year interval. In this analysis, 'stable' physicians were classified by whether their regions of registration in 1991 and 1996 were the same or not.

It is important to recall that the results presented below do not provide a complete picture of physician mobility over this interval. We were limited to three observations per physician

[25] For the 'inflow' analyses, we assigned 'stable' physicians to their 1996 region. Conversely, for the 'outflow' analysis, 'stable' physicians were examined in relation to their 1991 region. We chose these differences in assignment to in order that the groups were compared in relation to their resident region at the same point in time.

(3 different years) so that any movement occurring between our 'snapshots' may not have been captured. Physicians who migrated to different practice sites on multiple occasions during this interval may not be captured by our data. However, we view these misclassifications as rare. For 'stable' physicians who were classified as not having moved between regions (i.e., the 1991 and 1996 Health Regions were congruent), only 20 (0.34%) were located in a different region during the intervening year (1993).

4.3.2.1 'Inflow' of Physicians by HHRU and Grouped Specialty

Table 4.24 presents the regional distribution of new registrants by their specialties and compares it to the similar distribution for 'stable' physicians. (The regions presented reflect the 1996 registration status for both groups of physicians.) Taken together, these physicians represent the totality of B.C.'s physician population in 1996 (excluding 75 'other' physicians who were registered in both 1991 and 1996, but not 1993). For GP/FPs, differences in the proportions of new entrants by HHRU region were on the whole relatively small (21.2%-25.3%), except for the large proportions of new registrants in the North (56%) and North Central (32.7%) regions. For specialists, the contribution of new entrants across the HHRU regions (20.4-27.2%) mirrored that of GP/FPs. The North Central and South East regions were exceptions, however, with a relatively large influx of new registrant specialists (44% and 33.3%) during this period. The North was also an outlier with no new specialist registrants.

When broken down by grouped specialty, one main pattern emerges. For most specialty groups, 'inflow' physicians make up a larger proportion of the physician supply in the more rural HHRU regions compared with the Capital and Vancouver and District regions. The largest proportional gains of newly registered general internists, general surgeons, surgical subspecialists, psychiatrists, obstetricians and gynecologists, and anesthesiologists occurred, for the most part, outside the lower mainland and southern Vancouver Island. These findings are consistent with the 'net' effects presented in Section 4.1.2. The absolute number of new entrants, however, was often very small (i.e. fewer than 5 physicians) in many regions. For this reason, generalizations are hazardous.

4.3.2.2 'Outflow' of Physicians by HHRU Region and Grouped Specialty

Table 4.25 presents the regional distribution of physicians who left the CPSBC register between 1991 and 1996 by specialty and compares it to the 1991 distribution of physicians with 'stable' registration. Taken together, these physicians represent the total physician population in 1991 (excluding 75 'other' physicians who were registered in both 1991 and 1996, but not 1993).[26] There was considerable variability between HHRU regions in the proportion of GP/FPs who were lost from the provincial registries during the study period ($p<0.001$). Five of the nine

[26] For 'stable' physicians, there were some physicians who changed their specialty designations between 1991 and 1996. During this time 67 physicians changed their specialty designation, including 30 physicians who shifted from general practice / family medicine to RCPSC specialties.

Table 4.24: Geographic Distribution of 'Inflow' and 'Stable' Physicians by Grouped Specialty and HHRU Region, 1991-1996*

	GP/FPs				General Internal Medicine				Medical Subspecialties			
	Stable		Inflow		Stable		Inflow		Stable		Inflow	
HHRU Region	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)
Vancouver & District	1,663	(75.8)	531	(24.2)	186	(84.5)	34	(15.5)	218	(81.0)	51	(19.0)
Capital	383	(78.8)	103	(21.2)	29	(85.3)	5	(14.7)	33	(73.3)	12	(26.7)
Fraser Valley	149	(76.0)	47	(24.0)	6	(75.0)	2	(25.0)	5	(71.4)	2	(28.6)
Okanagan	263	(77.1)	78	(22.9)	12	(70.6)	5	(29.4)	19	(63.3)	11	(36.7)
South East	140	(76.1)	44	(23.9)	9	(90.0)	1	(10.0)	2	(66.7)	1	(33.3)
Island Coast	334	(76.4)	103	(23.6)	14	(66.7)	7	(33.3)	7	(77.8)	2	(22.2)
Central	139	(74.7)	47	(25.3)	7	(87.5)	1	(12.5)	7	(87.5)	1	(12.5)
North Central	148	(67.3)	72	(32.7)	6	(60.0)	4	(40.0)	4	(66.7)	2	(33.3)
North	22	(44.0)	28	(56.0)	1	(100.0)	0	(0.0)	-	-	-	-
Totals	3,241	(75.5)	1,053	(24.5)	270	(82.1)	59	(17.9)	295	(78.2)	82	(21.8)

	General Surgery				Surgical Subspecialties				Pediatrics			
	Stable		Inflow		Stable		Inflow		Stable		Inflow	
HHRU Region	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)
Vancouver & District	78	(90.7)	8	(9.3)	305	(82.2)	66	(17.8)	120	(74.5)	41	(25.5)
Capital	19	(95.0)	1	(5.0)	59	(84.3)	11	(15.7)	12	(80.0)	3	(20.0)
Fraser Valley	6	(85.7)	1	(14.3)	19	(86.4)	3	(13.6)	3	(60.0)	2	(40.0)
Okanagan	15	(83.3)	3	(16.7)	35	(70.0)	15	(30.0)	8	(57.1)	6	(42.9)
South East	9	(75.0)	3	(25.0)	7	(70.0)	3	(30.0)	3	(75.0)	1	(25.0)
Island Coast	16	(76.2)	5	(23.8)	36	(76.6)	11	(23.4)	10	(90.9)	1	(9.1)
Central	8	(72.7)	3	(27.3)	15	(75.0)	5	(25.0)	5	(83.3)	1	(16.7)
North Central	6	(75.0)	2	(25.0)	11	(64.7)	6	(35.3)	3	(60.0)	2	(40.0)
North	3	(100.0)	0	(0.0)	1	(100.0)	0	(0.0)	-	-	-	-
Totals	160	(86.0)	26	(14.0)	488	(80.3)	120	(19.7)	164	(74.2)	57	(25.8)

	Psychiatry				Obstetrics & Gynecology				Laboratory/Radiology			
	Stable		Inflow		Stable		Inflow		Stable		Inflow	
HHRU Region	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)
Vancouver & District	246	(73.4)	89	(26.6)	83	(77.6)	24	(22.4)	254	(77.0)	76	(23.0)
Capital	44	(67.7)	21	(32.3)	13	(100.0)	0	(0.0)	43	(78.2)	12	(21.8)
Fraser Valley	7	(58.3)	5	(41.7)	4	(66.7)	2	(33.3)	13	(76.5)	4	(23.5)
Okanagan	15	(68.2)	7	(31.8)	11	(78.6)	3	(21.4)	22	(81.5)	5	(18.5)
South East	6	(54.5)	5	(45.5)	2	(50.0)	2	(50.0)	11	(68.8)	5	(31.3)
Island Coast	16	(64.0)	9	(36.0)	14	(73.7)	5	(26.3)	23	(79.3)	6	(20.7)
Central	3	(42.9)	4	(57.1)	3	(50.0)	3	(50.0)	17	(100.0)	0	(0.0)
North Central	2	(28.6)	5	(71.4)	2	(28.6)	5	(71.4)	10	(52.6)	9	(47.4)
North	-	-	-	-	1	(100.0)	0	(0.0)	3	(100.0)	0	(0.0)
Totals	339	(70.0)	145	(30.0)	133	(75.1)	44	(24.9)	396	(77.2)	117	(22.8)

	Anesthesiology				All Specialists**				All Physicians**			
	Stable		Inflow		Stable		Inflow		Stable		Inflow	
HHRU Region	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)
Vancouver & District	162	(81.8)	36	(18.2)	1,730	(79.5)	445	(20.5)	3,393	(77.7)	976	(22.3)
Capital	37	(88.1)	5	(11.9)	308	(79.6)	79	(20.4)	691	(79.2)	182	(20.8)
Fraser Valley	8	(88.9)	1	(11.1)	71	(76.3)	22	(23.7)	220	(76.1)	69	(23.9)
Okanagan	21	(87.5)	3	(12.5)	163	(73.1)	60	(26.9)	426	(75.5)	138	(24.5)
South East	1	(20.0)	4	(80.0)	50	(66.7)	25	(33.3)	190	(73.4)	69	(26.6)
Island Coast	17	(63.0)	10	(37.0)	155	(72.8)	58	(27.2)	489	(75.2)	161	(24.8)
Central	8	(80.0)	2	(20.0)	77	(79.4)	20	(20.6)	216	(76.3)	67	(23.7)
North Central	6	(66.7)	3	(33.3)	51	(56.0)	40	(44.0)	199	(64.0)	112	(36.0)
North	0	(0.0)	0	(0.0)	9	(100.0)	0	(0.0)	31	(52.5)	28	(47.5)
Totals	260	(80.2)	64	(19.8)	2,614	(77.7)	749	(22.3)	5,855	(76.5)	1,802	(23.5)

* 'Stable' physicians refer to physicians on the 'active' CPSBC registers in 1991, 1993, and 1996. 'Inflow' physicians include newly-registered physicians be 1991 and 1996. Excludes 244 physicians who both gained and dropped CPSBC 'active' registration over this interval. HHRU region reflects the physician's postal code from the 1996 CPSBC registration records. Specialty designations refer to most recently recorded specialty from the CPSBC in 1996.
**Includes specialists (109 'stable' and 35 'inflow') in community medicine, physical medicine, occupational medicine, radiation oncology, and emergency medicine.

Table 4.25: Geographic Distribution of 'Outflow' and 'Stable' Physicians by Grouped Specialty and HHRU Region, 1991-1996*

	GP/FPs				General Internal Medicine				Medical Subspecialties			
	Stable		Outflow		Stable		Outflow		Stable		Outflow	
HHRU Region	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)
Vancouver & District	1,696	(87.6)	240	(12.4)	190	(86.0)	31	(14.0)	216	(92.7)	17	(7.3)
Capital	382	(87.0)	57	(13.0)	24	(77.4)	7	(22.6)	30	(88.2)	4	(11.8)
Fraser Valley	146	(86.9)	22	(13.1)	7	(87.5)	1	(12.5)	5	(100.0)	0	(0.0)
Okanagan	244	(89.4)	29	(10.6)	13	(72.2)	5	(27.8)	18	(100.0)	0	(0.0)
South East	146	(81.6)	33	(18.4)	9	(90.0)	1	(10.0)	2	(100.0)	0	(0.0)
Island Coast	319	(86.7)	49	(13.3)	12	(80.0)	3	(20.0)	7	(87.5)	1	(12.5)
Central	141	(90.4)	15	(9.6)	7	(87.5)	1	(12.5)	7	(100.0)	0	(0.0)
North Central	160	(87.4)	23	(12.6)	7	(100.0)	0	(0.0)	4	(100.0)	0	(0.0)
North	30	(78.9)	8	(21.1)	-	-	-	-	-	-	-	-
Unknown	5	(11.1)	40	(88.9)	1	(25.0)	3	(75.0)		(0.0)	2	(100.0)
Totals	3,269	(86.4)	516	(13.6)	270	(83.9)	52	(16.1)	289	(92.3)	24	(7.7)

	General Surgery				Surgical Subspecialties				Pediatrics			
	Stable		Outflow		Stable		Outflow		Stable		Outflow	
HHRU Region	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)
Vancouver & District	79	(79.8)	20	(20.2)	305	(86.2)	49	(13.8)	125	(86.2)	20	(13.8)
Capital	17	(77.3)	5	(22.7)	58	(77.3)	17	(22.7)	11	(100.0)	0	(0.0)
Fraser Valley	6	(75.0)	2	(25.0)	20	(83.3)	4	(16.7)	2	(66.7)	1	(33.3)
Okanagan	13	(72.2)	5	(27.8)	33	(73.3)	12	(26.7)	9	(81.8)	2	(18.2)
South East	7	(87.5)	1	(12.5)	6	(75.0)	2	(25.0)	3	(75.0)	1	(25.0)
Island Coast	15	(75.0)	5	(25.0)	34	(97.1)	1	(2.9)	7	(87.5)	1	(12.5)
Central	10	(66.7)	5	(33.3)	15	(78.9)	4	(21.1)	4	(80.0)	1	(20.0)
North Central	7	(53.8)	6	(46.2)	12	(75.0)	4	(25.0)	4	(100.0)	0	(0.0)
North	3	(75.0)	1	(25.0)	1	(50.0)	1	(50.0)	-	-	-	-
Unknown	0	(0.0)	3	(100.0)	0	(0.0)	6	(100.0)	0	(0.0)	1	(100.0)
Totals	157	(74.8)	53	(25.2)	484	(82.9)	100	(17.1)	165	(85.9)	27	(14.1)

	Psychiatry				Obstetrics & Gynecology				Laboratory/Radiology			
	Stable		Outflow		Stable		Outflow		Stable		Outflow	
HHRU Region	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)
Vancouver & District	254	(87.9)	35	(12.1)	83	(83.0)	17	(17.0)	259	(85.2)	45	(14.8)
Capital	39	(84.8)	7	(15.2)	13	(72.2)	5	(27.8)	38	(70.4)	16	(29.6)
Fraser Valley	6	(75.0)	2	(25.0)	4	(100.0)	0	(0.0)	13	(86.7)	2	(13.3)
Okanagan	16	(100.0)	0	(0.0)	10	(76.9)	3	(23.1)	19	(79.2)	5	(20.8)
South East	4	(100.0)	0	(0.0)	2	(100.0)	0	(0.0)	10	(66.7)	5	(33.3)
Island Coast	11	(78.6)	3	(21.4)	14	(93.3)	1	(6.7)	23	(88.5)	3	(11.5)
Central	3	(100.0)	0	(0.0)	3	(42.9)	4	(57.1)	16	(94.1)	1	(5.9)
North Central	2	(100.0)	0	(0.0)	2	(40.0)	3	(60.0)	12	(92.3)	1	(7.7)
North	-	-	-	-	1	(100.0)	0	(0.0)	3	(100.0)	0	(0.0)
Unknown	-	-	-	-	-	-	-	-	0	(0.0)	1	(100.0)
Totals	335	(87.7)	47	(12.3)	132	(80.0)	33	(20.0)	393	(83.3)	79	(16.7)

	Anesthesiology				All Specialists**				All Physicians**			
	Stable		Outflow		Stable		Outflow		Stable		Outflow	
HHRU Region	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)
Vancouver & District	169	(88.0)	23	(12.0)	1,758	(86.9)	265	(13.1)	3,454	(87.2)	505	(12.8)
Capital	33	(80.5)	8	(19.5)	279	(79.5)	72	(20.5)	661	(83.7)	129	(16.3)
Fraser Valley	9	(90.0)	1	(10.0)	72	(84.7)	13	(15.3)	218	(86.2)	35	(13.8)
Okanagan	16	(88.9)	2	(11.1)	152	(80.9)	36	(19.1)	396	(85.9)	65	(14.1)
South East	1	(50.0)	1	(50.0)	44	(80.0)	11	(20.0)	190	(81.2)	44	(18.8)
Island Coast	15	(78.9)	4	(21.1)	142	(85.0)	25	(15.0)	461	(86.2)	74	(13.8)
Central	8	(80.0)	2	(20.0)	76	(80.9)	18	(19.1)	217	(86.8)	33	(13.2)
North Central	4	(80.0)	1	(20.0)	54	(78.3)	15	(21.7)	214	(84.9)	38	(15.1)
North	-	-	-	-	8	(80.0)	2	(20.0)	38	(79.2)	10	(20.8)
Unknown	0	(0.0)	3	(100.0)	1	(5.0)	19	(95.0)	6	(9.2)	59	(90.8)
Totals	255	(85.0)	45	(15.0)	2,586	(84.5)	476	(15.5)	5,855	(85.5)	992	(14.5)

* 'Stable' physicians refer to physicians on the 'active' CPSBC registers in 1991, 1993, and 1996. 'Outflow' physicians refer to those leaving the CPSBC active' registers between 1991 and 1996. Excludes 244 physicians who both gained and dropped CPSBC 'active' registration over this interval. HHRU region reflects the physician's postal code from the 1991 CPSBC registration records. Specialty designations refer to most recently recorded specialty from the CPSBC in 1991.

**Includes specialists (106 'stable' and 16 'outflow') in community medicine, physical medicine, occupational medicine, radiation oncology, and emergency medicine.

regions had similar exit rates, ranging from 12.4% to 13.3% (Vancouver and District, Capital, Fraser Valley, Island Coast, and North Central). The Okanagan and the Central regions had about 10% of their physicians drop from the registration rolls, while in two regions the exit rates were about 20% or more.

Among HHRU regions, the proportion of specialists who exited from the 'active' CPSBC registration rolls ranged from 13.1% (Vancouver and District: 265 physicians) to 21.7% (North Central: 15 physicians). However, there is little consistency in the rates of loss by HHRU regions across specialties. As with the patterns of inflow, the absolute numbers of 'outflow' physicians outside the large urban regions were often extremely small (<5 physicians).

4.3.2.3 Inter-regional Migration Patterns

Parts (a) and (b) of Table 4.26 delineate the migration patterns of 'stable' physicians between HHRU regions based on the postal codes extracted from the 1991 and 1996 CPSBC registration records. For the sake of simplicity, physicians are aggregated as 'GP/FPs' and 'All Specialists'. The rows represent the numbers of 'stable' physicians located in each HHRU region in 1991 and the columns represent the regions where the same physicians were located in 1996. The shaded boxes represent the physicians who were located in the same region for both registration years. In other words, the off-diagonal cells represent the inter-regional movements of physicians, with the rows and columns representing the HHRU regions *from* which and *to* which physicians migrated. For each pair of HHRU regions, the 'net' migration of physicians is simply the 'cell' in the bottom left segment of the table minus the corresponding 'cell' in the top right portion. For instance, for the Vancouver and District region, the 'net' migration of GP/FPs from the Fraser Valley was: 3 - 6 = -3. The net migration patterns are presented in Table 4.26, Parts (c) and (d).

Table 4.27 presents similar data for net migration patterns for the grouped specialties, except that all the inter-regional moves are combined for each referent region. The purpose of this analysis is to examine the net migration pattern for each specialty group. A first observation from the table is that the number of net inter-regional moves was small regardless of specialty. In other words, no regions gained or lost physicians to any great extent to other regions during this interval. However, given that the supply of specialist physicians in many regions is relatively sparse, a net change of one or two physicians can represent a large change in the provision of specialist services. The specialties with the greatest net inter-regional mobility were anesthesiology, psychiatry, and pediatrics with 4.2%, 3.6%, and 3.5 % of the respective physician populations moving between regions. One of the most striking observations is that, for all specialty groups (except obstetrics and gynecology where there was no net migration), Vancouver and District lost more physicians to other regions than it gained. The North Central also had a net loss of physicians to other regions in all but two specialty groups (the medical subspecialties and obstetrics and gynecology). At the other end of the spectrum, in the Capital region, there was a net gain of physicians from the other regions in all specialty groups except two (the surgical subspecialties and obstetrics and gynecology). The Island Coast and the Okanagan also gained at least one (net) physician from the other regions in most specialty

Table 4.26: Regional Migration Patterns for 'Stable' Physicians 1991-1996, GP/FPs and Specialists

a. General / Family Practitioners' Location of Practice, 1991 and 1996

		HHRU 1996								
		Vanc & Dist	Capital	Fraser Valley	Okanagan	South East	Island Coast	Central	N.Central	North
H	Vanc & Dist	1619	7	6	14	5	21	5	7	
H	Capital	6	363			1	7	1	2	
R	Fraser Valley	3	1	139		1			2	
U	Okanagan	2			238	2		1		
1	South East	6	2		3	124	1	3		1
9	Island Coast	6	4	2	2	1	301	1	1	
9	Central	4	1		4	1	4	127		
1	N. Central	13	3	1		3			134	
	North	3	2	1	2				1	21

Note: Includes only 'stable' physicians registered in 1991, 1993 and 1996. Specialty designation as of 1996.

b. Specialists' Location of Practice, 1991 and 1996

		HHRU 1996								
		Vanc & Dist	Capital	Fraser Valley	Okanagan	South East	Island Coast	Central	N.Central	North
H	Vanc & Dist	1711	21	2	10	1	18	4	3	
H	Capital	1	276		1		1	1		1
R	Fraser Valley	4	1	67						
U	Okanagan	3		1	147		1	1		
1	South East				3	47				
9	Island Coast	3	5				135			
9	Central	1	1		2	1		71		
1	N. Central	7	3	1		1			48	
	North									8

Note: Includes only 'stable' physicians registered in 1991, 1993 and 1996. Specialty designation as of 1996.

c. GP/FP 'Net' Migration Patterns 1991-1996

	Vanc & Dist	Capital	Fraser Valley	Okanagan	South East	Island Coast	Central	N.Central	North
Vanc & Dist	x	1	3	12	-1	15	1	-6	-3
Capital	-1	x	-1	0	-1	3	0	-1	-2
Fraser Valley	-3	-3	x	0	1	-2	0	1	-1
Okanagan	-12	0	0	x	-1	-2	-3	0	-2
South East	1	1	-1	1	x	0	2	-3	1
Island Coast	-15	-3	2	2	0	x	1	1	0
Central	-1	0	0	3	-2	1	x	0	0
N. Central	6	1	-1	0	3	1	0	x	-1
North	3	2	1	3	-1	0	0	1	x

Note: Specialty designation as of 1996. Referent region is on horizontal axis.

d. Specialist 'Net' Migration Patterns 1991-1996

	Vanc & Dist	Capital	Fraser Valley	Okanagan	South East	Island Coast	Central	N.Central	North
Vanc & Dist	x	20	-2	7	1	15	3	-4	0
Capital	-20	x	-1	1	0	-4	0	-3	1
Fraser Valley	2	1	x	-1	0	0	0	-1	0
Okanagan	-7	-1	1	x	-3	1	-1	0	0
South East	-1	0	0	3	x	0	-1	-1	0
Island Coast	-15	4	0	1	0	x	0	0	0
Central	-3	0	0	1	1	0	x	0	0
N. Central	4	3	1	0	1	0	0	x	0
North	0	-1	0	0	0	0	0	0	x

Note: Specialty designation as of 1996. Referent region is on horizontal axis.

Table 4.27: Net Inter-regional Physician Migration Patterns for 'Stable' Physicians, 1991-1996

Specialty	Vancouver & District		Capital		Fraser Valley		Okanagan		South East	
	Net Migrat'n 1991/96	Physician Pop'n 1991	Net Migrat'n 1991/96	Physician Pop'n 1991	Net Migrat'n 1991/96	Physician Pop'n 1991	Net Migrat'n 1991/96	Physician Pop'n 1991	Net Migrat'n 1991/96	Physician Pop'n 1991
GP/FPs	-21	1,684	3	380	3	146	20	243	0	140
General Internal Medicine	-1	187	2	27	-1	7	-1	13	0	9
Medical Subspecialties	-5	223	4	29	0	5	1	18	0	2
General Surgery	-2	80	2	17	0	6	2	13	1	8
Surgical Subspecialties	-1	306	0	59	-1	20	2	33	-1	8
Pediatrics	-3	123	1	11	1	2	-1	9	0	3
Psychiatry	-10	256	6	38	1	6	-1	16	0	6
Obstetrics & Gynecology	0	83	0	13	0	4	1	10	0	2
Laboratory/Radiology	-8	262	5	38	0	13	3	19	1	10
Anesthesiology	-8	170	5	32	-1	9	4	17	-1	2
All Specialties	-40	1,770	27	281	-1	72	10	153	0	50
All Physicians	-61	3,454	30	661	2	218	30	396	0	190

Specialty	Island Coast		Central		North Central		North		Unknown	
	Net Migrat'n 1991/96	Physician Pop'n 1991	Net Migrat'n 1991/96	Physician Pop'n 1991	Net Migrat'n 1991/96	Physician Pop'n 1991	Net Migrat'n 1991/96	Physician Pop'n 1991	Net Migrat'n 1991/96	Physician Pop'n 1991
GP/FPs	16	318	-2	141	-6	154	-8	30	-5	5
General Internal Medicine	2	12	0	7	-1	7		0	-1	1
Medical Subspecialties	0	7	0	7	0	4	0	0	0	0
General Surgery	1	15	-2	10	-2	8	0	3	0	0
Surgical Subspecialties	2	34	0	15	-1	12	0	1	0	0
Pediatrics	3	7	1	4	-2	5	0	0	0	0
Psychiatry	5	11	0	3	-1	3	0	0	0	0
Obstetrics & Gynecology	-1	15	0	3	0	2	0	1	0	0
Laboratory/Radiology	0	23	1	16	-2	12	0	3	0	0
Anesthesiology	2	15	0	8	-1	7	0	0	0	0
All Specialties	12	143	1	76	-9	60	0	8	-1	1
All Physicians	28	461	-1	217	-15	214	-8	38	-6	6

Note: 'Net' migration refers to the number of physicians migrating to other HHRUs minus the number of physicians migrating from other HHRUs.
Includes only 'stable' physicians on the 'active' CPSBC registers in 1991, 1993 and 1996. 'Outflow' and 'inflow' physicians not included. Physician population refers to the number of 'stable' physicians located in each HHRU in 1991. Specialty designations refer to the 'most' recent specialty recorded as of 1996.

categories. No consistent migration patterns are readily apparent for the remaining HHRU regions.

Principal Findings: ***Geographic Patterns in Physician Stability***

- In most HHRU regions, new entrants who gained registration within the previous five years made up about 20-25% of the 1996 physician populations. However, several regions had particularly high proportions of newly-registered physicians. For GP/FPs, new entrants comprised more than one-third of the physician pool in the North and North Central regions. For specialists, new registrants made up more than one-third of the specialist pool in the North Central and South East regions.
- Among regions, there was considerable variation in the proportion of 'outflow' physicians, that is, physicians who dropped their 'active' CPSBC registration between 1991 to 1996. Most regions saw about 15% of their GP/FPs and specialist population leave the 'active' registers. The main outliers with higher exit rates included the South East, North and North Central regions.
- Across specialties and HHRU regions, the 'net' inter-regional migration rates over this time interval were relatively small. Vancouver and District saw the greatest net loss of physicians to other regions across most specialties. Conversely, the Capital, Island Coast, and Okanagan regions saw the most consistent net increases in physicians on the active registers originating from other regions.

4.3.3 Stability Status by Physician Demographic and Training Characteristics

Table 4.28 presents the demographic and medical school training characteristics of 'inflow' physicians in comparison to physicians in 'stable' practice. Table 4.29 presents similar data for 'outflow' physicians. For all analyses, the 244 physicians with an 'other' stability pattern (i.e., both incoming and outgoing during this time) were excluded.

4.3.3.1 Characteristics of 'Inflow' Physicians

Overall, a much larger proportion of physicians who gained registration over the study period were aged <40 years (69.3%) compared with 'stable' physicians (16.2%) ($p<0.001$). This is not surprising since a large proportion of new entrants (GP/FPs and specialists) to the CPSBC registers were physicians who had recently completed their postgraduate medical education. The proportion of newly-registered GP/FPs aged < 40 years (77.2%) was significantly larger than the similar proportion of newly-registered specialists (58.5%) ($p<0.001$). Again, this is expected given the longer training requirements of specialty physicians. Among specialty groups, however, the proportion of new entrant physicians aged <40 years ranged from 33.8% for psychiatry to 69.5% for the medical subspecialties. The proportion of newly registered physicians aged 65 years or more was very small (less than 5%) for both GP/FPs and specialists. Among specialty

groups, the major exception to this finding was general surgery, where three of the 26 newly-registered physicians were aged 65 or older (11.3%).

In addition to being younger, 'inflow' physicians were also more likely to be female than were physicians in stable practice ($p<0.001$). Moreover, the proportion of new entrant female physicians was significantly higher for GP/FPs (39.9%) than for specialists (26.6%). The sex differentials for new entrants were also larger than those for 'stable' GP/FPs and specialists (25.8% vs. 15.6%). In other words, although new entrant GP/FPs and specialists were more likely to be female than were 'stable' physicians, the growth in the proportion of females was larger for GP/FPs. Among the specialty categories, there was wide variation in the proportion of females to the new-entrant specialty populations ($p<0.001$). General surgery and the surgical subspecialties had the smallest proportions (11.5% and 10.0% respectively) but they were significantly higher than the proportion of females in 'stable' practice (3.8% and 5.7% respectively) ($p<0.001$). At the other end of the spectrum, 42.1% of newly registered pediatricians were female which was significantly higher than the 28.7% of stable pediatricians ($p<0.001$), a figure that was the highest of all the specialty groups. The remaining specialties were intermediate with respect to the proportion of female new entrants, ranging from 24.8% of laboratory and radiology physicians to 36.4% of obstetrician and gynecologists.

Extending the geographic analyses presented in Section 4.3.3, Table 4.28 also presents the geographies of 'inflow' and 'stable' physicians grouped into urban, semi-urban, and rural locales. For all physicians, the differences in these geographies were statistically significant ($p<0.001$). 'Inflow' physicians were more likely to locate in rural LHAs (9.3% vs. 4.5%) but less likely to locate in urban ones (50.9% vs. 53.8%). This finding provides some insight as to the mechanisms behind the reduction in disparities among Health Regions seen in Section 4.1.3. The geographic distributions of 'inflow' versus 'stable' physicians were statistically different ($p<0.001$) when physicians were divided into GP/FPs and specialists. Again, a higher proportion of new entrants in both groups were located in rural LHAs compared with their 'stable' counterparts. Among specialty groups, new entrants were less likely than 'stable' physicians to locate in urban centres. For all specialties (except pediatrics and laboratory medicine/radiology), we also found that a smaller proportion of new entrants were located in the Vancouver and District and Capital regions. This finding supports those presented in Section 4.3.3.

The proportion of physicians graduating from the U.B.C. medical school was very similar for 'inflow' physicians (25.0%) compared with 'stable' physicians (26.0%). While more 'stable' GP/FPs graduated from U.B.C. (32.8%) compared with 'stable' specialists (17.9%) ($p<0.001$), these proportions did not change significantly for new entrants. Among the specialty groups, the proportion of new entrants who received their undergraduate medical training in B.C. ranged from 9.1% in obstetrics and gynecology to 24.4% in the medical subspecialties. Overall, 26.5% of 'inflow' physicians received training outside of Canada compared to 29.4% of 'stable' physicians. New entrant GP/FPs were also significantly less likely (23.0%) than new entrant specialists (31.5%) to have gained their training at non-Canadian schools. However, these proportions were not much different from similar proportions for 'stable' physicians. Across the specialty groups, the proportion of foreign-trained 'inflow' physicians ranged from less than 15% in the surgical subspecialties to more than 50% in psychiatry ($p<0.001$).

Table 4.28: Demographic and Training Characteristics of 'Inflow' and 'Stable' Physicians 1991-1996, by Grouped Specialty

Characteristic	General / Family Practice				General Internal Medicine				Medical Subspecialties				General Surgery				Surgical Subspecialties				Pediatrics			
	Inflow		Stable		Inflow		Stable		Inflow		Stable		Inflow		Stable		Inflow		Stable		Inflow		Stable	
	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)
Age																								
< 40	813	(77.2)	750	(23.1)	37	(62.7)	14	(5.2)	57	(69.5)	20	(6.8)	15	(57.7)	8	(5.0)	77	(64.2)	35	(7.2)	36	(63.2)	10	(6.1)
40 to 64	229	(21.7)	2,224	(68.6)	18	(30.5)	197	(73.0)	25	(30.5)	258	(87.5)	8	(30.8)	110	(68.8)	39	(90.7)	383	(78.5)	20	(35.1)	132	(80.5)
65+	11	(1.0)	267	(8.2)	4	(6.8)	59	(21.9)	0	(0.0)	17	(5.8)	3	(11.5)	42	(26.3)	4	(3.6)	70	(14.3)	1	(1.8)	22	(13.4)
Sex																								
Male	633	(60.1)	2,404	(74.2)	44	(74.6)	237	(87.8)	58	(70.7)	255	(86.4)	23	(88.5)	154	(96.3)	108	(90.0)	460	(94.3)	33	(57.9)	117	(71.3)
Female	420	(39.9)	837	(25.8)	15	(25.4)	33	(12.2)	24	(29.3)	40	(13.6)	3	(11.5)	6	(3.8)	12	(10.0)	28	(5.7)	24	(42.1)	47	(28.7)
Geographic Location																								
Urban	494	(46.9)	1484	(45.8)	34	(57.6)	182	(67.4)	51	(62.2)	209	(70.8)	5	(19.2)	74	(46.3)	65	(54.2)	279	(57.2)	38	(66.7)	109	(55.9)
Semi-urban	414	(39.3)	1536	(47.4)	24	(40.7)	84	(31.1)	29	(35.4)	83	(28.1)	20	(76.9)	75	(46.9)	52	(43.3)	206	(42.2)	18	(31.6)	53	(40.7)
Rural	145	(13.8)	221	(6.8)	1	(1.7)	4	(1.5)	2	(2.4)	3	(1.0)	1	(3.8)	11	(6.9)	3	(2.5)	3	(0.6)	1	(1.8)	2	(3.4)
Medical School																								
UBC	316	(30.0)	1,062	(32.8)	10	(16.9)	34	(12.6)	20	(24.4)	67	(22.7)	6	(23.1)	17	(10.6)	29	(24.2)	92	(18.9)	6	(10.3)	14	(8.5)
Other Canada	495	(47.0)	1,391	(42.9)	31	(52.5)	142	(52.6)	44	(53.7)	133	(45.1)	14	(53.8)	84	(52.5)	74	(61.7)	256	(52.5)	26	(44.8)	54	(32.9)
Non-Canada	242	(23.0)	788	(24.3)	18	(30.5)	94	(34.8)	18	(22.0)	95	(32.2)	6	(23.1)	59	(36.9)	17	(14.2)	140	(28.7)	26	(44.8)	96	(58.5)
Totals	1,053	-	3,241	-	59	-	270	-	82	-	295	-	26	-	160	-	120	-	488	-	58	-	164	-

Characteristic	Psychiatry				Obstetrics & Gynecology				Laboratory & Radiology				Anesthesiology				All Specialists**				Total Physicians**			
	Inflow		Stable		Inflow		Stable		Inflow		Stable		Inflow		Stable		Inflow		Stable		Inflow		Stable	
	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)
Age																								
< 40	49	(33.8)	23	(6.8)	29	(65.9)	10	(7.5)	75	(64.1)	36	(9.1)	43	(67.2)	28	(10.8)	418	(58.5)	198	(7.6)	1,248	(69.3)	948	(16.2)
40 to 64	93	(64.1)	246	(72.6)	15	(34.1)	91	(68.4)	39	(33.3)	316	(79.8)	19	(29.7)	211	(81.2)	276	(38.7)	2,032	(77.7)	523	(29.0)	4,256	(72.7)
65+	3	(2.1)	70	(20.6)	0	(0.0)	32	(24.1)	3	(2.6)	44	(11.1)	2	(3.1)	21	(8.1)	20	(2.8)	384	(14.7)	31	(1.7)	651	(11.1)
Sex																								
Male	96	(66.2)	251	(74.0)	28	(63.6)	108	(81.2)	88	(75.2)	309	(78.0)	47	(73.4)	219	(84.2)	550	(73.4)	2,207	(84.4)	1,183	(65.6)	4,611	(78.8)
Female	49	(33.8)	88	(26.0)	16	(36.4)	25	(18.8)	29	(24.8)	87	(22.0)	17	(26.6)	41	(15.8)	199	(26.6)	407	(15.6)	619	(34.4)	1,244	(21.2)
Geographic Location																								
Urban	81	(55.9)	252	(74.3)	17	(38.6)	77	(57.9)	73	(62.4)	237	(59.8)	33	(51.6)	166	(74.3)	397	(55.6)	1665	(57.9)	917	(50.9)	3,149	(53.8)
Semi-urban	59	(40.7)	85	(25.1)	23	(52.3)	55	(41.4)	41	(35.0)	146	(36.9)	30	(46.9)	92	(25.1)	296	(41.5)	908	(41.4)	718	(39.8)	2,444	(41.7)
Rural	5	(3.4)	2	(0.6)	4	(9.1)	1	(0.8)	3	(2.6)	13	(3.3)	1	(1.6)	2	(0.6)	21	(2.9)	41	(0.8)	167	(9.3)	262	(4.5)
Medical School																								
UBC	16	(11.0)	52	(15.3)	4	(9.1)	26	(19.5)	26	(22.2)	66	(16.7)	11	(17.2)	75	(28.8)	134	(17.9)	461	(17.6)	450	(25.0)	1,523	(26.0)
Other Canada	56	(38.6)	143	(42.2)	24	(54.5)	47	(35.3)	53	(45.3)	197	(49.7)	32	(50.0)	99	(38.1)	379	(50.6)	1,220	(46.7)	874	(48.5)	2,611	(44.6)
Non-Canada	73	(50.3)	144	(42.5)	16	(36.4)	60	(45.1)	38	(32.5)	133	(33.6)	21	(32.8)	86	(33.1)	236	(31.5)	933	(35.7)	478	(26.5)	1,721	(29.4)
Totals	145	-	339	-	44	-	133	-	117	-	396	-	64	-	260	-	749	-	2,614	-	1,802	-	5,855	-

* 'Stable' physicians refer to physicians on the 'active' CPSBC registers in 1991, 1993, and 1996. 'Inflow' physicians include newly-registered physicians between 1991 and 1996. Excludes 244 physicians who both gained and dropped CPSBC 'active' registration over this interval. Age and geographic location specified as of 1996. Geographic location determined by grouping Local Health Areas (LHAs) with regards to population density. Specialty designations refer to most recently recorded specialty from the CPSBC in 1996.

**Includes specialists (109 'stable' and 35 'inflow') in community medicine, physical medicine, occupational medicine, radiation oncology, and emergency medicine.

Table 4.29: Demographic and Training Characteristics of 'Outflow' and 'Stable' Physicians 1991-1996, by Grouped Specialty

	General / Family Practice				General Internal Medicine				Medical Subspecialties				General Surgery				Surgical Subspecialties				Pediatrics			
	Outflow		Stable		Outflow		Stable		Outflow		Stable		Outflow		Stable		Outflow		Stable		Outflow		Stable	
Characteristic	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)
Age																								
< 40	189	(36.6)	1,345	(41.5)	5	(9.6)	44	(16.3)	5	(20.8)	106	(35.9)	5	(9.4)	23	(14.4)	17	(17.0)	120	(24.6)	4	(14.8)	40	(24.4)
40 to 64	208	(40.3)	1,770	(54.6)	22	(42.3)	195	(72.2)	12	(50.0)	182	(61.7)	22	(41.5)	114	(71.3)	47	(47.0)	333	(68.2)	16	(59.3)	111	(67.7)
65+	119	(23.1)	126	(3.9)	25	(48.1)	31	(11.5)	7	(29.2)	7	(2.4)	26	(49.1)	23	(14.4)	36	(36.0)	35	(7.2)	7	(25.9)	13	(7.9)
Sex																								
Male	403	(78.1)	2,404	(74.2)	51	(98.1)	237	(87.8)	20	(83.3)	255	(86.4)	53	(100.0)	154	(96.3)	98	(98.0)	460	(94.3)	19	(70.4)	117	(71.3)
Female	113	(21.9)	837	(25.8)	1	(1.9)	33	(12.2)	4	(16.7)	40	(13.6)	0	(0.0)	6	(3.8)	2	(2.0)	28	(5.7)	8	(29.6)	47	(28.7)
Geographic Location																								
Urban	279	(54.1)	1,536	(47.4)	40	(76.9)	182	(67.4)	22	(91.7)	212	(71.9)	21	(39.6)	74	(46.3)	63	(63.0)	288	(59.0)	20	(74.1)	113	(68.9)
Semi-urban	181	(35.1)	1,444	(44.6)	11	(21.2)	84	(31.1)	2	(8.3)	82	(27.8)	29	(54.7)	71	(44.4)	35	(35.0)	197	(40.4)	7	(25.9)	48	(29.3)
Rural	56	(10.9)	261	(6.1)	1	(1.7)	4	(1.3)		(0.0)	1	(0.3)	3	(5.7)	15	(9.4)	2	(2.0)	3	(0.6)	0	(0.0)	3	(1.8)
Medical School																								
B.C.	106	(20.5)	1,062	(32.8)	6	(11.5)	34	(12.6)	3	(12.5)	67	(22.7)	4	(7.5)	17	(10.6)	14	(14.0)	92	(18.9)	3	(11.1)	14	(8.5)
Other Canada	229	(44.4)	1,391	(42.9)	27	(51.9)	142	(52.6)	12	(50.0)	133	(45.1)	36	(67.9)	84	(52.5)	59	(59.0)	256	(52.5)	10	(37.0)	54	(32.9)
Non-Canada	181	(35.1)	788	(24.3)	19	(36.5)	94	(34.8)	9	(37.5)	95	(32.2)	13	(24.5)	59	(36.9)	27	(27.0)	140	(28.7)	14	(51.9)	96	(58.5)
Totals	516	-	3,241	-	52	-	270	-	24	-	295	-	53	-	160	-	100	-	488	-	27	-	164	-

	Psychiatry				Obstetrics & Gynecology				Laboratory/Radiology				Anesthesiology				All Specialists**				All Physicians**			
	Outflow		Stable		Outflow		Stable		Outflow		Stable		Outflow		Stable		Outflow		Stable		Outflow		Stable	
Characteristic	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)
Age																								
< 40	4	(8.5)	76	(22.4)	5	(15.2)	21	(15.8)	14	(17.7)	110	(27.8)	8	(17.8)	81	(31.2)	71	(14.9)	655	(25.1)	260	(26.2)	2,000	(34.2)
40 to 64	22	(46.8)	229	(67.6)	17	(51.5)	95	(71.4)	39	(49.4)	265	(66.9)	26	(57.8)	171	(65.8)	228	(47.9)	1,767	(67.6)	436	(44.0)	3,537	(60.4)
65+	21	(44.7)	34	(10.0)	11	(33.3)	17	(12.8)	26	(32.9)	21	(5.3)	11	(24.4)	8	(3.1)	177	(37.2)	192	(7.3)	296	(29.8)	318	(5.4)
Sex																								
Male	38	(80.9)	251	(74.0)	26	(78.8)	108	(81.2)	72	(91.1)	309	(78.0)	34	(75.6)	219	(84.2)	425	(89.3)	2,207	(84.4)	828	(83.5)	4,611	(78.8)
Female	9	(19.1)	88	(26.0)	7	(21.2)	25	(18.8)	7	(8.9)	87	(22.0)	11	(24.4)	41	(15.8)	51	(10.7)	407	(15.6)	164	(16.5)	1,244	(21.2)
Geographic Location																								
Urban	37	(78.7)	247	(72.9)	20	(60.6)	82	(61.7)	53	(67.1)	245	(61.9)	29	(64.4)	170	(65.4)	315	(66.2)	1,696	(64.9)	594	(59.9)	3,232	(55.2)
Semi-urban	10	(21.3)	90	(26.5)	11	(33.3)	50	(37.6)	22	(27.8)	139	(35.1)	16	(35.6)	87	(33.5)	149	(31.3)	874	(33.4)	330	(33.3)	2,318	(39.6)
Rural	0	(0.0)	2	(0.6)	2	(6.1)	1	(0.8)	4	(5.1)	12	(3.0)	0	(0.0)	3	(1.2)	12	(2.5)	44	(1.7)	68	(6.9)	305	(5.2)
Medical School																								
B.C.	4	(8.5)	52	(15.3)	1	(3.0)	26	(19.5)	9	(11.4)	66	(16.7)	5	(11.1)	75	(28.8)	50	(10.5)	461	(17.6)	156	(15.7)	1,523	(26.0)
Other Canada	20	(42.6)	143	(42.2)	13	(39.4)	47	(35.3)	42	(53.2)	197	(49.7)	24	(53.3)	99	(38.1)	249	(52.3)	1,220	(46.7)	478	(48.2)	2,611	(44.6)
Other Country	23	(48.9)	144	(42.5)	19	(57.6)	60	(45.1)	28	(35.4)	133	(33.6)	16	(35.6)	86	(33.1)	177	(37.2)	933	(35.7)	358	(36.1)	1,721	(29.4)
Totals	47	-	339	-	33	-	133	-	79	-	396	-	45	-	260	-	476	-	2,614	-	992	-	5,855	-

* 'Stable' physicians refer to physicians on the 'active' CPSBC registers in 1991, 1993, and 1996. 'Outflow' physicians refer to those leaving the CPSBC 'active' registers between 1991 and 1996. Excludes 244 physicians who both gained and dropped CPSBC 'active' registration over this interval. Age and geographic location specified as of 1991. Geographic location determined by grouping Local Health Areas (LHAs) with regards to population density. Specialty designations refer to most recently recorded specialty from the CPSBC in 1991.

**Includes specialists (106 'stable' and 16 'outflow') in community medicine, physical medicine, occupational medicine, radiation oncology, and emergency medicine.

4.3.3.2 Characteristics of 'Outflow' Physicians

Not surprisingly, we found that 'outflow' physicians were significantly older than those in 'stable' practice from 1991 to 1996 ($p<0.001$). Overall, 29.8% of the exiting physicians were aged 65+ years compared to only 5.4% of stable physicians ($p<0.001$). Although the reasons underlying these exits are unknown, the most likely explanations for this age group are retirement and death (although this is a rare occurrence). The proportion of older 'outflow' specialists (37.2%) was also significantly larger than a similar proportion of exiting GP/FPs (23.1%) ($p<0.001$). This finding suggests that GP/FPs may be more likely than specialists to retire at younger ages. Another important finding was the relatively large percentage of exiting GP/FPs who were less than 40 years of age (36.6%). Not only was this larger than that for older 'outflow' GP/FPs (23.1%), but it was also much larger than the similar proportion of younger specialist physicians who exited (14.9%). Retirement is unlikely in this age group and further research is needed to understand the reasons underlying these departures from practice. Across the specialty groups, the proportion of 'outflow' physicians aged 65+ years ranged from 24.4% for anesthesiology to 49.1% for general surgery. In all cases, however, the proportion of older 'outflow' physicians was greater than the 'stable' pool of physicians. Conversely, the proportion of exiting physicians aged less than 40 years ranged from only 8.5% of psychiatrists to 20.8% of medical subspecialists. The specialties with the greatest proportion of outflow physicians in this youngest age group (<15%) were the medical and surgical subspecialties, anesthesiology, obstetrics and gynecology, and laboratory/radiology medicine.

In contrast to the analysis of 'inflow' physicians (see Section 4.3.3.1), 'outflow' physicians were significantly more likely to be male (83.5%) than were 'stable' physicians (78.8%) ($p<0.001$). This differential is apparent for both GP/FPs and specialists ($p<0.001$) and relates to the fact that older retiring physicians were more likely male. Among the specialty groups, there was some variability in the sex distribution of 'outflow' versus 'stable' physicians. For the most part, however, the overwhelmingly male sex-mix of the 'stable' community was reflected in that of the departing physicians.

No consistent patterns emerge in the examination of the geographic distribution of 'outflow' versus 'stable' physicians. On the whole, more 'outflow' physicians originated from urban locales than did 'stable' physicians, but this finding was not consistent across the specialty groups. The proportion of exiting physicians originating from rural LHAs was small (10% or less) for all the specialty groups with no large differences among them.

In contrast to 'inflow' physicians who were as likely to be trained at U.B.C. as 'stable' physicians, 'outflow' physicians were less likely to have received their medical degrees from U.B.C. (15.7% vs. 26.0%) ($p<.0001$). This finding was apparent for both GP/FPs and specialists. When separated by specialty, smaller proportions of 'outflow' physicians were trained at U.B.C. compared with 'stable' physicians in most specialties, but there are many small cell sizes. Moreover, while exiting physicians were more likely than 'stable' ones to have been trained outside Canada (36.1% vs. 29.4%), this pattern was not consistent across specialties. Thus, greater representation of U.B.C.-trained physicians over time (see Section 4.1) was due not to a

greater inflow of U.B.C.-trained physicians, but rather to a higher outflow of non-Canadian trained ones.

Principal Findings: ***Physician Stability by Demographic and Training Characteristics***

- Among specialties, there were significant age differences in physicians entering and exiting practice. As expected, 'inflow' physicians were significantly younger and 'outflow' physicians significantly older than 'stable' physicians.
- There was also significant variability among specialty groups in the proportions of female physicians migrating in and out of practice. Overall, 'inflow' physicians were more likely and 'outflow' physicians less likely to be female than were 'stable' physicians.
- 'Inflow' physicians were more likely to locate in rural areas and less likely to move to urban areas than physicians in 'stable' practice. Exiting physicians appear to be no more likely than 'stable' physicians to come from urban areas.
- 'Inflow' physicians were no more likely than 'stable' physicians to have received their medical degrees at U.B.C. However, exiting physicians were less likely to be U.B.C.-trained, which explains the net increase in the representation of U.B.C.-trained physicians seen in Section 4.1.

4.4 Aim IV: The 'Life Cycle' of a Physician's Practice, 1991/92 to 1996/97

In addition to examining the number of physicians entering and leaving practice, medical human resources planning should also account for expected changes in practice intensity. This section examines how practice intensity changes over the professional 'life-cycle' of a physician's practice, from the period following completion of post-secondary education until retirement. The purpose of this section is to provide data with which to understand changes in practice intensity. For these analyses, physicians on the 'active' register of the CPSBC in 1991, 1993 and 1996 (i.e., 'stable' physicians) were divided into 5-year birth cohorts. We analyzed how the income of these physicians changed over the study period as a function of their age. Physician income was used to measure practice 'output'. In general, we hypothesized that younger physicians would have growing practices, middle-aged physicians would have relatively stable practices, and older physicians would gradually taper their practices as they neared retirement. The departure from practice for older physicians is discussed in Section 4.3. Incomes were indexed to remove the effect of price changes and inflation.

For this analysis, we excluded specialties where service agreements accounted for more than 10% of all physician payments by the Ministry of Health in 1996/97, including pediatrics, geriatric medicine, medical oncology, and emergency medicine. Exclusion of these specialists was necessitated by the lack of physician-specific payment information for these service agreements. Physicians who changed specialty designation during this period were excluded. Laboratory and radiology specialists were also excluded because of the lack of physician-specific FFS billing information. We also excluded 110 'outlier' physicians with large changes in their billing patterns

over the course of the study period. These excluded physicians were those whose proportional change in billings (i.e., [1996/97 income – 1991/92 income] ÷ [1991/92 income]) were in the top or bottom percentile, compared to their peers. Given the large changes in the billings for these physicians, we assumed that there were other significant and unobserved factors that influenced their changes in practice intensity.

Figure 4.19 shows the mean payments (FFS billings combined with APB Salary/Sessional payments) for this subset of physicians in 1991/92 compared to their 1996/97 payments. Two main age-related findings are readily apparent. First, there were significant differences in the total payments for physicians in different birth cohorts in both study years ($p<0.0001$). During 1991/92, physician payments progressively increased until age 50-54 and then progressively decreased until age 65+. Second, there appeared to be significant differences by birth cohort in how incomes changed over the period from baseline in 1991/92. The practices of physicians aged <40 years tended to grow (with the largest increases occurring in physicians aged <30 years). Practices were relatively stable for physicians between 40-49 years of age, and then gradually declined after age 50 (with the largest declines occurring after age 60).

Figures 4.20, Parts (a) to (d) show similar graphs that analyze this pattern of practice acceleration, stability, and deceleration for physician specialty, sex, geographic location and place of medical education.

Figure 4.20, Part (a) compares GP/FPs with all specialists combined. Because of the small cell sizes for grouped specialties leading to instability in the estimates, all specialists were analyzed together. Overall, the shapes of the two graphs appear similar (despite the very different mean incomes). In 1991/92, middle-aged physicians had the highest incomes, while the incomes of younger and older physicians were substantially reduced. Also, the change in income appeared to be age-related, with younger physicians gaining, middle-aged physicians remaining stable, and older physicians tapering down practice. While the overall patterns were similar, there were some differences in which age groups the peaks occurred, as well as for the size of the changes. In 1991/92, specialist incomes were highest for specialists aged 45-59 while for GP/FPs the peak income was marginally older at ages 50-54. Over the ensuing 5 years, younger specialists (i.e., <50 years) had larger proportional changes than did GP/FPs. Moreover, growth peaked later for specialist practices than for GP/FP practices. The tapering of practice intensity after age 55 however, was similar for both GP/FPs and specialists.

Across the categories of age, geographic location, and location of medical school, the convex shape of the distribution was consistent. Income tended to peak at middle age, although there was some variation in which age group was the largest. Similarly, younger physicians (aged <50) consistently showed growing practices, middle-aged physicians had relatively stable practices, and older physicians had tapering practices regardless of their sex, geographic location, or the location of their medical school education.

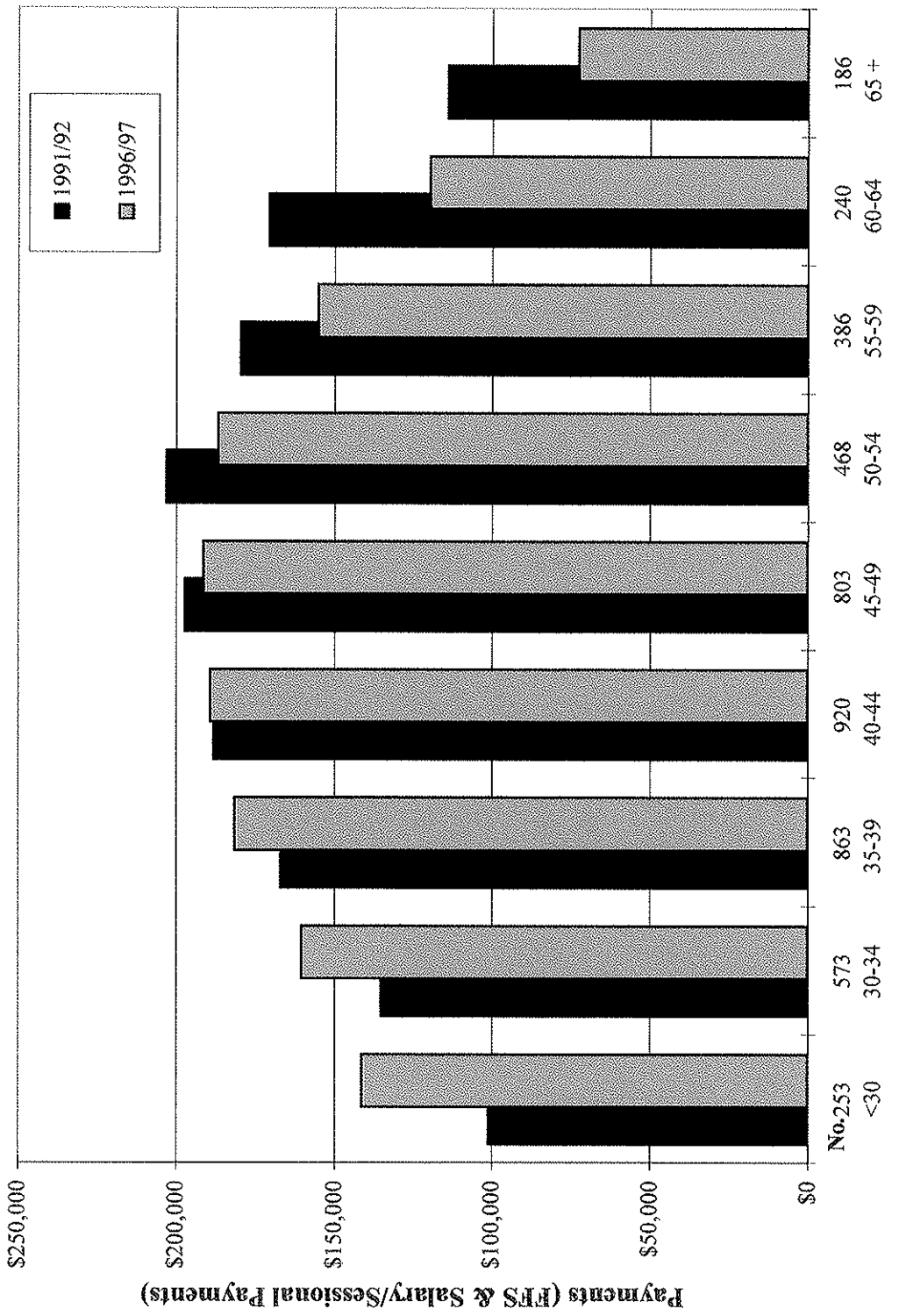
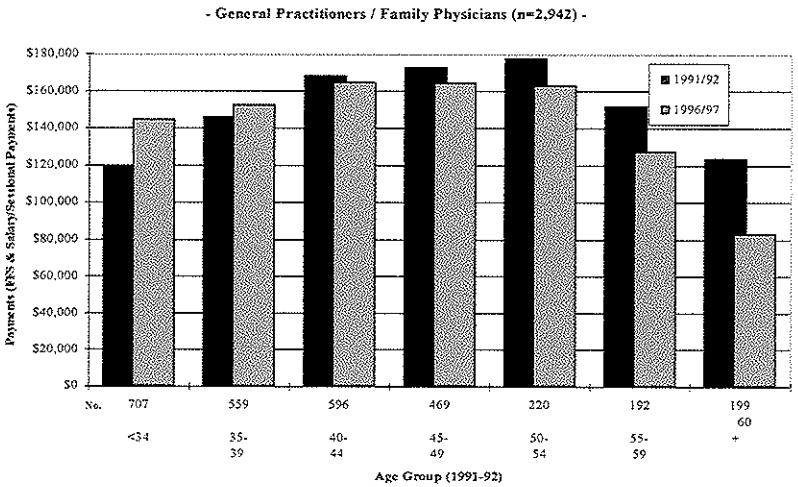
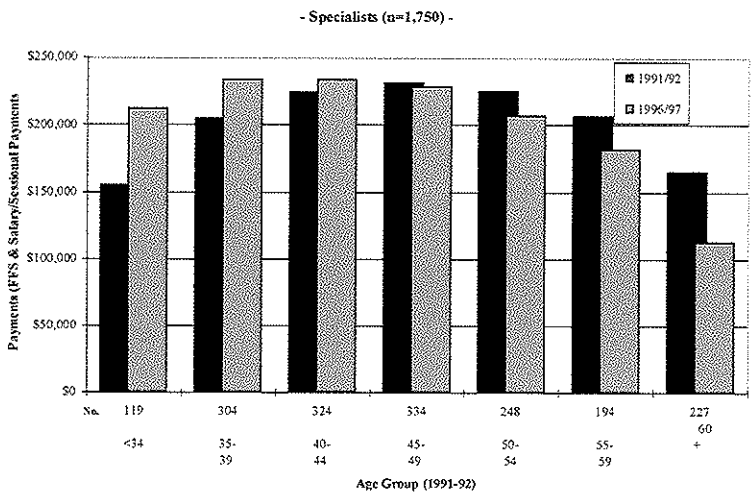


Figure 4.19: Mean Total Payments in 1991/92 & 1996/97 for Cohort of 'Stable' Physicians by Age Group in 1991/92 (n=4,692)

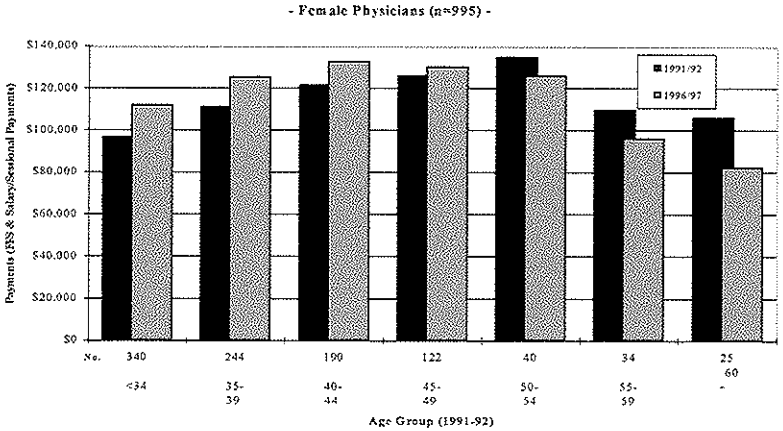
Figure 4.20 Mean Total Payments in 1991/92 & 1996/97 for Cohort of 'Stable' Physicians by Age Group in 1991/92, Specialty, Sex, Geography, and Place of Graduation

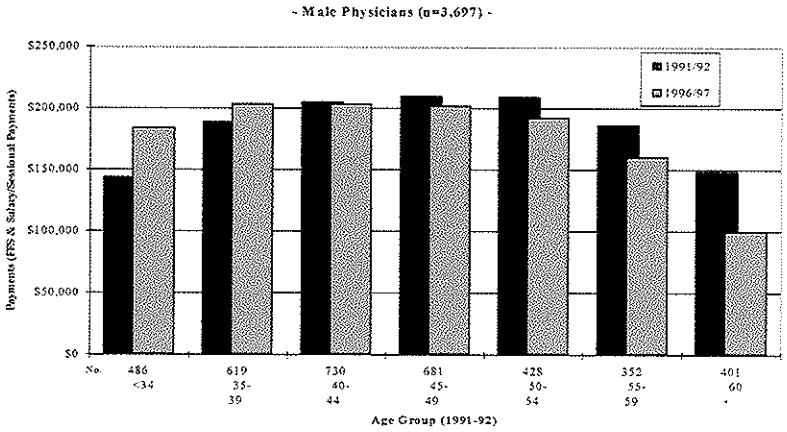
a. Primary Care/Specialty Care





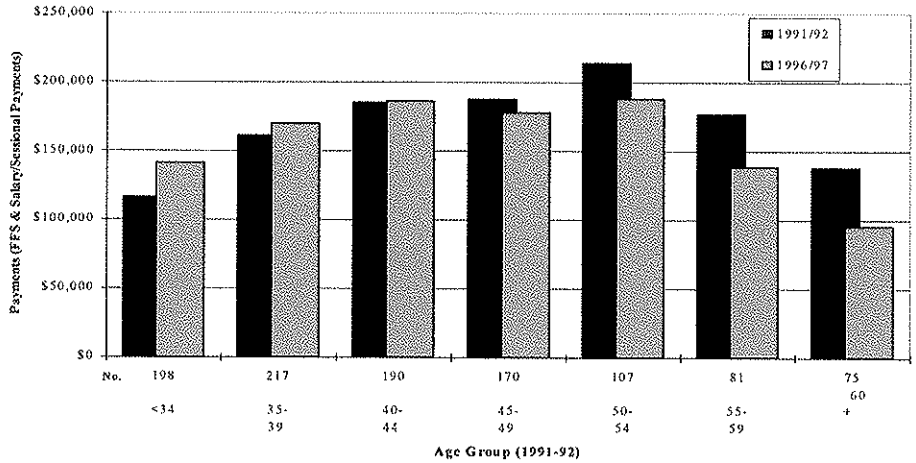
b. Sex



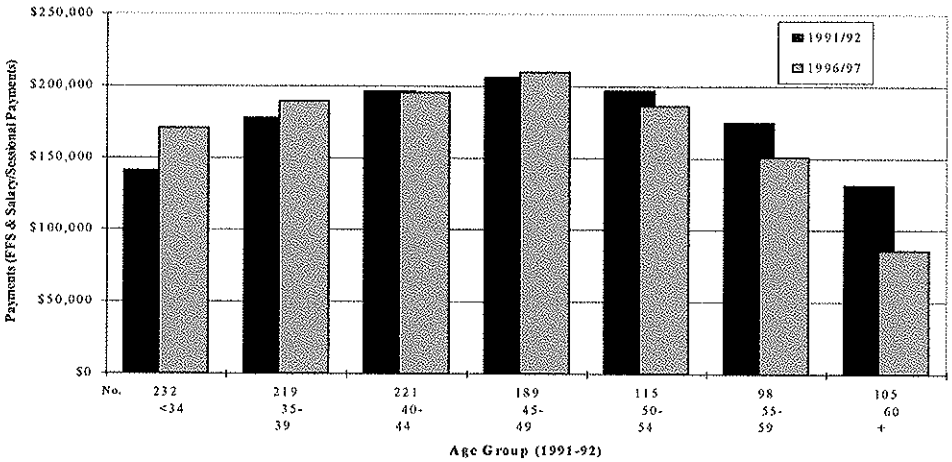


c. Geographic Location

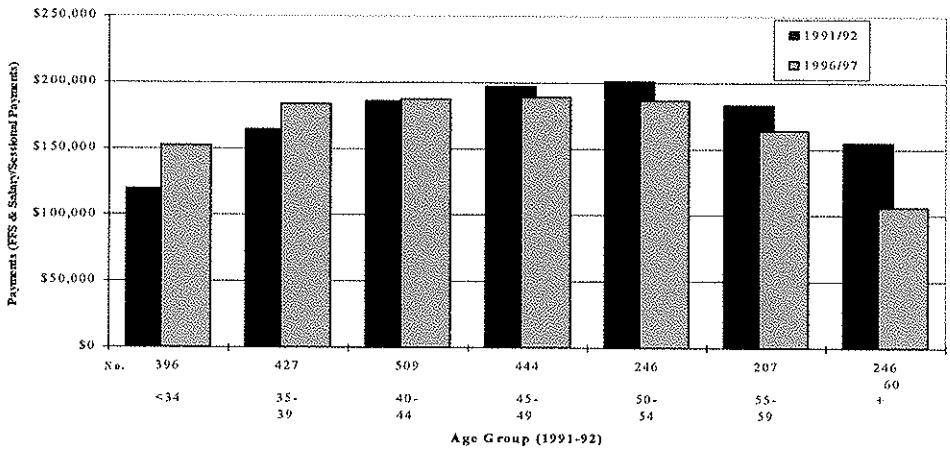
- Rural Physicians (n=1,038) -



- Semi-urban Physicians (n=1,179) -

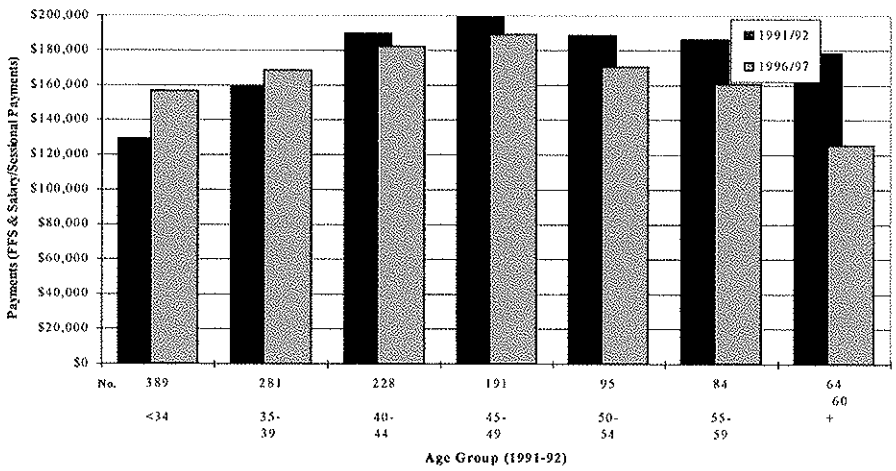


- Urban Physicans (n=2,475)

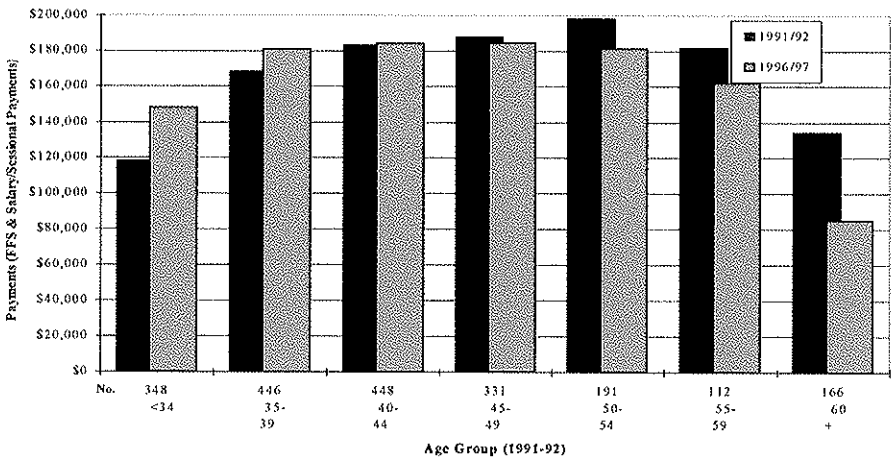


d. Location of Medical School

- U.B.C. Graduates (n=1,332) -



- Other Canadian Graduates (n=2,042) -



- Non-Canadian Graduates (n=1,318) -

Table 4.30 shows similar analyses using the proportional change in income as the dependent variable. On the right side of the table, we present a one-way analysis of variance analysis examining the effect of age on changes in practice income, stratified for different sexes, location of medical school education, full-time-equivalency, and geographic location. The intent of these analyses is to confirm the findings above with regard to how changes in proportional income vary over the 'life-cycle' of a physician's practice. These analyses are presented for GP/FPs only; there were similar findings for specialists but the data are not shown for the sake of simplicity. At first glance, it is evident that all the analyses are statistically significant, showing important age-related differences across these stratification variables. Furthermore, if one analyzes the mean values (interpreted as the proportional change in income), one sees that the changes are consistently positive for younger physicians (<40 years), with the largest increases seen for those physicians aged <30 in 1991/92. The mean values approach zero at age 40-49 years for most categories, with the main exception being female and part-time physicians (i.e., FTE<0.5). For the cohort aged 50-59, most physician groups show a decline in practice activity (several are positive but near zero). After age 60, all categories of physicians were found to taper their practices. While the trends appear similar across categories, however, the magnitude of the changes was quite variable. Moreover, there was significant variation around the mean in most categories. Thus, to obtain precise estimates of the age-related effects in the change in practice intensity, multivariate analyses are required to control these confounding variables.

The analyses described above suggest that there are important changes in practice intensity that can be expected as physicians age. This effect is evident for GP/FPs and specialists across sex, geographic location, place of medical school education, and full-time-equivalency categories. On the whole, physician practices appear to grow until about age 40, remain stable until about age 55, and then progressively decline. The main policy implication of these findings is that the present cohort of physicians can be expected to expand or taper their practices as a function of their age characteristics. In regions and/or specialties with a large proportion of young physicians, increased productivity can be predicted for those that remain in practice. Conversely, for those specialties and/or regions with an older group of physicians (especially if a large proportion are over 55 years) significant reductions in service intensity (and thus overall supply) can be expected. However, predictions of this type may be hazardous, given that they involve generalizing from the group level to the individual physicians. In regions and/or specialties with small numbers, the predictability of these changes is severely limited.

Table 4.30: Change in Practice Income between 1991/92 and 1996/97 for GP/FPs by Age Group, Sex, Place of Medical School Education, Geographic Location and Full-time-Equivalency*

	All Ages					Age Group																
						<30 Years			30-39 Years			40-49 Years			50-59 Years			60+ Years				
	n	Mean	SD	Statistic**	P-value	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD	Statistic***	P-value
Sex																						
Female	768	0.43	1.4	34.48	0.0001	109	0.97	1.98	372	0.47	1.51	226	0.24	0.83	49	0.03	0.77	12	-0.27	0.42	7.14	0.0001
Male	2,174	0.15	1.02			140	1.1	2.05	645	0.32	1.16	839	0.02	0.61	363	-0.06	0.49	187	-0.11	1.13	48.18	0.0001
Medical School																						
B.C.	1,001	0.21	0.97	0.63	0.5351	124	0.88	1.37	431	0.28	1.15	294	-0.01	0.33	110	-0.07	0.33	42	-0.32	0.33	27.1	0.0001
In Canada	1,237	0.26	1.17			108	1.03	2.04	436	0.37	1.23	490	0.11	0.82	134	0.05	0.81	69	-0.21	0.88	19.77	0.0001
Outside Canada	704	0.21	1.31			17	2.34	4.34	150	0.65	1.78	281	0.09	0.63	168	-0.1	0.31	88	0.04	1.43	21	0.0001
Full-Time-Equivalency																						
< 0.5	319	0.13	1.78	1.29	0.2765	30	0.51	1.93	91	0.48	2.26	67	0.18	1.7	42	-0.36	0.52	89	-0.15	1.52	2.66	0.0327
0.5-1.2	1,908	0.23	1.11			168	1.12	2.23	670	0.37	1.21	672	0.04	0.53	297	-0.01	0.57	101	-0.10	0.59	44.43	0.0001
>1.2	715	0.25	0.83			51	1.09	1.13	256	0.36	1.04	326	0.10	0.53	73	0.01	0.26	9	-0.06	0.2	20.76	0.0001
Geographic Location																						
Rural	815	0.24	1.23	55.46	0.0001	63	0.75	1.58	299	0.51	1.62	285	0.05	0.76	117	-0.06	0.66	51	-0.25	0.42	12.27	0.0001
Semi-urban	817	0.20	1.02			56	1.33	2.4	305	0.28	0.97	284	0.05	0.47	119	-0.07	0.43	53	-0.12	1.15	25.35	0.0001
Urban	1,310	0.24	1.15			130	1.06	2.02	413	0.35	1.25	496	0.09	0.71	176	-0.02	0.5	95	-0.06	1.31	24.78	0.0001

* Change in income is calculated as (1996/97 income - 1991/92 income) /1991/92 income. Includes GP/FPs on the 'active' CPSBC registers in 1991, 1993, and 1996, excluding those with extreme proportional billing changes (< -0.95 and > 13.53).
1996/97 income adjusted by Consumer Price Index: 1996 index = 111.85 (base 1991).

**F-statistic from analysis of variance (unbalanced model) testing for differences in mean billing change between levels of the covariate of interest.

***F-statistic from one-way analysis of variance (unbalanced model) testing for differences in mean billing change among urbanicity levels, stratified by age, sex, medical school, FTE or PGME location.

Principal Findings: The Professional 'Life cycle' of a Physician's Practice

- Important effects exist between physician age and practice output (i.e., gross income).
- Overall, incomes were highest for physicians aged 40-54. Incomes progressively increased with age before 40 years and progressively decreased with age after age 54.
- Over the 5-year study period, the practices of physicians aged <40 years tended to grow in intensity, were relatively stable for physicians between 40-49 years, and then gradually declined after age 50 (with the largest declines occurring after age 60).
- These age effects were generally consistent regardless of sex, geographic location, place of medical school graduation, and full-time-equivalency (although there were some differences in what ages the peaks occurred).
- The age of the physician pool for regions and/or specialty groups can have important implications for future supply. If current trends hold, regions and/or specialties with younger physicians can expect to have increased future supply (assuming limited out-migration) while those with older pools of physicians will likely see important reductions in activity.

5. Discussion

Concerns about physician supply usually focus on a discrete set of questions including: Is the ratio of doctors to the population enough? Will growth in physician numbers meet the demands of an aging population? How will the introduction of new technologies change the need for physicians? On deeper examination, the array of issues faced by B.C. policy makers charged with physician workforce planning is much more complex, clustering around three principal themes: (1) *Physician Supply.* What is the current supply of different types of physicians in B.C.? How are they distributed among different populations? How many more can be expected to establish practice and how many will leave? From where will the new doctors to the province come? What policy 'levers' are available to influence migration patterns both into and out of the province and for different health regions? How is the 'load' of physician practices anticipated to change? (2) *Demand for Care.* What are the needs of the population for different types of physician services? How do these needs differ among important sub-populations? How will population growth influence these needs? Is case-mix and acuity expected to change and, if so, how and in which populations? How will advances in medical care and the move towards 'best practices' influence those needs? What are patient expectations regarding who provides their care? (3) *Physicians' Roles.* How are roles and responsibilities for patient care shared between primary care providers and the array of different specialists? Are these appropriate roles given the health system goals of efficiency and quality? How does the scope of practice for physicians differ and is this anticipated to change? What roles could and should be shared with non-physician providers, such as advanced practice nurses?

This report provides insight into some of the supply-side considerations listed above. Requested by the Postgraduate Medical Education Advisory Committee of B.C., this descriptive study was designed to examine the supply and distribution of GP/FPs and different types of specialist physicians across a variety of geographies in B.C. during the period 1991/92-1996/97. The study also examined patterns of entry to and exit from the province and its regions, differences in physician scope of practice, and age-related changes in physicians' practices over time. While the study intends to provide a comprehensive 'snapshot' of physician supply over this period, it does not examine other key issues mentioned above. Most importantly, the study does not consider issues relating to population 'need' nor the extent to which health care needs are met with the current complement of physicians. Moreover, while trends in stability and practice intensity were described, it was beyond the scope of this study to predict whether these trends will continue, accelerate, or decelerate in the future. Thus, while the data presented here seek to help policy makers understand the physician supply 'landscape' in B.C., the report presents only a small slice of the information required for comprehensive planning of B.C.'s physician workforce and training programs. Policy makers at the academic, provincial, regional, or local levels should interpret these findings only in the context of the broader dynamics of workforce planning and health services delivery. Where no or little data exist regarding the issues mentioned above, further research is required. The following discussion provides a synthesis of the key issues addressed in this report.

Growth in Physician Supply Relative to Population Growth

As a starting point, we found that there was little net change in the overall supply of physicians in B.C from 1991/92 to 1996/97. We estimate that the per capita supply of physicians remained relatively stable at about 18 full-time-equivalents per 10,000 B.C. residents in both study years. However, beneath this apparent stability, we found that some significant changes had taken place. During this period, B.C. had a net gain of 810 physicians from the baseline of 6,922 on the 'active' registers in 1991/92. However, this relatively large growth in supply was matched by equally rapid growth in the B.C. population, approximately 3% per year. When separated into generalist and specialist physicians, we found virtually no differences in the rates of growth; the supply of GP/FPs remained at about 10 FTEs per 10,000 population while specialist supply stayed at about 8 FTEs per 10,000. Thus, there was virtually no change in the relative proportions of primary care physicians and specialists (55% and 45%, respectively) over the interval.

These findings underscore the importance of anticipated population changes in workforce planning efforts. For instance, accelerations or decelerations in population growth may result in substantial differences in per capita supply in the face of relatively stable patterns of growth in physician numbers. Current projections are for the B.C. population to grow to approximately 4.17 million by 2001, about a 7.2% increase in the five year period since 1996[27]. This is about 1.4% annual growth – well below the observed growth in the previous 5 years. If the observed 1991-1996 physician growth pattern continues, the 2001 doctor/population ratios would likely increase substantially relative to that in 1996. However, if the growth in the number of physicians were to change, the doctor/population ratio would be appreciably modified. It was beyond the scope of this study to examine which among a number of alternative scenarios is more plausible.

While there were only small differences in patterns of growth between GP/FPs and all specialists combined, there were important differences in growth among RCPSC specialty groups. Most RCPSC specialties saw a net increase in the numbers of physicians during this period; however, four specialties saw a net decline (general surgery, otolaryngology, hematology, and orthopedic surgery). Moreover, when examined in relation to population growth, some specialties increased while others decreased in their per capita supply. The largest declines in per capita supply occurred in hematology (-5.3% per year), otolaryngology (-3.7% per year), general surgery (-3.6% per year), medical biochemistry (-2.8% per year), cardiovascular and thoracic surgery (-2.7% per year) and orthopedic surgery (-2.7% per year). Conversely, the largest relative gains were in endocrinology and metabolism (+10% per year), nuclear medicine (+9% per year), medical oncology (+6.81% per year) and psychiatry (+2.5% per year).

FTE/population ratios are presented in this report only to gauge how physician supply changed over the study period. In order to consider appropriateness of these ratios, they should be examined against the backdrop of region-specific population health needs. Furthermore, sociodemographic environmental, occupational, geographic and other factors should be examined when estimating population health needs. Questions pertaining to physician requirements/demand and population, health needs were beyond the scope of this study.

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Geographic Disparities in Physician Supply and Patterns of Growth

A large portion of this report is devoted to analyzing differences in the regional supply of physicians in British Columbia. The distributions of GP/FPs and all specialists combined were analyzed at the level of the Health Region. For groups of specialists, we analyzed the distribution of major RCPSC specialty groups for a larger unit of geography, the Health Human Resources Unit (HHRU) region. Only a few of the major findings are presented below. Readers are encouraged to review Sections 4.1.2 and 4.1.3 which provide a detailed description of regional growth by specialty.

For GP/FPs we found large differences in supply among the 20 Health Regions. There was almost a two-fold difference between the region with the largest supply, Vancouver (13.4 FTEs per 10,000), and the region with the smallest supply, Peace Liard (7.9 FTEs per 10,000). These large differences suggest important and continuing differences in the supply of physician-delivered primary care throughout the province. In general, health regions in the lower mainland and southern Vancouver Island had a greater number of FTEs per capita than regions in the interior or northern areas of the province, despite also having access to much larger supplies of all specialists and sub-specialists. The appropriateness of disparities in GP/FP supply across regions must be assessed in the context of differences in population health needs for primary care. The Provincial Health Officer's Annual Report on the Health of British Columbians (1996) suggests significant disparities in health status among the regions. More work is required to develop valid and reliable indicators of the need for different types of physician services before one can confidently comment on the adequacy of physician and other health workforce supply.

All regions (except West Kootenay-Boundary) saw a net increase in both the number of physicians and number of FTEs serving their populations during this time period. However, given the differential patterns of population growth, only 13 of the 20 regions saw increases in their per capita FTE supply. The changes in the FTE to population ratio ranged from –1.8 FTEs per 10,000 in West Kootenay-Boundary to +2.6 FTEs per 10,000 in the Northwest regions. Furthermore, the disparities in the regional supply of GP/FPs decreased during the study period. On the whole, regions with the largest per capita growth of GP/FPs were those with the smallest baseline supply. Differences in the rates of population growth among regions do not explain these differences. Clearly, an issue important to physician resources planning is to understand how or whether workforce policies in effect during this time influenced these changes. A variety of physician recruitment and retention policies were employed during some or all of this time period, some of which may have affected regional disparities in GP/FP supply. These measures included a variety of community recruitment efforts, the 'Northern and Isolation Allowance Program', the 'Subsidized Income Program', the 'Northern and Rural *Locum* Program' and the so-called 'Interim Physician Supply Measures' (IPSM) (Barer, Wood, and Schneider, 1999). The latter initiative, the best known among these policies (and which formed the basis of the Permanent Physician Supply Measures of 1996), provided financial incentives for locating in geographic areas of defined 'need'. Further research is needed to understand how these policy levers (and other factors) influenced the reduction in regional disparities in the GP/FP distribution during this time.

For specialists, we found that physician supply in the Vancouver and Capital health regions greatly exceeded that in all other health regions. This finding is not surprising and highlights the fact that many specialists act as 'provincial resources' delivering highly specialized care to all B.C. residents. Outside these regions, we also found considerable variability among regions suggesting that specialists in the remainder of the province are coordinated around secondary care centres and regional referral networks. All health regions (except the Peace Liard region) saw a net gain in the number of specialist FTEs during the study period. As with GP/FPs, differential rates of population growth resulted in an increase in per capita supply in just over one-half the regions. The changes in the specialist FTE to population ratio ranged from a drop of -1.0 FTEs per 10,000 to a gain of +1.4 FTEs per 10,000. As with GP/FPs, our analysis showed that (outside of the Vancouver and Capital regions) regions with the smaller 1991 supplies were more likely to gain in per capita supply.

For our major groupings of RCPSC specialties (internal medicine, general surgery, pediatrics, obstetrics/gynecology, psychiatry, medical subspecialties, surgical subspecialties, laboratory medicine and radiology, and 'other' specialists), there were substantial differences in supply across the nine HHRU regions. The specialties with the smallest disparities (i.e., between one third and 3-fold variation among main HHRU regions) included the 'general' specialties of internal medicine, general surgery, and laboratory medicine/radiology. These findings suggest that there was a fairly equitable distribution of these specialists surrounding regional referral centres (in as much as HHRU regions represent common resource units).

At the other end of the spectrum, there was greater than a 5-fold variation in the supply for psychiatry and the medical subspecialties. Given that psychiatry can also be considered a 'general' specialty, this finding may suggest the need for policies to improve the availability of psychiatric care in rural regions. Further research is required, however, to examine regional disparities in mental health needs. We may be overstating the regional disparities in the delivery of mental health care, given that other mechanisms exist to deliver psychiatric services to rural locales (Mental Health Evaluation and Community Consultation Unit (MHECCU), 2000). A joint study (HHRU, MHECCU) on the mental health workforce in BC is currently underway.

Our analysis of the geographic distribution of pediatricians is limited as we are not able to distinguish with our data sources 'general' pediatricians from pediatric subspecialists. Given this limitation, it is not surprising to find a relatively large supply of pediatricians in Vancouver, the site of the B.C. Children's Hospital. If one excludes this region (and the North region which had no permanent pediatricians in either study year), the distribution of pediatricians appears fairly equitable across the remaining HHRU regions (about a two-fold variation).

Over the study period, we found that supply increased fairly consistently across regions for some specialties, declined fairly consistently for others and was mixed for the remainder. General surgery saw the most consistent declines across regions, decreasing in per capita supply in 8 of the 9 HHRU regions. However, the declines were greater in some regions than others leading to more overall disparities. Psychiatry saw the most consistent increases across regions (8 regions) which had the effect of reducing disparities across regions. For many of these specialty groups, regions experienced the net loss or gain of only a few specialist FTEs. These small changes in physician

numbers often translated into large relative changes. This finding underscores the large influence on the regional supply of particular specialist services that the decisions of only one or two physicians can have. Furthermore, given that anecdotal accounts of recruitment and retention of specialists in these regions are often portrayed to be difficult and unpredictable, other strategies may be required to 'stabilize' specialist physician supply. These strategies would vary by specialty and may include (but are not limited to) mobile 'out-reach' clinics and tele-health. Also, since there is often a fixed supply of available specialists (unless they are recruiting from abroad), regions may unnecessarily 'compete' in trying to attract the same physicians. It is obvious from this analysis that efforts by one region can have large relative impacts on another. In addition, our analyses underscore the need for coordinated health human resource planning among regions (Health Association of B.C. and Council of University Teaching Hospitals, 1999).

Practice Stability, Scope of Practice and Life-Cycle Activity Patterns

In addition to describing how physician supply changed during the study period, this study sought to 'peel the onion' to expose the dynamics underlying the changes in the numbers and activity of physicians on the CPSBC 'active' registers. (See Figure 5.1.) In Sections 4.3 and 4.4, we examined the principal drivers of this change: 'inflow' to and 'outflow' of physicians from 'active' practice, and changes in practice intensity from the perspective of the professional 'life cycle'.

The analyses revealed a large net gain in physician numbers to 'active' practice during the study period. This net gain was a product of significant numbers of physicians who exited the registration rolls (15% of physicians registered in 1991) and an even a larger group of new entrants into practice (25% of those registered in 1996). Only about two-thirds of B.C.'s 'active' physicians from 1991 to 1996 were registered over the entire 5 year period. It was beyond the scope of this study to understand whether these trends will remain constant, accelerate, or decelerate. In order to accurately forecast these patterns, further research is needed to on the reasons underlying entries and exits (including re-entry into training programs, shifts to non-clinical practice, migration to practice outside the province, retirement, and death) from the B.C. registers.

A major focus of this study was to examine the age characteristics of B.C.'s physician supply and investigate the relationship between physician age and a variety of practice parameters. In 1991/92, the mean age of B.C. physicians was 45.4 years while in 1996/97 it was 46.2 years, signifying a modest aging of the physician population over this period. As expected, there were large differences in the age characteristics of GP/FPs versus specialists, with 35% and 20% aged <40 years and 8% and 15% aged 60+, years respectively. However, substantial differences existed in the age characteristics of individual specialties. Specialties which had more than 20% of their physician FTEs aged 60 years or older included community medicine, dermatology, medical microbiology, nuclear medicine, psychiatry and general surgery. Given the large differences in age between GP/FPs and specialists and the appreciable variation among specialty groups, we found large and important differences in the physician regional age structures which were in large part a reflection of these factors.

Specific life-cycle practice activity patterns by sex, geographic location and place of medical

school graduation were also delineated. This analysis indicated that there is a general pattern of early growth in intensity of practices, followed by a period of relative stability and eventually a period of tapering practice. However, while the overall trend appeared consistent, there were discernible differences in the life cycle activity patterns between male and female physicians (especially with regard to mean income) and by physicians' geographic location.

In addition to changes in practice intensity over the life cycle (as measured changes in mean incomes), we also found that physician age was associated in important ways with physician inflow and outflow and the scope of physicians' practices. Overall, younger physicians were less likely to migrate off the CPSBC registers over the study period. They also tended to have a more varied practice scope than did middle-aged physicians, as indicated by our analysis of the Herfindahl index (Section 4.2). Conversely, older physicians were more likely to drop their CPSBC registration status (not surprisingly) and delivered a significantly narrower scope of services than did their middle aged colleagues.

When the age-related influences on stability, practice intensity, and scope of practice are examined together, it is apparent that specialties with younger physicians will likely gain in future FTE physician supply while those with older ones will see a substantial loss. Moreover, given the regional differences in the age structure of the physician population, these changes are likely to have a larger impact on some regions than others. These complex regional differences are detailed in the report. The implications of age on future physician supply are dependent, however, on the generalization of these past trends in age-related practice patterns to future periods. We have described in great detail the age characteristics of physicians by specialty and region in the sections discussing various aspects of supply.

Location of Undergraduate Medical Education and B.C.'s Physician Supply

Another major goal of this report was to describe the training characteristics of B.C.'s physician supply.[28] Particular attention was paid to the contribution of B.C.'s undergraduate medical program to the supply of physicians over the study period. Overall, about one-quarter of physicians practicing in the province in 1996/97 received their medical degree from U.B.C. Graduates from the other 15 Canadian medical schools accounted for about one-half, while the remaining one-quarter obtained their medical degrees from schools outside Canada. The contribution of each of the other Canadian schools to B.C.'s physician population appears to be both a factor of the numbers produced and proximity to B.C. In sum, the medical schools of Ontario and Alberta graduated almost one-third of all physicians practicing in the province. GP/FPs were almost twice as likely to have obtained their undergraduate medical degree from U.B.C than were specialists, although we found wide variability in the contribution of U.B.C among the specialty groups.

Over the study period, we found a modest increase in the contribution of the U.B.C. undergraduate medical education program to B.C.'s physician supply. There was a net increase

[28] Unfortunately because data on post-graduate training characteristics of B.C. physicians were unavailable in time for this report, descriptive analyses regarding post-graduate training are not included in this report. These characteristics will be presented in a separate future report.

of 1% in proportion of physicians who obtained their undergraduate medical training from U.B.C. between 1991/92 to 1996/97. The reason behind this increase was the net flow: a greater proportion of new entrants (25%) were trained at U.B.C. compared to exiting physicians (15.7%). However, the proportion of newly trained physicians from U.B.C. was no different from those in 'stable' practice (25%). In addition, new entrants were more likely to come from other Canadian schools and less likely to come from foreign schools than were the cohort of physicians entering practice in earlier years.

There was also some variability in practice characteristics relating to the place of undergraduate medical school. With respect to location, GP/FPs trained at U.B.C. were more likely to be located in Health Regions in the lower mainland and generally less likely to be located in the northern and interior sections of the province. With respect to the practice scope of GP/FPs, physicians trained at U.B.C. appeared to have a significantly wider scope of practice (i.e., billed a greater number of fee items and had more balance across fee-item domains) than those trained elsewhere.

Many of the findings in this report reveal how decisions regarding workforce planning in one area may have implications for another; the analyses presented here attempt to show which specialties have seen recent growth/declines in supply and which have a complement of older physicians who are approaching retirement. Given that some types of specialties are in small numbers, recruitment of particular types to one region may have serious implications for others. Physician supply should be considered across the complement of regions so that these trade-offs are made explicit and workforce policies coordinated. Furthermore, academic training programs can assist by designing their programs to best meet the changing needs of physicians practicing in different locales. In addition, they can assist by adjusting residency program numbers to produce the required mix of specialists. Finally, the report highlights the degree to which planning for physicians in B.C. is constrained by the unrestricted migration patterns of physicians from other provinces. As such, training and licensing policies in effect in other provinces have implications for B.C.'s physician supply. Thus, physician training policies in B.C. and elsewhere in Canada should be considered in the national context to allow rational health workforce (and health services) planning at the Health Region level.

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7. Appendices

Appendix A: Population Density of Local Health Areas (LHAs) in B.C., 1996

	LHA	Area (km^2)	Pop'n*	Pop'n Density**
Urban***	Vancouver	132	546,211	4,134.05
	New Westminster	15	51,591	3,500.38
	Burnaby	91	187,086	2,066.09
	Greater Victoria	113	206,538	1,834.38
	Richmond	124	155,005	1,252.90
	Surrey	333	335,543	1,008.03
Semi-urban***	Delta	189	99,772	527.91
	Saanich	155	59,429	383.81
	Langley	324	107,392	331.80
	North Vancouver	399	127,800	320.51
	Abbotsford	414	110,338	266.84
	Coquitlam	728	178,306	245.04
	West Vanc-Bowen Island	235	48,972	208.39
	Cowichan	738	51,056	69.22
	Nanaimo	1,298	89,582	69.00
	Chilliwack	1,306	68,883	52.75
	Maple Ridge	1,457	72,653	49.88
	Central Okanagan	2,922	141,907	48.56
	Qualicum	840	37,278	44.39
Rural***	Gulf Islands	345	13,751	39.87
	Armstrong-Spallumcheen	261	9,578	36.63
	Ladysmith	444	16,177	36.41
	Courtenay	1,753	57,027	32.53
	Sooke	1,745	52,043	29.83
	Penticton	1,559	39,754	25.49
	Mission	1,433	36,176	25.24
	Trail	1,140	21,277	18.66
	Summerland	624	11,401	18.27
	Southern Okanagan	1,314	18,001	13.70
	Vernon	5,563	57,487	10.33
	Salmon Arm	3,114	30,748	9.87
	Castlegar	1,944	13,575	6.98
	Sunshine Coast	3,783	25,833	6.83
	Kamloops	16,318	100,850	6.18
	Cranbrook	4,429	25,277	5.71
	Nelson	4,796	25,046	5.22
	Alberni	6,626	32,906	4.97
	Enderby	1,861	7,279	3.91
	Powell River	5,229	20,305	3.88
	Creston	3,797	12,898	3.40
	Grand Forks	2,685	9,119	3.40
	Prince Rupert	5,915	19,390	3.28
Rural (cont.)	Campbell River	13,291	40,579	3.05
	Howe Sound	9,171	27,185	2.96
	Lake Cowichan	2,397	6,460	2.70
	Kimberley	4,337	9,020	2.08
	Fernie	8,058	15,849	1.97
	Keremeos	2,479	4,539	1.83
	Smithers	9,835	17,896	1.82
	Agassiz-Harrison	4,086	7,429	1.82
	Merritt	6,591	11,766	1.79
	Terrace	13,287	23,257	1.75
	Hope	5,291	8,519	1.61
	100 Mile House	10,956	15,477	1.41
	Prince George	76,087	103,625	1.36
	Upper Skeena	4,461	5,747	1.29
	Quesnel	23,722	26,396	1.11
	Peace River South	27,632	29,513	1.07
	Princeton	4,819	5,061	1.05
	Revelstoke	9,303	8,988	0.97
	Kettle Valley	4,345	3,738	0.86
	South Cariboo	9,481	7,712	0.81
	Vancouver Island North	19,800	15,538	0.78
	Windermere	10,978	8,462	0.77
	Arrow Lakes	7,442	5,249	0.71
	Kitimat	19,271	13,019	0.68
	Lillooet	7,477	4,938	0.66
	Vancouver Island West	5,496	3,600	0.65
	Cariboo-Chilcotin	44,463	28,277	0.64
	Queen Charlotte	9,686	5,841	0.60
	Golden	13,355	7,577	0.57
	Kootenay Lake	6,538	3,621	0.55
	Peace River North	68,372	28,951	0.42
	Nechako	42,509	17,802	0.42
	Nisga'a	5,053	2,071	0.41
	North Thompson	12,545	5,124	0.41
	Burns Lake	25,776	7,685	0.30
	Central Coast	10,140	1,842	0.18
	Bella Coola Valley	25,208	3,202	0.13
	Fort Nelson	89,435	6,257	0.07
	Snow Country	27,746	1,041	0.04
	Telegraph Creek	23,719	630	0.03
	Stikine	132,337	1,320	0.01
Total	All LHAs	88,490	3,331,240	37.65

* Population estimates supplied by Population Section, BC STATS, Ministry of Finance and Corporate Relations, are from the P.E.O.P.L.E. Projection Model - #24. All figures are as of July 1, 1996

** Calculated as persons per square kilometer.

***Geographic locations defined as follows: 'Urban' >1,000 persons per square kilometer; 'Semi-urban' 40-1,000 persons per square kilometer; and 'Rural' <40 persons per square kilometer.

Appendix B: Validation of Medical Services Plan Fee-item 'Domains'

This Appendix is intended to validate the assignment of MSP fee-items to 'specialty' domains. The proportion of a physicians billings across these domains was used to examine differences in the scope of practice provided by physicians (Aim II). Since fee-items are placed into specialty 'ownership' categories based on the specialty assumed to be 'most responsible', our validation of these groupings assessed the proportion of claims made by physicians assumed to 'own' that code. We also paid particular attention to the 'other' fee-items that were assigned to no specialty group.

Of the 2,918 fee-items that were billed in 1996/97 (representing the 53,302,669 services provided through the MSP during the 1996/97 fiscal year), 29 items (representing 1,222,840 of those services) were excluded because they were non-clinical in nature or were paid by third-party insurers. These fee-items included: night surcharges, tray fees, travel expenses, no-charge referrals, and claims paid by the Worker's Compensation Board (WCB) and Insurance Corporation of British Columbia (ICBC). Using the MSP grouping algorithm, the remaining 2,889 fee-items were clustered to 1 GP/FP, 21 specialist, and 1 'other' domain. The 'other' domain contained a total of 255 fee-items and represented approximately 4.9% of claims in 1996/97.

When we looked at which physicians made claims for these 'other' services, we found that many fee-items were claimed principally (and sometimes entirely) by physicians of a single specialty type. For instance, although 'eye encleation' was classified as an 'other' fee-item, 100% of billings for this item were submitted by ophthalmologists. For this reason, we opted to re-classify the 'domain' of these fee-items billed almost exclusively by one specialist group. We recoded 'other' fee-items only if they met both of the following explicit criteria: (a) more than 80% of claims were made by physicians in one specialty group; and, (b) two 'experts' (1 general practitioner and 1 researcher trained as a nurse) agreed that this specialty group could plausibly be considered 'most responsible' for the fee-item. The table below provides some examples of re-classified fee-items. This process led to the reassignment of 173 'other' items to various domains (representing 2.2% of all services billed in 1996/97). Eighty-two fee-items were retained in the 'other' category because less than 80% of respective services were claimed by one specialty group and/or the 'experts' did not agree on a single assignment.

For the remaining 2,634 fee-items assigned to a single domain (and that had any billings in 1996/97), we found that they were in large part billed by the physicians who 'owned' the item (i.e., 'in-domain' specialists).[29] Across all these items, the mean percent of services billed by 'in-domain' physicians was 90% (SD 21). Moreover, no large differences in this distribution were apparent when the items were stratified for GP/FPs and specialists separately. For the 55 fee-items in the GP/FP fee-item domain (that had any billings in 1996/97), the mean percent of services provided by GP/FPs was 86% (SD 29). For the 2,579 fee-items grouped in the specialist

[29] For fee-items assigned to multiple specialties (423), the proportions billed by each of the specified specialties were totaled and this proportion was defined as that billed by the 'in-domain' specialty. An example of an item assigned to multiple domains is 'ganglia (wrist) removal' assigned to general surgery, orthopedics, and plastic surgery. The proportion the claims for this fee-item billed by these specialists to give the 'indomain' proportion.

domains, the mean was 91% (SD 21). In fact, only 349 fee-items (13.4%) were billed more than 20% of the time by 'out-of-domain' physicians (representing only 7.1% of all services).

Examples of the Re-assignment of 'Other' Fee-items

Fee-item	Description	'Expert' opinion	% Billed by Spec.	Re-assignment
00050	Enucleation of Eye	Ophthalmology	100%	Ophthalmology
00775	Hydrotubation	Obstetrics & Gynecology	94%	Obstetrics & Gynecology
00779	Transurethral ureterorenoscopy	Urology	100%	Urology
00812	Selective angiocardiogram	Cardiovascular Surgery	97%	Cardiovascular Surgery
00933	Spirometry with FVC, FEV_1, FVC/FEV_1 ratio	Internal Medicine	97%	Internal Medicine

Thus, these empirical findings suggest that the MSP fee-item 'domains' have substantial validity in grouping fee-items with respect to the 'most responsible' specialties. For over 85% of items, more than four-fifths of the services were provided by 'in-domain' physicians. Based on these findings, we decided not to reassign any fee-items (except for some fee-items in the 'other' domain). The fee-items with the highest likelihood of errors in domain assignment (i.e., those items where more than 20% of services were provided by 'out-of-domain' physicians were infrequently used. In the 'other' fee-item domain, we reassigned 67% of the items to another specialty domain.

Appendix C: Estimates of Full-time-Equivalence for FY 1996-97

Specialty	No. MDs	FTE Estimates FTE (No SA) *	FTE +40%SA **	FTE +50%SA ***	FTE +60%SA ****	FTE + MOH Contracted FTEs #
General / Family Practice	4,335	3,772.53	3,815.51	3,809.92	3,805.85	3809.33
Cardiology	57	53.23	53.89	53.80	53.76	NS
Internal Medicine	358	300.09	322.53	319.71	317.13	310.89
Pediatrics	225	151.33	220.40	207.14	198.97	200.33
Psychiatry	488	440.67	449.38	448.10	447.31	448.57
General Surgery	189	150.87	154.46	154.08	153.77	NS
Obstetrics & Gynecology	182	153.89	165.14	163.41	162.35	167.89
Total (All Specialties)	7,732	6,796.87	6,955.57	6,930.42	6,913.40	

* FTEs based on only on Fee for Service and Salary and Sessional payments (i.e., no service agreeement FTEs estimated).

** FTEs include estimate based on Service Agreement Payments as proportion of 40th percentile of Fee for Service and Salary and Sessional Payments for that specialty.

*** FTEs include estimate based on Service Agreement Payments as proportion of 50th percentile of Fee for Service and Salary and Sessional Payments for that specialty. These estimates used in Table 4.1.

****FTEs include estimate based on Service Agreement Payments as proportion of 60th percentile of Fee for Service and Salary and Sessional Payments for that specialty.

#FTEs include estimate based on number of contracted FTEs specified on Service Agreements. 'NS' refers to 'not specified'.

Appendix D: 'Scope of Practice' Multivariate Linear Regression Model, excluding GP/FPs with Salary or Sessional Payments (n=3,359)

		Dependent Variables					
		Log HI		**Log (cv)²+1**		**Log 1/ N**	
Covariates		Estimate *(SE)*	p-value	Estimate *(SE)*	p-value	Estimate *(SE)*	p-value
Intercept		-0.287	0.0001	1.612	0.0001	-1.899	0.0001
		0.015		*0.0221*		*0.022*	
Age	≤40yrs	-0.042	0.0001	0.078	0.0001	-0.119	0.0001
		0.009		*0.0128*		*0.013*	
	41-65yrs*	-	-	-	-	-	-
	66+yrs	0.003	0.8907	-0.226	0.0001	0.230	0.0001
		0.021		*0.0308*		*0.031*	
Sex	Male*	-	-	-	-	-	-
	Female	-0.124	0.0001	-0.195	0.0001	0.071	0.0001
		0.009		*0.0138*		*0.014*	
Medical School	UBC*	-	-	-	-	-	-
	Other Can.	0.030	0.0001	0.010	0.3795	0.020	0.0898
		0.008		*0.0117*		*0.012*	
	Non-Can.	0.039	0.0001	-0.011	0.4283	0.050	0.0003
		0.009		*0.0138*		*0.014*	
Full-time-	<0.5	0.072	0.0001	-0.128	0.0001	0.200	0.0001
Equivalency		*0.013*		*0.0191*		*0.019*	
(FTE)* **	0.5-1.2*	-	-	-	-	-	-
	>1.2	-0.009	0.2585	0.044	0.0003	-0.054	0.0001
		0.008		*0.0122*		*0.012*	
Geographic	Urban*	-	-	-	-	-	-
Location**	Semi-urban	-0.043	0.0001	0.037	0.0078	-0.080	0.0001
		0.009		*0.0139*		*0.014*	
	Rural	-0.059	0.0001	0.101	0.0001	-0.160	0.0001
		0.015		*0.0214*		*0.021*	
GP/FP	Low	-0.106	0.0006	-0.057	0.2127	-0.049	0.2799
Availability#		*0.031*		*0.0453*		*0.045*	
	Medium*	-	-	-	-	-	-
	High	0.013	0.2499	-0.048	0.004	0.061	0.0002
		0.011		*0.0165*		*0.017*	
Specialist	Low*	-	-	-	-	-	-
Availability$	High	0.026	0.0222	-0.015	0.378	0.040	0.0161
		0.011		*0.0164*		*0.016*	
Interaction	Rural*≤40 yrs	0.029	0.0671	-0.036	0.1216	0.065	0.0056
Terms		*0.016*		*0.023*		*0.023*	
	Rural*66+ yrs	0.053	0.1853	0.272	0.0001	-0.220	0.0002
		0.040		*0.059*		*0.059*	
	Rural*Female	0.038	0.0339	0.037	0.1645	0.002	0.9361
		0.018		*0.027*		*0.027*	
R-squared		0.129		0.255		0.306	

*Reference category

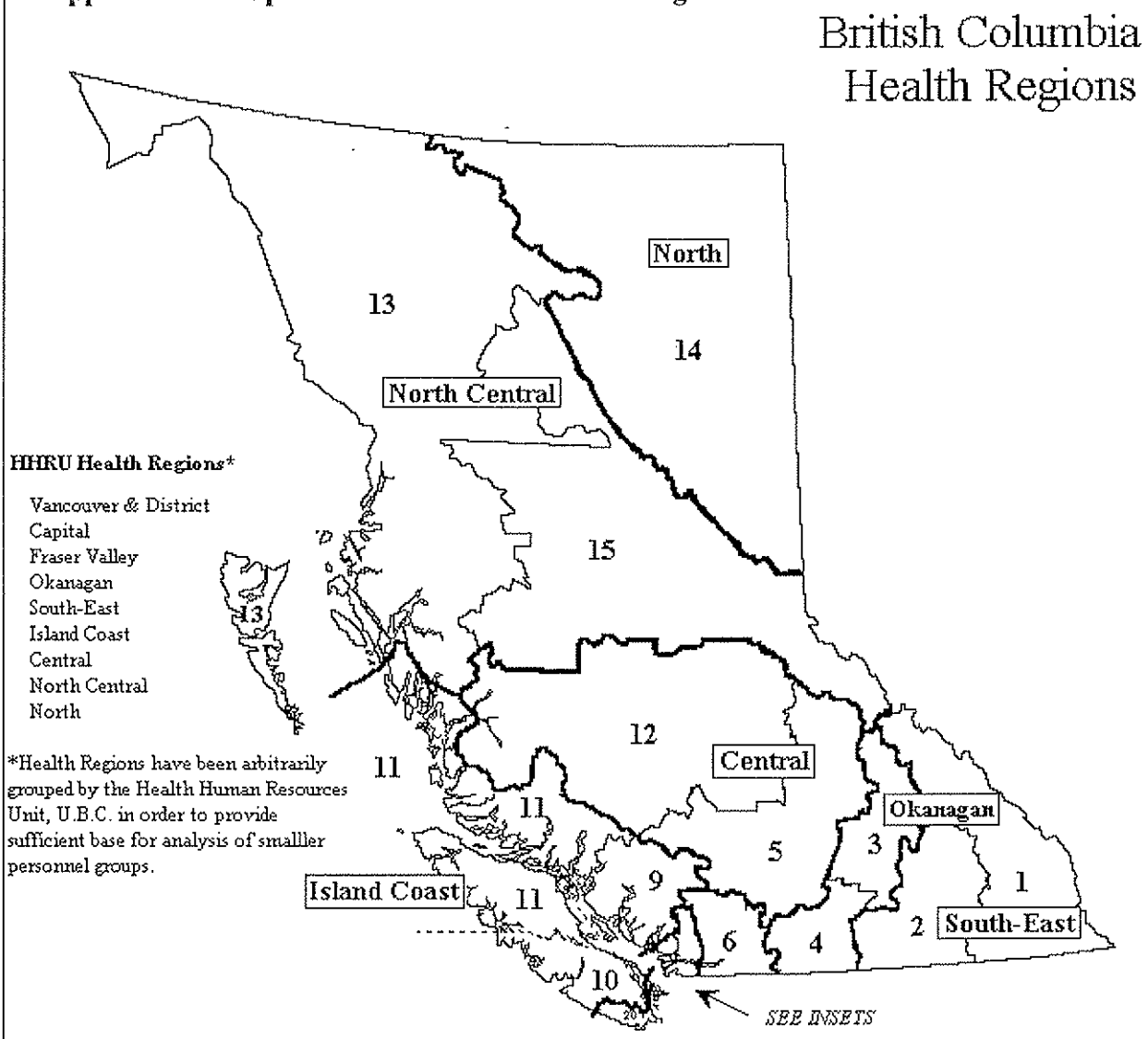
**Based on population density of Local Health Areas (LHAs)

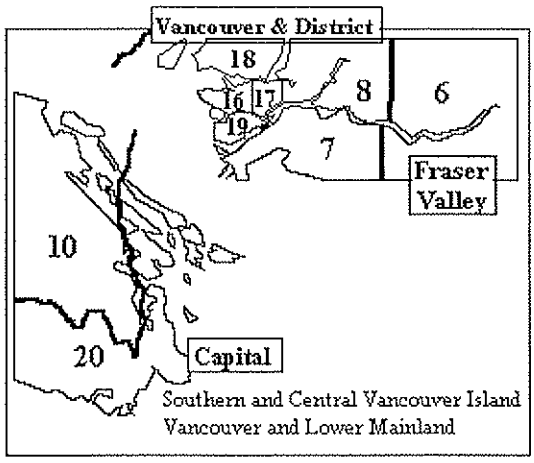
** FTEs calculated with fee-for-service and salary & sessional payments for FY 1996/97. FTE calcuations based on Health Canada formula.

#Based on 1996/97 supply characteristics of physician's Health Region (see section 4.1). 'High' ratios include health regions > 1.66 FTEs per 1,000, 'medium' supply includes regions at 1.29-1.66 FTEs per 1,000 and 'low' supply includes regions <1.29 FTEs per 1,000.

$High specialist supply is defined as Health Regions with specialist/GP ratios >0.65.

Appendix E: Map of British Columbia Health Regions





HEALTH REGIONS

1. East Kootenay
2. West Kootenay-Boundary
3. North Okanagan
4. South Okanagan Similkameen
5. Thompson
6. Fraser Valley
7. South Fraser Valley
8. Simon Fraser
9. Coast Garibaldi
10. Central Vancouver Island
11. Upper Island/Central Coast
12. Cariboo
13. North West
14. Peace Liard
15. Northern Interior
16. Vancouver
17. Burnaby
18. North Shore
19. Richmond
20. Capital

Prepared by: Planning & Evaluation Division, Ministry of Health and Ministry Responsible for Seniors
Boundary Source: B C STATS, Ministry of Finance and Corporate Relations

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March 20, 2001

Dear Reader:

We have recently become aware that computing errors were made during the production of Tables 3.5, 4.1, 4.2, 4.3, 4.5, 4.6, 4.8, 4.9, 4.12, 4.16, 4.17, 4.18, and 4.22 in the report Issues in Physician Resources Planning in B.C.: Key Determinants of Supply and Distribution, 1991-96. A Report to the Post-Graduate Medical Education Advisory Committee. Attached are the corrected tables. Please insert them in the appropriate sections of the report.

Table 3.5 Distribution of Ministry of Health Payments for Physician Services by Payment Mechanism, 1996/97[1]

Specialty	No.	Total Payments FY 1996/97[2]	Payment Mechanisms: Fee-For-Service (%)	Salary & Sessional (%)	Service Agreements (%)	Contractors[3]
General / Family Practice	4,335	638,901,798	96.0	3.1	0.9	12 Agencies
Anesthesiology	329	56,027,709	99.9	0.1		
Cardiology	57	23,436,740	98.4	0.5	1.0	Nanaimo General Hospital
Community Medicine	40	493,085	43.4	57		
Dermatology	62	15,290,151	98.4	1.6		
Endocrinology & Metabolism	14	2,515,038	93.8	6.2		
Emergency Medicine	71	13,718,800	59.9	0.4	39.6	Vancouver General, St. Paul's & B.C. Women's Hospital
Gastroenterology	28	9,080,362	100			
Haematology	18	2,411,532	83.8	16.2		
Internal Medicine	358	67,327,316	89.9	5.3	4.8	Greater Victoria Hospital Society, Vancouver General Hospital & St. Paul's Hospital[5]
Medical Biochemistry	12	7,472,848	100			
Medical Microbiology	25	5,885,350	99.6	0.4		B.C. Children's, St. Paul's Hospital, U.B.C. Medical Microbiology & Greater Victoria Hosp. Society
Medical Oncology	16	17,518,337	7.3		92.7	B.C. Cancer Agency
Nephrology	11	3,716,090	96.2	3.8		
Neurology	69	14,891,509	96.4	3.6		
Nuclear Medicine	19	17,511,482	100			
Pediatrics	225	36,584,621	69.4	11.1	19.5	B.C. Children's Hospital, Sunny Hill Children's Health Centre & Queen Alexandra Children's Health Centre
Pathology - General	103	108,875,406	100	0.0		
Pathology - Anatomical	70	55,093,083	100			
Physical Medicine	37	5,035,181	67.8	32.2		
Psychiatry	488	76,474,980	67.5	31.0	1.6	Juan de Fuca Hospital Society, St. Joseph's Gen. Hosp., Trail Regional Hosp. & West Coast General Hosp.
Radiology - Diagnostic[4]	291	97,436,764	99.8	0.2		
Respiratory Medicine	44	11,025,355	94.7	5.3		
Rheumatology	27	4,833,618	91.0	9.0		
Cardiovascular and Thoracic Surgery	33	10,301,299	100			
General Surgery	189	40,198,514	98.0	0.0	2.0	Prince George Regional Hospial
Neurosurgery	32	8,163,795	99.3	0.7		
Obstetrics & Gynecology	182	39,143,784	93.1	1.5	5.4	Greater Victoria Hosp. Society & B.C. Women's Hosp.[6]
Ophthalmology	182	58,660,936	99.4	0.6		
Orthopedic Surgery	148	30,183,249	99.3	0.7		
Otolaryngology	69	17,339,056	100	0.0		
Plastic Surgery	55	11,924,217	99.4	0.6		
Urology	68	20,349,066	99.5	0.5		
Vascular Surgery	25	7,502,115	99.8	0.2		
All Physicians	7,732	$1,535,323,185	93.5	3.7	2.8	

[1] Includes physicians on the 'active' registers of the CPSBC in 1996.

[2] Excludes service agreement for transplantation services.

[3] Refers to organizations specified under service agreements for physician services in FY 1996/97. Agreements are specified by 'service type' not RCPSC specialty. Payments for service agreements are allocated to RCPSC specialty that best matches service type specified.

[4] Includes 32 Radiation Oncology Specialists.

[5] Agreements specified for intensive care services & geriatric home assessment.

[6] Agreements specified for maternal & newborn care.

Table 4.1: Supply of Physicians in B.C. by Specialty, Number, FTEs, and FTE per 10,000 Population - 1991/92 and 1996/97[1]

	1991 - 1992			1996 - 1997			
Specialty	No.	FTEs	FTEs/10,000 Pop'n[2]	No.	FTEs	FTEs/10,000 Pop'n[2]	Average Annual % Change[3] in FTEs/10,000 Pop'n[2]
General / Family Practice	3,847	3,299.36	9.78	4,335	3,809.92	9.81	0.07
Anesthesiology	301	260.44	0.77	329	287.13	0.74	-0.85
Cardiology	47	46.86	0.14	57	53.80	0.14	-0.05
Community Medicine[4]	33	33.00	0.10	40	40.00	0.10	1.04
Dermatology	57	51.12	0.15	62	56.42	0.15	-0.83
Endocrinology & Metabolism	6	7.37	0.02	14	13.66	0.04	10.00
Emergency Medicine[4]	59	59.00	0.17	71	71.00	0.18	0.90
Gastroenterology	22	21.29	0.06	28	27.35	0.07	2.23
Hematology	20	17.80	0.05	18	15.63	0.04	-5.27
Internal Medicine	339	266.64	0.79	358	319.71	0.82	0.82
Medical Biochemistry[4]	12	12.00	0.04	12	12.00	0.03	-2.77
Medical Microbiology[4]	23	23.00	0.07	25	25.00	0.06	-1.13
Medical Oncology[4]	10	10.00	0.03	16	16.00	0.04	6.81
Nephrology	11	10.66	0.03	11	11.26	0.03	-1.70
Neurology	64	60.69	0.18	69	63.08	0.16	-2.02
Nuclear Medicine[4]	11	11.00	0.03	19	19.00	0.05	8.46
Pediatrics	192	183.58	0.54	225	207.14	0.53	-0.39
Pathology - General[4]	97	97.00	0.29	103	103.00	0.27	-1.60
Pathology - Anatomical[4]	64	64.00	0.19	70	70.00	0.18	-1.01
Physical Medicine	31	28.14	0.08	37	34.80	0.09	1.45
Psychiatry	382	344.40	1.02	488	448.10	1.15	2.49
Radiation Oncology[4]	28	28.00	0.08	32	32.00	0.08	-0.14
Radiology - Diagnostic[4]	240	240.00	0.71	259	259.00	0.67	-1.28
Respiratory Medicine	35	33.33	0.10	44	38.93	0.10	0.30
Rheumatology	26	23.65	0.07	27	25.21	0.06	-1.52
Cardiovascular & Thoracic Surgery	31	29.10	0.09	33	29.23	0.08	-2.68
General Surgery	213	162.55	0.48	189	154.07	0.40	-3.81
Neurosurgery	29	23.33	0.07	32	27.97	0.07	0.82
Obstetrics & Gynecology	167	141.51	0.42	182	163.42	0.42	0.07
Ophthalmology	165	157.50	0.47	182	170.47	0.44	-1.22
Orthopedic Surgery	149	124.10	0.37	148	124.45	0.32	-2.71
Otolaryngology	76	67.66	0.20	69	64.47	0.17	-3.70
Plastic Surgery	49	42.99	0.13	55	50.46	0.13	0.40
Urology	63	58.52	0.17	68	63.70	0.16	-1.11
Vascular Surgery	23	22.06	0.07	25	23.04	0.06	-1.92
Total Physicians	6,922	6,061.65	17.97	7,732	6,930.41	17.85	-0.13

[1] For 1996, FTEs are based on Fee for Service, Salaried and Sessional, and most Service Agreement payments, excluding payments to the British Columbia Cancer Agency. For 1991, FTEs are based on Fee for Service and Salaried and Sessional payments.

[2] Based on 1991 BC Population = 3,373,399 and 1996 BC Population = 3,882,043. Population estimates supplied by Population Section, BC STATS, Ministry of Finance and Corporate Relations, are from the P.E.O.P.L.E. Projection Model - #24. All figures are as of July 1 of the year stated.

[3] Average annual percent change in FTEs/10,000 population is calculated as follows: $[(\text{FTE 96-97/pop/FTE 91-92/pop})^{1/5} - 1]*100$.

[4] As a more accurate representation of personnel in this specialty, 1 person=1 FTE.

Table 4.2: Age Distribution of B.C. Physicians by RCPSC Specialty - 1996/97[1]

Specialty	Under 40 yrs			40 thru 49 yrs			50 thru 59 yrs			60 thru 69 yrs			70 yrs and older			Totals	
	No	FTEs	%	No	FTEs	%	No	FTEs	%	No	FTEs	%	No	FTEs	%	No	FTEs
General Practice	1588	1338.09	35.5	1442	1378.92	36.6	797	751.99	19.9	375	259.20	6.9	133	44.33	1.2	4335	3772.53
Anaesthesiology	75	71.11	24.8	123	120.23	41.9	83	72.21	25.1	39	22.68	7.9	9	0.90	0.3	329	287.13
Cardiology	15	12.43	23.4	25	24.95	46.9	16	14.85	27.9	1	1.00	1.9				57	53.23
Community Medicine[2]	4	4.00	10.0	13	13.00	32.5	12	12.00	30.0	9	9.00	22.5	2	2.00	5.0	40	40.00
Dermatology	8	6.10	10.8	22	23.39	41.5	16	15.05	26.7	11	10.84	19.2	5	1.04	1.8	62	56.42
Endocrinology and Metabolism	6	6.00	43.9	6	6.25	45.8	1	0.58	4.2	1	0.83	6.1				14	13.66
Emergency Medicine[2]	23	23.00	32.4	33	33.00	46.5	14	14.00	19.7	1	1.00	1.4				71	71.00
Gastroenterology	8	6.76	24.7	15	15.35	56.1	5	5.24	19.2							28	27.35
Haematology	3	2.59	16.6	10	7.86	50.3	5	5.18	33.1							18	15.63
Internal Medicine	57	45.62	15.2	110	104.88	34.9	95	92.23	30.7	62	47.66	15.9	34	9.70	3.2	358	300.09
Medical Biochemistry[2]	2	2.00	16.7	3	3.00	25.0	6	6.00	50.0	1	1.00	8.3				12	12.00
Medical Microbiology[2]	3	3.00	12.0	9	9.00	36.0	8	8.00	32.0	5	5.00	20.0				25	25.00
Medical Oncology[2]	5	5.00	31.3	6	6.00	37.5	5	5.00	31.3							16	16.00
Nephrology	5	4.61	40.9	4	4.35	38.6	2	2.30	20.4							11	11.26
Neurology	11	10.18	16.1	24	23.80	37.7	18	17.50	27.7	14	11.30	17.9	2	0.30	0.5	69	63.08
Nuclear Medicine[2]	6	6.00	31.6	5	5.00	26.3	3	3.00	15.8	4	4.00	21.1	1	1.00	5.3	19	19.00
Paediatrics	46	40.38	21.5	79	79.43	42.3	56	45.39	24.2	31	18.43	9.8	13	4.04	2.2	225	187.67
Pathology - General[2]	15	15.00	14.6	29	29.00	28.2	31	31.00	30.1	22	22.00	21.4	6	6.00	5.8	103	103.00
Pathology - Anatomical[2]	17	17.00	24.3	33	33.00	47.1	18	18.00	25.7	2	2.00	2.9				70	70.00
Physical Medicine	5	3.57	10.3	15	16.06	46.1	12	11.78	33.9	4	3.37	9.7	1	0.02	0.1	37	34.80
Psychiatry	76	70.03	15.9	167	159.63	36.2	123	118.17	26.8	87	72.49	16.4	35	20.35	4.6	488	440.67
Radiation Oncology[2]	12	12.00	37.5	15	15.00	46.9	5	5.00	15.6							32	32.00
Radiology - Diagnostic[2]	60	60.00	23.2	70	70.00	27.0	75	75.00	29.0	39	39.00	15.1	15	15.00	5.8	259	259.00
Respiratory Medicine	8	6.98	17.9	25	22.91	58.8	10	8.04	20.7	1	1.00	2.6				44	38.93
Rheumatology	3	2.59	10.3	14	12.34	48.9	10	10.28	40.8							27	25.21
Cardiovascular and Thoracic Surg	4	4.06	13.9	12	10.85	37.1	11	10.76	36.8	5	2.29	7.8	1	1.27	4.3	33	29.23
General Surgery	23	23.81	15.8	42	41.78	27.7	51	52.60	34.9	47	30.78	20.4	26	1.90	1.3	189	150.87
Neurosurgery	8	7.45	26.6	6	7.01	25.1	9	9.16	32.7	6	4.28	15.3	3	0.07	0.3	32	27.97
Obstetrics and Gynaecology	41	36.36	23.6	50	45.10	29.3	43	43.79	28.5	31	24.14	15.7	17	4.50	2.9	182	153.89
Ophthalmology	37	33.06	19.4	56	65.09	38.2	52	53.76	31.5	23	14.19	8.3	14	4.37	2.6	182	170.47
Orthopaedic Surgery	25	21.39	17.2	52	55.10	44.3	38	31.33	25.2	26	15.41	12.4	7	1.22	1.0	148	124.45
Otolaryngology	11	10.05	15.6	23	24.56	38.1	23	21.70	33.7	10	7.44	11.5	2	0.72	1.1	69	64.47
Plastic Surgery	13	11.94	23.7	22	23.33	46.2	17	14.04	27.8	2	1.03	2.0	1	0.12	0.2	55	50.46
Urology	15	14.53	22.8	17	19.26	30.2	16	18.09	28.4	12	10.84	17.0	8	0.98	1.5	68	63.70
Vascular Surgery	1	1.01	4.4	13	12.48	54.2	6	5.93	25.7	4	3.24	14.1	1	0.38	1.6	25	23.04
Totals	2239	1937.70	28.4	2590	2520.91	36.9	1692	1608.95	23.5	875	645.44	9.4	336	120.21	1.8	7732	6833.21

[1] FTE calculations are based on Fee for Service and Salaried and Sessional payments.

[2] As a more accurate representation of personnel in this specialty, 1 person=1 FTE.

Table 4.3: Sex Distribution of Physician FTEs in B.C. by Age and Specialty - 1996/97[1]								
Specialty	Totals		Under 40		40 thru 59		60 and older	
	FTEs	% Female	FTEs	% Female	FTEs	% Female	FTEs	% Female
General Practice	3772.5	24.3	1338.1	36.1	2130.9	19.2	303.5	6.7
Anaesthesiology	287.1	13.4	71.1	14.0	192.4	13.9	23.6	8.3
Cardiology	53.2	9.2	12.4	18.7	39.8	3.3	1.0	100.0
Community Medicine[2]	40.0	23.3	4.0	25.0	25.0	28.0	11.0	
Dermatology	56.4	16.1	6.1	25.7	38.4	17.0	11.9	8.2
Endocrinology and Metabolism	13.7	22.0	6.0	33.3	6.8		0.8	
Emergency Medicine[2]	71.0	12.2	23.0	26.1	47.0	6.4	1.0	
Gastroenterology	27.4	14.0	6.8	31.7	20.6	10.6		
Haematology	15.6	21.3	2.6	0.0	13.0	27.4		
Internal Medicine	300.1	9.2	45.6	25.9	197.1	12.9	57.4	3.1
Medical Biochemistry[2]	12.0	41.7	2.0	100.0	9.0	33.3	1.0	
Medical Microbiology[2]	25.0	50.0	3.0	33.3	17.0	58.8	5.0	
Medical Oncology[2]	16.0	37.5	5.0	80.0	11.0	27.3		
Nephrology	11.3	8.6	4.6	21.7	6.7			
Neurology	63.1	5.9	10.2	10.1	41.3	4.7	11.6	0.6
Nuclear Medicine[2]	19.0	20.0	6.0	16.7	8.0	25.0	5.0	
Paediatrics	187.7	24.5	40.4	41.9	124.8	20.6	22.5	21.4
Pathology - General[2]	103.0	21.2	15.0	40.0	60.0	20.0	28.0	10.7
Pathology - Anatomical[2]	70.0	28.2	17.0	35.3	51.0	25.5	2.0	50.0
Physical Medicine	34.8	12.6	3.6	28.3	27.8	12.0	3.4	
Psychiatry	440.7	27.3	70.0	38.5	277.8	28.8	92.8	13.5
Radiation Oncology[2]	32.0	22.0	12.0	25.0	20.0	25.0		
Radiology - Diagnostic[2]	259.0	19.4	60.0	26.7	145.0	21.4	54.0	5.6
Respiratory Medicine	38.9	19.0	7.0	68.1	31.0	2.0	1.0	
Rheumatology	25.2	22.1	2.6	24.7	22.6	21.8		
Cardiovascular and Thoracic	29.2	4.6	4.1	0.0	21.6	6.2	3.6	
General Surgery	150.9	3.9	23.8	8.6	94.4	4.2	32.7	
Neurosurgery	28.0	0.0	7.5	0.0	16.2	0.0	4.4	
Obstetrics and Gynaecology	153.9	21.4	36.4	37.1	88.9	20.9	28.6	2.9
Ophthalmology	170.5	10.5	33.1	23.5	118.9	8.5	18.6	0.2
Orthopaedic Surgery	124.5	0.7	21.4	0.0	86.4	1.0	16.6	
Otolaryngology	64.5	6.9	10.1	9.7	46.3	7.8	8.2	
Plastic Surgery	50.5	8.2	11.9	25.5	37.4	3.1	1.2	
Urology	63.7	1.1	14.5	4.6	37.4		11.8	
Vascular Surgery	23.0	4.7	1.0	0.0	18.4	6.7	3.6	
Total	6833.2	20.7	1937.7	33.0	4129.9	17.5	765.7	6.7

[1] FTE calculations are based on Fee for Service and Salaried and Sessional payments.

[2] As a more accurate representation of personnel in this specialty, 1 person=1 FTE.

Table 4.5: Supply of Physicians by Place of Medical School Education - 1996[1]

Specialties	Totals	U.B.C.		Other Canada		Non-Canada	
		No.	(%)	No.	(%)	No.	(%)
General / Family Practice	4,335	1,392	(32.1)	1,903	(43.9)	1,040	(24.0)
Anesthesiology	329	88	(26.7)	134	(40.7)	107	(32.5)
Cardiology	57	16	(28.1)	23	(40.4)	18	(31.6)
Community Medicine	40	9	(22.5)	22	(55.0)	9	(22.5)
Dermatology	62	16	(25.8)	34	(54.8)	12	(19.4)
Endocrinology & Metabolism	14	3	(21.4)	6	(42.9)	5	(35.7)
Emergency Medicine	71	12	(16.9)	53	(74.6)	6	(8.5)
Gastroenterology	28	6	(21.4)	19	(67.9)	3	(10.7)
Hematology	18	5	(27.8)	8	(44.4)	5	(27.8)
Internal Medicine	358	51	(14.2)	186	(52.0)	121	(33.8)
Medical Biochemistry	12	3	(25.0)	6	(50.0)	3	(25.0)
Medical Microbiology	25	2	(8.0)	11	(44.0)	12	(48.0)
Medical Oncology	16	4	(25.0)	8	(50.0)	4	(25.0)
Nephrology	11	3	(27.3)	3	(27.3)	5	(45.5)
Neurology	69	13	(18.8)	35	(50.7)	21	(30.4)
Nuclear Medicine	19	1	(5.3)	14	(73.7)	4	(21.1)
Pediatrics	225	20	(8.9)	80	(35.6)	125	(55.6)
Pathology - General	103	24	(23.3)	41	(39.8)	38	(36.9)
Pathology - Anatomical	70	19	(27.1)	26	(37.1)	25	(35.7)
Physical Medicine	37	6	(16.2)	16	(43.2)	15	(40.5)
Psychiatry	488	71	(14.5)	200	(41.0)	217	(44.5)
Radiation Oncology	32	8	(25.0)	5	(15.6)	19	(59.4)
Radiology - Diagnostic	259	37	(14.3)	152	(58.7)	70	(27.0)
Respiratory Medicine	44	7	(15.9)	19	(43.2)	18	(40.9)
Rheumatology	27	6	(22.2)	10	(37.0)	11	(40.7)
Cardiovascular & Thoracic Surgery	33	6	(18.2)	21	(63.6)	6	(18.2)
General Surgery	189	24	(12.7)	100	(52.9)	65	(34.4)
Neurosurgery	32	4	(12.5)	20	(62.5)	8	(25.0)
Obstetrics & Gynecology	182	31	(17.0)	72	(39.6)	79	(43.4)
Ophthalmology	182	30	(16.5)	105	(57.7)	47	(25.8)
Orthopedic Surgery	148	28	(18.9)	77	(52.0)	43	(29.1)
Otolaryngology	69	7	(10.1)	37	(53.6)	25	(36.2)
Plastic Surgery	55	24	(43.6)	24	(43.6)	7	(12.7)
Urology	68	18	(26.5)	36	(52.9)	14	(20.6)
Vascular Surgery	25	7	(28.0)	10	(40.0)	8	(32.0)
Total Specialists	3,397	609	(17.9)	1,613	(47.5)	1,175	(34.6)
Total BC	7,732	2,001	(25.9)	3,516	(45.5)	2,215	(28.6)

[1] Includes physicians on the 'active' registers of the CPSBC in 1996.

Table 4.6: Place of Medical School Education (%) by Specialty & GP/FP - 1991, 1996, and % Change

Specialties	U.B.C.			Other Canada			Non-Canada		
	1991	1996	% Change	1991	1996	% Change	1991	1996	% Change
General / Family Practice	31.1	32.1	1.0	43.0	43.9	0.9	25.9	24.0	-1.9
Anesthesiology	26.2	26.7	0.5	41.2	40.7	-0.5	32.6	32.5	0.0
Cardiology	21.3	28.1	6.8	42.6	40.4	-2.2	36.2	31.6	-4.6
Community Medicine	18.2	22.5	4.3	36.4	55.0	18.6	45.5	22.5	-23.0
Dermatology	24.6	25.8	1.2	52.6	54.8	2.2	22.8	19.4	-3.5
Endocrinology & Metabolism	0.0	21.4	21.4	50.0	42.9	-7.1	50.0	35.7	-14.3
Emergency Medicine	16.9	16.9	0.0	71.2	74.6	3.5	11.9	8.5	-3.4
Gastroenterology	18.2	21.4	3.2	72.7	67.9	-4.9	9.1	10.7	1.6
Hematology	25.0	27.8	2.8	45.0	44.4	-0.6	30.0	27.8	-2.2
Internal Medicine	14.2	14.2	0.1	52.2	52.0	-0.3	33.6	33.8	0.2
Medical Biochemistry	16.7	25.0	8.3	50.0	50.0	0.0	33.3	25.0	-8.3
Medical Microbiology	4.3	8.0	3.7	39.1	44.0	4.9	56.5	48.0	-8.5
Medical Oncology	20.0	25.0	5.0	30.0	50.0	20.0	50.0	25.0	-25.0
Nephrology	27.3	27.3	0.0	27.3	27.3	0.0	45.5	45.5	0.0
Neurology	20.3	18.8	-1.5	45.3	50.7	5.4	34.4	30.4	-3.9
Nuclear Medicine	0.0	5.3	5.3	72.7	73.7	1.0	27.3	21.1	-6.2
Pediatrics	8.9	8.9	0.0	33.9	35.6	1.7	57.3	55.6	-1.7
Pathology - General	20.6	23.3	2.7	41.2	39.8	-1.4	38.1	36.9	-1.3
Pathology - Anatomical	25.0	27.1	2.1	43.8	37.1	-6.6	31.3	35.7	4.5
Physical Medicine	9.7	16.2	6.5	45.2	43.2	-1.9	45.2	40.5	-4.6
Psychiatry	14.4	14.5	0.2	42.4	41.0	-1.4	43.2	44.5	1.3
Radiation Oncology	17.9	25.0	7.1	32.1	15.6	-16.5	50.0	59.4	9.4
Radiology - Diagnostic	13.1	14.3	1.2	56.3	58.7	2.3	30.6	27.0	-3.6
Respiratory Medicine	14.3	15.9	1.6	42.9	43.2	0.3	42.9	40.9	-1.9
Rheumatology	19.2	22.2	3.0	34.6	37.0	2.4	46.2	40.7	-5.4
Cardiovascular & Thoracic Surgery	16.1	18.2	2.1	64.5	63.6	-0.9	19.4	18.2	-1.2
General Surgery	10.3	12.7	2.4	56.8	52.9	-3.9	32.9	34.4	1.5
Neurosurgery	13.8	12.5	-1.3	58.6	62.5	3.9	27.6	25.0	-2.6
Obstetrics & Gynecology	16.2	17.0	0.9	36.5	39.6	3.0	47.3	43.4	-3.9
Ophthalmology	13.9	16.5	2.5	57.0	57.7	0.7	29.1	25.8	-3.3
Orthopedic Surgery	17.4	18.9	1.5	51.0	52.0	1.0	31.5	29.1	-2.5
Otolaryngology	13.2	10.1	-3.0	53.9	53.6	-0.3	32.9	36.2	3.3
Plastic Surgery	32.7	43.6	11.0	53.1	43.6	-9.4	14.3	12.7	-1.6
Urology	27.0	26.5	-0.5	47.6	52.9	5.3	25.4	20.6	-4.8
Vascular Surgery	26.1	28.0	1.9	39.1	40.0	0.9	34.8	32.0	-2.8
Total Specialists	16.6	17.9	1.4	47.8	47.5	-0.3	35.6	34.6	-1.1
Total Physicians	24.7	25.9	1.2	45.1	45.5	0.3	30.2	28.6	-1.6

Note: 1991 figures for Radiation Oncology were taken from Report Table 4.4.

Table 4.8: Geographic Distribution of Physician in B.C. by HHRU Region and Grouped Specialty, 1996/97[1]

		General / Family Practice			General Internal Medicine			Medical Subspecialties			General Surgery			Surgical Subspecialties			Pediatrics		
HHRU Region	Population[2]	No.	FTEs	FTE / Pop.	No.	FTEs	FTE / Pop.	No.	FTEs	FTE / Pop.	No.	FTEs	FTE / Pop.	No.	FTEs	FTE / Pop.	No.	FTEs	FTE / Pop.
Vancouver & District	1,910,331	2,215	1,899.1	99.41	232	177.5	9.29	258	234.5	12.28	86	71.6	3.75	373	331.7	17.36	161	147.4	7.71
Capital	331,761	491	376.1	113.37	34	24.7	7.44	45	55.3	16.68	20	13.2	3.98	70	63.2	19.05	15	17.4	5.26
Fraser Valley	231,345	197	199.7	86.32	9	9.8	4.23	6	5.5	2.36	7	7.4	3.20	22	22.9	9.89	5	6.1	2.64
Okanagan	334,743	343	321.7	96.10	19	18.5	5.53	29	32.6	9.72	19	14.1	4.20	51	48.2	14.39	14	10.4	3.09
South East	160,708	184	157.8	98.21	10	9.1	5.67	3	2.6	1.61	12	9.0	5.58	10	10.1	6.29	4	4.6	2.87
Island Coast	425,368	444	403.5	94.87	21	21.2	4.99	9	8.2	1.92	21	19.0	4.46	47	43.4	10.21	11	8.7	2.04
Central	203,742	189	182.0	89.31	8	7.9	3.89	8	9.2	4.52	12	8.8	4.33	21	19.4	9.52	6	6.0	2.95
North Central	219,324	221	218.6	99.65	11	14.0	6.40	5	5.4	2.45	9	8.0	3.67	17	14.7	6.71	5	6.6	3.00
North	64,721	51	51.4	79.43	1	0.9	1.38	0	0.0	0.00	3	3.0	4.60	1	0.2	0.36	0	0.0	0.00
Unknown	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total BC	3,882,043	4,335	3,809.9	98.14	345	283.6	7.31	363	353.2	9.10	189	154.1	3.97	612	553.8	14.27	221	207.2	5.34

		Psychiatry			Obstetrics & Gynecology			Laboratory/Radiology[3]			Anesthesiology			Other[4]			All Specialists		
HHRU Region	Population[2]	No.	FTEs	FTE / Pop.	No.	FTEs	FTE / Pop.	No.	FTEs	FTE / Pop.	No.	FTEs	FTE / Pop.	No.	FTEs	FTE / Pop.	No.	FTEs	FTE / Pop.
Vancouver & District	1,910,331	339	321.8	16.85	107	102.1	5.34	335	335.0	17.54	200	171.7	8.99	100	97.7	5.12	2,191	1,991	104.23
Capital	331,761	65	48.3	14.55	15	10.9	3.27	55	55.0	16.58	42	35.7	10.75	29	27.9	8.40	390	352	105.96
Fraser Valley	231,345	12	10.1	4.35	6	6.2	2.66	19	19.0	8.21	10	9.9	4.30	0	0.0	0.00	96	97	41.83
Okanagan	334,743	22	21.6	6.46	14	11.5	3.42	27	27.0	8.07	24	23.2	6.94	7	8.4	2.51	226	215	64.33
South East	160,708	11	9.9	6.17	4	2.6	1.62	16	16.0	9.96	5	3.8	2.35	1	1.0	0.62	76	69	42.74
Island Coast	425,368	25	22.6	5.32	20	14.7	3.46	29	29.0	6.82	29	24.7	5.80	4	4.0	0.94	216	196	45.97
Central	203,742	7	6.9	3.39	7	7.0	3.42	17	17.0	8.34	10	10.1	4.98	4	3.8	1.86	100	96	47.20
North Central	219,324	7	6.9	3.12	8	7.6	3.45	19	19.0	8.66	9	8.0	3.65	3	3.0	1.37	93	93	42.47
North	64,721	0	0.0	0.00	1	1.0	1.55	3	3.0	4.64	0	0.0	0.00	0	0.0	0.00	9	8	12.52
Unknown	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total BC	3,882,043	488	448.1	11.54	182	163.4	4.21	520	520.0	13.40	329	287.1	7.40	148	145.8	3.76	3,397	3116.3	80.28

[1] FTE calculations are based on Fee for Service, Salaried and Sessional, and most Service Agreement payments, excluding payments to the British Columbia Cancer Agency. FTE/Population Ratios are number of FTEs per 100,000.

[2] Population estimates supplied by Population Section, BC STATS, Ministry of Finance and Corporate Relations, are from the P.E.O.P.L.E. Projection Model - #24. All population estimates are as of July 1, 1996.

[3] As a more accurate representation of personnel in this specialty, 1 person=1FTE.

[4] "Other" category includes: Community Medicine, Emergency Medicine, Occupational Medicine, Physical Medicine, and Public Health.

Table 4.9: Geographic Distribution of Physicians in B.C. by HHRU Region and Grouped Specialty, 1991/92[1]

		General / Family Practice			General Internal Medicine			Medical Subspecialties			General Surgery			Surgical Subspecialties			Pediatrics		
HHRU Region	Population[2]	No.	FTEs	FTE / Pop. Ratio	No.	FTEs	FTE / Pop. Ratio	No.	FTEs	FTE / Pop. Ratio	No.	FTEs	FTE / Pop. Ratio	No.	FTEs	FTE / Pop. Ratio	No.	FTEs	FTE / Pop. Ratio
Vancouver & District	1,647,358	1,968	1,634.4	99.21	233	156.8	9.52	223	212.1	12.88	99	77.2	4.68	355	318.7	19.35	145	129.4	7.85
Capital	307,644	443	333.9	108.53	31	23.5	7.65	34	35.6	11.58	22	13.1	4.26	75	64.3	20.91	11	13.5	4.38
Fraser Valley	191,031	169	172.3	90.21	8	8.7	4.55	5	5.2	2.71	8	8.3	4.34	24	23.7	12.41	3	3.9	2.04
Okanagan	279,790	275	264.5	94.52	18	17.9	6.41	18	19.9	7.09	19	13.4	4.80	45	40.3	14.41	11	11.8	4.22
South East	145,167	179	156.8	108.00	10	9.0	6.22	2	2.5	1.75	8	7.0	4.83	8	6.9	4.77	4	4.6	3.19
Island Coast	361,145	372	341.2	94.48	15	15.9	4.39	8	7.7	2.13	20	18.4	5.09	35	33.7	9.32	8	9.4	2.60
Central	178,944	160	156.9	87.66	8	8.3	4.62	7	8.5	4.73	16	10.2	5.68	19	19.4	10.83	5	5.3	2.96
North Central	202,571	184	174.4	86.08	7	9.7	4.77	4	4.6	2.29	13	9.4	4.65	16	14.5	7.18	4	5.7	2.83
North	59,749	39	39.1	65.44	0	0.0	0.00	0	0.0	0.00	4	4.3	7.15	2	0.5	0.77	1	0.0	0.00
Unknown	-	58	26.0	-	4	1.6	-	2	2.0	-	4	1.3	-	6	3.2	-	-	-	-
Total BC	3,373,399	3,847	3,299.4	97.81	334	251.3	7.45	303	298.1	8.84	213	162.6	4.82	585	525.3	15.57	192	183.6	5.44

		Psychiatry			Obstetrics & Gynecology			Laboratory/Radiology[3]			Anesthesiology			Other[4]			All Specialists		
HHRU Region	Population[2]	No.	FTEs	FTE / Pop. Ratio	No.	FTEs	FTE / Pop. Ratio	No.	FTEs	FTE / Pop. Ratio	No.	FTEs	FTE / Pop. Ratio	No.	FTEs	FTE / Pop. Ratio	No.	FTEs	FTE / Pop. Ratio
Vancouver & District	1,647,358	289	264.4	16.05	100	85.6	5.20	305	305.0	18.51	192	162.8	9.88	87	83.5	5.07	2,028	1,796	108.99
Capital	307,644	46	33.6	10.91	18	13.0	4.24	54	54.0	17.55	41	35.8	11.64	19	18.8	6.10	351	305	99.23
Fraser Valley	191,031	8	8.7	4.57	4	4.2	2.19	16	16.0	8.38	10	10.6	5.53	0	0.0	0.00	86	89	46.72
Okanagan	279,790	16	17.4	6.21	14	11.8	4.23	24	24.0	8.58	18	17.1	6.12	7	8.2	2.92	190	182	64.99
South East	145,167	4	2.7	1.88	2	2.0	1.38	15	15.0	10.33	2	0.9	0.62	0	0.0	0.00	55	51	34.97
Island Coast	361,145	14	12.0	3.31	15	11.3	3.13	26	26.0	7.20	19	15.8	4.38	7	7.0	1.94	167	157	43.48
Central	178,944	3	3.8	2.10	7	6.7	3.74	17	17.0	9.50	10	9.6	5.35	3	2.7	1.49	95	91	51.00
North Central	202,571	2	1.9	0.93	5	5.5	2.71	13	13.0	6.42	5	4.7	2.30	0	0.0	0.00	69	69	34.06
North	59,749	0	0.0	0.00	1	1.0	1.59	3	3.0	5.02	0	0.0	0.00	0	0.0	0.00	11	9	14.53
Unknown	-	-	-	-	1	0.4	-	2	2.0	-	4	3.2	-	-	-	-	23	13.3	-
Total BC	3,373,399	382	344.4	10.21	167	141.5	4.19	475	475.0	14.08	301	260.4	7.72	123	120.1	3.56	3,075	2762.3	81.88

[1] FTE calculations are based on Fee for Service and Salaried and Sessional payments. FTE/Population Ratios are number of FTEs per 100,000.

[2] Population estimates supplied by Population Section, BC STATS, Ministry of Finance and Corporate Relations, are from the P.E.O.P.L.E. Projection Model - #24. All population estimates are as of July 1, 1991.

[3] As a more accurate representation of personnel in this specialty, 1 person=1FTE.

[4] "Other" category includes: Community Medicine, Emergency Medicine, Occupational Medicine, Physical Medicine, and Public Health.

Table 4.12: Regional Distribution of BC Physicians by Age Group, Sex, and Place of Medical School Training, 1996

General / Family Medicine

	Vancouver		Capital		Fraser Vall		Okanagan		South East		Isl Coast		Central		N & N Cent		Totals	
Age median (IQR)	43	(16.0)	45	(14.0)	46	(16.0)	43	(15.0)	43	(15.0)	43	(13.0)	42	(14.0)	41	(13.5)	43	(15.0)
Age Group n (%)																		
< 40	859	(38.8)	136	(27.7)	66	(33.5)	121	(35.3)	66	(35.9)	153	(34.5)	77	(40.7)	110	(40.4)	1,588	(36.6)
40 to 64	1,208	(54.5)	315	(64.2)	109	(55.3)	206	(60.1)	106	(57.6)	265	(59.7)	107	(56.6)	151	(55.5)	2,467	(56.9)
65+	148	(6.7)	40	(8.1)	22	(11.2)	16	(4.7)	12	(6.5)	26	(5.9)	5	(2.6)	11	(4.0)	280	(6.5)
Sex n (%)																		
Male	1,466	(66.2)	343	(69.9)	163	(82.7)	262	(76.4)	130	(70.7)	337	(75.9)	145	(76.7)	213	(78.3)	3,059	(70.6)
Female	749	(33.8)	148	(30.1)	34	(17.3)	81	(23.6)	54	(29.3)	107	(24.1)	44	(23.3)	59	(21.7)	1,276	(29.4)
Medical School n (%)																		
U.B.C.	791	(35.7)	137	(27.9)	65	(33.0)	100	(29.2)	37	(20.1)	143	(32.2)	60	(31.7)	59	(21.7)	1,392	(32.1)
Other Canada	931	(42.0)	251	(51.1)	73	(37.1)	179	(52.2)	105	(57.1)	187	(42.1)	79	(41.8)	99	(36.4)	1,903	(43.9)
Non-Canada	493	(22.3)	103	(21.0)	59	(29.9)	64	(18.7)	42	(22.8)	114	(25.7)	50	(26.5)	114	(41.9)	1,040	(24.0)
Totals	2,215	-	491	-	197	-	343	-	184	-	444	-	189	-	272	-	4,335	-

'General' Specialties (General Internal Medicine; General Surgery; Psychiatry; Pediatrics; Obstetrics & Gynecology)

	Vancouver		Capital		Fraser Vall		Okanagan		South East		Isl Coast		Central		N & N Cent		Totals	
Age median (IQR)	50	(17.0)	57	(15.0)	46	(17.0)	50	(23.0)	48	(17.0)	53	(18.0)	49	(19.0)	45	(19.0)	50	(18.0)
Age Group n (%)																		
< 40	159	(17.4)	11	(7.4)	8	(21.1)	16	(18.4)	6	(14.6)	14	(14.3)	9	(22.5)	15	(34.1)	238	(16.9)
40 to 64	608	(66.5)	103	(69.1)	27	(71.1)	52	(59.8)	32	(78.0)	64	(65.3)	27	(67.5)	23	(52.3)	936	(66.3)
65+	147	(16.1)	35	(23.5)	3	(7.9)	19	(21.8)	3	(7.3)	20	(20.4)	4	(10.0)	6	(13.6)	237	(16.8)
Sex n (%)																		
Male	677	(74.1)	124	(83.2)	32	(84.2)	72	(82.8)	38	(92.7)	88	(89.8)	35	(87.5)	36	(81.8)	1,102	(78.1)
Female	237	(25.9)	25	(16.8)	6	(15.8)	15	(17.2)	3	(7.3)	10	(10.2)	5	(12.5)	8	(18.2)	309	(21.9)
Medical School n (%)																		
U.B.C.	141	(15.4)	12	(8.1)	8	(21.1)	12	(13.8)	4	(9.8)	5	(5.1)	2	(5.0)	5	(11.4)	189	(13.4)
Other Canada	384	(42.0)	73	(49.0)	11	(28.9)	50	(57.5)	19	(46.3)	54	(55.1)	21	(52.5)	16	(36.4)	628	(44.5)
Non-Canada	389	(42.6)	64	(43.0)	19	(50.0)	25	(28.7)	18	(43.9)	39	(39.8)	17	(42.5)	23	(52.3)	594	(42.1)
Totals	914	-	149	-	38	-	87	-	41	-	98	-	40	-	44	-	1,411	-

All Other Specialties (Medical Subspecialties; Surgical Subspecialties; Laboratory & Radiology; Anesthesiology)

	Vancouver		Capital		Fraser Vall		Okanagan		South East		Isl Coast		Central		N & N Cent		Totals	
Age median (IQR)	47	(15.0)	50	(14.0)	49	(12.0)	45	(14.0)	42	(11.0)	47	(16.0)	47	(14.5)	45	(16.0)	47	(14.0)
Age Group n (%)																		
< 40	245	(20.8)	25	(11.8)	9	(15.5)	43	(32.6)	13	(38.2)	23	(20.2)	9	(16.1)	14	(25.5)	381	(20.7)
40 to 64	834	(70.9)	157	(74.1)	43	(74.1)	79	(59.8)	20	(58.8)	80	(70.2)	44	(78.6)	36	(65.5)	1,293	(70.3)
65+	98	(8.3)	30	(14.2)	6	(10.3)	10	(7.6)	1	(2.9)	11	(9.6)	3	(5.4)	5	(9.1)	164	(8.9)
Sex n (%)																		
Male	958	(81.4)	193	(91.0)	52	(89.7)	122	(92.4)	29	(85.3)	101	(88.6)	54	(96.4)	49	(89.1)	1,558	(84.8)
Female	219	(18.6)	19	(9.0)	6	(10.3)	10	(7.6)	5	(14.7)	13	(11.4)	2	(3.6)	6	(10.9)	280	(15.2)
Medical School n (%)																		
U.B.C.	287	(24.4)	24	(11.3)	12	(20.7)	25	(18.9)	4	(11.8)	22	(19.3)	8	(14.3)	11	(20.0)	393	(21.4)
Other Canada	529	(44.9)	124	(58.5)	29	(50.0)	77	(58.3)	21	(61.8)	60	(52.6)	33	(58.9)	24	(43.6)	897	(48.8)
Non-Canada	361	(30.7)	64	(30.2)	17	(29.3)	30	(22.7)	9	(26.5)	32	(28.1)	15	(26.8)	20	(36.4)	548	(29.8)
Totals	1,177	-	212	-	58	-	132	-	34	-	114	-	56	-	55	-	1,838	-

Note: The 'North' and 'North Central' regions have been grouped. Physicians in emergency medicine, community medicine, physical medicine and public health are excluded from the analyses. Includes only physicians on the 'active' register of the CPSBC. IQR refers to 'inter-quartile range'.

Table 4.17: Distribution of Herfindahl Index for GP/FPs & Specialists by HHRU Regions, 1996-97[1,2,3]

HHRU Region	General / Family Practice				Specialists			
	n	Mean	Median	SD	n	Mean	Median	SD
Vancouver & District	1,839	0.77	0.78	0.14	1,071	0.89	0.96	0.15
Capital	403	0.75	0.76	0.13	181	0.88	0.93	0.15
Fraser Valley	177	0.74	0.75	0.14	55	0.92	0.95	0.10
Okanagan	315	0.73	0.75	0.13	142	0.87	0.92	0.13
South-East	155	0.74	0.77	0.15	38	0.88	0.94	0.14
Island Coast	398	0.73	0.75	0.13	129	0.90	0.95	0.12
Central	170	0.73	0.76	0.14	58	0.88	0.93	0.13
North Central	187	0.71	0.73	0.14	52	0.89	0.95	0.12
North	47	0.68	0.69	0.15	6	0.83	0.81	0.09
Total Physicians	3,691	0.75	0.76	0.14	1,732	0.90	0.95	0.14

[1] Includes physicians on the 'active' CPSBC registers in 1996 except for pediatrics, rehabilitation medicine, community medicine/ public health, psychiatry, laboratory medicine and radiology, medical oncology and radiation oncology (N=1,377). Also, excludes 644 GP/FPs and 288 specialists with FTE < 0.2 in 1996/97 or who had no FFS billings.

[2] Note: The footnote on Page 77 of the PGME Report should read (n=1,377) specialties excluded.

[3] Section 4.2.2.1 on Page 75 should also read (n=1,377) for specialties excluded and (n=932) for other physicians excluded.

Table 4.16: General Practitioners / Family Physicians by Health Region, Age, Sex, and Place of Medical School Education, 1996

Characteristic	East Kootenay	West Kootenay - Boundary	North Okanagan	South Okanagan - Similkameen	Thompson	Fraser Valley	South Fraser Valley	Simon Fraser	Coast Garibaldi	Cent Vanc Island	Upper Island/ Central Coast
Age median (IQR)	42.5 (17.0)	43 (13.0)	44 (18.0)	43 (13.0)	44 (16.0)	46 (16.0)	44 (16.0)	43 (15.0)	42 (14.0)	44 (41.5)	42 (14.0)
Age Group n (%)											
< 40	32 (37.2)	34 (34.7)	47 (37.3)	74 (34.1)	46 (37.4)	66 (33.5)	160 (37.0)	103 (37.5)	29 (35.8)	75 (31.3)	49 (39.8)
40 to 64	47 (54.7)	59 (60.2)	73 (57.9)	133 (61.3)	73 (59.3)	109 (55.3)	237 (54.9)	157 (57.1)	49 (60.5)	148 (61.7)	68 (55.3)
65+	7 (8.1)	5 (5.1)	6 (4.8)	10 (4.6)	4 (3.3)	22 (11.2)	35 (8.1)	15 (5.5)	3 (3.7)	17 (7.1)	6 (4.9)
Sex n (%)											
Male	65 (75.6)	65 (66.3)	97 (77.0)	165 (76.0)	92 (74.8)	163 (82.7)	302 (69.9)	204 (74.2)	58 (71.6)	189 (78.8)	90 (73.2)
Female	21 (24.4)	33 (33.7)	29 (23.0)	52 (24.0)	31 (25.2)	34 (17.3)	130 (30.1)	71 (25.8)	23 (28.4)	51 (21.3)	33 (26.8)
Medical School n (%)											
U.B.C.	15 (17.4)	22 (22.4)	45 (35.7)	55 (25.3)	36 (29.3)	65 (33.0)	138 (31.9)	96 (34.9)	25 (30.9)	77 (32.1)	41 (33.3)
Other Canada	53 (61.6)	52 (53.1)	61 (48.4)	118 (54.4)	59 (48.0)	73 (37.1)	185 (42.8)	118 (42.9)	41 (50.6)	96 (40.0)	50 (40.7)
Non-Canada	18 (20.9)	24 (24.5)	20 (15.9)	44 (20.3)	28 (22.8)	59 (29.9)	109 (25.2)	61 (22.2)	15 (18.5)	67 (27.9)	32 (26.0)
Totals	86 -	98 -	126 -	217 -	123 -	197 -	432 -	275 -	81 -	240 -	123 -

Characteristic	Cariboo	North West	Peace Liard	Northern Interior	Vancouver	Burnaby	North Shore	Richmond	Capital	All Regions
Age median (IQR)	41 (11.0)	42 (16.0)	39 (10.0)	42 (15.0)	43 (16.0)	42 (15.5)	45 (18.0)	43 (15.0)	45 (14.0)	43 (15.0)
Age Group n (%)										
< 40	31 (47.0)	39 (38.2)	27 (52.9)	44 (37.0)	387 (39.7)	69 (43.1)	76 (35.8)	64 (39.5)	136 (27.7)	1,588 (36.6)
40 to 64	34 (51.5)	60 (58.8)	22 (43.1)	69 (58.0)	527 (54.1)	81 (50.6)	116 (54.7)	90 (55.6)	315 (64.2)	2,467 (56.9)
65+	1 (1.5)	3 (2.9)	2 (3.9)	6 (5.0)	60 (6.2)	10 (6.3)	20 (9.4)	8 (4.9)	40 (8.1)	280 (6.5)
Sex n (%)										
Male	53 (80.3)	77 (75.5)	42 (82.4)	94 (79.0)	608 (62.4)	103 (64.4)	132 (62.3)	117 (72.2)	343 (69.9)	3,059 (70.6)
Female	13 (19.7)	25 (24.5)	9 (17.6)	25 (21.0)	366 (37.6)	57 (35.6)	80 (37.7)	45 (27.8)	148 (30.1)	1,276 (29.4)
Medical School n (%)										
U.B.C.	24 (36.4)	25 (24.5)	8 (15.7)	26 (21.8)	345 (35.4)	61 (38.1)	88 (41.5)	63 (38.9)	137 (27.9)	1,392 (32.1)
Other Canada	20 (30.3)	48 (47.1)	12 (23.5)	39 (32.8)	416 (42.7)	67 (41.9)	87 (41.0)	58 (35.8)	251 (51.1)	1,904 (43.9)
Non-Canada	22 (33.3)	29 (28.4)	31 (60.8)	54 (45.4)	213 (21.9)	32 (20.0)	37 (17.5)	41 (25.3)	103 (21.0)	1,039 (24.0)
Totals	66 -	102 -	51 -	119 -	974 -	160 -	212 -	162 -	491 -	4,335 -

Table 4.18: Distribution of Herfindahl Index for GP/FPs[1] by Age, Sex, Place of Training and FTE Status, 1996-97

	All Regions					Urban			Semi-Urban			Rural				
	n	Mean	SD	Statistic[2]	P-value	n	Mean	SD	n	Mean	SD	n	Mean	SD	Statistic[3]	P-value
Age Group																
<30	122	0.73	0.13	37.7	<0.000	65	0.73	0.13	42	0.70	0.13	15	0.74	0.12	0.50	0.605
31-40	1,248	0.72	0.14			536	0.73	0.13	583	0.70	0.14	129	0.74	0.12	6.0	0.003
41-50	1,284	0.74	0.14			548	0.76	0.14	631	0.73	0.13	105	0.68	0.15	29.4	<0.0001
51-60	688	0.79	0.13			290	0.80	0.14	347	0.77	0.13	51	0.78	0.12	5.7	0.003
61-70	286	0.81	0.14			133	0.81	0.14	135	0.80	0.13	18	0.82	0.08	0.36	0.698
70+	63	0.82	0.16			27	0.86	0.13	33	0.80	0.16	3	0.75	0.20	0.97	0.327
Sex																
Female	1,057	0.69	0.13	309.8	<0.000	556	0.70	0.14	432	0.69	0.13	69	0.70	0.13	1.03	0.272
Male	2,634	0.77	0.13			1,043	0.80	0.13	1339	0.75	0.14	252	0.74	0.13	57.2	<0.0001
Medical School																
U.B.C.	1,250	0.73	0.14	21.4	<0.000	615	0.74	0.14	579	0.71	0.13	56	0.73	0.11	6.08	0.002
In Canada	1,556	0.75	0.14			648	0.76	0.14	776	0.74	0.14	132	0.74	0.13	4.53	0.011
Non-Canada	885	0.77	0.14			336	0.80	0.14	416	0.76	0.14	133	0.72	0.15	14.3	<0.0001
Full-Time-Equivalency																
0.2-0.5	309	0.78	0.14	9.38	<0.000	162	0.78	0.15	123	0.78	0.14	24	0.79	0.12	0.13	0.879
0.5-1.2	2,509	0.74	0.14			1,166	0.76	0.14	1112	0.73	0.14	231	0.73	0.13	7.4	0.001
>1.2	873	0.75	0.14			271	0.79	0.14	536	0.73	0.13	66	0.73	0.14	13.2	<0.0001
Totals	3,691					1,599			1,771			321				

[1] Includes GP/FPs on the 'active' CPSBC registers in 1996. Excludes 644 GP/FPs with FTE < 0.2 in FY 1996/97 or who had no FFS billings.

[2] F-statistic from analysis of variance to test for differences in log HI between levels of the covariate of interest.

[3] F-statistic from one-way analysis of variance testing for differences in log HI among urban, semi-urban and rural levels, stratified by age, sex, medical school, FTE or PGME location.

Table 4.22: Demographic and Training Characteristics of GP/FP 'Specialists' in Obstetrics & Gynecology, Anesthesiology, and Surgery, 1996/97

	All GP/FPs[1]	GP/FP 'Specialists'[2]								
		Obstetrics & Gynecology			Anesthesiology			Surgery		
			Statistic[3]	P-value		Statistic[3]	P-value		Statistic[3]	P-value
Age median (IQR)	43 (24.0)	39 (11.0)	29.7	<0.001	43 (14.0)	0.13	0.717	45 (18.0)	14.5	<0.001
Age Group n (%)										
<40	1,373 (37.2)	96 (54.9)	37.6	<0.001	25 (31.6)	2.10	0.555	68 (34.7)	30.2	<0.001
40-49	1,283 (34.8)	62 (35.4)			33 (41.8)			61 (31.1)		
50-59	687 (18.6)	11 (6.3)			15 (19.0)			27 (13.8)		
60+	348 (9.4)	6 (3.4)			6 (7.6)			40 (20.4)		
Sex n (%)										
Male	2,634 (71.4)	24 (13.7)	298.8	<0.001	70 (88.6)	11.7	<0.001	169 (86.2)	22.3	<0.001
Female	1,057 (28.6)	151 (86.3)			9 (11.4)			27 (13.8)		
Medical School n (%)										
U.B.C.	1,250 (33.9)	74 (42.3)	8.70	0.013	19 (24.1)	16.2	0.001	56 (28.6)	2.59	0.273
In Canada	1,556 (42.2)	73 (41.7)			26 (32.9)			89 (45.4)		
Non-Canada	885 (24.0)	28 (16.0)			34 (43.0)			51 (26.0)		
Geographic Location n (%)										
Urban	1,599 (43.3)	93 (53.1)	7.83	0.020	9 (11.4)	98.5	0.001	88 (44.9)	0.473	0.789
Semi-urban	1,771 (48.0)	72 (41.1)			40 (50.6)			93 (47.4)		
Rural	321 (8.7)	10 (5.7)			30 (38.0)			15 (7.7)		
Totals	3,691 -	175 -			79 -			196 -		

[1] Includes all GP/FPs on the 'active' registers of the College of Physicians and Surgeons of B.C., excluding GP/FPs with FTE<0.2 or who had no FFS billings in 1996/97 (n=644).

[2] GP/FP 'specialists' were defined by the proportion of billings within the respective specialty 'domains'. GP/FP 'anesthesiologists' and 'surgeons' were defined as GP/FPs with >10% of total billings in the respective domain. GP/FP 'obstetrician/gynecologists' were defined as GP/FPswith >20% of total billings in the obstetrics & gynecology fee-item domain. Percents given are relative to all GP/FPs.

[3] For categorical variables, chi-square test for homogeneity is presented. For age (as a continuous variable), the F-statistic relating to one-way analysis of variance is presented.

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Dear Reader:

We have recently become aware that computing errors were made during the production of Table 4.11 in the report Issues in Physician Resources Planning in B.C.: Key Determinants of Supply and Distribution, 1991-96. A Report to the Post-Graduate Medical Education Advisory Committee. Attached is the corrected table. Please insert the table in the appropriate section of the report.

Table 4.11: Change in Population, Physicians, and FTE/Population Ratios by HHRU Region, 1991/92-1996/97*

	Vancouver	Capital	Fraser Valley	Okanagan	South East	Island Coast	Central	N. Central	North
Population Growth 91-96 (%)	16.0	7.8	21.1	19.6	10.7	17.8	13.9	8.3	8.3
Change in No. Physicians n (%)**									
General Internal Medicine	-1 -(0.4)	3 (9.7)	1 (12.5)	1 (5.6)	0 (0.0)	6 (40.0)	0 (0.0)	4 (57.1)	1 -
Medical Subspecialties	35 (15.7)	11 (32.4)	1 (20.0)	11 (61.1)	1 (50.0)	1 (12.5)	1 (14.3)	1 (25.0)	0 -
General Surgery	-13 -(13.1)	-2 -(9.1)	-1 -(12.5)	0 (0.0)	4 (50.0)	1 (5.0)	-4 -(25.0)	-4 -(30.8)	-1 -(25.0)
Surgical Subspecialties	18 (5.1)	-5 (16.0)	-2 -(8.3)	6 (13.3)	2 (25.0)	12 (34.3)	2 (10.5)	1 (6.3)	-1 -(50.0)
Pediatrics	16 (11.0)	4 (36.4)	2 (66.7)	3 (27.3)	0 (0.0)	3 (37.5)	1 (20.0)	1 (25.0)	-1 -(100)
Psychiatry	50 (17.3)	19 (41.3)	4 (50.0)	6 (37.5)	7 (175.0)	11 (78.6)	4 (133.3)	5 (250.0)	0 -
Obstetrics & Gynecology	7 (7.0)	-3 -(16.7)	2 (50.0)	0 (0.0)	2 (100.0)	5 (33.3)	0 (0.0)	3 (60.0)	0 (0.0)
Laboratory & Radiology	30 (9.8)	1 (1.9)	3 (18.8)	3 (12.5)	1 (6.7)	3 (11.5)	0 (0.0)	6 (46.2)	0 (0.0)
Anesthesiology	8 (4.2)	1 (2.4)	0 (0.0)	6 (33.3)	3 (150.0)	10 (52.6)	0 (0.0)	4 (80.0)	0 -
Change in FTE / Population Ratios (FTEs per 100,000)									
General Internal Medicine	-0.23	-0.22	-0.33	-0.88	-0.55	0.60	-0.73	1.63	1.38
Medical Subspecialties	-0.60	5.10	-0.35	2.63	-0.14	-0.21	-0.21	0.16	0.00
General Surgery	-0.93	-0.28	-1.15	-0.60	0.75	-0.62	-1.35	-0.98	-2.54
Surgical Subspecialties	-1.99	-1.86	-2.52	-0.01	1.52	0.89	-1.31	-0.47	-0.41
Pediatrics	-0.14	0.88	0.60	-1.12	-0.32	-0.56	-0.01	0.17	0.00
Psychiatry	0.80	3.64	-0.22	0.24	4.28	2.01	1.29	2.20	0.00
Obstetrics & Gynecology	0.15	-0.97	0.47	-0.81	0.25	0.34	-0.33	0.74	-0.04
Laboratory & Radiology	-0.98	-0.97	-0.16	-0.51	-0.38	-0.38	-1.16	2.25	-0.39
Anesthesiology	-0.89	-0.89	-1.24	0.82	1.73	1.42	-0.38	1.35	0.00

* Includes only physicians on the 'active' registers of the CPSBC.

** Percent change is calculated (no. 1996/97 - no. 1991/92) / (no. 1991/92) *100