Canadian Journal of Rural Medicine
CJRM CMR
Journal canadien de la médicine rurale

Original Article
Article original

Early-career work location of Memorial University medical graduates: Why the decline in rural practice?

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This article has been peer reviewed.

Introduction: In a previous study, we found a decline in the proportion of Memorial University of Newfoundland (MUN) medical alumni practising in rural areas, particularly in Newfoundland and Labrador. The current study focused on the work location of recent graduates and examined the predictors of working in rural Canada and in rural Newfoundland and Labrador within the first 15 years following graduation.
Methods: We linked data from graduating class lists and the alumni and postgraduate databases with Scott's Medical Database to create a record of all graduates from 1973 to 2008, including their work location. We identified differences and significant predictors for each outcome and then described and compared the characteristics of 4 cohorts of graduating classes.
Results: In their early career, 127/1113 (11.4%) MUN medical graduates were working in rural Canada, and 57 (5.1%) were working in rural Newfoundland and Labrador. Having a rural background and being a family physician were predictors of working in rural Canada, and having a rural background, doing at least part of the residency at MUN, being from Newfoundland and Labrador and being a family physician were predictors of working in rural Newfoundland and Labrador. Seventy-four (13.6%) and 33 (6.1%) of 1989–1998 graduates worked in rural Canada and rural Newfoundland and Labrador, respectively, compared to 53 (9.3%) and 24 (4.2%), respectively, of 1999–2008 graduates.
Conclusion: The proportion of MUN medical graduates who worked in rural communities early in their career decreased among recent cohorts. The results show the impact of changes in the characteristics of MUN medical graduates, who increasingly opt for specialist practice and residency training outside the province, and the important role of local postgraduate training.

Introduction : Une étude antérieure a révélé une baisse du nombre de diplômés en médecine de l'Université Memorial de Terre-Neuve (MUN) exerçant en région rurale, plus particulièrement à Terre-Neuve-et-Labrador. L'étude actuelle portait sur le lieu de travail de diplômés récents et sur les prédicteurs du travail en milieu rural au Canada et dans la province de Terre-Neuve-et-Labrador dans les 15 premières années suivant l'obtention du diplôme.
Méthodes : Nous avons établi un lien entre les listes de diplômés, les bases de données des anciens et des postdoctorants et la Base de données médicales Scott's afin de créer un dossier de tous les diplômés de 1973 à 2008, y compris de leur lieu de travail. Nous avons établi des différences et des prédicteurs importants pour chaque résultat et avons ensuite décrit et comparé les caractéristiques de 4 cohortes de classes de diplômés.
Résultats : Au début de leur carrière, 127 sur 1113 (11,4 %) diplômés en médecine de MUN travaillaient en région rurale au Canada et 57 (5,1 %) en région rurale à Terre-Neuve-et-Labrador. Le fait de venir d'un milieu rural et d'être un médecin de famille était des prédicteurs de travail en milieu rural au Canada alors que le fait de venir d'un

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milieu rural, d'avoir fait au moins une partie de sa résidence à MUN, d'être originaire de Terre-Neuve-et-Labrador et d'être médecin de famille étaient des prédicteurs de travail en milieu rural à Terre-Neuve-et-Labrador. Soixante-quatorze (13,6 %) et 33 (6,1 %) diplômés de 1989 à 1998 travaillaient en milieu rural au Canada et en milieu rural à Terre-Neuve-et-Labrador, respectivement, par comparaison à 53 (9,3 %) et à 24 (4,2 %), respectivement, pour les diplômés de 1999 à 2008.

Conclusion : La proportion de diplômés en médecine de MUN qui ont travaillé dans des localités rurales au début de leur carrière a diminué au sein des cohortes récentes. Les résultats de notre étude montrent l'incidence du changement des caractéristiques des diplômés en médecine de MUN, lesquels choisissent de plus en plus de se spécialiser et de faire leur résidence à l'extérieur de la province, ainsi que le rôle important de la formation médicale postdoctorale à l'échelle locale.

INTRODUCTION

Part of the social accountability mandate of medical schools is to address the local, regional and national physician workforce.[1,2] Medical schools, through their "organization, location and mission play a significant role in rural health care by designing and facilitating medical training policies and programs that contribute to recruitment and retention efforts."[3] Local graduates (that is, students from the province, those who graduated from local medical schools or those who completed residency training in the province) are seen as key contributors to a stable workforce of rural physicians, since they are more likely to work in smaller communities, remain longer in those communities and be familiar with local culture and practices.[2,4–9]

The medical school of Memorial University of Newfoundland (MUN), St. John's, was established in 1967 to meet the local need for physicians, particularly in rural communities. Previously, in an effort to show MUN's social accountability, we examined the work locations of physicians in the graduating classes of 1973–1998 and of 1973–2008.[4,10] In 2004, 86.8% of MUN medical graduates were working in Canada, with 30.7% in Newfoundland and Labrador, and 12.6% in rural Canada (including rural Newfoundland and Labrador [6.1%]). In 2014, the corresponding figures were 88.1%, 34.2% and 11.6% (4.9%).[11] Given the decline in the proportion of alumni practising in rural areas, we performed a study to determine how many MUN medical graduates work in rural communities in Canada and in Newfoundland and Labrador early in their career, and what factors predict whether MUN medical graduates work in rural communities early in their career. The focus was on recent graduates because physicians are more likely to work in rural communities early in their careers, with many subsequently moving to urban communities.[6–8] Few urban physicians "convert" to rural practice as their careers progress.[9]

METHODS

As previously described,[4,10] data were linked from graduating class lists, the alumni database and the postgraduate database with Scott's Medical Database to create a data set of all graduates from MUN medical school, with their 2004 work location identified. Data were linked with the use of first, last and maiden names as well as sex and graduation year, since this information is common to each data source. The original database included graduates from 1973 (the first class) to 1998. We then repeated the linking strategy to update the database to include graduates from 1973 to 2008, with graduates' 2014 work location identified.[11] The cut-off for year of graduation was set at 6 years before the work location to allow sufficient time for graduates to complete their residency training and enter practice.

Physicians who had died or retired (no longer part of the physician workforce), military physicians (limited ability to choose their practice location) and trainees sponsored by the Malaysian government (required to return home after completing their training), were excluded from the sample. This information is included in the alumni database and in Scott's Medical Database. We made additional efforts, such as reviewing publications from MUN alumni magazines, to identify deceased and retired physicians.

We examined 2 dependent variables related to physicians' early-career work location: work in rural Canada (yes/no) and work in rural Newfoundland and Labrador (yes/no). We obtained work location from the 2004 or 2014 Scott's Medical Database, supplemented by the alumni database. Both databases are routinely updated when new information is received. Work location com-

munities were coded as urban (10 000 or greater population) or rural (less than 10 000 population) based on their 2001 census population.[12] We included "bedroom communities" as part of larger urban centres, based on Statistics Canada metropolitan influence scores.[13] To be consistent across studies and to allow direct comparisons, we used the 2001 census population and the population cutoff of 9999 for rural communities.

We examined the following variables in the analyses: decade of graduation, sex, home community (rural/urban), from Canada (yes/no), from Newfoundland and Labrador (yes/no), completed at least some residency training at MUN (yes/no), specialty (family physician/specialist), age at graduation (< 30 or ≥ 30 yr) and graduation year (1989–1998/1999–2008). We used hometown, reported at the time of admission and included on the graduating class lists, to determine whether graduates were from Canada, from Newfoundland and Labrador, and from a rural community. We coded hometowns as urban or rural using the same approach as for work location. Specialty was based on the physician's certified specialization recorded in Scott's Medical Database, supplemented by the alumni database. Each physician was coded as either a family physician (general practitioner or family medicine specialist) or a specialist.

The analyses were carried out with the use of SPSS software (version 22.0) and were conducted in 2 parts. In part 1, the sample was limited to graduates from 1989–1998 and from 1999–2008 who had known work locations in 2004 and 2014, respectively. We used χ^2 tests to identify differences between predictors and each outcome (2004 work location for 1989–1998 graduates and 2014 work location for 1999–2008 graduates). We then used multiple logistic regression to identify significant ($p < 0.05$) predictors for each outcome. Potential predictors for each regression model were selected on the basis of the χ^2 tests. We examined variables for possible colinearity before starting the regression analyses. Predictors were removed from the model if they were not significant (based on the Wald test) and if they did not significantly improve the change in the –2 log-likelihood value.[14] The tables presented in the Results section list all the variables included in each of the final regression models.

The second part of the analyses included all eligible MUN alumni (1973–2008), regardless of whether work location was known. We used χ^2 tests to describe and compare the characteristics of 4 cohorts of graduating classes (1973–1978, 1979–1988, 1989–1998 and 1999–2008). These analyses provided a complete portrayal of the changing characteristics of MUN medical graduates and indicated whether differences between the classes of 1989–1998 and 1999–2008 were consistent with larger trends.

Ethics approval

The Newfoundland and Labrador Health Research Ethics Board approved this study (HREB no. 14.065).

RESULTS

Between 1973 and 2008, MUN graduated 1996 physicians. We excluded 47 physicians who had died, 10 who had retired, 13 who were sponsored by the Malaysian government and 779 who graduated before 1989, leaving 1147 physicians. Work location was known for 1113 (97.0%) of the 1147.

The majority of physicians in the study were female (53.2%), from urban hometowns (66.9%), from Canada (93.6%), from Newfoundland and Labrador (72.9%), specialists (58.6%) and under 30 years old at graduation (82.0%) (Table 1). More than half (581 [52.2%]) did at least some part of their postgraduate residency training at MUN. Early in their careers, roughly 1 in 9 (11.4%) was working in a rural community in Canada, and 1 in 20 (5.1%) was working in a rural community in Newfoundland and Labrador.

Compared to the study sample, a larger proportion of physicians excluded from the study because their early-career work location was unknown were male, were not from Canada, were not from Newfoundland and Labrador, did not do any residency training at MUN and graduated in 1999–2008.

Compared to physicians who did not work in a rural community in Canada early in their careers, a larger proportion of those who worked in a rural community had a rural background, did at least some of their residency at MUN, were family physicians and graduated in 1989–1998 (Table 2). Seventy-four graduates (13.6%) from 1989–1998 worked in a rural community in Canada early in their careers, compared to 53 (9.3%) of those from 1999–2008 ($p = 0.02$). Physicians with a rural background and family physicians were more likely to have worked in a rural community in Canada (Table 3).

Compared with graduates who did not work in a rural community in Newfoundland and Labrador, a

larger proportion of graduates who worked in a rural community in the province had a rural background, were from Newfoundland and Labrador, did at least some of their residency at MUN and were family physicians (Table 2). Thirty-three graduates (6.1%) from 1989–1998 worked in a rural community in the province early in their careers, compared to 24 (4.2%) of those from 1999–2008. Physicians with a rural background, Newfoundlanders, those who did at least some of their residency training at MUN and family physicians were more likely to work in a rural community in the province (Table 3).

Table 1: Characteristics of MUN medical graduates who graduated in 1989–1998 or 1999–2008

Characteristic	No. (%) of physicians (n = 1113)
Sex	
Male	521 (46.8)
Female	592 (53.2)
Hometown classification	
Urban	745 (66.9)
Rural	357 (32.1)
Unknown	11 (1.0)
From Canada	
No (international)	61 (5.5)
Yes	1042 (93.6)
Unknown	10 (0.9)
From Newfoundland and Labrador	
No	291 (26.1)
Yes	811 (72.9)
Unknown	11 (1.0)
Did at least some residency training at MUN	
No	516 (46.4)
Yes	581 (52.2)
Unknown	16 (1.4)
Specialty	
Specialist	652 (58.6)
Family physician	460 (41.3)
Unknown	1 (0.1)
Age at graduation, yr	
< 30	913 (82.0)
≥ 30	190 (17.1)
Unknown	10 (0.9)
Graduation year	
1989–1998	542 (48.7)
1999–2008	571 (51.3)
Worked in rural Canada early in career	
No	986 (88.6)
Yes	127 (11.4)
Worked in rural Newfoundland and Labrador early in career	
No	1056 (94.9)
Yes	57 (5.1)

MUN = Memorial University of Newfoundland.

In part 2 of the analysis, all MUN medical alumni who graduated between 1973 and 2008 were included (n = 1996). We excluded 47 physicians who had died, 10 who had retired and 13 sponsored by the Malaysian government, leaving 1926 physicians, of whom 249 graduated between 1973 and 1978, 530 between 1979 and 1988, 550 between 1989 and 1998, and 597 between 1999 and 2008. The proportion of women in each cohort grew over time (Figure 1). Starting in the 1990s, the proportion of physicians who completed residency training at MUN declined, as did the proportion who became family medicine specialists (Figure 1). The proportion of physicians with a rural background began to increase in the 1980s. Detailed comparisons are shown in Table 4.

DISCUSSION

By replicating earlier study methods[4,10] (and using 2001 populations to define rural communities), we were able to compare 2 cohorts of newly graduated physicians in their first years of practice. These cohorts had substantially different work location patterns. The proportion of MUN medical graduates who worked in rural communities early in their career decreased over the study period: 13.6% and 6.1% of 1989–1998 graduates, compared to 9.3% and 4.2% of 1999–2008 graduates, worked in a rural community in Canada and in a rural community in Newfoundland and Labrador, respectively. Although studies show that recent MUN medical graduates are choosing to remain in Canada and in the province,[10,11] our findings confirm that new graduates are opting to work in urban communities early in their careers.

The change in the profile of MUN medical graduates, particularly in relation to the characteristics that predict rural practice, may explain these findings. For example, having a rural background and being a family physician are well-known predictors of rural practice in Canada and in Newfoundland and Labrador.[2–4,8] In addition, completing residency training in Newfoundland and Labrador is a predictor for rural practice in the province.[11] Although the proportion of graduates with a rural background was at an all-time high in the 1999–2008 cohort, a smaller proportion of these graduates than in earlier cohorts opted for family medicine or residency training at MUN. Moreover, the relative magnitude of the odds ratios for each of

these predictors also offers some insight into the relative importance of the graduates' characteristics. The odds ratios for being a family physician (for rural practice in either Canada or Newfoundland and Labrador) and for doing MUN residency training were greater than the odds ratio for having a rural background.

Our results highlight the role of local postgraduate training in the development and retention of rural physicians. Increasingly, researchers have found that a large proportion of rural physicians work within close proximity to their postgraduate training site.[15–17] Studies of rural physicians in Newfoundland and Labrador have shown that physicians (especially MUN graduates) who had done any residency training at MUN were more likely than physicians who had not done postgraduate training at MUN to work in rural communities and to remain in such communities longer.[4,18] Those studies suggest that, to increase the number of physicians who opt for rural practice in Newfoundland and Labrador, MUN should not only continue to recruit rural students but also encourage these students to become family physicians and to complete their residency training at MUN. However, in 2013, less than half of MUN residency positions were filled by MUN graduates; in family medicine, 35 (52%) of the 67 2-year training program seats were filled by MUN graduates.[19]

We found that the proportion of women in the cohorts increased over the study period. However, our results also show that sex is not a predictor of rural practice. The lower rate of rural practice is not due to the increasing number of women among MUN medical graduates.

Table 2: Characteristics of MUN medical graduates who worked or did not work in rural Canada and in rural Newfoundland and Labrador early in their career

	Worked in rural Canada, no. (%) of physicians			Worked in rural Newfoundland and Labrador, no. (%) of physicians		
Characteristic*	No (n = 986)	Yes (n = 127)	p value	No (n = 1056)	Yes (n = 57)	p value
Sex			0.2			0.5
Male	455 (46.1)	66 (52.0)		492 (46.6)	29 (50.9)	
Female	531 (53.8)	61 (48.0)		564 (53.4)	28 (49.1)	
Hometown classification			0.000			0.000
Urban	680 (69.6)	65 (52.0)		721 (69.0)	24 (42.1)	
Rural	297 (30.4)	60 (48.0)		324 (31.0)	33 (57.9)	
From Canada			0.1			0.07
No (international)	58 (5.9)	3 (2.4)		61 (5.8)	0 (0.0)	
Yes	920 (94.1)	122 (97.6)		985 (94.2)	57 (100.0)	
From Newfoundland and Labrador			0.4			0.000
No	262 (26.8)	29 (23.2)		289 (27.6)	2 (3.5)	
Yes	715 (73.2)	96 (76.8)		756 (72.3)	55 (96.5)	
Did at least some residency training at MUN			0.001			0.000
No	475 (48.9)	41 (32.8)		509 (48.9)	7 (12.3)	
Yes	497 (51.1)	84 (67.2)		531 (51.0)	50 (87.7)	
Specialty			0.000			0.000
Specialist	620 (62.9)	32 (25.2)		637 (60.4)	15 (26.3)	
Family physician	365 (37.0)	95 (74.8)		418 (39.6)	42 (73.7)	
Age at graduation, yr			0.9			0.8
< 30	809 (82.8)	104 (82.5)		865 (82.7)	48 (84.2)	
≥ 30	168 (17.2)	22 (17.5)		181 (17.3)	9 (15.8)	
Graduation year			0.02			0.2
1989–1998	468 (47.5)	74 (58.3)		509 (48.2)	33 (57.9)	
1999–2008	518 (52.5)	53 (41.7)		547 (51.8)	24 (42.1)	

MUN = Memorial University of Newfoundland.
*Some variables had missing data.

Table 3: Predictors of having worked in rural Canada and in rural Newfoundland and Labrador early in career

Variable	Location; OR (95% CI)	
	Rural Canada	Rural Newfoundland and Labrador
Hometown classification		
Urban	1.00	1.00
Rural	1.93 (1.31–2.85)	2.32 (1.33–4.08)
From Canada		
No	–	–
Yes	–	–
From Newfoundland and Labrador		
No	–	1.00
Yes	–	6.95 (1.65–29.24)
Did at least some residency training at MUN		
No	–	1.00
Yes	–	4.31 (1.90–9.76)
Specialty		
Specialist	1.00	1.00
Family physician	5.03 (3.28–7.72)	3.81 (2.05–7.06)
Graduation year		
1989–1998	–	–
1999–2008	–	–

CI = confidence interval; OR = odds ratio; MUN = Memorial University of Newfoundland.

Limitations

Our study has a number of limitations. We used administrative program data, which do not provide information on the full range of factors that influence work location. For example, the data do not include family characteristics (e.g., marital status, number and age of children) or other contextual factors (e.g., economic situation, government incentives) that may influence work location. In addition, we used a cross-sectional design, and physicians within each cohort will have been in practice for disparate periods, ranging from 5 to 13 years; many older physicians may have moved after working in a rural community for a number of years. Although our study sample included 97% of eligible physicians, our results may nonetheless underestimate the rural work location of men, international students, students from outside Newfoundland and Labrador, those who did not complete MUN residency training and 1999–2008 graduates, who were disproportionately excluded from the study sample because their early-career work location was unknown. Finally, we looked at 1 medical school in 1 Canadian province; results may not be generalizable to other medical schools or regions.

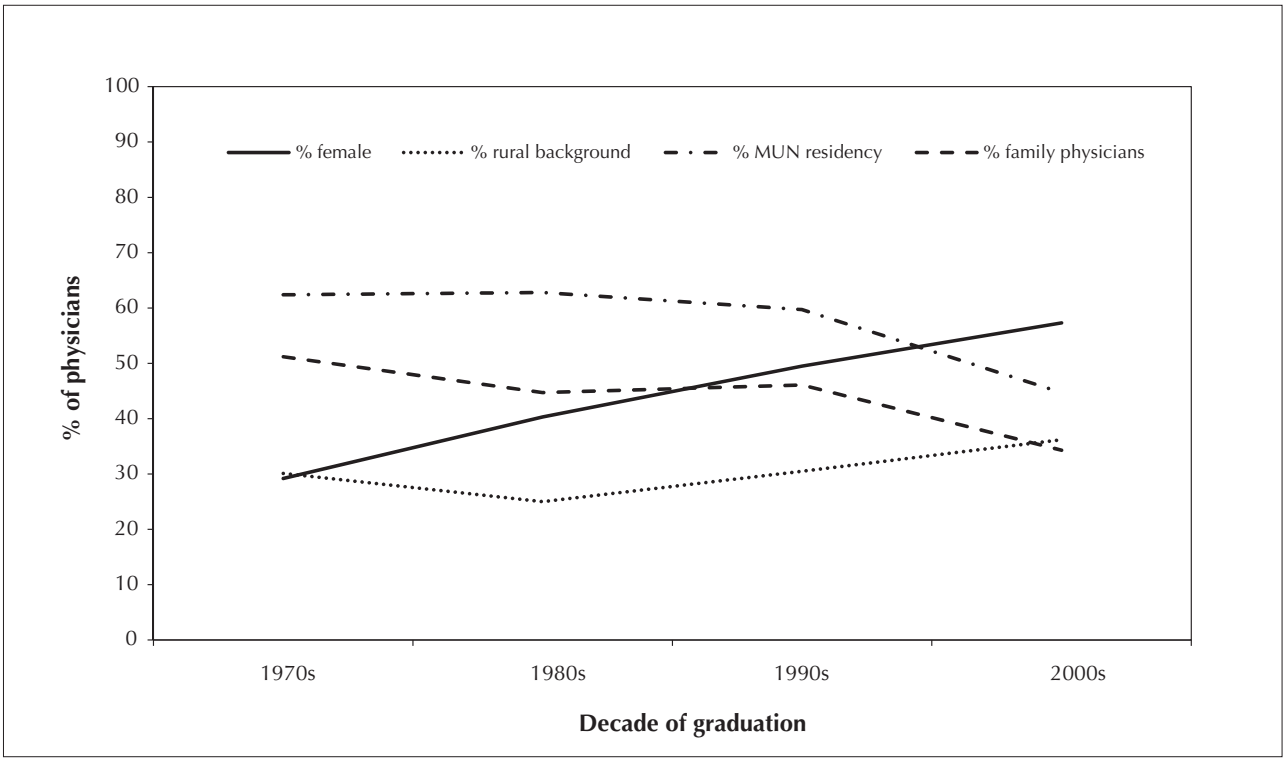


Fig. 1. Trends in selected characteristics of medical graduates of Memorial University of Newfoundland (MUN) from 1973 to 2008. There were significant differences in values over the decades for all characteristics; see Table 4 for details.

Table 4: Characteristics of MUN medical graduates by decade of graduation

Characteristic*	No. (%) of physicians					
		Decade of graduation				
	Overall (*n* = 1926)	1973–1978 (*n* = 249)	1979–1988 (*n* = 530)	1989–1998 (*n* = 550	1999–2008 (*n* = 597)	*p* value
Sex						0.000†‡§¶**††
Male	1047 (54.4)	181 (72.7)	322 (60.8)	280 (50.9)	264 (44.2)	
Female	879 (45.6)	68 (27.3)	208 (39.2)	270 (49.1)	333 (55.8)	
Hometown classification						0.000†**††
Urban	1328 (70.0)	167 (69.0)	395 (75.8)	398 (72.4)	368 (63.0)	
Rural	569 (30.0)	75 (31.0)	126 (24.2)	152 (27.6)	216 (37.0)	
From Canada						0.000‡§¶**††
No (international)	96 (5.0)	11 (4.5)	11 (2.1)	0 (0.0)	74 (12.6)	
Yes	1813 (95.0)	235 (95.5)	517 (97.9)	549 (100.0)	512 (87.4)	
From Newfoundland and Labrador						0.5
No	500 (26.2)	56 (22.8)	135 (25.6)	146 (26.5)	163 (27.9)	
Yes	1409 (73.8)	190 (77.2)	393 (74.4)	404 (73.4)	422 (72.1)	
Did at least part of residency at MUN						0.000§**††
No	826 (43.4)	96 (39.0)	191 (36.2)	207 (38.3)	332 (56.5)	
Yes	1075 (56.5)	150 (61.0)	336 (63.8)	333 (61.7)	256 (43.5)	
Specialty						0.000†§**††
Specialist	1086 (56.7)	113 (45.6)	305 (57.6)	287 (52.2)	381 (64.9)	
Family physician	828 (43.3)	135 (54.4)	224 (42.3)	263 (47.8)	206 (35.1)	
Age at graduation, yr						0.1
< 30	1604 (84.2)	215 (86.7)	457 (86.4)	452 (82.2)	480 (82.9)	
≥ 30	302 (15.8)	33 (13.3)	72 (13.6)	98 (17.8)	99 (17.1)	

MUN = Memorial University of Newfoundland.
*Some variables had missing data.
Post hoc tests: †1973–1978 differs significantly from 1979–1988, ‡1973–1978 differs significantly from 1989–1998, §1973–1978 differs significantly from 1999–2008, ¶1979–1988 differs significantly differs 1989–1998, **1979–1988 differs significantly from 1999–2008, ††1989–1998 differs significantly from 1999–2008.

CONCLUSION

The proportion of MUN medical graduates who worked in rural communities, whether in Newfoundland and Labrador or anywhere in Canada, early in their career decreased among recent cohorts. A total of 9.3% and 4.2% of 1999–2008 graduates worked in a rural community in Canada and in Newfoundland and Labrador, respectively, compared to 13.6% and 6.1%, respectively, of 1989–1998 graduates. Our findings illustrate the downstream impact of changes in the characteristics of medical students in Newfoundland and Labrador, who increasingly opt for specialist practice and residency training outside the province. It also highlights the importance of local postgraduate training. To increase the number of physicians who opt for rural practice, medical schools should not only continue to admit rural students but also encourage them to become family physicians and complete their residency training near the rural regions that hope to recruit them.

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Competing interests: None declared.

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