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3 **Title:** Regional Campuses Matter: A Study of Long-term Outcomes
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Abstract

Background: Regional medical campuses (RMCs) have been implemented across North America to address gaps in physician workforce. We report findings from a study that examined whether being trained at an RMC impacts choice of speciality and location of practice.

Methods: In 2004, the University of British Columbia (UBC) added two RMCs, one in a large population centre in a rural and coastal context, and one in a medium sized population centre in an isolated northern and rural context. Data were extracted from UBC's Medical Education Database. Multiple logistic regression examined the relationship of age, sex, rural background, and campus location to students choosing to practice family medicine and to practice in a rural location.

Results: Being female (OR 1.40, CI 1.04-1.87), older in age (OR 1.10, CI 1.06-1.15), having rural background (OR 1.71, CI 1.04-2.82), and trained at the RMC with the most rural context (OR 1.73, CI 1.08-2.75) predicted family medicine practice. Students with rural background (OR 2.59, CI 1.08-6.21) and trained at either RMC (OR 3.24, CI 1.19-8.83 and, OR 5.38, CI 2.24-12.91) predicted rural family practice.

Interpretation: Being female, older, and training in the most rural context was associated with family practice. Rural background and training in either RMC predicted entering rural family practice. These early results suggest that being trained at an RMC is contributing to addressing workforce gaps in family medicine and rural practice.

Introduction

In Canada, like many countries, access to a family physician remains problematic for many patients, especially those in northern, rural, and remote communities.¹⁻⁴ Although 19% of Canadians live in rural areas, less than 8% of physicians practice in rural areas.⁵

Educational institutions, government and health professions' organizations all have an important role to play in responding to rural disparities.⁶ Many countries have attempted to address these shortages through educational strategies.⁷ Regional medical campuses (RMCs) represent one educational strategy for addressing healthcare workforce needs.⁸ Traditionally, RMCs provide training in either basic science, clinical, or a combination of both. This study focuses on a combined RMC model where the regional campus provides both basic science and clinical training, thus students spend the majority of their undergraduate medical education at one location.⁸

In 2004, UBC established a combined RMC model⁹ with two RMCs in addition to the main campus. This was the first combined RMC in Canada, and one of the first across North America. In 2006, the Association of American Medical Colleges (AAMC) reported that the establishment of four year regional campuses was underway at a number of American medical schools with the intent to address social missions¹⁰ and many Canadian medical schools have also subsequently developed regional campuses.¹¹

Due to the length of medical education and the time it takes to settle into a practice setting, outcomes from curriculum level educational interventions in MD Undergraduate programs are not observable for more than a decade. Previous studies have suggested that at the undergraduate level, rural training, especially longitudinal rural training increases the likelihood of rural practice and students with rural backgrounds are more likely to practice in rural areas.¹² However, no published studies as yet evaluate the long-term impact of regional campuses in Canada on the rural workforce. Indeed, evidence beyond descriptive studies for any educational interventions to increase the rural workforce is lacking.¹³

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3 This study examines two workforce outcomes (family medicine and rural practice) associated
4 with being trained at an RMC. The two RMCs are located in geographies surrounded by rural and
5 suburban communities and are at some distance from the main campus, which is situated in a dense
6 metropolitan region.
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11 **Methods**

13 **Setting**

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15 Physician maldistribution is evident in British Columbia (BC), where physicians cluster mainly in urban
16 areas.¹⁴ British Columbia community action led to a collaboration between the UBC Faculty of Medicine,
17 the BC government, the University of Northern British Columbia (UNBC) and University of Victoria (UVic)
18 to double the number of undergraduate medical school and residency seats by creating regional
19 campuses.⁹
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28 In the UBC combined model, RMC students are allocated to their campus at the time of
29 admission, spend the first semester at the main campus, then move to their regional campus for the
30 remainder of their undergraduate education. All trainees remain students of UBC and the curriculum
31 and assessment are common across all campuses. The school is accredited as a single medical school
32 and the undergraduate curriculum is governed with campus representation on all key committees.
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34 Teaching is shared across campuses, with lectures and labs delivered through videoconferencing, while
35 small group sessions and clinical training are delivered locally. Although the learning objectives,
36 assessments and student performance are comparable across all campuses, there are important
37 differences in the training context.
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48 The main campus is located at UBC in Vancouver, the largest metropolitan city in the province,
49 with a population of 2.4 million.¹⁵ Vancouver is culturally and ethnically diverse. There are three tertiary
50 care teaching hospitals in the centre of the city, and several university-affiliated large suburban
51 hospitals. It is the site of specialized training for the province.
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3 The Island Medical Program (IMP) RMC is housed at UVic in the city of Victoria, Vancouver
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5 Island. The island is 32,134 sq km in area and approximately half of the Island's population (367,770) live
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7 in Victoria, a large sized population center.¹⁵ The remaining population live in small and rural
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9 communities scattered across the island and on neighbouring islands. There are 11 hospitals on
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11 Vancouver Island. By virtue of its context, students at the IMP-RMC are exposed to both urban and rural
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13 practitioners and have the opportunity to experience clinical practice in a range of small communities.
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17 The Northern Medical Program (NMP) RMC is housed at UNBC in Prince George, a Northern and
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19 isolated medium sized population centre of 86,662 ¹⁵ servicing a vast and scattered geography with
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21 many rural communities. The economy has historically been reliant on natural resources. There is one
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23 hospital which is staffed by a range of generalist specialist physicians and full service family physicians.
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25 The NMP-RMC has a particular mandate to encourage students to consider rural medical careers and
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27 uses, as part of its admission process, a remote and rural suitability tool to identify applicants with rural
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29 backgrounds and affinity.¹⁶
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32 **Study population**

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34 Study participants are part of a prospective longitudinal study, established in 2004, on the outcomes of
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36 UBC's RMCs. We extracted data from UBC's Medical Education Database which links information about
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38 students from admissions through undergraduate and postgraduate training, and into practice. We
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40 extracted data for students admitted the first four years after the RMCs opened (2004-07). Postgraduate
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42 records (2004-07) were obtained from the UBC Post-Graduate Dean's office and the Canadian Post MD
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44 Education Registry (CAPER) and linked to records in the Canadian Medical Directory (CMD) to identify
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46 practice speciality and location. Other sources were used to fill in missing data including public
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48 directories provided by the Royal College of Physicians and Surgeons of Canada (RCPS), the College of
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50 Family Physicians of Canada (CFPC), and provincial licensing bodies (e.g., College of Physicians and
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52 Surgeons of BC (CPSBC), and the College of Physicians and Surgeons of Ontario (CPSO).
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Outcome measures

Practice specialty (family medicine) and practice location (rural family practice) were the primary outcomes of interest. Practice specialty was classified as family medicine or “other specialties” based on the trainee’s postgraduate training program record upon completion of postgraduate training. Practice location was classified as “urban” or “rural” based on the address provided by trainees who are licenced to practice family medicine in Canada as their primary location of practice in the CMD. The Rural and Small Town (RST) definition was used to classify practice location.¹⁷ We collapsed the eight-point RST scale into two categories with 4-8 representing rural (census subdivisions located outside of census metropolitan or agglomeration areas) and 1-3 representing urban (census subdivisions located within census metropolitan or agglomeration areas).

Explanatory variables

Using data from students who began their medical education training from 2004-07, we constructed a Campus variable with three categories representing training location (Main Campus, IMP-RMC, NMP-RMC). Sex, age at time of entry, and rural background based on high school location were also included as explanatory variables.

Statistical analysis

Analyses were conducted using SPSS software, version 23. χ^2 analyses were used to examine differences in categorical variables and Student’s t-test was used to evaluate differences on continuous variables. We used multivariate logisitical regression to examine the effect of training at each campus location (Main Campus, IMP-RMC, NMP-RMC) on each outcome. Other independent variables in the model included sex, age at time of entry into the undergraduate program, and rural background as defined by location of high school.

Ethics approval

This study (H15-02916-A001) was approved by the University of British Columbia Behavioural Research Ethics Board.

Results

There were a total of 904 students who entered their first year of medical school at UBC from 2004-07. Of that total, 699 (77%) completed their studies at the Main Campus, 104 (12%) studied at IMP-RMC, and 101 (11%) studied at NMP-RMC. The average age of trainees at time of entry was 25 years (range 19-43). The proportion of females (56%) was slightly higher than males (44%).

By 2015, 98% (888/904) of trainees in the sample had entered postgraduate medical training; 689 from Main Campus, 100 from IMP-RMC, and 99 from NMP-RMC. Over half, (58% or 520/904) of trainees had completed licensing requirements and were practicing in Canada (Main Campus n=387, NMP-RMC n=71 and IMP-RMC n=62). Over one-third, (39% or 352/904) of trainees were still in postgraduate medical training, while 2% (16/904) of trainees were practicing outside of Canada and the remaining 2% (n=16) were lost to follow-up or were not in practice.

Family medicine

Table 1 shows descriptive statistics for explanatory variables and their comparisons between family medicine and other specialties. Age, rural background and campus were significant variables based on univariate analyses.

Findings from the multiple logistics regression on family medicine practice (Table 2) indicate students trained at the NMP-RMC were more likely to practice family medicine compared to students at the Main Campus (OR 1.73, CI 1.08-2.75) after we controlled for other variables. Being female (OR 1.40, CI 1.04-1.87), older in age (OR 1.10, CI 1.06-1.15), and having rural background (OR 1.71, CI 1.04-2.82) all predicted family medicine practice.

Rural practice

Table 3 shows descriptive statistics for explanatory variables and their comparisons between rural and urban practice. Age, rural background and campus were significant variables based on univariate analyses.

Findings from multiple logistics regression on rural family practice (Table 3) indicate students trained at the IMP-RMC (OR 3.24, CI 1.19-8.83) or the NMP-RMC (OR 5.38, CI 2.24-12.91) were more likely to practice rural family medicine compared to students trained at the Main Campus after other variables are controlled for. Having rural background (OR 2.59, CI 1.08-6.21) also predicted rural practice. Sex and age were not found to be associated with rural practice.

Interpretation

In this study, choosing family practice was associated with being female, older, having a rural background and training at the NMP-RMC. Choosing to practice family medicine in a rural location was associated with rural background and being trained at either of the RMCs (i.e., IMP-RMC, NMP-RMC). Although results support previous studies regarding the significance of a rural background in choosing rural practice,¹⁸ and age and gender¹⁹⁻²¹ in choosing family medicine, this study adds to evidence that undergraduate medical training at regional campuses is related to students choosing both family medicine and rural family practice above and beyond the selection of students from rural backgrounds.²²

The association between practice and regional campus locations suggests that training context affects career choice. A context such as Prince George, where there is one hospital with full service family physicians caring for inpatients and where students encounter many family physicians may have a significant influence on their career choice and professional identity.

In examining the effects of campus locations on practice outcomes, the NMP-RMC appears to be contributing most significantly to differences between campuses in selection of family medicine as a

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3 career since those students were more than one-and-a-half times more likely to select family medicine
4 relative to those trained at the main campus. In addition, students from both regional campuses were
5 more likely to choose rural practice relative to those trained at the main campus.
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10 Although students at the main campus are required to complete a rural clerkship, the two RMCs
11 have a sustained emphasis on rural practice. They provide a different kind of learning experience
12 because they are geographically smaller and have less specialized care. These students are engaged in a
13 broad scope of rural and regional medical practice throughout their four years, learning by participating
14 in local health services. They also have more opportunity to develop relationships with generalist
15 clinicians who are more visible in the medical education community, and to maintain these relationships
16 across the four years. We postulate that learners, embedded within the context of the RMCs are
17 strongly influenced by these activities and relationships.²³ Attitudes and values are particularly
18 susceptible to influence from the context of training,²⁴ and role models, mentors, role expectations,
19 respect and collegiality, and scope of practice may all impact the student's career decisions. Over the
20 course of their medical education, both undergraduate and postgraduate, they are drawn into
21 participation in family medicine and rural practice.²⁵ As their competence grows, so does their
22 professional identity, becoming more consistent with family and rural practice.²⁵
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39 There was an interesting magnitude of difference in rural practice found between the two
40 regional campuses. Students at the IMP-RMC were three times more likely to choose rural practice,
41 while those from the NMP-RMC were five times more likely to do so. This may be due to the addition of
42 a rural admissions process specific to the NMP-RMC, as well as a more intense exposure to rural practice
43 in that context. This result builds on existing evidence that a rural campus with an approach that
44 simultaneously addresses multiple factors can contribute to increasing the supply of rural physicians.^{26,27}
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52 At the NMP-RMC, an admissions stream for students inclined toward rural practice with a strong
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3 emphasis on the rural clinical learning environment was associated with a higher likelihood of graduates
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5 choosing rural family practice.
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7 **Strengths and limitations**

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10 This study provides evidence regarding the association of a combined model of RMCs and the rural
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12 family practice workforce. It indicates the importance of institutional and government investment in the
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14 development of four year regional campuses. However, there are several limitations to be noted. The
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16 full impact of this combined RMC model on rural practice will not be known until the cohort of
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18 graduates still in specialty training programs enter practice and we can assess whether being trained at
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20 an RMC impacts subspecialty choice and practice location choice for specialist physicians.
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23 Another limitation is the RST definition employed in this study which used physician's office
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25 address to classify urban versus rural practice. This definition does not account for access to health care.
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27 For example, physicians located in Prince George would not be classified as practicing rural family
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29 medicine, though they may serve patients from surrounding rural areas. Thus, "rural practice" could be
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31 underestimated in this study. Finally, the current national databases do not adequately capture
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33 physicians who take on sessional practice, or who spend time providing locum services in rural areas
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35 prior to settling into long-term practice locations. These limitations mean that our data do not represent
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37 the entirety of impacts of RMCs on rural and family practice.
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41 **Conclusion**

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43 The evidence from this study suggest that a combined regional campus model in medical education
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45 matters. It suggests that the approach can make a positive contribution to addressing gaps in family
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47 medicine and rural practice and that regional campuses are an important part of the pipeline to family
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49 practice and rural recruitment. Their most important effect may be to provide students with experience
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51 in contexts of rural and family medicine and exposure to physician role models with fulfilling family
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53 practice careers.
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Table 1: Descriptives and Differences in Explanatory Variables According to Postgraduate Training Specialty (on exit)

Characteristics	Family Practice	Other Specialties	χ^2 (1) or t (886)	<i>P</i>
Sex (n,%)				
Female (n=499)	193 (38.7%)	306 (61.3%)	3.45	0.63
Male (n=389)	127 (32.6%)	262 (67.4%)		
Age at UBC entry^a (Mean, SD)	25.7 (4.2)	24.3 (3.3)	5.33	0.000
Rural background^b (n,%)				
Rural (n=75)	39 (52.0%)	36 (48.0%)	8.67	0.003
Urban (n=780)	272 (34.9%)	508 (65.1%)		
Campus (n, %)^c				
Main Campus (n=689)	221 (32.1%)	468 (67.9%)	22.89	0.000
IMP-RMC (n=100)	45 (45.0%)	55 (55.0%)		
NMP-RMC (n=99)	54 (54.5%)	45 (45.5%)		

Note ^a. T test used for age variable; Chi-square test used for all other variables.

^b. Missing data on Rural Background n=33

^c. χ^2 df = 2

Table 2. Summary of Logistic Regression Analysis Explaining Family Medicine

Variable	B	SE	OR	95% CI	Wald Statistics	P
Sex	0.34	0.15	1.40	1.04-1.87	5.03	0.025
Age	0.10	0.02	1.10	1.06-1.15	21.74	0.000
Rural Background	0.54	0.26	1.71	1.04-2.82	4.41	0.036
Campus					6.24	0.037
IMP-RMC	0.34	0.23	1.40	0.90-2.17	2.22	0.136
NMP-RMC	0.55	0.24	1.73	1.08-2.75	5.28	0.022

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Table 3: Descriptives and Differences in Explanatory Variables According to Practice Location

Characteristics	Rural Practice	Urban Practice	χ^2 (1) or t (307)	<i>P</i>
Sex (n, %)				
Female (n=187)	22 (11.8%)	165 (88.2%)	0.59	0.444
Male (n=122)	18 (14.8%)	104 (85.2%)		
Rural background^b (n, %)				
Rural (n=38)	12 (31.6%)	26 (68.4%)	13.37	0.000
Urban (n=263)	27 (10.3%)	236 (89.7%)		
Age at UBC entry^a (Mean, SD)	27.2 (5.1)	25.4 (4.0)	-2.58	0.010
Campus (n, %)^c				
Main Campus (n=211)	14 (6.6%)	197 (93.4%)	29.85	0.000
IMP-RMC (n=42)	7 (16.7%)	35 (83.3%)		
NMP-RMC (n=56)	19 (33.9%)	37 (66.1%)		

Note ^a. T test used for age variable; Chi-square test used for all other variables.

^b. Missing data on Rural Background n=16

^c. χ^2 df = 2

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Table 4. Summary of Logistic Regression Analysis Explaining Rural Family Medicine

Outcome	B	SE	OR	95% CI	Wald Statistics	P
Sex	-0.55	0.38	0.58	0.28-1.22	2.08	0.149
Age	0.03	0.04	1.03	0.95-1.12	0.56	0.454
Rural Background	0.95	0.45	2.59	1.08-6.21	4.57	0.032
Campus					15.13	0.001
IMP-RMC	1.18	0.51	3.24	1.19-8.83	5.28	0.022
NMP-RMC	1.68	0.45	5.38	2.24-12.91	14.17	0.000

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