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Liens entre les caractéristiques des médecins et leur profil de pratique dans le contexte canadien : une revue exploratoire

Ariana Mihan, Nicole Kester, Michael Fitzgerald, Karine Fournier and Claire E Kendall

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Article abstract

Background: Physician characteristics such as education and sociodemographic attributes are associated with particular practice patterns, such as practice in rural settings. Understanding the Canadian context of such associations can inform medical school recruitment and health workforce decision-making.

Objective: The objective of this scoping review was to report the nature and extent of the literature on associations between characteristics of physicians in Canada and physicians' practice patterns. Eligibility criteria: We included studies reporting associations between 1) the education or sociodemographic attributes of practicing physicians or residents in Canada and 2) practice patterns, including career choice, practice setting, and populations served.

Methods: We searched five electronic databases (MEDLINE (R) ALL, Embase, ERIC, Education Source and Scopus) for quantitative primary studies and reviewed reference lists of included studies for additional studies. Data were extracted using a standardized data charting form.

Results: Our search yielded 80 studies. Sixty-two examined education, evenly divided between undergraduate and postgraduate. Fifty-eight examined physicians' attributes, most focusing on sex/gender. The majority of studies focused on the outcome of practice setting. We found no studies examining race/ethnicity or socioeconomic status.

Conclusion: Many studies in our review found positive associations between (i) rural training or rural background and rural practice setting and (ii) location of training or physicians' origin and practice in that location, consistent with previous literature. Associations for sex/gender were mixed, suggesting it may be a less useful target for workforce planning or recruitment aiming to address gaps in health care provision. More research is needed on the association of characteristics, particularly race/ethnicity and socioeconomic status, with career choice and populations served.

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Reviews, Theoretical Papers, and Meta-Analyses

Characteristics of Canadian physicians and their associations with practice patterns: a scoping review

Liens entre les caractéristiques des médecins et leur profil de pratique dans le contexte canadien : une revue exploratoire

Ariana Mihan,[1] Nicole Kester,[1] Michael Fitzgerald,[1] Karine Fournier,[2] Claire E Kendall[1,3]

[1]Bruyère Research Institute, Ontario, Canada; [2]Health Sciences Library, University of Ottawa, Ontario, Canada; [3]Office of Social Accountability, Faculty of Medicine, University of Ottawa, Ontario, Canada

Correspondence to: Claire E. Kendall, 85 Primrose Ave, Ottawa ON K1N 5C8; phone: 613-562-6262 ext. 2941; email: ckendall@uottawa.ca,

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Abstract

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Résumé

Contexte : Il existe un lien entre les caractéristiques des médecins, comme leur formation et leur profil sociodémographique, et des cadres de pratique particuliers, comme la pratique en milieu rural. La compréhension de ces liens dans le contexte canadien peut éclairer les stratégies d'admission dans les facultés de médecine et la planification de la main-d'œuvre dans le secteur de la santé.

Objectif : L'objectif de cette revue exploratoire était de faire état de la nature et de l'étendue de la littérature sur les liens entre les caractéristiques des médecins au Canada et leurs cadres de pratique. Critères de sélection : Nous avons inclus les études établissant des liens entre 1) la formation ou le profil sociodémographique des médecins ou des résidents en exercice au Canada et 2) les cadres de pratique, y compris le choix de carrière, le milieu de pratique et les populations desservies.

Méthodes : Nous avons effectué des recherches dans cinq bases de données électroniques (MEDLINE (R) ALL, Embase, ERIC, Education Source et Scopus) pour trouver des études quantitatives primaires et avons examiné les listes de références bibliographiques des articles retenus pour repérer d'autres études. Les données ont été extraites à l'aide d'un formulaire normalisé.

Résultats : Notre recherche a permis de recenser 80 études. Soixante-deux d'entre elles portaient sur l'éducation, réparties de manière égale entre le premier cycle et le cycle de spécialisation. Cinquante-huit examinaient les caractéristiques des médecins, la plupart portant sur le sexe/genre. La majorité des études étaient focalisées sur le critère du milieu de pratique. Nous n'avons trouvé aucune étude portant sur la race/ethnicité ou le statut socio-économique.

Conclusion : En accord avec des travaux antérieurs de nombreuses études de notre revue trouvent des associations positives entre (i) la formation en milieu rural ou l'origine rurale et un cadre de pratique rural et entre (ii) le lieu de formation ou l'origine du médecin et une pratique dans ce lieu. Les associations relatives au sexe/genre étaient mitigées, ce qui porte à croire qu'il s'agit peut-être d'une cible moins utile pour la planification ou le recrutement d'une main-d'œuvre visant à combler les lacunes dans la prestation des soins de santé. Des travaux supplémentaires sont nécessaires sur les liens entre le profil des médecins, en particulier la race/ethnie et le statut socio-économique, d'une part, et le choix de carrière et les populations desservies d'autre part.

Introduction

Medical schools are increasingly incorporating social accountability into their mandates as a commitment to address the priority needs of the communities they are meant to serve.[1,2] A key aspect of social accountability is the intention to matriculate physicians who can meet current and future health needs of the community. Ways to achieve this objective have included rural placements, and targeted admissions pathways that increase the diversity of backgrounds of their medical student bodies.[3] Understanding the training characteristics and sociodemographic attributes that contribute to medical students' choice of future practice setting is critical for tailoring medical education and the consequent impact on health human resources.

Studies in other contexts have looked at how a variety of physician characteristics influence practice patterns. For example, a 2016 review of U.S. studies found that characteristics such as race/ethnicity and language and certain education characteristics were associated with practicing in underserved regions.[4] In Canada, studies have examined characteristics associated with rural practice, such as rural geographic background.[5] However, to our knowledge, no reviews of studies in the Canadian context have examined a wide range of physician characteristics and their association with practice patterns such as career choice or population served. A Canadian focus is important, given our universal healthcare system and particular factors, such as geographic distances, which impact healthcare access.

The objective of this scoping review was therefore to assess the nature, range and extent of the literature on quantitative studies pertaining to physician characteristics (sociodemographic attributes and training) and report their association with practice patterns in the Canadian context. These practice patterns include career choice, practice setting, and populations served. Our review explores the following questions:

i. Which characteristics of physicians in Canada have been examined for associations with physicians' practice patterns?

ii. Among career choice, practice setting, and populations served, which outcome measures have been prioritized?

iii. What associations have been found between the identified physician characteristics and these outcomes?

Methods

Study design

We used Arksey and O'Malley's scoping review framework,[6] supplemented by Levac et al.[7] and Peters et al.,[8] to methodically assess the literature examining how Canadian physicians' characteristics are associated with their practice patterns, comprising career choice, practice setting and populations served. We developed our protocol using the Joanna Briggs Institute Manual For Evidence Synthesis[9] which was registered and updated on Open Science Framework (https://osf.io/4fr95).

Eligibility criteria

To be considered for this review, studies must have examined the association between physician characteristics and their practice patterns. We restricted our search to studies conducted in a Canadian setting published after 2000, in English or French. If a study examined multiple countries including Canada but did not present results distinguishing between countries it was excluded. We broadly included any practice patterns related to career choice (e.g., specialty), practice setting (e.g., urban/rural, neighbourhood characteristics), and populations served (e.g. low income, immigrants/newcomers). We excluded studies that were not conducted among practicing physicians or residents (postgraduate trainees) or that only examined trainees' or physicians' intention to practice. If a study examined other populations (e.g., medical students) and practicing physicians/residents, but did not present results that distinguished between the populations, the study was excluded. Studies must have examined the association between characteristics and practice patterns, and thus must have included a comparison group. Therefore, we considered quantitative primary research studies, and conference abstracts considered as grey literature, and excluded qualitative studies, commentaries, letters and news articles. We did not consider other sources of grey literature for feasibility reasons.

Search strategy

We conducted a preliminary search of Medline (OvidSP) to identify initial search terms through analysis of text words in titles and abstracts. An information specialist (KF) searched the following electronic databases on December 18th, 2020: MEDLINE (R) ALL (OvidSP), Embase (OvidSP),

ERIC (OvidSP), Education Source (EBSCOHost) and Scopus using a combination of subject headings and keywords for the concepts of "practicing physicians," "practice patterns or choice," and "Canada" (see Appendix A for search strategies). A second information specialist peer-reviewed our search strategy according to the Peer Review of Electronic Search Strategies (PRESS) guidelines.[10] We considered studies published in English or French, Canada's two official languages. We limited our search to studies published after 2000, as changes in medical school curricula and admissions criteria over time are likely to have significantly changed the makeup of physician cohorts. Databases' limits were used to remove non-peer-reviewed research when feasible (editorials, comments, letter to the editors). We also scanned the reference lists of included articles to identify additional studies.

Study selection

We imported citations (titles and abstracts) yielded from the search strategy into Covidence (Veritas Health Information, Melbourne, Australia) systematic review software. Duplicate citations were removed, but we retained any reports that evaluated different components of the same activity. We developed a pre-defined eligibility criteria form for screening (see Appendix B) and used the first 20 studies as a pilot to test the eligibility criteria. Reviewers discussed and adjusted the criteria where discrepancies occurred. The two reviewers (AM and NK) then independently screened titles and abstracts to identify articles that potentially meet the inclusion criteria (yes, no, unsure). Citations considered by either reviewer as "yes" or "unsure" advanced to full text review. For rigor, a third reviewer (MF) screened a small sample of titles and abstracts and compared their responses with reviewer 1 and 2. Following abstract and title screening, two reviewers independently screened the full text of articles for potential inclusion. Any discrepancies were discussed amongst the two reviewers and, if needed, a third reviewer was consulted to determine final inclusion. Reasons for exclusion at the full text review level were recorded and reported.

Data extraction

Two reviewers (AM and NK) independently conducted data extraction using a standardized data charting form using Microsoft Excel, and iteratively updated the variables to extract and the level of detail required. We reported on the key study characteristics, physician characteristics and outcomes examined in each study in tabular form. Contextual information was extracted in narrative form.[11] To pilot the form, two reviewers independently extracted data from five included articles and adapted the data extraction tool as needed to capture any additional relevant data components during the process. We reported any adjustments in the protocol. If discrepancies arose, the two reviewers discussed with one another and/or consulted with a third reviewer. We did not formally appraise the quality of included studies as the aim of our review was to assess the nature, range and extent of literature pertaining to physician characteristics and their practice patterns in the Canadian context.

Data analysis and presentation

We descriptively analysed the data using frequency counts of the different physician characteristics and practice patterns. We report our findings using the PRISMA Extension for Scoping Reviews (PRISMA-ScR) to guide the reporting of our findings.[12]

Results

The database searches yielded 7672 citations with 6153 remaining to be screened after de-duplication. Title and abstract screening resulted in the exclusion of 5916 citations, leaving 237 studies for full-text review. Following full-text screening, we excluded a further 162 studies, leaving 75 studies. We reviewed the reference lists of these studies, which yielded four additional studies for inclusion. We also examined the reference lists of any relevant reviews our search had captured and identified one additional study for inclusion. The final number of studies for analysis was 80 (Figure 1). Of these, 62 studies examined physicians' education and 58 examined sociodemographic attributes.

Physicians' education and sociodemographic attributes

Sixty-two studies examined the association between physicians' education and their practice patterns. We grouped these studies into three categories: undergraduate medical education (UGME), postgraduate medical education (PGME), and other training. Fifty-eight studies examined the association between physicians' attributes and their practice patterns. We found no comparative studies on the association of race/ethnicity or income with practice patterns. (see Table 1).

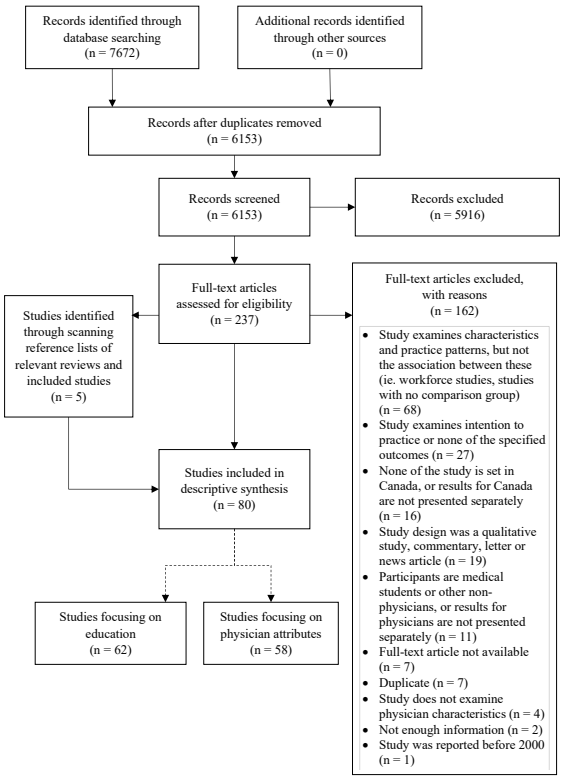

Figure 1. PRISMA Diagram: article flow

Table 1. Distribution of included literature by education and physician attribute

Education	# Studies(*n*)	Proportion (%)
Undergraduate medical school		
Undergraduate medical school	24	39
Undergraduate medical curriculum	13	21
Postgraduate medical school		
Postgraduate medical school	23	37
Postgraduate medical curriculum	11	18
Postgraduate training type	7	11
Postgraduate program size	1	2
Other		
Skills enrichment program	1	2
IMG program	1	2
Return for service agreement	1	2
Mentorship/role model	5	8
Physician attribute		
Sex/gender	40	69
Age	28	48
Cohort year*	25	43
Geographic background/Region of origin	25	43
Languages spoken	3	5

**Comprises graduation year, years since graduation, and number of years in practice.*

Physician practice patterns

We also grouped studies according to the practice patterns examined using three broad categories: practice setting, career choice and population served (see Table 2, Appendix C).

Education and practice setting: Rural practice, practice in location of training, and other practice setting. Fifty studies examined associations between physicians' education and practice setting (rural, location of training, other) (see Table 3, Appendix C). Twenty-nine studies looked at education characteristics associated with practicing in a rural setting, the large majority of which found positive associations with the characteristics they examined.

Twenty-two studies looked at characteristics associated with practice in location of training, such as a specific region or province. A few studies looked at characteristics associated with other practice setting outcomes, including international mobility (*n* = 4) and practicing in an underserviced area (*n* = 1).

Associations between (i) education and career choice and (ii) education and population served. Fourteen studies looked at characteristics associated with career choice, whereas six studies looked at the characteristics associated with population served (see Table 4, Appendix C).

Nine studies looked at choice of specific specialty/sub-specialty. Seven studies examined choice of family medicine as a specialty. Four studies looked at provision of care to patients in long term care. Three studies examined the provision of care to other specific populations.

Associations between physician attributes and practice setting. Thirty-seven studies examined physician attributes for association with choice of practice setting (see Table 5, Appendix C). Twenty-four studies examined attributes for association with choice of rural practice setting. Thirteen studies examined attributes for association with choice of region/province of practice. Five studies examined attributes for association with other practice settings.

Associations between (i) physician attributes and career choice and (ii) between physician attributes and populations served. Thirteen studies examined physician attributes for association with career choice, and thirteen studies physician attributes in association with population served (see Table 6, Appendix C). Nine studies examined attributes for association with choice of specialty/sub-specialty. Five studies examined attributes for association with choice of Family Medicine. Four studies examined attributes for association with caring for patients with complex care needs (e.g., HIV, Hepatitis C Virus (HCV), Autism Spectrum Disorder (ASD)). Three studies examined attributes for associations with caring for patients in long term care. Three studies examined attributes for

association with caring for patients with mental health/addictions. Two studies examined attributes for association with caring for other specific patient populations.

Discussion

This scoping review describes studies examining the characteristics of Canadian physicians and their associations with physicians' practice patterns, including career choice, practice setting, and populations served. In the 62 studies we found that examined education, the most frequently examined characteristics were UG and PG medical schools, and the most frequently examined practice pattern was practice setting and, within this, rural practice setting. In the 58 studies we found that examined physicians' attributes, the most frequently examined attributes were sex/gender and age, whereas the most frequently examined practice pattern was rural practice setting. Associations between characteristics and our outcomes of interest varied, but some key patterns are apparent.

First, we found no comparative studies that examined the attributes of either socioeconomic status, immigrant status or race/ethnicity for the outcomes of interest. Studies that examined languages spoken were also rare. In the studies that met our inclusion criteria, sex/gender was the attribute most often examined, followed by age, and practice setting was the most common outcome of interest, particularly rural practice setting. This contrasts with Goodfellow et al.'s 2016 review of studies focusing on practice in underserved urban or rural areas in the U.S.,[4] which reported no studies focusing on the attributes of sex/gender or age, but several that focused on race/ethnicity. Our findings may reflect the fact that diversity considerations of race/ethnicity and socioeconomic status in health workforce planning and medical education are relatively recent in the Canadian context compared to sex/gender and age differences, for which data have been collected for longer.[13,14]

Second, the most frequent associations we identified were positive relationships to rural practice setting. Of the studies that examined education and rural practice setting, most found that it was positively associated with the UG or PG medical school attended, such as MUN, the UBC distributed site, and NOSM. These results may be due to certain medical schools prioritizing recruitment of medical students with particular geographic backgrounds, such as NOSM, which uses a context score as part of its selection criteria,[15] and the UBC distributed site, which prioritizes students with rural backgrounds.[16] Of the studies that examined physicians' attributes and rural practice setting, most found it was positively associated with rural geographic background, consistent with previous literature.[5,17,18] Geographic background was also shown to be positively associated with practice in specific regions in over half of the studies that examined this relationship, and education in a specific location was shown to be positively associated with practice in that location in a majority of studies that examined this characteristic. These findings may reflect Canada's geography, which is largely rural or remote and yet with a population that largely lives in urban or semi-urban areas, and the fact that health systems, including training and regulation, are predominantly a provincial, rather than federal, responsibility. It is also likely that certain schools place a greater emphasis on rural curricula, as we found that rural exposure in either UGME or PGME was also positively associated with rural practice setting. These findings could suggest that if curriculum planners are interested in increasing the number of physicians in rural practice, they might want to consider incorporating rural learning opportunities for both undergraduate and postgraduate medical education. Our findings might also support the strategy of considering students' geographic background in admissions processes that aim to address gaps in the rural and regional/provincial physician workforce.[5,19,20] However, our review did not include the outcome of physician retainment in these practice settings. Future quantitative studies might want to explore these areas.

Third, studies that reported on the association of education or attributes with career choice were more varied. This may be because studies were heterogenous in terms of specialties examined. However, three studies did find that mentorship during education was positively associated with choice of specialty. This is consistent with the findings of a previous systematic review that primarily included studies conducted in the United States, which found positive influences of mentorship on medical career choice.[21] Certain UG medical schools (NOSM, international medical schools, distributed UBC site) were associated with choosing family medicine and, interestingly, were the same schools that were associated with rural practice. While some studies specifically examined rural family medicine practice, schools with distributed medical education and an emphasis on rural learning may also simultaneously emphasize exposure to more family medicine role models and community-based experiences compared to urban

hospital-based learning, as seen in the comprehensive community clerkship experiences at NOSM[15] and as suggested by Lovato et al[16] regarding the UBC distributed site. Additionally, rural practice is more likely to require generalist physicians, particularly those offering a comprehensive scope of practice, due to the characteristics of rural areas and lower availability of specialists.[22] Just over half of the studies that examined career choice in relations to physician attributes found positive associations among the attributes examined, but most of those that examined sex/gender found no associations.

Fourth, far fewer studies focused on populations served. This indicates the need for further research in this area in Canada. given the significant variation in access to care and health outcomes among underserved populations. For example, individuals experiencing homelessness in Toronto have been reported to face greater unmet healthcare needs compared to the city's general population,[23] and wide disparities in avoidable mortality rates have been demonstrated between the least and most marginalized neighbourhoods in Ontario.[24,25] In particular, we found only one study that focused on Indigenous populations, which could suggest a research gap in this area. Future studies should explore the association between physician characteristics and population served in a Canadian setting in order to optimize health human resources in a way that contributes to a more equitable health care system.

Fifth, the lack of eligible studies examining Canadian physicians' race/ethnicity and socioeconomic status contrasts with the literature in other jurisdictions. For example, in the United States, attributes such as race and ethnicity are associated with serving underserved communities,[26] and in Australia, lower socioeconomic status background of physicians and their practice in poorer communities are associated.[27] Given that medical student diversity is a key target of social accountability mandates,[28] further studies should seek to understand how physician characteristics contribute to their practice populations in the Canadian context.

Our study had some limitations. Our review focused on capturing quantitative studies; there may be qualitative research that addresses areas in which we found research gaps, such as with populations served. Also, we recognize that residents are often not in a position to choose all of their practice settings and populations they serve, and thus for this category the associations may be less meaningful.

Conclusion

Most Canadian studies of physicians' education and sociodemographic attributes have focused on rural factors or sex/gender and on rural practice settings or practice in the same region as the region of training. Associations between rural practice experiences in medical education or rural background and rural practice are consistent with previous studies and reinforce strategies aimed to increase recruitment of rural physicians. More comparative studies are needed to examine training characteristics and their association with career choice to better inform recruitment strategies for different medical disciplines. Future studies should also explore the association of physicians' characteristics with populations served to better inform and improve equity in healthcare workforce planning. Finally, more studies are needed to examine attributes such as income and race/ethnicity on practice pattern and their associations with practice patterns, particularly in association with populations served in Canada.

Conflicts of Interest: The authors state that they have no conflicts of interest to declare.

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Appendix A: Search Strategies

Search performed December 18th, 2020

MEDLINE(R) ALL (OVID, 1946 to December 17, 2020)

1. exp canada/
2. (canad* or "british columbia" or "Colombie britannique" or alberta* or saskatchewan* or manitoba* or ontario* or quebec* or “new brunswick” or "nouveau brunswick" or "nova scotia" or "nouvelle ecosse" or "prince edward island" or newfoundland* or labrador* or nunavut* or nwt or "northwest territories" or yukon* or nunavik* or inuvialuit* or nunatsiavut*).ti,ab,kf,jn,jw,cp.
3. or/1-2
4. exp physicians/ or specialization/
5. Family Practice/
6. "Internship and Residency"/
7. ((resident* or fellow* or ((medicine or medical) adj1 graduate*) or physician* or clinician* or general practitioner* or family doctor* or family practice* or specialist* or obstetrician* or gyn?ecologist* or p?ediatrician* or internist* or surgeon* or neurosurgeon* or psychiatrist* or radiologist* or an?esthesiologist* or dermatologist* or oncologist* or rheumatologist* or neurologist* or pathologist* or cardiologist* or urologist* or geriatrician* or gerontologist* or gastroenterologist* or respirologist* or hematologist* or endocrinologist* or nephrologist* or physiatrist* or allergist* or intensivist* or otolaryngologist* or immunologist* or neuropathologist* or ophthalmologist*) adj5 (characteristic* or factor* or predictor* or attribute* or background* or socioeconomic* or sociodemographic* or neighborhood* or neighbourhood* or age* or sex or sexes or gender* or race* or ethnic* or education* or training or language* or francophone* or anglophone* or bilingual*)).ti,ab,kf.
8. or/4-7
9. professional practice/
10. Practice Patterns, Physicians'/
11. Career Choice/
12. Professional Practice Location/
13. (career* adj2 (choice* or choos* or pattern* or selection* or location*)).ti,ab,kf.
14. (practice* adj2 (location* or setting* or professional* or choice* or choos*)).ti,ab,kf.
15. ((urban* or neighborhood* or neighbourhood* or rural* or remote*) adj2 (location* or practice* or choice* or choos*)).ti,ab,kf.
16. Medically Underserved Area/
17. Vulnerable Populations/
18. physician* shortage*.ti,ab,kf.
19. ((underserv* or vulnerable* or disadvantag*) adj2 (region* or area* or location* or group* or population* or people or person* or patient*)).ti,ab,kf.
20. ((population* or group*) adj2 (served or serving)).ti,ab,kf.
21. exp "emigrants and immigrants"/ or refugees/
22. exp indigenous peoples/
23. exp Poverty/
24. ((low* income* or poor* or poverty or immigrant* or refugee* or newcomer*) adj3 (population* or group* or people* or person* or patient*)).ti,ab,kf.
25. (indigenous* or inuit* or first nation* or Metis* or aboriginal*).ti,ab,kf.
26. or/9-25
27. 3 and 8 and 26
28. limit 27 to yr="2000 -Current"
29. limit 28 to (english or french)
30. (comment or letter or editorial).pt.
31. 29 not 30

Results: **2,236** references retrieved

Embase (OVID, 1947 to 2020 December 17)

1. exp Canada/
2. (canad* or "british columbia" or "Colombie britannique" or alberta* or saskatchewan* or manitoba* or ontario* or quebec* or new brunswick or "nouveau brunswick" or "nova scotia" or "nouvelle ecosse" or "prince edward island" or newfoundland* or labrador* or nunavut* or nwt or "northwest territories" or yukon* or nunavik* or inuvialuit* or nunatsiavut*).ti,ab,kw,jn.
3. or/1-2
4. specialization/ or general practice/
5. exp physician/
6. ((resident* or fellow* or ((medicine or medical) adj1 graduate*) or physician* or clinician* or general practitioner* or family doctor* or family practice* or specialist* or obstetrician* or gyn?ecologist* or p?ediatrician* or internist* or surgeon* or neurosurgeon* or psychiatrist* or radiologist* or an?esthesiologist* or dermatologist* or oncologist* or rheumatologist* or neurologist* or pathologist* or cardiologist* or urologist* or geriatrician* or gerontologist* or gastroenterologist* or respirologist* or hematologist* or endocrinologist* or nephrologist* or physiatrist* or allergist* or intensivist* or otolaryngologist* or immunologist* or neuropathologist* or ophthalmologist*) adj5 (characteristic* or factor* or predictor* or attribute* or background* or socioeconomic* or sociodemographic* or neighborhood* or neighbourhood* or age* or sex or sexes or gender* or race* or ethnic* or education* or training or language* or francophone* or anglophone* or bilingual*)).ti,ab,kw.
7. or/4-6
8. professional practice/ or medical practice/
9. clinical practice/
10. career planning/
11. (career* adj2 (choice* or choos* or pattern* or selection* or location*)).ti,ab,kw.
12. (practice* adj2 (location* or setting* or professional* or choice* or choos*)).ti,ab,kw.

13. ((urban* or neighborhood* or neighbourhood* or rural* or remote*) adj2 (location* or practice* or choice* or choos*)).ti,ab,kw.
14. medically underserved/
15. vulnerable population/
16. ((underserv* or vulnerable* or disadvantag*) adj2 (region* or area* or location* or group* or population* or people or person* or patient*)).ti,ab,kw.
17. physician* shortage*.ti,ab,kw.
18. ((population* or group*) adj2 (served or serving)).ti,ab,kw.
19. immigrant/ or immigration/
20. exp refugee/
21. indigenous people/ or canadian aboriginal/ or first nation/
22. exp inuit/
23. poverty/
24. ((low* income* or poor* or poverty or immigrant* or refugee* or newcomer*) adj3 (population* or group* or people* or person* or patient*)).ti,ab,kw.
25. (indigenous* or inuit* or first nation* or Metis* or aboriginal*).ti,ab,kw.
26. or/8-25
27. 3 and 7 and 26
28. limit 27 to yr="2000 -Current"
29. limit 28 to (english or french)
30. (Letter or Editorial).pt.
31. abstract report/ or letter/
32. or/30-31
33. 29 not 32
34. limit 33 to (conference abstracts or embase)
Results: **4,297** references retrieved

ERIC (OVID, 1965 to September 2020)
1. (canad* or "british columbia" or "Colombie britannique" or alberta* or saskatchewan* or manitoba* or ontario* or quebec* or new brunswick or "nouveau brunswick" or "nova scotia" or "nouvelle ecosse" or "prince edward island" or newfoundland* or labrador* or nunavut* or nwt or "northwest territories" or yukon* or nunavik* or inuvialuit* or nunatsiavut*).tw,jn,jx,lo.
2. physicians/
3. specialization/
4. specialists/
5. "family practice (medicine)"/
6. ((resident* or fellow* or ((medicine or medical) adj1 graduate*) or physician* or clinician* or general practitioner* or family doctor* or family practice* or specialist* or obstetrician* or gyn?ecologist* or p?ediatrician* or internist* or surgeon* or neurosurgeon* or psychiatrist* or radiologist* or an?esthesiologist* or dermatologist* or oncologist* or rheumatologist* or neurologist* or pathologist* or cardiologist* or urologist* or geriatrician* or gerontologist* or gastroenterologist* or respirologist* or hematologist* or endocrinologist* or nephrologist* or physiatrist* or allergist* or intensivist* or otolaryngologist* or immunologist* or neuropathologist* or ophthalmologist*) adj5 (characteristic* or factor* or predictor* or attribute* or background* or socioeconomic* or sociodemographic* or neighborhood* or neighbourhood* or age* or sex or sexes or gender* or race* or ethnic* or education* or training or language* or francophone* or anglophone* or bilingual*)).tw.
7. or/2-6
8. career choice/ or career planning/
9. (career* adj2 (choice* or choos* or pattern* or selection* or location*)).tw.
10. (practice* adj2 (location* or setting* or professional* or choice* or choos*)).tw.
11. ((urban* or neighborhood* or neighbourhood* or rural* or remote*) adj2 (location* or practice* or choice* or choos*)).tw.
12. disadvantaged/ or economically disadvantaged/ or educationally disadvantaged/
13. physician* shortage*.tw.
14. ((underserv* or vulnerable* or disadvantag*) adj2 (region* or area* or location* or group* or population* or people or person* or patient*)).tw.
15. ((population* or group*) adj2 (served or serving)).tw.
16. exp immigrants/ or immigration/ or refugees/
17. indigenous populations/ or canada natives/
18. poverty/ or low income/ or low income groups/ or low income students/ or poverty areas/
19. ((low* income* or poor* or poverty or immigrant* or refugee* or newcomer*) adj3 (population* or group* or people* or person* or patient*)).tw.
20. (indigenous* or inuit* or first nation* or Metis* or aboriginal*).tw.
21. or/8-20
22. 1 and 7 and 21
23. limit 22 to yr="2000 -Current"
Results: **59** references retrieved

Education Source (EBSCOHost)

#	Query	Results
S1	TI (canad* or "british columbia" or "Colombie britannique" or alberta* or saskatchewan* or manitoba* or ontario* or quebec* or “new brunswick” or "nouveau brunswick" or "nova scotia" or "nouvelle ecosse" or "prince edward island" or newfoundland* or labrador* or nunavut* or nwt or "northwest territories" or yukon* or nunavik* or inuvialuit* or nunatsiavut*)) OR AB (canad* or "british columbia" or "Colombie britannique" or alberta* or saskatchewan* or manitoba* or ontario* or quebec* or “new brunswick” or "nouveau brunswick" or "nova scotia" or "nouvelle ecosse" or "prince edward island" or newfoundland* or labrador* or nunavut* or nwt or "northwest territories" or yukon* or nunavik* or inuvialuit* or nunatsiavut*)) OR KW (canad* or "british columbia" or "Colombie britannique" or alberta* or saskatchewan* or manitoba* or ontario* or quebec* or “new brunswick” or "nouveau brunswick" or "nova scotia" or "nouvelle ecosse" or "prince edward island" or newfoundland* or labrador* or nunavut* or nwt or "northwest territories" or yukon* or nunavik* or inuvialuit* or nunatsiavut*)) OR SO (canad* or "british columbia" or "Colombie britannique" or alberta* or saskatchewan* or manitoba* or ontario* or quebec* or “new brunswick” or "nouveau brunswick" or "nova scotia" or "nouvelle ecosse" or "prince edward island" or newfoundland* or labrador* or nunavut* or nwt or "northwest territories" or yukon* or nunavik* or inuvialuit* or nunatsiavut*))	82,467
S2	TI (((resident* or fellow* or ((medicine or medical) N1 graduate*) or physician* or clinician* or general practitioner* or family doctor* or family practice* or specialist* or obstetrician* or gyn?ecologist* or p?ediatrician* or internist* or surgeon* or neurosurgeon* or psychiatrist* or radiologist* or an?esthesiologist* or dermatologist* or oncologist* or rheumatologist* or neurologist* or pathologist* or cardiologist* or urologist* or geriatrician* or gerontologist* or gastroenterologist* or respirologist* or hematologist* or endocrinologist* or nephrologist* or physiatrist* or allergist* or intensivist* or otolaryngologist* or immunologist* or neuropathologist* or ophthalmologist*) N5 (characteristic* or factor* or predictor* or attribute* or background* or socioeconomic* or sociodemographic* or neighborhood* or neighbourhood* or age* or sex or sexes or gender* or race* or ethnic* or education* or training or language* or francophone* or anglophone* or bilingual*))) OR AB (((resident* or fellow* or ((medicine or medical) N1 graduate*) or physician* or clinician* or general practitioner* or family doctor* or family practice* or specialist* or obstetrician* or gyn?ecologist* or p?ediatrician* or internist* or surgeon* or neurosurgeon* or psychiatrist* or radiologist* or an?esthesiologist* or dermatologist* or oncologist* or rheumatologist* or neurologist* or pathologist* or cardiologist* or urologist* or geriatrician* or gerontologist* or gastroenterologist* or respirologist* or hematologist* or endocrinologist* or nephrologist* or physiatrist* or allergist* or intensivist* or otolaryngologist* or immunologist* or neuropathologist* or ophthalmologist*) N5 (characteristic* or factor* or predictor* or attribute* or background* or socioeconomic* or sociodemographic* or neighborhood* or neighbourhood* or age* or sex or sexes or gender* or race* or ethnic* or education* or training or language* or francophone* or anglophone* or bilingual*))) OR KW (((resident* or fellow* or ((medicine or medical) N1 graduate*) or physician* or clinician* or general practitioner* or family doctor* or family practice* or specialist* or obstetrician* or gyn?ecologist* or p?ediatrician* or internist* or surgeon* or neurosurgeon* or psychiatrist* or radiologist* or an?esthesiologist* or dermatologist* or oncologist* or rheumatologist* or neurologist* or pathologist* or cardiologist* or urologist* or geriatrician* or gerontologist* or gastroenterologist* or respirologist* or hematologist* or endocrinologist* or nephrologist* or physiatrist* or allergist* or intensivist* or otolaryngologist* or immunologist* or neuropathologist* or ophthalmologist*) N5 (characteristic* or factor* or predictor* or attribute* or background* or socioeconomic* or sociodemographic* or neighborhood* or neighbourhood* or age* or sex or sexes or gender* or race* or ethnic* or education* or training or language* or francophone* or anglophone* or bilingual*)))	19,483
S3	TI ((career* N2 (choice* or choos* or pattern* or selection* or location*))) OR AB ((career* N2 (choice* or choos* or pattern* or selection* or location*))) OR KW ((career* N2 (choice* or choos* or pattern* or selection* or location*)))	4,154
S4	TI ((practice* N2 (location* or setting* or professional* or choice* or choos*))) OR AB ((practice* N2 (location* or setting* or professional* or choice* or choos*))) OR KW ((practice* N2 (location* or setting* or professional* or choice* or choos*)))	10,427
S5	TI (((urban* or neighborhood* or neighbourhood* or rural* or remote*) N2 (location* or practice* or choice* or choos*))) OR AB (((urban* or neighborhood* or neighbourhood* or rural* or remote*) N2 (location* or practice* or choice* or choos*))) OR KW (((urban* or neighborhood* or neighbourhood* or rural* or remote*) N2 (location* or practice* or choice* or choos*)))	2,317
S6	TI "physician* shortage*" OR AB "physician* shortage*" OR KW "physician* shortage*"	39
S7	TI (((underserv* or vulnerable* or disadvantag*) N2 (region* or area* or location* or group* or population* or people or person* or patient*))) OR AB (((underserv* or vulnerable* or disadvantag*) N2 (region* or area* or location* or group* or population* or people or person* or patient*))) OR KW (((underserv* or vulnerable* or disadvantag*) N2 (region* or area* or location* or group* or population* or people or person* or patient*)))	6,599
S8	TI (((population* or group*) N2 (served or serving))) OR AB (((population* or group*) N2 (served or serving))) OR KW (((population* or group*) N2 (served or serving)))	1,187
S9	TI (((low* income* or poor* or poverty or immigrant* or refugee* or newcomer*) N3 (population* or group* or people* or person* or patient*))) OR AB (((low* income* or poor* or poverty or immigrant* or refugee* or newcomer*) N3 (population* or group* or people* or person* or patient*))) OR KW (((low* income* or poor* or poverty or immigrant* or refugee* or newcomer*) N3 (population* or group* or people* or person* or patient*)))	9,460
S10	TI ((indigenous* or inuit* or "first nation*" or Metis* or aboriginal*)) OR AB ((indigenous* or inuit* or "first nation*" or Metis* or aboriginal*)) OR KW ((indigenous* or inuit* or "first nation*" or Metis* or aboriginal*))	16,673

S11	(DE "Immigrants" OR DE "Children of immigrants" OR DE "Immigrant students" OR DE "Undocumented immigrants") OR (DE "Refugee children")	12,569
S12	S3 OR S4 OR S5 OR S6 OR S7 OR S8 OR S9 OR S10 OR S11	60,886
S13	S1 AND S2 AND S12	80
S14	S1 AND S2 AND S12 Limiters: Published Date: 2000 01 01-2020 12 31 Source Types: Academic Journals Conference Papers	73

Results: **73** references retrieved

Scopus

(TITLE-ABS-KEY (canad* OR "british columbia" OR "Colombie britannique" OR alberta* OR saskatchewan* OR manitoba* OR ontario* OR quebec* OR "new brunswick" OR "nouveau brunswick" OR "nova scotia" OR "nouvelle ecosse" OR "prince edward island" OR newfoundland* OR labrador*)) AND ((TITLE-ABS-KEY (((medicine OR medical) W/1 graduate*) W/5 (characteristic* OR factor* OR predictor* OR attribute* OR background* OR socioeconomic* OR sociodemographic* OR neighborhood* OR neighbourhood* OR age* OR sex OR sexes OR gender* OR race* OR ethnic* OR education* OR training OR language* OR francophone* OR anglophone* OR bilingual*))) OR (TITLE-ABS-KEY ((resident* OR fellow*) W/5 (characteristic* OR factor* OR predictor* OR attribute* OR background* OR socioeconomic* OR sociodemographic* OR neighborhood* OR neighbourhood* OR age* OR sex OR sexes OR gender* OR race* OR ethnic* OR education* OR training OR language* OR francophone* OR anglophone* OR bilingual*))) OR (TITLE-ABS-KEY ((physician* OR clinician* OR "general practitioner*") W/5 (characteristic* OR factor* OR predictor* OR attribute* OR background* OR socioeconomic* OR sociodemographic* OR neighborhood* OR neighbourhood* OR age* OR sex OR sexes OR gender* OR race* OR ethnic* OR education* OR training OR language* OR francophone* OR anglophone* OR bilingual*))) OR (TITLE-ABS-KEY (("family doctor*" OR "family practice*" OR specialist*) W/5 (characteristic* OR factor* OR predictor* OR attribute* OR background* OR socioeconomic* OR sociodemographic* OR neighborhood* OR neighbourhood* OR age* OR sex OR sexes OR gender* OR race* OR ethnic* OR education* OR training OR language* OR francophone* OR anglophone* OR bilingual*))) OR (TITLE-ABS-KEY ((obstetrician* OR internist* OR surgeon* OR neurosurgeon* OR psychiatrist* OR radiologist* OR dermatologist* OR oncologist* OR rheumatologist* OR neurologist* OR pathologist* OR cardiologist* OR urologist* OR geriatrician* OR gerontologist* OR gastroenterologist* OR respirologist* OR hematologist* OR endocrinologist* OR nephrologist* OR physiatrist* OR allergist* OR intensivist* OR otolaryngologist* OR immunologist* OR neuropathologist* OR ophthalmologist*) W/5 (characteristic* OR factor* OR predictor* OR attribute* OR background* OR socioeconomic* OR sociodemographic* OR neighborhood* OR neighbourhood* OR age* OR sex OR sexes OR gender* OR race* OR ethnic* OR education* OR training OR language* OR francophone* OR anglophone* OR bilingual*))) OR (TITLE-ABS-KEY (("gyn$ecologist*" OR "p$ediatrician*" OR "an?esthesiologist*") W/5 (characteristic* OR factor* OR predictor* OR attribute* OR background* OR socioeconomic* OR sociodemographic* OR neighborhood* OR neighbourhood* OR age* OR sex OR sexes OR gender* OR race* OR ethnic* OR education* OR training OR language* OR francophone* OR anglophone* OR bilingual*)))) AND ((TITLE-ABS-KEY ((career* W/2 (choice* OR choos* OR pattern* OR selection* OR location*)))) OR (TITLE-ABS-KEY ((practice* W/2 (location* OR setting* OR professional* OR choice* OR choos*)))) OR (TITLE-ABS-KEY (((urban* OR neighborhood* OR neighbourhood* OR rural* OR remote*) W/2 (location* OR practice* OR choice* OR choos*)))) OR (TITLE-ABS-KEY ("physician* shortage*")) OR (TITLE-ABS-KEY (((underserv* OR vulnerable* OR disadvantag*) W/2 (region* OR area* OR location* OR group* OR population* OR people OR person* OR patient*)))) OR (TITLE-ABS-KEY (((population* OR group*) W/2 (served OR serving)))) OR (TITLE-ABS-KEY ((("low* income*" OR poor* OR poverty OR immigrant* OR refugee* OR newcomer*) W/3 (population* OR group* OR people* OR person* OR patient*)))) OR (TITLE-ABS-KEY ((indigenous* OR inuit* OR "first nation*" OR metis* OR aboriginal*)))) AND (LIMIT-TO (PUBYEAR , 2020) OR LIMIT-TO (PUBYEAR , 2019) OR LIMIT-TO (PUBYEAR , 2018) OR LIMIT-TO (PUBYEAR , 2017) OR LIMIT-TO (PUBYEAR , 2016) OR LIMIT-TO (PUBYEAR , 2015) OR LIMIT-TO (PUBYEAR , 2014) OR LIMIT-TO (PUBYEAR , 2013) OR LIMIT-TO (PUBYEAR , 2012) OR LIMIT-TO (PUBYEAR , 2011) OR LIMIT-TO (PUBYEAR , 2010) OR LIMIT-TO (PUBYEAR , 2009) OR LIMIT-TO (PUBYEAR , 2008) OR LIMIT-TO (PUBYEAR , 2007) OR LIMIT-TO (PUBYEAR , 2006) OR LIMIT-TO (PUBYEAR , 2005) OR LIMIT-TO (PUBYEAR , 2004) OR LIMIT-TO (PUBYEAR , 2003) OR LIMIT-TO (PUBYEAR , 2002) OR LIMIT-TO (PUBYEAR , 2001) OR LIMIT-TO (PUBYEAR , 2000)) AND (LIMIT-TO (DOCTYPE , "ar") OR LIMIT-TO (DOCTYPE , "re") OR LIMIT-TO (DOCTYPE , "cp") OR LIMIT-TO (DOCTYPE , "no") OR LIMIT-TO (DOCTYPE , "sh") OR LIMIT-TO (DOCTYPE , "Undefined")) AND (LIMIT-TO (LANGUAGE , "English") OR LIMIT-TO (LANGUAGE , "French"))

Results: **1,007** references retrieved

The total number of references retrieved is 7,672. Using Covidence's automatic duplicate removal feature, 1,519 duplicate records were removed. Which leaves **6,153 references** for the screening phase**.**

Appendix B. Preferred Reporting Items for systematic reviews and meta-analyses extension for scoping reviews (PRISMA-ScR) Checklist

Section	Item	PRISMA-scr checklist item	Reported on page #
Title			
Title	1	Identify the report as a scoping review.	1
Abstract			
Structured summary	2	Provide a structured summary that includes (as applicable): background, objectives, eligibility criteria, sources of evidence, charting methods, results, and conclusions that relate to the review questions and objectives.	1
Introduction			
Rationale	3	Describe the rationale for the review in the context of what is already known. Explain why the review questions/objectives lend themselves to a scoping review approach.	2
Objectives	4	Provide an explicit statement of the questions and objectives being addressed with reference to their key elements (e.g., population or participants, concepts, and context) or other relevant key elements used to conceptualize the review questions and/or objectives.	2
Methods			
Protocol and registration	5	Indicate whether a review protocol exists; state if and where it can be accessed (e.g., a Web address); and if available, provide registration information, including the registration number.	2
Eligibility criteria	6	Specify characteristics of the sources of evidence used as eligibility criteria (e.g., years considered, language, and publication status), and provide a rationale.	2
Information sources*	7	Describe all information sources in the search (e.g., databases with dates of coverage and contact with authors to identify additional sources), as well as the date the most recent search was executed.	2,3
Search	8	Present the full electronic search strategy for at least 1 database, including any limits used, such that it could be repeated.	Appendix
Selection of sources of evidence†	9	State the process for selecting sources of evidence (i.e., screening and eligibility) included in the scoping review.	3
Data charting process‡	10	Describe the methods of charting data from the included sources of evidence (e.g., calibrated forms or forms that have been tested by the team before their use, and whether data charting was done independently or in duplicate) and any processes for obtaining and confirming data from investigators.	3
Data items	11	List and define all variables for which data were sought and any assumptions and simplifications made.	3
Critical appraisal of individual sources of evidence§	12	If done, provide a rationale for conducting a critical appraisal of included sources of evidence; describe the methods used and how this information was used in any data synthesis (if appropriate).	N/A
Synthesis of results	13	Describe the methods of handling and summarizing the data that were charted.	3
Results			
Selection of sources of evidence	14	Give numbers of sources of evidence screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally using a flow diagram.	3,4
Characteristics of sources of evidence	15	For each source of evidence, present characteristics for which data were charted and provide the citations.	-
Critical appraisal within sources of evidence	16	If done, present data on critical appraisal of included sources of evidence (see item 12).	N/A
Results of individual sources of evidence	17	For each included source of evidence, present the relevant data that were charted that relate to the review questions and objectives.	-
Synthesis of results	18	Summarize and/or present the charting results as they relate to the review questions and objectives.	3-5,Appendix
Discussion			
Summary of evidence	19	Summarize the main results (including an overview of concepts, themes, and types of evidence available), link to the review questions and objectives, and consider the relevance to key groups.	5,6
Limitations	20	Discuss the limitations of the scoping review process.	6
Conclusions	21	Provide a general interpretation of the results with respect to the review questions and objectives, as well as potential implications and/or next steps.	6
Funding			
Funding	22	Describe sources of funding for the included sources of evidence, as well as sources of funding for the scoping review. Describe the role of the funders of the scoping review.	6

JBI = Joanna Briggs Institute; PRISMA-ScR = Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews.

* Where *sources of evidence* (see second footnote) are compiled from, such as bibliographic databases, social media platforms, and Web sites.

† A more inclusive/heterogeneous term used to account for the different types of evidence or data sources (e.g., quantitative and/or qualitative research, expert opinion, and policy documents) that may be eligible in a scoping review as opposed to only studies. This is not to be confused with *information sources* (see first footnote).

‡ The frameworks by Arksey and O'Malley (6) and Levac and colleagues (7) and the JBI guidance (4, 5) refer to the process of data extraction in a scoping review as data charting.

§ The process of systematically examining research evidence to assess its validity, results, and relevance before using it to inform a decision. This term is used for items 12 and 19 instead of "risk of bias" (which is more applicable to systematic reviews of interventions) to include and acknowledge the various sources of evidence that may be used in a scoping review (e.g., quantitative and/or qualitative research, expert opinion, and policy document). *From:* Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, et al. PRISMA Extension for Scoping Reviews (PRISMAScR): Checklist and Explanation. Ann Intern Med. 2018;169:467–473. doi: 10.7326/M18-0850.

Appendix C. Tables

Table 2. Distribution of included literature based on practice

Practice Patterns	**Education**		**Physician attributes**	
	# Studies (*n*)	**Proportion (%)**	**# Studies (*n*)**	**Proportion (%)**
Practice setting	**50**	**81**	**37**	**64**
Rural	29	47	24	41
Location of practice*	22	35	13	22
International mobility	4	6	3	5
Underserviced area	1	2	1	2
Practice environment (e.g., community centre)	–	–	1	2
Career choice	**14**	**23**	**13**	**22**
Specialty/sub-specialty	9	15	9	16
Family Medicine/General practice	7	11	5	9
Population served	**6**	**10**	**13**	**22**
Patients in long term care	4	6	3	5
Patients with specific complex care needs (e.g., HIV, hepatitis C, ASD, seniors)	1	2	4	7
Patients with mental health/addictions	–	–	3	5
Immigrants	–	–	2	3
Indigenous patients	1	2	–	–
Patients with low SES	1	2	–	–
Vulnerable patients (general)	–	–	1	2
*Comprises practice in location of training, and practice in a specific region or province.				

Table 3. Associations between education and practice setting

Education	Positive Association	Negative Association	Mixed/Unspecified/No Association
Practice in rural settings			
Undergraduate medical school			
Specific medical school vs. other medical school (school in parentheses)	**6** Rourke et al[29] (MUN) Rourke et al[30] (MUN) Snadden et al[31] (UBC) Lovato et al[16] (UBC) Wenghofer et al[32] (NOSM) Hogenbirk et al[33] (NOSM)	**0**	**2** Hutten-Czapiski et al[34] Shepherd et al[35] (UWO)
International vs. Canadian medical school	**3** Thind et al[36] Buske[37] Schroeder et al[38]	**0**	**0**
Non-Ontario vs. Ontario medical schools	**1** Rourke et al[39]	**0**	**0**
Undergraduate medical school curriculum			
Rural vs. non-rural curriculum	**4** Szafran et al[40] Orzanco et al[41] Tate & Aoki[42] Rourke et al[39]	**1** Sempowski et al[43]	**0**
Postgraduate medical school			
Specific medical school vs. other medical school (school or program in parentheses)	**10** Rourke et al[29] (MUN) Mathews et al[44] (MUN) Rourke et al[30] (MUN) Mathews et al[45] (MUN) Mathews et al[46] (MUN) Heng et al[47] (NOFM) Hogenbirk et al[33] (NOSM)	**0**	**3** Shepherd et al[35] (UWO) Wenghofer et al[32] (NOSM) Hutten-Czapiski et al[34]

	Jamieson et al[48] (UBC-Distributed campus) Hogenbirk et al[49] (NOPS) Godwin et al[50] (NOSM & QU)		
Rural vs urban site	**1** Myhre et al[51]	**0**	**0**
Postgraduate medical curriculum			
Rural exposure vs. no rural exposure	**3** Szafran et al[40] Rourke et al[39] Tate & Aoki[42]	**1** Sempowski et al[43]	**1** Woloschuk et al[52]
Postgraduate training type			
Family medicine with additional specialty year vs family medicine training with no additional specialty year (training type in parentheses)	**2** Green et al[53] (Anesthesia, NOFMP & NOMP) Hutten-Czapiski et al[34]	**1** Hutten-Czapiski et al[34] (EM)	**1** Casson et al[54] (EM)
Extra training vs. no extra training	**1** Sempowski et al[43] (Anesthesia & Obstetrical)	**0**	**1** Sempowski et al[43] (EM)
Other characteristics			
Skills enrichment program vs. no skills enrichment program	**1** Gorsche et al[55]	**0**	**0**
Mentorship role model vs. no role model	**0**	**0**	**1** Mitra et al[56]
Practice in location of training			
Undergraduate medical school			
Specific medical school vs. other medical school (school in parentheses)	**9** Suess et al[57] (Quebec) Suess et al[58] (Quebec) Rourke et al[29] (MUN) Fleming et al[59] (MUN) Mathews et al[60] (MUN) Mathews et al[61] (MUN) Cottrell et al[62] Hogenbirk et al[33] (NOSM) Woolley et al[63]	**0**	**2** Wenghofer et al[32] (NOSM) McCready et al[64]

	(NOSM)		
Undergraduate medical curriculum			
Rural exposure vs. no rural exposure	**1** Bustinza et al[65]	**0**	**0**
New Brunswick exposure vs. no New Brunswick exposure	**1** Landry et al[66]	**0**	**1** Schofield et al[67]
Multiple NOMP placements vs. single NOMP placement	**1** McCready et al[64]	**0**	**0**
Postgraduate medical school			
Specific medical school vs. other medical school (school in parentheses)	**11** Raghavan et al[68] (UofM) Rourke et al[29] (MUN) Heng et al[47] (NOFM) Wenghofer et al[32] (NOSM) Hogenbirk et al[33] (NOSM) Woolley et al[63] (NOSM) Mathews et al[69] (MUN) Mathews et al[46] (MUN) Hogenbirk et al[49] (NOPS) Landry et al[66] Cottrell et al[62]	**0**	**2** Fleming & Mathews[59] (MUN) Ryan & Stewart[70]
Postgraduate medical curriculum			
Training in region vs. no training in region	**1** Bustinza et al[65]	**0**	**0**
New Brunswick exposure vs. no New Brunswick exposure	**1** Schofield et al[67]	**0**	**0**
Multiple NOMP placements vs. single NOMP placement	**0**	**0**	**1** McCready et al[64]
Other characteristics			
1-year vs. 3-month IMG program	**1** Mowat et al[71]	**0**	**0**
RFS agreement vs. no RFS agreement	**1** Mathews et al[72]	**0**	**0**
1 year mentorship program vs. no mentorship program	**0**	**0**	**1** Mowat al[71]
International mobility			

Undergraduate medical school			
Specific medical school vs. other medical school (school in parentheses)	**1** Philips et al[73] (McGill, UofT, UofM)	**1** Mathews et al[61] (MUN)	
Postgraduate medical school			
Specific medical school vs. other medical school (school in parentheses)	**0**	**2** Mathews et al[46] (MUN) Mathews et al[69] (MUN)	**0**
Underserviced area			
Undergraduate medical curriculum			
Outreach activities included vs. no outreach activities	**0**	**0**	**1** Hodges et al[74]
Postgraduate medical curriculum			
Rural or northern experience vs. no rural or northern experience	**1** Hodges et al[74]	**0**	**0**

Table 4. Associations between (i) education and career choice and (ii) education and population sessions

Education	Positive Association	Negative Association	Mixed/Unspecified/No Association
Career choice			
Specialty/sub-specialty			
Undergraduate medical school			
Specific medical school vs. other medical school (school in parentheses)	**0**	**0**	**1** Gagne & Leger[75]
Undergraduate medical curriculum			
Specialty experience vs. other experiences	**1** Manassis et al[76]	**0**	**1** Horn et al[77]
Positive clinical experiences vs. other experiences	**0**	**0**	**1** Kuroweck et al[78]
Postgraduate medical school			
Specific medical school vs. other medical school (school in parentheses)	**2** Hameed et al[79] (Northern) Sivachandran et al[80] (McGill, UofT, UWO, USask)	**0**	**1** Shepherd & Burden[35]
Postgraduate medical curriculum			
Exposure to subspecialty vs. no exposure to subspecialty (subspecialty in parentheses)	**1** Katz & Yacyshyn[81] (Rheumatology)	**0**	**1** Horn et al[77]
Postgraduate program size			
Large vs. small program	**1** Hameed et al[79]	**0**	**0**
Other characteristics			
Mentorship vs. no mentorship	**3** Noble[82] Fernando et al[83] Kurowecki et al[78]	**0**	**0**
Family medicine/general practice			
Undergraduate medical school			
Specific medical school vs. other medical school (school in parentheses)	**3** Lovato et al[16] (UBC-Distributed) Snadden et al[31] (UBC-Distributed) Strasser et al[84] (NOSM)	**0**	**2** Shepherd & Burden[35] (UWO) Gagne & Leger[75]
International vs. Canadian medical school	**1** Mok et al[85]	**0**	**0**
Postgraduate medical school			
Specific medical school vs. other medical school (school in parentheses)	**0**	**0**	**1** Shepherd & Burden[35] (UWO)
Other characteristics			
Role model vs. no role model	**0**	**0**	**1** Mitra et al[56]
Population served			

Patients in long-term care			
Undergraduate medical school			
Canadian vs. non-Canadian medical school	**1** Lam et al[86]	**0**	**0**
Postgraduate medical school			
Rural vs. urban stream	**1** Myhre et al[51]	**0**	**0**
Post graduate training type			
Specific vs. non-specific training (training type in parentheses)	**2** Green et al[53] (EM, elderly, NOFMP/NOMP) Chan[87] (CCFP)	**1** Chan[87] (CCFP-EM)	**0**
Indigenous patients			
Postgraduate medical school			
Rural vs. urban stream	**1** Myhre et al[51]	**0**	**0**
Patients with complex care needs			
Postgraduate training type			
Child development training vs. no child development training	**1** Penner et al[88]	**0**	**0**
Low SES patients			
Postgraduate training type			
Family Medicine training vs. other specialty training	**0**	**0**	**1** Jaakkimainen et al[89]

Table 5. Associations between physician attributes and practice

Attribute	Positive Association	Negative Association	Mixed/Unspecified/No Association
Practice in rural settings			
Sex/gender			
Male vs. Female	**5** Jamieson et al[48] Rourke et al[39] Mathews et al[90] Tate & Aoki[42] Sempowski et al[43]	**0**	**10** Shepherd & Burden[35] Mathews et al[44] Schroeder et al[38] Hogenbirk et al[33] Orzanco et al[41] Mitra et al[56] Woloschuk et al[52] Mathews et al[45] Lovato et al[16] Hutten-Czapski & Thurber[34]
Female vs. Male	**0**	**1** Hogenbirk et al[49]	**0**
Age characteristics			
Older vs. Younger	**6** Schroeder et al[38] Mitra et al[56] Sempowski et al[43] Wenghofer et al[32] Hutten-Czapski & Thurber[34] Lovato et al[16]	**0**	**7** Mathews et al[45] Orzanco et al[41] Jamieson et al[48] Woloschuk et al[52] Lovato et al[16] Mathews et al[44] Tate & Aoki[42]
Cohort year			
Earlier vs. Later graduation year	**3** Mathews et al[44] Tate & Aoki[42] Kurdyak et al[91]	**0**	**3** Shepherd & Burden[35] Rourke et al[39] Freeman et al[92]
Graduation in 1990s vs. Before or after 1990s	**1** Mathews et al[45]	**0**	**0**
Fewer vs. More years	**1** Mathews et al[90]	**0**	**0**
Geographic background/region of origin			

Rural vs. Urban	**15** Woloschuk et al[93] Mathews et al[44] Chan et al[94] Szafran et al[40] Hogenbirk et al[33] Orzanco et al[41] Jamieson et al[48] Mitra et al[56] Woloschuk et al[52] Beauchamp et al[95] Rourke et al[39] Tate & Aoki[42] Mathews et al[45] Lovato et al[16] Mathews et al[46]	**0**	**2** Shepherd & Burden[35] Sempowski et al[43]
Language spoken			
French vs. English	**0**	**0**	**1** Hogenbirk et al[33]
Practice in a specific region or province			
Sex/gender			
Male vs. Female	**0**	**0**	**8** Mathews et al[72] Landry et al[66] Hogenbirk et al[33] Suess et al[58] Mathews et al[69] Fleming & Mathews[59] Mccready et al[64] Mathews et al[46]
Age characteristics			
Age	**0**	**0**	**4** Suess et al[58] Mathews et al[69] Mathews et al[46] Fleming & Mathews[59]
Cohort year			
Earlier graduation year vs. Later graduation year	**0**	**1** Suess et al[57]	**1** Mathews et al[72]
Graduation in 2000s vs. Before or after 2000s	**1** Mathews et al[46]	**0**	**0**
Earlier graduation cohort vs later graduation cohort			**2** Jaakkimainen et al[89] Fleming & Mathews[59]
More than ten years vs. Fewer than ten years in practice	**1** Bustinza et al[65]	**0**	**1** Landry et al[66]
More vs. Fewer years since graduation	**0**	**1** Mowat et al[71]	**0**
Geographic background/region of origin			

Physicians practicing in the same region as their origin vs. Physicians practicing in a different region (region in parentheses)	**4** Suess et al[57] (Quebec) Bustinza et al[65] (St. Lawrence Region) Mathews et al[46] (Rural) Mathews et al[69] (Rural, Newfoundland and Labrador)	**1** Hodges et al[74]	**3** Landry et al[66] Mathews et al[72] Suess et al[58]
Language spoken			
French vs. Non-French	**0**	**0**	**1** Hogenbirk et al[33]
Practice in underserviced areas			
Sex/gender			
Male vs. Female	**0**	**0**	**1** Hodges et al[74]
Age characteristics			
Younger vs. Older	**0**	**0**	**1** Hodges et al[74]
International mobility			
Sex/gender			
Female vs. Male	**0**	**2** Mathews et al[69] Mathews et al[46]	**0**
Age characteristics			
Age	**0**	**0**	**2** Mathews et al[69] Mathews et al[46]
Cohort year			
Earlier vs. Later graduation year	**0**	**1** Mathews et al[69]	**0**
Graduation after 1979 vs. Graduation before 1979	**0**	**1** Mathews et al[46,61]	**0**
Started residency in 1990s vs. Before	**0**	**1** Mathews et al[61]	**0**
Geographic background/region of origin			
Canadian vs. Non-Canadian	**0**	**1** Mathews et al[69]	**0**
Rural vs. Urban	**0**	**1** Mathews et al[46]	**0**
Practice in specific practice environments			
Cohort year			
Earlier vs. Later cohort	**0**	**0**	**1** Harneed et al[79] (community practice)

Table 6. Associations between (i) physician attributes and career choice and (ii) physician attributes and populations served

Attribute	Positive Association	Negative Association	Mixed/Unspecified/ No Association
Career choice			
Choosing to practice in a specific specialty			
Sex/gender			
Male vs. female (sub-outcome in parentheses)	**1** Horn et al[77] (Procedural based specialties)	**0**	**5** Shepherd & Burden[35] (Emergency medicine) Sivachandran et al[80] (Ophthalmology) Kurowecki et al[78] (Diagnostic radiology) Noble et al[96] (Ophthalmology) Garfinkel et al[97] (Psychiatry)
Female vs. male (sub-outcome in parentheses)	**1** Hogenbirk et al[49] (Non-surgical specialty)	**0**	**0**
Age characteristics			
Younger vs. older	**1** Chan[98] (Emergency medicine)	**0**	**0**
Cohort year			
Earlier vs. later graduation year (sub-outcome parentheses)	**1** Compeau et al[99] (General surgery)	**0**	**1** Shepherd & Burden[35] (Emergency Medicine)
Geographic background/region of origin			
Large vs. small hometown/community	**0**	**0**	**2** Shepherd & Burden[35] (Emergency Medicine) Horn et al[77] (Procedural-based specialities)
Choosing to practice in family medicine			
Sex/gender			
Female vs. male	**1** Snadden et al[31]	**0**	**2** Shepherd & Burden[35] Gagne & Leger[75]
Age characteristics			
Older vs. younger	**1** Mitra et al[56]	**0**	**1** Gagne & Leger[75]
Cohort year			
Later graduation year vs. earlier graduation year	**0**	**0**	**2** Mok et al[85] (mixed) Shepherd & Burden[35]
Geographical background/region of origin			
Large vs. small hometown/community	**0**	**0**	**1**

			Shepherd & Burden[35]
Languages spoken			
French vs/ non-French	**1** Gagne & Leger[75]	**0**	**0**
Populations served			
Patients with complex care needs			
Sex/gender			
Male vs/ female	**2** Cox et al[100] (HCV) Hansen et al[101] (HIV)	**0**	**2** Penner et al[88] (ASD) Guenter & Scott[102] (HIV)
Age characteristics			
Older vs. younger	**1** Cox et al[100]	**1** Guenter & Scott[102]	**1** Penner et al[88]
Cohort year			
Number of years in practice	**0**	**0**	**1** Penner et al[88]
Patients in long term care			
Sex/gender			
Male vs. female	**1** Lam et al[86]	**0**	**1** Chan[87]
Age characteristics			
Older vs. younger	**1** Lam et al[86]	**0**	**1** Chan[87]
Cohort year			
Earlier vs. later cohort	**0**	**2** Freeman et al[92] Chan[87]	**0**
Patients with mental health/addictions			
Sex/gender			
Male vs. female	**1** Garfinkel et al[97]	**0**	**1** Fleury et al[103]
Age characteristics			
Younger vs. older	**1** Garfinkel et al[97]	**0**	**1** Fleury et al[103]
Medical school graduation characteristics			
More vs. fewer years since graduation	**1** Fleury et al[104]	**0**	**0**
Immigrants			
Sex/gender			
Female vs. male	**1** Kamrul[105]	**0**	**1** Pottie & Swinkels[106]
Age characteristics			
Younger vs. older	**1** Kamrul[105]	**1** Pottie & Swinkels[106]	**0**
Languages spoken			

More than one vs. only one	**1** Pottie & Swinkels[106]	**0**	**0**
Vulnerable patients (general)			
Medical school graduation timing characteristics			
Less than five years vs. more than five years in practice	**1** Breton et al[107]	**0**	**0**