A Step-by-Step Process for Assessing the Economic Impact of Regional Medical Campuses in Canada

Geneviève Maltais Lapointe MA; Kim Lemky PhD; Pierre Gagne MD; Jill Konkin MD; Karl Stobbe MD; Gervan Fearon PhD

Abstract

Background: Regional medical campuses create positive economic impacts in rural communities and small cities. They increase educational capacity, medical services, and address the shortage or maldistribution of physicians in these areas. Our paper answers the question: How do you assess the economic impact of a regional medical campus?

Methods: The Canadian Input-Output model and the Simplified American Council on Education model are adapted to assess the economic impact of an individual regional medical campus using a step-by-step process. The models are tested using data from three Canadian medical schools and their regional campuses.

Results: A comparison of the two models found similarities with data requirements. However, the Canadian Input-Output model calculations use North American Industry Classification System multipliers thus calculations are more complex. The outputs in this model result in a single number for each economic category. The Simplified American Council on Education model, in contrast, applies a single multiplier of 1.5 to all categories, which results in a single number output for each category and a cumulative total of all impacts by summing outputs.

Conclusion: Both models successfully assess economic impacts of regional medical campuses. The step-by-step process allows administrators and others to understand the limitations of each model, but also facilitates an in-house economic assessment. The authors provide guidance on choosing the best model.

Introduction

Regional medical campuses (RMCs), i.e., instructional sites that are distinct from the central/administrative campus, are areas of growth in medical education in Canada and elsewhere.[1-3] A call to action by the American Association of Medical Colleges (AAMC) in 2006 led to a recognition that strategies are needed to address the maldistribution of physicians.[1] The benefits of RMCs include reducing physician shortages outside of large urban centres, and strengthening medical facilities in underserved areas.[1] RMCs also diversify student training to meet the needs of diverse cultures, communities, and locales.[4-6] RMCs help to meet social accountability mandates and expand the teaching capacity of medical schools; furthermore, these new medical education opportunities create positive economic impacts in the regions where they are located.[1, 4]

Geneviève Maltais Lapointe MA, Research Analyst, Institutional Data & Analysis, Brandon University, LapointeG@BrandonU.ca
Kim Lemky PhD, School of Business and Leadership, Aurora College, KLemky@AuroraCollege.NT.ca
Pierre Gagne MD, MSc, FRCP(C) Founding Regional Dean, Campus de l'Université de Montréal en Mauricie, Québec. PE.Gagne@gmail.com
Jill Konkin MD, Professor, Family Medicine, Faculty of Medicine & Dentistry, University of Alberta, Edmonton AB DKonkin@UAlberta.ca
Karl Stobbe MD, Clinical Professor, Department of Family Medicine, Michael G. DeGroote School of Medicine, McMaster University, Saint Catharines, Ontario StobbeK@Mcmaster.ca
Gervan Fearon PhD, President, George Brown College, Toronto, Ontario Gervan.Fearon@GeorgeBrown.ca
Corresponding author: Kim Lemky PhD, School of Business and Leadership, Aurora College, Bag 9700, 5004-54th Street, Yellowknife, NT, X1A 2R3 KLemky@AuroraCollege.NT.ca Cell Number : 204-441-0032 Fax : Unavailable

Canada responded to pressures to increase the number of physicians practicing in rural areas and to diversify medical education beyond large urban centres by increasing medical educational capacity. These strategies include increasing the number of RMCs, but also developing opportunities for training medical students outside of major urban areas. Enrollment into Canadian RMCs on specific campuses increased substantially, from 152 students in 2005[1] to 1700 in 2020.[2] Opportunities are also available to hundreds of students at dozens of locations that support approximately a year of longitudinal integrated clerkships (LIC).[3] Currently, all medical students in Canada train off the main campus at some point during their training.[4]

These RMCs may fall into four different models: basic science, clinical, longitudinal, or combined.[1] Some medical schools increased class sizes at main campuses and other medical schools created new RMCs.[1-3] Areas of concern identified by the Group on Regional Medical Campuses (GRMC) (a working group that is part of the AAMC) include: a) pedagogical success, b) quality of medical practice, c) health care access and d) local economic development.[5] Measuring the impact of RMCs improves our understanding of how to increase their positive outcomes through education and as economic drivers.[5, 7] A literature review identified four major themes focused on RMCs: workforce, social accountability, rural medical education, and rural versus urban settings.[1] There is a gap in research on financial and local economic impact of RMCs or distributed medical education.[8]

Economic impact measurement and analysis of regional medical campuses provides information required for decision-making for government, educational, and regional partners. This data helps to support the securing of needed investment and increases to operating budgets.[8] As well, economic information accounts for the spillover benefits extending beyond students graduating from the program. RMCs have significant public and community health benefits and regional development benefits, beyond any monetary amount tabulated in this paper.[1,2,4-8] These benefits warrant further study, and the authors recognize that the economic impact analysis shared in this paper only partially captures the benefits, but is still essential in assuring the development and perpetuity of RMCs.

The purpose of this paper is to explain and demonstrate, using data from several medical schools, the application of two methodologies to assess the economic impacts of RMCs. The authors' previous review of models used for measuring and assessing economic impacts of RMCs[8] formed the basis of the choice of these two models. In that study, given the availability of data, the models determined most suitable to assess RMCs are the Canadian Input-Output (I-O) model and the Simplified American Council on Education (ACE) model (two input-output models). The information included here provides a guide for RMC program administrators and others to choose a model to assess their economic impact. The data used to test the two models came from three Canadian RMCs, covering a range of programs from an individual campus to a longitudinal clerkship.

Literature Review

Few publications exist that measure the economic impact of RMCs for the Canadian context. The Canadian studies found in the literature include a Canada-wide study measuring the economic impact of medical education and health science partners,[9] another specific to the Northern Ontario School of Medicine and its RMCs[10] and an unpublished document regarding healthcare in a rural Manitoba region.[11] This paper builds on the authors' previous publication and recommends creating an accessible and reliable method to measure the economic impact of distributed medical education through the RMC to provide information for regional and rural community development, policy development, and return on investment.[8] These new RMCs not only increase capacity to existing medical programs, but also generate economic benefits in smaller centres and can help boost small community economies.

Measuring the impact of RMCs is complex. Surveys of key community leaders, the business community, and university managers provide insight into social, health, and other qualitative impacts.[10-11] Economic impact surveys collect quantitative data on spending by students, faculty, staff, and visitors; however, it may be difficult to find an adequate sample of participants who also keep meticulous records of all

aspects of spending over the years of study. Other spending data collected on graduates captures the impact of former students who remain in the region after graduation. In this paper, we assess the two main models used by post-secondary institutions to measure economic impact, adjusted for a single program. The model data includes estimates of spending by students and visitors found on websites, and institutional financial records.[8]

The facilities used for training in RMCs range from a full regional medical campus with fit-for-purpose buildings in a mid-size city to a single clinic in a small community (longitudinal integrated clerkships).[1] Programs may include classroom teaching and video conferencing from the main campus. Students complete their medical training for their undergraduate degree at a regional medical campus, or take a portion (i.e., eight weeks to a full year) of their training at a facility distant from the main campus at a clinic, hospital, or public health unit in a rural community. Given the challenges of measuring economic impacts of diverse programs, researchers instead focused on key economic impact variables common to each program: students, visitors, and institutional spending; alumni and potential research impact.

Economic assessments of RMCs need to focus on their location, i.e., small and mid-size cities, community-based, and rural programs.[1] This requires a range of data to evaluate, understand, and be useful in decision-making. Economic information provides valuable input into continuity and the impact of a change to these programs.

Choosing an Economic Model to Assess RMC

One of the challenges to assessing the economic impact of RMCs is the diversity of programs, e.g., longitudinal integrated clerkships, shorter rural medicine placements, and complete regional medical campuses.[1] The Canadian Medical Education Journal published an evaluation of models with the potential to assess the economic impacts of RMCs.[8] The study found that universities apply either the Simplified ACE model or the Canadian I-O model to assess university-wide impacts in Canada.[8] The economic impact reports provide specific information on university impacts, but they do not provide detailed information on how to gather data (and challenges to finding it), economic impact calculations, or the importance of using these calculations (outputs) in decision-making.[8] Furthermore, none of the studies applied the two models specifically to an RMC, an individual small-scale program, or a subset of their university programming. Additionally, the recent expansion of RMCs in Canada limits the scope for statistical techniques involving econometric (regression) analysis.

The basis for the inclusion of these two models to assess RMCs in Canada are:

a) their use in determining university-wide impacts,
b) their use of critical economic variables needed to evaluate a university's impact (institutional spending, student spending, and visitor spending) for the Canadian I-O model and additionally alumni and research impact for the Simplified ACE model,
c) their replicability,
d) the likely availability of data (either in-house or easily accessible from a reliable third party, e.g., Statistics Canada) to run the models and,
e) the variety of outputs or results produced by the models, providing a broad range of information for stakeholders to include in their evaluations or decision-making processes.[8]

Model Overviews

Input-Output models use region- and industry-specific multipliers to estimate how much of an initial investment (i.e., the direct effect) is re-spent by its suppliers across different industries (i.e., indirect effect) and by employees of the firm and its suppliers (i.e., induced effect). "The Canadian I-O model was developed to determine the economic impact of an initial investment (or adjustment) in the economy of a predefined area by tracking how the investment recirculates within the economic area depending on the interdependencies of a region's industries."[12] The total economic impact of the investment on the local economic area comprises the sum of the direct, indirect, and induced effect.[12] The multipliers provide a measure of the interdependence between an industry and the rest of the economy (Table 1).

Table 1: Terminology for the Economic Impact

Economic Term	Definition
Direct Economic Effect	Initial investment and spending
Indirect economic	Dollars that are re-spent by supplier
Induced Economic effect	Dollars that are re-spent by the employees and the organization
Multiplier	A value estimated as the impact above the actual spending, the ACE model uses 1.5,[13] provincial or national multipliers are ~2 indicating that the impacts are greater at the larger spatial scale[9]
Leakage	Spending outside the region that cannot be counted as an economic impact locally, smaller communities have greater leakages than large spatial areas e.g., province or country[10,14]

Data required to apply the Canadian I-O model includes institutional spending, student spending based on enrollment, and an estimate of visitor numbers and their corresponding spending. The size of the industry multiplier allocated to a specific spending category depends on the change to the economy attributed to it. This enables a calculation of the overall impact of a university or university program. Outputs are a result of a calculation that includes the impact of that industry on Gross Output, Gross Domestic Product (GDP) Basic Price, labour income, job creation, and indirect taxes. Studies using multipliers based on industry standards and averages are comparable within the same industry sector or with other sectors. Typically, measurements span a one-year time frame and thus use annual data.[12]

The Simplified ACE model requires the same raw data as a Canadian I-O model, but includes both alumni and research impacts. Instead of using a specific computed multiplier based on its impact on the industry sector for each category of spending, a single multiplier, in this case 1.5, is multiplied to each spending category. Thus, to calculate outputs, each of the sums of the five different spending categories, e.g., institutional, student, visitor, alumni, and research impacts, is multiplied by a single multiplier to measure the total economic impact on a community.[13] Other researchers assess research impact separately, but alternatives to measure this at a small scale are limited, thus the authors apply a 1.5 multiplier to research impact.

Several research groups note that the multiplier should decrease as the size of the city decreases to account for larger leakages in smaller communities. Smaller communities offer less retail and services, thus it is necessary to purchase items in larger population centres.[9,14] Multipliers should generally remain less than two unless applied at a state or provincial level.[9] Incorporation of data into decision-making is by separate outputs for each category of spending. Summing the five separate outputs for a single cumulative number representing the impact of the whole RMC is also an alternative. Cumulative assessment of the economic impacts of RMCs nationally is possible with this model.

Overview of variables

The two models use economic variables that provide the most complete economic assessment of the RMC program: student spending, visitor spending, institutional spending; and for the Simplified ACE model, additionally, alumni practicing in the region and research output. Using a representative set of variables at a point in time is essential to assess the most comprehensive and accurate economic impact of RMC. It is also challenging due to the following:

a. The variety of RMCs,
b. The array of (governmental, for-profit, and not-for-profit) organizations and individuals who contribute to and/or benefit from an RMC program which render the gathering of institutional spending more complex,
c. The potential lack of data (e.g., financial, logistical, programmatic) that outlines specific allocation of funds to the RMC due to the interconnection of budgets with the main medical campus, and
d. The models currently rely on provincial and national multipliers and focus on a university as a whole; thus, for smaller centres, economic impacts of local, regional, and portions of institutions requires the use of estimates by researchers.

Student, visitor, and institutional spending are variable through time because the development and operation of an RMC is ongoing and non-linear. Figure 1 conceptualizes six stages of RMC development. These stages may overlap:

Stage 1: Creation of the RMC via an initial proposal, partnership, and/or funding, capital cost;

Stage 2: Construction of necessary infrastructure, e.g., classrooms, labs; purchasing supplies; and recruitment and hiring faculty/staff;

Stage 3: Implementation of training; this is the start of the first cohort of students for each year (Pre-med to Year 3 or 4). Training costs associated with each year of medical school differ;

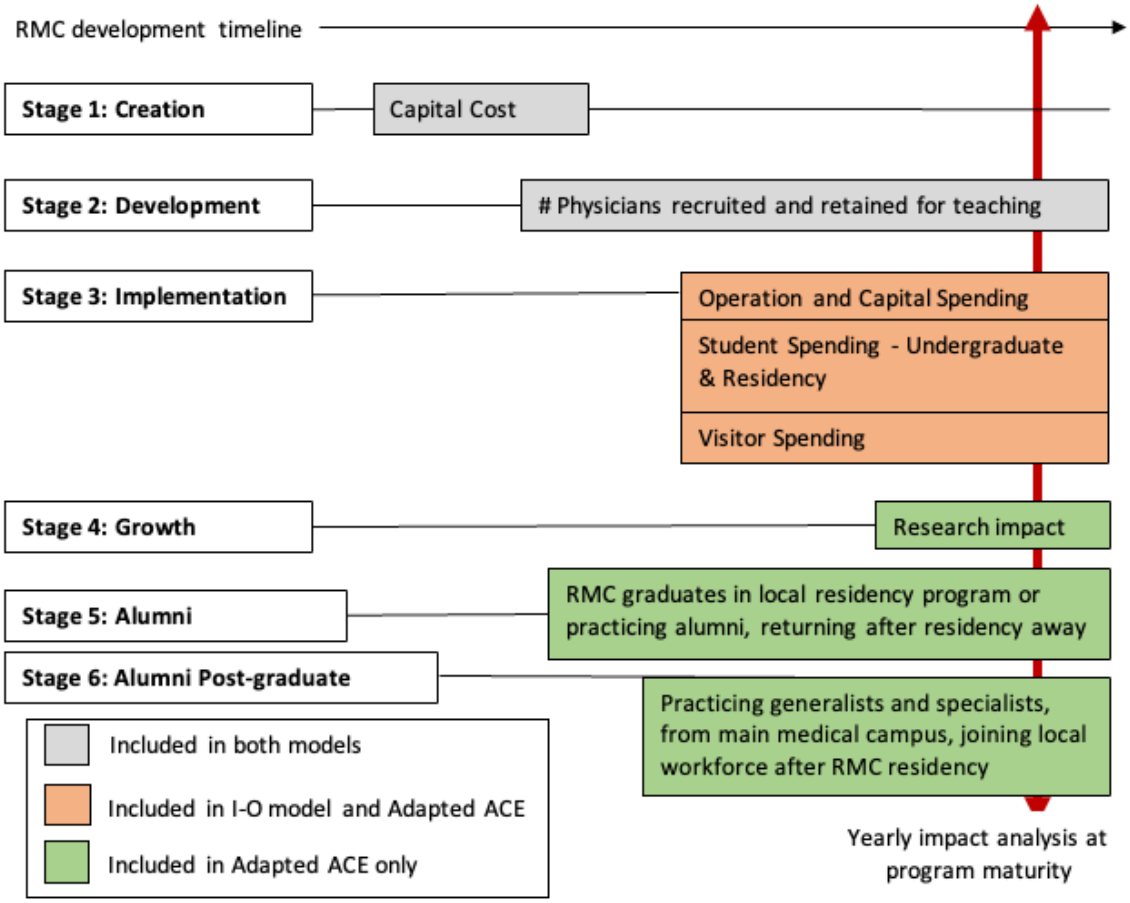
Stage 4: This stage recognizes the growth and evolution of the program to full capacity (all cohorts) and ongoing maintenance of the program and infrastructure;

Stage 5: Alumni - the first cohort enters into residency. A sound teaching environment for medical students implies being in touch with residents. This can be done locally through one or many Family Medicine Training Units (FMTU) created in conjunction with the RMC or be part of mandatory or optional clerkship in residency training program for the main campus taking part locally at the RMC. For example, general surgery residents belonging to the main campus program can be sent to spend three months training at the RMC as part of their educational pathway during their five years training. Ultimately, those residents can become part of the workforce as practicing licensed physicians, as exposure to the reality of the RMC increases the likelihood of attraction and retention (alumni impacts); this likelihood is even stronger for the FMTU, as time spent by the residents is maximal. Administration of this post-graduate program requires an increase in infrastructure and an added layer of instructors, leaders, and administrators; and

Stage 6: Creation of a post-graduate or residency program increases the attraction of a newly created environment. The appeal of a newly created dynamic and promising academic environment can increase the capacity of attraction of newly graduated family medicine and specialists of a region long before RMC students graduate from their RMC academic program. Maturity of an RMC occurs once residents graduate and settle in the community and/or become faculty. Administration of this post-graduate program requires an increase in infrastructure and an added layer of instructors, leaders, and administrators.

Researchers recommend measuring economic impact during maximum undergraduate enrollment (i.e., include all student cohorts of the medical program). Measurements at earlier phases in the development process result in wide variations because of capital costs (i.e., infrastructure development varies from renovating an operating room to constructing an entire medical school). A measurement at the inception of the program would only include a partial measurement of the student body, staff, and faculty. Measuring when all student cohorts are present results in the assessment of the whole program. The economic impact is calculated for a single year for both models.

Figure 1: Stages of development of a RMC program and the variables included in the two economic impact model



Method

The methods section comprises a review of the data required for the models, calculations, and subsequent output. Tables included below provide readers with examples of the data analysis. Data collection requires collaboration with the institution and the RMC coordinator to ensure the collection of the appropriate detail of data. Additional data from an independent third party may be required to complete data collection of yearly spending (e.g., a student or graduate website). The following sections describe how to a) obtain the data for each of the five variables, b) estimate annual spending and c) assess the economic impact using both models at each geographic level (provincial and regional). A table following each section provides a summary of the data required and how to format it. The model requires all data from a single year. For example, operating expenditures for the 2015-16 fiscal year requires student enrollment numbers for the 2015-16 academic year.

Undergraduate Student and Resident Spending

Data Collection

Information and data required to assess learner spending:

1) Number of undergraduate (students) and postgraduate learners (residents) enrolled in the RMC;
2) The duration of the study period (in months) for each year of the program;
3) Average monthly spending for learners; and
4) Yearly salary earned by residents.

The RMC administration (or an equivalent administrative body) stores information on both the number of learners enrolled in the program and duration of the study period in the region for each year. It also gathers information on the number of residents in the program per year.

Resident numbers include full-time equivalent (FTE), or estimates of residency placement length.

The average monthly student expense estimate uses the information found on provincial student loan program websites, the institution's website and/or the student union website (Table 2).

Table 2: Average monthly spending for an undergraduate student in the Waterloo Region[15]

Spending Category	Monthly Spending
Housing	$485.00
Utilities	$75.00
Food	$350.00
Cell phone & High-speed internet	$150.00
Transportation	$400.00
Entertainment	$250.00
Retail and miscellaneous	$150.00
Total average monthly spending	**$1,860.00**

Residents likewise would potentially have similar spending patterns, albeit they have salaries. The Professional Association of Residents of Ontario (PARO) website lists salaries for residents.[16] Resident salary data is also available nationally on the Canadian Resident Match Service CaARMS organization.[17] The salary depends on the year of residency and program.

Spending Calculation

The total number of undergraduate students multiplied by the number of months spent in the region and the average monthly expenses for each spending category provides an estimate of the yearly student and resident spending (Table 3). The model assumes that all learners are renting instead of living at home. Multiplying the FTE for each year of residency with the appropriate salary provides an estimate of resident spending.

Simplified ACE Model Output

Using the Simplified ACE Model, the sum of spending in each category is multiplied by 1.5.[13] This calculation repeats for each spending category. The data required for the calculations includes institution, student, and visitor spending (as with the Canadian I-O model), as well as alumni impact and research impact. All data is multiplied using the multiplier of 1.5.

The number of alumni practicing in the RMC region comprises two categories: general practitioner and specialist. Many RMC administrators keep track of where their alumni practice. However, cross-referencing the list of all graduates with a physician directory is an alternative method to finding the location of alumni.[18] Further, the alumni may leave the region and return after completing their residency or, if the opportunity is available at the RMC, complete their residency locally. Other residents from the main campus may complete part of their residency at the RMC and stay after completion. The National Physician Database and National Health Expenditure Database by the Canadian Institute for Health Information contain payment data per physician, by specialty, and by province or territory.[18]

The authors recommend applying the same multiplier of 1.5 to research dollars procured at the institution each year as per the Simplified ACE model. A commonly used method applied to larger institutions tends to exaggerate impact for small institutions.[19] This simple multiplier accounts for the hiring of graduate students and the purchase of software and equipment as a conservative method to estimate research impact.

Canadian I-O Model Output

The Canadian I-O model links each spending category to the most appropriate Statistics Canada industry-defined multiplier (Table 3) to assess the impact. The

multipliers comprise three broad categories: business, government, and non-profit institutions serving the household sector. The North American Industry Classification System (NAICS) forms the basis of the disaggregation of the business sector multipliers by industry and the government sector multipliers by function.[20,21] Application of the lowest possible aggregation level avoids overestimating the economic impact of the spending categories.

Table 3: Classification of student spending by Statistics Canada industry-specific multipliers for Ontario[20,21]

	I-O Multipliers		Ontario Coefficient
Spending Category	**Code**	**Title**	**Gross Output Direct & Indirect**
Housing (rent)	BS531100	Lessors (landlord) of real estate	1.4135434802
Utilities	BS220	Utilities	1.3275880175
Food	BS445000	Food and beverage stores	1.4319196251
Cell phone & High-speed internet	BS517000	Telecommunications	1.4224332046
Transportation – Gas	BS447000	Gasoline stations	1.4008403673
Transportation – Car maintenance	BS811100	Automotive repair and maintenance	1.4432209024
Entertainment	BS719	Arts, entertainment, and recreation	1.5246111266
Retail and miscellaneous	BS453000	Miscellaneous store retailers	1.5136241074
Resident Spending	GS622000	Hospitals	1.3800731490

To capture the socio-economic effect of additional medical staff (even if training) within the region, researchers linked the GS622000 Hospitals multiplier with resident spending. For each spending category, there are 12 different coefficients, four categories of coefficients (e.g., Gross Output, GDP basic price, labour income, and jobs), and three types of impact in each category (i.e., direct; direct and indirect; direct, indirect, and induced). Adding together the taxes on products and taxes on production for each industry-defined multiplier results in a calculation of indirect taxes. The authors calculated the multiplier for each impact category (Gross Output, GDP Basic Price, labour income, jobs) and output type (direct; direct and indirect; direct, indirect, and induced) to yearly spending categories. The calculation resulted in twelve different components of the provincial economic impact.

Scaling down the effect of the provincial multipliers simulates a regional impact.[15] The Labour Force Survey (LFS) formed the basis of the estimation of a region's labour force.[21] The regional share of employment by industry calculation employed Table 282-0125, available through the Canadian Socio-Economic Information Management System (CANSIM). This estimated the percentage of the provincial economic impact attributed to the region.[22] For example, in 2015, 27,900 people worked in the industry classified as code 22 – Utilities in the province of Québec and 1700 in the region of Mauricie, PQ. Thus, the Mauricie region's share of employment for the Utilities industry is 6.1%. Therefore, calculating the regional economic impact requires multiplying the provincial economic impact by the share of employment for each industry, e.g., 0.061 for Utilities.

Visitor spending

Data Collection

Visitor spending is determined using four variables:

1) An estimate of the number of casual visitors each learner attracts to the region;
2) An estimate of the number of days and/or nights each visitor spends in the region;
3) The average spending per day and/or night per visitor; and
4) The distribution of visitors spending across categories.

Researchers base these numbers on the literature for similar locations and/or verified the information by consulting RMC administrations. The number of visitors per learner ranges from 2-11 per student. Some tourism departments (e.g., Ontario, Manitoba) publish regional statistics on visitor numbers and spending. These statistics may also include visitor type and purpose of travel. Statistics Canada Travel Survey of Residents of Canada (TSRC),[23] provides equivalent information for other provinces and measures the size and state of Canada's tourism industry.

Spending Calculations

Multiplying the estimated number of visitors per learner by the total learner enrollment determines the total number of casual visitors to the region generated by the presence of the RMC. Multiplying the total number of visitors by the number of days spent in the region and the average spending per day results in the total spending in the region. Finally, the distribution of spending by category includes the total spending by expenditure type of all visitors in the region or province (Table 4).

Table 4: RMC visitors spending by expenditure type*

Itemized Visitor Spending in Region	**Total spending for all visitors to the region***	**Distribution of spending**	**Breakdown of total RMC visitor spending**
Public Transport	$1,163,000	0.5%	$129
Vehicle Rental	$4,120,000	1.7%	$457
Vehicle Operations	$48,119,000	20.3%	$5,338
Local Transport	$3,721,000	1.6%	$413
Accommodation	$44,369,000	18.7%	$4,922
Food & Beverage	$91,193,000	38.4%	$10,117
Recreation/Entertainment	$13,500,000	5.7%	$1,498
Retail/Other	$31,353,000	13.2%	$3,478
Total Visitor Spending	$193,169,000	100%	$26,352
		Total RMC Visitor Spending	**$26,352**

*The RMC location is anonymous; however, the numbers are factual

The Canadian I-O model links each visitor spending category to the most appropriate Statistics Canada industry-defined multiplier (Table 5). The provincial and regional economic impact calculations use the same methodology as for student spending. The provincial economic impact uses the Statistics Canada multiplier. Scaling down of this multiplier by share of employment results in the regional economic impact.

Table 5: Classification of visitor spending by Statistics Canada industry-specific multipliers

	I-O Multipliers	
Spending Category	**Code**	**Title**
Public Transport	BS48A000	Other transit and ground passenger transportation and scenic and sightseeing transportation
Vehicle Rental	BS532100	Automotive equipment rental and leasing
Vehicle Operations	BS447000	Gasoline stations
Local Transport	BS485300	Taxi and limousine service
Accommodation	BS721100	Traveller accommodation
Food & Beverage	BS720000	Food services and drinking places
Recreation/Entertainment	BS719	Arts, entertainment, and recreation
Retail and miscellaneous	BS453000	Miscellaneous store retailers

Institutional Spending

Data Collection

Institutional spending includes operating and capital expenses of the RMC at a specific point in time, using year-end financial data provided by the university finance department. All expenses, regardless of who incurred or paid for them, are included. For example, the hospital where learners complete their residency might encounter costs directly related to the program. The capital expenses that occur during the creation stage of the program are not included to avoid inflating the annual economic impact. Building costs are one-off expenses, versus the other variables that provide yearly impact.

Operating expenditures include but are not limited to: salaries (academic), salaries (staff), benefits, travel, supplies and consumable expenses, major renovations, rent/utilities, internet, property taxes, preceptor payment, and scholarship and bursaries.

Capital expenditures include research equipment, library book acquisitions, capital equipment expenditures, and other capital fund accounts.

Spending Calculation

Calculating the operating expenditure and capital expenditure separately allows a nuanced interpretation of the result. The sum of institutional spending represents the total dollar amount spent in the province. The percent of provincial spending that remains in the region provides the regional spending estimate. Discussions with the finance department or other individuals in the RMC with appropriate knowledge determines the different spending categories and the regional percentage. Categorizing university vendors by their geographical location provides the percentages of spending locally, regionally, and provincially. The final numbers result from prorating the initial spending based on the percentage spent in the region and summed to calculate the total regional spending (Table 6).

Table 6: Example of prorated spending

Categories	**Total**	**% Spent in Region**	**$ Spending in Region**
Salaries (Academic)	$ 1,262,000	90%	$ 1,136,000
Salaries (Support)	$ 690,000	90%	$ 621,000
Benefits	$ 386,000	0%	$ 0
Travel	$ 70,000	25%	$ 17,000
Supplies and consumable expenses	$ 212,000	80%	$ 169,000
Rent/Utilities	$ 161,000	100%	$ 161,000
Preceptor payments	$ 382,000	80%	$ 305,000
Total	**$ 3,165,000**		**$ 2,412,000**
% of total expenditure in the region			**76.2%**

The provincial economic impact of institutional spending (operating and capital) uses GS611300 University multiplier.

The regional impact calculations require dividing the sum of regional operating or capital expenditures by the sum of provincial operating or capital expenditures. This calculation determines the percentage of total provincial expenditures in the region. The provincial impact requires scaling down the impact by multiplying by the percentage of expenditures in the region.

Results

The following five tables illustrate the calculations using data from a single RMC for both the Simplified ACE model and the Canadian I-O Model. The authors use the same variables at the RMC level as used when applying these models at a university level to assess yearly economic impact.

Simplified ACE Model

The Simplified ACE model assesses a cumulative impact in each area of impact, e.g., institutional, students, visitors, alumni, and research. A second option using this model is to sum these numbers to

obtain an overall cumulative impact i.e., a single value (Tables 7 and 8). Given that most of the spending takes place at the regional level, except for university operations, the provincial impact is about the same as the regional impact using this method.

Table 7: Simplified ACE model economic impact output at the regional level*

Spending in the Region		**Multiplier**	**Total Impact in Region**
Undergraduate Students	$1,375,136	1.5	$2,062,704
Residents	$1,453,166	1.5	$2,179,749
Out-of-town Visitors	$26,352	1.5	$39,528
University Operations	$2,601,758	1.5	$3,902,637
Capital Expenditure	$22,410	1.5	$33,615
Practicing Graduate	$10,953,366	1.5	$16,430,049
Research Impact		1.5	$0
Total Impact	**$16,432,188**		**$24,648,282**

* To ensure anonymity of the RMC, its location is anonymous; the numbers are factual

Table 8: Simplified ACE model economic impact output at provincial level*

Spending in the Province		**Multiplier**	**Total Impact in the province**
Undergraduate Students	$1,375,136	1.5	$2,062,704
Residents	$1,453,166	1.5	$2,179,749
Out-of-town Visitors	$26,352	1.5	$39,528
University Operations	$3,427,288	1.5	$5,140,932
Capital Expenditure	$22,410	1.5	$33,615
Practicing Graduate	$10,953,366	1.5	$16,430,049
Research Impact		1.5	$0
Total Impact	**$17,257,718**		**$25,886,577**

* To ensure anonymity of the RMC, its location is anonymous; the numbers are factual.

Canadian I-O Model

The output for the Canadian I-O model, in contrast to the Simplified ACE, results in a single number for each economic category (these cannot be summed). It is also possible to calculate impact by geographical region by estimating the regional impact (Table 9) and the provincial impact (Table 10). These calculations result in a more conservative economic impact; however, calculating impact over a variety of economic indicators may be more useful to decision-makers. For example, the model calculates the number of jobs created by the RMC and taxation information.

Table 9: Canadian I-O model output at the regional level*

Initial Spending	$2,828,302	$26,352	$2,601,758	$22,410	**$5,478,822**
Direct, Indirect & Induced Impact	**Learner Spending**	**Visitor Spending**	**University operations**	**Capital Expenditure**	**Impact in Region**
Total Gross Output	$507,615	$5,094	$3,983,696	$34,313	**$4,530,718**
Total GDP Basic Price	$305,227	$2,872	$2,888,509	$24,880	**$3,221,488**

Total Labour Income	$195,887	$1,623	$1,688,578	$14,544	**$1,900,632**
Total Jobs	4	0	26	0	**30**
Total Indirect Taxes	$28,795	$241	$129,993	$1,120	**$160,148**

*To ensure anonymity of the RMC, its location is anonymous; the numbers are factual.

Table 10: Canadian I-O model output at the provincial level*

Initial Spending	$2,828,302	$26,352	$2,601,758	$22,410	**$5,478,822**
Direct, Indirect & Induced Impact	**Learner Spending**	**Visitors Spending**	**University operations**	**Capital Expenditure**	**Impact in Province**
Total Gross Output	$4,973,185	$48,049	$5,247,711	$34,313	**$10,303,259**
Total GDP Basic Price	$2,986,961	$25,507	$3,805,025	$24,880	**$6,842,372**
Total Labour Income	$1,859,859	$15,082	$2,224,358	$14,544	**$4,113,844**
Total Jobs	37	1	35	0	**72**
Total Indirect Taxes	$293,944	$1,926	$171,239	$1,120	**$468,229**

*To ensure anonymity of the RMC, its location is anonymous; the numbers are factual.

The model also calculates the personal income tax generated through the labour income (Table 11) by multiplying by the ratio of personal income tax for the province and the dollar amount of compensation of employees. The Table 384-0040 "Current account – Households, provincial and territorial, annual available" through the Canadian Socio-Economic Information Management System (CANSIM)" contains multiplier data.[21]

Table 11: Personal income tax generated by the additional labour income created*

	Total Labour Income	**Ratio**	**Personal Income Tax**
Ontario	$4,113,844	22.8%	**$937,956**

*To ensure anonymity of the RMC, its location is anonymous; the numbers are factual.

Discussion

Although many RMCs have very complicated funding formulas, adapting models that dozens of universities use to assess economic impact (and thus a familiar context), should assist both main campus and RMCs to document spending in a manner that will facilitate applying these models in the future. The models could be applied prior to establishing an RMC by using estimates of RMCs that are going to be emulated, or these models can be applied post construction.

Further, developing a model to measure spending and calculating economic impact for the region served by RMCs is potentially a less time-consuming and less costly option for RMC administrations than a survey of educators, students, visitors, and graduates.[15] It provides a much simpler model requiring input from fewer information sources (e.g., the university, tourism associations, and Statistics Canada). However, bringing awareness to administrators of these data needs for evaluating an RMC's economic impact prior to developing new RMCs facilitates data collection. Administrators could more easily set up Excel worksheets to ensure that spending categories are recognized at the onset of the program. It would also be possible to verify these spending estimates by conducting surveys for each group of spenders to verify spending. This type of research requires ethics review and random sampling of a group of spenders, and it may be difficult to ensure the anonymity of the participants. It also depends on the goodwill of participants to record or share private information.

The economic impact calculations for RMCs include two models and three steps: a) data collection, b) spending calculations, and c) analysis of outputs.

Data Collection

The data inputs are similar for both models. However, obtaining the data required for an analysis may be a challenge. Awareness of the data needs, the format required, and the fiscal year will reduce the data gathering time. Upon completion of the first economic impact calculations, subsequent data collection will be easier, which will facilitate year-over-year comparisons of impact.

Institutional spending: University financial departments record RMC and the main campus medical program expenses separately; they typically supply a detailed breakdown of financial data for a specific fiscal year. However, it is possible that the RMC financials are quite closely intertwined with main campus financial data, and it may be difficult to separate out the RMC expenses. It may not be possible to attribute costs solely to the RMC or solely to the parent university. As an example:

1. Main campuses video conference most preclinical courses to the RMC site. As a result, the full cost of these courses is difficult to separate between the main campus (physical classroom and instructor) and the RMC (physical classroom at RMC, video conference and IT equipment) or smaller sites for the LIC. In these cases, the budget for the course may be recorded under that of the main campus;
2. Employees may hold joint positions administratively, therefore allocation of a portion of the salary to the RMC depends on the percentage of their duties needed for the remote campus. Potential multiple and changing roles with the development of these programs may complicate this allocation of resources.

Many partnerships and funding formulas finance the RMCs, e.g., other organizations and levels of government, and a wide variety of programs under the umbrella of RMC, ranging from a clinic not administered under the university umbrella at the University of Alberta, to an entire campus (e.g., l'Université de Montréal en Mauricie in Trois Rivières, PQ). Consequently, institutions need to record all the spending precisely (Table 12). Researchers recognize the complexity of gathering comprehensive financial data. Ideally, all expenses should be included in the analysis, regardless of who incurred or paid the expense, and partnerships need acknowledgement. For example, the province may pay the preceptors directly, and the university will not have a record of the dollar amount within their financial statement. If financial statements of partner organizations are available, this will improve the accuracy of economic impact calculations.

Table 12: Operating expenditures-extract from economic impact of Univ. de Montréal en Mauricie

Paid by	Categories
UdeM	Salaries (Academic)
UdeM	Salaries (Support)
CIUSSS	**Salaries**
CIUSSS	**Travel cost**
UdeM	Supplies and consumable expenses
CIUSSS	**Rent/Utilities**
UdeM	Internet
RAMQ	**Clerkship/preceptor payments**
… etc.	… etc.
UdeM : Université de Montréal CIUSSS : Centre Intégré Universitaire de Santé et de Services Sociaux RAMQ : Régie de l'Assurance Maladie du Québec[24]	

The RMC administration reviews and verifies numbers as data collection nears completion. They verify that data are accurate and representative of spending. Gathering all the necessary financial data and the level of detail to have a meaningful economic assessment requires the commitment of the university as a whole. Gathering data in a reasonable time period is facilitated by the support of university executives. If the data are incomplete, it may be necessary to either estimate the data or leave the data out. An alternative option would be to examine other RMCs of similar size and location where data are more easily obtainable and estimate their impacts. If data is inadequate to complete an economic assessment, the worksheet will help the RMC identify data gaps early in the study.

Student enrollment: Institutional spending uses a fiscal year for recording and reporting financial information. Student enrollment, in contrast reports for an academic year that spans across two different fiscal years. Determining the numbers of students and the number of months they study in the region is a way to match the financial data. However, this is complicated, and most of the time not feasible. If student spending represents a whole year of data, even if the end and start date do not coincide with the fiscal year, it is still representative of the economic impact of students for one year of the program.

Spending Calculation

As data are not always available from the same source, collection of multiple categories of data occurs simultaneously. Verification of spending occurs by postal code or company names to determine its geographic location. The percentage of spending broken down by geographic location might require proportional scaling, for example what percentage of the spending occurs in the local region, in the province, and outside of the province (or nationally). This step is essential to allocate economic impact of the RMC to the region versus spending outside the region.

Average monthly spending for undergraduate students at many institutions is available online. However, the average monthly spending may not be available for new RMC students located in smaller cities and rural areas. Spending based on the averages for the main medical campus may result in an overestimate or an underestimate. The RMC administrator could verify, with students, that estimates are reasonable.

Output

Due to the nature of the data available through the CANSIM tables, interpreting data requires consideration of two factors. First, the calculation for share of employment is at a higher aggregate level than most of the spending categories, i.e., resident spending utilizes the Hospital [62-2] multiplier. However, the share of employment uses the Health Care and Social Assistance [62] industry which encompasses four other industries: Ambulatory Health Care Services [62-1], Hospitals [62-2], Nursing and Residential Care Facilities [62-3] and Social Assistance [62-4].[18] The region used to assess the share of employment may encompass a larger area than is ideal for the RMC's economic impact because of grouping small regions with neighbouring regions with similar economic characteristics. These two factors will tend to overestimate the regional impact.

Each model calculates a unique output. The Simplified ACE using only one multiplier is much easier to calculate; however, the results provide limited overall economic data for each category. A single number output enables universities to make sweeping statements about the impact of their program. The size of the multiplier, e.g., 1.5, is not adjusted to the size of the region. However, its simplicity results in frequent application to university settings. Further to this, repetition of calculations yearly is unnecessary unless there is a major change in institutional spending, student or visitor numbers, alumni, or research. The multiplier remains the same for all elements of the model.

A benefit is the overall summative number; a decision-maker can state that a particular RMC impacts the local economy by eight to nine million dollars per year. It does not account for leakages out of the economy; for example, the Northern Ontario School of Medicine researchers state that since leakages are greater in smaller cities, they require smaller multipliers. Using a standard multiplier of 1.5 on a region of 100,000 people may exaggerate the economic impact.[9]

The Canadian I-O model, in contrast, uses multipliers built on industry averages. Multipliers exist only at the provincial or national level; they do not exist at the regional level. Thus, to diminish the overestimation of economic impact in a smaller region, the researchers adjusted the provincial impact to the population size.

This information is valuable to local decision-makers; it includes not only the impact on Total Gross Output, GDP Basic Price, and on labour income, jobs created, and potential indirect taxes, but also impacts calculated by the data category and by different economic parameters. These numbers are not cumulative; however, they provide decision-makers with valuable information in each of these broad categories. A further benefit of this output is its comparability to other industries that use the Statistics Canada I-O multipliers.

Both models provide practitioners with information for decision-making. Individual application provides results for different variables. Calculations for both models provide a broader understanding of the potential economic impacts of RMCs. A limitation of both models is that they each measure for a specified academic year. If significant changes occur to a program, the economic assessment for that year requires updating. Statistics Canada updates its multipliers every four years to current economic conditions (linked to NAICS); the Simplified ACE model, in contrast, consistently uses the same multiplier regardless of the year.

Economic information resulting from this analysis is invaluable in the decision-making process for several reasons. It provides (1) a benchmark of current economic impacts of an RMC by collating student, visitor, and institutional spending into economic models, and (2) a quantitative analysis of an RMC, which includes additional information to qualitative data that may already exist. These data are comparable to other industry sectors, providing decision-makers with an understanding of investment in medical education versus other sectors of the economy.

Different stakeholders have an interest in completing these analyses and incorporating the resulting data. They include the RMC administrators, the main medical campus administrators, government officials, city and community decision-makers, not for profit groups, and philanthropists or other funders. Medical schools use these data when they approach funders, e.g., government and philanthropists. Substantial investment occurs in these programs. It is therefore of the utmost importance for faculties of medicine and their affiliated healthcare facilities to be socially accountable toward the populations they serve. Governments face tough investment decisions, and evidence-based data are needed to make the best choices.

Creation of the l'Université de Montréal en Mauricie RMC occurred in 14 months; it was urgently needed to increase the number of physicians in the region,[25] thus addressed a critical need for more practicing physicians. This RMC faced significant challenges in receiving the necessary financial support even though it was addressing the population's needs. One of the issues was identifying which ministry in government held the responsibility to finance this RMC, Health or Education. Alternatively, a third party, e.g., a different ministry with special funds to promote economic diversification from the traditional dying industries such as paper mills in regions like the Mauricie, could have subsidized the creation of the regional medical campus if an economic study showed some clear economic impact to the region.

As the RMCs become established, there is an expectation that research will increase. A survey study identified the importance of establishing research agendas at the RMC planning phase to ensure resources and funding needs are identified and that research is incorporated into the RMC mandate.[6] The medical faculty at RMCs are uniquely situated to study rural regional issues and methods to improve primary care to the populations that they serve. More research is required into the role of researchers at the main medical campuses who collaborate with the regional medical campus faculty, and vice versa. If research dollars are procured for these research endeavours, this data can be incorporated into an economic model.

Although publications on RMCs' research output are limited, a recent research project on the Michael G.

DeGroote School of Medicine students documents research participation amongst three cohorts of medical students.[26] The researchers state that two barriers to research participation identified are students' perceptions of both inadequate time and access to projects; however, additional limitations include inadequate education in research methodology and appraisal of scientific literature.[26] Despite this, survey results state that 70.4% of students do participant in some type of research project.

Both returning alumni from undergraduate medical programs and alumni from the main campus or residents moving to RMCs to continue their specialist training are integral to the region to address the health needs of the local population. Research suggests that 50% of physicians trained in rural areas return to these areas upon graduation, for not only the quality of care, but to address the specific health challenges faced in smaller cities and rural populations.[27] Further, access to specialist treatment locally ensures that travel is not a limiting factor in getting access to health services. RMCs may further develop to provide essential medical graduate education in different areas of specialty. The vast richness and diversity of RMCs is a result of each being created according to different local and regional needs, challenges, and opportunities. Increasing educational opportunities thus increases the attraction and retention of physicians locally. The present article broadens the scope and benefits in investing in various forms of RMCs as an economic stimulus. Measuring the return on investment using an indicator such as the retention of medical professionals could also enhance community buy-in and appeal to private business investors.

The models are applicable regardless of the size of the RMC, e.g., a full medical campus or an LIC. A limiting factor for using the models would be getting enough data to run the models. It may be a challenge to separate spending on a clinic or operating room from overall hospital or health spending in a region. For those facilities providing a dual purpose, percentage of time using the facility for education of undergraduate or graduate medical students versus a regular treatment room may be the only way to attribute costs. If the local undergraduate or residency programs address the maldistribution of physicians locally, this is a net gain for the region.

The analysis provides a mechanism for incorporating RMCs into regional economic development strategies and extending the role of the RMC beyond the traditional domain of solely rural health care provision. A multi-year approach to RMC investment and development is required to understand the full impact. The research, student, and population health benefits of RMCs are important, but beyond the scope of this economic impact analysis. The social value of RMCs is broad and represents a significant and increasing development in Canadian medical education and health services provision. Table 13 itemizes the benefits and limitations of each model.

Table 13: Benefits and Limitations of Economic Impact Models

	I-O Model (Statistics Canada)	**Simplified ACE Model**
Benefits	- Standard set of industry multipliers - Comparable to other industries using similar model - Provides impacts in economic terms on job creation	- Simple model using a set multiplier (1.5) for all categories of spending - Assesses longitudinal impact of education and research - Result is a single number for each category of spending or a cumulative number allowing for easy interpretation
Limitations	- Multipliers are not estimated at the regional (Local) level and need to be estimated by percentage of spending	- May under- or overestimate the impact due to the simplistic nature of the multiplier, typically there is greater leakage of spending out of

	- Underestimates the impact since it does not include alumni and research as variables - Results are for several different economic variables which complicates the interpretation - No cumulative number that is easily understandable by decision makers	smaller communities, thus multiplier should be smaller - No impact provided on job creation

Table 14 provides a summary of impact category, data requirements and source of information for each type of category needed in the two models.

Table 14: Summary of Impact Category, Data Requirement and Source

Impact Category	Data required
Student Impact	▪ Number of full-time undergraduate students per year ▪ Duration (number of months) of each year ▪ Number of Residency students per residency level ▪ Duration (number of months) residency or full-time equivalency ▪ Average spending per category ▪ Residency salary per year ▪ Share of employment by NAIC codes for each expenditure category (Higher aggregate)
Visitor Impact	▪ Average Number of Annual Casual Visitors ▪ Average dollar amount spent per person per visit ▪ Length of stay (number of days) per visitor ▪ Total spending by expenditure type ▪ Share of employment by NAIC codes for each expenditure category (Higher aggregate)
Operations Impact	▪ Spending (dollar amount) per operating category ▪ Percent of regional spending per category
Capital Impact	▪ Spending (dollar amount) per capital category ▪ Percent of regional spending per category
Practicing Graduate Impact Medical student influence on solving challenges associated with creating a new regional medical campus.	▪ Number of graduates practicing in the region by family medicine and specialist ▪ Average Clinical Payment

CONCLUSION

The benefits of RMCs are multiple: they address the maldistribution of physicians and/or provide better medical services in smaller communities and city centres. Research also demonstrates that exposure of medical learners to rural practices increase the likelihood of choosing to practice in a rural area, be it the same one or a new one, potentially impacting similar communities geographically distant from the RMC. Stakeholders involved in hosting, investing, creating, or administrating RMCs for these institutions need to be able to speak more broadly to the benefits of RMCs and include quantitative economic data in their decision-making.

This paper provides both the rationale and the step-by-step process for calculating the economic impact of RMCs using two different models. It gives direction on conditions needed for applying either model. Use of either model will depend on who the users of the information are. With the detailed outputs of the Canadian I-O model, stakeholders can access different types of information, e.g., jobs created, impact on indirect taxes, as well as implications to GDP. Further to this, it is easier to calculate impacts at various geographical scales, e.g., regional, provincial, and national. The benefit of the Simplified ACE model is the breakdown of impacts by spending, and the calculation of a cumulative number. Decision-makers may find it easier to include this single number in decision-making rather than the detailed breakdown of the Canadian I-O model. However, providing numbers, such as the increase in jobs and impact on taxes, are useful to others.

These models were both tested with real RMC data. However, it is important to note that the economic benefits of any size of campus can be estimated from using estimates of spending by the university on an RMC. Thus, although our research is retrospective on most of the spending, it is possible to forecast spending and thus economic impact of future RMCs. It is possible that this data combined with the needs of the underserved community will provide decision-makers with an understanding of the impact of an RMC in the area and a solid estimate of future economic impacts.

The Simplified ACE model is a relatively easy model to apply as it requires only the data from the university and a standardized multiplier; it provides a single usable economic impact but may overestimate the impacts in smaller communities. The Canadian I-O model requires extra steps to apply but provides a richer set of information for decision-makers.

The next steps for economic assessment of RMCs are to:

a) Build a national and/or international database from economic assessments of RMCs to be able to gain an overview of RMC economic impact nationally and internationally
b) Increase the use of these models while ensuring there are checks and balances in place to ensure consistent usage, and access research funds to enable collaboration amongst RMCs to conduct a more in-depth study of economic impacts involving surveys and/or discussions with local decision-makers
c) Conduct workshops to garner the opinions and experiences of Deans of RMCs on how to improve the models and an understanding of other types of impacts
d) Collate the processes that resulted in the decision to increase medical education for each type of RMC across the country, and
e) Develop an online resource with various case studies so that users understand the benefits and challenges of the use of these models, and the outcomes this will ensure that studies are comparable.

We hope this paper can support the social accountability mission of medical schools and their RMCs, including the economic impacts, and further advance our mission in serving underserved communities.

References

1. Cheifetz CE, McOwen KS, Gagne P. Wong JL. Regional medical campuses: A new classification system. *Acad Med*. 2014;89:1140-1143 DOI: 10.1097/ACM.0000000000000295
2. Association of Faculties of Medicine of Canada. *Canadian Medical Education Statistics V42,* 2020. Available at https://www.afmc.ca/sites/default/files/pdf/CMES/CMES2020-Complete_EN.pdf
3. Consortium of Longitudinal Integrate Clerkships, Longitudinal Integrated Clerkship Programs Retrieved April 8, 2022 https://clicmeded.com/lic-programs/
4. Ellaway R, Bates J. Distributed medical education in Canada*. Can Med Ed J* 2018;9(1):e1-5. DOI: https://doi.org/10.36834/cmej.43348
5. Snadden D, Bates J, Philip B, Casiro O, Hays R, Hunt D, Towle A. Developing a medical school: Expansion of medical student capacity in new locations: AMEE Guide No. 55 *Med Teach*. 2011;33(7):518-529 DOI:

https://doi.org/10.3109/0142159X.2011.564681
6. Group on Regional Medical Campuses. About the GRMC. 2013; Available at: https://www.aamc.org/members/grmc/about/ [Accessed March 21, 2019].
7. Fyfe TM, Akins R, Gagne P, Cheifetz C, Petrocelly S, Payne GW. Regional Medical Campuses in Canada and the United States: A Systematic Review. *JRMC*. 2018:1:3. DOI:10.24926/jrmc.v1i3.1158
8. Lemky K, Gagne P, Konkin J, Stobbe K, Fearon G, Blom S, Maltais Lapointe G. A review of methods to assess the economic impacts of distributed medical education (DME) in Canada. *CMEJ*. 2018;9(1):e87-e99. DOI: https://doi.org/10.36834/cmej.43343
9. Tripp Umbach. "The Economic Impact of Canada's Faculties of Medicine and Health Science Partners." The Association of Faculties of Medicine of Canada. 2014. Available at: https://afmc.ca/pdf/Economic_Impact_Study_Report_FINAL_EN.pdf
10. Hogenbirk JC, Robinson DR, Hill ME, et al. The economic contribution of the Northern Ontario School of Medicine to communities participating in distributed medical education. *Can J Rural Med*. 2015;20:25-32.
11. Heide W, Nasewich R. Parkland Health Care and Doctor Recruitment Study. Parkland Community Futures Development Corporation. Unpublished Document. 1996.
12. Statistics Canada. User's Guide to the Canadian Input-Output Model. 2009.
13. Sudmant, W. The Economic Impact of the University of British Columbia. Planning and Institutional Research, 2009. Available at: http://president.ubc.ca/files/2010/04/economic_impact_2009.pdf [Accessed July 22, 2018].
14. Ambargis, ZO, McComb, T. Robbins, CA. 2011. Estimating the local economic impacts of university activity using a bill of goods approach. In the 19th International Input-Output Conference, June 12-19, 2011. Retrieved https://www.bea.gov/system/files/papers/WP2011-6.pdf
15. University of Waterloo. 2021. Off-Campus Housing. Retrieved https://uwaterloo.ca/off-campus-housing/students/important-tips/cost-living
16. Professional Association of Residents of Ontario. 2021. PARO Inspired by our love of medicine. Retrieved https://myparo.ca/
17. Canadian Resident Matching Service (CaRMS). 2022. Salary: See salaries and benefits for postgraduate training by province. https://www.carms.ca/match/r-1-main-residency-match/salary/
18. Canadian Institute for Health Information. Data Tables: National Physician Database. 2016. Available at: https://www.cihi.ca/en/access-data-reports/results?f%5B0%5D=field_primary_theme%3A2047 [Accessed July 10, 2018]
19. Martin F. The economic impact of Canadian university R&D. RP. 1998;27:677-687. DOI: https://doi.org/10.1016/S0048-7333(98)00083-3
20. Statistics Canada. Provincial Input-Output Multipliers, 2013. Statistics Canada Catalogue no. 15F0046XDB. Industry Accounts Division. 2017.
21. Statistics Canada. No Date. Table 282-0125 - Labour force survey estimates (LFS), employment by economic region based on 2011 Census boundaries and North American Industry Classification System (NAICS), annual (persons), CANSIM (database).
22. Statistics Canada. Household sector, current accounts, provincial and territorial, annual. Table: CANSIM 384-0040. 2015. Available at: https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=3610022401
23. Statistics Canada. 2007. Tourism Demand in Canada, constant prices (X 1,000,000) CANSIM Table: 36-10-0230-01 (formerly CANSIM 387-0001). Available at: https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=3610023001 [Accessed June 16, 2018]
24. Centre Intégré Universitaire de Santé et de Services Sociaux (CIUSSS), RAMQ: Régie de l'Assurance Maladie du Québec Available at: http://www.ramq.gouv.qc.ca/fr/citoyens/programmes-aide/aide-domestique/Pages/aide-domestique.aspx [Accessed May 15, 2018]
25. Gagne P, Levasseur-Fortin P, Dazé P-L. Medical student influence on solving

challenges associated with creating a new regional medical campus. The Regional Medical Campus: A Resource for Faculty, Staff, and Learners. In M. P. Flanagan (Ed.) Pages 38-44. 2018. Oscala, Florida: Atlantic Publishing Group).

26. Leigh J, Khalid M, Tsang J. Motivating factors of and perceived barriers to research at a Canadian medical university with regional campuses: A cross-sectional survey study. JRMC. 2021;4(3). DOI: https://doi.org/10.24926/jrmc.v4i2.3934

27. Kondro W. Eleven satellite campuses enter orbit of Canadian medical education. CMAJ. 2006;175(5),461-462.