

Relationship between practice location of Ontario family physicians and their rural background or amount of rural medical education experience

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Introduction: The present study was designed to determine if there was a difference in rural background and rural medical education experience between practising rural physicians and practising urban physicians in Ontario.
Method: A cross-sectional survey was mailed to 507 strictly defined rural family physicians and 505 urban family physicians practising in Ontario. The main outcome measures were population of the community while growing up, rural medical education and medical school attended.
Results: Responses of 264 rural physicians were compared with 179 urban physician responses. The groups were comparable in years of practice. Rural physicians were significantly more likely to have grown up in a rural community (34.9% v. 14.6%), to have had clinical training in a rural setting during medical school (55.4% v. 35.2%) and to have had clinical training in a rural setting of 8 weeks or more during postgraduate residency training (38.8% v. 20.2%). During residency training, longer duration of rural placements (more than 6 months) was significantly associated with practice in a rural area (15.5% of rural physicians, 1.7% of urban physicians). After controlling for other predictors, each of the following were independent variables: growing up in a community of less than 10 000 people (odds ratio [OR] 3.31), having had some undergraduate rural clinical training (OR 2.46), having had postgraduate rural training of 8 weeks or more (OR 2.17), attending a Canadian medical school outside Ontario (OR 3.80) and being male (OR 2.57).
Conclusion: Practising rural physicians compared with urban physicians were significantly more likely to have come from a rural background, to have had an undergraduate rural medical education, to have had postgraduate rural training, to have graduated from a Canadian medical school outside Ontario, and to be male. Each of these had an independent effect on practice location.

Introduction : L'étude visait à déterminer s'il y avait une différence au niveau des antécédents ruraux et de l'expérience de formation médicale en milieu rural entre médecins ruraux et médecins urbains actifs en Ontario.
Méthode : On a envoyé par la poste un questionnaire transversal à strictement 507 médecins de famille ruraux et 505 médecins travaillant en médecine familiale urbaine en Ontario. Les principales mesures de résultats étaient la population de la communauté où l'intéressé a grandi, la formation médicale en milieu rural et la faculté de médecine fréquentée.
Résultats : On a comparé les réponses de 264 médecins ruraux à celles de 179 médecins urbains. Les groupes étaient comparables sur le plan des années d'expérience. Les médecins ruraux étaient beaucoup plus susceptibles d'avoir grandi en milieu rural (34,9 % c. 14,6 %), d'avoir suivi une formation clinique en contexte rural pendant leurs études en médecine (55,4 % c. 35,2 %) et d'avoir reçu une formation clinique en contexte rural d'une durée de huit semaines ou plus pendant leur résidence postdoctorale (38,8 % c. 20,2 %). Au cours de la formation en résidence, on a établi un lien important entre des stages ruraux de plus longue durée (plus de six mois) et la pratique en région

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rurale (15,5 % des médecins ruraux, 1,7 % des médecins urbains). Compte tenu d'autres prédicteurs, chacun des facteurs suivants constituait une variable indépendante : fait de grandir dans une communauté de moins de 10 000 personnes (risque relatif [RR] 3,31), d'avoir reçu un peu de formation clinique prédoctorale en milieu rural (RR 2,46), d'avoir suivi une formation postdoctorale en milieu rural d'une durée de huit semaines ou plus (RR 2,17), d'avoir fréquenté une faculté de médecine canadienne en dehors de l'Ontario (RR 3,80) et d'être de sexe masculin (RR 2,57).
Conclusion : Comparativement aux médecins urbains, les médecins ruraux actifs étaient beaucoup plus susceptibles d'avoir des antécédents ruraux, d'avoir suivi une formation médicale prédoctorale en milieu rural, d'avoir reçu une formation postdoctorale en milieu rural, d'avoir obtenu leur diplôme d'une faculté de médecine canadienne en dehors de l'Ontario et d'être de sexe masculin. Chacune de ces variables avait un effet indépendant sur le lieu de pratique.

Introduction

In Ontario, as in the rest of Canada and around the world, there is a continuing shortage of rural physicians. Two of the most important factors associated with a physician's choice of rural practice location are rural background and rural medical training.[1] This study was designed to determine whether rural and urban family physicians in Ontario differed with respect to where they grew up and the amount of rural undergraduate/postgraduate medical training they received.

Studies of physicians in other countries indicate that rural physicians are more likely than their urban counterparts to have a rural background.[2–5] Medical school selection processes that facilitate entry of rural students have been shown to be effective in producing more physicians who will practise in rural areas.[6–11] The location of the medical school, or decentralized affiliate medical school in a rural area, has also been effective partly through the natural selection process of students from rural areas.[12–14]

Physicians practising in rural locations are more likely to have had rural experiences as medical undergraduates,[3,6,7,10,14–16] and to have had some postgraduate rural training.[5,17–19]

Most rural undergraduate medical school programs and postgraduate rural family medicine training tracks encourage or actively select rural-oriented students. This makes it difficult to distinguish between the confounding variables of rural background and rural education effects ("nature-versus-nurture"[20]). For example, extensive study of Jefferson Medical College graduates who were practising in Pennsylvania in 1996 found participation in the Jefferson Physicians Shortage Area Program (rural medical education stream) was significantly associated with rural practice but when entered into a logistic analysis with rural background and specialty interest was not an independent predictor of rural practice. The most consistent finding was the powerful impact of rural background on eventual rural practice.[10]

A study of practising rural physicians in the United States found that those who were prepared for small town living stayed longer in rural practice.[21] A Canadian study found that those who had done rural practice residency felt more prepared for rural practice.[22]

There are only a few Canadian studies that address this relationship between practice location and rural background and rural medical education. In a study reported in 1987, Robin Carter surveyed 562 physicians in Manitoba who had graduated from the University of Manitoba to assess the effect of personal characteristics on choosing practice location.[23] Those in non-urban practice locations were significantly more likely to have had non-urban backgrounds and to have spouses with non-urban backgrounds. Practitioners who were male and whose fathers were farmers or health care professionals were also more likely to practise in non-urban areas. Regression analysis found that non-urban physicians were 4.63 times more likely to have had a non-urban high school education and 1.87 times more likely to have had a non-urban medical school preceptorship.

The Canadian Medical Association (CMA) surveyed 2400 rural physicians in 1991, with a response rate of 55%.[24,25] Of the respondents, 14% were female. The respondents were asked about the size of the community they lived in before university: 1 in 3 reported coming from communities of 5000 or fewer; 27% reported coming from communities >250 000. Forty-four percent reported that they had received exposure to practice in a rural area in the course of their medical education. Fif-

teen percent indicated "rural experience in training" was very important in the decision to locate in a rural area. Fifty-three percent indicated "desire for rural practice" was very important in the decision to locate in a rural area. Both rural background and rural experience in training can contribute to this "desire for rural practice."[25]

Easterbrook and colleagues surveyed 159 physicians in 1993 who graduated from the family medicine program at Queen's University, Kingston, Ont., between 1977 and 1991.[26] Physicians who were raised in rural communities were 2.3 times more likely than those from non-rural communities to choose to practise in a rural community immediately after graduation. They were also 2.5 times more likely to still be in rural practice (at the time of the survey). Physicians exposed to rural practice during their undergraduate medical training were 1.7 times more likely to practise in a rural area than those who did not have such exposure. Although a similar difference (relative risk 1.62) was found for exposure to rural practice during family medicine residency training, this difference was not statistically significant. The authors suggest that their study may not have had the power to detect associations that were not as strong. In addition, they suggest that self-selection at the Queen's University Family Medicine Program, "because of its reputation for offering rural medical training," may have minimized the outcome differences.[26]

The current study was designed to test the hypothesis that rural family physicians in Ontario are more likely to have had a rural background, and rural undergraduate and postgraduate medical training than their urban counterparts; and to determine if these confounding nature-versus-nurture variables also act independently.

Method

This study was developed as part of the resident research project of one of the authors (F.I.) for the University of Western Ontario Rural Regional Family Medicine Training Program. After a literature review, a survey was developed based in part on the 1991 CMA study of medical care in underserved regions.[24] The survey was developed to address multiple factors and issues related to rural and urban practice, as perceived by practising family physicians.[27,28] The first section of the questionnaire contained demographic and educational background questions as reported in this paper. This included questions such as "What was the population range of the city or town in which you grew up: a) <10 000, b) 10 000–50 000, c) 50 000–100 000, or d) >100 000?" The study was piloted by Goderich, Ont., physicians and subsequently modified. It underwent further modification after review and before approval by the University of Western Ontario Review Board for Health Sciences.

A mail survey of Ontario family physicians was conducted in November 1999. A modification of the Dillman method was used as a basis for the survey.[29] One follow-up mailing was sent to non-responders. All surveys were affixed with an identification number, and confidentiality of all questionnaires was maintained.

The questionnaire was sent to all 507 family physicians defined as practising in a rural area by the Ontario Medical Association (OMA). For the purposes of its continuing medical education grant allocation, the OMA has strictly defined "rural practice" as practice in communities with a population of <10 000 and >80 km away from a regional centre of >50 000 people.[30,31] This very restrictive definition of rural practice was used in this study in order to distinctly define a group of physicians in rural practice. The urban comparison group of 505 physicians was randomly selected from a list of Ontario family physicians practising in communities with a population of >50 000, which was generated from the 1998 MD Select database of Canadian physicians (www.mdselect.com). This value was chosen in order to exclude centres with a population that less clearly distinguished it as either urban or rural.

Findings

Of 1012 surveys sent out to family physicians in active practice, 484 (47.8%) were returned completed. Twenty-six surveys were excluded because the physician was no longer in active practice. Fifteen additional surveys were excluded as the practice location was a community with a population between 10 000 and 50 000. The study sample comprised 443 active family physicians: 264 rural and 179 urban. The data were analyzed using SPSS 8.0.

Personal characteristics

While no data were collected on the age of respondents, the year of graduation provides a good comparison for the groups' demographic similarity. There was no difference in years since graduation

between the rural and urban respondents. Seventy-two percent of rural respondents were male, compared with 50% of the urban cohort (χ^2 = 21.24, degrees of freedom [df] = 1, $p < 0.001$). Male physicians had been in practice longer than female physicians (F = 39.21, df = 1, $p < 0.001$); this was consistent for both the urban and rural groups.

Rural background

Table 1, "a" section, shows the breakdown of physicians by their current practice location and the population of the community where they grew up. Rural physicians were 2.4 times more likely to have grown up in a town with a population under 10 000 than their urban counterparts. Urban physicians were 1.6 times more likely to have grown up in a large city of over 100 000. The higher the population of the town the physician grew up in, the less likely it was that they would currently be practising in a rural location. The odds ratios (ORs) are shown in Figure 1.

Medical school location

Table 1, "b" section, shows the medical schools that

Table 1. Location of current practice by background, medical school and education variables

Variable	Rural physicians (Valid %)	Urban physicians (Valid %)	Rural/Urban % ratio
Background			
a) Population of community where physicians grew up			
<10 000*	90 (34.9)	26 (14.6)	2.39
10 000–50 000	32 (12.4)	15 (8.4)	1.48
50 000–100 000	33 (12.8)	25 (14.0)	0.91
>100 000*	103 (39.9)	112 (62.9)	0.63
Total	258 (100)	178 (100)	
Medical school			
b) Graduating medical school			
In Canada, but not Ontario*	55 (21.1)	12 (6.9)	3.06
Ontario	182 (69.7)	147 (85.0)	0.82
University of Toronto*	44 (16.9)	72 (41.6)	0.41
University of Western Ontario	40 (15.3)	25 (14.5)	1.06
Queen's University	35 (13.4)	19 (11.0)	1.22
University of Ottawa	35 (13.4)	13 (7.5)	1.79
McMaster University	28 (10.7)	18 (10.4)	1.03
International	24 (9.2)	14 (8.1)	1.14
Total	261 (100)	173 (100)	
Education variables			
c) Duration of clinical training in a rural setting during medical school			
None*	116 (44.6)	116 (64.8)	0.69
Up to 7 weeks†	92 (35.4)	43 (24.0)	1.48
8 weeks – 6 months†	49 (18.8)	19 (10.6)	1.77
>6 months	3 (1.2)	1 (0.6)	2.00
Total	260 (100)	179 (100)	
d) Duration of clinical training in a rural setting during residency training			
None	125 (48.4)	93 (52.2)	0.93
Up to 7 weeks†	33 (12.8)	49 (27.5)	0.46
8 weeks – 6 months	60 (23.3)	33 (18.5)	1.26
>6 months*	40 (15.5)	3 (1.7)	9.12
Total	258 (100)	178 (100)	

*Significant difference between rural and urban physicians, $p < 0.001$.
†Significant difference between rural and urban physicians, $p < 0.01$.

graduated the rural and urban physicians who responded to the survey. Rural physicians were 3 times more likely than urban physicians to have graduated from Canadian medical schools outside Ontario. The urban physicians were 2.5 times more likely to have graduated from the University of Toronto.

Rural undergraduate education

Rural physicians were 1.6 times more likely than urban physicians to have received clinical training in a rural setting during medical school (Table 1, "c"). Rural physicians were 1.8 times more likely to have spent ≥8 weeks in a rural setting during their undergraduate medical training compared with their urban counterparts. Almost no respondents received >6 months of clinical training in a rural setting during medical school (3 respondents in rural practice, and 1 respondent in urban practice). Figure 2 shows the ORs of rural training compared with no rural training in medical school.

Rural residency training

Rural physicians were only slightly more likely to

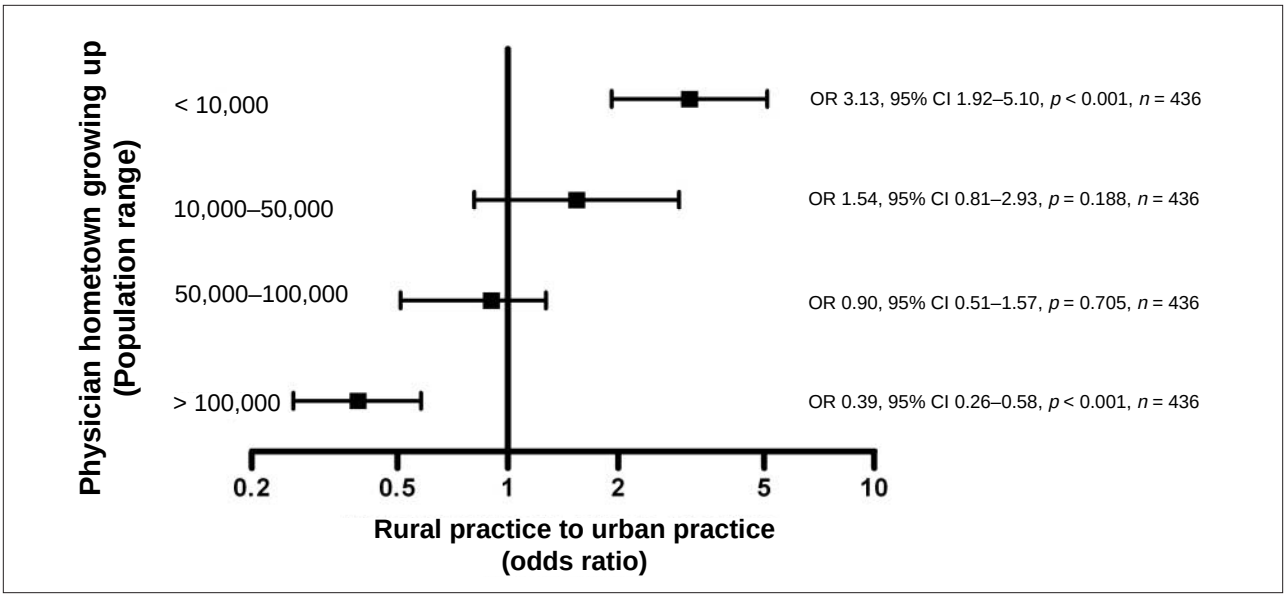


Fig. 1. Odds of physician choosing rural practice versus urban practice, based on the physician's hometown population.

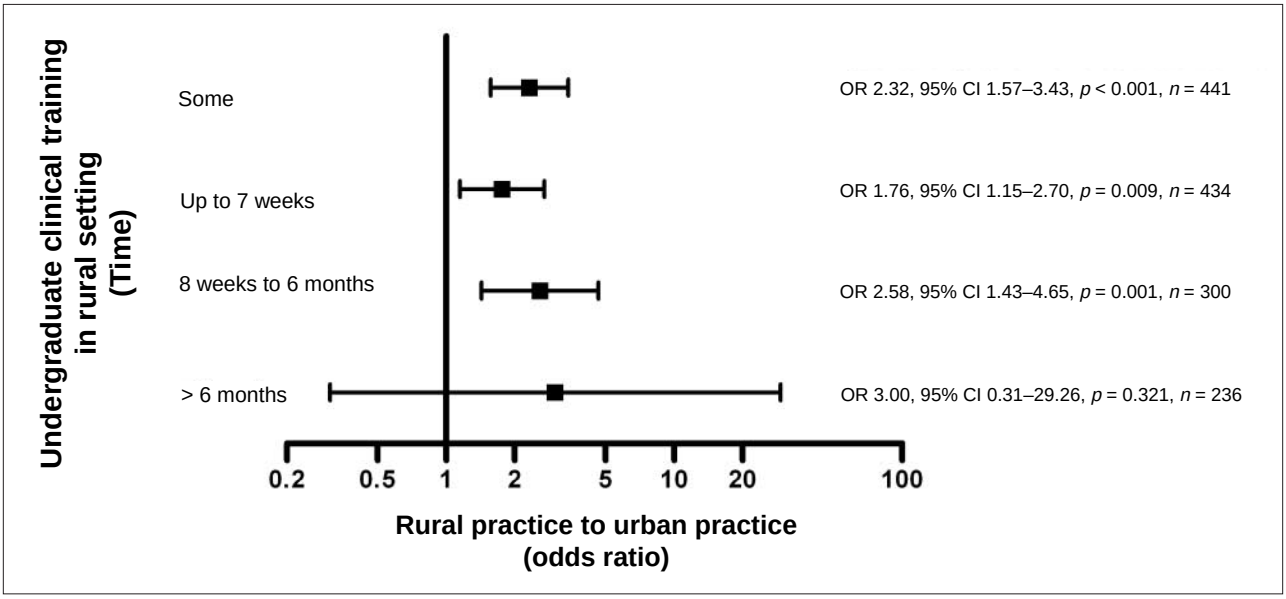


Fig. 2. Odds of physician choosing rural practice versus urban practice based on time spent in rural setting during undergraduate clinical training.

have had some clinical training in a rural setting during residency training; however, there was a positive relationship between practice in a rural location and duration of clinical training in a rural setting during residency training (Table 1, "d"). Rural physicians were 1.9 times more likely to have had ≥8 weeks of clinical training in a rural setting during their residency compared with their urban counterparts and were 9.1 times more likely to have had >6 months clinical training in a rural setting during residency training. Figure 3 shows the ORs of rural training during residency compared with no rural training.

Regression analysis

Multiple logistic regression analysis of the key study variables was done and is shown in Table 2. After controlling for other predictors, growing up in a community of <10 000 people (OR 3.31), some undergraduate rural clinical training (OR 2.46), postgraduate rural training of ≥8 weeks (OR 2.17), outside Ontario Canadian medical school (OR 3.80) and male gender (OR 2.57) each were independent variables.

Large city urban and rural background subsets

Physicians who grew up in large cities (>100 000 population) made up 39.9% of the practising rural physician group and 62.9% of the urban physician group. Of note, the 103 rural physicians from a large city background were significantly more likely (2.7 times, $p = 0.001$) to have had clinical training in a rural setting during medical school, than their 112 urban background counterparts in urban practice.

Seventeen of these 103 rural physicians from a large city background had >6 months of clinical training in a rural setting during residency training compared with just 1 of the 112 urban physicians from a large city background ($p < 0.001$). Clinical training in a rural setting during residency training of 8 weeks to 6 months was not significantly different between rural and urban physicians from a large city urban background.

Table 2. Multiple logistic regression analysis showing predictions of rural practice

Variable	Odds ratio (95% CI)
Population of community growing up	
>10 000	1.00
<10 000	3.31 (1.87–5.86)
Undergraduate rural clinical training	
None	1.00
Some	2.46 (1.53–3.96)
Medical school	
Ontario	1.00
Other Canadian	3.80 (1.85–7.81)
Gender	
Female	1.00
Male	2.57 (1.60–4.12)
Postgraduate rural training	
0–7 weeks	1.00
≥8 weeks	2.17 (1.28–3.69)

CI = confidence interval

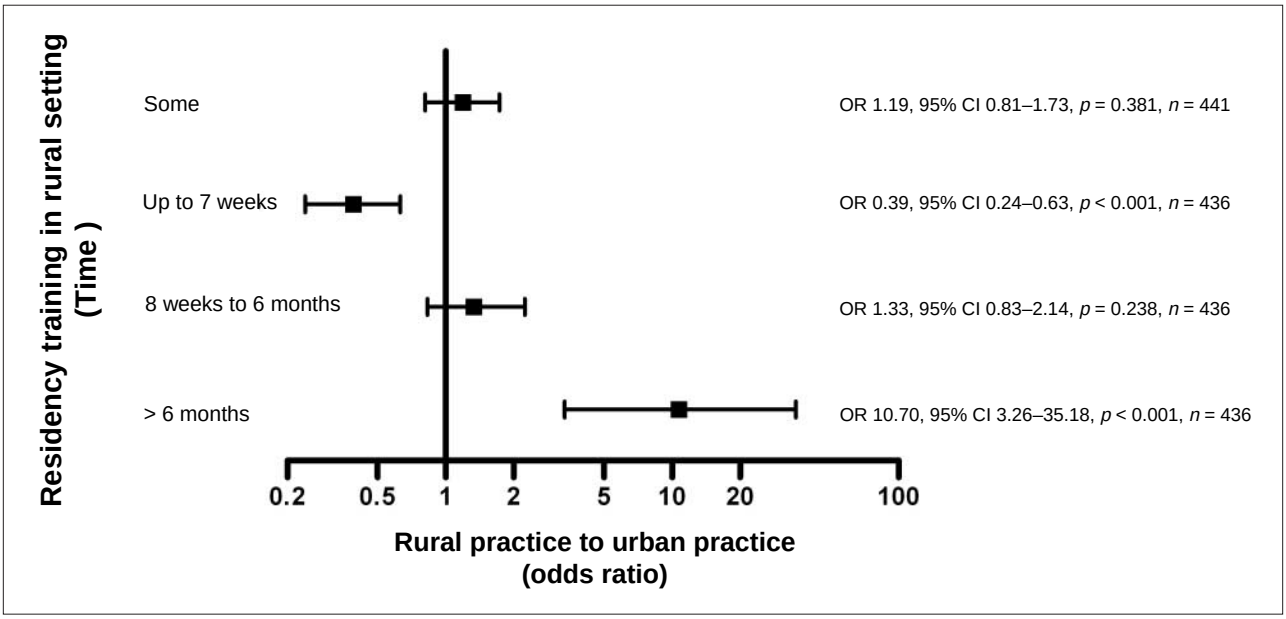


Fig. 3. Odds of physician choosing rural practice versus urban practice based on rural residency training.

Physicians who grew up in rural communities (<10 000 population) made up 34.9% of the practising rural physician group and 14.6% of the urban physician group. Of note, the 90 rural physicians from a rural background were 2.1 times more likely to have had clinical training in a rural setting during medical school than their 26 rural background counterparts in urban practice.

Fifteen of these 90 rural physicians from a rural background had >6 months of clinical training in a rural setting during residency training compared with none of the 26 urban physicians from a rural background ($p = 0.027$).

Discussion

This study helps to clarify the nature-versus-nurture confounding variables of rural background and rural medical education effects. Multiple logistic regression analysis found that the population of community growing up, undergraduate rural clinical education, postgraduate rural training of ≥8 weeks, graduation from Canadian medical schools outside Ontario and male gender were each independent variables for rural practice compared with urban practice in Ontario.

This study shows that rural background is significantly associated with rural versus urban practice location. Rural background students however, may be under-represented in medical schools for a variety of reasons, including various education and financial barriers.[32,33] Based on these and other similar findings around the world, it is reasonable to suggest that in any strategy to increase medical school production of physicians who are likely to choose rural practice as a career, admission policies should consider rural background and life experience.

The size of the study permitted an analysis of rural education variables on the rural background subset (<10 000 population when growing up) and the large city urban background subset (>100 000 population when growing up).

In this study, rural physicians were significantly more likely than urban physicians to have had clinical training in a rural setting during medical school. This was consistent for both the subsets of those from a rural background and those from a large city urban background. This indicates that for physicians in Ontario, clinical training in a rural setting during medical school is an important variable independent of rural background.

Rural physicians were significantly more likely than urban physicians to have had clinical training in a rural setting during residency training of >6 months duration. This was also consistent for both the subsets of those from a rural background and those from a large city urban background. This indicates that for physicians in Ontario, long rural residency experience is an important variable that is associated with rural practice independent of rural background.

It is notable that 40% of rural physicians are from large city backgrounds. Given that Ontario will never have enough rural background students in medical school to produce enough rural physicians, (since many will go on to choose specialist careers or urban family practice), it is necessary to attract urban background students to rural practice as a career.

Rural medical education is also important for rural background students, as a desire for rural practice that many bring into rural medical school may be either extinguished or improved depending on their experience during medical school and postgraduate training. For the study subset of physicians who grew up in rural communities of <10 000, rural physicians were 2.1 times more likely to have had clinical training in a rural setting during medical school compared with urban physicians and all those with >6 months clinical training in a rural setting during residency training were in rural practice.

Another interesting finding of the study was that rural physicians in Ontario were significantly more likely than their urban counterparts to have graduated from Canadian medical schools outside Ontario. These medical schools may have had more students with a rural background and provided more rural undergraduate or postgraduate medical education.

These findings would indicate that strategies to increase the number of rural doctors should include increasing admission of rural background students into medical school, as well as providing extensive undergraduate and long postgraduate rural clinical education experiences for students with both rural and urban backgrounds.

Study limitations

The study's overall response rate of 47.8% is lower than we would have liked but is comparable to that of other large surveys (for example, the response rate of the College of Family Physicians of Canada 2001 Janus Survey[34] was 51.2% and the CMA rural

physician survey[24] was 55%). There was no statistical difference in gender and years since graduation between responders and non-responders indicating that the sample is fairly representative. Not all the physicians surveyed replied, and there remains the possibility of a non-response bias.

In Ontario, at the time of the study, 27.5% of urban physicians were female and 23.0% of rural physicians were female (CMA physician master file data, January 2000). Our respondents fairly represented the rural female and male gender mix; however, a higher percentage of urban women than urban men responded. Twenty-three out of the 24 rural-based international medical graduates were male, while 9 out of the 14 urban international medical graduates were male. Significantly fewer rural females had no rural training, which may reflect their more recent graduation, when rural training was more available.

The study included a broad range of ages of physicians as represented by number of years in practice or years since graduation. Most of the older physicians would not have had the opportunity to undertake rural medical education. This may have reduced the magnitude of the effects shown. When the 69 graduates from before 1971 are removed from this table, the difference of medical undergraduate and postgraduate rural learning experience between rural and urban physicians was increased.

The length of clinical training in a rural setting during residency training "8 weeks to 6 months" was not broken down into smaller units. Such a breakdown may have revealed significant differences at some lengths shorter than 6 months.

This study does not compare optional versus mandatory rural rotations. There may have been a self-selection bias in those physicians who have taken optional rural rotations, especially longer rural rotations.

As always, a study of established physicians in practice is not necessarily translatable to new physicians entering rural practice in a different time and with a different training experience.

Conclusion

Practising rural physicians, compared with urban physicians, were significantly more likely to have come from a rural background, to have had clinical training in a rural setting during medical school, to have had ≥8 weeks of clinical training in a rural setting during residency training, to have graduated from a Canadian medical school outside Ontario, and to be male. Each of these had an independent effect on practice location. More than 6 months of rural residency training was almost always associated with rural practice location and was significant for rural physicians from both rural and large city urban background subsets. Canadian medical schools outside Ontario were found to be a significant source of Ontario's rural physicians

This study indicates that selection of rural background students into medical school is important in graduating physicians who practise in rural locations; and that undergraduate and longer postgraduate rural medical education is important for both rural and urban background medical students.

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