RURAL COMMUNITY DEVELOPMENT TOOLS

FROM THE MEDICAL PERSPECTIVE:

A NATIONAL FRAMEWORK OF RURALITY AND

PROJECTIONS OF PHYSICIAN WORKFORCE SUPPLY IN

RURAL AND REMOTE AREAS OF CANADA

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(On behalf of the Canadian Medical Association Project Advisory Group on Rural and Remote Practice Issues)

Report to Health Canada

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EXECUTIVE SUMMARY

This report of the Canadian Medical Association (CMA) describes the development of

1) ***a national framework of rurality*** *and its application, and 2)* ***projections on the future supply of physicians in rural and remote areas of Canada****. The CMA believes that these initiatives will ultimately contribute to improving access to health care in rural and remote areas of Canada by ensuring the necessary supply, specialty mix and geographic distribution of physicians. In addition, they will set the foundation for further research into the provision of rural medical services and the development of physician retention and recruitment strategies for rural and remote areas of Canada.*

The national framework of rurality was developed on the basis of feedback from rural Canadian physicians to the January 1999 "Canadian Medical Association Survey on Rural Medical Practice in Canada." The framework is not intended to determine if a community is "rural" or not but, rather, to determine, from a medical perspective, its relative degree of ruralness to an established norm or relative to another community.

The framework consists of the factors that most define a community as rural/remote, as selected by the survey respondents. This was achieved by selecting the top 10 ranked factors and breaking them down into 4 primary and 6 secondary factors. For the most part, these primary and secondary factors coincide with anecdotal assertions made by a variety of groups. After isolating these ten factors, a relative weighting was calculated for each based on the number of mentions it received relative to the other 9 factors included in the framework. A means of applying the national framework of rurality is proposed in the report that follows.

Using the Physician Resource Evaluation Template (PRET) developed by the CMA, results for 6 rural physician workforce supply scenarios have been developed for the years 1998 to 2021 based on a variety of assumptions and using several data sources. A status quo national (urban and rural) scenario has also been included for comparison purposes. A review of the results for each scenario shows that a change in only one of the assumptions in each scenario will have significant effects on the overall supply of rural physicians.

Along with a detailed monitoring of present attrition rates, mix and distribution of physicians, an analysis of each of the 6 rural scenarios created by the CMA can greatly assist physician resource planners in recommending short and long term policy initiatives. In addition, the PRET for rural Canada can be applied to a variety of scenarios, such as increased migration, increased enrollment, younger retirement age, different gender mix, or changes in other variables.

POLICY IMPLICATIONS

National Framework of Rurality

The national framework of rurality that has been developed by the CMA can be easily adapted to regional areas and may serve as an effective tool for physician resource planning in rural and remote areas of Canada. The framework is also a useful basis for the development of physician retention and recruitment initiatives. In addition, the fact that the framework was based on survey feedback from rural physicians may positively

influence the response from this stakeholder group to proposed policies and programs at the government level.

Projections for Physician Workforce Supply in Rural and Remote Areas of Canada, 1998-2021

All of the scenarios created using the PRET are considered reasonable since they are not unprecedented based on previous trends in physician flow. All scenarios of physician supply in rural and remote areas of Canada project a decrease in physician:population ratio for every year to the year 2021, including the 2 scenarios where an assumption of net overall gain of physician supply to rural areas was made compared to the status quo (scenarios A and C). This is mostly due to the age distribution of the current active supply; this factor contributes more than any other to the increased attrition (such as retirement) that is seen throughout the projection years.

The percentage of the population living in rural and remote areas (22.2%) was held constant in all the scenarios for rural Canada as well as throughout the entire time span of the projections (1998-2021); this percentage could in fact change over time, in which case the physician: population ratios would also vary.

All scenarios modify a single assumption compared to the status quo for rural Canada. This is the minimum change that would be effected; in a real life situation, more than one variable is likely to change in any given year. The model is not designed to project the most likely future; rather, it is designed to analyze the change of individual variables.

RECOMMENDATIONS TO HEALTH CANADA

Recommendation 1

That the proposed national framework of rurality be tested and evaluated at the regional or provincial level before it is implemented as a physician resource planning tool for rural and remote areas of Canada.

Recommendation 2

That Health Canada convene a national stakeholder conference to 1) develop recommendations on the application of the national framework of rurality; and 2) develop physician retention and recruitment strategies for rural and remote areas of Canada.

Recommendation 3

That Health Canada involve all relevant stakeholders in the development of a research program that identifies best practices for the delivery of medical services for rural and remote regions of Canada.

1. INTRODUCTION

In December 1998, the CMA was awarded funding from Health Canada for the following 2 initiatives: 1) to develop a national framework of rurality, and 2) to forecast physician workforce supply for rural and remote areas of Canada.

As part of its mission, the CMA has a long-standing interest in promoting the highest standards of health and health care for Canadians. The national framework of rurality and forecasted physician workforce supply for rural and remote areas of Canada support the federal government's and the CMA's commitment to rural community development. The CMA believes that these initiatives will ultimately contribute to improving access to health care by Canadians in rural and remote areas by helping to ensure the necessary supply, specialty mix and geographic distribution of physicians.

2. NATIONAL FRAMEWORK OF RURALITY

2.1 Introduction

Many quantitative studies have identified a range of personal and professional factors associated with rural recruitment and retention of physicians, such as spousal employment opportunities, work hours and professional support. A 1992 study by the CMA identified the factors that encouraged physicians to locate in a rural setting and the influences that caused them to move to an urban environment.[(1)] These surveys found significantly greater concern with personal and professional factors among physicians living more than 100 miles from a larger population centre. Since that time, various factors have changed the rural medicine landscape, such as (1) the major changes in the duration and number of training opportunities in medicine, (2) more opportunities for undergraduate and postgraduate training in rural sites, and (3) the involvement of more

generalists in teaching medical students and residents.

More recently, Dr. Eugene Leduc has developed a detailed general practice rurality index by assigning a weighting system to a series of quantifiable variables such as the number of GP/FPs and specialists in the community.[(2)] This formula was developed and tested in a single provincial situation, in this case British Columbia.

A comprehensive literature search has revealed no published peer-reviewed research in this area that would have applicability to the physician workforce in Canada at the national level.

The following methodology was used to build on the findings of the two studies mentioned above and to develop a national framework from which relative rurality may be measured. This framework of rurality would not be dependent on the collection of detailed geographic data.

2.2 Methodology

Step 1

Based on previous studies,[1,2] a list of factors that can be used in determining the extent of isolation or ruralness of a practice setting was compiled, e.g., distance to the closest referral centre, availability of specialists, presence of an acute care hospital, etc.

Step 2

A survey instrument was designed in collaboration with Dr. Eugene Leduc, Dr. Keith MacLellan and the CMA Project Advisory Group on Rural and Remote Practice Issues.[(3)] A copy of the *Canadian Medical Association Survey on Rural Medical Practice in Canada 1999* is attached as Appendix 1.

Step 3

The survey was mailed on 21 January 1999 to 5,347 rural physicians. This number corresponds to the entire population of rural physicians in Canada, using the broad criteria of rurality as being outside census metropolitan areas (>100,000 population) and census agglomerations (10,000 to 100,000 population). The anonymous survey was followed up at 2 week intervals with 2 waves of reminder cards to the full sample. The

Angus Reid Group was retained to administer the survey and compile the results.

Step 4

A key component of the survey was the section on *"What Defines A Community as Rural."* This section included a question asking rural physicians to rate the importance of 21 factors determined in Step 1, using a 5-point scale ranging from "not at all important" to "extremely important." Once they had rated the 21 factors, they were asked to select the top 3 factors from the list that they felt were most important in determining relative degrees of rurality between 2 communities. They were also invited to suggest other factors not included in the list.

The proposed methodology for developing the national framework of rurality was discussed with the experts. The importance assigned by the survey respondents to each of the factors determined in Step 1 was analyzed and then an analysis was undertaken of regional commonalities and differences. A regional analysis was also done of the rankings of the top 3 factors identified by respondents as being the most important in determining relative degrees of rurality between 2 communities.

Step 5

Based on the results in Step 4, a national framework of rurality was developed consisting of primary and secondary factors. A relative weighting was calculated for each of the primary and secondary factors, based on the number of mentions it received relative to the other factors that were included in the framework.

2.3 Findings

A national framework of rurality was developed on the basis of feedback from rural Canadian physicians to the January 1999 *Canadian Medical Association Survey on Rural Medical Practice in Canada*. The survey yielded a response rate of 31% (n=1658) which, although lower than hoped for and expected, provided enough information to develop a national framework of rurality. Fortunately, there was very high concordance among responses to section 3 of the survey, "*What Defines A Community as Rural*," which was key for the development of the national framework. In addition, the response sample was very representative, percentage-wise, of the total rural physician population in Canada. This held true by age, sex, broad specialty and province/territory, with the exception of Quebec. (Quebec's low response rate was not unexpected given that the CMA usually receives a lower response rate from that province.) It should be noted that the relatively low response rate may be attributed to the limited field time for the survey (approximately 5-6 weeks). This restricted the number and nature (reminder card only)

of the follow-up steps that could be done in the time allotted and budget allocated. Selected survey findings and related information are included in Appendices 2, 2-1 and 2-2.

2.3.1 Rating of Importance of the 21 Factors in Defining the Level of Rurality of a Community

An overview of responses at the national level is shown in Table 1.

Overall, more than 4 in 5 physicians (84%) rated a high level of on-call responsibilities[(4)] as being very or extremely important in defining the levels of rurality of a community. This was followed by long distances to both secondary (73%) and tertiary (71%) referral centres.

Table 1.

Percentage of respondents rating factor very or extremely important

Description	Atlantic n=277	Quebec n=264	Ontario n=411	Prairies n=390	BC&Terr n=251	Canada n=1593
a. insufficient GP/FPs	54.8	53.6	45.5	52.2	53.4	51.2
b. lack of specialist services	69.5	50.6	63.1	66.4	71.6	64.2
c. lack of other health care professionals	50.8	28.6	37.1	48.9	48.1	42.5
d. long distance to secondary referral centre	78.2	56.1	73.5	78.4	78.8	73.3
e. long distance to a tertiary referral centre						
f. catchment population greater than community	68.4	62.8	71.6	79.5	71.6	71.3
g. seasonal population greater than year-round community	31.9	30.4	34.3	36.1	26.1	32.2
h. sparsely populated catchment	12.0	16.7	24.6	16.3	18.2	17.9
i. reliance on advance practice nurses/nurse practitioners						

j. reliance on telemedicine	36.5	53.2	35.2	34.6	29.5	37.2
k. absence of equipment (lab, xray)	28.7	33.8	21.2	32.9	28.4	28.5
l. inability to provide services such as obst. and gen. surgery	22.4	23.1	19.0	26.1	15.5	21.4
m. no ambulance service	64.2	39.4	53.8	69.4	64.4	68.5
n. difficulty in obtaining locums	69.5	41.3	56.4	64.7	69.3	59.1
o. no local CME opportunities	72.9	47.5	63.8	71.4	69.0	65.1
p. high level of on-call	64.9	58.7	63.9	71.7	71.2	66.2
q. low potential mate pool	52.6	35.3	49.6	59.4	63.6	52.2
r. inability of spouses to find work	81.7	72.8	86.3	86.7	88.3	83.5
s. lack of recreational facilities	41.4	39.0	52.3	53.1	47.7	47.6
t. lack of educational opportunities for children	55.1	56.5	57.0	63.4	53.8	57.3
u. high turnover rate of physicians	39.7	36.4	33.3	50.9	36.7	39.4
	57.2	49.0	51.9	64.1	57.5	56.1
	64.2	52.5	55.9	67.7	63.2	60.6

More than two thirds of the respondents rated the absence of equipment such as x-ray and laboratory services (69%) and difficulty in obtaining locums (66%) as being important as well. There did not appear to be significant differences in how physicians answered the question based on gender, certification status (GP/FP or specialist) or age, although more detailed analyses should be carried out to verify this from a statistical perspective.

It was apparent, however, that there were significant regional differences among responses and these are discussed later in this section. Regions were defined as Atlantic, Quebec, Ontario, Prairies, and British Columbia combined with the Territories.

For a few of the factors, physicians responded differently depending on the degree of rurality they indicated for the community in which they practise. For example, the more remote the community, the more highly they rated the importance of distance to a tertiary centre in defining rurality.

2.3.2 Ranking of Factors in Determining Relative Degrees of Rurality Between Two Communities

After respondents rated the 21 characteristics, they were asked to select the top 3 factors that they felt were most important in determining relative degrees of rurality between two communities (Table 2).

The 6 highest ranked factors can be broadly grouped or categorized as: inadequate physician supply (both GP/FPs and specialists), distance to referral centres (secondary and tertiary), level of on-call responsibilities[4] and the absence of equipment.

Family physicians tended to rank on-call responsibilities[4] among the top 3 factors more frequently than specialists (44% vs 33%) but both groups rated it very highly in terms of importance (86% and 88% reported it was very or extremely important) in the previous question. The likelihood of selecting on-call responsibilities[4] among the top 3 factors diminished with age: almost half (48%) of those physicians who were under 35 chose it in their top 3 compared with only 19% of those 65 and over. Despite this variation, and with the exception of those 65 and over, more than 80% of every age group rated it as very or extremely important.

As with the importance ratings, respondents exhibited regional differences when selecting their top 3 factors. However, when looking at the 6 most frequently cited factors rated by each region, it became clear that there was much similarity among the regions and only a few outliers (see Table 3). For instance, all regions included the following factors among the 6 most frequently selected (out of a list of 21 factors): *on-call responsibilities,*[4] *long distance to secondary referral center, lack of specialist services and insufficient GP/FPs*. To round out their top 6 factors, all regions except Quebec included *the absence of equipment such as x-ray and laboratory services*. The Atlantic region frequently chose *no ambulance service* as being important while the British Columbia region (including the Territories) included *lack of locums*. Three regions (Quebec, Ontario and the Prairies) included *long distance to tertiary care centers* but Quebec was the only region to include a *sparsely populated catchment area* among their 6 most frequently selected factors.

Table 2.

Regional differences among what rural physicians selected as the top 3 factors in determining relative rurality did not always correspond to how they rated their importance. For instance, although only 56% of Quebec respondents rated long distance to a secondary referral center as being very or extremely important (compared to 73% for Canada), it ranked as the most frequently mentioned factor by Quebec physicians when asked to pick their top 3.

This does not necessarily indicate any inconsistency in the thought process of the respondents. In the first part of the question, they are given the opportunity of "sitting on the fence" by rating the importance of any or all of the factors listed. In the second part of the question, they are forced to choose the top 3 factors, regardless of their previous ratings.

Table 3.

Top Six Factors By Region

Atlantic	Quebec	Ontario	Prairies	BC & Terr	Canada
p	d	d	p	p	p
d	a	p	d	d	d
b	p	b	e	b	b
a	b	e	b	a	a
m	h	a	a	k	e
k	e	k	k	n	k

Atlantic - excluded e (long distance to tertiary), included m (no ambulance)

Quebec - excluded k (x-ray and lab), included h (sparsely populated catchment)

BC & Terr - excluded e (long distance to tertiary), included n (lack of locums)

2.4 Conclusions

Because of the regional differences identified, the framework of rurality consists of all the factors that the regions selected most frequently rather than limiting it to the national results. This was achieved by selecting the top 10 ranked factors at the national level and breaking them down into 4 primary factors and 6 secondary factors as shown in Table 4.

Table 4.

Primary and Secondary Factors

Primary Factors:

- high level of on-call responsibilities
- long distance to secondary referral centre
- lack of specialist services
- insufficient GP/FPs

Secondary Factors:

- long distance to tertiary referral centre
- absence of equipment such as x-rays and laboratory services
- difficulty in obtaining locums
- no ambulance service
- inability to provide services such as obstetrics and general surgery
- sparsely populated catchment population

The primary factors account for 50% of the total number of mentions (n= 4555) for all factors listed and the secondary factors account for 33%. This means that over four-

fifths of all factors cited by respondents as their top 3 are encompassed within this list.

After isolating only these factors, a relative weighting was calculated for each based on the number of mentions it received relative to the other 9 factors included in the framework (see Table 2). The primary and secondary factors comprise 60% and 40%, respectively, of the total weight.

2.4.1 Applying the Framework of Rurality

The framework of rurality is not intended to determine if a community is "rural" or not but rather to determine its relative degree of ruralness relative to an established norm or relative to another community.

Step 1 - Measure the factors

For a planner to apply the model at say a regional level, they must first measure the ten factors included in the framework (e.g., distance to secondary referral centre). For factors such as *insufficient GP/FPs* the number of physicians per 1,000 population may be used in the equation. The same method can be applied to calculating a number for *lack of specialist services* although the planner may wish to some extent to include visiting specialists in the rate per 1,000 population.

Step 2 - Code the measurements

The factors must then be categorized into a consistent measurement scale. For instance, each factor could be coded to 5 categories and assigned a score of 1 to 5 where 5 would represent the most underserviced category and 1 would be the most serviced. For example, a high level of on-call responsibilities[4] might be any arrangement where the physician is on call more than once every 3 days. This would be assigned to category 5 and receive a score of 5. Similarly, GP/FPs per 1,000 population could be grouped into 5 ranges such that the lowest values would receive a score of 5.

Step 3 - Apply the weights

The relative weights are applied by multiplying the factor category scorings (1 to 5) by the weight for that factor (e.g., 0.17 for distance to secondary centre) and then summed across all ten factors. This results in the **rurality index** for the community. By categorizing the factors first, it prevents large measurements such as distance to tertiary referral centre (in kilometres) from dominating the numeric value of the index.

Step 4 - Assess relative rurality of community

There are a couple of ways that a planner can use the framework to compare the relative rurality of the community. The first method would involve establishing some sort of norm or standard for the province in terms of the 10 factors. This could perhaps be done through a panel of experts within each province since the standards would probably vary by province. From this set of norms, a base rurality index would be calculated. All community specific indices would then be compared to this provincial standard.

A second way would be to strictly compare the relative difference of the rurality indices between 2 or more communities in the absence of any base standard. The numerical index would support the overall framework of rurality within which to assess potential relative need between communities without precluding an examination of unique factors that would affect a community's ability to gain access to care.

3. PROJECTIONS OF PHYSICIAN WORKFORCE SUPPLY IN RURAL AND REMOTE AREAS OF CANADA, 1998-2021

3.1 Introduction

In response to one of the recommendations of the National Ad Hoc Working Group on Physician Resource Planning, the CMA has developed a spreadsheet-based projection template (Physician Resource Evaluation Template (PRET))[(5)] to incorporate the key parameters in estimating physician supply over the next couple of decades.

The PRET was used to arrive at projections of the future supply of physicians in rural and remote Canada. The projections are specific for age, sex and broad specialty, and include estimates to the year 2021. Variables in the model were adjusted to test the effects of different attrition and gain scenarios on future supply.

The following section will describe how the PRET works, the data variables and sources used, and the assumptions and results of six scenarios that have been created to project possible future supplies of physicians in rural Canada. For the purpose of comparison, the status quo scenario for all of Canada has been included.

3.2 Methodology

3.2.1 Template Variables

The PRET uses 4 main categories of variables to determine the projected size of practising physicians in rural Canada: base stock, exits, entrants and flow of active physicians between rural and urban areas of Canada. The projected population of rural Canada is used to determine physician to population ratios.

3.2.1.1 Definitions

Rural Canada

Unless otherwise specified, rural in this documentation refers to all areas of Canada that are not part of a census agglomeration or census metropolitan area.[(6)]

Census Agglomeration

A census agglomeration is a large urban area (known as the urban core) together with adjacent urban and rural areas (known as urban and rural fringes) that have a high degree of social and economic integration with the urban core. A census agglomeration has an urban core population of at least 10,000, based on the previous census. However, if the population of the urban core of a census agglomeration declines below 10,000, the census agglomeration is retired. Once a census agglomeration attains an urban core population of at least 100,000, based on the previous census, it is eligible to become a census metropolitan area. Census agglomerations that have urban cores of at least 50,000, based on the previous census, are subdivided into census tracts. Census tracts are maintained for census agglomerations even if the population of the urban cores subsequently falls below 50,000. A census agglomeration may be consolidated with adjacent census agglomerations if they are socially and economically integrated. This new grouping is called a consolidated census agglomeration and the component census agglomerations are called primary census agglomerations.

Census Metropolitan Area

A very large urban area (known as the urban core) together with adjacent urban and rural areas (known as urban and rural fringes) that have a high degree of social and economic integration with the urban core. A census metropolitan area has an urban core population of at least 100,000, based on the previous census. Once an area becomes a census metropolitan area, it is retained as a census metropolitan area even if the population of its urban core declines below 100,000. All census metropolitan areas are subdivided into census tracts. A census metropolitan area may be consolidated with adjacent census agglomerations if they are socially and economically integrated. This new grouping is known as a consolidated census metropolitan area and the component

census metropolitan area and census agglomeration(s) are known as the primary census metropolitan area and primary census

agglomeration(s). A census metropolitan area may not be consolidated with another census metropolitan area.

Stock of the Day

In the rural PRET, stock of the day refers to the practising physicians in rural Canada in January of the given projection year. For instance, the sex distribution of the stock of the day for 2012 refers to the projected percent males and females make up of the practising physician pool in January 2012.

Broad Specialty

The PRET groups all specialties into one of 3 categories:

1. General Practice/Family Practice (GP/FP)

2. Medical Specialty (includes clinical and laboratory specialists)

3. Surgical Specialty.

Age Group

The PRET uses the following age groups:

Under 30 years, 31-35 years, 36-40 years, 41-45 years, 46-50 years, 51-55 years, 56-60 years, 61-65 years, 66-70 years, 71-75 years, and 76-80 years.

3.2.2 Base Stock

The PRET uses the CMA Masterfile data base to establish a base stock of active, licensed physicians, aged 80 and under. The Masterfile data contains information on a physician's practice postal code. These postal codes were mapped by Statistics Canada to determine whether or not they were part of a census metropolitan or census agglomeration area. The template uses the January 1998 numbers as a starting point for future estimates of supply. The base stock is entered into the PRET by age, sex, and broad specialty.

The Masterfile data base indicates 5,531 as the number of active, licensed physicians, aged 80 and under, practising in rural Canada in January 1998. Appendix 3 contains the base stock of rural Canadian physicians by age, sex and broad specialty that was used to seed the PRET projections.

3.2.3 Exits From the System

The PRET removes physicians from the active pool for one of three reasons: retirement, death, or emigration. Both retirement and death are rate variables, i.e., attrition percentages are applied to the active stock to remove physicians. Emigration is a magnitude variable, i.e., a total number of emigrating physicians is subtracted from the active pool.

3.2.3.1 Retirement

The total number of physicians retiring each year and the breakdown by age, sex and specialty is based on statistics compiled of year-over-year comparisons of physician activity status from the CMA Masterfile. The Masterfile contains data on all physicians in Canada (both CMA members and non-members) and is updated on a daily basis.

Physicians are retired using the percent of active stock that retires throughout the year in each age/broad specialty group. For example, if there were 50 GP/FPs age 66-70 in January 1997 and 25 of these physicians had retired by January 1998, the retirement rate for this age/broad specialty group would be 50%. Retirement rates are only available for 1998 for physicians practising in rural Canada.

CMA Masterfile analysis indicates that 135 rural physicians retired in 1998. See Appendix 4 for the retirement attrition rates used in the PRET, by broad specialty and age group, based on year over year comparisons of the CMA Masterfile.

User Input

The PRET retires physicians using the 1998 rates for age/broad specialty groups for every projection year unless a specific level of attrition (e.g., 70%) is specified by the user to begin for physicians of a particular age/sex/broad specialty in a particular year. If desired, the model could be altered to include this high level of attrition for only specified years. For example, one could project the effects of offering retirement buy-out packages in 2001, 2006 and 2010 to physicians age 65 and over, and see what the

effects on physician supply would be if 70% of eligible physicians took the retirement packages in each of those years.

3.2.3.2 Death

Each year a number of physicians possessing active licences die prior to retirement.

The PRET removes a percent of the January stock of physicians each year due to death (i.e., in the same fashion as retirement attrition rates). The PRET currently holds death rates constant over time as there is no indication that the percent of stock in each age group that dies each year changes drastically. The percent of stock dying varies according to age and sex, but is averaged across all specialty groups.

Using a percent of stock by age seems to be a logical choice because if the retirement age is lowered, the total number of physicians dying in the PRET should and will decrease because there will be fewer older physicians left in the active population.

See Appendix 5 for death rates by age, sex and broad specialty.

User Input

There is no user input for the death variable.

3.2.3.3 Emigration

The number of physicians moving abroad is calculated annually by the Canadian Institute for Health Information (CIHI), based on analysis of the information obtained from the Southam Medical Data Base. Further breakdowns of the 1994-1997 levels were requested to show the age group, sex, and specialty of the physicians emigrating from rural areas of Canada.

User Input

Total number

The number of rural physicians moving abroad each year since 1994:

Year	1994	1995	1996	1997
# Abroad	85	79	67	66

The input number is entered by the user and can therefore vary.

Sex

The sex distributions of rural physicians moving abroad each year since 1994:

Year	1994	1995	1996	1997
% Male	80%	84%	84%	77%
% Female	20%	16%	16%	23%

This distribution is similar to the distribution of the stock of the day. Therefore, for each projection year, the January stock of the day sex distribution is applied to the number of physicians moving abroad. The user can override this default and enter a different sex distribution.

Age

Unlike the sex distribution, the age of physicians moving abroad is not consistent with the stock of the day: a greater proportion of younger physicians emigrate. The age distribution of emigrating rural physicians in the PRET is based on the average of the 1994 to 1997, broad specialty-specific age distribution of all physicians who emigrated from rural Canada; this was held constant for each projection year. See Appendix 6 for the average age distribution applied to emigrating rural physicians in the PRET.

Broad Specialty

The proportion of rural Canada's emigrating physicians made up of GP/FPs compared to specialists has been:

Year	1994	1995	1996	1997
%GP/FP	81%	95%	93%	92%
% specialist	19%	5%	7%	8%

The GP/FP/specialist distribution can be changed for each projection year. If a distribution is not entered, the PRET defaults to the stock of the day percent of GP/FPs and specialists.

3.2.4 Additions to the System

3.2.4.1 Postgraduate Practice Entry

The postgraduate practice entry group are those physicians who have proceeded directly through post-MD training from graduation. Re-entry trainees are excluded to prevent double counting. The postgraduate practice entry cohort includes all graduates of Canadian faculties of medicine plus all international medical graduates (IMGs) who are Canadian citizens or permanent residents.

The information available on where the practice entry cohort sets up practice comes from the Canadian Post-MD Education Registry (CAPER) data and postal codes on the CMA Masterfile. Without access to the Statistics Canada postal code conversion file, one cannot say exactly in what size community these new physicians began practice. However, this can be estimated, based on the second digit of their location postal code after exit from the postgraduate training system. A proxy for rural status occurs if the second digit of a postal code is zero. A shortcoming of this method is that, over time, Canada Post has been updating postal codes to have fewer Canadian addresses that have a zero as the second digit; this means that a postal code could change but the community size may have remained the same. Thus, over time, it will look like fewer physicians (and Canadians in general) have a rural address even though they have not physically moved, nor has the size of their community changed significantly.

Therefore, as no other data are available for this study without great cost, the PRET will estimate rural addresses by the second digit of the postal code for the addition variable of postgraduate practice entry. It should be noted that this problem is somewhat abated through the very nature of the PRET which shows the results of various user defined scenarios. So, while good quality historical data on the number of postgraduate practice entry cohort physicians who set up practice in a rural area may not be available, the power of the PRET to look at differing scenarios (e.g., 5%, 10%, 15%, etc., of the practice entry cohort beginning practice in a rural area) is not diminished.

User Input

The following steps are used to calculate the number of postgraduate practice entry physicians who will begin practice in rural Canada each year. It should be noted that the user can use the default numbers and distributions that are available for **all** input

variables, or s/he can choose his or her own numbers and distributions.

1. Enter the total (all of Canada) number of postgraduate exits for each year in the projection model into User Input Area One. The sex and broad specialty distributions

of this national group are automatically calculated based on a recent trend analysis, but can be modified if desired.

2. Enter the gain rate for rural Canada for family medicine practitioners, i.e., what percent of the postgraduate family medicine practice entry cohort will begin practising in rural areas of Canada? For example, 735 family medicine physicians finished postgraduate

training in Canada in 1998; of these 735, 86 (11.7%) began practice in rural Canada upon completion of postgraduate training.

3. Enter the gain rate for rural Canada for specialists. I.e., what percent of the postgraduate specialist practice entry cohort will begin practising in rural areas of Canada? For example, 1006 specialists finished postgraduate training in Canada in 1998. Of these 1006, 28 (2.8%) began practice in rural Canada upon completion of postgraduate training.

4. These total numbers of physicians calculated for rural Canada will be automatically distributed by age and sex for each year in the PRET.

To create different scenarios using the PRET, all numbers/rates can be changed for any year.

Total Number by Broad Specialty

The number of practice entry cohort physicians setting up practice in rural Canada in 1998:

Broad Specialty	Number	% of total practice entry cohort by broad specialty
GP/FPs	86	11.7%
Medical Specialists	20	2.8%
Surgical Specialists	8	2.8%
Total	114	6.5%

The total number and rates are entered by the user and can therefore vary for any projected year.

Sex

Data on the demographics of physicians who have completed training each year are published by CAPER and can be analysed over time. The following table shows the sex distributions, by broad specialty, of the national practice entry cohort for the past six years.

Year	1993	1994	1995	1996	1997	1998
Family Medicine % Female	46%	50%	51%	50%	53%	53%
Medical Specialists % Female	35%	39%	39%	42%	44%	43%
Surgical Specialists % Female	26%	23%	23%	33%	26%	28%

The 1998 sex distributions by broad specialty, for the portion of the practice entry cohort that set up practice in rural Canada was 50% female for family medicine, 40% female for medical specialists and 38% female for surgical specialists.

Changes in the male/female ratio can be incorporated into the PRET by broad specialty and age group to reflect the future mix of active physicians. The PRET can use any sex distribution. The default sex distributions for new rural physicians for all scenarios can be seen in Appendix 7.

Age

The PRET does not allow the user to enter the age distribution within each sex group. This distribution has been 'hard-coded' into the system (i.e. can only be changed by the PRET administrator) based on the average age distribution of the postgraduate practice entry cohorts who began practice in Canada, by broad specialty and sex, from 1994-1998. The model tries to maximize the user's flexibility, but at the same time, reduce the number of variables that must be entered. The default age distribution used for all

scenarios can be seen in Appendix 8.

3.2.4.2 Returning From Abroad to Active Practice

Time series information on physicians returning to active practice from abroad (excluding postgraduate trainees) are available from the CIHI.

User Input

Total Number

The time series for rural Canada is:

Year	1994	1995	1996	1997
# returning	27	29	25	17

The input number is chosen by the user and can therefore vary.

Age, Sex, and Broad Specialty

The CMA has obtained the 1994-1997 figures from CIHI for rural Canada by estimated age group, sex and specialty. The distribution is not reflective of the stock of the day. Therefore, the average of the 1994-1997 returnees to rural Canada distribution by age, sex, and broad specialty is applied and held constant for each year in the model.

See Appendix 9 for the age/sex/broad specialty distribution used in the PRET for returns from abroad to rural Canada.

3.2.4.3 Immigration of Physicians

In the PRET, IMGs who have completed postgraduate training in Canada are included in the postgraduate practice entry cohort. Data on those physicians without postgraduate training in Canada but with pre-arranged employment were obtained from Citizenship & Immigration Canada.

Data are available from Citizenship & Immigration Canada regarding which province the physicians entered; however, postal code is not available. As such, it is not known if the immigrating physicians are entering rural or urban areas. However, as many Canadian jurisdictions are placing practice location restrictions on even Canadian graduates, thereby making it difficult to work in urban areas, it is assumed that very few IMGs with no postgraduate training would be allowed to practise in urban areas. For the PRET, it was assumed that only tertiary care specialists would be recruited to urban areas. The specialties counted as going to rural areas were: general/family practice, general internists, obstetricians/gynecologists, general surgeons and anesthetists.

User Input

Total Number

The time series data available from Citizenship & Immigration Canada for IMGs with the above specialties immigrating to Canada with previously arranged employment (PAE) are:

Year	1993	1994	1995	1996	1997
Number of PAEs	123	66	63	34	37
% GP/FP	77%	73%	83%	71%	68%

Any number of PAEs can be entered for each year in the model.

Age, Sex and Broad Specialty

The age and sex of PAEs is not known. The stock of rural physicians in the estimate year is used to approximate the distribution of these new physicians by age and sex. It is further assumed that no IMGs over the age of 65 are recruited to practise in Canada. The specialty of these immigrating physicians is known, and as shown above, has been made up of a higher proportion of GP/FPs than specialists. All scenarios in the PRET use the most recent five year average, i.e., 74% GP/FP.

3.2.5 Flow of Active Physicians Between Urban and Rural Areas

Each year a large number of practising Canadian physicians move from one region of Canada to practise in another. Formerly Health Canada, and now CIHI, keeps statistics on this migration of active physicians. The CMA has purchased 1994-1997 inter-rural/urban migration data from CIHI by age, sex and specialty. Postgraduate trainees

are excluded from these numbers.

The aggregate time series for inter-rural/urban migration is:

	1994	1995	1996	1997
To rural areas from urban areas	404	373	386	322
To urban areas from rural areas	332	264	298	325
Net gain (+)/Net loss(-) for rural areas	+72	+109	+88	-3

User Input

The user enters the net loss or net gain for rural areas, for each sex/broad specialty/age group cell. Refer to Appendix 11-7 for an example of the user input screen for the flow of active physicians between rural and urban areas of Canada.

3.2.6 Calculations

3.2.6.1 Calculating Net Supply

A net supply of rural Canada's physicians is calculated for the end of each projection year based on the initial stock (as of January) plus total entrants to the system, less total exits. Further, all physicians are removed from the system at age 81.

The stock is aged one year every January. For the base stock in 1998, the individual ages are known. For the subsequent entrants to the system, the aging process occurs based on the known age group of the physician. It is assumed that the physicians entering the system are distributed evenly within each known 5-year age group. For example, it is assumed that the net gain in the 36 to 40 age group is distributed such that 20% of the physicians are 36, 20% are 37, 20% are 38, etc. Therefore only one-fifth of these entering physicians are moved to the next (41 to 45) age group in the following projection year, along with all the physicians who were known to be 40 in the initial year. The remainder stay within the 36 to 40 age group. These cohorts are tracked throughout the system and aged accordingly in subsequent years. Exits are based on individual ages, so the physicians who die, retire or move abroad are removed for each individual age.

Exits have to be based on individual ages otherwise negative numbers could result. For example if the January stock is:

66 year olds = 20 male GP/FPs

67 year olds = 30 male GP/FPs

68 year olds = 6 male GP/FPs

69 year olds = 24 male GP/FPs

70 year olds = 20 male GP/FPs

Total 66-70 year olds = 100

And if the retirement rate is 50% for 66-70 year old male GP/FPs, the total who will retire will be 50% of 100 = 50. If these 50 physicians were divided 1/5 for each age, a negative number of 68 year olds would result (6 - 10 = -4). Therefore, the 50% rate is applied across the age group, to each individual age. So, in the above case, the retirement numbers would be:

66 year olds = 20 male GP/FPs @ 50% attrition = 10 retire

67 year olds = 30 male GP/FPs @ 50% attrition = 15 retire

68 year olds = 6 male GP/FPs @ 50% attrition = 3 retire

69 year olds = 24 male GP/FPs @ 50% attrition = 12 retire

70 year olds = 20 male GP/FPs @ 50% attrition = 10 retire

Total 66-70 year olds = 100 @ 50% attrition = 50 retire

The overall calculation for each age is best shown with an example. To calculate 40 year olds for January 1999 the equation is:

39 year-olds in January 1998

minus (39 year-olds who retire in 1998)

minus (39 year-olds who die in 1998)

minus (39 year-olds who emigrate in 1998)

plus 1/5(36-40 year-old 1998 postgraduate exits in the practice entry cohort)

plus 1/5(36-40 year-old 1998 returns from abroad)

plus 1/5(36-40 year-old 1998 immigrants with previously arranged employment)

plus/minus (39 year-old net inter-rural/urban migration*)

*inter-rural/urban migration can be a net gain or loss.

3.2.7 Population Estimates

To calculate physician-to-population ratios for the future years, the template uses population projections extracted from the Statistics Canada publication, *Population Projections for Canada, Provinces and Territories 1993-2016*, published in December 1994. As the publication shows projections only for Canada as a whole, rural population must be estimated. In 1996, rural population in Canada made up 22.2% of the total population. As such, the PRET uses the projections for Canada and calculates 22.2% of the projected total population to obtain an estimation of rural population.

The Statistics Canada publication, *Population Projections for Canada, Provinces and Territories 1993-2016,* includes population estimates for three growth scenarios: high, medium and low. Any population series can be used in the PRET. As a default, the PRET uses series two, i.e., medium growth. The population projections used for this project can be seen in Appendix 11-8.

3.3 Findings

This section is part methodology, part results. It was felt that, due to the nature of the PRET, this was the simplest way to convey the findings of the different scenarios.

Six different scenarios have been created and run to project possible future physician supplies for rural Canada. The summary of the assumptions and results for these scenarios is in Appendix 10-1. The scenarios are named: Status Quo Rural and Scenarios A-E Rural. A graph of the results is available in Appendix 10-2. For purposes of comparison, a seventh scenario, the Status Quo National (i.e., urban and rural)

projection, has been included (Appendices 17-1 to 17-7).

3.3.1 Status Quo Scenario - Rural

Assumptions

The Status Quo scenario has been created using recent trend data for all variables. The results of this scenario show projected rural Canada physician supply if no significant changes (e.g., medical school enrolments cuts or increases, increased emigration) occur.

Base Stock - The PRET is seeded using January 1998 CMA Masterfile data by age, sex and broad specialty for all physicians in non-census metropolitan/census agglomeration areas.

Retirement - The PRET uses CMA Masterfile data for rural Canada for 1998 to obtain retirement rates by age and broad specialty and retires physicians at the same rates for every projection year.

Death - The PRET uses the most recent four year average based on year over year CMA Masterfile analyses and holds these death rates constant over time.

Emigration - 66 is used as the number of rural physicians moving abroad each year.

Postgraduate Practice Entry Cohort - The size of the national practice entry cohort is held at 1741 for 1998, 1750 for 1999, then reduced to 1705 in 2000 and further reduced to 1675 per year from 2001 onward. This is to account for undergraduate cuts that occurred in the early 1990s. The percentage of the practice entry cohort setting up practice in rural Canada (the gain rate) each year is set at the 1998 levels by broad specialty.

Returns from Abroad - The number of physicians returning from abroad to rural areas each year is held constant at 17.

Immigration - The number of physicians immigrating to Canada and entering rural Canada with previously arranged employment is held constant at 37 for each year. 74%

of these physicians are set to be GP/FPs, the remaining 26% are set to be specialists.

Inter-Rural/Urban Migration - The gains and losses are balanced such that the net

change = 0.

Appendices 11-1 to 11-7 show the user input screens as they look for the Status Quo scenario.

Results

The PRET produces results at a detailed level by age, sex and broad specialty for January of each projection year. Appendices 11-8 and 11-9 show a summary of the results for each projection year and detailed results for both head counts and full-time equivalent counts by sex, broad specialty and 5-year age groups for the years 1998, 2001, 2006, 2011, 2016 and 2021. Detailed results for the remaining projection years are available from the CMA upon request.

Analysis

Keeping the model at status quo levels for all variables allows the user to view future supply if no major changes occur within the system. The status quo scenario projects a decrease of rural physicians from 5,531 in 1998 to 4,529 in 2021 (an 18% decrease). The ratio of physicians per 1000 population will decrease even more, assuming the rural population of Canada continues to hold at 22.2% of the total. The ratio is projected to decrease from 0.81 physicians per 1000 population in 1998 to 0.53 by 2021 (a 35% decrease).

Not only will there be fewer physician in 2021, they will be older. In 1998, 21.7% of rural physicians are over age 55. By 2021, this figure is projected to be 46.6%. Females are projected to make up 44.1% of the practising rural physician population by 2021, compared to 24.6% in 1998.

3.3.2 Scenario A - Rural

Assumptions

Symbols before the name of the variable indicate whether the input for the variable is the same as the status quo input() or different from the status quo input ().

Base Stock - The PRET is seeded using January 1998 CMA Masterfile data by age, sex and broad specialty for all physicians in non-census metropolitan/census agglomeration areas.

Retirement - The PRET uses CMA Masterfile data for rural Canada for 1998 to obtain retirement rates by age and broad specialty and retires physicians at the same rates for every projection year.

Death - The PRET uses the most recent four year average based on year over year CMA Masterfile analyses and holds these death rates constant over time.

Emigration - 66 is used as the number of rural physicians moving abroad each year.

Postgraduate Practice Entry Cohort - The size of the national practice entry cohort is held at 1741 for 1998, 1750 for 1999, then reduced to 1705 in 2000 and further reduced to 1675 per year from 2001 onward. This is to account for undergraduate cuts that occurred in the early 1990s. The percentage of the practice entry cohort setting up practice in rural Canada (the gain rate) each year is set at the 1998 levels by broad specialty.

Returns from Abroad - The number of physicians returning from abroad to rural areas each year is held constant at 17.

Immigration - The number of physicians immigrating to Canada and entering rural Canada with previously arranged employment is held constant at 37 for each year. 74% of these physicians are set to be GP/FPs, the remaining 26% are set to be specialists.

Inter-Rural/Urban Migration - The net gains to rural areas are set to 67. This is the average of the last four years for which data are available.

Appendices 12-1 to 12-7 show the user input screens as they look for Scenario A.

Results

The PRET produces results at a detailed level by age, sex and broad specialty for January of each projection year. Appendices 12-8 and 12-9 show a summary of the results for each projection year and detailed results for both head counts and full-time equivalent counts by sex, broad specialty and 5-year age groups for the years 1998, 2001, 2006, 2011, 2016 and 2021. Detailed results for the remaining projection years are available from the CMA upon request.

Analysis

The only variable altered from status quo levels in Scenario A is the flow of active physicians between urban and rural areas. The most recent four year average is used, and amounts to a net gain of 67 physicians per year to rural areas. Scenario A is the only one of the 6 scenarios presented in this report which projects an increase of rural physicians by 2021. The supply is projected to increase from 5531 in 1998 to 5856 in 2021 (a 6% increase). As with all other scenarios, however, the ratio of physicians per 1000 population will decrease, assuming the rural population of Canada continues to hold at 22.2% of the total. The ratio is projected to decrease from 0.81 physicians per 1000 population in 1998 to 0.68 by 2021 (a 16% decrease).

By 2021, the overall rural physician population will be older. In 1998, 21.7% of rural physicians are over age 55. By 2021, this figure is projected to be 34.5%. Females are projected to make up 48.3% of the practising rural physician population by 2021, compared to 24.6% in 1998.

In Scenario A, there is a net gain of physician supply every year until 2016 when the ever increasing numbers of physicians reaching retirement age groups starts to outweigh the effects of the addition variables. The number of physicians retiring each year is at a low of 110 in 2002 and reaches a high of 169 by 2021.

3.3.3 Scenario B - Rural

Assumptions

Symbols before the name of the variable indicate whether the input for the variable is the same as the status quo input() or different from the status quo input ().

Base Stock - The PRET is seeded using January 1998 CMA Masterfile data by age, sex and broad specialty for all physicians in non-census metropolitan/census agglomeration areas.

Retirement - The PRET uses CMA Masterfile data for rural Canada for 1998 to obtain retirement rates by age and broad specialty and retires physicians at the same rates for every projection year.

Death - The PRET uses the most recent four year average based on year over year CMA Masterfile analyses and holds these death rates constant over time.

Emigration - 66 is used as the number of rural physicians moving abroad each year.

Postgraduate Practice Entry Cohort - The size of the national practice entry cohort is held at 1741 for 1998, 1750 for 1999, then reduced to 1705 in 2000 and further reduced to 1675 per year from 2001 onward. This is to account for undergraduate cuts that occurred in the early 1990s. The percentage of the practice entry cohort setting up practice in rural Canada (the gain rate) each year is set at the 1998 levels by broad specialty.

Returns from Abroad - The number of physicians returning from abroad to rural areas each year is held constant at 17.

Immigration - The number of physicians immigrating to Canada and entering rural Canada with previously arranged employment is held constant at 75 for each year. 74% of these physicians are set to be GP/FPs, the remaining 26% are set to be specialists.

Inter-Rural/Urban Migration - The gains and losses are balanced such that the net

change = 0.

Appendices 13-1 to 13-7 show the user input screens as they look for Scenario B.

Results

The PRET produces results at a detailed level by age, sex and broad specialty for January of each projection year. Appendices 13-8 and 13-9 show a summary of the results for each projection year and detailed results for both head counts and full-time equivalent counts by sex, broad specialty and 5-year age groups for the years 1998, 2001, 2006, 2011, 2016 and 2021. Detailed results for the remaining projection years

are available from the CMA upon request.

Analysis

The only variable altered from status quo levels in Scenario B is the number of immigrating physicians allowed to set up practise in rural Canada each year. This number is doubled from 37 to 75 per year. Scenario B projects the maximum number of rural physicians at 5568 in 2009 and then projects a decrease every year to 2021 when the low of 5150 is reached. This is a decrease of 7% from the 1998 supply. These yearly decreases occur as the number of physicians reaching retirement age groups increases. The ratio of physicians per 1000 population will decrease, assuming the rural population of Canada continues to hold at 22.2% of the total. The ratio is projected to decrease from 0.81 physicians per 1000 population in 1998 to 0.60 by 2021 (a 26% decrease).

By 2021, the overall rural physician population will be older. In 1998, 21.7% of rural physicians are over age 55. By 2021, this figure is projected to be 47.9%. Females are projected to make up 43.6% of the practising rural physician population by 2021, compared to 24.6% in 1998.

3.3.4 Scenario C - Rural

Assumptions

Symbols before the name of the variable indicate whether the input for the variable is the same as the status quo input() or different from the status quo input ().

Base Stock - The PRET is seeded using January 1998 CMA Masterfile data by age, sex and broad specialty for all physicians in non-census metropolitan/census agglomeration areas.

Retirement - The PRET uses CMA Masterfile data for rural Canada for 1998 to obtain retirement rates by age and broad specialty and retires physicians at the same rates for every projection year.

Death - The PRET uses the most recent four year average based on year over year CMA Masterfile analyses and holds these death rates constant over time.

Emigration - 66 is used as the number of rural physicians moving abroad each year.

Postgraduate Practice Entry Cohort - First year undergraduate enrolment is increased by 10% beginning in 1999. The percentage of the practice entry cohort setting up practice in rural Canada (the gain rate) each year is set at the 1998 levels by broad specialty.

Returns from Abroad - The number of physicians returning from abroad to rural areas each year is held constant at 17.

Immigration - The number of physicians immigrating to Canada and entering rural Canada with previously arranged employment is held constant at 37 for each year. 74% of these physicians are set to be GP/FPs, the remaining 26% are set to be specialists.

Inter-Rural/Urban Migration - The gains and losses are balanced such that the net

change = 0.

Appendices 14-1 to 14-7 show the user input screens as they look for Scenario C.

Results

The PRET produces results at a detailed level by age, sex and broad specialty for January of each projection year. Appendices 14-8 and 14-9 show a summary of the results for each projection year and detailed results for both head counts and full-time equivalent counts by sex, broad specialty and 5-year age groups for the years 1998, 2001, 2006, 2011, 2016 and 2021. Detailed results for the remaining projection years are available from the CMA upon request.

Analysis

The only variable altered from status quo levels in Scenario C is the enrolment of medical students into first year medical school in 1999. This number is increased by 10% and then held constant for each subsequent year in the model. Scenario C projects a higher physician supply than the Status Quo scenario, but still projects a net loss every year. The supply decreases to 4,692 by 2021. This is a decrease of 15% from the 1998 supply. These yearly decreases become larger as the number of physicians reaching retirement age groups increases. In this scenario, only 105 physicians retire in 2003 compared to 164 in 2021. The ratio of physicians per 1000 population will

decrease, assuming the rural population of Canada continues to hold at 22.2% of the total. The ratio is projected to decrease from 0.81 physicians per 1000 population in 1998 to 0.55 by 2021 (a 32% decrease).

By 2021, the overall rural physician population will be older. In 1998, 21.7% of rural physicians are over age 55. By 2021, this figure is projected to be 44.9%. Females are projected to make up 44.3% of the practising rural physician population by 2021, compared to 24.6% in 1998.

3.3.5 Scenario D - Rural

Assumptions

Symbols before the name of the variable indicate whether the input for the variable is the same as the status quo input() or different from the status quo input ().

Base Stock - The PRET is seeded using January 1998 CMA Masterfile data by age, sex and broad specialty for all physicians in non-census metropolitan/census agglomeration areas.

Retirement - The PRET uses CMA Masterfile data for rural Canada for 1998 to obtain retirement rates by age and broad specialty and retires physicians at the same rates for every projection year until 2001 when these rates are increased for all physicians age 70+ to 75% retirement per year. Physicians under age 70 continue to retire at the 1998 rates each year.

Death - The PRET uses the most recent four year average based on year over year CMA Masterfile analyses and holds these death rates constant over time.

Emigration - 66 is used as the number of rural physicians moving abroad each year.

Postgraduate Practice Entry Cohort - The size of the national practice entry cohort is held at 1741 for 1998, 1750 for 1999, then reduced to 1705 in 2000 and further reduced to 1675 per year from 2001 onward. This is to account for undergraduate cuts that occurred in the early 1990s. The percentage of the practice entry cohort setting up practice in rural Canada (the gain rate) each year is set at the 1998 levels by broad

specialty.

Returns from Abroad - The number of physicians returning from abroad to rural areas each year is held constant at 17.

Immigration - The number of physicians immigrating to Canada and entering rural Canada with previously arranged employment is held constant at 37 for each year. 74% of these physicians are set to be GP/FPs, the remaining 26% are set to be specialists.

Inter-Rural/Urban Migration - The gains and losses are balanced such that the net

change = 0.

Appendices 15-1 to 15-7 show the user input screens as they look for Scenario D.

Results

The PRET produces results at a detailed level by age, sex and broad specialty for January of each projection year. Appendices 15-8 and 15-9 show a summary of the results for each projection year and detailed results for both head counts and full-time equivalent counts by sex, broad specialty and 5-year age groups for the years 1998, 2001, 2006, 2011, 2016 and 2021. Detailed results for the remaining projection years are available from the CMA upon request.

Analysis

The only variable altered from status quo levels in Scenario D is retirement. Retirement rates are kept at status quo levels for all age groups for all years up to 2001, when the attrition due to retirement is increased to 75% for physicians aged 70 and over. Status quo retirement rates continue to be used by all physicians under age 69. Scenario D projects an even lower physician supply than the Status Quo scenario. The supply decreases to 4,392 by 2021. This is a decrease of 21% from the 1998 supply. The ratio of physicians per 1000 population will decrease, assuming the rural population of Canada continues to hold at 22.2% of the total. The ratio is projected to decrease from 0.81 physicians per 1000 population in 1998 to 0.51 by 2021 (a 37% decrease).

By 2021, the overall rural physician population will be older. In 1998, 21.7% of rural physicians are over age 55. By 2021, this figure is projected to be 44.9%. Females are projected to make up 45.0% of the practising rural physician population by 2021,

compared to 24.6% in 1998.

3.3.6 Scenario E - Rural

Assumptions

Symbols before the name of the variable indicate whether the input for the variable is the same as the status quo input() or different from the status quo input ().

Base Stock - The PRET is seeded using January 1998 CMA Masterfile data by age, sex and broad specialty for all physicians in non-census metropolitan/census agglomeration areas.

Retirement - The PRET uses CMA Masterfile data for rural Canada for 1998 to obtain retirement rates by age and broad specialty and retires physicians at the same rates for every projection year.

Death - The PRET uses the most recent four year average based on year over year CMA Masterfile analyses and holds these death rates constant over time.

Emigration - 80 is used as the number of rural physicians moving abroad each year.

Postgraduate Practice Entry Cohort - The size of the national practice entry cohort is held at 1741 for 1998, 1750 for 1999, then reduced to 1705 in 2000 and further reduced to 1675 per year from 2001 onward. This is to account for undergraduate cuts that occurred in the early 1990s. The percentage of the practice entry cohort setting up practice in rural Canada (the gain rate) each year is set at the 1998 levels by broad specialty.

Returns from Abroad - The number of physicians returning from abroad to rural areas each year is held constant at 17.

Immigration - The number of physicians immigrating to Canada and entering rural Canada with previously arranged employment is held constant at 37 for each year. 74% of these physicians are set to be GP/FPs, the remaining 26% are set to be specialists.

Inter-Rural/Urban Migration - The net loss to rural areas is set to 10 physicians per year.

Appendices 16-1 to 16-7 show the user input screens as they look for Scenario E.

Results

The PRET produces results at a detailed level by age, sex and broad specialty for January of each projection year. Appendices 16-8 and 16-9 show a summary of the results for each projection year and detailed results for both head counts and full-time equivalent counts by sex, broad specialty and 5-year age groups for the years 1998, 2001, 2006, 2011, 2016 and 2021. Detailed results for the remaining projection years are available from the CMA upon request.

Analysis

The only 2 variables altered from status quo levels in Scenario E is the number of rural physicians moving abroad to practise and the change in the flow of active physicians between urban and rural areas of Canada. The number of rural physicians moving abroad is increased from 66 to 80 per year. The net change to rural areas due to physician migration between rural and urban areas of Canada is set at a net loss of 10 physicians per year for rural areas. Scenario E projects a net loss every year that varies from 47 to 85 fewer physicians practising in rural Canada each year. The supply decreases to 4,050 by 2021. This is a decrease of 27% from the 1998 supply. In this scenario, only 108 physicians retire in 2002 compared to 145 in 2021. The ratio of physicians per 1000 population will decrease, assuming the rural population of Canada continues to hold at 22.2% of the total. The ratio is projected to decrease from 0.81 physicians per 1000 population in 1998 to 0.47 by 2021 (a 42% decrease).

By 2021, the overall rural physician population will be older. In 1998, 21.7% of rural physicians are over age 55. By 2021, this figure is projected to be 40.9%. Females are projected to make up 47.8% of the practising rural physician population by 2021, compared to 24.6% in 1998.

3.3.7 Status Quo Scenario - National (Urban and Rural)

Assumptions

The national Status Quo scenario has been created using recent trend data for all variables. The results of this scenario show projected physician numbers if no significant changes (e.g., medical school enrolments cuts or increases, increased

emigration) occur.

Base Stock - The PRET is seeded using January 1999 CMA Masterfile data.

Retirement - The PRET uses the most recent four year averages based on year over year CMA Masterfile analyses and retires physicians at these same rates for every projection year.

Death - The PRET uses the most recent four year average based on year over year CMA Masterfile analyses and holds these death rates constant over time.

Emigration - 600 is used as the number of physicians moving abroad each year.

Postgraduate Practice Entry Cohort - The size of the practice entry cohort is set at 1750 for 1999, then reduced to 1705 in 2000 and further reduced to 1675 per year from 2001 onward. This is to account for undergraduate cuts that occurred in the early 1990s.

Returns from Abroad - The number of physicians returning from abroad each year is held constant at 250.

Immigration - The number of these physicians entering Canada with previously arranged employment is held constant at 100 for each year.

Appendices 17-1 to 17-5 show the user input screens as they look for the national Status Quo scenario.

Results

The PRET produces results at a detailed level by age, sex, and broad specialty for January of each projection year. Appendices 17-6 and 17-7 show a summary of the results for each projection year and detailed results for both head counts and full-time equivalent counts by sex and 5-year age groups for the years 1999, 2001, 2006, 2011, 2016 and 2021. Detailed results for the remaining projection years are available from the CMA upon request.

Analysis

Keeping the model at status quo levels allows the user to view future supply if no major changes occur within the system. However, applying today's retirement rates on a demographically shifting group of active physicians results in increased attrition. The number of physicians retiring each year jumps dramatically around the year 2010 due to an aging physician population and this number increases throughout the remaining projection years. Holding variables at their Status Quo levels means that the only projected yearly net gain of physicians occurs from 1999 to 2000. For all other years in the status quo scenario, the overall supply is projected to have an annual decrease. The overall supply is reduced from 56,775 in 1999 to 52,438 in 2021. Relative to the population, this means there will be 1.36 physicians per 1000 people compared with 1.82 in 1999 (25% decrease).

Not only will there be fewer physicians, but the average age of those in practice will be older than today. The model projects that by 2021, 42.4% of practising physicians will be 55 or over. Further, the status quo scenario projects that by 2021, 41.9% of practising physicians will be women.

3.4 Conclusions

The CMA PRET is a simple, easily understood and easily modified spreadsheet application (Excel version 5 for Windows). The PRET addresses the key parameters affecting physician supply using CMA data as a base and incorporating readily available data from CIHI, the Association of Canadian Medical Colleges (ACMC) and CAPER.

The PRET for rural Canada can be applied to a variety of scenarios such as increased migration, increased enrollment, younger retirement age, different gender mix, etc.

Together with the detailed monitoring of present attrition rates, mix and distribution of physicians, the analysis of the distinct scenarios can greatly assist physician resource planners in recommending short and long term policy initiatives.

4. POLICY IMPLICATIONS

4.1 National Framework of Rurality

The national framework of rurality that has been developed by the CMA can be easily adapted to regional areas and may serve as an effective tool for physician resource planning in rural and remote areas of Canada. The framework is also a useful basis for

the development of physician retention and recruitment initiatives. In addition, the fact that the framework was based on survey feedback from rural physicians may positively influence the

response from this stakeholder group to proposed policies and programs at the government level.

4.2 Projections for Physician Workforce Supply in Rural and Remote Areas of Canada, 1998-2021

All of the scenarios created using the PRET are considered reasonable since they are not unprecedented based on previous trends in physician flow. All scenarios of physician supply in rural and remote areas of Canada project a decrease in physician:population ratio for every year to the year 2021, including the 2 scenarios where an assumption of net overall gain of physician supply to rural areas was made compared to the status quo (scenarios A and C). This is mostly due to the age distribution of the current active supply; this factor contributes more than any other to the increased attrition (such as retirement) that is seen throughout the projection years.

The percentage of the population living in rural and remote areas (22.2%) was held constant in all the scenarios for rural Canada as well as throughout the entire time span of the projections (1998-2021); this percentage could in fact change over time, in which case the physician: population ratios would also vary.

All scenarios modify a single assumption compared to the status quo for rural Canada. This is the minimum change that would be effected; in a real life situation, more than one variable is likely to change in any given year. The model is not designed to project the most likely future; rather, it is designed to analyze the change of individual variables.

4.3 Recommendations to Health Canada

Recommendation 1

That the proposed national framework of rurality be tested and evaluated at the regional or provincial level before it is implemented as a physician resource planning tool for rural and remote areas of Canada.

Recommendation 2

That Health Canada convene a national stakeholder conference to 1) develop recommendations on the application of the national framework of rurality; and 2) develop physician retention and recruitment strategies for rural and remote areas of Canada.

Recommendation 3

That Health Canada involve all relevant stakeholders in the development of a research program that identifies best practices for the delivery of medical services for rural and remote regions of Canada.

1. Canadian Medical Association Report of the Advisory Panel on the Provision of Medical Services in Underserviced Regions, March 1992.

2. Leduc E. Defining Rurality: A General Practice Rurality Index. Can J Rural Med 1997; 2:125-31.

3. Members of the CMA Project Advisory Group on Rural and Remote Practice Issues are: Neil Leslie MD and Chair, Granger Avery MD, J. Guy Gokiert MD, Jean Gray MD, William E. Hogg MD and Greg Browne MD.

4. For most survey respondents, on-call responsibilities would include the frequency of being on-call and the level of responsibility while on-call (e.g., the acuity of the cases seen, the ease of dealing with the cases, the ability to transport to a referral centre, etc.).

5. Newton S, Buske L. Physician Resource Evaluation Template: A Model for Estimating Future Supply in Canada. *Annals RCPSC* 1998;31:145-50.

6. 1996 Census Dictionary (Statistics Canada--Cat. No. 92-351-XPE) available through GEO-HELP at Tel: 613-951-3889 or e-mail: goehelp@statcan.ca.