

---

**The Link between Rural Medical Education and Rural Medical  
Practice Location:**

**Literature Review and Synthesis**

---

**Raymond W. Pong, Ph.D**

**Denis Heng, MSc**

**Centre for Rural and Northern Health Research  
Laurentian University**

**Submitted to  
Physician Planning Unit  
Ministry of Health & Long-Term Care**

**August 2005**

## **Acknowledgements**

The authors of this report and the Centre for Rural and Northern Health Research (CRaNHR) at Laurentian University wish to acknowledge our research collaborators at Memorial University of Newfoundland, Vernon Curran, Stephen Bornestein, Michael Jong and Lisa Fleet, for their previous work that has informed this literature review and synthesis.

The authors also wish to thank Dr. Roger Strasser and Dr. Geoff Tesson for their critical comments on an earlier draft of this report and useful suggestions for improving the study. But the authors are responsible for the views expressed in this report, as well as shortcomings.

Copyright © 2005 by the  
Centre for Rural and Northern Health Research, Laurentian University  
Sudbury, ON  
All rights reserved.

## Executive Summary

Compared to urban communities, rural communities have been shown to have poorer health status, lower life expectancy, and higher levels of disability. There are concerns that the health status of rural communities will be detrimentally affected without an adequate number of rural physicians. Over the years, there have been several attempts to address this concern. Many programs have been introduced with a view towards recruiting and retaining physicians to rural, northern, or remote communities, and they have achieved varying degrees of success. Increasingly, attention is focusing on rural medical education.

This report reviews the evidence surrounding rural medical education and how it contributes to future rural practice location decisions in order to inform policy decisions and program planning. Rural medical education refers to medical education at the undergraduate or graduate levels that takes place in a rural setting for varying lengths of time and with a rural focus. The report is based on an extensive literature and document review. The review and synthesis of the literature follows the “pipeline” model of rural physician production.

For the purposes of analysis, the review of the literature is separated into three dimensions of rural medical education. The key findings from each section are:

*Length of rural exposure* – It seems that programs that offer short rural exposure will continue to be found ineffective on their own in shaping students’ career choices and practice location decisions, whereas programs with longer and more intense rural exposure and a more carefully designed rural curriculum will be found to be more effective.

*Rural exposure at the undergraduate and the graduate levels* – Based on comparative studies alone, it has proven difficult to assess the effectiveness of undergraduate versus residency programs in influencing the subsequent practice locations of their participants since rural medical education varies from program to program. Evidence from descriptive studies and informed opinions suggest that students who have positive rural clinical experiences at undergraduate and/or post-graduate levels are both more likely to enter rural practice after completion of medical education.

*Family medicine education and specialty education in rural areas* – There is hardly any published research on training specialists in rural settings and its impact on practice location decisions. As a result, this literature review is unable to determine the effectiveness of rural exposure for specialty residents. But several studies on rural exposure for family medicine residents show that rural exposure has considerable impact on rural practice decisions.

Although it makes intuitive sense that providing rural exposures could foster rural practice decisions, there is surprisingly little systematic evidence on the independent effect of rural medical education on predicting future practice locations. The reviewed studies provide evidence of varying strengths. While evidence from comparative studies is generally considered to be the strongest, one cannot completely dismiss informed

opinions which could be seen as cumulative wisdom, though well-designed empirical studies should be done to verify such claims. The findings of this literature review indicate that rural medical education contributes to decisions to practice in rural areas. But the strength of the relationship is difficult to specify since high-quality evidence is sparse. Also, it is difficult to isolate the influence of rural medical education from other factors such as rural background and health care policies.

The top four factors that are most often listed in the literature as being associated with eventual rural practice are i) rural upbringing; ii) positive undergraduate rural exposure; iii) targeted post-graduate exposure outside urban areas; and iv) stated intent/preference for general or family practice primary care. The findings of this literature review suggest that these four characteristics, as well as many others, work in a synergistic manner to influence the choice of practice location of physicians rather than acting alone as separate factors.

Our assessment of the current body of knowledge leads us to conclude that there is some evidence, based mainly on informed opinions and descriptive studies, that longer rural exposures at both the undergraduate and post-graduate levels, as an aspect of the pipeline model, contribute to encouraging more physicians to choose rural practice. But as emphasized by the pipeline model, it is not the only factor that needs to be addressed. A multi-pronged approach that includes multiple or longer exposures to rural environments at all levels of the medical education process, along with other strategies, is needed as a long-term solution to the problem of geographic maldistribution of physicians. Further work is required to examine the long-term effects of rural/northern medical education initiatives and strategies, including those about to be implemented with the creation of the Northern Ontario School of Medicine (NOSM).

The following limitations of this report should be acknowledged:

- There are no commonly accepted definitions of rural in the literature, making it difficult to compare the results from study to study.
- There is a paucity of Canadian or Ontario studies that explore whether there is a direct association between specific components of rural medical education, namely, length of rural medical exposure and level of rural medical exposure, and rural practice.
- While it is possible to compile a list of rural medical education-related factors that may influence future practice location, no systematic studies have been done to weight the relative importance of these individual factors or to examine the relationships amongst them.
- Most studies tend to be descriptive in nature with little rigorous evaluation of quantity, quality, or effectiveness.

## Table of Contents

<b>Acknowledgements .....</b>	<b>ii</b>
<b>Executive Summary.....</b>	<b>iii</b>
<b>Table of Contents.....</b>	<b>v</b>
<b>Chapter 1 – Introduction .....</b>	<b>1</b>
<b>Objectives of the Study .....</b>	<b>3</b>
<b>Organization of the Report .....</b>	<b>3</b>
<b>Chapter 2 – Scope of the Study and Methodology .....</b>	<b>4</b>
<b>Scope of the Study .....</b>	<b>4</b>
<b>What is Rural? .....</b>	<b>4</b>
<b>Literature Search and Review Methodology .....</b>	<b>5</b>
<b>Review of Articles and Reports.....</b>	<b>7</b>
<b>Chapter 3 – Findings from the Literature Review .....</b>	<b>9</b>
<b>Length of Rural Exposure .....</b>	<b>13</b>
<b>Rural Medical Education at Undergraduate Level versus Graduate Level .....</b>	<b>14</b>
<b>Family Medicine Education versus Specialty Education in Rural Areas..</b>	<b>17</b>
<b>Chapter 4 – Discussion and Conclusion .....</b>	<b>20</b>
<b>Conclusions .....</b>	<b>24</b>
<b>References .....</b>	<b>25</b>
<b>Appendix A: Study Summaries on Rural Medical Education.....</b>	<b>35</b>
<b>Comparative Studies.....</b>	<b>36</b>
<b>Descriptive Studies .....</b>	<b>44</b>
<b>Informed Opinion .....</b>	<b>54</b>



## Chapter 1 – Introduction

There is considerable discussion about the maldistribution of physicians across rural and urban areas (Barer and Stoddart, 1992; Barer and Stoddart, 1999; Chan, 2002; Chan and Barer, 2000; Council on Graduate Medical Education, 1998; Crandall et al., 1990; Hart et al., 2002; Pitblado and Pong, 1999; Pong and Pitblado, 2001). This uneven distribution of physicians raises concerns about access to and quality of medical care available to rural residents. Rural communities have been shown to have poorer health status, lower life expectancy and higher levels of disability. Health status disparities between rural and urban communities have been commonly observed (Badgley, 1991; Institut National de Santé Publique du Québec, 2004; Mansfield et al., 1999; Pampalon, 1991; Pitblado et al., 1995; Watanabe and Casebeer, 2000). There are concerns that the health status of rural communities will be detrimentally affected without an adequate number of rural physicians. Policy initiatives have been implemented with the goal of increasing the supply of rural physicians, but to date it has proven difficult to implement a multi-pronged approach that is effective.

A conceptual framework of a rural medical education strategy needed to produce rural physicians has previously been described in the literature (Geyman et al., 2000; Hart et al., 2002). This strategy is based on beliefs and to some extent, evidence that students from rural backgrounds are more likely than urban students to practice in a rural community (Rabinowitz, 1988; Roberts et al., 1991; Strasser, 1992; Stratton et al., 1991; Tepper and Rourke, 1999) and that greater exposure of students to rural settings during their medical education further enhances the likelihood of rural practice after graduation (Rosenblatt et al., 1992; Rourke, 2002). The passage of students from the point in their early schooling where they might first entertain the possibility of a medical career through the shaping effects of the medical education process itself and the accessing of continuing medical education and practice support after graduation has been compared to a pipeline (Council on Graduate Medical Education, 1998; Hart et al., 2002). This “pipeline” model is shown in Figure 1.

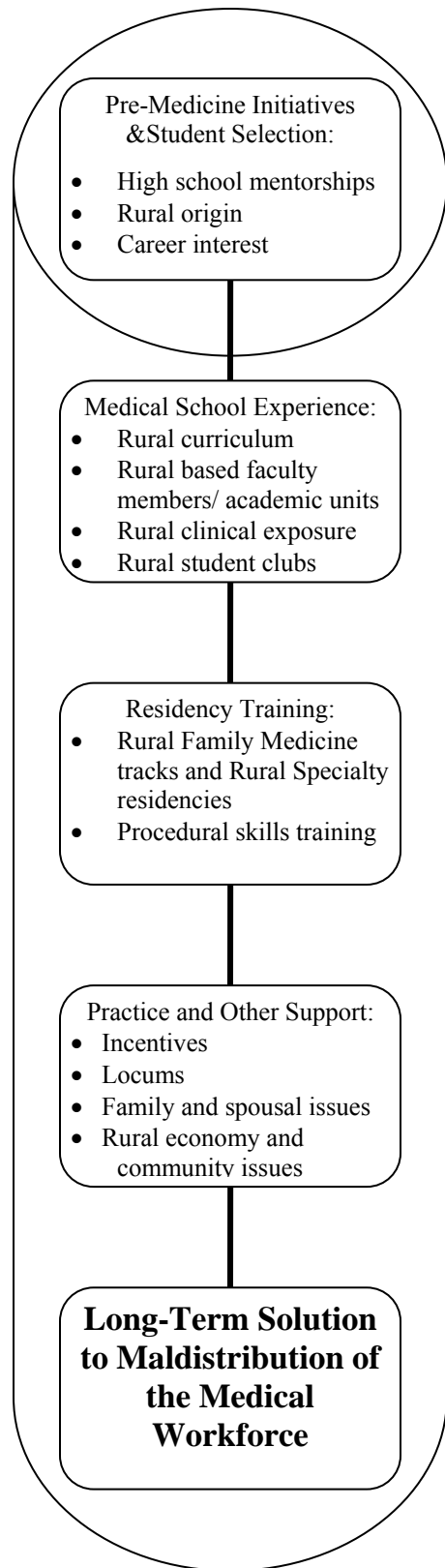


Figure 1: Pipeline Model of Rural Physician Production

A study investigating the characteristics of first-year medical students has concluded that Canadian medical students differ significantly from the general population, with certain minority groups (black and Aboriginal) being underrepresented, with others (Chinese, South Asian) being overrepresented, and with medical students being more likely to come from families of higher socioeconomic status (Dhalla et al., 2002). This profile does not reflect the reality of most rural communities. Medical students are less likely to come from rural areas, but a wide range of activities can be implemented prior to medical school in order to increase the number rural applications to medical school. These activities include mentorship programs, rural observation experiences helping students to prepare for medical school exams, and local high school encouragement and opportunity activities. Examples of pre-medical school initiatives are the two components of the Alabama Rural Health Leaders Pipeline Program – the Health College Connection Program II and the Minority Rural Health Pipeline Program that prepare underserved rural communities and minority rural applicants to pursue health professions (Rackley et al., 2003). These programs are designed to promote medicine as an attainable career choice. Medical schools can play an even larger role in aggressively recruiting candidates (Foreman, 1994), even before students are admitted to medical school by working with career counselors and rural schools to identify and mentor rural students with an interest in medicine.

Another point in the pipeline that medical educators can intervene to possibly increase the supply of rural physicians is during the medical school admission process. Some studies have reported an association between physicians' rural background characteristics and specialty and practice location choices (Basco et al., 1998; Kassebaum and Szenas, 1993; Laven and Wilkinson, 2003; Rabinowitz, 1999; Woloschuk and Tarrant, 2002; Woloschuk and Tarrant, 2004). In other words, there is evidence that increasing the number of medical school students with a rural background and/or an interest in rural medicine will help to increase the number of rural physicians.

Medical education at the undergraduate and graduate levels represents another section of the pipeline. The Ministry of Health and Long Term Care (MOHLTC) has identified the need to review the evidence surrounding exposing medical school students and/or residents to rural medical practice (hereinafter referred to as "rural exposure") and how it contributes to future rural practice location choices in order to inform future policy decisions and program planning. Rural medical education refers to medical education and training at the undergraduate or post-graduate levels that take place in rural settings for varying lengths of time presumably with the goal of fostering a greater understanding of rural health issues and increasing skills needed for rural practice. This review is to ensure that planning and funding of distributed medical education activities will be guided by evidence. In general terms, distributed medical education involves providing medical education opportunities outside urban-based academic health science centres, particularly in smaller, rural or remote communities.



## **Objectives of the Study**

The objective of this study is to review in a systematic way the evidence surrounding rural medical education and how it affects future practice location. More specifically, it will:

1. Examine how the length of rural medical education (ranging from a couple of weeks to one or more years) contributes to future rural practice location;
2. Examine whether there are differences in rural medical education at the undergraduate level versus the graduate level in terms of rural practice location;
3. Examine whether there are differences between family medicine education in rural areas and specialty education in rural areas in terms of rural practice location; and
4. Identify lessons learned and gaps in knowledge.

## **Organization of the Report**

This report has four chapters plus an appendix. Following the Introduction:

Chapter 2 describes the scope of the study and explains the literature selection criteria and the review process.

Chapter 3 presents some broad findings on the three characteristics of rural medical education listed in the previous section. Each section ends with a brief summary of the findings and discusses some of the implications with respect to each specific characteristic.

Chapter 4 draws together the major findings of the literature review and synthesis and discusses the lessons learned.

Detailed summaries of the articles reviewed as part of this literature scan and synthesis can be found in Appendix A.

## **Chapter 2 – Scope of the Study and Methodology**

### **Scope of the Study**

The Physician Planning Unit of MOHLTC has asked the Centre for Rural and Northern Health Research (CRaNHR) at Laurentian University to conduct a literature review and synthesis on the evidence surrounding rural medical education and how it contributes to future rural practice location decisions.

Talley (1990) has articulated four basic “truths” about the rural physician workforce: i) Students with rural origins are more likely to train in primary care and return to rural areas; ii) Residents educated in rural areas are more likely to choose to practice in rural areas; iii) Family medicine is the key discipline of rural health care; and iv) Graduates practice close to where they train. This literature review and synthesis examines the available evidence in relation to hypotheses ii) and iii) above.

The literature review consists mainly of studies of rural medical education conducted in Canada, Australia, and the United States. Studies from these countries were targeted because of the many common characteristics that their rural populations face (including similarities in health care and medical education systems, socioeconomic and cultural characteristics and problems of access to services due to widely scattered populations) and the many rural medical education initiatives that have been instituted in these countries that may be applicable to Ontario. It was decided that only the more recent (i.e., 1990 and after) reports and documents would be included in order to keep the study manageable, given the time and resource constraints.

It is important, at the outset, to indicate what is and what is not included in this study. This literature review and synthesis focuses primarily on the association between rural medical education and rural practice location. There are many related aspects, such as pre-medical school initiatives, medical school admissions policies, financial incentives, medical practice support, continuing medical education and health care policies, that may have an impact on where physicians choose to work. These are beyond the scope of this review.

### **What is Rural?**

Given that this literature review examines rural medical education and rural medical practice, it is necessary to determine what constitutes “rural”. Most people have an intuitive notion of what rural means, but a precise and universally accepted definition of rural has thus far eluded researchers and administrators. Rural, to most people, is non-urban (and urban is non-rural) – a largely tautological definition that is not particularly helpful for research purposes. du Plessis et al. (2002) and Pong and Pitblado (2001) have commented on the difficulties in defining rural, have identified several commonly used definitions in Canada, and have examined the strengths and limitations of each

definition. Given the ambiguity and multidimensional nature of the concept of rural, it is not surprising that there are also many definitions of rural used in Australia (Australian Bureau of Statistics, 2004; Australian Institute of Health and Welfare, 2004) and the United States (Rural Policy Research Institute, 2005).

To complicate matters further, it is necessary to point out that there are several other related concepts that have been used in various Canadian publications. These include “remote”, “isolated”, “northern”, and “underserved areas”. “Northern,” as in northern Ontario, is not uniformly rural. But northern Ontario, notwithstanding the fact that there are a few small and mid-sized cities, is mostly sparsely populated. Similarly, although some larger urban centres in northern Ontario could be designated as “underserved areas” by the Underserved Area Program, MOHLTC, the term “underserved area” is mostly used to refer to smaller communities in northern Ontario and southern non-urban regions, which have severe health human resources needs. These terms are sometimes used interchangeably with rural and sometimes used to refer to regions or communities on the extreme rural end of the urban-rural continuum.

A cursory scan of the publications as part of this literature review shows that, with very few exceptions, rural is not explicitly defined by the authors. The lack of a precise definition means that comparisons of the results are problematic. The term is typically used as if readers know what it means. By necessity, the strategy adopted by this study is to not define rural in a precise and consistent manner, but rather to accept the ways “rural” have been used by other authors. Generally speaking and for the purpose of this review, rural, remote, northern, isolated and underserved areas refer to areas, regions or communities that are far from major urban centres and have a small or widely dispersed population. For the sake of convenience and parsimony, only “rural” is used in the rest of this report and the term is employed in a broad sense to include remote, northern, isolated, and underserved areas.

### **Literature Search and Review Methodology**

Several search methods were used to identify and select relevant sources of information. Initially, online searches were conducted on the MEDLINE computerized bibliographic database. Searches were limited to studies and reports published in English, in the period from January 1990 to May 2005. The following terms were used in the online searches: Education (5,335 citations); Education-Medical-Undergraduate (5,574); Education-Medical-Graduate (5,548); Rural (31,213); Rural Health (6,676); and Rural Population (10,022). These terms were usually combined in order to refine the search results (Table 1). Additional searches were conducted in MEDLINE using the names of authors frequently identified in the database search. Some search statistics are presented in Table 1.

Table 1. Number of citations found in MEDLINE.

Search	Keyword groups	Number of Citations on MEDLINE
1	Education OR Education-Medical-Undergraduate OR Education-Medical-Graduate	16,157
2	Rural OR Rural Health OR Rural Population	31,213
3	Education OR Education-Medical-Undergraduate OR Education-Medical-Graduate AND Rural OR Rural Health OR Rural Population	286
4	Bowman, RC OR Hays, R OR Hutten-Czapski, P OR Pathman, DE OR Rabinowitz, HK OR Rosenthal, TC OR Rourke, J OR Strasser, R	337

Keyword searches on bibliographic databases are constrained by the coverage of the databases, the keywords adopted, and the journals indexed. Other potentially relevant sources were explored including:

- The online tables of contents of the *Canadian Journal of Rural Medicine*, the *Australian Journal of Rural Health*, the *Journal of Rural Health*, and the *Rural and Remote Health Online Journal*;
- The references sections of selected articles and reports; and
- The Internet – a general search was conducted using some of the key words listed above.

Finally, individuals who were knowledgeable in rural health workforce and rural medical education issues were canvassed for published and unpublished studies.

Altogether, 166 documents had been identified as potentially useful, of which 88 were deemed relevant and useful after further review and screening. A list of the documents selected for review, detailing authors, year of publication, a description of the study population if applicable and a summary of the key findings, can be found in the Appendix A of this report.

## Review of Articles and Reports

Each article was reviewed by one of the co-investigators and classified according to its research methodology. This classification was based on the following categories: informed opinion article, descriptive study, and comparative study. In general, informed opinion articles are considered to provide the least valid evidence and comparative studies the most valid evidence pertaining to the relationship between an intervention and an outcome.

**Informed opinion articles:** This category includes expressions of personal views and summaries of relevant literature. The article typically does not describe the methods or results of original research. Examples include articles which discuss the pros and cons of different approaches to educate practitioners in rural/remote areas, but provide no data or results. These articles may cite findings from other studies. Non-systematic review articles are included in this category.

**Descriptive studies:** These are studies which describe the methods and results of original studies, but whose purpose is not to compare the outcomes of different interventions. This category includes a wide variety of research designs such as survey and case study.

**Comparative studies:** These are studies that compare the outcomes of different interventions and include several sub-categories. In quasi-comparative studies (without contemporaneous local comparisons), the outcomes occurring in the intervention group are compared with the outcomes in historical or non-local controls. Differences in group characteristics and data collection methodology, as well as other external factors, tend to decrease the validity of such studies. In comparative studies with contemporaneous local comparisons, the outcomes are assumed to be measured in a similar manner and are compared between/among groups. These groups are similar in all other respects. Types of studies, rated according to their methodological strength, are as follows:

*Cross-sectional:* Outcomes and interventions are measured at the same time.

*Case-control:* Participants with positive and negative outcomes are compared for differences in intervention.

*Cohort:* Participants with different interventions are followed longitudinally and compared for outcomes.

*Pre-/post-test:* Participants are compared for outcomes before and after interventions.

*Clinical trial:* Subjects are randomized to receive different interventions and are compared for outcomes.

*Community trial:* Community members or groups are randomized to receive different interventions and are compared for outcomes.

*Systematic review:* Results from several original comparative studies are systematically compared and synthesized. These include meta-analyses.

Of the 88 documents reviewed, 32 were classified as comparative studies, 37 as descriptive studies and 19 as informed opinion (Appendix A).

Studies were also classified according to subject matter, using categories identified by the MOHLTC in its original request to CRaNHR. The results of the literature review are presented according to these themes:

- Length of rural medical education;
- Rural medical education at the undergraduate level versus graduate level; and
- Rural family medicine education versus rural specialty education.

### **Chapter 3 – Findings from the Literature Review**

Some studies have presented evidence on how rural medical education contributes to the supply of rural physicians. Older studies (Cordes and Rea, 1993; Fryer et al., 1993; Gray et al., 1994; Mahaffy et al., 1994; Riley et al., 1991; Stratton et al., 1991), as well as more recent ones (Brooks et al., 2003; Frisch et al., 2003; Godwin et al., 1998; Jensen and DeWitt, 2002; Nichols et al., 2004; Phillips et al., 1999), have reported results which suggest that students who are exposed to rural medical practice experiences during their undergraduate medical education and graduate residency are more likely to practice in rural areas.

In an attempt to clarify the role rural medical education plays in influencing the medical practice location choices of medical graduates, this chapter is divided into three themes: the length of rural medical education; rural medical education exposure at the undergraduate level versus the graduate level; and rural medical education exposure for family medicine residents versus residents in other specialties. Table 1 presents selected examples of medical education programs that provide rural exposures to its medical students and residents. These studies were reviewed as part of this project and referred to as illustrations this chapter.

Table 1. Selected Examples of Rural Medical Education Programs

Program	Authors	Length	Level of Rural Exposure	Type of Residency	Rural Practice outcome
Brody School of Medicine, East Carolina University	Lynch and Willis, 2000	3 days	1 <sup>st</sup> year undergraduate	N/A	Reported only interest in rural practice. Did not examine whether students entered rural practice.
University of Minnesota Medical School	Seim, 1997	3 days	1 <sup>st</sup> year undergraduate	N/A	No effect on increasing a student's likelihood of entering family practice four years later.
University of Western Australia	Talbot and Ward, 2000	4 days	4 <sup>th</sup> year undergraduate	N/A	Reported only interest in rural practice. Did not examine whether students entered rural practice.
Melbourne University, Victoria, Australia	Peach and Bath, 2000 Peach and Barnett, 2002	Not specified	3 <sup>rd</sup> year undergraduate	N/A	Reported only interest in rural practice and subsequent location of internship. Did not examine whether students entered rural practice.
Rural Primary Care Clerkship at Morehouse School of Medicine, Atlanta, Georgia	Jones et al., 2000	4 weeks	3 <sup>rd</sup> or 4 <sup>th</sup> year undergraduate	N/A	Reported only interest in rural practice. Did not examine whether students entered rural practice.
University of Calgary, Alberta	Woloschuk and Tarrant, 2002 Woloschuk and Tarrant, 2004	4 weeks	4 <sup>th</sup> year undergraduate	N/A	Students with a rural background who subsequently graduated from a rural family medicine clerkship at the undergraduate level were approximately 2.5 times more likely to enter rural practice than their urban background peers.
University of Nebraska Medical Center	Paulman and Davidson-Stroh, 1993	8 weeks	4 <sup>th</sup> year undergraduate	N/A	Reported only interest in rural practice. Did not examine whether students entered rural practice.



University of Illinois College of Medicine	Stearns et al., 1997	16 weeks	4 <sup>th</sup> year undergraduate	N/A	69% of the first three graduating classes (n=39) were in family practice residences, with a total of 82% in primary care.
Jefferson Medical College of Thomas Jefferson University, Pennsylvania	Rabinowitz et al., 1999 Rabinowitz et al., 2001	Not specified	Undergraduate	N/A	13% (206 of 1,609) of Jefferson graduates from the classes of 1972 to 1991 were practicing in rural areas. Rural background was overwhelmingly the most important independent predictor of rural practice, and freshman plans to enter family practice was the only other independent predictor.
Northwestern Ontario Medical Programme	McCready et al., 2004	Generally 4 weeks	Both undergraduate and residency	Family medicine and other clinical specialties	Medical school graduates participating in this programme were 7.11 times more likely to practice in northwestern Ontario compared to non-participants.
WWAMI (Washington, Wyoming, Alaska, Montana and Idaho) Program, University of Washington School of Medicine (UWSOM)	Ramsey et al., 2001	Not specified	Both undergraduate and residency	Family medicine and other clinical specialties	According to a 1997 alumni survey of all UWSOM and affiliated residency programs, approximately 21% practiced in rural communities of less than 10,000 population and 31% practiced in communities of less than 25,000.  Among the 24 graduates to date from rural training tracks, 83% were in rural practices.
Queen's University School of Medicine	Easterbrook et al., 1999	Not specified	Both undergraduate and residency	Family Medicine	In the bivariate analysis, undergraduate rural exposure was associated with choosing a rural community as first practice location. But this association was no longer present when other variables were controlled for. Rural exposure in residency was not correlated with first practice location.

---

Northern Family Medicine Education Program, Memorial University of Newfoundland	Jong and Beach, 1997	28 weeks	Residency	Family Medicine	3 graduates were undertaking further post-graduate training at the time of the study. 10 (91%) of 11 graduates who were practicing medicine at the time of the study were in rural practice.
Northeastern Ontario Family Medicine Program	Pong et al., 2005	2 years	Residency	Family Medicine	64% of all person-years of medical practice of the NOFM graduates between 1993 and 2003 took place in northern Ontario
Northeastern Stream Residency Program	Northeastern Ontario Medical Education Corporation (NOMECE)	Approximately 2 years of a 4 to 5 year program	Residency	Specialty	No evaluation or tracking of the graduates has occurred to date
Northeastern Ontario Post-graduate Specialty Program	NOMECE	1 to 6 months	Residency	Specialty	No evaluation or tracking of the graduates has occurred to date
University of Washington	Jensen and DeWitt, 2002	4 to 8 weeks	2 <sup>nd</sup> and 3 <sup>rd</sup> year residency	Internal Medicine	No significant different when comparing the proportions of physicians practicing in rural and non-rural areas

---

## Length of Rural Exposure

There are few studies that have attempted to measure the association between the length of rural exposure during medical education and the propensity to practice in rural areas. Only one comparative study was identified that specifically examined the association between length of rural exposure and rural practice. It compared participants and non-participants in a one- or two-month rural clinical elective available to second- and third-year internal medicine residents at the University of Washington. Although residents with rural exposure reported that their rural experience influenced their interest in rural practice and career choices, no significant difference was found when comparing the proportions of physicians practicing in rural and non-rural areas (Jensen and DeWitt, 2002).

Other comparative studies have examined the length of rural exposure using a pre-post test design, but they have not looked specifically at rural practice. Instead of using rural practice location as the outcome, these studies have compared medical students' interest in rural practice. Most of these studies have concluded that rural exposure for any length of time usually increased interest in rural practice. Studies, which have reported brief rural placements such as a 4-day attachment for first-year medical students at the University of Minnesota (Seim, 1997), a 4-day volunteer rural attachment during the fourth year of undergraduate studies at the University of Western Australia<sup>1</sup> (Talbot and Ward, 2000) and a 4-week required Rural Primary Care Clerkship during the third or fourth year undergraduate studies at the Morehouse School of Medicine in Atlanta, Georgia (Jones et al., 2000), indicate increased interest in rural practice by the students. A 3-day perceptorship during the first year of undergraduate studies where students were randomly assigned to a rural or urban experience suggested that a brief exposure to rural experience did little to influence students' opinions about living and working in small communities (Lynch and Willis, 2000). For longer rural exposure, a required 8-week rural family practice preceptorship at the University of Nebraska Medical Center found that 94.5% of senior medical students were uninfluenced by the perceptorship, with 3.8% showing an interest in family practice and 1.8% showing a negative interest (Paulman and Davidson-Stroh, 1993).

Many studies of rural medical education are descriptive in nature. For example, Stearns et al. (1997) described the rural experience during a 4-year period at the University of Illinois' College of Medicine in Rockford, Illinois. A 16-week "immersion" experience in a rural Illinois community in the fourth year of undergraduate education was only one component of the rural-specific options that encouraged students to select family medicine in rural settings. Other programs with longer rural exposures, such as the Physician Shortage Area Program at Jefferson Medical College, Pennsylvania, at the undergraduate level, and those offered by the Northeastern Ontario Medical Education Corporation (NOMEC) and the Northwestern Ontario Medical Programme (NOMP), at the graduate level, have reported relatively high levels of graduates practicing in rural areas, and this may be partly attributable to longer rural exposure.

---

<sup>1</sup> Medical undergraduate programs in Australia are generally 6 years in length where students enter straight out of high school, whereas medical undergraduate programs in Canada and the United States are usually 4 years in length where most students have already obtained an undergraduate degree.

## **Rural Medical Education at Undergraduate Level versus Graduate Level**

### ***Undergraduate Medical Education***

It is generally assumed that rural exposure by medical students and residents will result in more graduates pursuing rural practice, thus increasing the supply of rural doctors. All Canadian medical schools provide opportunities to learn in a rural setting and most rural experiences last between 2 and 4 weeks (Rourke and Strasser, 1996). Some authors have suggested an expansion of rural medical education opportunities (Adams, 1998; Anonymous, 1997). There are two new ventures in rural medical education that differ from the others. These are the extension of the University of British Columbia medical school to include new sites on Vancouver Island and in Prince George (Tesson et al., 2005b; University of British Columbia, 2005), and the opening of the Northern Ontario School of Medicine (NOSM), based at Laurentian University in Sudbury and Lakehead University in Thunder Bay (Northern Ontario School of Medicine, 2005; Rourke, 2002; Tesson et al., 2005b). These rural medical education initiatives are grounded on a distributed medical education model and take place in locations in which it is hoped that most of the graduates will eventually practice.

Although no comparative studies have been found that examine the effect of undergraduate rural exposure versus graduate rural exposure, studies of individual medical education programs that feature rural exposures have reported on the practice locations of their graduates. These studies have claimed that rural exposure at the undergraduate level is not the primary factor in producing rural physicians. Three examples discussed below, one each from the United States, Australia, and Canada, provide a range of evidence of the limited effect of rural exposure at the undergraduate level on future practice decisions.

The medical program at Melbourne University, Australia is an example where early undergraduate rural exposure did not increase the number of students taking rural internships. Researchers followed a cohort of students who had participated in a voluntary placement in a rural general practice or rural hospital during their third year of undergraduate education between 1995 and 1997. As part of a post-placement survey, rural background and non-rural background students participating in this rural placement rated the experience equally favourably, though a higher percentage of rural students reported considerable positive change in feelings towards rural practice compared to urban students (Peach and Bath, 2000). The proportion of students who completed the rural placement did not differ significantly from that of other students in doing internships in a regional or outer Melbourne hospital (Peach and Barnett, 2002). The authors concluded that regardless of the effect of early undergraduate rural placements had on their feelings towards rural practice at the time, or their background, it appears that the higher achieving students were likely to do their internships in Melbourne.

The medical program at Jefferson Medical College, Pennsylvania, and the University of Calgary, Alberta, are two other examples of programs that have high rates of graduates entering rural practice. A study of graduates from the Jefferson Medical College found that other than rural background, the only other variable that increased the likelihood of

graduates entering rural practice was freshman interest in family practice (Rabinowitz et al., 1999). A subsequent study of the Physician Shortage Area Program (PSAP) of the Jefferson Medical College found that non-PSAP graduates with two key characteristics (having grown up in a rural area and freshman-year plans for family practice) were 78% as likely as PSAP graduates to be rural primary care physicians. All this suggests that its admissions component is the most important reason for its success when compared to other factors such as its required third-year family practice clerkship at a rural location (Rabinowitz et al., 2001).

The family medicine clerkship at the University of Calgary is a 4-week rotation that provides medical students an opportunity to experience rural practice. A pre-post test indicated that their rural educational experience contributed to increases in the stated likelihood of students participating in rural locums, regardless of student background, but did not have an impact on the stated intentions of rural practice (Woloschuk and Tarrant, 2002). They also observed that students with a rural background were more likely to do a rural locum and practicing in a rural community, irrespective of participating in a rural educational experience (Woloschuk and Tarrant, 2002). In a follow-up study on the same cohort of medical students, the authors found that students with a rural background who subsequently undertook rural family medicine clerkship at the undergraduate level were approximately 2.5 times more likely to enter rural practice than their peers with an urban background (Woloschuk and Tarrant, 2004).

These three examples demonstrate that some graduates from these undergraduate medical programs with a rural focus are entering rural practice. Informed opinion articles have postulated that medical schools that are decentralized, located in rural areas, have a rural focus, encourage admission of rural students, implement rural-oriented medical curricula, and provide early and repeated undergraduate rural medical learning experience are the most successful at graduating physicians who will choose rural practice (Bowman and Penrod, 1998; Brooks et al., 2002; Rosenblatt et al., 1992; Rourke, 2002). There are also suggestions that rural-orientated undergraduate curriculum contributes to increasing the number of medical students choosing rural family medicine residency in Canada (Topps et al., 2003) and rural internships in Australia (Wilkinson et al., 2004). But, these descriptive studies provide no empirical evidence to establish a direct association between rural exposure at the undergraduate level and eventual rural practice.

### ***Graduate Medical Education***

The rationale for rural-based graduate programs is that they can adequately train doctors for rural practice and result in higher rural placement rates after graduation. Ontario family medicine residents in a survey rated a “separate rural stream for aspiring rural physicians” as very or most important in creating interest in rural practice (Rourke et al., 2003). Rural residency tracks (RRT) in family medicine residencies in the United States usually include the last two years of a 3-year program being spent in a distant rural community where the primary faculty are members of a rural family practice group (Anonymous, 2000; Damos et al., 1998; Rosenthal et al., 1992). Approximately three-quarters of the physicians graduating from a rural residency track between 1988 and

1997 were practicing in a rural community in 1998 (Rosenthal et al., 2000). In a nationwide survey of American primary care physicians who had established rural practices from 1987 to 1990, Pathman et al. (Pathman et al., 1999) found that the only educational experience that was related to rural practice was rural rotations during residency.

Three Canadian examples of graduate level programs with a rural focus are the opportunities offered by the Northern Family Medicine Education Program (NorFaM) in HappyValley-Goose Bay, Labrador, the Northwestern Ontario Medical Program (NOMP), based in Thunder Bay, and the Northeastern Ontario Medical Education Corporation (NOMECE), based in Sudbury. Results from the NorFaM Program suggest that extensive rural exposure at the graduate level may lead to more physicians choosing rural practice. Initial results has shown that 10 (91%) of the 11 residents who had completed the program and were practicing medicine at the time of the study (Jong and Beach, 1997). A tracking study of the NOMP participants found that medical school graduates participating in this programme were 7.11 times more likely to practice in northwestern Ontario compared to non-participants (McCready et al., 2004). A significant predictor of practicing in northwestern Ontario was rural exposure as a graduate versus undergraduate learner.

A tracking study of the NOMECE participants has found results similar to those of the NOMP study reported above. From 1993-2003, 137 family physicians graduated from NOMECE, compared to 359 graduates from its parent family medicine residency program at the University of Ottawa. A study comparing the two programs (Pong et al., 2005) has shown that approximately 64% of all person-years of medical practice of the NOMECE family medicine graduates took place in northern Ontario, compared to less than 5% of the graduates at the University of Ottawa family medicine residency program. If person-years in all rural areas in Ontario and other provinces are combined with those in northern Ontario, 67.4% of all person-years of medical practice by NOMECE graduates occurred in rural and/or northern Ontario settings. In a different, descriptive tracking study of the NOMECE's family medicine program, approximately three-quarters of the physicians who had spent time in northern Ontario, including northern placements during their undergraduate medical education, reported that this experience had had a positive influence on their perception of northern Ontario medical practice (Heng and Pong, 2005).

## **Family Medicine Education versus Specialty Education in Rural Areas**

### ***Family Medicine Education in Rural Areas***

Family physicians are an integral part of Canada's medical care system because they serve as a first contact for most patients. They are the gatekeepers to the health care system and provide referrals to specialists when necessary. Family physicians make up a large proportion of rural physicians, thus making family medicine education very important in terms of the provision of rural health care (Talley, 1990). A study by Pitblado and Pong (1999) shows that less than 3% of specialists practiced in rural areas. In other words, about 87% of all rural physicians were family physicians. But, the number of family medicine graduates is decreasing (Chan, 2002; Shortt et al., 2003; Sullivan, 2003; Thurber and Busing, 1999) and this will have an enormous impact on the recruitment of rural physicians.

A study in 2002 identified 12 family medicine residency programs in Canada that offered dedicated rural streams and rural positions represented 20% of all family medicine residency positions available to medical school graduates (Krupa and Chan, 2005). Family medicine education in rural areas provides residents with more hands-on experience, promotes greater procedural competence by imparting specific knowledge and skills in a generalist learning environment (Strasser, 2005). The extent of rural exposure varies from one program to another, ranging from partial rural exposure to complete immersion in a rural or northern environment. Examples of the latter include NOMEK and NOMP. As mentioned in the previous section on graduate medical education, these family medicine residency programs have had considerable success in producing rural physicians (McCready et al., 2004; Pong et al., 2005).

An American example of family medicine education in rural areas occurs as part of the WWAMI program at the University of Washington in Seattle. It is a community-based program to increase the number of generalist physicians throughout a predominantly rural and underserved region in the U.S. Northwest. Using U.S. 2000 census data, approximately 37% of the populations of Alaska, Idaho, Montana and Wyoming are rural<sup>2</sup> (U.S.Census Bureau, 2005). Through rural rotations and tracks offered by the University of Washington-affiliated Family Practice Residency Network, family medicine

---

<sup>2</sup> The U.S. Census Bureau classifies as urban all territory, population, and housing units located within urbanized areas (UAs) and urban clusters (UCs). It delineates UA and UC boundaries to encompass densely settled territory, which generally consists of:

- A cluster of one or more block groups or census blocks each of which has a population density of at least 1,000 people per square mile at the time, and
- Surrounding block groups and census blocks each of which has a population density of at least 500 people per square mile at the time, and
- Less densely settled blocks that form enclaves or indentations, or are used to connect discontinuous areas with qualifying densities.

Rural consists of all territory, population, and housing units located outside of UAs and UCs. Geographic entities, such as metropolitan areas, counties, minor civil divisions (MCDs) and places, often contain both urban and rural territory, population, and housing units.

residents are exposed to rural practice at different regional sites throughout the five states. According to a 1997 alumni survey of all University of Washington School of Medicine and affiliated family medicine residency programs, approximately 21% of graduates practiced in rural communities of less than 10,000 population and 31% practiced in communities of less than 25,000 (Ramsey et al., 2001). Furthermore, among the 24 graduates to date from rural training tracks, 83% were in rural practices

The paucity of specialists in rural areas and the need for a broad range of skills required to succeed in rural practice have resulted in efforts to increase the number of rural opportunities available to family medicine residents who wish to pursue additional skills training in areas such as emergency medicine, anaesthesia, general surgery, obstetrics, psychiatry, care of the elderly, palliative care, aboriginal health and paediatrics (Chaytors and Spooner, 1998; Wetmore and Stewart, 2001).

### ***Specialty education in rural areas***

There appears to be a trend in medicine towards specialization. But very few of the specialty disciplines are taught at the undergraduate level in a rural context. Important exceptions are the Parallel Rural Community Curriculum at Flinders University, Adelaide, Australia, where rural clinical exposure is not limited to family medicine (Worley et al., 2004), and the proposed curriculum of NOSM, which is modeled on Flinders University's program (Tesson et al., 2005a). At the graduate level, studies have shown that specialists are much less likely to participate in rural rotations compared to family practice residents (Pathman et al., 1999; Tepper and Rourke, 1999).

No studies have been found that specifically examine the association between rural specialty education and rural practice, probably because, as noted earlier, specialty education in rural settings is rare. This is because in less populated areas, a critical mass of patients to sustain a specialty practice may not exist. Without a sufficient volume of procedures to properly train specialist residents, there is a dearth of educational opportunities for specialists in rural areas. Most publications about specialist education in rural areas are informed opinion articles that have either advocated for more specialist education positions in rural areas (Seal, 2001) or focused on how rural specialty education should be done rather than on examining whether rural specialty education leads to rural practice (Birks and Green, 1999; DeWitt et al., 2001; Field Jr., 1995; Kiroff, 1999).

The few programs that have been established to provide specialty education in rural areas are voluntary in nature (Gray et al., 1994). Two Ontarian examples of rural exposure for specialty residents are the Northeastern Stream Residency Program (NESR) and the Northeastern Ontario Post-graduate Specialty (NOPS) Program, offered by NOMECC. These two programs offer training opportunities in anaesthesia, general surgery, internal medicine, paediatrics, psychiatry, etc. The objective of both programs is to expose specialists to rural practice and equip them with skills and experience that are appropriate for northern and rural settings, with a view to encouraging specialist physicians to work in rural/northern communities upon graduation. These programs are



relatively small. Eight residents were admitted to the NESR Program in 2003, and 24 residents accounted for a total of 52 person-months of specialty residency education in northeastern Ontario in the NOPS Program in 2002/2003. But there has been no evaluation of these two programs and no tracking of the residents and graduates. As a result, it is not known if such rural exposure for specialists has any effect on subsequent practice location.

Because of the paucity of graduate specialist education programs in rural areas and the lack of studies of existing graduate specialist education in rural settings, it is not possible to assess the relative effectiveness of family medicine education versus specialty education in rural areas.

## Chapter 4 – Discussion and Conclusion

Despite the review's focus on these three dimensions of rural medical education, it is important to put this discussion in the larger context of the pipeline model. Given the maldistribution of physicians across rural and urban areas (Barer and Stoddart, 1999), to increase the number of rural physicians at the end of this pipeline, there must be enough flow of physicians into the pipeline at the beginning, as well as minimizing the number of "leaks" in the pipeline due to factors such as urban disruption. Many knowledgeable individuals have advocated a multi-dimensional approach to increasing the number of rural practitioners, which includes rural medical education at the undergraduate and graduate levels (Bowman, 2005; Campos-Outcalt et al., 1995; Hutten-Czapski and Thurber, 2002; Pong and Russell, 2003; Rourke et al., 2000; Rourke and Strasser, 1996; Tepper and Rourke, 1999). Each dimension can address a certain portion of the pipeline model, but it is difficult to rank one element higher than the other because if there is one big leak in the system, none of the other variables will matter. For example, the WWAMI program has a program to provide family physicians with additional obstetrics/gynaecology training so that they can deliver babies (including caesarians) in rural areas where there are no specialists. The value of the program though, has been undermined by skyrocketing costs of liability insurance for these physicians, resulting in physicians not being able to afford to do obstetrics for which they are so well prepared (Tesson, personal communication, July 19, 2005).

Other recruitment and retention initiatives can focus on a host of other factors that influence physicians' choices of practice location (Chan and Barer, 2000). Factors such as remuneration, professional support, locum relief, workloads, spousal employment opportunities, children's education, quality of the physical environment, and proximity to family members are beyond the ability of medical schools to influence (Heng and Pong, 2004; Jones et al., 2004; Kazanjian and Pagliccia, 1996; Pong and Russell, 2003).

Various limitations in this area of research have been noted by other authors (Bowman, 2005; Brooks et al., 2002; Campos-Outcalt et al., 1995; Geyman et al., 2000; Pathman, 1996; Rabinowitz et al., 2001). The findings and conclusions of this review and synthesis study are constrained by these limitations. Part of the difficulty is defining what rural exposure is. Many rural education models and initiatives have been developed by various universities, including perceptorships, rural attachments, clinical rotations, and rural weekend placement programs, which have different objectives, curriculum contents, and length and intensity of exposure. They are lumped together under the heading of rural medical education, and few, if any, studies have attempted to differentiate them and assess their effects separately. Additionally, few of the studies reviewed have examined the quality of rural exposure during medical education and whether this has a greater influence than the quantity of rural exposure. This is not surprising since quality is even harder to assess than quantity.

Although it makes intuitive sense that providing rural exposures could foster rural practice decisions, there is surprisingly little systematic evidence on the independent effect of rural medical education on predicting future practice locations. There is a paucity of Canadian or Ontario studies that explore whether there is a direct association

between specific dimensions of rural medical education, namely, length of rural exposure and type of rural exposure and rural practice. Rural medical education and its direct effects on eventual rural practice is a complex issue that requires more sophisticated research designs than are found in most of the studies reviewed. What is needed are well designed, multi-year comparative studies involving multiple sites and the ability to control for such factors as student selection, background of the students, curriculum, and nature of the interventions (Bowman, 2005; Campos-Outcalt et al., 1995).

Given these methodological challenges, what can we say about the relationship between rural exposure and rural practice? For the purpose of analysis, this literature review and synthesis has separated the elements of rural medical education into three dimensions: length of rural exposure, timing of rural exposure in the medical education process, and rural exposure according to specialty. Research findings are examined according to these three dimensions. The reviewed studies provide evidence of varying strengths. While evidence from comparative studies is generally considered to be the strongest and evidence from descriptive studies as less strong and informed opinion studies as providing the personal views of the authors.

The findings of this literature review indicate that rural medical education contributes to decisions to practice medicine in rural areas. But the strength of the relationship is difficult to specify since high-quality evidence is sparse. Also, it is difficult to isolate the influence of rural medical education from other factors such as rural background and health care policies. Most studies reviewed have not controlled for such potentially confounding factors. Other writers (Brooks et al., 2002; Campos-Outcalt et al., 1995; Dunbabin and Levitt, 2003) have arrived at similar conclusions.

In general, it has proven difficult to assess the effectiveness of undergraduate versus residency programs in influencing the subsequent practice locations of their participants, based on the comparative studies reviewed. Rural medical education varies from program to program, thus making it difficult to make meaningful comparisons. Furthermore, most rural medical education exposures are voluntary, which can introduce biases such as self selection. Other possible confounders that many studies are unable to control for include rural origins, special characteristics of the programs, and so forth (Easterbrook et al., 1999; Pathman, 1996; Rabinowitz et al., 1999; Xu et al., 1997a; Xu et al., 1997b).

More specifically, it is difficult to determine how much rural exposure is necessary to influence graduates to become a rural physician. The majority of the studies of brief rural exposure occur during the first couple of years of undergraduate education. The opportunities for longer rural experiences (i.e., greater than one month) were generally offered to third- and fourth-year medical students, as well as residents. Many of these studies reported an increase in interest in rural practice or family medicine, but not necessarily a corresponding increase in actual rural practice. It is important to recognize when interpreting these results that interest in rural practice at the undergraduate level

does not always translate into a greater number of rural physicians. Interest or intention is not the same as actual behaviour.

Much of the existing literature comprises descriptive and informed opinion studies. Despite the lesser strength of evidence provided by these two types of studies relative to comparative studies though, one cannot completely dismiss informed opinions, which could be seen as cumulative wisdom based on observations and experience. Based on these types of studies, there is some general indication that rural rotations of three or more months were more likely to prepare physicians for rural medical practice and rural living (Pathman et al., 1999). The benefits of a longer rural rotation are multiple including students being able to learn to become more self-directed, able to have more direct involvement in clinical experience rather than learning through observation, and better able to involve in community activities outside their role as medical students (Denz-Penhey et al., 2005). It seems that programs that offer short rural exposure will continue to be found ineffective on their own in shaping students' career choices and practice location decisions, whereas programs with longer and more intensive rural exposures and more carefully designed rural curricula will be found to be more effective (Denz-Penhey et al., 2005; Pathman, 1996).

When rural exposures at the undergraduate level and at the graduate level are compared, findings based mainly on informed opinions and descriptive studies suggest that students who have positive rural clinical experiences at undergraduate and/or graduate levels are both more likely to enter rural practice (Fry and Terry, 1995; Hays et al., 1995; McCreedy et al., 2004; Rourke and Strasser, 1996). It is more difficult to establish a direct causal link between rural exposure at the undergraduate level and future rural practice because rural experience at that level can occur as little as two years and as many as five or more years before a physician finishes her/his medical education. But using the pipeline model perspective, without rural exposure in the undergraduate years, one could argue that the number of residents seeking rural exposure at the graduate level will be considerably lower.

It is a well-established fact that the great majority of physicians working in rural Canada are family physicians. Most rural communities simply do not have the population base to support specialists. Thus, it is not a surprise that there are fewer rural exposure opportunities for specialty residents than for family medicine residents (Australian Medical Workforce Advisory Committee, 2005). It is also not surprising that, to date, there is hardly any published research on training specialists in rural settings and its impact on practice location decisions. As a result, this literature review is unable to determine the effectiveness of rural exposure for specialty residents. But several studies on rural exposure for family medicine residents show that rural exposure has considerable impact on rural practice decisions.

There may be a need to reframe the notion of "rural", insofar as specialists are concerned, for future research purposes. When we talk about rural in relation to family physicians, we typically refer to communities that are quite small, like those with less

than 10,000 population and are sufficiently far away from urban centres (even though, as noted earlier, there is no consensus on what constitutes rural). Using northern Ontario as an example, we typically would not call places like Timmins (~45,000) and North Bay (~53,000) rural. But we may have to stretch our understanding of rural a bit when considering the provision of specialist services by considering places like Timmins and North Bay “rural”. Specialists working in such locations tend to have a much broader scope of practice than their big-city counterparts (Baldwin et al., 1999) and see patients from a very large catchment area. Similarly, we may want to consider specialists as serving a mostly rural population if they regularly take part in outreach activities like the Visiting Specialist Clinic Program and the Respite Locum Program for Specialists of the Underserved Area Program.

The main role of rural exposure may be in its ability to maintain the interest of those who have a rural background and are already interested in rural practice (Rabinowitz et al., 1999). An important factor that may erode the rural interest is “urban disruption”. Urban disruption, in this context, occurs where students who are considering rural practice become accustomed to learning and practicing medicine where technological support and specialist consultations are readily available (Crump et al., 2004). Rural exposure is an attempt to reduce this likelihood. In Alberta, an evaluation of the Rural Physician Action Plan (RPAP) after its first four years concluded that, though there was not yet any evidence that this program had increased rural physician recruitment and retention rates, evidence did exist that without the RPAP, these rates would have decreased and resulted in a net loss of rural physicians in Alberta (Chaytors and Spooner, 1998). Similarly, a review of the Rural Training Track graduates in the United States suggested that they might do little more than preserving the inclination of medical students to practice in rural America. These programs may only minimize the leak in the pipeline at the graduate education level, but they seemed to accomplish this better than did any other strategy (Rosenthal, 2000).

But rural medical education could have a number of other benefits. It provides superior clinical experiences and teaches the skills necessary to work with rural populations (Denz-Penhey et al., 2005; Leeper et al., 2001; Pathman et al., 1999). Rural physicians tend to have a wider scope of practice than most urban physicians because specialists are few and far between in rural areas and referrals are often impractical. Rural medical education exposes students and residents to a broader practice profile (Paulman et al., 1995; Worley et al., 2000b). Also, the intrinsic educational value of placing medical students in rural communities has been noted by many authors because it offers an excellent generalist learning environment for all medical students (Strasser, 2005; Worley et al., 2000a; Worley et al., 2004). Areas that rural medical education have the potential of influencing include providing medical students and residents with the opportunity to experience rural medical practice; allowing them to forge contacts with healthcare professionals in rural communities; teaching them the procedural and life-coping skills of dealing with professional isolation; and helping to develop certain rural community leadership skills (Heng and Pong, 2004; Woloschuk et al., 2005).

## Conclusions

The top four factors that are most often listed in the literature as being associated with eventual rural practice are rural upbringing, positive undergraduate rural exposure, targeted post-graduate exposure outside urban areas, and stated intent/preference for general or family practice. The findings of this literature review suggest that these four characteristics, as well as others, work in a synergistic manner to influence the choices of practice locations of physicians rather than acting alone as separate factors.

It is widely believed that rural medical education plays an important role in the eventual recruitment and retention of physicians to rural areas, but the exact characteristics of rural medical education and their contributions are still largely unclear at this time. Our assessment of the current body of knowledge leads us to conclude that there is some evidence, based mainly on informed opinions and descriptive studies, that longer and more intensive rural exposures at both the undergraduate and graduate levels contribute to encouraging more physicians to choose rural practice by minimizing the leakage of physicians while they pass through the pipeline. But other factors beside rural medical education exposure are equally important. A multi-pronged approach is needed as a long-term solution to the problem of geographic maldistribution of physicians.

While the evidence is partial at best at this time, we agree with Campos-Outcalt et al. (1995) when they conclude that policy- and decision-makers can still act in a proactive manner because the best outcomes could be expected from comprehensive, school-wide programs that address admission, faculty composition, and curricula, provide exposure to rural medical education in the community, and promote an atmosphere where family medicine practice is celebrated as a worthy career path.

Canada, including Ontario, has taken up the challenge of addressing the chronic and possibly worsening problem of medical workforce maldistribution. Efforts are being made to reverse the trend, including the many new initiatives under the Underserved Area Program of MOHLTC, similar strategies introduced by other provinces, and major “experiments” in rural medical education, such as the expansion of the University of British Columbia medical school to rural and more remote areas in that province and the founding of NOSM. However, very little has been done to examine the successes or failures of these initiatives and strategies. As pointed out earlier, programs such as NESR and NOPS, though put in place for several years, have never been evaluated. We simply do not know if the time, effort, and money are well spent.

The creation of NOSM offers a once-in-a-lifetime opportunity to institute a well-planned program of research from day one to assess the long-term outcomes of a rural/northern medical education program. Similarly, several models of distributed medical education are now in place in Canada including those in Alberta, British Columbia, and Newfoundland. This offers an opportunity to compare and assess the strengths and weaknesses of each model and to learn from the lessons they provide.

## References

- Adams, J. (1998) Medical resources and manpower. *Canadian Journal of Rural Medicine*. 3(2): 105.
- Anonymous. (1997) Recruitment and retention: consensus of the conference participants, Banff 1996. *Canadian Journal of Rural Medicine*. 2(1): 28-31.
- Anonymous. (2000) The effect of accredited rural training tracks on physician placement. *American Family Physician*. 62(1): 22.
- Australian Bureau of Statistics. (2004). Australian Standard Geographical Classification (ASGC) 2004. *Statistical Concepts Library*. Available at: <http://abs.gov.au/Ausstats/abs@.nsf/66f306f503e529a5ca25697e0017661f/f186dc405e3d1f13ca256f19000ebd9e!OpenDocument>. Date Accessed: 12-5-2005.
- Australian Institute of Health and Welfare. (2004) Rural, regional and remote health: a guide to remoteness classifications. AIHW Cat. No. PHE 53. Canberra, ACT: AIHW. Available at: <http://www.aihw.gov.au/publications/index.cfm/title/9993>.
- Australian Medical Workforce Advisory Committee. (2005) Doctors in vocational training: rural background and rural practice intentions. *Australian Journal of Rural Health*. 13(1): 14-20.
- Badgley, R. F. (1991) Social and economic disparities under Canadian health care. *International Journal of Health Services*. 21( 4): 659-671.
- Baldwin, L.-M., R. A. Rosenblatt, R. Schneeweiss, D. M. Lishner and L. G. Hart. (1999) Rural and Urban Physicians: Does the Content of Their Medicare Practices Differ? *The Journal of Rural Health*. 15(2): 204-251.
- Barer, M. L. and G. L. Stoddart. (1992) Toward integrated medical resource policies for Canada: 8. Geographic distribution of physicians. *Canadian Medical Association Journal*. 147(5): 617-623.
- Barer, M. L. and G. L. Stoddart. (1999) Improving Access to Needed Medical Services in Rural and Remote Canadian Communities: Recruitment and Retention Revisited. Discussion paper prepared for Federal/Provincial/Territorial Advisory Committee on Health Human Resources. Vancouver, BC: Centre for Health Services and Policy Research, The University of British Columbia.
- Basco, W. T., S. B. Buchbinder, A. K. Duggan and M. H. Wilson. (1998) Associations between Primary Care-oriented Practices in Medical School Admission and the Practice Intentions of Matriculants. *Academic Medicine*. 73(11): 1207-1210.
- Birks, D. and T. Green. (1999) Training, Retraining and Retaining Rural General Surgeons: Comment. *Australia and New Zealand Journal of Surgery*. 69(12): 885-886.

Bowman, R. C. (2005). Evaluating Rural Medical Education Programs. *Rural Family Medicine (Official site of the Society of Teachers of Family Medicine Rural Interest Group)*. Available at: [http://www.ruralfamilymedicine.org/educational%20strategies/evaluating\\_rural\\_medical\\_educati.htm](http://www.ruralfamilymedicine.org/educational%20strategies/evaluating_rural_medical_educati.htm). Date Accessed: 5-19-2005.

Bowman, R. C. and J. D. Penrod. (1998) Family Practice Residency Programs and the Graduation of Rural Family Physicians. *Family Medicine*. 30(4): 288-292.

Brooks, R. G., R. Mardon and A. Clawson. (2003) The Rural Physician Workforce in Florida: A Survey of US- and Foreign-Born Primary Care Physicians. *The Journal of Rural Health*. 19(4): 484-491.

Brooks, R. G., M. Walsh, R. E. Mardon, M. Lewis and A. Clawson. (2002) The Roles of Nature and Nurture in the Recruitment and Retention of Primary Care Physicians in Rural Areas: A Review of the Literature. *Academic Medicine*. 77(8): 790-798.

Campos-Outcalt, D., J. Senf, A. J. Watkins and S. Bastacky. (1995) The Effects of Medical School Curricula, Faculty Role Models, and Biomedical Research Support on Choice of Generalist Physician Careers: A Review and Quality Assessment of the Literature. *Academic Medicine*. 70(7): 611-619.

Chan, B. T. B. (2002) From Perceived Surplus to Perceived Shortage: What Happened to Canada's Physician Workforce in the 1990s? Toronto, ON: Canadian Institute for Health Information.

Chan, B. T. B. and Barer, M L. (2000) Access to Physicians in Underserved Communities in Canada: Something Old, Something New. *Sydney, Australia: 5th International Medical Workforce Conference*. Session 5: Medical Workforce Supply in Underserved Communities - Canada.

Chaytors, R. G. and G. R. Spooner. (1998) Training for Rural Family Medicine: A Cooperative Venture of Government, University, and Community in Alberta. *Academic Medicine*. 73(7): 739-742.

Cordes, D. H. and D. F. Rea. (1993) Residency Rotations to Foster Careers in Rural Health Care. *Academic Medicine*. 68(12): 900-901.

Council on Graduate Medical Education. (1998) Tenth report, physician distribution and health care challenges in rural and inner-city areas. Rockville, MD: CGME.

Crandall, L. A., J. W. Dwyer and R. P. Duncan. (1990) Recruitment and Retention of Rural Physicians: Issues for the 1990s. *The Journal of Rural Health*. 6(1): 19-38.

Crump, W. J., D. Barnett and S. Fricker. (2004) A Sense of Place: Rural Training at a regional Medical School Campus. *The Journal of Rural Health*. 20(1): 80-84.



Damos, J. R., C. Christman and C. Gjerde. (1998) Using Rural Training Tracks to Encourage Rural Practice Careers and Enhance Training in Family Medicine. *Academic Medicine*. 73(5): 599.

Denz-Penhey, H., S. Shannon, C. J. Murdoch and J. W. Newbury. (2005) Do benefits accrue from longer rotations for students in Rural Clinical Schools? *Rural and Remote Health*. 5(2, online): 414. Available at: <http://rrh.deakin.edu.au>

DeWitt, D. E., M. Migeon, R. LeBlond, J. D. Carline, L. Francis and D. M. Irby. (2001) Insights from Outstanding Rural Internal Medicine Residency Rotations at the University of Washington. *Academic Medicine*. 76(3): 273-281.

Dhalla, I. A., J. C. Kwong, D. L. Streiner, R. E. Baddour, A. E. Waddell and I. L. Johnson. (2002) Characteristics of first-year students in Canadian medical schools. *Canadian Medical Association Journal*. 166(8): 1029-1035.

du Plessis, V., Beshiri R., Bollman R.D., and Clemenson H. (2002) Definitions of "Rural". *Agriculture and Rural Working Paper Series*. Working Paper No.61. Ottawa, ON: Statistics Canada, Agricultural Division. Available at: <http://www.statcan.ca/english/research/21-601-MIE/2002061/21-601-MIE2002061.pdf>.

Dunbabin, J. S. and L. Levitt. (2003) Rural origin and rural medical exposure: their impact on the rural and remote medical workforce in Australia. *Rural and Remote Health*. 3(1, online): 212. Available at: <http://rrh.deakin.edu.au>

Easterbrook, M., M. Godwin, R. Wilson, G. Hodgetts, G. Brown, R. W. Pong and E. Najgebauer. (1999) Rural background and clinical rural rotations during medical training: effect on practice location. *Canadian Medical Association Journal*. 160 (8): 1159-1163 .

Field Jr., R. J. (1995) Beyond the Scalpel. *American Surgeon*. 61(1): 1-6.

Foreman, S. (1994) Social Responsibility and the Academic Medical Center: Building Community-based Systems for the Nation's Health. *Academic Medicine*. 69(2): 97-102.

Frisch, L., R. Kellerman and T. Ast. (2003) A Cohort Study of Family Practice Residency Graduates in a Predominantly Rural State: Initial Practice Site Selection and Trajectories of Practice Movement. *The Journal of Rural Health*. 19(1): 47-54.

Fry, L. J. and M. A. Terry. (1995) Factors That Predict Medical Students' Interest in Rural Practice. *Academic Medicine*. 70(2): 167-168.

Fryer, G. E., T. J. Myoshi, C. Stine and R. D. Krugman. (1993) Colorado's Decentralized Medical Education to Increase the Number of Graduates Practicing Primary Care in Rural Areas. *Academic Medicine*. 68(4 ): 310-311.

Geyman, J. P., G. Hart, T. E. Norris, J. B. Coombs and D. M. Lishner. (2000) Educating Generalist Physicians for Rural Practice: How Are We Doing? *The Journal of Rural Health*. 16(1): 56-80.

- Godwin, M., G. Hodgetts, R. Wilson, R. W. Pong and E. Najgebauer. (1998) Practice choices of graduating family medicine residents. *Canadian Family Physician*. 14: 532-536.
- Gray, J. D., L. C. Steeves and J. W. Blackburn. (1994) The Dalhousie University Experience of Training Residents in Many Small Communities. *Academic Medicine*. 69(10): 847-851.
- Hart, L. G., E. Salsberg, D. M. Phillips and D. M. Lishner. (2002) Rural Health Care Providers in the United States. *The Journal of Rural Health*. 18(Suppl): 211-232.
- Hays, R. B., A. Nichols, A. Wise, P. Adkins, M. Craig and M. Mahoney. (1995) Choosing a Career in Rural Practice in Queensland. *Australian Journal of Rural Health*. 3: 171-174.
- Heng, D. and R. W. Pong. (2005) Family Medicine Tracking Study: Report on the 2003 Surveys. Sudbury, ON: Centre for Rural and Northern Health Research, Laurentian University.
- Heng, D. and R. W. Pong. (2004) Family Medicine Residents Choose the North. *Research in FOCUS on Research*. A2. Sudbury, ON: CRaNHR. Available at: <http://www.cranhr.ca/pdf/focus/FOCUS04-A2.pdf>.
- Hutten-Czapski, P. and A. D. Thurber. (2002) Who makes Canada's rural doctors? *Canadian Journal of Rural Medicine*. 7 (2): 95-100.
- Institut National de Santé Publique du Québec. (2004) Vivre dans une collectivité rurale plutôt qu'en ville fait-il vraiment une différence en matière de santé et de bien-être? Québec, QC: Institut national de santé publique du Québec.
- Jensen, C. C. and D. E. DeWitt. (2002) The Reported Value of Rural Internal Medicine Residency Electives and Factors That Influence Rural Career Choice. *The Journal of Rural Health*. 18( 1): 25-30.
- Jones, A. R., R. A. Oster, L. L. Pederson, M. K. Davis and D. S. Blumenthal. (2000) Influence of a Rural Primary Care Clerkship on Medical Students' Intentions to Practice in a Rural Community. *The Journal of Rural Health*. 16(2): 155-161.
- Jones, J. A., J. S. Humphreys and M. A. Adena. (2004) Rural GPs' ratings of initiatives designed to improve rural medical workforce recruitment and retention. *Rural and Remote Health*. 4(2, online): 314. Available at: <http://rrh.deakin.edu.au>
- Jong, M. K. K. and D. A. Beach. (1997) NorFaM - training residents for rural practice. *Canadian Journal of Rural Medicine*. 2(3): 120-124.
- Kassebaum, D. G. and P. L. Szenas. (1993) Rural Sources of Medical Students and Graduates' Choice of rural Practice. *Academic Medicine*. 68(3): 232-236.

- Kazanjian, A. and N. Pagliccia. (1996) Key factors in physicians' choice of practice location: findings from a survey of practitioners and their spouses. *Health and Place*. 2(1): 27-34.
- Kiroff, G. (1999) Training, Retraining and Retaining Rural General Surgeons. *Australia and New Zealand Journal of Surgery*. 69(6): 413-414.
- Krupa, L. K. and B. T. B. Chan. (2005) Canadian rural family medicine training programs: Growth and variation in recruitment. *Canadian Family Physician*. 51: 852-853.
- Laven, G. and D. Wilkinson. (2003) Rural Doctors and Rural Backgrounds: How Strong is the Evidence? A Systematic Review. *Australian Journal of Rural Health*. 11(6): 277-284.
- Leeper, J., S. Hullett and L. Wang. (2001) Rural Alabama Health Professional Training Consortium: Six-Year Evaluation Results. *Family Community Health*. 24(2): 18-26.
- Lynch, D. C. and S. E. Willis. (2000) Can a 3-Day Preceptorship Change First-Year Medical Students' Opinions About Living and Working in Small Towns? *Family Medicine*. 32(7): 495-500.
- Mahaffy, J., B. W. Goldberg and D. E. Girard. (1994) A Rural Multidisciplinary Clerkship in Primary Care. *Academic Medicine*. 69(5): 422-423.
- Mansfield, C. J., J. L. Wilson, E. J. Kobrinski and J. Mitchell. (1999) Premature mortality in the United States: The roles of geographic area, socioeconomic status, household type, and availability of medical care. *American Journal of Public Health*. 89(6): 893-898.
- McCready, W., J. Jamieson, M. Tran and S. Berry. (2004) The first 25 years of the Northwestern Ontario Medical Programme. *Canadian Journal of Rural Medicine*. 9(2): 94-100.
- Nichols, A., P. S. Worley, L. M. Toms and P. R. Johnston-Smith. (2004) Change of place, change of pace, change of status: rural community training for junior doctors, does it influence choices of training and career? *Rural and Remote Health*. 4(2, online): 259. Available at: <http://rrh.deakin.edu.au>
- Northern Ontario School of Medicine. (2005). Northern Ontario School of Medicine - Home. *NOSM*. Available at: <http://www.normed.ca/>. Date Accessed:
- Pampalon, R. (1991) Health discrepancies in rural areas in Quebec. *Social Science and Medicine*. 33(4): 355-360.
- Pathman, D. E. (1996) Medical Education and Physician's Career Choices: Are We Taking Credit beyond Our Due? *Academic Medicine*. 71(9): 963-968.

Pathman, D. E., B. D. Steiner, B. D. Jones and T. R. Konrad. (1999) Preparing and retaining rural physicians through medical education. *Academic Medicine*. 74(7): 810-820.

Paulman, P. and L. Davidson-Stroh. (1993) The effect of a rural family practice preceptorship on medical students' residency selection. *The Family Practice Research Journal*. 4: 385-389.

Paulman, P., C. Gilbert, L. Davidson-Stroh and F. Ulrick. (1995) A Way to Improve Training for Rural Health Care Providers? *Academic Medicine*. 70(7): 562-563.

Peach, H. G. and N. Barnett. (2002) Effect of an early rural placement on internship choices of medical students. *Medical Education*. 36(8): 791-792.

Peach, H. G. and N. E. Bath. (2000) Comparison of rural and non-rural students undertaking a voluntary rural placement in the early years of a medical course. *Medical Education*. 34(3): 231-233.

Phillips, T. J., R. A. Rosenblatt, D. C. Schaad and T. J. Cullen. (1999) The Long-term Effect of an Innovative Family Physician Curricular Pathway on the Specialty and Location of Graduates of the University of Washington. *Academic Medicine*. 74(3): 285-288.

Pitblado, J. R. and R. W. Pong. (1999) Geographic Distribution of Physicians in Canada. Ottawa, ON: Health Canada.

Pitblado, R J, Pong, R W, and Jacono, J (1995) Regional differences in contacts with health care providers in Ontario. In Minore, B and Hartviksen, C, eds. *Redressing the Imbalance: Health Human Resources in Rural and Northern Communities*. Thunder Bay, ON: Lakehead University .

Pong, R. W., D. Heng, and L. Liboiron-Grenier. (2005) Medical Training and Practice Locations: An Initial Assessment of Two Family Medicine Residency Programs, 1993-2003. A Report Prepared for the Northeastern Ontario Medical Education Corporation. Sudbury, ON: Centre for Rural and Northern Health Research, Laurentian University.

Pong, R. W. and N. Russell. (2003) A Review and Synthesis of Strategies and Policy Recommendations on the Rural Health Workforce. Sudbury, ON: Centre for Rural and Northern Health Research, Laurentian University. Available at: [http://www.cranhr.laurentian.ca/pdf/TORC\\_Ruralhealthworkforcesynthesis-finaldraft-May.pdf](http://www.cranhr.laurentian.ca/pdf/TORC_Ruralhealthworkforcesynthesis-finaldraft-May.pdf).

Pong, R. W. and J. R. Pitblado. (2001) Don't take "geography" for granted! Some methodological issues in measuring geographic distribution of physicians. *Canadian Journal of Rural Medicine*. 6(2): 103-112. Available at: [collection.nlc-bnc.ca/100/201/300/cdn\\_medical\\_association/cjrm/vol-6/issue-2/0103.htm](http://collection.nlc-bnc.ca/100/201/300/cdn_medical_association/cjrm/vol-6/issue-2/0103.htm)

- Rabinowitz, H. K. (1988) Evaluation of a selective medical school admissions policy to increase the number of family physicians in rural and underserved areas. *The New England Journal of Medicine*. 319(8): 480-486.
- Rabinowitz, H. K. (1999) The Role of the Medical School Admission Process in the Production of Generalist Physicians. *Academic Medicine*. 74(1, Suppl): S39-S44.
- Rabinowitz, H. K., J. J. Diamond, M. Hojat and C. E. Hazelwood. (1999) Demographic, Educational and Economic Factors Related to Recruitment and Retention of Physicians in Rural Pennsylvania. *The Journal of Rural Health*. 15(2): 212-218.
- Rabinowitz, H. K., J. J. Diamond, F. W. Markham and N. P. Paynter. (2001) Critical Factors for Designing Programs to Increase the Supply and Retention of Rural Primary Care Physicians. *Journal of the American Medical Association*. 286(9): 1041-1048.
- Rackley, B. P., J. R. Wheat, C. E. Moore, R. G. Garner and B. W. Harrell. (2003) The Southern Rural Access Program and Alabama's Rural Health Leaders Pipeline: A Partnership to Develop Needed Minority Health Care Professionals. *The Journal of Rural Health*. 19(Suppl ): 354-360.
- Ramsey, P. G., J. B. Coombs, D. D. Hunt, S. G. Marshall and M. D. Wenrich. (2001) From Concept to Culture: The WWAMI Program at the University of Washington School of Medicine. *Academic Medicine*. 76(8): 765-775.
- Riley, k., W. Myers, M. J. Gordon, M. Laskowski, S. Kriebel and S. Dobie. (1991) A Collaborative Approach to a Primary Care Preclinical Preceptorship for Underserved Settings. *Academic Medicine*. 66(12): 776-777.
- Roberts, A., L. Davis and J. Wells. (1991) Where physicians practicing in Appalachia in 1978 to 1990 were trained and how they were distributed in urban and rural Appalachia. *Academic Medicine*. 66(11): 682-686.
- Rosenblatt, R. A., M. E. Whitcomb, T. J. Cullen, D. M. Lishner and L. G. Hart. (1992) Which medical schools produce rural physicians? *Journal of the American Medical Association*. 268(12): 1559-1565.
- Rosenthal, T. C. (2000) Outcomes of Rural Training Tracks: A Review. *The Journal of Rural Health*. 16(3): 213-216.
- Rosenthal, T. C., R. K. Maudlin, M. Sitorius, J. A. Florence, G. Markowski, P. D. Cleveland and R. Schneeweiss. (1992) Rural Training Tracks in Four Family Practice Residences. *Academic Medicine*. 67(10): 685-691.
- Rosenthal, T. C., H. McGuigan and G. Anderson. (2000) Rural Residency Tracks in Family Practice: Graduate Outcomes. *Family Medicine*. 32(3): 174-177.
- Rourke, J. T. B. (2002) Building the new Northern Ontario Rural Medical School. *Australian Journal of Rural Health*. 10(2): 112-116.

- Rourke, J. T. B., F. Incitti, L. L. Rourke and M. Kennard. (2003) Keeping family physicians in rural practice. *Canadian Family Physician*. 49: 1142-1149.
- Rourke, J. T. B., P. Newberry and D. Topps. (2000) Training an adequate number of rural family physicians. *Canadian Family Physician*. 46: 1245-1248.
- Rourke, J. T. B. and R. P. Strasser. (1996) Education for rural practice in Canada and Australia . *Academic Medicine*. 71(5): 464-469.
- Rural Policy Research Institute. (2005). RUPRI - Rural Policy Context, Defining Rural. *Rural Policy Research Institute*. Available at: <http://www.rupri.org/resources/context/rural.html>. Date Accessed: 12-5-2005.
- Seal, R. F. (2001) Crisis in rural anesthesia. *Canadian Journal of Rural Medicine*. 6(4): 241-243.
- Seim, H. C. (1997) Rural Family Practice Program for First-Year Students. *Academic Medicine*. 72(9): 735-736.
- Shortt, S. E. D., M. E. Green, and C. Keresztes. (2003) The Decline of Family Practice as a Career in Ontario: A Discussion Paper on Interventions to Enhance Recruitment and Retention. Kingston, ON: Centre for Health Services and Policy Research, Queen's University.
- Stearns, J. A., M. Glasser and P. Fulkerson. (1997) Medical Student Education: An Admission and Curricular Approach to Rural Physician Shortages. *Academic Medicine*. 72(5): 438-439.
- Strasser, R. (1992) How can we attract more doctors to the country? *Australian Journal of Rural Health*. 1(1): 39-42.
- Strasser, R. (2005) Anticipated impact of the Northern Ontario School of Medicine on Ontario's rural medical workforce and how NOSM plans to fulfill its expected roles. *Sudbury, ON: Ontario Training Centre for Health Services and Policy Research: 2005 Summer Institute*. "Rural Physician Shortages and the Northern Ontario School of Medicine: From Research to Policy Decision".
- Stratton, T. D., J. M. Geller, R. L. Ludtke and K. M. Fickenscher. (1991) Effects of an Expanded Medical Curriculum on the Number of Graduates Practicing in a Rural State. *Academic Medicine*. 66(2): 101-105.
- Sullivan, P. (2003) Family medicine crisis? Field attracts smallest-ever share of residency applicants. *Canadian Medical Association Journal*. 168(7): 881-882.
- Talbot, J. and A. Ward. (2000) Alternative Curricular Options in Rural Networks (ACORNS): Impact of Early Rural Clinical Exposure in the University of West Australia Medical Course. *Australian Journal of Rural Health*. 8(1): 17-21.
- Talley, R. C. (1990) Graduate medical education and rural health care. *Academic Medicine*. 65(12, Suppl): S22-S25.

- Tepper, J. D. and J. T. B. Rourke. (1999) Recruiting rural doctors: ending a Sisyphean task. *Canadian Medical Association Journal*. 160(8): 1173-1174.
- Tesson, G., V. Curran, R. W. Pong and R. Strasser. (2005a) Advances in rural medical education in three countries: Canada, the United States and Australia. *Rural and Remote Health*. In press:
- Tesson, G., V. Curran, R. Strasser, R. W. Pong and D. Chivot. (2005b) Des innovations de programmes en éducation médicale pour faciliter le recrutement des médecins pour les régions rurales et éloignées du Canada, des États-Unis et de l'Australie . *Cahiers de sociologie et de démographie médicales*. In press:
- Thurber, A. D. and N. Busing. (1999) Decreasing supply of family physicians and general practitioners: Serious implications for the future. *Canadian Family Physician*. 45: 2084-2089.
- Topps, D., J. T. B. Rourke and P. Newberry. (2003) Wanted: Trainees for Rural Practice. *Australian Journal of Rural Health*. 11(2): 96-98.
- U.S.Census Bureau. (2005). American FactFinder. *Census 2000 Summary File 1 (SF1) 100-Percent Data*. Available at:  
[http://factfinder.census.gov/servlet/DTSelectedDatasetPageServlet?\\_lang=en&\\_ts=140009606546](http://factfinder.census.gov/servlet/DTSelectedDatasetPageServlet?_lang=en&_ts=140009606546). Date Accessed: 7-21-2005.
- University of British Columbia, Faculty of Medicine. (2005). Faculty of Medicine, Development of Distributed Educational Programs. *UBC*. Available at:  
<http://www.med.ubc.ca/expansion/>. Date Accessed:
- Watanabe, M. and A. Casebeer. (2000) Rural, Remote and Northern Health Research: The Quest for Equitable Health Status for all Canadians. *The Rural Health Research Summit*. Prince George, BC: University of Northern British Columbia.
- Wetmore, S. J. and M. Stewart. (2001) Is there a link between confidence in procedural skills and choice of practice location? *Canadian Journal of Rural Medicine*. 6(3): 189-195.
- Wilkinson, D., J. Birks, L. Davies, S. A. Margolis and P. Baker. (2004) Preliminary evidence from Queensland that rural clinical schools have a positive impact on rural intern choices. *Rural and Remote Health*. 4(4): 340. Available at:  
<http://rrh.deakin.edu.au>
- Woloschuk, W., R. Crutcher and O. Szafran. (2005) Preparedness for rural community leadership and its impact on practice location of family medicine graduates. *Australian Journal of Rural Health*. 13(1): 3-7.
- Woloschuk, W. and M. Tarrant. (2002) Does a rural educational experience influence students' likelihood of rural practice? Impact of student background and gender. *Medical Education*. 36(3): 241-247.

Woloschuk, W. and M. Tarrant. (2004) Do students from rural backgrounds engage in rural family practice more than their urban-raised peers? *Medical Education*. 38: 259-261.

Worley, P. S., D. J. Prideaux, R. P. Strasser, C. A. Silagy and J. A. Magarey. (2000a) Why we should teach undergraduate medical students in rural communities. *Medical Journal of Australia*. 172(12): 615-617.

Worley, P. S., C. A. Silagy, D. J. Prideaux, D. Newble and A. R. Jones. (2000b) The Parallel Rural Community Curriculum: an integrated clinical curriculum based in rural general practice. *Medical Education*. 34(7): 558-565.

Worley, P. S., R. P. Strasser and D. J. Prideaux. (2004) Can medical students learn specialist disciplines based in rural practice: lessons from students' self reported experience and competence. *Rural and Remote Health*. 4(4, online): 338. Available at: <http://rrh.deakin.edu.au>

Xu, G., J. J. Veloski, M. Hojat, R. M. Politzer, H. K. Rabinowitz and S. L. Rattner. (1997a) Factors Influencing Physicians' Choices to Practice in Inner-city or Rural Areas. *Academic Medicine*. 72(12): 1026.

Xu, G., J. J. Veloski, M. Hojat, R. M. Politzer, H. K. Rabinowitz and S. L. Rattner. (1997b) Factors Influencing Primary Care Physicians' Choice to Practice in Medically Underserved Areas. *Academic Medicine*. 72(10, Suppl 1): S109-S111.



## **Appendix A: Study Summaries on Rural Medical Education**

Appendix A provides summaries of the publications reviewed for this report. It is divided into three sections according to the strength of the study:

- ▶ Comparative Studies (n=32)
- ▶ Descriptive Studies (n=37)
- ▶ Informed Opinions (n=19)

Under each section, the author(s), year of publication, a description of the study population if applicable, and a summary of the key findings are presented.

It is important to note that not all of the references cited in the bibliography are detailed in this appendix. Rather, only those studies that were deemed relevant and useful according to the categories identified by MOHLTC and highlighted in this report, namely:

- ▶ Length of rural medical education;
- ▶ Rural medical education at the undergraduate level versus graduate level; and
- ▶ Rural family medicine education versus rural specialty education.

## Comparative Studies

Authors	Year	Participants / Methods	Key Findings
Australian Medical Workforce Advisory Committee	2005	Mail survey to Australian doctors registered with one of Australia's 17 medical college vocational training programs in September 2002 (N=7899)  Response rate = 54%	<ul style="list-style-type: none"> <li>To provide a snapshot of the views and career plans of Australian doctors in vocational training, to enlist their cooperation in a longitudinal study and to provide baseline data for the monitoring of factors influencing the career decisions of this cohort of doctors.</li> <li>Findings indicate that general practice trainees tended to choose their discipline earlier in their medical career compared to all other specialist trainees.</li> <li>37% of general practice trainees had their main training experiences located in a rural area, while only 4% of doctors in other specialist training programs were similarly located.</li> <li>31% of general practice trainees indicated a preference for rural practice compared with 10% of doctors in the other specialist training programs.</li> <li>50% of the 203 general practice trainees with a rural background would prefer to practice in a rural area in the future, compared with 25% of trainees with an urban background; 23% of the 770 specialist trainees with a rural background and 7% of 2749 with an urban background.</li> <li>A positive association was observed between preference to practice in a rural/remote location and enrolment in the general practice rural practice training pathway and involvement in other rural education and training experiences.</li> </ul>
Baldwin Hart West Norris Gore Schneeweiss	1995	Comparative – Cohort study of University of Washington Family Medicine Residency Network graduates between 1973 and 1990 (N=597)  Response rate = 84%	<ul style="list-style-type: none"> <li>Describes how graduates who practice in rural locations differ from their urban counterparts with respect to demographic characteristics, practice organization, practice content, scope of services, and satisfaction.</li> <li>Findings show that 27% of graduates nationwide were practicing in rural counties.</li> <li>Rural graduates were more likely to be male, in private practice, have substantially higher patient care workloads, and perform a much broader range of procedures than their urban counterparts.</li> <li>Rural communities and hospitals need to be aware of these differences and develop flexible practice opportunities.</li> </ul> <p><i>Implications for residency training programs:</i></p> <ul style="list-style-type: none"> <li>Should include practice management issues for solo practice.</li> <li>Adequate training in a broad scope of procedures and inpatient care.</li> <li>Continued development of rural training track residencies in which residents enter into partnerships with rural physicians and their community hospitals.</li> </ul>
Brooks Walsh Mardon Lewis Clawson	2002	21 quantitative articles between 1990 and 2000 were systematically reviewed  Studies scored formally out of 60 on six criteria (study design, study population, response rate, years studied, data source and stats methods).	<ul style="list-style-type: none"> <li>Studies were classified by whether they assessed factors related to pre-medicine, medicine or residency.</li> <li>Findings indicate that the factors most strongly correlated with recruitment were pre-medical factors such as rural upbringing and specialty preference.</li> <li>Factors most strongly associated with retention were training factors such as commitment to rural curricula and rotations, especially during residency.</li> <li>Both nature (i.e., selecting the right students) and nurture (i.e., giving them the right experiences during training) are important.</li> </ul>
Brooks Mardon Clawson	2003	Mail survey to all of Florida's rural primary care physicians (N=399) and a 10% sampling of urban and suburban primary care physicians (N=1236) Rural Response rate = 68%	<ul style="list-style-type: none"> <li>To assess key characteristics of primary care physicians practicing in rural, suburban, and urban communities.</li> <li>Findings indicate that rural physicians were more likely to have been raised in a rural area, foreign-born and trained, National Health Service Corps members or J-1 visa waiver program participants.</li> <li>Having exposure to medical practice and living in rural areas during medical school had a significant effect on the likelihood of later rural practice.</li> </ul>

		Urban/Suburban response rate = 59%	<ul style="list-style-type: none"> <li>• Rural upbringing and medical school training did not predict future rural practice with foreign-born physicians.</li> <li>• Concludes that recruiting and retaining doctors in rural areas can be best supported through a mission-driven selection of medical students, with subsequent training in medical school and residency in rural health areas.</li> </ul>
Campos-Outcalt Senf Watkins Bastacky	1995	<p>Reviewed a total of 85 articles published from 1984 through 1993</p> <p>Assessed studies on the following criteria:</p> <ul style="list-style-type: none"> <li>▶ Type of Study</li> <li>▶ Size of Study</li> <li>▶ Response Rate</li> <li>▶ Years Studied</li> <li>▶ Data Sources</li> <li>▶ Statistical Methods</li> <li>▶ Theoretical Model</li> </ul>	<ul style="list-style-type: none"> <li>• To evaluate and review the literature on the effects of medical school curricula, faculty role models, and federal biomedical research support on the specialty choices of U.S. medical students.</li> <li>• Major educational reforms emphasizing primary care have resulted in significant increases in the percentages of graduates choosing generalist careers.</li> <li>• Except for required clinical training in family practice, individual curriculum components have generally not been successful.</li> <li>• Students and physicians often stated that faculty role models influenced specialty choices; there is some evidence that faculty composition is related to students' career choices.</li> <li>• There was a consistent inverse correlation between the amount of federal biomedical research funding received and the percentage of a school's graduates choosing generalist careers; not sure whether this relationship is causative.</li> <li>• Concludes that the best strategies to enlarge the proportion of medical students choosing generalist careers include institutional reform to emphasize generalist training, increasing the size of generalist faculty, and requiring clinical training in family practice.</li> <li>• Notes that research on specialty choice could be improved by including a larger number of schools and students, studying trends over several years, and using validated measures and outcomes, control groups and multivariate analyses.</li> </ul>
Coombs Miller Leeper	1995	Cross-sectional comparative survey of University of Alabama undergraduate medical students; (N=396 in 1981; N=381 in 1991)	<ul style="list-style-type: none"> <li>• To compare actual choices of locations with specialties and with location preferences stated 10 years earlier.</li> <li>• 56% of all primary care physicians, 66% of FP/GP, 46% of non-primary care specialists were practicing in communities of less than 100,000.</li> <li>• 32% of primary care physicians and 21% of specialists were located in small communities (&lt;20,000);</li> <li>• Although family practitioners were more likely to practice in small towns than other specialists, more of them found their way to larger cities by 1991 than would have been predicted from student preferences.</li> <li>• Whereas subspecialists were more likely to be practicing in larger cities than family medicine physicians, a higher percentage than expected were actually located in small towns.</li> </ul>
Easterbrook Godwin Wilson Hodgetts Brown Pong Najgebauer	1999	Cross-sectional mail survey of Family Medicine Program graduates (1977-1991) at Queen's University	<ul style="list-style-type: none"> <li>• To determine whether exposure to rural practice during undergraduate medicine or family medicine residency (dichotomous variable) is associated with an increased likelihood of practicing in a rural area.</li> <li>• In the bivariate analysis, undergraduate rural exposure was associated with choosing a rural community as first practice location. But this association was no longer present when other variables were controlled for.</li> <li>• Rural exposure in residency was not correlated with first practice location.</li> <li>• Authors admit possible limitations of study (i.e., small sample, self-selection of students based on Queen's reputation for rural training) may explain lack of impact of rural training.</li> </ul>
Frisch Kellerman Ast	2003	Survey of Kansas University School of Medicine-Wichita graduates (1970-2000); (N=484)	<ul style="list-style-type: none"> <li>• Urban-based family residency portions of program require a 2-month rural rotation during the 2<sup>nd</sup> or 3<sup>rd</sup> year.</li> <li>• To evaluate rural practice selection and movement patterns by graduates of family practice residency programs affiliated with Kansas University School of Medicine.</li> <li>• 61% chose initial practice sites in non-metro counties (rural-urban continuum codes 4-9); 32% in the</li> </ul>

			<p>most remote areas (codes 7-9).</p> <ul style="list-style-type: none"> <li>• Study did not collect any information about graduates' background.</li> </ul>
Fryer Myoshi Stine Krugman	1993	Area Health Education Center (AHEC) program of the University of Colorado Health Sciences Centre (N=131 graduates) compared to those who had not completed a AHEC rotation (N=158 graduates)	<ul style="list-style-type: none"> <li>• Graduates who had completed AHEC rotations established practices in rural counties more frequently (13.7% versus 7.8%), especially in towns with fewer than 5,000 people (9.9% versus 4.0%, P = .04).</li> <li>• Graduates who had completed AHEC rotations were also more likely than their counterparts to practice a primary care specialty (50.4% versus 34.0%, P = .01), particularly family practice (26.7% versus 10.5%, P&lt;.01).</li> </ul>
Fryer Stine Krugman Myoshi	1993	Evaluation of the Area Health Education Center (AHEC) program of the University of Colorado Health Sciences Center	<ul style="list-style-type: none"> <li>• Since 1971, the US Bureau of Health Professions has provided funding to establish AHEC programs that address inaccessibility to primary medical care services, particularly by Americans residing in rural areas.</li> <li>• AHEC program has sponsored rotations for medical students in rural Colorado since 1980.</li> <li>• Evaluation included a review of the current community of practice for each University of Colorado School of Medicine graduate in the classes of 1980 to 1985.</li> <li>• Of the 131 graduates who had taken part in AHEC-sponsored rotations, 7 (5.3%) had practices in towns with fewer than 2,500 people, and 18 (13.7%) had practices in rural communities.</li> <li>• 13.6% (21 of 155) of the former participants in other states were practicing in communities with fewer than 2,500 people and 29 (18.7%) were practicing in rural communities.</li> </ul>
Geyman Hart Norris Coombs Lishner	2000	Content review of more than 125 relevant articles and review of other materials provided by members of the Society of Teachers of Family Medicine Working Group on Rural Health	<ul style="list-style-type: none"> <li>• Purpose was to review the literature on innovations in medical education and government policy for rural practice with an emphasis on 'small rural' communities under 10,000.</li> <li>• This is a comprehensive, thematically organized review of large body of largely American literature, including tabular presentation of best US models and of factors predicting successful rural recruitment and retention; note emphasis on gender and on influence of spouse on choice of first practice location.</li> </ul>
Goodwin Hodgetts Wilson Pong Najgebauer	1998	Cross-sectional mail survey of Family Medicine Program graduates (1977-1991) at Queen's University	<ul style="list-style-type: none"> <li>• To examine the types of practice residents chose immediately out of residency, their practice choices during the first 2 years after residency and how those choices changed over 15 years.</li> <li>• 75% of graduates locate in communities smaller than Kingston; 33% of graduates locate in settings with populations &lt;10,000.</li> </ul>
Heng Pong	2004	An ongoing tracking study of family medicine residents participating in a residency program based in northeastern Ontario. Results are based on 5 years of data (N=149)	<ul style="list-style-type: none"> <li>• To examine the residents' previous experience of the North, where they intended to practice, and where the graduates actually did practice.</li> <li>• Time spent in northern Ontario by residents before they enrolled generally had a positive influence on their perception of northern Ontario medical practice.</li> <li>• Of the graduates who responded to the survey, 88% were practicing in communities under 100,000 while only 63% of new residents had grown up in communities of that size or smaller.</li> <li>• The intent to practice in northeastern Ontario decreased somewhat the further the respondents looked into the future.</li> <li>• By the two-year mark after their graduation, 99% of graduates had begun their medical practice; most had been practicing in the same community for from one to five years; once established in a community, about half intended to stay for six years or more.</li> <li>• Personal considerations, such as spousal and family influence and lifestyle, are among the most important factors in the graduates' decisions about practice location.</li> <li>• Consistent with the intent of residents, about two-thirds of the graduates stayed to practice medicine in northeastern Ontario; however, only one-third of them grew up in northeastern Ontario.</li> </ul>
Heng Pong	2005		

			<ul style="list-style-type: none"> <li>• Concludes that this family medicine residency program and other northern electives may have played a role in influencing physicians' practice location decisions.</li> </ul>
Hutten-Czapski Thurber	2002	Retrospective cohort analysis of physicians graduating from Canadian family practice training programs (N=3088) and specialty programs (N=4380) between 1994 and 1998	<ul style="list-style-type: none"> <li>• To investigate the relationship between location of medical training (undergraduate and graduate) and proportion of graduates practicing in a rural area 2 yrs after graduation.</li> <li>• 20.9% of family practice trained physicians and 4.4% of specialty trained physicians practiced in rural areas (population &lt;10,000).</li> <li>• Nurturing role of medical school relates to how well the school presents and prepares students for family practice and especially for rural family medicine as a career.</li> <li>• Although a large number of rural family physicians also do emergency medicine, a third year in emergency medicine training rarely results in rural practice.</li> <li>• IMGs do not preferentially choose rural settings.</li> <li>• Rural focus is not guaranteed by a regional training setting.</li> </ul>
Jensen DeWitt	2002	University of Washington internal medicine residents who completed voluntary 1-2 month rural electives and a matched group of randomly selected residents who did not (N=83 for each group)  Response rates: 70% participants 61% non-participants	<ul style="list-style-type: none"> <li>• To examine how rural electives affects internal medicine residents' opinions about rural practice and which factors encourage or discourage choice of rural practice.</li> <li>• Findings indicate that residents who did rural electives reported more interest in rural practice before (p=0.01) and after the rural elective (p=0.02) than participants in urban practice.</li> <li>• Rural elective participants were more likely to see the breadth of practice (p=0.02), continuity of care (p=0.009), quality of life in rural areas (p=0.009) and experiences with mentors as encouraging rural practice (p=0.05).</li> <li>• Elective participation did not demonstrably increase rural career choice.</li> <li>• Elective participants suggested that electives may be more effective in influencing rural career choice if they occurred earlier in their training (p=0.03), lasted for longer periods of time, and address the needs of spouses and partners (p=0.02).</li> </ul>
Jones Oster Pederson Davis Blumenthal	2000	Pre- and post-test of Morehouse School of Medicine graduates (N=291), compared to Association of American Medical Colleges Medical Colleges Medical school graduation questionnaire between 1988 and 1997	<ul style="list-style-type: none"> <li>• To examine the relationship of rural clerkship to medical students' interest in establishing careers in rural communities.</li> <li>• Following a period of two years, MSM students showed a statistically insignificant increased preference for future career in a rural community (p= 0.094).</li> <li>• Because most of the graduates who experienced the RPCC were still in residency at the time of this study, it could not be determined whether the stated preference for rural practice translated into actual practice location after residency.</li> </ul>
Laven Wilkinson	2003	12 studies between 1973 and 2001 were systematically reviewed  Inclusion criteria of required studies to comprise urban and rural groups to allow an explicit comparison	<ul style="list-style-type: none"> <li>• Summarizes the evidence for an association between rural background and rural practice by reviewing national and international published reports.</li> <li>• Rural background was associated with rural practice in 10 of the 12 studies, with most odds ratios (OR) approximately 2-2.5.</li> </ul> <p><i>Note: The subsequent factors were not included in the search strategy and conclusions cannot be drawn from this review</i></p> <ul style="list-style-type: none"> <li>• Rural schooling was associated with rural practice in all 5 studies that reported on it, with most OR approximately 2.0.</li> <li>• Having a rural partner was associated with rural practice in 3 of the 4 studies reporting on it, with OR approximately 3.0.</li> <li>• Rural undergraduate training was associated with rural practice in 4 of 5 studies, with most OR approximately 2.0.</li> <li>• Rural post-graduate training was associated with rural practice in 1 of 2 studies with rural doctors reporting rural training about 2.5 times more often.</li> </ul>
Lynch Willis	2000	Pre-post test of first year medical students from a public	<ul style="list-style-type: none"> <li>• To investigate the effect of a three-day family medicine preceptorship in a small town on first-year medical students' opinions about living and working in small towns and their plans to live in and</li> </ul>

		<p>medical school located in a predominantly rural region of the southeastern United States participating in a 3-day preceptorship; (N=137)</p> <p>Students randomly assigned to small or large communities. Randomly assigned to complete questionnaire either pretest or posttest.</p>	<p>practice medicine there.</p> <ul style="list-style-type: none"> <li>• From pretests or posttest, there were no significant differences in opinions about living in small towns among students who went to small communities or among those went to large communities.</li> <li>• No significant differences from pretest to posttest in opinions about working in small towns among either group.</li> <li>• Brief exposure to rural medicine early in the curriculum appears to have little effect on influencing students' opinions about or interest in living in and working in small towns or rural areas.</li> <li>• Three days of practice experiences in a small community may be insufficient to modify students' opinions about living and working in small towns. Providing rural education training experiences later in the curriculum may be more meaningful.</li> </ul>
Pathman Steiner Jones Konrad	1999	<p>Two mail surveys (1991 and 1996-97). 1991 survey: Random selection of primary care physicians (N=661) who had moved to rural practice in the US from 1987 through 1990 (and who had not served with the National Health Service Corps). Response rate = 69%</p> <p>1996/97 survey: Eligible physicians (N=456) were resurveyed about their career paths and more details about their medical training. Response rate = 99.5%</p>	<ul style="list-style-type: none"> <li>• To identify educational approaches that best prepare physicians for rural work and small town living, and that promote longer rural practice retention.</li> <li>• Findings indicate that 63% of physicians recalled they had been interested in rural practice when they started medical school.</li> <li>• Participation in rural rotations was common among respondents, although typically brief. More than half of the respondents had participated in rural rotations as students and almost half had participated as residents. 28% had participated in rural rotations as both students and residents.</li> <li>• Physicians who felt better prepared for rural careers were found to stay longer in their rural practices. In addition, feeling prepared for small town living was more important to retention than was feeling prepared for the practice of rural medicine.</li> <li>• Rural experiences during residency, not medical school, appeared particularly effective. During medical school, only rural experiences of greater than three months were associated with a greater preparation for rural practice. This might be explained by the fact that residents were at a stage of their professional development where they were more receptive to the important lessons of rural rotations.</li> <li>• However, only those physicians who were in their first jobs following residency benefited from their rural and other educational experiences by feeling more prepared and staying at their practices.</li> <li>• Suggests that once physicians have practice experience, earlier formal educational experiences no longer positively affect their sense of preparedness and retention.</li> </ul>
Phillips Rosenblatt Schaad Cullen	1999	<p>Medical students who entered between 1968 and 1973 and participated in a family physician curricular pathway at the University of Washington (N=239)</p> <p>Data collected from the 1994 Physician Masterfile of the American Medical Association</p>	<ul style="list-style-type: none"> <li>• To report the specialty and rural/urban distribution of students from a family physician curricular pathway.</li> <li>• Findings indicate that 72% of the students had left school intent on careers in family practice; 57% were family physicians in 1994.</li> <li>• Findings exceeded an original goal that at least 20% of each class should enter family practice.</li> <li>• 3.5% of these graduates were family physicians in rural Washington in 1994.</li> <li>• Concludes that early identification and support of students interested in family practice is an appropriate starting place for producing more family physicians.</li> </ul>
Rabinowitz Diamond Markham Hazelwood	1999	<p>Retrospective cohort study of the Physician Shortage Area Program (PSAP) of Jefferson Medical College graduates (1972-1991) (N=1609)</p>	<ul style="list-style-type: none"> <li>• To determine the direct and long-term impact of the PSAP on the rural physician workforce. Compared the PSAP graduates currently practicing family medicine in rural and underserved areas of Pennsylvania with all allopathic medical school graduates in the state, and with all US and international allopathic graduates. All PSAP graduates were also compared with the non-PSAP peers at JMC regarding the US practice location, medical specialty, and retention for the past 5-10 years.</li> <li>• PSAP graduates account for 21% (32/150) of family physicians practicing in rural Pennsylvania who</li> </ul>

			<p>graduated from one of the state's seven medical schools even though they represent only 1% (206/14710) of graduates from those schools (RR 19.1).</p> <ul style="list-style-type: none"> <li>• Among all US and international medical school graduates, PSAP graduates represent 12% of all family physicians in rural Pennsylvania. Results were similar for PSAP graduates practicing in underserved areas.</li> <li>• Overall, PSAP graduates were more likely than their non-PSAP classmates at JMC to practice in a rural area of the United States (34% vs. 11%: RR 3.0), to practice in an underserved area (30% vs. 9%: RR3.2), to practice family medicine (52% vs. 13%: RR4.0), and to have a combined care area in family practice with practice in a rural area (21% vs. 2%: RR 8.5).</li> <li>• Of PSAP graduates, 84% were practicing in a rural area.</li> <li>• Of those PSAP graduates of those practicing between 5 and 10 years ago, 87% were currently practicing in rural family medicine.</li> <li>• 94% of PSAP graduates were practicing in underserved areas.</li> <li>• The PSAP after more than 22 years had disproportionately high impact on rural physicians in the workforce.</li> <li>• Concludes that policy makers and medical schools can have a substantial impact on the shortage of physicians in rural areas.</li> </ul>
Rabinowitz Diamond Markham Paynter	2001	Jefferson Medical College graduates from the class of 1978 to 1993, including 220 PSAP graduates (N=4314)	<ul style="list-style-type: none"> <li>• To identify factors independently predictive of rural primary care supply and retention and to determine which component of the Physician Shortage Area Program (PSAP) lead to its outcomes.</li> <li>• Findings indicate that freshman-year plans for family practice, PSAP participation, receiving a National Health Service Corps Scholarship, taking an elective senior family of practice rural preceptorship, and gender (male) were independently predictive of physicians practicing rural primary care.</li> <li>• For 1978 to 1982 graduates, growing up in a rural area was the only independent predictor of rural primary care.</li> <li>• Non-PSAP graduates having grown up in a rural area and a freshman-year plan for family practice were 78% as likely as PSAP graduates to be rural primary care physicians and 75% as likely to remain.</li> <li>• Suggests that admissions component of the PSAP is the most important reason for its success.</li> </ul>
Rosenblatt Whitcomb Cullen Lishner Hart	1992	Physicians who graduated from American medical schools between 1976 and 1985. There were 578,610 physicians listed in the Masterfile. Those who reported they were still in training were excluded from the study, but since this number is not defined in the study, the exact sample size is unknown. It is known that 15,375 physicians (12.6% of the study population) were practicing in rural areas	<ul style="list-style-type: none"> <li>• To examine the hypothesis that medical schools vary systematically and predictably in the proportion of their graduates who enter rural practice.</li> <li>• The methodology involved the examination of the 1991 rural and urban practice locations of the sample. This was determined using the December 1991 American Medical Association Physician Masterfile which, in addition to practice location, also includes information on the year and medical school of graduation and the physician's self-designated specialty, gender, and current practice status. The study findings suggest that medical schools vary enormously in the likelihood that their graduates will enter rural practice. The results range from 41.2% of graduates from the University of North Dakota practicing in rural areas to 2.3% of Mt. Sinai's graduates. 13 medical schools had over 20% of their graduates practicing in rural areas, while another 13 had fewer than 5% practicing in rural areas. This study also examined the association between medical school characteristics and the practice locations of their graduates.</li> <li>• Findings indicated the strongest association was between the percentage of rural graduates and the rurality of the state where the medical school is situated.</li> </ul>
Rosenthal McGuigan Anderson	2000	13 nationally distributed rural training tracks between 1988 and 1997 (N=77)	<ul style="list-style-type: none"> <li>• Examined the graduate outcomes of rural resident tracks in family practice in the US.</li> <li>• 76% (n=49) of respondents practiced in a rural community and 61% (n=39) practiced in federally designated health professionals shortage areas.</li> </ul>

		Response rate = 83%	<ul style="list-style-type: none"> <li>• 69% (n=44) of respondents admitted patients to rural hospitals, 67% (n=43) provided labour and delivery services, and 40% (n=31) performed caesarean sections. Assisting physician groups were major influences on practice location.</li> <li>• 39% (n=25) were near their hometown and 45% (n=29) were near the community in which they completed their residency training.</li> <li>• 14 (n=9) had a financial obligation to the community.</li> <li>• 94% (n=60) reported that their rural training was adequate or better.</li> <li>• Most graduates from rural training tracks have located their practice sites in rural communities and most graduates provide labour and delivery services.</li> </ul>
Szafran Crutcher Chaytors	2001	Cross-sectional, retrospective survey mailed to family medicine residency graduates at the University of Alberta and the University of Calgary	<ul style="list-style-type: none"> <li>• To examine the effectiveness and influence of Alberta's family medicine programs on graduates' choice of practice location.</li> <li>• Variables included current practice location, factors influencing family practice location, gender, and community lived in under 18 years of age.</li> <li>• Overall, the most influential factors in attracting graduates to their current practice locations were spousal influence, type of practice, proximity to extended family.</li> <li>• Types of practice, income, community efforts to recruit, medical need in the area, and loan repayments had a substantial influence on the family physicians decision to practice in rural areas.</li> <li>• Male physicians ranked type of practice, whereas female physicians ranked spousal influence, as the most influential on choice of practice location.</li> <li>• Significantly more female than male identified working hours, familiarity with medical community or resources and availability of support specialties and personnel as having a moderate or major influence on their decision.</li> </ul>
Talbot Ward	2000	Pre- post test of a 4-day rural placement as part of the 5-week General Practice term, for Y4 students in Western Australia	<ul style="list-style-type: none"> <li>• To assess the efficacy of a 4-day rural placement in altering students' attitudes towards rural general practice.</li> <li>• Findings show that the percentage of students interested in rural practice increased from 48% before program to 81% after.</li> <li>• An indication that early exposure to rural practice increases likelihood that students will choose rural practice.</li> </ul>
Wetmore Stewart	2001	Mail survey to 2nd year residents in Ontario in 1997  Respondents were similar to the total sampling frame with respect to gender and participation in family medicine program.	<ul style="list-style-type: none"> <li>• To determine if the levels of confidence in procedural skills of family medicine residents in Ontario is associated with the choice of rural practice location.</li> <li>• No association between confidence in procedural skills and choice of practice location was found.</li> <li>• Logistic regression analysis showed that residents who received some rural training were 1.5 times more likely to choose a non-urban practice location than residents who did not receive rural training.</li> <li>• Residents with some rural training had significantly more confidence than residents without rural training in both ambulatory care and emergency procedures.</li> <li>• Suggests that more training required for rural practice.</li> <li>• A limitation of this study is small sample size. More research needed to determine the contribution of rural training, taking into consideration pre-existing inclination to rural practice, and other variables, in choice of practice location.</li> </ul>
Woloschuk Tarrant	2002	Pre-rotation demographic and post-rotation evaluation questionnaires to clinical clerks from 1996-2000 who trained at rural sites as part of their mandatory four-week family medicine clerkship rotation at	<ul style="list-style-type: none"> <li>• To determine whether exposure to a rural educational experience changed students likelihood of doing a rural locum or rural practice and whether student background and gender were related to these practice plans.</li> <li>• Findings indicate that 50 students had rural backgrounds; 23 of this 50 (46%) were female.</li> <li>• Students stated they were more likely to do a rural locum as a result of the rural educational experience however, a pre- to post-increment in the likelihood of rural practice was not observed.</li> <li>• Reasons for this finding are unclear, but may reflect the greater commitment required for rural</li> </ul>



		the University of Calgary (N=273) Response rate = 93%	<p>practice, demands which might be too excessive for many students at this stage in their training.</p> <ul style="list-style-type: none"> <li>• Students with rural backgrounds have a more favourable attitude toward rural practice.</li> <li>• Training in a rural community actually discourages some students from rural practice. This was evident more for students with urban backgrounds. It seems that students from rural backgrounds might be more accepting of the experience.</li> <li>• Concludes that admissions should give preference to candidates raised in rural areas.</li> </ul>
Woloschuk Tarrant	2004	Students from the original study (classes 1996-20000 who entered family medicine residency training programmes were identified for practice location follow-up (N=254)	<ul style="list-style-type: none"> <li>• A follow-up to the original study (Woloschuk and Tarrant, 2002) to determine whether rural background students entered rural family practice at a higher rate than their urban-background peers</li> <li>• Practice location follow-up revealed that 78 students from the original cohort were actually practicing family medicine at the time of follow-up.</li> <li>• Rural background students who participated in a rural family medicine clerkship and subsequently graduated from family medicine residency programmes were ~2.5 times more likely to enter rural practice than their urban background peers.</li> <li>• 7 of 22 students with rural background from the original 254 students in the cohort became family practitioners in a rural community; this compares to 7 of 56 students with urban backgrounds.</li> </ul>
Woloschuk Crutcher Szafran	2005	Mail survey in 2001 to graduates of the family medicine residency program at the Universities of Alberta and Calgary between 1996 and 2000 (N=369) Response rate = 75%	<ul style="list-style-type: none"> <li>• To identify non-clinical dimensions of preparedness for rural practice and to determine whether preparedness for rural practice is predictive of rural practice location.</li> <li>• 49% of respondents indicated that they completed rural rotations that totaled more than eight weeks in duration; 34% reported living in a rural community prior to their 18th birthday.</li> <li>• Factor analysis of the preparedness for rural practice identified two factors labeled 'rural culture' and 'rural community leader'; collectively explained 72% of the variance in the responses.</li> <li>• 73% reported that residency training prepared them to handle the 'rural culture' dimension of rural practice, but only 40% believed they were prepared for the role of 'rural community leader'.</li> <li>• Findings from the logistic regression analysis indicate that preparedness for the role of 'rural community leader' and those having lived in a rural community prior to their 18th birthday were the two variables independently related to rural practice of family medicine graduates.</li> <li>• Preparedness for 'rural culture', age, gender, and amount of time spent in rural rotations were not associated with rural practice in this study.</li> <li>• Concludes that in addition to clinical training, family medicine residency programs should consider expanding rural rotation objectives to include those related to development of certain rural community leadership skills.</li> </ul>
Xu Veloski Hojat Politzer Rabinowitz Rattner	1997b	Mail survey to randomly drawn sample of all physicians who graduated in 1983 and 1984, who identified their specialties as family practice, general practice, general internal medicine, or general pediatrics (N=2955) Response rate = 75%	<ul style="list-style-type: none"> <li>• To examine relationships between physicians' choice of practicing medicine in underserved areas and their background variables using data from a national sample of primary-care physicians.</li> <li>• Assessed six categories of variables: personal and demographic characteristics, financial aid obligations and debt, medical school experience, internship or residency experiences, current practice specialty, and currently working in a federally funded shortage area (outcome variable).</li> <li>• Underserved areas included both rural and inner-city locations in this study.</li> <li>• Findings indicate that 63% of those working in underserved areas were family physicians, as compared with 24% who were general internists and 12% who were general pediatricians.</li> <li>• Physicians' decisions to practice in underserved areas were associated with growing up in an underserved area, prior expressed interest (before medical school) in serving in an underserved area and their federal and/or state financial aid obligations.</li> <li>• Clinical experiences during medical school, either required or elective, and experiences in residency were not associated with their choice to practice in an underserved area.</li> <li>• Suggests that physicians' personal and demographic characteristics, their financial aid obligations, and their expressed interest to practice in underserved areas prior to entering medical school were</li> </ul>

			<p>the most important factors influencing their choices of practice locations in underserved areas.</p> <ul style="list-style-type: none"> <li>• Since background characteristics were related to the physician's choice to practice in underserved areas, a school's admission policy is key to increasing the number of its graduates who would be more likely to practice in an underserved area. Effort should be directed to recruiting underrepresented minority applicants who grew up in underserved areas and who have shown interest in practicing in underserved areas.</li> <li>• Findings support the idea that financial programs have a positive impact on the recruitment and retention of physicians who choose to practice in underserved areas. Overall, approximately 45% of the national sample for this study who had received financial support was currently practicing underserved areas.</li> </ul>
--	--	--	---

### Descriptive Studies

Authors	Year	Participants / Methods	Key Findings
Anonymous	2000	<p>29 programs in the United States that have separately accredited rural tracks in family practice</p> <p>Response rate: 22 of 29</p>	<ul style="list-style-type: none"> <li>• Accredited family practice rural training tracks have proved useful in increasing the placement of doctors in rural areas.</li> <li>• Study findings show that 136 (76%) of the 179 residents graduated from these programs are practicing in rural communities; the greatest benefit went to the states in which the training occurred (95 of 136 rural practice sites).</li> <li>• Findings also show that the impact was felt quickly after a new training program was established, i.e., the rate of rural practice was 88% among programs established within the past 10 years.</li> <li>• These results compare favourably to the national average (21%) of family practitioners who are practicing in rural (non-MSA) counties.</li> </ul>
Bowman Penrod	1998	<p>Distribution of three annual mail surveys (1994-96) to United States family practice residency program directors (N=353); Data on programs from the American Academy of Family Physicians; Census data</p>	<ul style="list-style-type: none"> <li>• To examine current scope of rural family practice residency programs and to assess relationship between various features and the graduation of rural family physicians by different programs.</li> <li>• Findings show that residencies that graduate the highest percentage of physicians choosing rural practice sites are those that: had more months of required rural and obstetrical training; had a full or partial rural mission; were located in more rural states; emphasized procedural training; designated their program director as the rural contact; had lower % of women or minority students; and did their own training rather than relying on other specialties.</li> <li>• There is a recent decrease in number of graduates choosing rural practice locations despite increasing number of students doing rural residencies suggest content of programs needs attention.</li> <li>• The strong explanatory influence of length of rural training suggests longer rural stays are important.</li> </ul>
Chaytors Spooner	1998	<p>Alberta Rural Physician Action Plan (RPAP)</p>	<ul style="list-style-type: none"> <li>• Describe initiatives which take place through, or are supported by the RPAP in 1990.</li> <li>• Nine rural sites selected and equipped for blocktime residency rotations (12 weeks in Y1 and 20 weeks in Y2 for each resident).</li> <li>• In Y3, 24 positions are funded to allow further training in specialties underrepresented in rural Canada (emergency medicine; general surgery plus obstetrics; psychiatry, geriatrics, palliative care, sports medicine, native health, pediatrics).</li> <li>• Annual rural faculty development workshops included visiting faculty expertise.</li> <li>• Much of the training done in regional centres.</li> </ul>

Cordes Rea	1993	University of Arizona	<ul style="list-style-type: none"> <li>• Editorial describes efforts to create new elective training rotations dealing with elements of rural public health.</li> <li>• Of the 17 preventive medicine program graduates from 1987 to 1992, 7 residents have chosen one of the elective rotations.</li> <li>• As of October 1993, three of the seven graduates have practiced in rural settings.</li> </ul>
Crandall Dwyer Duncan	1990		<ul style="list-style-type: none"> <li>• To categorize approaches to recruitment and retention of rural physicians under four categories (affinity models; economic incentive models; practice characteristic models; indenture models); to examine the impact of recent structural and economic changes in the profession and rural society on each category and to recommend a mixed model for optimal success.</li> <li>• Recommendations: encouraging rural high schools and health care providers to identify and motivate top rural science students; providing summer jobs in rural community health centres, as well as scholarship programs, orientation and premed support programs on campus; ensuring that training programs encourage these students to pick rural practice rather than discourage them; providing primary care tracks and rural externships; modifying unpleasant aspects of rural practice, especially salary and benefit packages in salaried positions and marketing positive aspects of rural practice.</li> </ul>
Crump Barnett Fricker	2004	Mail survey to medical students who had shown interest in the rural campus at Madisonville , Kentucky of the University of Louisville School of Medicine (N=76) Response rate = 55%	<ul style="list-style-type: none"> <li>• To report the results of the first 10 years of a rural campus in western Kentucky, including response to difficulties filling openings for 3<sup>rd</sup> and 4<sup>th</sup> year medical students at the campus.</li> <li>• Preclinical summer activities of the Trover Campus produced physicians more likely to choose primary care, but many students were not choosing the rural campus for clinical training.</li> <li>• Urban disruption is often viewed from an educational perspective with rural students simply becoming more comfortable learning and practicing medicine where technology and specialty consultation area close at hand.</li> <li>• Findings indicate that 3<sup>rd</sup> year students base their decision to move to Madisonville much more on personal and social issues than on educational consideration.</li> <li>• Concludes that in order to have a significant effect on the rural underserved, special attention is need to minimize urban disruption during high school, college, and the first two years of medical school.</li> </ul>
Damos Cristman Gjerde	1998	Rural training track at the University of Wisconsin-Madison Family Practice program	<ul style="list-style-type: none"> <li>• To describe the process used to set up the first rural training track.</li> <li>• The establishment of program has had a positive impact on the core residency program which has developed new modules for all residents and nearby rural locations in rural emergency medicine and rural general surgery, among other fields.</li> </ul>

Denz-Penhey Shannon Murdoch Newbury	2005	Evaluations using in-depth interviews of the Rural Clinical Schools at the University of Western Australia's Rural Clinical School and the Spencer Gulf Rural Health School over a two year period	<ul style="list-style-type: none"> <li>To discuss findings and insights relating to rural rotations from in-depth evaluation studies.</li> <li>Three approaches to students' placements across the two Rural Clinical Schools were used: Students based long term in one centre (with only a few days away at a time). Students based long term in one centre with short-term rotations (3-6 wks) away from home base. 6-week rotations without a home base.</li> <li>Most students preferred having a home base in one centre; benefits were described in three areas – academic, clinical, and social.</li> <li>Academically, students with a home base were more likely to exhibit self-directed learning and these students sought opportunities to extend and consolidate areas of need.</li> <li>Clinically, longer rotations allow them to become full participating members of the healthcare team.</li> <li>Socially, all students with a home base actively participated in a wide range of community activities that was not paralleled by students without a home base.</li> <li>Concludes that short rotations are likely to be less optimal than longer rotations for meeting the goal of building future rural workforce capacity.</li> <li>Findings suggest that an opportunity to acculturate students into the rural lifestyle is lost when students' placements are insufficiently long for them to put down roots in their community.</li> <li>Good rural experiences and teaching and learning opportunities are not sufficient in themselves.</li> </ul>
DeWitt Migeon LeBlond Carline Francis Irby	2001	In-depth interviews of preceptors of three rural residency sites of the University of Washington School of Medicine	<ul style="list-style-type: none"> <li>For over 25 years, the University of Washington School of Medicine has provided elective one- and two-month elective rural residency rotations to second- and third-year residents.</li> <li>To identify the characteristics of outstanding rural residency rotations.</li> <li>Preceptors interviewed about their experiences, teaching strategies, and opinions about curriculum.</li> <li>The preceptors believed that outstanding rotations were led by enthusiastic preceptors who served as role models, provided residents with meaningful responsibilities and emphasized independent decision making based on history and physical examination.</li> <li>Emphasized supervised independent and self-directed learning with frequent feedback.</li> <li>Emphasized treating each resident as a colleague and encouraged residents to continually reflect on the meaning and implications of each diagnostic treatment decision.</li> <li>Stressed the importance of safe disagreement, immediate feedback, and deliberately selecting patient problems for residents.</li> </ul>
Dorner Burr Tucker	1991	Survey was distributed to the residency program directors of a random sample of residency programs in the United States (N=701) Response rate = 58.5%, resulting in data on 2612 physicians	<ul style="list-style-type: none"> <li>To examine one of the factors that contribute to the distribution of physicians – how far they move from their residency sites to establish their first practices.</li> <li>Almost 41% of physicians had moved less than 10 miles from their residencies; over half had moved less than 75 miles.</li> <li>The mean distanced moved was 100 miles greater for specialty care and hospital-based physicians compared with primary care physicians.</li> <li>Study findings showed that the primary care physicians demonstrated a propensity to locate their practices closer to where they had completed their residencies than did physicians in most other specialties.</li> </ul>
Fry Terry	1995	Medical students at the end of three-month rotations at South Florida sites from 1990 through 1994 (N=164)	<ul style="list-style-type: none"> <li>Describes an analysis of required evaluation items.</li> </ul> <p>Stepwise multiple regression showed items that predicted increased student interest were:</p> <ul style="list-style-type: none"> <li>Presentation of medical knowledge that was meaningful and relevant.</li> <li>Instructors recommending textbooks and literature resources to enrich learning experiences.</li> <li>Instruction in clinical procedures.</li> </ul> <p>Collectively, the three items claimed 42% of the variance in student interest.</p>

			<ul style="list-style-type: none"> <li>• Concludes that one way for medical schools to generate interest in rural practices is to pay more attention to their rotations, especially the quality of rural preceptors.</li> </ul>
Gray Steeves Blackburn	1994	<p>Graduates of primary care residency programs who were licensed to practice in one of the Atlantic Provinces were surveyed between 1987 and 1991 (N=200)</p> <p>Graduates of specialty residency programs that had more than 10 graduates were also surveyed for the same time period (N=371)</p>	<ul style="list-style-type: none"> <li>• To determine the practice locations of those individuals who had received primary care residency training at Dalhousie University and had entered general or family practice in order to determine the influence of their training locations on practice locations.</li> <li>• Family medicine training program requires at least 12 weeks with a community family physician in a rural setting.</li> <li>• Specialty training programs have encouraged (not required) senior residents to spend 3 to 6 months of their final year of training under the supervision of specialists practicing in a rural community. Authors note that many residents have taken advantage of this opportunity.</li> <li>• Findings indicate that of the 200 primary care graduates, 65% remained in practice in Atlantic Canada, while 57% had practices in rural locations.</li> <li>• Of the 371 specialty graduates, 50% or more of those with practices in the Atlantic provinces practiced in rural locations in general surgery, internal medicine, ophthalmology, and otolaryngology.</li> </ul>
Hays Nichols Wise Adkins Craig Mahoney	1995	Structured interviews of a stratified sample of rural doctors in Northern Queensland, according to the Rural and Remote Areas Classification (N=23)	<ul style="list-style-type: none"> <li>• To investigate the reasons behind the decisions of graduates currently practicing in rural Northern Queensland to enter rural practice, in order to improve initiatives to recruit medical graduates to a distant, predominantly rural region such as North Queensland.</li> <li>• Nine doctors were raised and educated in a rural community.</li> <li>• Non-metropolitan clinical attachments after graduation appear to have been an important influence for those who had no rural life experience before entering medical school.</li> <li>• In most cases, the rural doctors entered rural practice in the hinterland of the city where they had completed their intern and/or residency years.</li> <li>• Concludes that positive experiences in a rural community during post-graduate training (or even later) may still be influential in subsequent career choice.</li> </ul>
Jong Beach	1997	Northern Family Medicine Education Program (NorFaM) of the Faculty of Medicine of Memorial University of Newfoundland	<ul style="list-style-type: none"> <li>• To describe the NorFaM Program, which trains family medicine residents in Labrador, northern Canada and relate this training to location of practice of its graduates.</li> <li>• Following the 28 weeks family medicine rotation in the second year of residency, 11 of the 14 graduates of the NorFaM Program were practicing medicine, 10 (91%) were practicing in rural areas; 3 of the 14 graduates were undertaking further postgraduate training.</li> <li>• Of the 10 graduates in rural practice, 6 returned to work in Labrador.</li> <li>• 86% of the 14 graduates evaluated the program as excellent overall. All residents felt that NorFaM training encouraged them to work in rural practice.</li> <li>• An additional 3rd year was recommended for additional skills training in community development, surgery, obstetric and gynecology and anesthesia.</li> </ul>
Krupa Chan	2005	Semistructured telephone interviews of directors of all family medicine residency programs in Canada in 2002 (n=20)	<ul style="list-style-type: none"> <li>• To document the proliferation of rural family medicine residency programs and to note differences in design as they affect rural recruitment.</li> <li>• Findings show that the number of rural training programs rose from one in 1973 to 12 in 2002.</li> <li>• From 1989 to 2002, the number of rural residency positions quadrupled from 36 to 144.</li> <li>• Rural positions now represent 20% of all family medicine residency positions.</li> <li>• Minimum rural exposure ranged from 4 to 12 months.</li> </ul>
Mahaffy Boldberg Girard	1994	Primary Care Clerkship at the Oregon Health Sciences University School of Medicine	<ul style="list-style-type: none"> <li>• To describe this required 6-week third-year rotation.</li> <li>• Goal is to have each student participate in an intensive and broad-based clinical experience in primary care practice in a rural Oregon community.</li> </ul>
McCready Jamieson Tran	2004	Undergraduate medical students and residents who participated in the Northwestern	<ul style="list-style-type: none"> <li>• To identify factors contributing to recruitment of physicians to the region and to gain insights that might guide planning for a new northern medical school or other regionally focused initiatives.</li> <li>• NOMP participants were 7.11 times more likely to practice in northwestern Ontario than those</li> </ul>

Berry		Ontario Medical Programme (NOMP), Thunder Bay, ON from 1972 to 1997 (N=2335)  Total records located in the Canadian Medical Directory = 85%	<p>Ontario medical school graduates who had not done a NOMP placement.</p> <ul style="list-style-type: none"> <li>• Having a placement as a post-graduate versus an undergraduate learner was a significant predictor of practice in northwestern Ontario; may reflect the fact that post-graduates are closer to the time they will make decisions about where to set up practice.</li> <li>• Undergraduates experiencing multiple placements was a significant predictor of practice in northwestern Ontario; these undergraduates who chose to return for repeated NOMP placements might do so because they have an interest in working in the region.</li> <li>• Gender was not a significant predictor of working in northwestern Ontario.</li> <li>• Limitations include that participating in NOMP was not by random assignment; statistical analysis could not control for rural origin of participants.</li> <li>• Findings are consistent with the view that regional-based training leads to great physician recruitment in that area.</li> </ul>
Paulman Davidson-Stroh	1993	Pre- and post-rotation questionnaires to senior medical students at the University of Nebraska Medical Center after a required 8-week rural family practice preceptorship	<ul style="list-style-type: none"> <li>• To determine if the senior medical student rural family practice preceptorship was a positive influence on students' selection of family practice as a specialty.</li> <li>• According to the literature, early exposure to family practice in the curriculum appears to have a positive influence on students' choice of family practice.</li> <li>• Findings indicate that 565 students (94.5%) were uninfluenced by the preceptorship; 98 of these students had chosen family practice before the preceptorship and planned to follow on with this career choice.</li> <li>• 33 students (5.8%) reported a change in residency choice after completing the rural preceptorship; 23 (3.8%) of these students were positively influenced toward family practice; 10 (1.8%) were negatively influenced.</li> <li>• 15 of the 23 students who indicated they were positively influenced toward family practice went on to choose a family practice residency.</li> </ul>
Paulman Gilbert Davidson-Stroh Ulrich	1995	Examination of the clinical experiences of senior medical students at the University of Nebraska Medical Center during their required 8-week preceptorships in rural family practice between 1989 and 1993	<ul style="list-style-type: none"> <li>• To determine if the clinical content of students' community preceptorships reflects the scope of community practice and should therefore be considered in the design of predoctoral and graduate educational programs.</li> <li>• During their preceptorships students recorded all clinical diagnosis and procedures .</li> <li>• Findings indicate that there may be differences in the patterns and frequencies of diagnoses encountered by students that are determined by the "rurality" of their preceptorship site.</li> <li>• Further research is required to determine whether such differences are significant and whether they should be considered in the design of future curricula.</li> </ul>
Peach Bath	2000	Post-placement questionnaire to third year students at Melbourne University that participated in a voluntary placement in a rural general practice or hospital (N=197; 35 rural, 162 urban)  Response Rate = 72%	<ul style="list-style-type: none"> <li>• The objectives of the voluntary placement are for students to experience rural health-care services, to understand the problems of delivering health care in rural areas and experience rural lifestyle.</li> <li>• To examine the experiences of rural and non-rural students undertaking a voluntary rural placement in the early years of medical school.</li> <li>• Students were asked to rate the placement and to rate their feelings towards rural practice.</li> <li>• 46% of the rural students reported the placement had changed their feelings towards rural practice compared with only 24% of the non-rural students.</li> <li>• Noted that the later year placements provide a further opportunity for students to experience rural practice which may change or reinforce their feelings.</li> </ul>
Peach Barnett	2000	Refers to a cohort of students from an earlier study (Peach and Barnett, 2000a), who had taken part in a 3rd-year rural	<ul style="list-style-type: none"> <li>• To analyze the elective choices of this cohort to test the hypothesis that these students, who had completed the rural placement, would be more likely to undertake at least part of their fourth-year elective in a non-capital city.</li> <li>• 53% of students who had undertaken the third year placement chose a non-capital city compared</li> </ul>

		placement (N=456)  51% of students undertook at least part of their elective in Australia	with 42% of the other students, p=0.11. <ul style="list-style-type: none"> <li>• Women who had undertaken the early placement were significantly more likely than other female students to chose a non-capital city (67% vs 42%, p=0.019).</li> <li>• Women who had taken the third year placement had scores which were, on average, significantly higher than other students (67.7% vs 65.3%, p=0.008).</li> </ul>
Peach Barnett	2002	Refers to a cohort of students from an earlier study (Peach and Barnett, 2000a), who had taken part in a 3rd-year rural placement (N=539)  89% of the cohort undertook internships in Victorian hospitals	<ul style="list-style-type: none"> <li>• Discusses whether an early rural placement in the 3rd year of medical school in Australia influences students' internship choices.</li> <li>• During the period, up to 328 internships had been offered each year: 75% by inner Melbourne hospitals, 15% by outer Melbourne hospitals and 10% by regional hospitals.</li> <li>• The combined number of students taking internships in regional and outer Melbourne hospitals increased from 6.2% to 14.9%.</li> <li>• Findings indicate that the proportion of students having completed placements who undertook internships in regional or outer Melbourne hospitals did not differ significantly from that of other students; the proportion of students with a rural background undertaking internships in such hospitals also did not differ significantly from that of other students.</li> <li>• Concludes that neither the early placement nor rural background accounted for the increase; the authors did not suggest any other factors that might have influenced the increase.</li> </ul>
Ramsey Coombs Hunt Marshall Wenrich	2001	The WWAMI program at the University of Washington School of Medicine (UWSOM), which serves to prepare physicians for practice in five Northwest states (Washington, Wyoming, Alaska, Montana and Idaho)	<ul style="list-style-type: none"> <li>• In 1970 USWOM administrators and faculty initiated a four-state community based program to increase the number of generalist physicians throughout a predominantly rural and underserved region in the US Northwest; in 1976 Wyoming joined the program, which became WWAMI.</li> <li>• Results included widespread participation in and ownership of the program by the participating physicians, faculty, institutions, legislatures, and associations; and development of an educational continuum with recruitment and/or training at multiple levels, including K-12, undergraduate, graduate training, residency, and practice.</li> <li>• The program's positive influences on UWSOM have included focus on primary care and community-based clinical training.</li> <li>• The use of new information technologies promised to further expand the ability to organize and offer medical education in the WWAMI region.</li> <li>• WWAMI has implemented and supported many programs such as the Minorities Medical Education Program; the Medical Scholars Program; the Ambassador's Program; the Rural Observation Experience; and the Rural Integrated Training Experience.</li> <li>• WWAMI research centres were set up to perform research on rural and underserved health care issues.</li> <li>• Programs for healthy communities were set up to help rural communities stabilize their health systems. Community assessments, market surveys, management and financial studies, and other analysis were conducted to assist local community leaders in developing long-range plans for improvement in health systems. The program also served as a home to the WWAMI rural telemedicine network.</li> <li>• The WWAMI graduate retention rate for Idaho was 44% (n=107), Montana was 41% (n=119), and in Alaska 51% (n=76).</li> <li>• According to a 1997 alumni survey, approximately 21% practiced in rural communities of less than 10,000 and 31% practiced in communities of less than 25,000.</li> <li>• Of the 1999 graduating class of the UWSOM, 35% entered primary care training, indicating a strong likelihood of pursuing a career in primary care.</li> </ul>

Riley Myers Gordon Laskowski Kriebel Dobie	1991	Rural/Underserved Opportunities Program (R/UOP), a collaborative effort undertaken by the University of Washington School of Medicine, the Area Health Education Center Program, the Washington Academy of Family Practice, and the Family Health Foundation of Washington	<ul style="list-style-type: none"> <li>• Purpose was to describe the first few years of the R/UOP that provides students with an early introduction to primary care practice in rural and urban underserved settings. Placements were offered to undergraduate students between their first and second years.</li> <li>• Students were extremely satisfied with the program's ability to provide them with first-hand exposure to community medicine.</li> <li>• 65 students (89%) were interested in future rural or underserved area placements while in medical school; 57 students (78%) indicated interest in such placements once they would become residents or practicing physicians.</li> </ul>
Rosenthal Maudlin Sitorius Florence Markowski Cleveland Schneeweiss	1992	Four family practice residency programs (in Washington, Nebraska, New York, and Kentucky) that have established rural training tracks (RTTs)	<ul style="list-style-type: none"> <li>• Rationale of RTTs was the assumption that graduates practiced in the regions where they trained; goal was to increase the number of residents selecting rural careers.</li> <li>• <i>Washington</i> - RTT services areas ranged in population from 11,000 to 25,000. Each RTT site had an established family practice group of at least 4 physicians who served as primary faculty and included obstetrics and surgery in their practice. Each community site also had a hospital that maintained obstetric and surgical services, as well as emergency room and critical care services. No more than 2 residents at a time were placed at one site. First year of the residency was completed in the urban tertiary center. Residents moved to their RTT site in the 2nd year.</li> <li>• <i>Nebraska</i> - RTT sites were in communities with populations of 800 to 1,200. Practices in the communities ranged in size from 4 to 7 family physicians and each designated one physician as program coordinator.</li> <li>• <i>New York</i> - RTT site was Cuba Memorial Hospital, in Cuba, New York. This community had a population of approximately 2,000 and is located 70 miles south of Buffalo. First year of residency was completed in the large tertiary center. Residents relocated to Cuba in year 2.</li> <li>• <i>Kentucky</i> - As with the other programs, the first year of residency took place in the urban center. In Year 2, residents moved to the RTT site, the Appalachian Regional Healthcare Medical Center. The area's population (6000) was economically depressed, medically underserved and aging.</li> </ul>
Rosenthal	2000	Summary of previous data collected from the program directors and graduates of the Rural Training Tracks (RTT) by the author	<ul style="list-style-type: none"> <li>• The theoretical basis for RTTs was that the skills, knowledge and values of rural practice can best be nurtured in rural communities.</li> <li>• Review of studies found that 94% of graduates felt adequately trained for practice by their RTT experience.</li> <li>• 76% of graduates had a primary office ZIP code in a rural community; 61% practiced in a designated Health Professional Shortage Area.</li> <li>• Increasing size of the city of training was associated with declining intention for rural practice.</li> <li>• Concluded that these first RTT graduates support the hypothesis that rural-based graduate medical education can adequately train family doctors for the demands of rural practice and result in high placement rates after graduation.</li> <li>• But, RTTs may have done little more than preserved the inclination to practice in rural America, but they appeared to accomplish this better than any other strategy.</li> </ul>
Rourke Incitti Rourke Kennard	2003	Mail survey to rural family practices (N=276) and family medicine residents (N=210) in Ontario Overall response rate = 54%	<ul style="list-style-type: none"> <li>• To determine how family medicine residents and practicing rural physicians rate possible solutions for recruiting and sustaining physicians in rural practice.</li> <li>• Residents thought the most important solutions were an alternative payment plan with time off for CME, sabbaticals with pay, and a provincial locum program with financial support for travel and accommodation and a guaranteed income.</li> <li>• Practicing physicians thought the most important solutions were continued funding for the rural CME program, an alternative payment program, being on call no more than 1 night in 5, and a provincial</li> </ul>



			<p>locum program.</p> <ul style="list-style-type: none"> <li>• 88% of residents rated a “separate rural stream for aspiring rural physicians” as very or most important.</li> <li>• Authors acknowledge that education solutions proposed by the survey questionnaire were limited to those directly related to residents and practicing physicians, and did not include medical school admission issues or undergraduate rural educational exposure.</li> <li>• Study does not measure the effect of the proposed solutions.</li> </ul>
Seim	1997	<p>4-day attachment for first-year medical students at the University of Minnesota</p> <p>Students are invited to a feedback session and complete a post-test of their knowledge of and attitudes towards rural practice.</p>	<ul style="list-style-type: none"> <li>• First-year medical students have an opportunity to spend a few days with rural family physicians the week before classes began. The hope is that exposing students early to the challenges of rural medical practice will result in more choosing to practice medicine in rural areas.</li> <li>• Students live with the local family physician for about three days. They observe the physician at work and take part in family and social activities.</li> <li>• Students typically show about 20% improvement in knowledge.</li> <li>• With regards to attitudes students typically give the highest rankings to the following characteristics of rural medical practice: lifestyle; the ability to develop closer relationships with patients and their families; and the diversity of cases and the opportunity for continuity of care.</li> </ul>
Silagy Piterman	1991	<p>Questionnaire to final-year medical students at the University of Melbourne and Monash University (N=360) Response rate = 87%</p>	<ul style="list-style-type: none"> <li>• To assess the attitudes of these students towards the choice of location for post-graduate training as well as ultimate practice location. Survey collected demographic data; personal information; and information on gender, marital status, religion, place of birth, place of education, location of parents, and frequency of visits to rural areas.</li> <li>• Findings indicated 42% of this group were women; 20% of students were born and educated in a rural area; 87% wanted to do their internship training in a metropolitan hospital if given a choice.</li> <li>• The reasons indicated for this included (1) partner or family, (2) better training and educational opportunities, (3) preference for city life.</li> <li>• After completing their training, 59% of students wanted to work in urban areas, 12% in rural areas, and 29% were undecided.</li> <li>• Factors which emerged as influential in determining the students' choices of training locations: (1) education and training, (2) personal and social factors.</li> <li>• Findings supported those which were commonly found in the literature - that the majority of medical students favour a metropolitan training post.</li> <li>• Findings also confirmed a strong relationship between a rural background and the subsequent intention to train and work in a rural area. The study findings also indicated the influence of spouse/family on training location choice. This raised the possibility that while a number of students may have chosen to train in rural areas, the ultimate decision to live and work there involved factors outside their immediate control (ie. spouse, family, and children).</li> </ul>
Stearns Glasser Fulkerson	1997	<p>University of Illinois College of Medicine at Rockford</p>	<ul style="list-style-type: none"> <li>• Discussed the creation of a special admission and curricular track to commit students to family medicine careers in rural Illinois.</li> <li>• While applicants must first meet the college's admission criteria, a secondary screening evaluated the rural origins of students and their families, evidence of rural community involvement and leadership, understanding of family medicine, and other variables that increase the likelihood of a primary career choice.</li> <li>• Those accepted into the program must sign a pledge to enter family practice residency and to return</li> </ul>

			<p>to practice in rural Illinois.</p> <ul style="list-style-type: none"> <li>• In the 1st year of the curriculum there were seminars on rural health and safety, rural community structure, and community-oriented primary care. Students were also encouraged to participate in rural primary care summer internships. In the 2nd year, there were seminars on family medicine relating to rural health care delivery. In the 3rd year, there were seminars focusing on community-oriented primary care. In the 4th year, students spent 16 weeks in a rural Illinois community.</li> </ul>
Stearns Stearns Glasser Londo	2000	The Illinois Rural Medical Education (RMED) program was developed by the University of Illinois college of medicine at Rockford	<ul style="list-style-type: none"> <li>• The RMED program is a comprehensive, multifaceted program that combines recruitment, admissions, curriculum, support, and evaluation components.</li> <li>• The admissions process seeks to select students who possess traits indicating success in the eventual rural family practice. These traits are fostered and developed by the four-year rural curriculum, which emphasizes family medicine, community-oriented primary care, the physician functioning in the context of community, and service learning.</li> <li>• After six years, RMED had graduated 39 physicians: 69% have gone into family practice and 82% have selected primary care residencies.</li> </ul>
Stratton Geller Ludtke Fockenscher	1991	University of North Dakota school of medicine	<ul style="list-style-type: none"> <li>• To compare the number of graduates practicing medicine in North Dakota before and after the implementation of the expanded medical curriculum and to compare personal and professional characteristics of all alumni.</li> <li>• In 1973, curriculum was expanded to include all four years of medical education. The hope was that this change, along with a renewed emphasis on primary care oriented residency training, would encourage medical students to establish practices within the state, which is largely rural.</li> <li>• Findings indicate that the expansion into a four-year degree program signaled a dramatic increase in the number of North Dakotans establishing practices within the state.</li> <li>• Before expansion, 23.6% of rural alumni and 18.6% of urban alumni chose to stay and practice in the state. Following expansion these percentages increased to 34.4% and 26.9%, respectively.</li> <li>• When students completed all phases of their medical education and residency training in-state they were much more likely to practice in-state. Since North Dakota is a rural state, this emphasizes the need to recruit and train students from rural backgrounds.</li> </ul>
Tesson Curran Strasser Pong	In press	In-depth interviews with officials responsible for the rural component of 6 medical schools in the United States, Australia, and Canada	<ul style="list-style-type: none"> <li>• To examine selected Australian, Canadian, and American medical education programs designed to meet the medical workforce needs of rural and remote areas.</li> <li>• It focuses on a range of strategies, from recruitment and admissions policies to exposure to rural clinical practice and modified curricula, each designed to produce medical graduates with a strong orientation to rural practice.</li> <li>• Also highlights the important role played by special government funding targeted at rural medical education initiatives and discusses the changes that such initiatives face.</li> </ul> <p>Programs studied are:</p> <ul style="list-style-type: none"> <li>• <i>University of Washington School of Medicine</i>: a large, well-established metropolitan school in Seattle, which has a very successful rural medicine component that serves 5 states.</li> <li>• <i>University of New Mexico School of Medicine</i>: a relatively small school specifically created to meet the medical manpower needs of one of the most economically disadvantaged states in the U.S.</li> <li>• <i>Flinders University</i>: a well established medical school has developed a rural stream within its program in which students are given extensive exposure to rural practice settings.</li> <li>• <i>James Cook University School of Medicine</i>: newly created in 1999 with a mandate to meet the health needs of Northern Queensland and specifically its rural and remote residents.</li> <li>• <i>University of British Columbia's</i> medical school that has expanded to new sites in Victoria, on Vancouver Island, and Prince George in the north of the province.</li> <li>• <i>Northern Ontario School of Medicine</i>: the first new stand-alone medical school in Canada for over 30</li> </ul>

			years, specifically created to meet the challenges of delivering health care in the northern part of Ontario.
Weissman Campbell Gokhale Blumenthal	2001	A national survey of residents completing their training in eight specialties at 162 U.S. academic health center hospitals in 1998 (N=4019) Response rate = 65%	<ul style="list-style-type: none"> <li>To examine the preferences of resident physicians to locate in underserved areas.</li> <li>Findings indicate that only one-third of residents rated public hospitals as desirable settings, though there were large variations by specialty.</li> <li>Desirability was not associated with having trained in public hospital or having greater exposure to underserved populations (39% vs 31%, p=0.02).</li> <li>Only about one-quarter of respondents ranked rural (26 percent) areas as desirable. Men (29%, p&lt;0.01) and non-citizen IMGs (43%, p&lt;0.01) were more likely than others to prefer rural settings.</li> <li>Residents with plans to specialize or enter fellowships were much less likely to prefer rural areas (17% vs 34%, p&lt;0.01).</li> <li>Specialty was predictive of location preference, with 44 percent of family practice residents preferring rural areas.</li> <li>Concludes that this study demonstrates the need to expose graduate trainees to underserved populations.</li> </ul>
Wilkinson Birks Davies Margolis Baker	2004	Time series analysis of University of Queensland, Australia graduates and interns. Comparison trends were made between two sites, Rockhampton and Toowoomba, from 2001-2005	<ul style="list-style-type: none"> <li>To determine the impact of the rural clinical division of the School of Medicine at the University of Queensland on the intern workforce in central and southern Queensland, Australia.</li> <li>First preferences for Rockhampton (central Queensland) increased from six in 2001 to 10 in 2005; for Toowoomba (southern Queensland) from five in 2002 to 12 in 2005; Mackay was stable at two interns in 2001 and 2005 (control community with no ties to the rural clinical division).</li> <li>Interns were more likely to seek to work in the hospitals in Rockhampton and Toowoomba since the establishment of the rural clinical schools in these towns.</li> <li>Limitations include a relatively small sample size and a trend over a fairly short period of time.</li> </ul>
Worley Strasser Prideaux	2004	Retrospective survey to medical students undertaking their Y3 study at the School of Medicine at Flinders University, South Australia (N=32) Response rate = 91%	<ul style="list-style-type: none"> <li>To compare the self-reported experience and competence of students training in three different locations: rural primary care, remote secondary hospital, urban tertiary teaching hospital.</li> <li>Findings indicate a pattern of increased clinical exposure to common clinical conditions and procedures for the rural primary care students compared with both the tertiary and secondary students.</li> <li>There was a positive correlation between reported experience and self-perceived competence that was greater for procedural skills.</li> <li>Importantly, for a small number of procedures and common conditions, students did report competence in the performance of procedures and management of conditions that they had not seen during their Y3 training.</li> <li>Concludes that study provides further evidence that rural primary care is an excellent setting for high quality clinical and educational experiences.</li> </ul>
Xu Veloski Hojat Politzer Rabinowitz Rattner	1997a		<ul style="list-style-type: none"> <li>The authors previously (1997b) analyzed factors influencing physician's choice to practice in underserved vs. non-underserved location. In that study they did not distinguish between inner-city and rural locations. The purpose of this study was to present new findings as another analysis of the data separated rural and inner-city.</li> <li>Findings indicate that the most significant factors in physicians' choices to practice in rural areas were: receipt of National Health Service Corps funding (p&lt;.001); interest expressed prior to medical school (p&lt;.001); gender (p&lt;.004).</li> <li>Men are more likely than women to practice in rural areas.</li> </ul>

## Informed Opinion

Authors	Year	Participants	Key Findings
Adams	1998		<ul style="list-style-type: none"> <li>• Focuses on problems of recruitment and retention in British Columbia.</li> </ul> <p>Proposed solutions include:</p> <ul style="list-style-type: none"> <li>• Revising undergraduate and graduate training, including expanding training in rural locations.</li> <li>• Expanding graduate training for rural doctors with at least 1 year on procedural skills and mandatory courses in basic life support.</li> <li>• Improving quality of life of rural physicians and their family by increasing pay differentials for isolation</li> <li>• Set a maximum workload of 25 patients/per day.</li> </ul>
Anonymous	1997	Annual meeting of the Society of Rural Physicians of Canada – one-day conference	<ul style="list-style-type: none"> <li>• To examine the success and failure of various types of initiatives used to recruit and retain doctors in rural areas and to examine the available evidence supporting their use.</li> <li>• Group was unable to come up with any specific recommendations on how to manage and implement a rural health care strategy.</li> <li>• Concluded that any plan to address recruitment and retention must be comprehensive, flexible, and amenable to implementation.</li> <li>• It must also outline the range of services that will be needed in all areas of rural medicine and address the quality of access to good health care by rural residents.</li> <li>• Need for financial recognition, reasonable call schedules, quality education aimed at the needs of rural medicine, and support for rural physicians in both their private and professional lives must be met to solve the chronic problems of recruitment and retention of Canada's rural physicians.</li> </ul>
Barer Stoddart	1992		<ul style="list-style-type: none"> <li>• There are serious problems with the geographic distribution of physicians in Canada; specific concerns include lack of specialty services in rural areas and oversupply of general or family practitioners in many cities.</li> <li>• Equal population physician ratios for all regions and all types of physicians are not appropriate objectives for physician resource policy because of the spatial distribution of populations and the incidence and prevalence of illnesses requiring the attention of different specialties.</li> <li>• The initial location decision depends on such factors as the students' background, the life experiences of students before entering medical school, influences and exposures during medical education, relative incomes and various lifestyle factors.</li> <li>• The influences during medical education include location of training sites, exposure to rural practice during training, generalist curricular content and perceived prestige and promotion of different specialties and practice arrangements within the medical school.</li> <li>• The discussion of maldistribution suggests five kinds of causes: sources and selection of medical students, educational exposures and influences, and financial, professional lifestyle and personal lifestyle considerations.</li> <li>• A systematic, coordinated initiative aimed at the whole physician lifecycle may be warranted. Aspects of such an initiative might include: science enrichment programs for rural high schools; career counselling for rural high schools students; the reservation of seats in medical school for qualified applicants interested in practicing in rural areas through arrangements for return for service after graduation; the restructuring of medical admissions criteria so that factors other than pure excellence in traditional premedical science courses are given more weight or so that extra weight is given to students from rural</li> </ul>

			<p>areas; the restructuring of undergraduate medical education, particularly in third and fourth years, to inject more exposure to community and ambulatory practice and to cover issues of broader determinants of population health; the provision of more rural clinical sites in family practice programs through the inclusion of more clinical faculty members from rural areas; the enhancement of rural exposure and the development of rotations tailored to rural practice; the development of compulsory rural rotations and more community-based exposure; the development of new residency training programs designed explicitly to prepare generalist specialists to serve as rural regional consultants; income incentives to encourage practice location in non urban settings; various other incentives and initiatives to attract and retain positions in rural areas; academic medical centers as the hub of on-call, clinical decision making support networks and his sources of locum and on-call relief for rural community physicians.</p>
Barer Stoddart	1999		<ul style="list-style-type: none"> <li>• Discusses a number of policy recommendations concerning means for addressing physician maldistribution in Canada.</li> <li>• Recommendations include several pre-medical, admissions, financial, and continuing medical education initiatives.</li> </ul> <p>Strategies in terms of the role of medical education include:</p> <ul style="list-style-type: none"> <li>• Focus on recruiting/admitting medical students from rural or remote areas and from Aboriginal groups.</li> <li>• Positively promote rural practice within medical schools and modify curriculum to reinforce this.</li> <li>• Exposure of medical undergraduates to rural/remote practice settings, the challenges and rewards of those settings, and the special needs of rural/remote communities.</li> <li>• Similar exposures for residents, including extended periods of experience with rural/remote preceptors.</li> <li>• Extended opportunities for practicing physicians for skills upgrading/continuing education appropriate to rural/remote practice.</li> <li>• Opportunities for existing physicians to re-enter training to specialize in areas of need in rural/remote areas.</li> </ul>
Birks Green	1999	Rural Surgical Training Program in Latrobe, Victoria & Atherton, Queensland	<ul style="list-style-type: none"> <li>• Key obstacle to getting graduates to take up rural practice is attitudes of urban surgeons toward rural general surgery.</li> <li>• Rural Surgical Training Program has a flexible design to accommodate practice intentions of students. It is an integral part of a broader General Surgical Training Program, with the same exam and a single final Fellowship in general surgery.</li> </ul>
Bowman	Accessed 2005		<ul style="list-style-type: none"> <li>• Describes how its contents can help others assess the state of health education in their areas and identify areas of strength and weakness.</li> </ul> <p><i>Some suggestion for how to improve upon the state of medical education</i></p> <ul style="list-style-type: none"> <li>• Consider all levels of preparation and training (i.e., pre-med, undergraduate, post-graduate, etc.). Successful interventions should be continuous, concurrent, and coordinated. It is important to target trainees at each year of training to keep them in the "rural pipeline".</li> <li>• Better admission screening to identify likely candidates with an interest in rural practice (i.e., those who come from rural backgrounds).</li> <li>• Do not ignore the influences of personal factors (e.g., family, spouse) on career choice.</li> </ul>

Council on Graduate Medical Education (CGME)	1998		<ul style="list-style-type: none"> <li>• CGME was authorized by Congress in 1986 to provide ongoing assessment of physician workforce trends and to recommend appropriate federal and private sector efforts to address identified needs.</li> <li>• To summarize the extent of the physician maldistribution problem in the United States and discusses the effect of an impending physician oversupply on location patterns of physicians, and proposes concrete recommendations to improve the geographic distribution of physicians in the United States.</li> <li>• The geographic maldistribution of health-care providers and services is one of the most persistent characteristics of the American health-care system.</li> <li>• Physicians who enter primary care disciplines and those who choose to become family physicians are much more likely to practice in underserved areas than their peers who enter specialty areas; women are much less likely than men to settle in rural areas; IMGs have established themselves as key providers in selected underserved rural areas.</li> <li>• One of the most powerful ways to address the problems of rural geographic maldistribution is to change the medical education system so that it selects, trains, and employs more people who choose to practice in rural areas.</li> <li>• The key seems to be the creation of a pipeline that reaches out to rural communities to encourage the selection of rural students, gives them opportunities throughout medical school and residency to work in rural settings, and supports them in practice after they do settle in rural areas.</li> <li>• Concludes that this, coupled with a medical school and residency training environment that values generalism, community-responsive practice, and rural life is a recipe for improving the flow of medical practitioners to underserved rural areas.</li> </ul>
Dunbabin Levitt	2003	Medical education in Australia	<ul style="list-style-type: none"> <li>• Explores how the relationship between rural origin and rural exposure during undergraduate and post-graduate training and the choice of practice location has underpinned initiatives in medical education in Australia between 1998 and 2003.</li> </ul> <p>These initiatives include:</p> <ul style="list-style-type: none"> <li>• Implementing admissions criteria which target rural students.</li> <li>• Revising/changing the curriculum (i.e., exposing students to clinical instruction earlier, establishing clinical schools in rural and remote Australia).</li> <li>• Establishing rural health clubs which promote rural practice and nurture students in this direction.</li> <li>• Establishing scholarship programs to support rural students.</li> </ul>
Field Jr.	1995		<ul style="list-style-type: none"> <li>• Surgical residency training should be changed to provide much needed surgical manpower to rural America.</li> <li>• Small-town and rural surgery practices demand that surgeons see and treat their patients as people.</li> <li>• Suggests a track for residents to follow if they wish to practice surgery in a rural environment: <ul style="list-style-type: none"> <li>▶ A rotating or flexible internship.</li> <li>▶ Following the first year, rotating 3 years of general surgery.</li> <li>▶ As a fifth year resident rotating through the specialties such as orthopedics, urology, and obstetrics/gynecology.</li> <li>▶ At some point during the 5 years, to spend time with a well trained surgeon in a rural practice, exposing the resident to both the practice and lifestyle.</li> </ul> </li> <li>• Concludes that if rural surgery could become a real option for young surgeons, it could bring about a change in the sometimes adversarial relationship between patients and their physicians.</li> </ul>
Foreman	1994		<ul style="list-style-type: none"> <li>• Academic medical centers need to take an active role in training professionals committed to serving isolated and poor communities.</li> <li>• To do this, the way physicians are being educated needs to change. This means providing real-life rural community experienced to undergraduate students in medical school. It means exposing these students</li> </ul>

			<p>to the social, environmental, and cultural influences that affect health and disease. Refers to some undergraduate programs which have been successfully preparing students for practice in underserved areas, such as the University of Minnesota.</p> <ul style="list-style-type: none"> <li>• These experiences need to be built on in the post-graduate curriculum. Training should be provided in rural setting where residents can come to know patients as members of the community and have the opportunity to work with physicians who have devoted their careers to inner city or rural practice.</li> <li>• Concludes that what students experience in medical school and in residency is more important than their background.</li> </ul>
Kiroff	1999	Rural general surgeons in Australia	<ul style="list-style-type: none"> <li>• To assess the problem of training, retraining, and retaining rural general surgeons in Australia where there is a maldistribution of surgical manpower.</li> <li>• Training for a rural practice is impossible in a generic sense; preparation of surgeons for this role must complement the breadth of general surgery and fit the individual to the likely practice location.</li> <li>• Suggests a Fellowship in General Surgery which incorporates rotations to country hospitals, and then additional modules that suit the ultimate practice location. Adequate retraining to meet changing needs is essential, as well as the availability of locums so that rural surgeons can get away for professional development.</li> <li>• To retain surgeons, one suggestion is to reduce professional isolation by bringing rural surgeons into a network relationship with city institutions. This would give them opportunities for continuing professional development, access to locums, and ongoing contact with students.</li> </ul>
Pathman	1996		<ul style="list-style-type: none"> <li>• Many educators believe that primary care rotations and various types of community-based training programs affect graduate's likelihood of choosing careers in primary care and in rural and underserved areas. Many studies support this belief as well.</li> <li>• This article discusses this belief and questions if it indeed is accurate.</li> <li>• Shortcoming of some studies is that there is little or no accounting for pre-existing characteristics, interests and career plans of students and residents. Therefore, the extent to which positive career outcomes are a consequence of the special training that learner's receive or are instead simply the nature of the learners, is unknown.</li> <li>• This raises the question "how important are learners' pre-existing career interests and inclinations relative to the influences of curricula, role models, and sites of training?"</li> <li>• Concludes that no curriculum effect is evident in many studies where learners take part in short rotations because many of these studies do not control for the characteristics of students.</li> <li>• However, in studies of long and multidimensional programs, career effects have been demonstrated.</li> </ul>
Pong Russell	2003	Reviewed 80 documents written since 1990 by both governmental and non-governmental bodies – commissions, advisory panels, task forces, committees and various organizations.	<ul style="list-style-type: none"> <li>• Review and synthesize proposed strategies and policy recommendations that address the distribution imbalances of health personnel in Ontario, including physicians.</li> <li>• Various commissions and task forces have identified the causes of physician shortages: lower medical school enrolments, restriction on international medical graduates, constraints on health care spending, a decline in the number of medical school graduates interested in family medicine, among others.</li> <li>• Various strategies have been suggested to address the problem of physicians shortages or maldistribution:</li> <li>• Foreign medical graduates could be used to make up for shortages of physicians in Canada, particularly in rural and remote regions.</li> <li>• Financial incentives can be used to help recruit and retain rural physicians, though these are mostly stopgap measures that only work some of the time.</li> <li>• <i>Locum tenens</i> programs allow physicians to go on vacation or attend courses which helps improve the lifestyle of rural physicians.</li> </ul>

			<ul style="list-style-type: none"> <li>• There are other ways to bring medical services to where they are needed, such as the UAP's Visiting Specialist Clinical Program.</li> <li>• Telemedicine/telehealth can be used to connect rural physicians with their colleagues in urban centres and to make consultations at a distance possible.</li> <li>• Increased rural medical education opportunities may address the longer-term needs of rural communities.</li> <li>• Further research is needed to find out which strategies work or don't work and why, in order to guide future workforce planning effort.</li> </ul>
Rourke Strasser	1996	Canadian and Australian health systems and medical education and their rural education initiatives	<ul style="list-style-type: none"> <li>• Similar rural education initiatives underway in both countries in an attempt to encourage rural students to consider medicine as a career including career promotion days at high schools and the development and distribution of videos on rural medicine.</li> </ul> <p><i>Similarities between the two countries</i></p> <ul style="list-style-type: none"> <li>• All of the medical schools offer opportunities for learning in a rural setting. Some medical schools have established rural practice clubs or mentor programs to encourage interest in rural practice.</li> <li>• The development of CME programs and opportunities for rural GPs. In Canada, these include the availability of courses such as Advanced Cardiac Life Support (ACLS), Advanced Trauma Life Support (ATLS). In Australia, these include the GP Rural Incentives Program (provides funding for GPs to take part in 1 to 12 months of training in obstetrics, anesthesia and other fields) and the Rural Health Education Satellite Network (provides internationally known speakers with a rural GP panel and moderator hooked by satellite link to hundreds of rural hospitals around the country) .</li> </ul> <p><i>Differences between the two countries</i></p> <ul style="list-style-type: none"> <li>• None of the medical schools in Canada have affirmative action programs for increasing the number of students from rural areas, but some Australian schools have introduced such programs with a rural focus.</li> <li>• Approaches to post-graduate training in rural practice. In Canada, post-graduate rural education has been developed almost exclusively at the provincial level. There is no common curriculum for rural practice training or advanced skills training. Family medicine training programs have been developed in response to regional needs and available resources. The advantage to this approach is that residents can choose from a variety of different programs to find one that suits their own needs. In Australia, however, the Faculty of Rural Medicine (FRM), established by the Royal Australian College of General Practitioners, is responsible for overseeing and coordinating the development of rural general practice training in Australia. It has developed a Rural Training Stream and detailed curricula for advanced training which are standard across the country.</li> </ul>
Rourke	2002	Northern Ontario School of Medicine	<ul style="list-style-type: none"> <li>• The new Northern Ontario rural medical school is to be developed to have a significant impact on education, recruitment and retention of physicians in rural and Northern Ontario and Canada.</li> <li>• It will be a co-operative partnership between Laurentian University in Sudbury and Lakehead University in Thunder Bay, and will have a network of learning sites throughout Northern Ontario.</li> <li>• It will be patient-centred, clinical problem-based, and have a significant focus on health determinants and aboriginal health content and contacts.</li> <li>• Small group learning will be used in distributed learning network with advanced information technology support.</li> <li>• It will aim to graduate highly qualified physicians with a state of art medical education, with enhanced knowledge, skills, and interests, in aboriginal, rural, northern, and underserved health care.</li> </ul>



Talley	1990		<ul style="list-style-type: none"> <li>All medical schools should be involved in seeking solutions to the problems of rural health.</li> <li>There are a number of generally accepted truths in reference to rural health and student and resident choices of a rural practice career:             <ol style="list-style-type: none"> <li>students from rural areas are more likely than those from urban areas to train in primary care and to return to rural areas to practice.</li> <li>residents who have a significant part of the residency training in rural areas are more like to choose to practice medicine in rural areas.</li> <li>family medicine is the key discipline of rural health care.</li> <li>residents practice close to where they train.</li> </ol> </li> </ul>
Tepper Rourke	1999		<ul style="list-style-type: none"> <li>Programs to facilitate electives in rural areas must be well funded to support student expenses, as well as preceptor time and costs.</li> </ul> <p><i>Evaluates recommendations in 3 specific areas</i></p> <ul style="list-style-type: none"> <li>▶ Importance of recruitment of future physicians from rural settings.</li> <li>▶ Need for exposure to rural medicine in medical school.</li> <li>▶ Role of exposure in residency training.</li> </ul>
Topps Rourke Newberry	2003		<ul style="list-style-type: none"> <li>To discuss some of the factors that may affect the effectiveness of a variety of methods of medical education being used to increase the number of rural health practitioners, including community based residency streams, additional skills training, and teamwork models.</li> <li>There is a steady decline in the numbers applying to family medicine programs as a first choice.</li> <li>13% of available positions in family medicine are in rural community-based training programs, authors suggest that this figure should be closer to 40% of trainees to keep up with the needs of rural communities.</li> <li>Medical schools that have developed a rural-oriented undergraduate curriculum are seeing increasing numbers of their students choose rural family medicine programs in the CaRMS match.</li> <li>There is increasing interest among rural GPs to expand their skill set.</li> </ul>
Worley Prideaux Strasser Silagy Magarey	2000		<ul style="list-style-type: none"> <li>In 1995 medical students from rural backgrounds in New South Wales were found to be two and a half times more likely than students of urban origin to become rural doctors. However, at the same time only 7.9% of Australia's medical students were of rural origin.</li> <li>In the U.S., when positive rural placement was combined with an affirmative action policy of admitting students of rural origin to medical schools, over 50% of rural graduates subsequently practiced in rural areas.</li> <li>Good evidence from US studies that rural communities are a credible setting for generalist medical training. In rural communities, the social forces influencing health can be more readily defined, while opportunities for intervention are more accessible to students.</li> <li>Rural communities also provide access to both community and hospital caseloads.</li> </ul>