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Rural Medical Students At Urban Medical Schools: Too Few and Far Between?

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ABSTRACT

Introduction: Rural regions of industrialized nations have a crisis in health care access reflecting a high disease burden and a low physician supply. The maldistribution of physicians stems partly from the low entry into medical school of applicants from rural backgrounds.

Methods: We analyzed applicants to the University of Toronto medical school in 2005 (n=2052) to test for a possible institutional bias against rural applicants and a possible applicant bias against the institution. We defined rural according to the Statistics Canada classification of home family postal code reflecting communities with a population of less than 10,000.

Results: Consistent with past reports, rural applicants were underrepresented (n=93, 4.5% of applicants relative to 20% of baseline population). Rural applicants, on average, were equally competitive with urban applicants as measured by grades, test scores, and interviews. Rural applicants were just as likely as urban applicants to be offered admission (17% vs. 14%, $p=0.43$), indicating no large bias from the institution. Rural applicants, however, were more than twice as likely to decline the admission offer (69% vs. 24%, $p<0.001$), indicating a large bias against the institution. This discrepancy was not explained by financial disparity and was not confined to those applicants most likely to receive invitations to other schools.

Conclusions: Programs to increase physician supply in rural areas need to address students' concealed preferences that are established prior to enrolment. Medical schools, in particular, need to encourage more rural students to apply and persuade those offered admission to accept.

MeSH Keywords: rural medical students admission medical school

INTRODUCTION

A few years ago, the executive director of the Office of Rural Health stated: “if there is a two-tiered medicine in Canada, it’s not rich and poor, it’s urban vs rural” [1]. Indeed, a perennial problem in health care for industrialized nations is the maldistribution of physicians that, in turn, contributes to long travel distance to healthcare services, limited access to care, and delayed follow-up. No physician, for example, currently practices north of 70° latitude in North America [2]. On a Canadian basis, about 20% of the population is rural but only 9% of the country's physicians practice in rural areas [2]. A shortfall in rural physicians is evident in other countries throughout the world [3,4,5]. The physicians located in rural areas, moreover, are often responsible for multiple duties, carry large patient rosters, and have limited back-up [6].

Improving the geographic maldistribution of physicians requires recruiting more clinicians to practice in rural communities. Past research indicates that certain characteristics are distinct to rural physicians. The most notable predictor is that rural physicians are up to 4-5 times more likely than their urban counterparts to come from rural backgrounds (eg, raised and schooled in a rural community) [7-15]. In addition, rural physicians are 2-3 times more likely to have had rural undergraduate training and 2-3 times more likely to have rural post-graduate training [9,13]. For most rural physicians, all three characteristics are true. Despite these recognizable distinctions, rural students are greatly under-represented in Canadian medical schools (11.0% overall), with similar shortfalls for other industrialized countries [10,14].

Two reasons may explain a lack of rural students in medical schools; namely, they don’t apply or they don’t get accepted. Individuals may not apply because of the cost, a lack of motivation, or distance from home [7]. Alternatively, individuals may not be accepted due to

lack of credentials or a systematic admission bias. Congruent with such concerns, some recommendations now suggest increasing the enrolment of rural students in medical school by reducing financial costs, adding more rural physicians to admissions committees, applying a rural adjustment factor to academic standards, and setting quotas for rural enrollment [7]. All these policies target the institution rather than the applicant. In this study we focused on one of North America's largest medical schools training a low proportion of rural students and asked: “Are admissions at the University of Toronto Medical School biased against rural applicants?”

METHODS

We obtained data for all students who applied to the University of Toronto Medical School in 2004-2005 from the office of the Associate Dean of Admissions (earlier years not available for analysis). Data were grouped according to those applicants who applied but were declined an interview (rejected), those who applied and were interviewed but not offered admission (rejected), those who were offered admission but did not accept (declined), and those who were both offered and accepted (accepted). Approval for this study was obtained from the Sunnybrook Health Sciences Centre Research Ethics Board and analyses were conducted using confidentiality safeguards at the Institute for Clinical Evaluative Sciences in Ontario.

The information collected for each applicant included age, gender, last degree obtained, last university attended, grade point average (GPA), Medical College Admission Test (MCAT) scores (including physical sciences, biological sciences, verbal reasoning, and writing sample), overall academic score (based on review of GPA, MCAT and other criteria), non-academic score (based on review of experiences, reference letters, and personal statement), file score (sum of academic and non-academic score), interview score, total score (weighted sum of file and

interview scores), and overall rank. These are the decisive data that determine all offers of admission and are restricted from public view.

Designations of rurality and socioeconomic status were based on the permanent home postal code of the applicant's family. In cases where the applicant listed no permanent postal code, we used the applicant's home postal code. In cases where the applicant provided neither a permanent nor a home postal code we excluded the individual from analysis. Rural status was defined from Statistics Canada data as a local population of fewer than 10,000. Classification of rurality was conducted using computerized linkages in a manner blind to all other characteristics of the applicant including final decision of admission. The same technique was also used to estimate socioeconomic status quintiles by neighborhood household income.

Statistical analysis was conducted using the Statview 5.0 statistical package using two-tailed tests throughout. Comparative descriptive statistics were based on means or percentages, as appropriate, to compare urban and rural students. Univariate differences were analyzed using an unpaired t-test or chi-square test as appropriate. Multivariate analyses were conducted using logistic regression to determine if rural students were less likely to be offered admission, using background (rural vs urban) as the main predictor variable and decision of the institution (offered vs rejected) as the main outcome variable. The same analyses then tested the decision of the individual (accepted vs declined) as the main outcome variable.

RESULTS

During the study, a total of 2106 individuals applied for admission to the University of Toronto medical school. Overall, 54 applicants were excluded from analysis because they

provided unusable postal codes, most commonly due to homes outside of Canada (these included 52 rejected and 2 accepted applicants). This yielded a total of 2052 applicants for analysis with 1991 unique postal codes. After applying the postal code classification algorithm, we obtained 93 rural students and 1959 urban students. Rural applicants were greatly under-represented in the applicant pool (4.5%) compared to national proportions (approx. 20% rural).

Rural and urban applicants were similar in personal background and academic merit (Table 1). Rural students had a slightly higher mean age (24.4 vs. 23.7, $p=0.02$) and were more often from the lowest socioeconomic quintile (18 vs. 7%, $p=0.006$). They were marginally more likely to have obtained an advanced degree prior to application (MSc, PhD, or other), but this trend was not statistically significant ($p=0.62$). Rural students had slightly lower average GPA scores but a slightly higher overall academic score, perhaps suggesting they may have taken more demanding courses. Interview scores for rural students were slightly lower, but average total scores (file score + interview score) were identical between the two groups.

Most students who applied to medical school were not granted admission. In total, 16 of the 93 rural applicants received offers of admission whereas 279 of 1959 urban applicants received offers of admission. This amounted to a slight increase in admission offer rates in favour of rural applicants (17% vs. 14%, $p=0.43$). In the multivariate analysis adjusting for age, gender, GPA, and MCAT scores, rural applicants had a higher odds ratio in admission offer rates that was not statistically significant (Adjusted odds ratio 1.63; 95% confidence interval 0.87 to 3.04). As expected, admission offers were highly correlated with GPA and MCAT scores ($p<0.001$, for both) but not correlated with socioeconomic status ($p=0.96$).

The majority of applicants offered admission subsequently accepted, but the difference in the proportion of rural and urban students who declined the invitation was notable. In total, 11 of 16 rural applicants declined the offer of admission whereas 68 of 279 urban applicants declined the offer of admission. This amounted to a large absolute increase in the rate of declined admission offers by rural applicants (69% vs. 24%, $p < 0.001$). After adjustment for age, gender, GPA, and MCAT scores, rural applicants had a higher odds of declining medical school admission offers compared to urban applicants (Adjusted odds ratio 7.75; 95% confidence interval 2.37 to 25.38). Decisions to decline the offer were not significantly correlated with GPA, MCAT scores, or socioeconomic status ($p > 0.20$, for all).

The reluctance of rural applicants to accept admission offers was also examined in two important subgroups specified in advance. When restricted to those applicants from the top two socioeconomic quintiles and when we restricted to those applicants below the median overall rank (based on all academic and interview scores), we continued to observe higher odds ratios in declined admission offers from rural applicants compared to urban applicants: 4.93 (95% confidence interval: 1.13 to 21.43) and 14.86 (95% confidence interval: 1.68 to 131.4), respectively.

We followed up after one year on those applicants who declined offers of admission. The majority of both rural and urban students had enrolled in another medical school elsewhere in the country (73% vs. 75%, $p > 0.20$). The rural students were distributed across six different schools with no dominant pattern of preferences and no school accepting more than two individuals. None had enrolled at the Northern Ontario School of Medicine, the institution in Ontario mandated to admit and train rural physicians. A few students had left the country for medical

school training (9% vs. 4%, $p>0.20$) and for one-in-five we found no evidence of subsequent medical training (18% vs. 21%, $p>0.20$).

DISCUSSION

We found that only five students admitted to one of Canada's largest medical schools in 2005 were from rural backgrounds, a rate that does little to redress the shortfall in rural healthcare in this nation. In accord with past research from the United States [16,17], the lack of enrollment was not explained by a lack of past training, academic accomplishments, test results, or socioeconomic status of the applicants. Nor was it explained by an overt bias by the institution in favour of similarly qualified urban applicants [8,18]. Instead, we discovered that a large factor was an applicant's reluctance to accept the offer of admission. This personal choice, in turn, was not easily traced to available socioeconomic or academic characteristics.

A limitation of our research is that we cannot identify the reasons why rural applicants declined offers despite having appeared positive at the time of their direct personal interview. Ontario has other medical schools, although tuition fees are similar throughout (for 2005, University of Toronto \$16,207 whereas Northern Ontario School of Medicine \$14,600) [19,20]. The fees outside of Ontario would be much higher by comparison (since the applicant would pay an out-of-province surcharge) and the fees in Toronto would, arguably, be much lower in some cases (due to bursary programs). Moreover, our analysis according to the applicant's socioeconomic status does not suggest that financing was the major cause for applicants' choices.

Rural applicants may decline urban medical schools because of social rather than financial preferences. Specifically, the unfamiliar population size of a city may be a deterrent

given that rural students grew up in small towns and possibly attended university in smaller cities as well. As noted in Australia, the structure of a city and the downtown location of a campus can be further aversive to a rural student [21]. The perceived academic image of the institution and the relative lack of emphasis on rural training may not appeal to those who desire to practice as rural physicians and want exposure to medical practice in remote regions [22]. The full set of reasons is unknown because so many unmeasured factors influence an individual's decisions and people are entitled to privacy.

Our study has other limitations since the data stem from a single medical school that may not match other settings. Moreover, even a single medical school can change over time, as illustrated by the Prince George program now linked with the University of British Columbia that promotes rural and remote training [23]. However, aggregate reports from different Ontario medical schools have shown widespread difficulties in recruiting rural applicants [24]. For example, the Northern Ontario School of Medicine (which preferentially selects rural applicants [25]) had about 26% of offers of admission declined in 2005. The situation was no different in 2006 when the Northern Ontario School of Medicine had about 28% of offers admission declined (compared to 17% for the entire province).

Whether urban institutions should increase the number of rural students accepted to medical school remains controversial. In theory, accepting more rural students to any medical school could contribute to more potential rural physicians being trained to bridge the geographic maldistribution of healthcare. In addition, rural students have been shown to be more likely to enter family practice [10,14], another area that is experiencing shortages across most industrialized countries. Yet these two workforce concerns are not the only current issues in

health care, immediate clinical care is not the only priority for all medical schools, and increasing diversity requires addressing many underrepresented groups.

This study confirms the importance of increasing the pool of rural applicants in order to achieve more representation of rural students in medical school. Some rural applicants may dismiss the idea of medical school because of misinformation or a lack of awareness over financial aid; hence, information regarding these options should be publicized early. This study also suggests a need to bolster the acceptance rate of rural applicants by offering some counsel to ease the transition to the big city, emphasizing rural training in the curriculum, and highlighting rural practice incentives [26]. In the interim, the data do not suggest an immediate call for revolutionary changes to the admission committee practices at large old urban medical schools.

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TABLE: Baseline Characteristics of Applicants

	Rural	Urban	P < 0.05
Applicants	(n = 93)	(n = 1959)	
Mean age	24.4	23.7	*
% Female	51.6	52.8	
% SES top quintile	26	41	*
% SES above middle quintile	20	22	
% SES middle quintile	12	16	
% SES below middle quintile	17	12	
% SES bottom quintile	18	7	*
% SES unknown	6	2	*
% Advanced Degree	20	18	
GPA (out of 4.0)	3.5	3.6	
MCAT- mean VR (max 15)	8.9	8.9	
MCAT- mean PS (max 15)	9.6	10.1	*
MCAT-mean BS (max 15)	10.0	10.5	*
MCAT-% excellent WS	29	31	
Academic Score (out of 60)	48.6	48.2	
Non-academic Score (out of 40)	31.5	30.8	
Interview Score (out of 20)	15.7	16.4	
Total Score (out of 100)	84.6	84.6	

Table. Baseline characteristics of rural and urban applicants. SES denotes socioeconomic status. Advanced Degree denotes Masters, PhD or other professional degree. GPA denotes grade point average after U of T conversion translation. MCAT denotes medical college admissions test with it's included components VR for verbal reasoning, PS for physical sciences, BS for biological sciences, and WS for writing sample (excellent WS classified as writing sample score of R, S, or T). Total Score (derived from Academic Score, Non-academic Score, and Interview Score) is the basis for final decision to offer or not offer admission to the candidate.

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