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The first 25 years of the Northwestern Ontario Medical Programme

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Objective: A tracking study of the undergraduate medical students and postgraduate residents who participated in the Northwestern Ontario Medical Programme (NOMP) during its first 25 years (1972–1997) was conducted to search for factors related to physician recruitment to Northwestern Ontario.

Methods: Annual editions of the *Canadian Medical Directory* were used to determine how many participants returned to practise in Northwestern Ontario.

Results: A total of 1982 (84.9%) of the 2335 NOMP participants were located using the *Canadian Medical Directory*. Of those located, 217 (10.9%) had established practice in Northwestern Ontario. Significantly higher recruitment rates ($p < 0.001$) were found for postgraduate residents (88/410 [21.5%]) than for undergraduates (95/1445 [6.6%]). Undergraduates who returned for multiple placements were significantly ($p < 0.001$) more likely to practise in Northwestern Ontario. Furthermore, significant differences in recruitment rates ($p < 0.001$) were found among the 5 Ontario medical schools. A “snapshot” of 1999 identified that undergraduate medical students and postgraduate residents who undertook a NOMP placement were significantly ($p < 0.001$) more likely to practise in Northwestern Ontario (odds ratio 7.11, 95% confidence interval 5.11–9.90) than those graduating from Ontario universities who did not experience a NOMP placement.

Conclusions: Analysis of 25 years of student tracking data confirms that NOMP placements were significantly associated with physician recruitment to Northwestern Ontario. Recruitment rates from participation in NOMP were higher for postgraduate residents, undergraduate medical students who returned for multiple placements, and for undergraduate medical students from certain Ontario universities.

Objectif : On a réalisé une étude de suivi des étudiants en médecine du premier cycle et des résidents au niveau postdoctoral qui ont participé au Programme médical du nord-ouest de l'Ontario (PMNO) au cours de ses 25 premières années (1972–1997) pour chercher les facteurs reliés au recrutement des médecins dans la région.

Méthodes : On a utilisé les éditions annuelles du “Répertoire des médecins canadiens” (*Canadian Medical Directory*) pour déterminer combien de participants sont retournés pratiquer dans le nord-ouest de l'Ontario.

Résultats : On a retrouvé au total 1982 (84,9 %) des 2335 participants au PMNO à l'aide du Répertoire des médecins canadiens. De ce total, 217 (10,9 %) avaient établi leur pratique dans le nord-ouest de l'Ontario. Les taux de recrutement étaient significativement plus élevés ($p < 0,001$) dans le cas des résidents au niveau postdoctoral (88/410 [21,5 %]) que dans celui des étudiants du premier cycle (95/1445 [6,6 %]). Les étudiants du premier cycle qui sont revenus faire de multiples stages étaient beaucoup ($p < 0,001$) plus susceptibles de pratiquer dans le nord-ouest de l'Ontario. De plus, on a constaté des écarts importants au niveau des taux de recrutement ($p < 0,001$) entre les cinq facultés de médecine de l'Ontario. Un «instantané» de 1999 a montré que les étudiants en médecine du premier cycle et les résidents au niveau postdoctoral qui entreprenaient un stage au PMNO étaient beaucoup ($p < 0,001$) plus susceptibles de pratiquer dans cette région (coefficient de probabilité à 7,11; intervalle de confiance à 95 %, 5,11–9,90) que ceux qui terminaient leurs études dans des universités de l'Ontario n'offrant pas de stages du PMNO.

Conclusions : Une analyse de 25 années de données sur le suivi des étudiants confirme l'existence d'un lien solide entre les stages du PMNO et le recrutement des médecins dans le nord-ouest de l'Ontario. Les taux de recrutement à la suite de la participation au PMNO étaient plus élevés dans le cas des résidents au niveau postdoctoral, des étudiants en médecine du premier cycle qui sont revenus y faire de multiples stages et des étudiants en médecine du premier cycle de certaines universités de l'Ontario.

BACKGROUND

Attracting and keeping physicians in rural and remote communities is a persistent and pervasive problem.¹⁻³ Previous studies of recruitment and retention of rural physicians have identified factors such as rural origins,⁴⁻⁷ exposure to rural communities during medical training,^{1,8-11} and professional and lifestyle issues¹²⁻¹⁴ as affecting physicians' choice of practice location. Various initiatives and strategies by government agencies and medical programs have been undertaken to encourage physicians to choose rural practice. In the United States, the Illinois Rural Medical Education Program was developed to address the shortage of physicians in rural counties of Illinois.¹⁵ Other programs with similar goals include the Physician Shortage Area Program in Pennsylvania¹⁶ and the Rural Physician Action Plan in Alberta.¹⁷ Within the province of Ontario, the Ministry of Health and Long-Term Care's Under-served Area Program provides financial incentives for health professionals to locate in under-served areas in northern Ontario.

In 1972, the Northwestern Ontario Medical Programme (NOMP) was established as a partnership between the Thunder Bay and Northwestern Ontario medical societies and McMaster University, Hamilton, Ont., along with support from the Ontario Ministry of Health. Northwestern Ontario is a vast area (Fig. 1), approximately 60% of the land mass of Ontario, with 1 urban referral centre, Thunder Bay (pop. 115 000), and many rural communities (pop. < 10 000). Clinical teaching sites for NOMP were established in Thunder Bay and in 17 of the rural communities, using a community-based preceptorship model of teaching. Clinical rotations, both elective and core, generally of 4 weeks duration, are provided for both undergraduate medical students and postgraduate residents, in family medicine and other clinical specialties. NOMP participants are provided with complete funding for transportation and accommodation. In addition to coordinating northern elective opportunities for an annual average of 125 Ontario medical students, in

1991 NOMP developed a further educational partnership with McMaster University in administering a full academic and clinical 2-year family medicine residency program based solely in the north. The data presented in this study include 15 of those family medicine residents, 9 of whom undertook a NOMP placement as an undergraduate medical student before entering the residency program.

It was felt that there were sufficient data in a 25-year span of the program (1972-1997) to conduct a comprehensive evaluation of NOMP's impact on the recruitment of physicians to Northwestern Ontario. The purpose of this tracking study was 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.

METHOD

All participants who undertook a NOMP rotation some time between its inception in 1972 and June 1997 were tracked. Basic program and demographic data were collected from historical records and transferred to a database program. Student demographic information included name (used only for tracking purposes), gender, the university of enrolment, status of medical training — an undergraduate medical student or postgraduate resident — and the total number of trainee months spent in Northwestern Ontario.

Annual editions of the *Canadian Medical Directory (CMD)* were used to identify those who had established practice in Northwestern Ontario. The *CMD* is published annually and, although most physicians in Canada are listed in the directory, it is not comprehensive because individuals may choose to be not listed. Each volume of the *CMD* from 1975 to 2001 was examined to determine whether each of the NOMP participants was listed for that year, and whether the clinical address was within Northwestern Ontario. The placements occurred between the years 1972 to 1997, which provided a delay of at least 4 years to allow time for graduation and completion of a residency.

The *CMD* for 1999 was also used to obtain a “snapshot” of the association between a NOMP placement and the likelihood of a physician working in Northwestern Ontario. The total number of physicians who graduated from each of the Ontario universities during the years 1973 to 1996 was obtained from the Canadian Medical Association. The other figures needed to calculate an odds ratio were obtained from the *CMD* and from the NOMP database. The 1973 to 1996 year restriction ensured the opportunity for medical students to select a NOMP placement and allowed time for them to complete their residency.

Data were analyzed using the SPSS statistical package. Chi-squared and logistic regression were used for tests of significance.

RESULTS

A total of 2335 undergraduate medical students and postgraduate residents participated in NOMP during the 25-year period, and 1982 (84.9%) were

tracked using the *CMD*. Significantly more men (1084/1229 [88.2%]) than women (897/1103 [81.3%]) were located ($p < 0.001$). (Gender information was not available for 3 participants.) Thirty-two individuals had been enrolled at a university outside of Canada, and only 1 was listed in *CMD*.

Of the 1982 NOMP participants who were listed in *CMD*, 217 (10.9% of those located) had practised or were currently practising in Northwestern Ontario. The following analyses attempted to identify factors related to practice in Northwestern Ontario.

Gender was not a significant predictor of working in Northwestern Ontario: 85/897 (9.5%) women and 132/1084 (12.2%) men practised in Northwestern Ontario. Gender information was not available for 1 participant. The strongest predictor of practice in Northwestern Ontario was whether the NOMP participant came as an undergraduate or during postgraduate residency training ($p < 0.001$). Only 95/1445 (6.6%) who participated in NOMP as undergraduates eventually established practice in



Fig. 1. The region of Ontario served by the Northwestern Ontario Medical Programme (dark shading).

Northwestern Ontario. In contrast, 88/410 (21.5%) postgraduates and 34/127 (26.8%) who participated as both undergraduates and postgraduates later practised in Northwestern Ontario.

Undergraduates who returned for multiple placements were significantly ($p < 0.001$) more likely to practise in Northwestern Ontario than those who experienced only a single placement (Table 1). Placements were normally of 1-month duration; longer periods generally indicate repeated placements. For undergraduates, only 50/1042 (4.8%) doing a single placement of 1 month or less practised in Northwestern Ontario, but longer placement periods were generally associated with higher rates of practice. This relationship was also significant ($p = 0.003$) for undergraduates who returned for placements as postgraduates, but duration of placements was not significantly related to recruitment for postgraduates.

The university of enrolment also emerged as a significant predictor of recruitment (Table 2). The differences among the 5 Ontario medical schools

were significant for those coming to NOMP as undergraduates only ($p = 0.001$), as postgraduates only ($p < 0.001$), and as both undergraduate and postgraduate ($p = 0.038$). The recruitment percentages were consistently higher for those from McMaster University and the University of Ottawa, and lower for those from the University of Western Ontario (UWO), London, Ont., or undergraduate students from Queen's University, Kingston, Ont.

These differences were still significant ($p < 0.001$) after controlling for whether NOMP participants were undergraduates or postgraduates, for the number of months of placements, and for the year of their placement. This finding showed that the differences in recruitment rates among the different universities were not artifacts of these factors.

To understand these differences among the Ontario medical schools, 2 additional statistics were computed for each school (Table 3). First, the rates of NOMP participation were obtained. The number of graduates from each medical school who partici-

Table 1. NOMP participants who set up practice in Northwestern Ontario, illustrated by number of months of placement and time of participation in the program

Total no. of months of placement	Participated as					
	Undergraduate medical student		Postgraduate resident		Both as undergraduate and as postgraduate	
	Total no. of participants	No. (and %) who set up practice	Total no. of participants	No. (and %) who set up practice	Total no. of participants	No. (and %) who set up practice
1 or less	1042	50 (4.8)	128	29 (22.7)	1	0 (0.0)
2	318	27 (8.5)	157	30 (19.1)	34	4 (11.8)
3	64	13 (20.3)	60	11 (18.3)	33	7 (21.2)
4	15	4 (26.7)	37	7 (18.9)	24	5 (20.8)
5	3	1 (33.3)	14	4 (28.6)	12	6 (50.0)
6 or more	3	0 (0.0)	14	7 (50.0)	23	12 (52.2)

NOMP = Northwestern Ontario Medical Programme

Table 2. NOMP participants who set up practice in Northwestern Ontario, as defined by the university they attended

University	Participated as							
	Undergraduate medical student		Postgraduate resident		Both as undergraduate and as postgraduate		Total	
	Total no. of participants	No. (and %) who set up practice	Total no. of participants	No. (and %) who set up practice	Total no. of participants	No. (and %) who set up practice	Total no. of participants	No. (and %) who set up practice
McMaster	447	34 (7.6)	99	36 (36.4)	61	24 (39.3)	607	94 (15.5)
UWO	432	16 (3.7)	60	6 (10.0)	13	1 (7.7)	505	23 (4.6)
Queen's	180	7 (3.9)	99	15 (15.2)	27	5 (18.5)	306	27 (8.8)
U of T	126	8 (6.3)	64	11 (17.2)	17	2 (11.8)	207	21 (10.1)
U of O	123	16 (13.0)	15	4 (26.7)	7	2 (28.6)	145	22 (15.2)

NOMP = Northwestern Ontario Medical Programme; UWO = University of Western Ontario; U of T = University of Toronto; U of O = University of Ottawa

pated in NOMP was divided by the total number of graduates from the medical school in the years 1973 to 1996. The participation rates were highest for students from McMaster University (28% participated in NOMP), UWO (23%) and Queen's University (19%), but lower for students from the universities of Ottawa (8%) and Toronto (< 4%). Second, odds ratios were computed for each medical school to show the strength of relationship between NOMP placements and practice locale in Northwestern Ontario. The number of graduates from each university during the years 1973 to 1996 who were practising in Northwestern Ontario in 1999 was separated into those who had NOMP experience and those who had not participated in NOMP. From these numbers odds ratios were computed to indicate the relationship between NOMP experience and practice in Northwestern Ontario in 1999. These odds ratios were all significantly ($p < 0.05$) above 1.0, indicating that NOMP placements were associated with increased rates of practice in Northwestern Ontario for students from all 5 Ontario medical schools.

The striking feature of the data in Table 3 is that those universities (Toronto and Ottawa) with the lowest percentage who participated in NOMP had the highest odds ratios: 14.91 and 12.16, respectively. In contrast, the 3 schools that had high participation rates showed weaker relationships between NOMP experience and practice in Northwestern Ontario.

Overall, the odds ratio was 7.11, 95% confidence interval, 5.11–9.90, indicating a significant ($p < 0.001$) association between NOMP placements and recruitment to Northwestern Ontario. In other words, physicians graduating from 1 of the 5

Ontario universities during 1973 to 1996 who participated in NOMP were 7.11 times more likely to practise in Northwestern Ontario in 1999 than those without a placement.

The specialties of the NOMP eligible physicians who were practising in Northwestern Ontario in 1999 were also examined. Of those in family medicine, 51.6% had a NOMP placement. Of those in another specialty only 31.0% had a NOMP placement. Thus, NOMP appears more effective at supplying family medicine physicians than other specialists to Northwestern Ontario.

DISCUSSION

The *CMD* was adequate for tracking purposes, with overall tracking success of 84.9%. There are several reasons why physicians might not have been found using the *CMD*. Besides a desire for anonymity, these factors include a change in surname, and never having worked in Canada as a physician. For example, women who married and changed their surnames after their placements would not have been found in the directory. This is supported by the finding that more men (88.2%) than women (81.3%) were tracked. Being enrolled in a non-Canadian university had a negative impact on tracking, and it is probable these individuals never subsequently worked in Canada.

NOMP participants were 7.11 times more likely to practise in Northwestern Ontario than those Ontario medical school graduates who had not done a NOMP placement. The association was significant for each of the 5 Ontario universities and shows a strong association between a NOMP experience and later practice in Northwestern Ontario.

Medical school	Ontario medical school graduates, 1973–1996		Ontario graduates practising in Northwestern Ontario in 1999		Odds ratio (and 95% confidence interval)
	Total no. of graduates	No. (and %) who participated in NOMP	Participated in NOMP	Did not participate	
McMaster University	2 226	624 (28.03)	30	9	8.94 (4.22–18.94)
University of Western Ontario	2 406	551 (22.90)	12	11	3.73 (1.64–8.81)
Queen's University	1 735	336 (19.37)	9	13	2.93 (1.24–6.92)
University of Toronto	5 807	215 (3.70)	16	30	14.91 (7.99–27.79)
University of Ottawa	1 896	150 (7.91)	7	7	12.16 (4.21–35.14)
Total	14 070	1876 (13.33)	74	70	7.11 (5.11–9.90)

NOMP = Northwestern Ontario Medical Programme

Two other significant predictors of practice in Northwestern Ontario were having a placement as a postgraduate versus undergraduate learner, and for undergraduates experiencing multiple placements. The finding that postgraduate NOMP elective learners were more likely to practise in Northwestern Ontario may reflect the fact that postgraduates are closer to the time they will make decisions about where to set up practise. Similarly, undergraduates who choose to return for repeated NOMP placements may do so because they have an interest in working in the region.

Significantly different recruitment rates were found for NOMP participants from the 5 Ontario universities, with the highest rates of practice in Northwestern Ontario from those NOMP participants enrolled at McMaster University and the University of Ottawa, and lower rates from the other 3 schools. Additional analyses were conducted to better understand these differences among the universities. Significant differences in NOMP participation rates were found among the universities, ranging from a high of 28% for students from McMaster, to a low of less than 4% for students from University of Toronto. These participation rates are similar to the percentage of graduates from each university who practise in rural settings.¹⁸ A 2002 article in this Journal reported that of the 5 Ontario universities, the University of Toronto had the lowest percentage of graduates who practised in rural settings (4.9%), with higher rates from Queen's (6.2%), UWO (9.1%), McMaster (11%) and the University of Ottawa (12.4%).¹⁸ It is possible that physicians from some universities, (e.g., University of Toronto) are less interested in rural practice and, as a consequence, are also less interested in choosing NOMP placements.

In addition, odds ratios showing the strength of association between NOMP placements and practice in Northwestern Ontario (for the year 1999) showed very large differences, ranging from a high of almost 15 for the University of Toronto, to a low of less than 3 for Queen's. For every university, the odds ratios were significantly ($p < 0.05$) above 1.0, revealing that NOMP placements were associated with higher rates of practice in Northwestern Ontario.

Paradoxically, the rank ordering of the odds ratios was inversely related to the participation rates. For example, University of Toronto was lowest in NOMP participation, but also had the strongest association between NOMP participation and practice in Northwestern Ontario. However,

UWO and Queen's had the second and third highest participation rates, but the 2 weakest associations between participation and practise in Northwestern Ontario. Why should the programs for which NOMP had the lowest participation rates be the ones to show the strongest association with recruitment to Northwestern Ontario?

One explanation for these apparently contradictory findings is that some individuals choose to have a NOMP experience because they are interested in possibly working in Northwestern Ontario, and wish to use NOMP to learn more about the community and medical working conditions and lifestyle in Northwestern Ontario. In contrast, others may choose a NOMP experience not because of interest in working in Northwestern Ontario, but for different reasons, perhaps to satisfy a program requirement for rural clinical experience or because this placement was recommended by their peers or program faculty. A small percentage of those enrolled at the universities of Toronto and Ottawa chose to have a NOMP experience, and these individuals were more likely to practise in Northwestern Ontario than other physicians from Toronto and Ottawa who did not have a NOMP placement. The low participation rates from the universities of Toronto and Ottawa suggest that the few individuals from those schools who choose to participate in NOMP are likely to do so because they have interest in working in Northwestern Ontario. In contrast, students from other schools with much higher NOMP participation rates, such as UWO or Queen's, may choose NOMP for a wider variety of reasons, resulting in a weaker association between NOMP participation and practice in Northwestern Ontario.

It is important to emphasize that this was not a randomized study, and caution must be used not to infer causality. Those participating in NOMP were not randomly assigned, and the reasons why individuals choose to come to NOMP are probably among the reasons why they choose to eventually practise in Northwestern Ontario. While such factors likely influenced both the decision to participate in NOMP as well as the decision to practise in Northwestern Ontario, it is nevertheless still reasonable to assume that the NOMP experience had some impact on the final decision regarding practice location. Having a positive NOMP experience likely served to support and consolidate an initial interest in northern, rural practice. Unfortunately the NOMP database did not include information about rural versus urban origins. It is possible that some

of the differences among the universities might reflect different numbers of students originally from Northwestern Ontario in the medical schools.

CONCLUSION

This study identified several significant predictors of physician recruitment to Northwestern Ontario. Data analysis confirms that experiencing a NOMP placement was significantly associated with recruitment. This finding is consistent with the view that regional-based training leads to greater physician recruitment.^{15-17,19} Furthermore, of the individuals who experienced a NOMP placement, higher recruitment rates were found for postgraduates, undergraduates who came for multiple placements, and for those who came from certain universities. These findings reveal that not everyone who is willing to experience clinical training in Northwestern Ontario is equally likely to practise in the region. Rural experiences that are mandated may not have as large a payoff for recruitment as regionally focused initiatives that target clinical training to those individuals who are raised in the region or who have an interest in northern and rural practice.

With the opening of a new northern medical school in the province of Ontario in 2005, the present findings may assist efforts to identify predictive factors for enhancing medical recruitment efforts in and for northern and rural regions.

Competing interests: None declared.

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