

Aligning education to societal needs

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ALIGNING EDUCATION TO SOCIETAL NEEDS

Evaluating Social Accountability in
Health Professions Education



Cassandra Barber

Aligning Education to Societal Needs:
Evaluating Social Accountability in Health Professions Education

Cassandra Barber

The research reported here was carried out at Maastricht University | Maastricht UMC+



in the School of Health Professions Education



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Aligning education to societal needs: Evaluating social accountability in health professions education

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ALIGNING EDUCATION TO SOCIETAL NEEDS
Evaluating Social Accountability in Health Professions
Education

DISSERTATION

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Chapter 1

Introduction

Social accountability is a critical component of health professions education and is defined as the obligation of schools to direct their education, research, and service activities towards addressing the priority health needs of the populations they serve.¹ Despite growing international interest and expanding literature over the last several decades, the operationalization of social accountability remains a global challenge. The lack of measurable outcome indicators has resulted in a limited understanding of the impact of medical schools on society. While various performance indicators have been developed to hold medical schools accountable to governments, students, accrediting bodies, and other stakeholders, the extent to which medical schools impact society remains largely underdeveloped. The lack of empirical studies examining educational outcomes has led to an unknown association between education and societal outcomes. This research is imperative, particularly at a time when schools are being asked to produce stronger evidence of accountability. Continued progress towards demonstrating social accountability has been made in select settings, but most programs do not empirically evaluate the extent to which the outcomes of their activities impact society. To address this gap, this thesis investigates social accountability in health professions education to enhance education and training, serving as one contributing factor to improving population health.

The introduction chapter sets the stage for this thesis and its topic. First, the concept of accountability is introduced, followed by focusing on accountability in education, which has a long history. Lastly, an overview of social accountability in health professions education is provided. Highlighting the central concept of accountability and educational accountability is useful to contrast and compare why social accountability represents its own conceptual element across different configurations. Furthermore, the introduction also provides a conceptual framework that examines key attributes of social accountability relevant to the research presented in this thesis. The chapter concludes with stating the main research questions and an overview of the thesis studies.

Accountability

Accountability is a key concept across many policy domains. However, it has been described in many ways across different contexts. To date, there remains no commonly agreed-upon universal definition or framework.^{2,3} The term has been referred to as a conceptual umbrella with chameleon-like qualities due to its broad and evolving nature.² The academic literature presents diverse conceptual approaches. Consequently, the meaning of accountability in different contexts and the fulfillment of accountable obligations have not been resolved in the literature.⁴ Rather than becoming more prescriptive, the concept continues to broaden.⁴

The origin of accountability relates to the notion of 'accounts' or 'counting'.⁵ At its core, accountability can be described as a relationship between two parties – the principal and agent - in which the agent provides an explanation to the principal for actions taken to achieve a particular goal or outcome.⁶ This relationship describes a process by which an actor(s) provides reasons or justifications for their actions.⁷ The first notion of accountability points to a condition of having to answer to an individual or body for one's actions.⁸ Accountability has also been described as an interaction between an 'accountor' (person or organization) and 'accountee',⁹ whereby the former's actions are evaluated and judged by the latter.¹⁰⁻¹³

Accountability is often used interchangeably with responsibility, answerability, or effectiveness to portray an image of trust, trustworthiness, or transparency.^{3,4,14,15} Derived from the verb 'account', accountability or to be accountable, in its simplest form, means answerability, the obligation to provide an account and be held responsible for one's actions.^{16,17} While there are several different terms of accountability, each refer to the same phenomenon. These terms often have varying overlapping connotations but different meanings and have been interpreted in several ways.¹⁸ Accountability takes on several forms (e.g., vertical, horizontal, and social), and often carry different normative interpretations of the relationship between actors or entities.^{3,4}

Despite the prevalence of the term, the concept of accountability lacks universality, and the direct translation is often 'responsibility' in many languages.¹⁹ This situation is further complicated by the vague, iconic qualities that the concept has adopted, making it challenging to operationalize in practice.⁵ The concept of accountability often features multiple and interrelated complex components, processes, and actors.²⁰

Educational Accountability

The literature on educational accountability is extensive and has grown significantly over the past few decades. This growth is largely in response to increasing societal demands for greater transparency and accountability within the public sector, specifically in countries where education is publicly funded.²¹ Since the 1970s, there has been an increase of educational reforms and renewals to promote educational improvement and hold schools more accountable.²²

Currently, educational programs face growing pressure to provide stronger evidence of accountability and a positive social return on investment.^{23,24} While the number of accountability initiatives have multiplied, many programs and organizations already have numerous accountability policies embedded into their mission statements, program objectives and strategic plans.²⁵ However, despite this popularity there exists a paucity of empirical evidence that connects program outcomes and impacts.²⁶

In education, accountability functions as a system used to evaluate institutional effectiveness; assesses how well institutions meet their goals, holds programs responsible for results, and promotes educational improvement.^{6,22,27-29} These systems imply a sense of responsibility, transparency, and public trust, whereby government entities or bodies are obligated to answer to society for their actions.¹⁵ The focus of educational accountability has shifted from traditional financial accountability systems to performance accountability, aimed at improving educational outcomes, where schools are identified as the unit of change.³⁰

Educational accountability systems focus on the interaction of institutional goals, performance indicators, decision rules, outcome rewards/sanctions and feedback.³¹ These systems are driven by a theory of action, whereby specific actions will produce a desired outcome, linking institutional goals and outcomes.^{32,33} This process is reflective of a logic model, commencing from institutional goals, followed by a series of actions and design decisions, which result in outcomes and feedback to institutional goal.³⁴ Continuous program evaluation is critical to ensure actions are successful in producing desired outcomes, rewards and/or sanctions are effective, and meaningful feedback is provided.³⁵

Educational accountability systems have been classified into several typologies, including legal, bureaucratic, professional, political, market and moral.^{17,36} This taxonomy can be distinguished by the following attributes: who is held to account, for what, to whom, and through what means.^{6,16,37} While each form of accountability is defined independently, many systems involve a combination of these approaches.

Social Accountability in Health Professions Education

Social accountability in health professions education is described as the obligation to be held to account by society. In 1995, the World Health Organization (WHO) defined social accountability as, "...the obligation of medical schools to direct their education, research, and service activities towards addressing the priority health concerns of the community, region, and/or the nation they have a mandate to serve. Priority health needs are to be identified jointly by governments, healthcare organizations, health professionals and the public."¹ To date, this definition remains among the most widely accepted definition internationally. However, in 2010, the Global Consensus for Social Accountability added to this definition by stating that social accountability should be a measurable activity, a state of social awareness, "...an action to respond to current and future health needs and challenges."³⁸

The idea of social accountability can be traced back to the Flexner³⁹ report, where he introduced the notion of social need and proposed medical schools served as public service corporations. Flexner recognized the initial correlation between improved medical education and favourable health outcomes.³⁹ He emphasized the importance of student selection and training and the need to ensure an adequate distribution of health benefits and provision of care, particularly for underserved groups.³⁹ However, despite the transformative advances made in medical education, there remains a misalignment between education and societal needs.^{40,41} More than a century post-Flexner, health professions worldwide continue to struggle to meet societal needs,⁴² and the health workforce remains largely unrepresentative of the populations served.⁴³

The medical profession has been granted certain responsibilities and privileges by society, resulting in an intrinsic social contract between medicine and society.²¹ Key to the notion of social accountability is the obligation to account to the public for one's actions. Through legislation, regulation and accreditation, medical schools are entrusted to educate competent physicians, prepared to meet societal needs.^{44,45} This implicit relationship represents an omnipresent social contract that exists between medicine and society. Medical schools are accountable to the medical profession, the public (patients, citizens, families, communities, and society at large), their educational products (graduates, service, and research activities), and future healthcare needs.

Conceptual Framework

This thesis employs a program evaluation logic-model approach to address the complexities associated with social accountability.

Program evaluation is a multi-disciplinary field. The term 'evaluation' has been used broadly with a plethora of definitions. In the context of this thesis, program evaluation can be defined as the process of determining the worth or merit of an object, program, or policy (*judgement*)

using information (*evidence*).⁴⁶ This definition involves determining standards or defensible criteria to determine an object's value in relation to those criteria. The primary goal of evaluation is to render judgments and determine the value, merit or worth of what is being evaluated to inform decision-making and quality improvement.⁴⁷ Program evaluation frameworks often serves as systematic, practical guides to monitor an institution progress toward its desired goals and objectives.⁴⁸

The task of measuring social accountability is complex and requires that the purpose and practices of health professions education begin in the identification of societal needs and concludes in meeting those needs. Therefore, we approached this research using a robust logic model approach to guide the systematic evaluation of social accountability and identify links between program inputs and activities and intended outcomes. The link between education and society is explicit in the literature. There is an assumption that medical school inputs and activities should influence the type and quality of care provided by graduates and ultimately impact society.^{49,50} However, the steps between what programs do in training and how these activities translate in practice are not straightforward. Logic models can provide an evaluation structure that incorporates systems theory application in thinking about educational programs.⁵¹

Logic-models assume a linear causal relationship between program elements (inputs and activities) and intended outcomes, while acknowledging the potential complexity of interactions.⁵²⁻⁵⁴ They provide a conceptual model for thinking about how inputs lead to outcomes. They are designed for program improvement and to assess the extent to which program inputs and activities translate effectively into outcomes.⁵⁵ There are various ways to present a logic model, and often differ by scope and use.⁵⁶ However, in its simplest form a logic model includes three core components: inputs, activities, and outcomes. 'Inputs' represent relevant resources available to support a program. 'Activities' are action components of a program and refer to a set of processes, strategies, or innovations in a program. 'Outcomes' are referred to as intended accomplishments of a program, often defined as short-, medium- or long-term changes resulting from its activities.

Thesis Aim, Research Questions & Outline

This thesis fills a gap in the literature as there are limited pre-existing tools, techniques and/or universal indicators available to evaluate social accountability.^{57,58} While continued progress towards demonstrating social accountability has been made in select settings, most programs do not empirically evaluate the extent to which the outcomes of their activities impact society. Several conceptual frameworks and institutional models have been created to assist programs demonstrate social accountability. However, the effects of health professions training activities on community health outcomes remains limited.⁵⁹

Social accountability is a favourable concept yet full of complexities and challenging to evaluate. There are several frameworks and institutional documents associated with social accountability in medical education. However, how social accountability is realized in practice is limited. Previous research has suggested the need to establish meaningful relationships between medical school outcomes and community impacts.^{57,60} However, this initial understanding failed to consider how these relationships are understood. Research to date has contributed to our conceptual understanding of social accountability, but it is limited by its

lack of empirical evidence in practice. Furthermore, the lack of comprehensive indicators needed to measure social accountability has limited the possibility to examine the impact medical schools have on society.

This thesis employs a logic model approach as an initial stage to begin to facilitate the indicators needed to evaluate social accountability outcomes. In the current thinking of social accountability, the focus on how educational inputs and activities lead to potential societal outcomes may serve as a potential starting point. This thesis addresses the following two research questions:

1. *What indicators may support the operationalization of social accountability?*
2. *How might these indicators be used to better support social accountability in practice at the regional and school level?*

This thesis consists of several chapters that consider certain aspects of social accountability (see Table 1). Chapters 2 and 3 address the first research question, and Chapters 4 and 5 address the latter.

Chapter 2 comprises the first step of examining the conceptual and operational aspects of social accountability in health professions education. It presents a study narratively reviewing key social accountability documents, policies, and frameworks in health professions education. This research utilizes a program evaluation CIPP model³⁵ (context-inputs-processes-products, and impacts) as an organizational framework to operationalize a set of indicators to assist medical schools develop accountability systems. Chapter 3 explores institutional practices and administrative perceptions of social accountability using an online survey distributed to a purposeful sample of English-speaking medical school senior administrators internationally. This research identifies common practices and perceptions of social accountability and examines how different elements are realized in practice. It also presents an international represented reliable tool to support the measurement of social accountability indicators.

Chapter 4 demonstrates how open-access, pan-national health data can be used to create a reliable health index to assist schools identify societal needs. This research validates a multi-dimensional health index using open-source population health data as an initial step to better identify and measure national health needs. Chapter 5 develops a methodological approach for creating medical schools' primary areas of responsibility using administrative boundaries. This research also explores graduate retention patterns nationally across training and practice locations by medical specialty as an initial step to examine social accountability outcomes.

Lastly, in Chapter 6, the results of the empirical chapters are reviewed, discussed in light of existing literature, and embedded in a systems-in-evaluation approach. Additionally, implications and recommendations for different stakeholders are provided and an agenda for future research is proposed.

NOTE: This thesis comprises a series of interconnected articles, each designed to stand independently. Consequently, some degree of repetition and overlap between chapters is unavoidable. This deliberate approach allows each chapter to be comprehensible, while the combination of these articles presents a comprehensive view of the overarching topic.

Table 1.
Studied research questions and corresponding research methods and analytical procedures

Chapter	Research Question	Research Method	Analytical Procedure
2	What are the common and unique elements across large-scale social accountability policies? How do these frameworks operationalize social accountability?	Narrative Review	Thematic analysis
3	What are the institutional practices and administrative perceptions of social accountability in medical education?	Survey Design	Exploratory factor analysis; reliability analysis and correlations
4	To what extent can secondary population health data be used to identify societal health needs?	Secondary Data Analysis	Non-linear confirmatory factor analysis; reliability analysis and correlations
5	Can administrative boundaries be used to create medical school service regions of responsibilities? To what extent do medical schools retain graduates within their service regions across the training continuum and into professional practice? To what extent do retention patterns differ by medical specialty?	Geographic Information System (GIS), Secondary Data Analysis	Descriptive Statistics, Service regions and retention proportions

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Chapter 2

Social Accountability Frameworks and Their Implications for Medical Education and Program Evaluation: A Narrative Review

Barber C, van der Vleuten C, Leppink J, Chahine S. Social Accountability Frameworks and Their Implications for Medical Education and Program Evaluation: A Narrative Review. *Acad Med.* 2020;95(12):1945-1954.

Abstract

Purpose. Medical schools face growing pressures to produce stronger evidence of their social accountability, but measuring social accountability remains a global challenge. This narrative review aimed to identify and document common themes and indicators across large-scale social accountability frameworks to facilitate development of initial operational constructs to evaluate social accountability in medical education.

Method. The authors searched 5 electronic databases and platforms and the World Wide Web to identify social accountability frameworks applicable to medical education, with a focus on medical schools. English-language, peer-reviewed documents published between 1990 and March 2019 were eligible for inclusion. Primary source social accountability frameworks that represented foundational values, principles, and parameters and were cited in subsequent papers to conceptualize social accountability were included in the analysis. Thematic synthesis was used to describe common elements across included frameworks. Descriptive themes were characterized using the context–input–process–product (CIPP) evaluation model as an organizational framework.

Results. From the initial sample of 33 documents, 4 key social accountability frameworks were selected and analyzed. Six themes (with subthemes) emerged across frameworks, including shared values (core social values of relevance, quality, effectiveness, and equity; professionalism; academic freedom and clinical autonomy) and 5 indicators related to the CIPP model: context (mission statements, community partnerships, active contributions to health care policy); inputs (diversity/ equity in recruitment/selection, community population health profiles); processes (curricular activities, community-based clinical training opportunities/learning exposures); products (physician resource planning, quality assurance, program evaluation and accreditation); and impacts (overall improvement in community health outcomes, reduction/prevention of health risks, morbidity/mortality of community diseases).

Conclusions. As more emphasis is placed on social accountability of medical schools, it is imperative to shift focus from educational inputs and processes to educational products and impacts. A way to begin to establish links between inputs, products, and impacts is by using the CIPP evaluation model.

Introduction

There have been repeated international calls for medical schools to be socially accountable to the populations they intend to serve. While social accountability is an ideal that many institutions strive toward, measuring it remains a global challenge. With increasing societal demands for greater transparency and accountability, medical schools face growing pressures to produce stronger evidence of their social accountability.^{1,2}

In 1995, the World Health Organization (WHO) defined *social accountability* as:

[T]he obligation of medical schools to direct their education, research and service activities towards addressing the priority health concerns of the community, region, and/or the nation they have a mandate to serve. The priority health needs are to be identified jointly by governments, healthcare organizations, health professionals and the public.³

Since then, the literature surrounding social accountability has expanded and the number of initiatives has multiplied.^{4,5} Many medical schools have embedded social accountability policies in their mission statements, program objectives, and strategic plans, and some organizations have included them in formal accreditation processes.⁵ Yet despite the growing interest, how social accountability is operationalized into measurable attributes remains elusive, making social accountability difficult to evaluate objectively.⁶

Although various policies and frameworks have been established to assist medical schools in the evaluation of social accountability, their descriptions of socially accountable principles, indicators, and parameters remain predominately conceptual in nature. The WHO's social accountability definition, above, encompasses the 3 domains of medical education (education, research, and service activities), and this review addresses the educational domain. The purpose of this review is to identify and document common themes and indicators across large-scale social accountability frameworks, using a program evaluation model as an organizational framework. It is intended to facilitate the development of initial operational constructs needed to evaluate social accountability in medical education.

Background

Derived from the verb account, accountability in its simplest form means answerability, the obligation to provide an account and be held responsible for one's actions.^{7,8} In education, accountability functions as a system to evaluate institutional effectiveness (i.e., how well institutions meet their goals), holding institutions responsible for results and promoting educational improvement.⁹⁻¹² This system implies a sense of responsibility, transparency, and public trust, whereby educational institutions are obligated to answer to society for their actions.^{13,14} While many forms of accountability exist, they all address the following fundamental questions: Who is held to account, for what, to whom, and through what means?^{7,10,15}

All medical schools are accountable to the public, regardless of whether they choose to acknowledge or address this obligation.³ Health professions education programs and any educational institutions responsible for preparing the future health care workforce are accountable to the medical profession; the public (patients, families, communities, and society); their educational

products (graduates, service activities, and research activities); and future health care needs. As a form of accountability, social accountability is implicit, explicit, and anticipated, in that medical schools must produce competent graduates prepared to respond to the changing public health care needs within their local communities.^{16–20}

The medical profession has been granted certain responsibilities and privileges by society. Through legislation, regulation, and accreditation, medical schools are entrusted to produce competent physicians who are prepared to meet the needs of society.^{21,22} This social role carries great responsibilities, signifying the intrinsic social contract between return.^{3,16} Social accountability represents an omnipresent social contract that exists between medicine and society.^{24–31}

Broadly, social accountability implies an entity's commitment to the society it is intended to serve for its actions, conduct, and performance.³² The WHO's definition of social accountability remains the most widely accepted internationally. In 2010, the Global Consensus for Social Accountability of Medical Schools reaffirmed this definition, emphasizing that social accountability is a measurable activity: [A]n action to respond to current and future health needs and challenges in society while working collaboratively with key stakeholders; policymakers; healthcare organizations; health insurance providers, health professionals and civil society.¹⁹

Within the broader accountability literature, the term accountability is often referred to as a conceptual umbrella^{13,33,34} and used interchangeably with responsibility, answerability, or effectiveness to portray an image of trust, trustworthiness, or transparency. However, in the medical education literature, the terms accountable, responsible, and responsive are not equivalent. Differences between them are clearly defined within Boelen and Woollard's social obligation scale.³² Their taxonomy represents a linear progression toward achieving social accountability: responsibility refers to a "state of awareness of duties to respond to society's needs"; responsiveness refers to "a course of action addressing society's needs"; and accountability represents a "measurable activity" to provide evidence that programs proactively meet the priority health care needs of society while working alongside key stakeholders to positively impact public health.³²

Method

Program evaluation models are widely used in multiple fields to provide comprehensive evaluations of social policies, programs, and interventions.^{35–39} We conducted a narrative review⁴⁰ using a program evaluation model as an organizational framework and a systematized process to review large-scale social accountability frameworks as well as journal articles and other documents from the medical education literature. We then synthesized key concepts using a qualitative approach.

Organizational Framework

We selected Stufflebeam's context–input–process–product (CIPP) model as the assessment tool to systematically identify social accountability complex needs, indicators, and outcomes.³⁵ First conceptualized in the 1960s to provide greater accountability in education, this program evaluation model is an internationally used accountability model and widely accepted in medical education.^{35–37} As depicted in Figure 1, the CIPP model uses evaluation as a method for program improvement and accountability. It consists of 4 interrelated components and incorporates continuous quality improvement feedback loops to be used throughout the evaluation model.^{35,36,38}

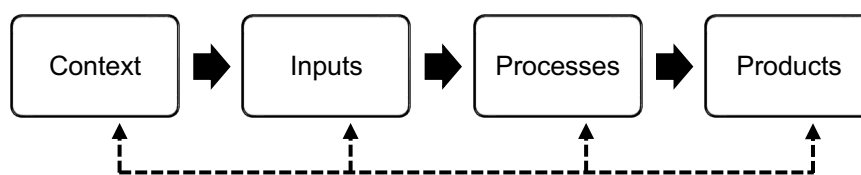


Figure 1. The CIPP (context–input–process–product) evaluation model, adapted from Stufflebeam,^{35,36,38} used as the organizational framework for this narrative review of social accountability frameworks in medical education. The solid black arrows represent the linear production function of the CIPP model, whereby educational inputs are transformed into educational products. The broken black arrows represent the continuous improvement feedback loop to be used throughout the model.

In the CIPP model,^{35–37} context refers to background—a needs assessment used to help identify needs, objectives, and/or opportunities of an educational institution. Inputs refer to material and human resources needed for effective functioning of an educational institution. Inputs are used to determine the appropriate course of action(s) required to achieve program goals and objectives. Processes are used to guide the implementation of a program. Products refer to the quality of student learning and its usefulness for the individual and for society. Products are used to measure outcomes. In later iterations of the CIPP model, the product component was divided into 4 subcomponents to assess a program’s impact, effectiveness, sustainability, and transportability.^{36,38} The CIPP model is dynamic and views education as a production function, whereby educational inputs are transformed to educational outputs. While each component can be evaluated independently, no indicator independently represents an absolute measure of program performance.^{36,38}

Selection and Search Criteria

Using an iterative process, we searched 5 electronic bibliographic databases and platforms (PubMed, Embase, ERIC, Web of Science, and Google Scholar) as well as the broader World Wide Web (using Google) for social accountability frameworks and peer-reviewed journal articles and documents applicable to medical education. These searches were limited to English-language documents. The searches were first conducted in October 2018 and then repeated on March 31, 2019, to include any more recent documents. Keywords used in the search strategies included social accountability OR responsibility, socially accountable OR responsible, and social policies. These words were searched in combination with medical education, medical schools, medical training programs, and health professions education subject heading terms. A sample database search strategy is provided in ‘Supplemental Digital Appendix I’ at <http://links.lww.com/ACADMED/B24>.

Inclusion and Exclusion Criteria

Our focus was social accountability in medical schools. Key English-language policy frameworks and peer-reviewed documents published from 1990 (when the term *social accountability* explicitly emerged within the medical education literature) through March 2019 were eligible for inclusion. Documents that did not discuss social accountability frameworks were excluded. All documents identified in the searches underwent an inclusion review process by the research team. Two of the authors (C.B. and S.C.) screened all documents identified in the searches. The full research team met frequently to review the documents and

come to consensus regarding eligibility requirements. Primary source social accountability frameworks which represented the foundational values, principles, and/ or parameters of the attributes medical schools can strive toward to fulfill their social mandate, and which were used in subsequent papers to conceptualize social accountability were included in the review. Sub-frameworks and/or program- or institution-specific documents were excluded as these built upon previously established frameworks and could lack generalizability.

Analysis

Thematic synthesis⁴¹⁻⁴⁴ was used to describe common and unique elements across the included social accountability frameworks. Thematic synthesis involves the systematic coding of text using an inductive approach to generate themes.^{43,44} The 3-stage analytical process starts with line-by-line coding of text; followed by the development of descriptive themes, which we characterized using the 4 dimensions of the CIPP model as an organizational framework; and then the generation of analytical themes. Two of the authors (C.B. and S.C.) coded the included documents independently. Resulting themes were reviewed by the 2 coders and discussed within the research team until consensus was reached to ensure coding accuracy and inclusivity.

Results

From the initial sample of 33 documents,^{3,16,18-20,23,44-70} we selected 4 key large-scale social accountability policy frameworks^{3,16,18,19} for inclusion in the review (see Table 1 for an overview of the selected frameworks). These 4 primary source documents represent the foundational values, principles, and/ or parameters of social accountability in medical education. Additionally, these documents have all been highly cited and used in subsequent papers to conceptualize social accountability. They were also used to inform the Training for Health Equity Network evaluation framework⁴⁷ as well as various institution-specific education, research, and service activities.

Table 1.

Key Large-Scale Social Accountability Frameworks in Medical Education Included in the Narrative Review

Framework	Authors, year ^{ref}	Title of document
World Health Organization	Boelen & Heck, 1995 ³	Defining and Measuring the Social Accountability of Medical Schools
Health Canada	Health Canada, 2001 ¹⁶	Social accountability: A Vision for Canadian Medical Schools
Conceptualization-Production-Usability	Boelen & Woollard, 2009 ¹⁸	Social accountability and Accreditation: A New Frontier for Educational Institutions
Global Consensus for Social Accountability of Medical Schools	Global Consensus for Social Accountability, 2010 ¹⁹	Global Consensus for Social Accountability of Medical Schools

These frameworks include policy, definition, application, and evaluation of social accountability at the local, national, and international levels.⁷¹ Although these frameworks differ slightly, they all describe characteristics that can be used toward demonstrating social accountability. Commonalities include responding to local public health needs; working alongside key stakeholders in identifying existing and forthcoming societal public health needs; servicing surrounding communities; addressing physician shortages; increasing diversity

within the admissions process to reflect local demographics and geography; producing competent medical professionals; and ensuring the curriculum reflects priority health needs.^{3,16,18,19}

Our thematic synthesis identified 6 themes, including shared values and 5 indicators as they relate to the CIPP evaluation model: context (program objectives), inputs (actions), processes (activities), products (institutional outputs/outcomes), and impacts on societal health. While impact evaluation is a subcomponent of product evaluation in the CIPP model, given the emphasis of social accountability in medical education on impact in practice and improvement in public health, we treated impacts as a separate theme in our analysis. Additionally, we identified subthemes within each theme, as described below and depicted in Figure 2. A selection of quotes to illustrate the themes and subthemes is provided in Table 2.

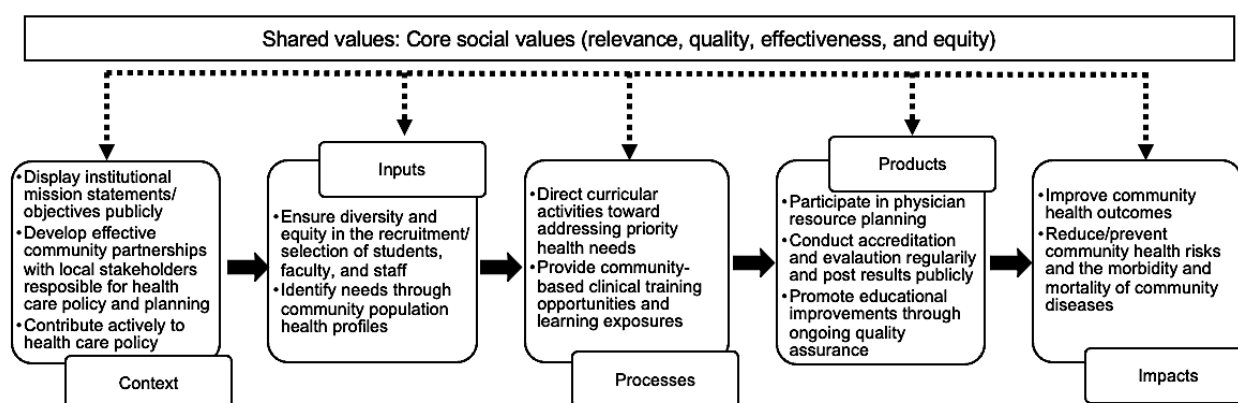


Figure 2. Themes and subthemes that emerged from the thematic synthesis of the narrative review of social accountability frameworks in medical education mapped to the interrelated components of the CIPP (context–input–process–product) evaluation model, used as an organizational framework.^{35,36,38} Impact evaluation was added in later iterations of the CIPP model as a subcomponent of product evaluation.^{36,38} Six themes were identified in the 4 included social accountability frameworks^{3,16,18,19}: shared values (inclusive of the 4 core social values) and 5 indicators as they relate to the CIPP evaluation model (context, inputs, processes, products, and impacts). The broken black arrows serve a dual purpose. First, they represent the far-reaching core social values, which extend across all dimensions of the CIPP model. These 4 core social values are intended to guide medical education program activities in education, research, and service across the training continuum.¹⁸ Additionally, the broken black arrows represent the continuous improvement feedback loop to be used throughout the model. The solid lines represent the linear production function of the CIPP model, whereby educational inputs are transformed into educational products.

Table 2.

Themes Identified Across the 4 Large-Scale Social Accountability Frameworks Included in the Narrative Review, Using the CIPP Model as an Organizational Framework^a

Themes and subthemes	Selected illustrative quotations
Shared Values	
Four Core Social Values (Relevance, quality, effectiveness, and equity)	...building a health care system that is relevant to the needs of the community or nation and provides high-quality health care that is cost effective and equitable. ^{3(p12)}
Professionalism	...embraces a scope of competencies for the medical doctor that is consistent with ... [relevance, quality, effectiveness, and equity] and the concept of professionalism... ^{19(p5)}

Table 2.

Themes Identified Across the 4 Large-Scale Social Accountability Frameworks Included in the Narrative Review, Using the CIPP Model as an Organizational Framework^a

Themes and subthemes	Selected illustrative quotations
Academic freedom and clinical autonomy	Academic freedom and clinical autonomy are other values entrenched within the Canadian academic and clinical communities. ^{16(p1)}
Context (program objectives)	
Mission statements	Medical schools should explicitly expound their commitment to social accountability and social responsiveness in their general orientation, including in their publicly-stated mandate or mission statement... ^{16(p3)}
Community partnerships	The institution is likely to improve its effectiveness if it works in partnership with other stakeholders in the system, namely, policy makers, health system managers, health care professionals and civil society. ^{18(p889)}
Active contributions to health care policy	Medical schools should not be just instruments of health policy, they should contribute towards creating it. ^{3(p5)}
Inputs (actions)	
Community population health profiles	...be responsive to the current and emerging needs of their individual communities, within the larger context of national and international trends, by continually profiling the health status and health care needs of the community. ^{16(p5)}
Diversity and equity in recruitment and selection (students, faculty, and staff)	The medical school recruits, selects and supports medical students who reflect social diversity and disadvantaged groups. ^{19(p6)}
Processes (practices)	
Curricular activities	The entire spectrum of educational interventions including curriculum content and structure, learning resources allocation, teaching methods, student assessment, faculty development and evaluation systems is shaped to best meet individual and societal needs. ^{19(p6)}
Community-based clinical training opportunities and learning exposures	Curriculum structure: early and longitudinal exposure to priority health issues in the community. ^{18(p892)}
Products (outputs/outcomes)	
Physician resource planning	...determining and educating the appropriate number and mix of physicians, and facilitating the geographic distribution necessary to meet the needs of the community. ^{16(p1)}
Quality assurance	The medical school engages in a periodic process of internal quality review and improvement, guided by defined standards... ^{19(p9)} Evaluation research is key to ensuring that such interventions meet identified needs and to providing a strong evidence base for sustainability. ^{16(p5)}
Program evaluation and Accreditation	Use evaluation and accreditation to assess performance and impact ^{19(p1)}
Impacts	
Overall improvement in community health outcomes	... medical schools must be able to demonstrate that the outcomes of their activities in these arenas make a difference. They have the obligation to demonstrate to society that they produce physicians who ... have a positive impact on the health care and health status of the population they serve. ^{16(p7)}

Table 2.

Themes Identified Across the 4 Large-Scale Social Accountability Frameworks Included in the Narrative Review, Using the CIPP Model as an Organizational Framework^a

Themes and subthemes	Selected illustrative quotations
Reduction/prevention of community health risks and morbidity and mortality of community diseases	The primary goal of medical education is to prepare graduates to practice effectively in reducing the burden of illness and improving the health of their communities. ^{16(p3)}

Notes. ^aThe context-input-process-product (CIPP) model was used as the organizational framework for this narrative review.³⁸ This program evaluation model was conceptualized in the 1960s to provide greater accountability in education and remains one of the most widely used systematic evaluation frameworks, whereby educational inputs are transferred into outputs (see Figure 1). The CIPP model contains 4, plus 1, interrelated evaluation components: context, input, process, product, and impact. Impact was added in later iterations of the CIPP model as a subcomponent of product evaluation.³⁶

Shared Values

All 4 frameworks emphasized the 4 core social values (relevance, quality, effectiveness, and equity).^{3,16,18,19} These far-reaching values extend across all components of the CIPP model. Generally, the core social values refer to the conceptual ideals and well-intended attributes of social accountability intended to inform context (program objectives), inputs (actions), processes (activities), and products (institutional outputs/ outcomes). They are action oriented and grounded in the identification of societal needs. They are intended to guide medical education program activities in education, research, and service across the training continuum.¹⁸

The core social values were originally conceptualized in 1995 by the WHO³ as a means to help medical schools evaluate their progress in addressing social accountability and have since been adapted by subsequent frameworks.^{16,18–20,23,44–70} *Relevance* implies that a medical education program addresses priority health needs or concerns of the population, community, or nation using a systematic approach in education, research, and service activities.^{3,16,18,19} *Quality* refers to providing individuals with the best possible care that is evidence based, comprehensive, and culturally sensitive.^{3,16,18,19} *Effectiveness* refers to the utilization of health care resources (costs) and ensuring that the greatest impact on public health is achieved while making the best use of resources.^{3,16,18,19} *Equity* refers to universal access and striving to ensure that all individuals have access to quality health care.^{3,16,18,19}

The interrelationship between these core social values represents a universal social commitment to “building a health care system that is relevant to the needs of the community or nation and provides high-quality care that is cost-effective and equitable.”³ Medical school activities in education, research, and service as well as health policies must be reflective of these needs—they must relate to, respond to, and anticipate priority health needs of the population.^{3,16,18,19}

In addition to the core social values, 3 of the included frameworks^{16,18,19} emphasized the value of professionalism as well as the following competencies: ethics, teamwork, cultural competence, leadership, communication, lifelong learning, and evidence-based practice. In the Canadian context, the values of academic freedom and clinical autonomy were also highlighted.¹⁶

CIPP Model

Context. Context is the first component in the CIPP model. Recurring subthemes that emerged across the frameworks included mission statements, community partnerships, and active contributions to health care policy.

Institutional or program mission statements, mandates, policies, objectives, and/or goals must reflect the core social values of social accountability and the explicit commitment to meeting societal health needs.^{3,16,18,19} These statements should be posted publicly and made easily accessible to the general population.¹⁶ Additionally, the content and context specificity of a medical school's mission statement and activities in education, research, and service should be inspired by and aligned with the current and anticipated priority health needs or concerns of the community and/or nation the institution serves.^{3,19} These mission statements serve as needs assessments and are intended to guide institutions' education, research, and service activities to demonstrate their social obligation and commitment to society.³

Developing effective community partnerships with local health systems as well as other stakeholders is also important.^{3,16,18,19} Medical schools are more likely to improve their effectiveness if they work collaboratively with other stakeholders to establish priorities and identify current and future health needs.¹⁸ The local community serves as the primary stakeholder of all medical schools.¹⁹ Therefore, it is imperative that schools work in partnership with local stakeholders responsible for health care policy, planning, and finance to identify priority health needs as well as services and resources required for optimal patient care.^{3,16,18,19} Partnerships with affiliated health care organizations, professional groups, governments, consumers, and civil society could facilitate and encourage shared work on health planning, policy development, health care delivery, and evaluation.¹⁶

Medical education programs also play an important role in shaping the health care system. Community partnerships would serve as a means for medical schools to actively contribute to health care policy.^{3,16,18,19} Medical schools should act as catalysts of change and actively contribute to the sustainability and evaluation of health care planning and delivery, and policy development.¹⁶

Inputs. Inputs are actions taken by programs to meet targeted goals. These actions are motivated by institution/ program mandates and mission statements, and they reflect the core social values of social accountability. Subthemes across frameworks included diversity and equity in recruitment and selection (students, faculty, and staff) and community population health profiles.

Two frameworks emphasized the importance of diversity and equity in the recruitment and selection of students.^{18,19} To meet the social commitments embedded within the core social values and mission statements, medical schools must adapt their recruitment and selection policies to increase the diversity of accepted applicants to include individuals from underrepresented populations and disadvantaged groups.¹⁸ Students should reflect the demographics of the general population—including race and ethnicity, visible minority or indigenous status, socioeconomic status, gender and sexual orientation, and religious affiliation—and reflect other disadvantaged groups, such as rural and underserved communities.¹⁹ Additionally, schools should implement strategic pipelines and/or quotas for

underrepresented groups as well as support mechanisms (e.g., financial aid, counseling services) to ensure equal opportunities for socially disadvantaged applicants.¹⁹ Medical schools should also ensure that faculty from medicine, health service delivery, and social science divisions are represented and involved in the curriculum and in programmatic decision making.¹⁸ Lastly, medical schools should matriculate students who are more likely to practice as generalists, as recommended by the WHO report.³

Another central theme in 3 frameworks was the need for medical schools to identify population needs as well as service gaps of a targeted community and/or nation.^{3,18,19} Schools can begin to identify these needs through well-defined population health research and the development of a comprehensive community population health profile.^{3,18} These profiles must reflect the community's sociodemographic and geopolitical composition as well as population health risks, social determinants of health, and barriers to accessing services.

Processes. Processes include the entire spectrum of educational activities: curricular content and structure; teaching methods; community-based clinical training opportunities and learning exposures to local populations and underserved areas; learning assessments; continuing professional development; and evaluation systems. Recurring subthemes that emerged across frameworks included curricular activities as well as community-based clinical training opportunities and learning exposures.

Medical schools must direct their curricular activities toward addressing priority public health needs.^{3,16,18,19} Curricular content and structure should be approached using a student-centered paradigm and must include the social determinants of health; public health risks; and the geopolitical, sociodemographic, and epidemiological specificities of a population, community, and/or nation.^{3,19} Additionally, schools' curricular activities should support lifelong learning opportunities for faculty, graduates, and staff through the availability of robust continuing professional development programs.^{16,18}

Community-based clinical training opportunities and learning exposures should be designed using a population approach.^{3,19} Medical schools should promote primary care and provide learning opportunities and exposure to primary care practices.^{3,16,19} Additionally, schools should provide longitudinal community-based learning experiences that are relevant to the community's health needs.^{3,19} Lastly, schools should provide learning opportunities in rural health care settings as well as exposure to disadvantaged and underserved groups.^{3,19}

Products. Product evaluation refers to the usability of a program's graduates. Recurring subthemes that emerged across frameworks included physician resource planning, quality assurance, and program evaluation and accreditation.

All 4 frameworks emphasized the importance of physician resource planning. Medical schools should be actively involved in determining and educating the right composition of students and in determining the distribution, deployment, and retention of graduates necessary to meet social needs.^{3,16,18,19} Additionally, schools must ensure local employment opportunities for primary care physicians.^{18,19} Another central theme was the importance of program evaluation and accreditation.^{3,16,18,19} Accreditation standards and processes should incorporate social accountability principles.^{3,16,18,19} Evaluation and accreditation must be conducted at regular intervals,^{3,19} and the results should be made publicly available and used for institutional

improvement.¹⁹ Additionally, evaluation and accreditation teams should be widely representative of stakeholders, including policymakers, health professionals, and community members.¹⁹

Lastly, the importance of embracing a continuous quality assurance process in education, research, and service delivery was emphasized across all frameworks.^{3,16,18,19} This process should be transparent and guided using well-defined standards to promote educational improvements.^{3,19} Additionally, graduate competencies must be assessed regularly and reflect well-defined educational standards to ensure quality of care and that graduates enter practice equipped with the skills required to meet changing public health needs.^{3,16,18,19}

Impacts. The premise of social accountability requires that the purpose and practices of medical education programs commence in the identification of societal needs and conclude in meeting those needs.¹⁸ Impact evaluation is part of product evaluation. A common theme highlighted across frameworks was overall improvement in community health outcomes.^{3,16,18,19} Another common theme was reduction and prevention of community health risks and morbidity and mortality of community diseases.^{16,19}

To evaluate societal impacts effectively, medical schools must develop standards that span the educational continuum and focus on impacts of graduates in practice.¹⁹ They must develop metrics to assess the extent to which their graduates reduce the burden of illness and improve the health of the communities they serve.¹⁶ Medical schools must be able to demonstrate that the outcomes of their activities have positive impacts on community health.^{3,16,18,19} They have an obligation to ensure their graduates have a positive social return on investment to public health by reducing community health risks and the morbidity and mortality of community diseases.^{16,19}

Discussion

This review identified major themes and indicators across 4 large-scale social accountability policy frameworks^{3,16,18,19} using the CIPP evaluation model.³⁵ The CIPP model has not been used previously in the medical education literature to identify social accountability indicators across policy documents, but this review provides evidence of its utility in the development of initial operational constructs to evaluate social accountability in medical education.

The themes explored in the included frameworks are consistent with the broader social accountability literature in medical education. However, the CIPP model provides an evaluation framework for medical education programs to strengthen their accountability systems.^{35–38} Additionally, this review also inadvertently addresses the fundamental questions of accountability: Who is held to account, for what, to whom, and through what means?^{7,10,15} These questions are critical to understanding accountability and can be used to help operationalize social accountability frameworks to better evaluate how and in which ways medical schools are socially accountable.

While this review focused primarily on social accountability of medical schools, it is important to acknowledge that social accountability is a dynamic process. It represents a collaborative relationship between citizens, government, training institutions, and health care educators/providers to systematically identify, prioritize, and address societal health

needs.^{3,72} The measurement and systematic evaluation of social accountability in medical schools requires the use of a robust evaluation model to capture its conceptual and operational complexities. While accreditation may address many of these issues, it often serves a different purpose—ensuring medical schools produce competent graduates for the workplace. In this instance, schools are accountable to the accreditors. Canada and Australia have incorporated formal social accountability standards into their accreditation processes as a means to evaluate a medical school's commitment to addressing the priority health concerns of the population.^{19,72,73} While this is a positive advancement, we need to continue to think about social accountability outcomes more broadly and establish meaningful relationships between educational inputs, outputs, and impacts.^{19,73}

There is, however, an understudied assumption that medical schools meet societal needs. According to Boelen,⁷² only 1% of medical schools are socially accountable, whereas 9% of medical schools are socially responsive and 90% are socially responsible. While transparency and accountability initiatives have emerged as a key strategy for improving public services, the relationship between these initiatives and their impacts on public health remains largely unknown.⁷⁴ This issue is not specific to medical education.⁷⁵ There is a need to evaluate and demonstrate the social impacts graduates have in practice on communities and establish a link between theory and practice.

This demonstration becomes less about providing public displays of good intentions and commitment to social accountability and more about proof of concept.⁷⁵ A growing body of literature seeks to affirm the progress of individual medical schools toward becoming socially accountable (see Reeve et al⁷⁶ for a systematic review). Some examples of medical schools' efforts include widening access through admissions processes,^{77–82} curricular reforms reflecting social determinants of health,^{83–86} community-based clinical training opportunities and learning exposures,^{87–90} and location of learners.^{91–97}

While progress in evaluating social accountability continues to expand in select medical education settings,⁹⁸ the extent to which social accountability initiatives impact societal health remains largely unknown.^{99,100} However, a small number of empirical papers associate patient health outcomes with physician training and performance^{101,102} and some commentaries^{103–105} emphasize the need to link graduate outcomes with patient impacts using national clinical datasets to better understand the effects medical education programs have on public health needs.

Limitations

This review extends earlier work.^{3,16,18–20,23,44–70} It does not provide a comprehensive list of all possible social accountability indicators. The themes and indicators presented here are limited to primary source social accountability policy frameworks and are not necessarily inclusive of metrics used to assess quality.

This review does not address more recent global health movements, for instance, the growing concerns regarding global health disparities. Additionally, the CIPP model assumes a top-down systems approach to education, whereby educational inputs are turned into products. This review is also primarily on medical education, not other interrelated and interdependent program activities of social accountability (i.e., research and service). Further research is

needed to examine these relationships in more detail and determine whether medical schools address and respond to local health needs.

Conclusion

This review links an established program evaluation model and evidence from 4 large-scale social accountability policy frameworks, which may lead to the creation of indicators across the medical education continuum. Program evaluation models provide a systematic and easily understood practical guide for monitoring the progress of an institution toward desired goals and objectives. However, even when medical schools attempt to fulfill their social obligations, there is no guarantee that these actions will positively impact public health.³

The task of evaluating social accountability is complex.⁶⁵ Most of the previous literature assessing the quality of medical education programs has focused predominantly on inputs and processes.⁷² As more emphasis is placed on social accountability, it is imperative that we as a community shift our focus from educational inputs and processes to products and impacts. There is a need to establish meaningful relationships between program inputs (who is trained and from where), products (what graduates do in practice, in what medical specialty, and where), and impacts (how graduates' activities improve population health).^{32,74} We suggest a way to begin to establish these links is through the use of the CIPP program evaluation model.

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Supplemental Digital Appendix I.

Search strategy used for searching Web of Science for research on social accountability in medical education

TS=("social accountability" OR "socially accountable" OR "social responsibility" OR "socially responsible" OR "social policy")

AND

TS=("medical education" OR "health professions education" OR "medical school" OR "medical training program")

AND

LANGUAGE: (English)

AND

DOCUMENT TYPES: (Article)

Timespan: 1990-2019.

Chapter 3

Global Perceptions on Social Accountability and Outcomes: A Survey of Medical Schools

Barber C, Chahine S, Leppink J, van der Vleuten C. Global Perceptions on Social Accountability and Outcomes: A Survey of Medical Schools. Teach Learn Med. Online ahead of print, July 29, 2022

Abstract

Phenomenon. Social accountability has become a universal component in medical education. However, medical schools have little guidance for operationalizing and applying this concept in practice. This study explored institutional practices and administrative perceptions of social accountability in medical education.

Approach. An online survey was distributed to a purposeful sample of English-speaking undergraduate medical school deans and program directors/leads from 245 institutions in 14 countries. The survey comprised of 38-items related to program mission statements, admission processes, curricular content, and educational outcomes. Survey items were developed using previous literature and categorized using a context-input-process-products (CIPP) evaluation model. Exploratory Factor Analysis (EFA) was used to assess the inter-relationship among survey items. Reliability and internal consistency of items were evaluated using McDonald's Omega.

Findings. Results from 81 medical schools in 14 countries collected between February and June 2020 are presented. Institutional commonalities of social accountability were observed. However, our findings suggest programs focus predominately on educational inputs and processes, and not necessarily on outcomes. Findings from our EFA demonstrated excellent internal consistency and reliability. Four-factors were extracted: (1) selection and recruitment; (2) institutional mandates; (3) institutional activities; and (4) community awareness, accounting for 71% of the variance. McDonald's Omega reliability estimates for subscales ranged from 0.80-0.87.

Insights. This study identified common practices of social accountability. While many medical schools expressed an institutional commitment to social accountability, their effects on the community remain unknown and not evaluated. Overall, this paper offers programs and educators a psychometrically supported tool to aid in the operationalization and reliability of evaluating social accountability.

Background

Social accountability is defined in medical education as the capacity to respond to societal needs and health system challenges.¹ This mandate implies a commitment from medical schools to direct their education, research, and service activities toward priority health needs in the communities they intend to serve.² Over the last decade, social accountability has become a universal component in medical education.^{3–7} Better alignment between medical education and societal needs is considered a key pathway for improving population health.⁸ However, the practical implementation of this widespread social commitment remains elusive.⁹ Social accountability has an internationally acknowledged definition,^{2,10} but medical schools have little guidance for operationalizing and applying this concept in practice.⁹ While social accountability focuses on education, research, and service activities, this paper focuses primarily on the educational perspective of social accountability in medical training.

Previous studies examined institutional differences surrounding the core principles of social accountability.^{11,12} For example, Preston et al.,¹¹ examined how social accountability was conceptualized by key stakeholders using a multi-case study. While commonalities were observed, stakeholder perceptions were multi-dimensional and largely influenced by contextual issues.¹¹ Similarly, Galukande et al.,¹² interviewed 12 key informants regarding their perceptions of social accountability. Their findings suggest individual perceptions of social accountability were not homogenous and contextualized by the lack of community resources.¹²

The lack of clarity surrounding social accountability has resulted in several institution-specific documents.^{13–25} While these documents differ in terms of application, they express similar social mission statements;^{26–28} widening admissions policies;^{29–31} curricular reforms;^{32–34} and community-based learning opportunities.^{35,36} Although these attributes are seen as steps in the right direction, they must be strengthened by the commitment to evaluate program outcomes.^{1,37}

There is growing evidence suggesting that institutional social mission activities are associated with increased workforce diversity, primary care selection, and physician distribution.³⁸ For example, Mullen et al.,³⁹ developed a social mission score to evaluate medical school outputs in the United States. This composite score comprised of three dimensions, the percentage of graduates from underrepresented groups, practice in primary care, and those who work in underserved areas. In 2021, Mullan et al.,⁴⁰ developed a health equity framework for medical schools. Using a multi-phased approach, eight modalities were identified to evaluate schools' social missions (i.e., institutional mission statement, pipeline programs for underrepresented populations, admissions and selection, curriculum content, location of clinical experience, tuition management, mentorship, and postgraduate engagement).⁴⁰

Additionally, Morley et al.,²⁸ examined the relationship between social mission statements and school outputs using an expert panel in the United States. Their findings suggest a positive relationship between social mission content and percentage of graduates working in primary care and underserved areas.²⁸ Lastly, Puschel et al.,⁴¹ developed the Social Accountability Instrument for Latin American Medical Schools (SAIL) questionnaire to measure institutional achievement in four key domains of social accountability. Using a mixed method approach this study designed and validated an instrument to measure social accountability.⁴¹

The task of evaluating social accountability is complex.⁹ In an effort to begin to understand how social accountability is operationalized in practice, we developed an online survey. This study aimed to construct a reliable social accountability scale and identify common practices and perceptions of social accountability.

Methods

This study investigated administrative perceptions and institutional practices of social accountability in medical schools using an online survey.

Participants

Using purposeful sampling, medical school deans and program directors/leads of English-speaking schools that offer an undergraduate medical program from 265 institutions in 14 countries (Australia and New Zealand, Canada, the Caribbean (Antigua, and Barbuda, Aruba, Barbados, Curaçao, Jamaica, Saint Kitts and Nevis, Saint Vincent and the Grenadines), South Africa, United Kingdom, Ireland, and the United States) were invited to complete an online survey. Individuals in leadership positions were deemed most appropriate based on their expert knowledge regarding institutional policies, program objectives, curricular activities, and institutional approach to program outcomes.

We conducted a hand search of English-speaking medical schools that offer an undergraduate medical program using the World Directory of Medical Schools website.⁴² We selected this inclusion criterion based on the premise that all medical schools are accountable to the public, regardless of whether they choose to acknowledge and/or address this duty.² Additionally, due to the complexities surrounding post-graduate programs,⁴³ specifically in the United States,⁴⁴ we selected only medical schools that offer an undergraduate training program for inclusion. Lastly, the sampling was exclusive to English-speaking medical schools as cultural and language barriers were not always adequately captured through direct language translation. Table 1 provides an overview of the type and duration of undergraduate medical programs by country included in the sample.

Table 1.

Type and length of medical degree program included in the survey sample by county

Country	Degree Awarded	Length of Program
Australia	Bachelor of Medicine and Bachelor of Surgery (M.B.B.S.) Medicinae Baccalaureus, Baccalaureus Chirurgiae (M.B., Ch.B.) Doctor of Medicine (M.D.)	3 to 7 years
Canada	Doctor of Medicine (M.D.)	3 to 4 years
Caribbean Countries	Bachelor of Medicine, Bachelor of Surgery (M.B.B.S.) Doctor of Medicine (M.D.)	4 to 5 years
New Zealand	Bachelor of Medicine and Bachelor of Surgery (M.B.B.S.) Medicinae Baccalaureus, Baccalaureus Chirurgiae (M.B., Ch.B.)	4 to 6 years
South Africa	Bachelor of Medicine, Bachelor of Surgery (M.B., Ch.B.)	5 to 6 years

Table 1.

Type and length of medical degree program included in the survey sample by county

Country	Degree Awarded	Length of Program
United Kingdom & Ireland	Bachelor of Medicine, Bachelor of Surgery (M.B., Ch.B.)	4 to 5 years
United States of America	Doctor of Medicine (M.D.)	4 years

Note. The information presented in this table was obtained using the World Directory of Medical Schools website.

Invitation Process

Participant contact information (name and corresponding email address of deans and program directors/leads from each school) were retrieved online using publicly available information (e.g., institutional websites and the Internet (using Google)). In an attempt to optimize response rates, contact information obtained from all deans and program directors/leads were invited to participate. The research team allocated a maximum of 15-minute search intervals for each school to locate the targeted contact information. If this information could not be obtained within 15 minutes, it was deemed publicly unavailable, and that school was excluded from the study.

The reliance on publicly available information as the sole source in reaching our target sample resulted in several assumptions that fell outside our control. For example, it was assumed that institutional websites listed names and corresponding email addresses of their academic leadership. Additionally, it was also assumed that these websites were updated regularly and were reflective of any leadership changes. We corrected errors resulting in incorrect contact information, names, and/or email addresses when possible and redistributed survey invitations.

Survey Design

We developed a 38-item survey, linked to social accountability indicators using social accountability frameworks, peer-reviewed journal articles, and documents applicable to social accountability in medical education.^{2,4,6,9-11,37,45-50} These documents represented the core principles, parameters, and/or attributes of social accountability (see Barber et al.,⁴⁹ for a narrative review of social accountability frameworks). We designed survey items and categorized them using a context-input-process-products (CIPP) evaluation model.^{49,51,52}

The CIPP evaluation model is widely accepted in medical education and used internationally across multiple fields to provide comprehensive evaluation and quality improvement of social policies, programs, and interventions.⁵¹ We organized survey items using the four components of the CIPP model. Context referred to items related to social accountability, conceptual perceptions, and medical school characteristics. Inputs captured items related to selection and recruitment of students, faculty, and staff as well as community engagement. Processes included items related to curricular activities and products referred to items concerning graduate outcomes and impact on population health.

We asked participants to reflect upon their institutional practices and answer a series of items related to their programs' mission statements, admission processes, curricular activities, and educational outcomes. The survey included five items related to respondent demographics; five institutional characteristics items, inclusive of dichotomous (yes/no) items as well as an

item asking respondents to rate their institutions' perceived importance of social accountability using a ten-point scale (1 = not at all important and 10 = extremely important). The survey also included 28 Likert scale items using a 5-point scale (1 = strongly disagree and 5 = strongly agree). The survey is available in 'Supplemental Digital Appendix I'.

Procedure

We developed survey items using an iterative process amongst researchers, over several months of discussions and revisions until we developed a final set of items. An expert panel review, consisting of medical physicians and academic scientists with expertise in social accountability in medical education, survey design, and measurement, validated the survey items. Twenty experts reviewed each survey-item based on relevance and clarity using a 3-point scale (nice to know, must know, and option to rewrite) and provided additional comments regarding item-scales as well as overall fit. Reviewer feedback was incorporated, and the pre-validated survey was disseminated to the targeted sample.

We distributed the survey and collected data electronically using Qualtrics Survey Software between February 24, 2020, and June 30, 2020. The authors intended the survey to take approximately 12 minutes to complete. Email invitations were extended to identified participants and included a brief introduction, survey instructions and expectations, information pertaining to consent, confidentiality, and anonymity as well as the survey link. The survey was voluntary; participants did not receive an incentive for participating. The survey remained open for several months to obtain optimal response rates during the initial stages of the COVID-19 pandemic. We conducted all correspondence between investigators and participants via email through Qualtrics. Following initial contact, bi-weekly email reminders were distributed over a four-month period.

Analysis

All survey responses were deidentified to ensure confidentiality and anonymity. Analyses included frequency distributions and descriptive analysis. To identify underlying constructs of the 28 Likert scale items, we used Exploratory Factor Analysis (EFA) using principal axis factor analysis with oblique rotation⁵³⁻⁵⁵ and 3:1 sample to variable ratio.^{53,56} EFA requires a minimal sample size of approximately 100 cases.⁵³⁻⁵⁵ McDonald's Omega was used to assess the internal consistency of the resulting scales. We selected Omega over Cronbach's Alpha based on its ability to provide more accurate estimates of a scale's internal structure.⁵⁷⁻⁵⁹ Analyses were conducted in SPSS (Version 26.0; IBM Corp. Armonk, NY) and Jamovi (Version 1.2; The jamovi project, Sydney, Australia).

Ethics: This study received ethical approval from Queen's University, Kingston Ontario, Canada (File No. 6028362).

Results

A total of 81 medical schools from 14 countries participated in the study. Institutional response rates varied by country, ranging from 21% to 100%, with an overall response rate of 31% (depicted in Table 2). Demographics and medical school characteristics are presented in Table 3. The number of responses for each survey item varied. Approximately, 38 (46.9%) of all

respondents were female. Most respondents (80.2%) self-identified as a medical practitioner, years of practice ranging from 5 to 43 ($M = 24.85$, $SD = 9.73$). Additionally, respondents reported working at their current institution 1 to 35 years ($M = 13.14$, $SD = 8.83$).

Table 2.

Social Accountability Survey Response Rates by Country and Medical School

Country	No. of Medical Schools	Response Rate No. (%) by Medical Schools
Australia & New Zealand	23	9 (39.1)
Canada	14*	14 (100.0)
Caribbean Countries	36	9 (25.0)
South Africa	9	4 (44.4)
United Kingdom & Ireland	42	9 (21.4)
United States	141	36 (25.5)
Total	265	81 (30.6)

*Excluding French-language medical schools

All respondents (98.8%) expressed a high importance of social accountability within their school ($M = 8.36$, $SD = 1.79$) and most (88.8%) reported their school had an explicit social accountability mandate. Many schools (93.7%) reported having a primary care or family medicine/general practice department or faculty. Exposure to primary care practice and principles or family medicine departments are considered to foster graduates committed to primary care.^{2,8} Additionally, all respondents (97.5%) reported having student learning opportunities in a hospital setting. However, fewer respondents (45.7%) reported having community-based learning exposures in patient homes or elderly care homes (56.8%). Community-based learning opportunities expose students to a variety of settings as well as disadvantaged populations and underserved groups.^{2,8} Lastly, most respondents (95.1%) reported that their program's mission statement was posted publicly.

Table 3.Descriptive Statistics: Mean (M), Standard Deviation (SD), Mode, and Range of Possible Scores for Social Accountability Survey Demographic and Medical School Characteristics Item Responses

	No. (%) out of 81 responses	M (SD)	Range of possible scores
Demographics			
<i>Country</i>			
Australia/New Zealand	9 (11.1)		
Canada	14 (17.3)		
Caribbean	9 (11.1)		
South Africa	4 (4.9)		
United Kingdom/Ireland	9 (11.1)		
United States	36 (44.4)		
<i>Gender</i>			
Male	43 (53.1)		
Female	38 (46.9)		
<i>Medical practitioner</i>			
Number of years practicing as a medical practitioner	61 (75.3)	24.85 (9.73)	5-43
Number of years working at current institution	79 (97.5)	13.14 (8.83)	1-35
Medical School Characteristics			
Explicit social accountability mandate	71 (87.7)		
Primary care or family medicine/general practitioner department or facility/discipline group	74 (91.4)		
<i>Educational experiences:</i>			
Hospitals (secondary and tertiary health care)	79 (97.5)		
Outpatient clinics	78 (96.3)		
Emergency clinics	72 (88.9)		
Community health centers or clinics	75 (92.6)		

Table 3.

Descriptive Statistics: Mean (*M*), Standard Deviation (*SD*), Mode, and Range of Possible Scores for Social Accountability Survey Demographic and Medical School Characteristics Item Responses

	No. (%) out of 81 responses	<i>M</i> (<i>SD</i>)	Range of possible scores
General Practice (Physician's office; consultation room/clinic)	73 (90.1)		
Patient Homes	37 (45.7)		
Homes for the elderly (retirement homes or aging care facilities)	46 (56.8)		
Chronic-care facilities	51 (63.0)		
<i>Institutional importance of social accountability (10-point scale 1 = not at all important and 10 = extremely important)</i>	80 (98.8)	8.36 (1.79)	1-10
<i>Publicly posted mission statement</i>	77 (95.1)		

Perceived Agreement of Socially Accountable Practices

The overall variance in the Likert scale items using McDonald's ω reliability estimate was 0.946, indicating excellent internal consistency. However, means and standard deviations of these items varied (depicted in Table 4). For example, item means related to institutional mission statements and community engagement were generally high (ranging from 4.0 to 4.5). Whereas item means related to coordinating with local organizations to promote health care, producing the right number of specialists needed to serve the local health workforce needs, and collecting data on the impact of graduates on patient outcomes were relatively low (ranging from 2.5 to 3.9).

Table 4.

Mean (*M*), Standard Deviation (*SD*), and Ranges of Possible Scores for the 28 Likert Scale Survey Item Responses (1 = strongly disagree, 5 = strongly agree)

	No. (%) out of 81 responses	<i>M</i> (<i>SD</i>)
<i>Missions Statement</i>		
Improve the quality of future graduates	79 (97.5)	4.46 (0.93)
Enhance the health status of the local population	79 (97.5)	4.52 (0.85)
Respond to priority health needs of the local population	79 (97.5)	4.42 (0.96)
Coordinate with local organizations to promote health care	79 (97.5)	3.77 (1.29)
<i>Population Profile</i>		
Responsible to serve a specific geographic region(s)	79 (97.5)	4.29 (1.09)
Actively conducts community-based health outcomes research	79 (97.5)	4.11 (1.01)
Aware of the epidemiological disease profile of the local population	79 (97.5)	4.44 (0.84)
Access to data containing a community profile of the local population (e.g., socio-demographic composition, priority health needs, health risks and health determinants)	79 (97.5)	4.29 (1.03)
<i>Community Engagement</i>		
Collaborates with local community agencies to provide health care in community	79 (97.5)	4.11 (1.10)
Works with local partners to identify population health needs	79 (97.5)	4.20 (1.03)
Collaborates with government agencies responsible for health care	78 (96.3)	4.24 (0.94)
Contributes to health care policy in my region	78 (96.3)	4.23 (1.07)
Involves community members to serve on internal committees	78 (96.3)	3.62 (1.20)
<i>Selection & Recruitment</i>		

Table 4.

Mean (M), Standard Deviation (SD), and Ranges of Possible Scores for the 28 Likert Scale Survey Item Responses (1 = strongly disagree, 5 = strongly agree)

	No. (%) out of 81 responses	M (SD)
Rural geographic areas	80 (98.8)	4.21 (1.14)
Local geographic regions	80 (98.8)	4.25 (1.12)
Indigenous populations	80 (98.8)	4.15 (1.20)
Traditional marginalized groups	80 (98.8)	4.17 (1.22)
Low socio-economic status	80 (98.8)	4.15 (1.29)
Attempting to create a student profile reflective of the socio-demographic composition of the local population	80 (98.8)	4.04 (1.25)
Attempting to create a faculty profile reflective of the socio-demographic composition of the local population	80 (98.8)	3.61 (1.31)
<i>Curriculum</i>		
Teaches health care that is responsive to the needs of the local population	80 (99.8)	4.34 (0.83)
Provides community-based learning opportunities	80 (98.8)	4.53 (0.84)
Offers longitudinal community-based learning opportunities	80 (98.8)	3.97 (1.25)
Provides learning opportunities that exposes students to vulnerable populations within the community	79 (97.5)	4.42 (0.93)
Provides opportunities for local community agencies to educate students on health human resources needs in the local community/region(s)	79 (97.5)	3.86 (1.08)
<i>Educational Products</i>		
Actively tracks graduate mobility (where graduates pursue residency and professional practice)	79 (97.5)	3.96 (1.25)
Produces the right number of specialists needed to serve the local health workforce needs	79 (97.5)	3.30 (1.18)
Collects data on the impact of graduates on patient outcomes	79 (97.5)	2.52 (1.25)

Social Accountability Index

EFA using principal axis factor analysis with oblique rotation on the 28 Likert scale items was conducted. The oblique rotation generated the most meaningful solution. Oblique rotation methods allow for factors to be correlated, and we assumed that any underlying factors would be related. Evaluation of the correlation matrix was favorable: Kaiser–Meyer–Olkin (KMO) Measure of Sampling Adequacy = 0.830, Bartlett's Test of Sphericity ($\chi^2 = 742.714$, $df = 120$, $p \leq 0.001$) was significant and confirmed sufficient power required to conduct EFA. KMO values > 0.70 are considered to indicate adequate sampling for factor analysis.^{56,60}

We determined the number of factors to be extracted using several criteria (e.g., parallel analysis, examination of the resulting scree plot, eigenvalues > 1.0 , and suppressing all factor coefficients > 0.4).⁶¹ Several additional rules were applied to determine the number of factors and individual items to retain: (1) factors needed to contain a minimum of three items, (2) the absolute value of all factor pattern coefficients needed to be ≥ 0.50 on at least one factor, and (3) items with factor pattern coefficients (absolute value) ≤ 0.30 on more than one factor were dropped.⁶²

An initial solution comprising of six-factors was observed. However, 12 items were excluded from the analysis due to cross loadings or unloading. The ultimate solution comprised of four-factors, accounting for 70.76% of the total variance in the items. All items had high extracted communalities (> 0.40), indicating that most of the common variance in the items can be

explained by the four extracted factors.⁶² The factor pattern coefficients from the principal axis factor analysis are displayed in Table 5.

Based on EFA findings, names, and alignment to CIPP domains were identified for each retained factor (see Table 5). Factor 1 labeled Selection & Recruitment aligned to input evaluation. Factor 2 Institutional Mandate and Factor 4 Community Awareness aligned to context evaluation and Factor 3 Institutional Activities aligned to process evaluation. Mean factor scores were computed and reliability analysis were conducted for each factor. McDonald's ω values were as follows: Selection & Recruitment (six items) = 0.870; Institutional Mandates (four items) = 0.848; Recruitment & Selection (three items) = 0.803; and Community Awareness (three items) = 0.799. All internal consistency reliability values were ≥ 0.75 and considered acceptable.⁵⁷

Table 5.

Results from Exploratory Factor Analysis with Oblique Rotation (Promax; $\theta = 0$) on 28 Social Accountability Likert Scale Survey Items

Item	Communalities	Factor Loadings, Names and CIPP Domain Alignment			
		1	2	3	4
		Selection & Recruitment (Inputs)	Institutional Mandate (Context)	Institutional Activities (Processes)	Community Awareness (Context)
<i>Selection:</i> Attempting to create a student profile reflective the socio-demographic composition of the local population.	0.780	0.751			
<i>Selection:</i> Select students from rural geographic areas	0.323	0.738			
<i>Selection:</i> Select students with low socio-economic status	0.606	0.734			
<i>Selection:</i> Select students from traditionally marginalized groups	0.640	0.725			
<i>Selection:</i> Select students from local regions	0.460	0.693			
<i>Selection:</i> Attempting to create a faculty profile reflective of the socio-demographic composition of the local population.	0.606	0.612			
<i>Mission Statement:</i> Respond to priority health needs of the local population	0.902		0.935		
<i>Mission Statement:</i> Improve the quality of future graduates	0.501		0.765		
<i>Mission Statement:</i> Enhance the health status of the local population	0.742		0.743		
<i>Mission Statement:</i> Coordinate with local organizations to promote health care	0.469		0.651		
<i>Curriculum:</i> Provides community-based learning opportunities	0.660			0.873	
<i>Curriculum:</i> Provides learning opportunities that expose students to vulnerable populations within the community	0.719			0.786	
<i>Curriculum:</i> Offers longitudinal community-based learning opportunities	0.517			0.534	
<i>Population Profile:</i> Aware of the epidemiological disease profile of the local population	0.843				0.903
<i>Population Profile:</i> Access to data	0.496				0.604

Table 5.

Results from Exploratory Factor Analysis with Oblique Rotation (Promax; $\delta = 0$) on 28 Social Accountability Likert Scale Survey Items

Item	Communalities	Factor Loadings, Names and CIPP Domain Alignment			
		1	2	3	4
		Selection & Recruitment (Inputs)	Institutional Mandate (Context)	Institutional Activities (Processes)	Community Awareness (Context)
containing a community profile of the local population (e.g., socio-demographic composition, priority health needs, health risks and health determinants) <i>Population Profile: Actively conducts community-based health outcomes research</i>	0.571				0.593
Eigenvalue		7.07	1.74	1.38	1.13
% of Variance		44.19	10.85	8.63	7.08
Cumulative %		44.19	55.05	63.68	70.76
<i>M (SD)</i>		4.07 (0.95)	4.29 (0.84)	4.30 (0.86)	4.28 (0.81)
McDonald's ω		0.870	0.848	0.803	0.799

Principal Axis Factoring. Promax rotation with Kaiser Normalization. Rotation converged in 7 iterations.

Pattern coefficients are presented. Entries in bold indicate pattern coefficients (absolute values) >0.50 on at least one factor.

Discussion

This study explored senior medical school administrators' perceptions and perceived institutional practices of social accountability. We identified an international representation of perceived socially accountable indices. To our knowledge, this study represents the first survey of administrative perceptions and institutional practices of social accountability, internationally.

We were able to identify several commonalities across medical schools. For instance, all respondents expressed a high importance of social accountability and most reported that their school had an explicit social accountability mandate. These findings are consistent with the broader literature, suggesting that social accountability has become a universal component of medical school's policy initiatives, mission statements, as well as accreditation standards.^{1,3-5,7,37,47}

While respondents reported high agreement when asked if their institution had access to data containing their local community profile, the extent to which this data is used to inform institutional policies remains unknown. Additionally, respondents also reported high agreement when asked if their institutions were aware of the epidemiological disease profile of the local population. However, it also remains unknown how this data is used to ensure curricular activities are designed to address community priority health needs, risks, or social health determinants.

Findings from our Likert scale items, and EFA demonstrates excellent internal consistency and reliability. However, variations were observed across Likert scale items. As items moved from internal practices (e.g., mission statements, admission policies, and curricular activities) to external practices (e.g., stakeholder engagement and partnerships, and involvement in health human resources) response means dropped considerably. For example, most respondents reported that their institution provides community-based learning. However, very few

respondents reported that their institution collects data on the impact of graduates on patient outcomes.

These variations were also reflected in the EFA. The items dropped from the initial six-factor solution comprised of educational product outcomes and community engagement. This finding suggests that institutional practices of social accountability emphasis are placed on inputs and processes but lack evidence related to community context and educational product outcomes. This may suggest a narrow focus and practices as most effort is placed on internal policies surrounding selection and recruitment and curricular activities, rather than how these activities impact society. However, these observations are consistent with previous literature suggesting medical schools often treat social accountability as programmatic checklists rather than fundamental elements.^{43,63} Despite previous evidence suggesting that social missions are associated with graduate specialty selection, location of practice, and workforce diversity,^{28,39-41} most studies do not evaluate graduate outcomes or empirically validate the extent to which school's fulfill their social missions.⁶⁴

Using data collected from 81 medical schools across 14 countries, we were able to confirm findings consistent with previous research. However, this is the largest known survey that examines administrator perceptions and institutional practices of social accountability internationally. This paper offers programs and educators with a new survey tool to aid in the operationalization and reliability of evaluating socially accountable indicators. Even though our findings indicate that we were able to demonstrate content validity and excellent internal consistency and reliability, there are some important limitations to consider.

First, participation in this study was voluntary. While 81 medical schools participated in our survey, we targeted 265 English-speaking medical schools. However, survey participation has gradually decreased over time and response rates for medical educators, especially physicians are generally lower due to demanding schedules and survey fatigue.^{65,66} We also relied on publicly available contact information which may have reduced efficiency in the survey delivery. It should also be acknowledged that this survey was distributed during the initial stages of the COVID-19 pandemic and many medical school administrators may have experienced rapidly changing priorities and conflicting clinical and administrative responsibilities. Additionally, the perceived importance of social accountability globally may have resulted in reporting biases both by respondents that elected to complete the survey as well as individual responses as the topics desirability may have prompted more favorably responses to certain items. Due to the desire of many schools to exert socially accountable qualities respondents may have self-reported higher ratings on items based on the perceived importance surrounding the topic. Further research is warranted to investigate how medical schools operationalize social accountability in practice, assess the quality of these practices, and impact on public health. These results also capture individual respondent perceptions and may not be necessarily reflective of their institution. However, this survey purposefully selected administrative leadership, which can be assumed to provide reliable information on institutional practices. Lastly, these outcomes may be specific to English-speaking undergraduate medical programs. However, the CIPP evaluation framework and methodological approach can be easily replicated in non-English contexts.

Conclusion

Despite expanding awareness, social accountability has not necessarily reliably translated effectively in practice. The perceptions captured in this study are reflective of institutional practices and administrative perceptions of social accountability indicators. Social accountability represents an actionable quality, rooted in the identification of societal needs, and evaluated based on how well such needs are achieved.² While most respondents expressed an institutional commitment to social accountability, the effects of their outcomes on the community remain unknown and not evaluated. Additionally, medical education is largely publicly funded in many countries, and medical schools should be evaluated based on how well they meet societal needs.⁶⁷ However, the lack of emphasis placed on impact may suggest that perhaps perceived institutional practices reflect acts of responsibility or responsiveness, and not necessarily accountability.⁵

Institutional practices of social accountability included in this study focused predominately on the commitment to, and adaption of select policies and curricular activities. This study provides empirical evidence to support previous claims suggesting that very few medical schools are truly socially accountable.¹ Medical schools must move beyond the commitment to address societal needs.³⁷ Socially accountable medical schools must demonstrate that the outcomes of their activities have positive impacts on public health in communities served.⁴⁵ Social accountability demands the articulation of measurable results and tangible outcomes where the focus on evaluation is on impact, not inputs and processes.⁵ However, despite continued progress and positive advancements within the literature, there is a need to establish meaningful relationships between medical school outcomes and community impact.^{6,68} Perhaps a way we can begin to establish such links is through the wider adaption and use of reliable tools to support the measurement of social accountability.

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Supplemental Appendix I.

Social accountability survey: Investigating social accountability outcomes and contextual factors in medical education

1.0. DEMOGRAPHICS & CONTENT

1.1. Title/Positions held with your institution: *(open ended)*

1.2. Gender:

- Male
- Female
- Other
- Prefer not the answer

1.3. Are you a medical practitioner?

- Yes
- No

(If responded 'Yes' to 1.3. Are you a medical physician?)

1.3.1. How many years have you been practicing? *(number of years - numeric textbox)*

1.3.2. What is your medical specialty? *(open ended)*

1.4. How many years have you been working at your current institution? *(number of years - numeric textbox)*

Please respond in the best way you can to the following statements:

1.5. I believe my institution has a primary care (or family medicine/general practitioner) department (or facility/discipline group).

- Yes
- No
- Unsure

1.6. I believe my institution provides educational experiences in the following sites:
(Please select all that apply)

- Hospitals (secondary and tertiary health care)
- Outpatient clinics
- Emergency clinics
- Community health centers or clinics
- General Practice (i.e., Physician's office; consultation room/clinic)
- Occupational/industrial health facilities
- Patient homes
- Homes for the elderly (retirement homes or aging care facilities)
- Chronic-care facilities

2.0. SOCIAL ACCOUNTABILITY

Social accountability of medical schools is defined as:

“The obligation [of medical schools] to direct their education, research and service activities towards addressing the priority health concerns of the community, region and/or nation they have a mandate to serve. The priority health concerns are to be identified jointly by governments, health care organizations, health professionals and the public” (WHO, 1995).

According to the Global Consensus for Social Accountability (GCSA, 2010), social accountability is a measurable activity - a state of social awareness, “...an action to respond to current and future health needs and challenges in society while working collaboratively with key stakeholders; policymakers; healthcare organizations; health-insurance providers, health professional and civil society”.

Please respond in the best way you can to the following statements:

2.1. I believe my institution has an explicit social accountability mandate.

- Yes
 No
 Unsure

2.2. On a scale of 1 to 10 (1 = not at all important and 10 = extremely important) how would you rate the following statement:

I believe social accountability is important to my institution.

- | | | | | | | | | | |
|-------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|------------------------|-----------------------|-----------------------|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Not at all
important | | | | | | | Extremely
important | | |

3.0. INSTITUTION MISSION STATEMENT

Please respond in the best way you can to the following statements:

3.1. I believe my institution’s mission statement is posted publicly.

- Yes
 No
 Unsure

3.2. To what extent do you agree or disagree with the following statements:

I believe my institution’s mission statement clearly articulates the program’s commitment to...

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
Society	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Improve the quality of future graduates	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Enhance the health status of the local population	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Respond to the health care needs of the local population	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Address the priority health needs of the local population	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Promotion of faculty	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Coordinate with local organizations to promote health care	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Patient education	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

4.0. POPULATION PROFILE

Please respond in the best way you can.

4.1. To what extent do you agree or disagree with the following statements:

I believe my institution...

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
Is responsible to serve a specific geographic region(s)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Is actively conducting community-based health outcomes research	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Is aware of the epidemiological disease profile of the local population	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Has access to data containing a community profile of the local population (e.g., socio-demographic, economic, cultural, environmental composition, priority health needs, health determinants and health risks)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Is responsible to serve a specific geographic region(s)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Is actively conducting community-based health outcomes research	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Is aware of the epidemiological disease profile of the local population	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Has access to data containing a community profile of the local population (e.g., socio-demographic, economic, cultural, environmental composition, priority health needs, health determinants and health risks)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
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5.0. COMMUNITY ENGAGEMENT

Please respond in the best way you can.

5.1. To what extent do you agree or disagree with the following statements:

I believe my institution...

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
Is partnering with local community agencies to provide health care in the community	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Works with local partners to identify population health needs	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Collaborates with national medical training programs	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Collaborates with regional care providers on matters of medical training	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Works on medical training with government agencies that are responsible for health care	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Works with higher education agencies	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Collaborates with private organizations interested in health professions education	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Contributes to health care policy in my region	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Involves community members to serve on medical education committees	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Is committed to partnering with key health actors in a defined population area (by contract or otherwise)?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

6.0. STUDENT SELECTION

Please respond in the best way you can.

6.1. To what extent do you agree or disagree with the following statements:

I believe my institution is attempting to select applicants from...

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
Rural geographic areas	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Local geographic regions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Indigenous groups	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Traditionally marginalized groups	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Low socio-economic status	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

6.2. I believe my institution is attempting to create a...

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
Student profile that reflects the socio-demographic composition of the local population.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Faculty profile that reflects the socio-demographic characteristics of the local population.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

7.0. CURRICULUM

Please respond in the best way you can.

7.1. To what extent do you agree or disagree with the following statements:

I believe my institution...

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
Teaches health care that is responsive to the needs of the local population	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Provides community-based learning opportunities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Offers longitudinal community-based learning opportunities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Provides learning opportunities that exposes students to vulnerable populations within the local community	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Provides opportunities for local community agencies to educate students on the health human resources needs in the local community/region(s)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Encourages students to pursue generalist specialties (for example: family medicine; general practice)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

8.0. EDUCATIONAL PRODUCTS

Please respond in the best way you can.

8.1. To what extent do you agree or disagree with the following statements.

I believe my institution...

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
Actively tracks graduate mobility (where graduates pursue residency and professional practice)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Produces the right number of specialists needed to serve the local health workforce needs	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Conducts health outcomes research that examines the impact of graduates on public health	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Collects data on the impact of graduates on patient outcomes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

9.0. ADDITIONAL COMMENTS

9.1. Please use the following space to express something you would like to tell us about your institution and social accountability that we have not asked you in this survey.

Chapter 4

Validity evidence and psychometric evaluation of a socially accountable health index for health professions schools

Barber C, van der Vleuten C, Chahine S. Validity evidence and psychometric evaluation of a socially accountable health index for health professions schools. *Adv Health Sci Educ Theory Pract*. Epub ahead of print. Jun 22, 2023. doi: 10.1007/s10459-023-10248-5.

Abstract

Introduction. There is an expectation that health professions schools respond to priority societal health needs. This expectation is largely based on the underlying assumption that schools are aware of the priority needs in their communities. This paper demonstrates how open-access, pan-national health data can be used to create a reliable health index to assist schools in identifying societal needs and advance social accountability in health professions education.

Methods. Using open-access data, a psychometric evaluation was conducted to examine the reliability and validity of the Canadian Health Indicators Framework (CHIF) conceptual model. A non-linear confirmatory factor analysis (CFA) on 67 health indicators, at the health-region level ($n = 97$) was used to assess the model fit of the hypothesized 10-factor model. Reliability analysis using McDonald's Omega were conducted, followed by Pearson's correlation coefficients.

Results. Findings from the non-linear CFA rejected the original conceptual model structure of the CHIF. Exploratory post hoc analyses were conducted using modification indices and parameter constraints to improve model fit. A final 5-factor multidimensional model demonstrated superior fit, reducing the number of indicators from 67 to 32. The 5-factors included: Health Conditions (8-indicators); Health Functions (6-indicators); Deaths (5-indicators); Non-Medical Health Determinants (7-indicators); and Community & Health System Characteristics (6-indicators). All factor loadings were statistically significant ($p < 0.001$) and demonstrated excellent internal consistency ($\omega > 0.95$).

Conclusion. Many schools struggle to identify and measure socially accountable outcomes. The process highlighted in this paper and the indices developed serve as starting points to allow schools to leverage open-access data as an initial step in identifying societal needs.

Introduction

Health professions education aims to produce competent graduates equipped to meet societal needs. This goal represents one of the core principles of social accountability in medical education, which emphasizes the need for schools to direct their education, research, and service activities towards priority health needs of the communities they serve.^{1,2} However, there remains a misalignment between health professions education and societal needs.³ While many schools have explicit institutional mandates to serve a specific geographic area or region,⁴ schools often remain unaware of the local health needs in their communities.² One approach to address this gap is for schools to leverage open access, secondary population health data to better identify priority health needs. Despite repeated calls to utilize publicly available data to improve medical training,⁵⁻⁷ this data has yet to be fully utilized to identify societal needs. This paper demonstrates how open access pan-national population health data can be used to better identify relevant health needs and advance the social accountability mandate of health professions education.

Social Accountability in Medical Education

Social accountability in health professions education is the obligation of medical schools to actively address the priority health needs of to their local communities.^{1,2} This includes ensuring education, research, and service activities are aligned with societal needs. Social accountability represents a measurable activity,² rooted in the identification of priority health needs and evaluated based on how well those needs are met.^{4,7-14} One strategy for schools to better identify priority health needs is to leverage open-access, secondary population health data.

Population Health Data and Education

Pan-national population health data are collected iteratively by governments or non-profit agencies in most countries worldwide for research, public policy, evaluation, and accountability purposes. This data is used extensively in public health, epidemiology, as well as social, health and clinical sciences. However, despite repeated calls to better utilize publicly available data to improve medical training,⁵⁻⁷ this data has yet to be leveraged to better inform educational, research and service activities.

Health indicators, derived from population health data, are often represented as summary statistics or proxy measures of health and factors that influence health.^{15,16} They are often used to evaluate population health outcomes and health systems performances through advocacy, accountability, quality improvement, and research.^{17,18} Health indicators provide insights into health risks, patterns, and trends and determine the extent to which performance expectations are met.¹⁹ These indicators are often used for accountability purposes by governments, health professionals, voluntary agencies, and the public. Additionally, health indicators are also used to improve public health education and professional training.²⁰⁻²¹ Health indicator frameworks capture relevant health outcomes, often comprised of numerous health and non-health related measures, to assess and monitor population health outcomes, inequities, and health care utilization.^{17,18,22,23} However, many health indicator frameworks lack validity evidence as they are often developed using conceptual models.^{16,17} Despite their usefulness in explaining causal connections and interrelationships across specific domains,

these frameworks must be empirical evaluated to ensure reliability and determine their effectiveness in serving their intended purposes.^{17,24}

Our review of the health professions education literature provides some key examples and methods of how population health data can be used to set educational priorities,²⁵ inform curricular content,²⁶ and evaluate institutional practices.²⁷ For instance, MacDonald et al.,²⁶ utilized secondary population health data to inform curricular content and establish educational priorities across the health professions training continuum. While this article was published more than 30 years ago, the authors identified prevalent health conditions in a population or geographic area to better inform curricular planning and set educational priorities. Their goal was to better equip medical graduates to address priority health needs of the community they serve. Similarly, Arthur & Baumann²⁶ described a planning framework to identify essential curricular context using a mixed methods approach. The authors utilized secondary population health data to identify community health needs relevant to nursing education. This data was triangulated using an expert panel and review of the literature to help inform core curricular content surrounding priority health issues. Lastly, Coutinho et al.,²⁷ examined the relationship between primary care medical graduates and indicators of population need using demographic data obtained from the United States Census Bureau. Findings from this study suggest little correlation between primary care residency training and population need. Moreover, the strategic initiative of expanding primary care residency training was not correlated to state needs in terms of the number of primary care physicians per population.²⁷

This paper adds to the literature by leveraging open-access, pan-national population health data and validates its viability to assist schools identify relevant health needs for social accountability purposes. This work is imperative in advancing the social accountability agenda of health professions education and can be used to identify regional health needs, inform educational priorities, and perhaps serve as an initial step towards monitoring educational outcomes on population health.

Methods

The goal of this study was to put forward an evidenced-based model that can be used by others to support social accountability. In this paper, we used open-source pan-national data from Statistics Canada's Canadian Community Health Survey (CCHS) Public Use Microdata File (PUMF)²⁸ and online mortality and vital statistics²⁹ to examine the factor structure and reliability of a national conceptual health indicator model in Canada. Using an iterative approach, a non-linear factor analysis was used to validate the viability of the Canadian Health Indicator Framework (CHIF).³⁰

Study Setting

Canada was the first country to adopt a national social accountability mandate for medical education globally.³¹ The Canadian healthcare system is publicly funded and provides universal coverage for medically necessary hospital and physician services to all Canadian citizens and permanent residents. The system is primarily funded through taxpayers and managed by individual provinces or territories.³² Canada also provides open access to high-quality and easily accessible pan-national data on the economy, society, and environment.³³

Currently, 187 countries worldwide have national statistical systems that collect, process, and disseminate official statistics on behalf of their respective national governments.³⁴ These systems aim to provide relevant, comprehensive, accurate, and objective statistical information on a country's society, economy, and environment.³⁵

Canada is widely recognized for having some of the most comprehensive health data in the world.³⁶ However, unlike other countries, Canada has yet to widely adapted a reliable national health indicator framework.³⁷

Organizational Framework

The CHIF³⁰ was selected as the organizational framework for grouping variables available from Statistics Canada's 2017–18 CCHS PUMF²⁸ and online mortality and vital statistics.

The CHIF is a conceptual model developed by Statistics Canada and Canadian Institute for Health Information (CIHI) through national consensus with provincial and regional health authorities.³⁸ Statistics Canada is Canada's national statistical agency responsible for collecting statistical data on the country's population, economy, society, and culture.³⁹ CIHI is an independent, not-for-profit organization that works closely with Statistics Canada and provincial and territorial governments to collect and share data on Canada's health system and population health.⁴⁰

This framework provides reliable and comparable data on the health of Canadians, health care systems, and health determinants³⁸ It consists of over 80 indicators, measured across 4 domains and several factors, including health status (4 factors), non-medical determinants of health (3 factors), health system performance (1 factor), and community health system characteristics (2 factors) (depicted in Table 1).³⁸ A more detailed description of the CHIF is provided on Statistics Canada and CIHI's website.³⁰ These indicators serve as both measures of health and factors which influence health, used to inform health policy and manage the health care system.²⁸ The CHIF has been widely used in guiding previous health indicator development.⁴¹ However, it has not been empirically validated.

Table 1.

Canadian Health Indicator Framework conceptual model used in selection of variables and development of the non-linear CFA socially accountable health index

Constructs and Sub-Components	Summary of Indicators
Health Status	
<i>Well-Being</i>	3 broad measures assessing the physical, mental, and social well-being of individuals.
<i>Health Conditions</i>	Inclusive of 17 items assessing individual attributes of health status which may lead to distress, interferences with daily activities, or contact with health services. These items are inclusive of disease (acute or chronic); injury or trauma; or health related status (e.g., birth-related indicators, aging, stress, or genetic predisposition).
<i>Health Functions</i>	5 items assessing levels of human function associated with the consequence of disease, disorder, injury and other health conditions (e.g., body function/structure (impairments), activity limitations, restrictions in participations).

Table 1.

Canadian Health Indicator Framework conceptual model used in selection of variables and development of the non-linear CFA socially accountable health index

Constructs and Sub-Components	Summary of Indicators
<i>Deaths</i>	11 items assessing a range of age and condition specific mortality rates as well as derived indicators.
Non-Medical Determinants of Health	
<i>Healthy Behaviours</i>	8 items assessing aspects of personal behaviour and risk factors that epidemiological studies have shown to influence health status.
<i>Living and working conditions</i>	13 indicators related to the socio-economic characteristics of working conditions of the population that epidemiological studies have shown to be related to health.
<i>Personal Resources</i>	2 items assessing prevalence of factors (social support) that epidemiological studies have shown to be related to health.
<i>Environmental Factors</i>	5 environmental items with the potential to influence human health.
Health System Performance	
<i>Acceptability</i>	1 item measuring patient satisfaction with the care/services provided.
<i>Accessibility</i>	Six items measuring the ability of patients to obtain health care/services, based on respective needs.
<i>Appropriateness</i>	2 items assessing the care/services provided is relevant to the clients'/patients' needs and based on established standards.
<i>Continuity</i>	1 item assessing the ability to provide uninterrupted, coordinated care/services across programs, practitioners, organizations, and levels of care/services, over time.
<i>Effectiveness</i>	10 items assessing whether care/service intervention or action achieves the desired results.
<i>Safety</i>	1 item assessing potential risks of an intervention, or the environment are avoided or minimized
Community and Health System Characteristics	
<i>Community</i>	10 items assessing community characteristics.
<i>Health System</i>	13 items assessing health system characteristics.

The importance of developing a population health profile has been well-established in the literature.^{1,2,8} From a social accountability perspective, the local community serves as the main stakeholder of all health professions schools, and it is essential for schools to identify and respond to the priority health needs in the communities they serve.¹ This includes identifying and understanding the cultural context, social determinants of health, and health disparities in the communities they are expected to serve.

The CHIF serves as a comprehensive set of health indicators that are specifically designed to measure and monitor the health of Canadians. This framework may be used as a valuable tool for schools to their advance their social accountability mandate by identifying relevant population health needs in their respective geographic areas or region.

Data

This study utilized two open-source data sources were, the CCHS PUMF and publicly available mortality and vital statistics data obtained online from Statistics Canada website.

The CCHS is a voluntary, cross-sectional nationally representative survey offered in both English and French and is distributed annual to individuals >12 years of age living in Canada.²⁸ Excluded from the sampling frame are individuals living on Indigenous reserves or other settlements, full-time members of the Canadian Forces, institutionalized populations, children aged 12–17 living in foster care, and those living in remote health regions in Quebec.²⁸ The survey employs a stratified multistage sampling strategy to provide reliable estimates at the health region level every two years.²⁸

The CCHS is comprised of two years of data and includes responses surveyed over the reference period. The CCHS cycle is comprised of common content (asked of all respondents), optional content (selected by each province/territory), and rapid response content.²⁸ The common content collected during the first year of the survey cycle consists of questions asked of all respondents. The optional content, collected from a smaller sample during the second year of the survey cycle, comprises of questions selected by each province/territory on specific health topics.²⁸

The CCHS PUMF is an open access dataset representing 3% of the Canadian population, inclusive of approximately 1,050 variables related to Canadians' health-status, health care utilization, and health determinants, including socio-demographic data, health conditions and diseases, lifestyle, social conditions, as well as mental health and well-being. A more detailed description of the CCHS PUMF survey design, sampling methodology, and validation has been described elsewhere.²⁸

To ensure comprehensive representation of all factors associated with the CHIF, publicly available mortality, vital statistics, and community indicators data were obtained online from Statistics Canada's website.^{29,41}

Ethics approval was obtained from Maastricht University's Ethics Review Committee Health, Medicine and Life Sciences (FHML-REC).

Analysis

Level of analysis

Due to missing data observed at the individual level due to the CCHS sampling design and data disclosures controls, the level of analysis was aggregated to the health region level ($n = 97$). The CCHS employs a stratified multistage sampling cycle and imposes several data disclosure controls to protect respondent anonymity and confidentiality. These controls include the use of subsampling and data suppression techniques, such as the removal of sensitive variables (e.g., outliers) or indirect identifiers (i.e., socio-demographic characteristics, geographic metrics), to minimize the risk of disclosing personal information due to small population sizes. These methods minimize the potential for identifying individual respondents while preserving the analytical value of the data.²⁸

To overcome missing data issues observed at the individual level, place-level data aggregation was imposed at the health region level. Health regions are administrative areas defined by provincial ministries of health responsible for delivering public health care services.²⁹ Aggregating the CCHS PUMF at the health region level yielded a total analytical sample of 97 health regions, which are listed in 'Appendix I'.

Measures

The selection of health indicators was guided by the CHIF conceptual model and based on data availability from the 2017–18 CCHS PUMF, and mortality and vital statistics, and community indicators obtained online from Statistics Canada website.^{30,42} A total of 67 variables were identified and selected to measure the CHIF conceptual model across four domains and several factors and indicators: (1) health status (4 factors, 40 indicators), (2) non-medical determinants of health (3 factors, 17 indicators), (3) health system performance (2 factors, 2 indicators), and (4) community health system characteristics (2 factors, 8 indicators) (shown in Table 1).

Nominal and ordinal scale indicators were recoded dichotomously. For instance, non-favourable health outcomes such as fair or poor perceived health, presence of disease (e.g., arthritis, cancer, diabetes, high blood pressure, etc.), and personal behaviours and risk factors (e.g., under/overweight, or obese body mass index (BMI), smoking, heavy drinking, etc.) were coded as '1'. On the other hand, favourable health outcomes such as good, very good, or excellent perceived health, normal BMI, absence of disease (e.g., no cancer in lifetime, normal blood pressure), and positive personal behaviours (e.g., non-smoker or non-drinker, etc.) were coded as '0'. These indicators were aggregated to the health region level and calculated as proportions derived from discrete counts at the aggregated health region. Ratio-scale variables such as income (i.e., low-income rates, medium share of income, government transfer income) and employment rates (unemployment rate, long-term unemployment rate) were not dichotomized to preserve their continuous scale and were aggregated to the health region level. The analytical dataset comprised of compositional data derived from discrete count-based proportions or percentages aggregated to the health region level.⁴³

Analytical Approach

To assess the factor structure of the CHIF at the health region level, a non-linear confirmatory factor analysis (CFA) was used due to the non-normality of the data.^{44,45}

Validity frameworks often consist of four components, including content validity, response process validity, internal structure validity, and criterion validity.^{46,47} The rigorous design and development process of the CHIF involved three validity components: content validity, response process validity, and criterion validity. These validity components were established through a comprehensive review of existing literature and expert consultation, the use of clear operational definitions and standardized data collection methods, and comparison with other established measures of health status.³⁰ This paper specifically assesses the internal structure validity of the CHIF using CFA. Factor analyses are often utilized to provide construct validity evidence⁴⁸⁻⁵⁰ to evaluate the underlying structure of the observed measures by examining inter-item correlation.

Using an iterative process, maximum likelihood with robust standard errors (MLR) and accelerated expectation maximization (EMA) estimators were used to estimate the factors. The expectation maximization (EM) algorithm⁵¹ was used to optimize the complete data loglikelihood, while EMA, an accelerated EM procedure, utilized Quasi-Newton and Fisher Scoring optimization.⁵² To improve model fit through modifications indices and identify potential misspecified parameters, post hoc model fit was conducted in an exploratory manner.⁵³ This approach aimed to create a multi-dimensional respecified model while ensuring that the hypothesized model fit well with the observed data and aligned theory and epistemology.⁵⁴ CFA analyses were conducted in Mplus (Version 8.7, Muthén & Muthén, Los Angeles, CA).

Model Specification

The CHIF conceptual model was used to initially specify the factor structure of the model. Criteria for retaining items in the model included a statistically significant path coefficient ($p < 0.05$) between the item and its predicted subscales on the CHIF. Post-hoc modification indices were used to modify the model for improved model fit indices. To set a metric for each factor, unit loading identification constraints were imposed by fixing the unstandardized coefficient of one item per latent variable equal to one.⁵⁵

The respecification process included examining modification indices, residuals, parameter estimates, and explained variance. Based on these sources of the model information, the Well-Being factor, and several indicators within the five remaining hypothesized factors were deleted due to weak relationships and excessive redundancy of items.⁵⁶ The use of modification indices resulted in the identification of additional statistically significant paths, leading to a better model fit. All factor loadings were statistically significant ($p < 0.001$), and residuals remained close to zero.

Several conditions needed to be satisfied for an item to be retained in the generated model. The path coefficient between an item and its predicted subscale on the CHIF needed to be statistically significant ($p < 0.05$). Post-hoc modification indices generated from the structural parameters were used to modify the model to achieve better model fit indices. To set a metric for each factor, unit loading identification constraints were imposed;⁵⁵ the unstandardized coefficient of one item per latent variable was fixed equal to '1'.

Respecification of the structural model included the examination of the following: (1) modification indices, (2) residuals, (3) parameter estimates, and (4) explained variance. Taken together, sources of model information suggested the deletion of the Well-Being factor as well as several indicators within the five remaining hypothesized factors. Item deletion was deemed appropriate due to weak relationships and evidence of excessive redundancy of items.⁵⁷ Additionally, modification indices generated from the structural parameters were used to identify additional statistically significant paths, resulting in a better model fit. All factor loadings were statistically significant ($p < 0.001$), and residuals remained close to zero.

Model Fit

The quality of the model was assessed by examining several fit indices, including Chi-square (χ^2), Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), Root Mean Square Error of

Approximation (RMSEA), and Standardized Root-Mean-Square Residuals (SRMR). Model fit was evaluated using a combination of these indices.^{57,58} The following thresholds were selected based on previous literature: CFI and TLI values ≥ 0.95 were considered favourable and indicative of good model fit,⁵⁹ RMSEA values between 0.05 and 0.08 indicated reasonable error of approximation,⁶⁰ and SRMR values ≤ 0.08 were considered reasonable.⁶⁰

Reliability

Internal consistency of scales resulting from the final CFA model was assessed using McDonald's Omega ω coefficient. The coefficient was obtained in JAMOVI (Version 1.2; The jamovi project, Sydney, Australia). McDonald's Omega coefficient was preferred over Cronbach's Alpha as it has been suggested to have superior psychometric properties and provide more accurate estimates of a scale's internal structure.⁶¹⁻⁶³

Results

In total, 67 indicators aggregated to the health region level ($n = 97$) from the 2017–18 CCHS PUMF and online mortality and vital and community indicators were analyzed using non-linear CFA. Table 2 provides the mean, standard deviation, distribution (skewness & kurtosis), and range of possible scores for the variables included in analysis. Overall, the number of health regions per indicator remained relatively stable. However, the range of possible scores, means, and standard deviation for each indicator varied. The skewness and kurtosis measures confirm non-normality of all indicators, except for the Government Share Income indicator.

Table 2.

Mean, SDs, Skewness, Kurtosis and Range of Possible Scores for the Variables Included in the Non-Linear Confirmatory Factor Analysis, Canadian Community Health Survey (CCHS), 2017-18

Domains, Factors, and Indicators	No. (%) out of a possible 97 cases	Mean (SD)	Skewness (SE)	Kurtosis (SE)	Range of Possible Scores
Health Status					
<i>Well-Being</i>					
Perceived Health	97 (100.00)	1.03 (0.42)	1.84 (0.25)	4.15 (0.49)	0.51-2.79
Perceived Mental Health	97 (100.00)	1.03 (0.53)	2.42 (0.25)	7.62 (0.49)	0.51-3.64
Perceived Life Stress	97 (100.00)	1.03 (0.59)	2.18 (0.25)	5.78 (0.49)	0.40-3.39
<i>Health Conditions</i>					
Adult BMI	97 (100.00)	1.03 (0.48)	1.99 (0.25)	5.03 (0.49)	0.48-3.05
Youth BMI	97 (100.00)	1.03 (0.54)	1.78 (0.25)	4.15 (0.49)	0.31-3.10
Arthritis	97 (100.00)	1.03 (0.42)	1.55 (0.25)	3.78 (0.49)	0.33-2.78
Diabetes	97 (100.00)	1.03 (0.45)	1.29 (0.25)	2.33 (0.49)	0.28-2.80
Asthma	97 (100.00)	1.03 (0.52)	2.03 (0.25)	5.60 (0.49)	0.39-3.35
High Blood Pressure	97 (100.00)	1.03 (0.42)	1.52 (0.25)	3.12 (0.49)	0.41-2.69
Chronic Obstructive Pulmonary Disease (COPD)	97 (100.00)	1.03 (0.46)	1.14 (0.25)	1.18 (0.49)	0.31-2.51
Pain or discomfort that prevents activities	97 (100.00)	1.03 (1.17)	3.18 (0.25)	13.28 (0.49)	0.07-7.89
Pain or discomfort by severity	97 (100.00)	1.03 (1.13)	2.94 (0.25)	11.00 (0.49)	0.07-7.23
Mood Disorders	97 (100.00)	1.03 (0.52)	2.45 (0.25)	8.20 (0.485)	0.45-3.60
Low birth weight	96 (98.90)	1.04 (1.45)	3.37 (0.25)	13.09 (0.49)	0.12-9.14
High birth weight	96 (98.90)	1.03 (0.91)	2.39 (0.25)	7.15 (0.49)	0.06-5.38

Table 2.

Mean, SDs, Skewness, Kurtosis and Range of Possible Scores for the Variables Included in the Non-Linear Confirmatory Factor Analysis, Canadian Community Health Survey (CCHS), 2017-18

Domains, Factors, and Indicators	No. (%) out of a possible 97 cases	Mean (SD)	Skewness (SE)	Kurtosis (SE)	Range of Possible Scores
Small for gestational age	96 (98.90)	1.04 (1.57)	3.47 (0.25)	13.74 (0.49)	0.11-9.91
Large for gestational age	96 (98.90)	1.04 (1.00)	2.60 (0.25)	8.21 (0.49)	0.13-6.04
Pre-term births	96 (98.90)	1.04 (1.32)	3.17 (0.25)	11.64 (0.49)	0.11-8.17
Cancer incidence (lifetime)	97 (100.00)	1.03 (0.46)	1.53 (0.25)	4.22 (0.49)	0.28-3.06
Injury required hospitalization	97 (100.00)	1.03 (0.48)	2.21 (0.25)	6.71 (0.49)	0.27-3.19
Injury requiring medical attention (24hrs)	97 (100.00)	1.03 (0.55)	2.90 (0.25)	11.83 (0.49)	0.42-3.93
Suffers from effects of a stroke	97 (100.00)	1.03 (0.48)	1.42 (0.25)	2.91 (0.49)	0.26-2.89
<i>Health Functions</i>					
Difficulty seeing	97 (100.00)	1.03 (0.49)	2.34 (0.25)	6.88 (0.49)	0.50-3.23
Difficulty hearing	97 (100.00)	1.03 (0.44)	2.12 (0.25)	5.78 (0.49)	0.50-2.84
Difficulty walking/climbing steps	97 (100.00)	1.03 (0.43)	1.74 (0.25)	4.40 (0.49)	0.43-2.76
Difficulty remembering/concentrating	97 (100.00)	1.03 (0.49)	2.08 (0.25)	5.62 (0.49)	0.46-3.16
Difficulty self-care	97 (100.00)	1.03 (0.43)	1.94 (0.25)	5.18 (0.49)	0.46-2.90
Difficulty communicating	97 (100.00)	1.03 (0.48)	1.67 (0.25)	3.89 (0.49)	0.38-3.05
Participation and activity limitation	97 (100.00)	1.03 (1.14)	3.18 (0.25)	13.41 (0.49)	0.08-7.68
<i>Deaths</i>					
Infant Mortality	87 (89.70)	1.14 (1.39)	3.53 (0.26)	15.75 (0.51)	0.29-9.41
Perinatal Mortality	92 (94.80)	1.09 (1.42)	3.63 (0.25)	16.51 (0.50)	0.23-9.72
Total Mortality	97 (100.00)	1.03 (1.03)	3.34 (0.25)	14.76 (0.49)	0.06-6.69
All diseases of the circulatory system deaths	97 (100.00)	1.04 (1.00)	3.05 (0.25)	12.57 (0.49)	0.03-6.25
All malignant neoplasms (cancer) deaths	97 (100.00)	1.03 (1.04)	3.18 (0.25)	13.18 (0.49)	0.05-6.46
All diseases of the respiratory system deaths	97 (100.00)	1.03 (0.98)	3.20 (0.25)	13.48 (0.49)	0.09-6.20
Suicide	97 (100.00)	1.03 (1.03)	2.67 (0.25)	8.57 (0.49)	0.13-5.92
Unintentional injury deaths	97 (100.00)	1.03 (0.89)	3.39 (0.25)	17.59 (0.49)	0.12-6.72
Premature mortality	95 (97.90)	1.05 (0.94)	2.73 (0.25)	9.74 (0.49)	0.13-5.98
Potential years of life lost—for total mortality	95 (97.90)	1.05 (1.00)	2.89 (0.25)	10.79 (0.49)	0.18-6.51
Non-Medical Determinants of Health					
<i>Healthy Behaviours</i>					
Smoking	97 (100.00)	1.03 (0.49)	1.55 (0.25)	2.70 (0.49)	0.41-2.88
Heavy Drinking	97 (100.00)	1.03 (0.54)	2.10 (0.25)	5.37 (0.49)	0.44-3.37
Adult Physical Activity (based on Canadian Physical Activity Guidelines)	97 (100.00)	1.03 (0.50)	1.40 (0.25)	2.10 (0.49)	0.32-2.76
Adult (18+) Self-reported Physical activity, 150mins/week	97 (100.00)	1.03 (0.50)	1.40 (0.25)	2.10 (0.49)	0.32-2.76
Youth Physical Activity (based on Canadian Physical Activity Guidelines)	97 (100.00)	1.03 (0.52)	1.59 (0.25)	3.31 (0.49)	0.39-3.08

Table 2.
Mean, SDs, Skewness, Kurtosis and Range of Possible Scores for the Variables Included in the Non-Linear Confirmatory Factor Analysis, Canadian Community Health Survey (CCHS), 2017-18

Domains, Factors, and Indicators	No. (%) out of a possible 97 cases	Mean (SD)	Skewness (SE)	Kurtosis (SE)	Range of Possible Scores
Youth (12-17 yrs old) self-reported physical activity (avg. 60 mins/day)	97 (100.00)	1.03 (0.53)	1.37 (0.25)	2.27 (0.49)	0.33-2.92
Breastfeeding practices	97 (100.00)	1.03 (0.72)	1.90 (0.25)	4.12 (0.49)	0.24-3.99
<i>Living and working conditions</i>					
Education (High school or less)	97 (100.00)	1.03 (0.43)	1.26 (0.25)	1.35 (0.49)	0.46-2.35
Unemployment Rates	97 (100.00)	8.8 (3.93)	2.53 (0.25)	7.66 (0.49)	4.50-27.64
Long-term Unemployment Rate	97 (100.00)	1.03 (1.34)	3.68 (0.25)	15.74 (0.49)	0.15-8.77
Low-Income Rate	97 (100.00)	1.03 (1.89)	4.97 (0.25)	29.54 (0.49)	0.00-14.16
Median Share of Income	97 (100.00)	22.08 (1.45)	-1.62 (0.25)	4.06 (0.49)	16.40-24.30
Government Transfer Income	97 (100.00)	14.07 (4.22)	0.47 (0.25)	0.77 (0.49)	5.50-28.30
Housing Affordability	97 (100.00)	1.03 (1.61)	4.59 (0.25)	26.91 (0.49)	0.02-12.21
Household Food Insecurity	97 (100.00)	1.03 (0.61)	2.41 (0.25)	6.53 (0.49)	0.32-3.70
<i>Personal Resources</i>					
Sense of Community Belonging	97 (100.00)	1.03 (0.70)	1.95 (0.25)	4.04 (0.49)	0.38-3.64
Life Satisfaction	97 (100.00)	1.03 (0.56)	2.21 (0.25)	6.11 (0.49)	0.37-3.63
Health System Performance					
<i>Accessibility</i>					
Influenza Immunization	97 (100.00)	1.03 (0.49)	2.13 (0.25)	6.054 (0.485)	0.52-3.18
Regular Medical Doctor	97 (100.00)	1.03 (0.50)	1.90 (0.25)	5.715 (0.485)	0.12-3.37
Community and Health System Characteristics					
<i>Community</i>					
Rural Population	96 (98.90)	1.05 (0.68)	1.07 (0.25)	1.112 (0.488)	0.01-3.08
Indigenous Population	97 (100.00)	1.03 (1.27)	3.76 (0.25)	17.639 (0.485)	0.00-8.79
Immigrant Population	97 (100.00)	12.83 (12.17)	1.80 (0.25)	3.21 (0.485)	0.00-60.2
Internal Migrant Mobility	97 (100.00)	1.03 (0.97)	1.81 (0.25)	3.165 (0.485)	0.12-4.64
Lone-Parent Families	97 (100.00)	1.03 (0.53)	1.67 (0.25)	3.198 (0.485)	0.37-3.04
Visible Minority Populations	97 (100.00)	1.03 (2.55)	4.38 (0.25)	23.237 (0.485)	0.01-18.06
<i>Health System</i>					
Contact with a medical doctor/Health care professional (last 12mths)	97 (100.00)	1.03 (1.23)	3.03 (0.25)	11.796 (0.485)	0.05-8.02
Contact with dental professional (last 12mths)	97 (100.00)	1.03 (0.51)	2.06 (0.25)	5.416 (0.485)	0.48-3.29

Social Health Index

The initial model involved 67 measured indicators and 10 hypothesized factors (shown in Table 2). However, the initial 10-factor model was rejected due to poor model fit. Post hoc analyses were conducted in an exploratory manner to identify which parameters in the model were misspecified.⁴³ Using an iterative process, modification indices and parameter constraints were imposed to improve model fit. The final 5-factor CFA (depicted in Fig. 1) included: (1) Health Conditions (8 indicators), (2) Health Functions (6 indicators), (3) Deaths (5 indicators),

(4) Non-Medical Health Determinants (7 indicators), and (5) Community & Health System Characteristics (6 indicators).

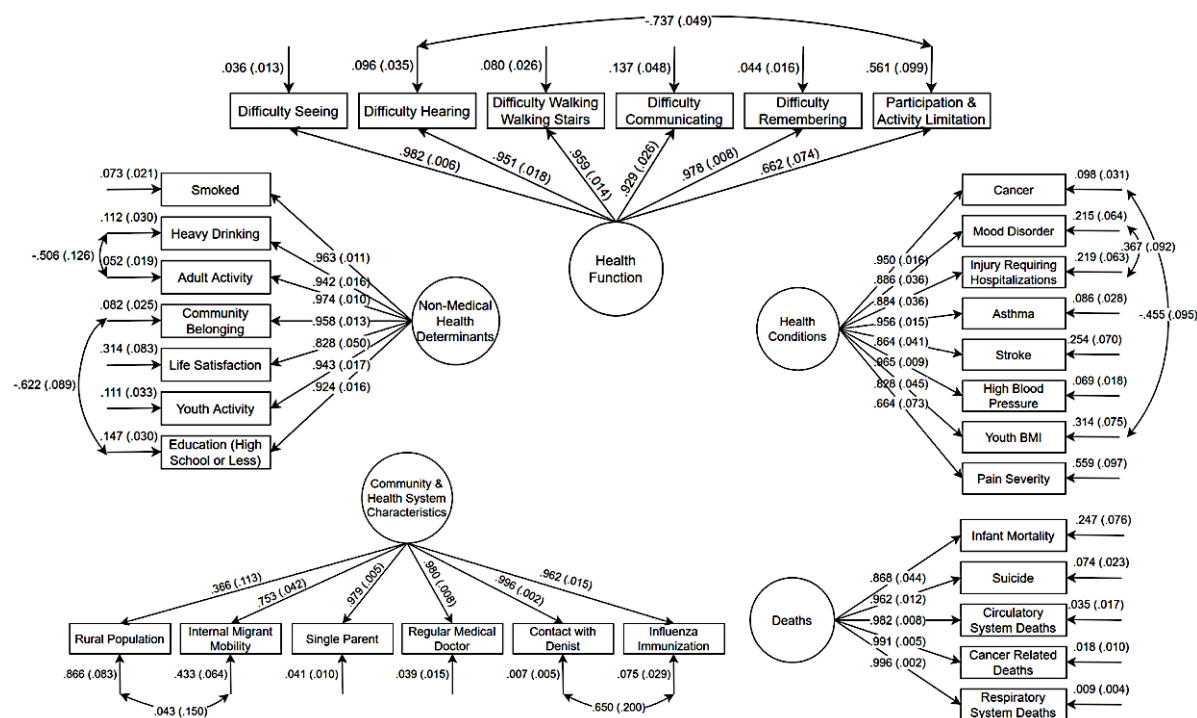


Figure 1. Final model with standardized loadings for 32 health indicators aggregated to the health region level from the 2017-18 CCHS PUMF

Note. Observed variables are represented as rectangles, circles represent the unobserved variables, and the arrows going to the rectangles represent the measurement error associated with each observed variable. The arrows between unobserved and observed variable represents a regression path and the standardised regression weight. The double-headed arrows represent the correlation between two unobserved variables (factor covariances) in the model.

Overall, 35 indicators were removed, resulting in the reduction of the number of indicators in the initial model from 67 to 32. Additionally, seven correlated error terms were allowed between two indicators on four of the five factors: Health Conditions, Health Functions, Non-Medical Health Determinants, and Community & Health System Characteristics. The 5-factor model demonstrated good model fit according to the recommended criteria⁵⁵ (shown in Table 3).

Table 3.
Model Fit Indices for Socially Accountable Health Indices

Model	Fit Index						ω	Mean (SD)
	χ^2	TLI	CFI	RMSEA	SRME			
1. Health Conditions	16.617*	0.993	0.997	0.073	0.015	.964	7.22 (3.57)	
2. Health Functions	9.478*	0.996	0.998	0.044	0.009	.967	6.19 (3.09)	
3. Deaths	7.590*	0.994	0.997	0.073	0.007	.984	5.15 (5.24)	
4. Non-Medical Health Determinants	19.416*	0.988	0.993	0.080	0.012	.979	7.22 (3.50)	
5. Community & Health System Characteristics	8.733*	0.994	0.997	0.051	0.011	.945	6.19 (3.08)	

Notes. χ^2 = Chi-square; TLI = Tucker-Lewis Index; CFI = comparative fit index; RMSEA = root mean square error of approximation; SRME = standardized root mean error; ω = McDonald's Omega; and SD = standard deviation. Recommended cut-offs: χ^2 ($p \leq 0.05$); TLI & CFI (≥ 0.95); RMSEA ($\leq 0.05-0.08$); SRME (≤ 0.08).

* $p \leq 0.001$.

Internal consistency reliability was conducted for the five scales at the health region level, based on the items retained in the final model, and assessed using McDonald's ω coefficient (Table 4). The coefficients for all subscales were excellent, ranging from 0.945 to 0.984.⁶⁴

Pearson's correlation coefficients were used to investigate the inter-relationships between the CFA factors. As shown in Table 4, all correlation coefficients were significant and positively correlated with one another. Based on the magnitude of the coefficients (ranging from strong to very strong), the strength of the association was highest for Health Function and Health Conditions (0.986), and lowest for Non-Medical Health Determinants and Deaths (0.733).

Table 4.
Correlation Matrix of the Socially Accountable Health Indices

	1.	2.	3.	4.
1. Health Conditions				
2. Health Functions	0.986*			
3. Deaths	0.819*	0.819*		
4. Non-Medical Health Determinants	0.956*	0.943*	0.733*	
5. Community & Health System Characteristics	0.955*	0.940*	0.788*	0.945*

Note. * $p \leq 0.001$

Discussion

This study developed and evaluated a multi-dimensional health index to be used by health professions programs for social accountability purposes. Utilizing open access, pan-national health data, this paper assessed the psychometric properties and internal factor structure of an existing national conceptual health indicator framework in Canada. This study represents, to our knowledge, the first examination of the underlying factor structure and reliability assessment of the CHIF at the health region level. This effort extends previous research that examined the correlations between CHIF health and healthcare performance indicators at the provincial and territorial level.⁶⁵

Results from our non-linear CFA rejected the original 10-factor conceptual model structure of the CHIF. Exploratory post hoc analyses resulted in a 5-factor multi-dimensional model, demonstrating excellent model fit on various fit indices. Our findings, generally corroborate the structural validity of the CHIF. However, several modifications were imposed to improve model fit, reducing the number of constructs and indicators in the final model from 67 to 32, creating a more parsimonious set of indicators. Additionally, outcomes from our analysis did not psychometrically support the inclusion of the well-being construct at health region level due to poor model fit. However, this finding does not suggest that well-being is not an important health indicator. These reductions improved the feasibility and utility of the indices. The reliability of each subscale supported by McDonald's ω coefficient exceeded the recommended standards of > 0.80 ,⁶⁴ indicating high internal consistency.

The findings from our 5-factor non-linear CFA demonstrated a multidimensional model of health, supportive of the multifaceted nature of the concept of health. The concept of health is both influenced and produced by biological and social factors, culture referents, as well as social interactions and networks.⁶⁶⁻⁶⁸ These 5-factors may be used as parcels in examining health at the construct level.⁶⁹ These findings are consistent with the public health literature which favour multi-dimensional models of health, over a single health composite score.^{23,70} The use of a single health composite measure was initially thought to provide a holistic

overview of health and the healthcare system.^{23,70} However, it has been found to be challenging to interpret and fails to account for heterogenous system differences.^{23,70}

The process highlighted in this paper and the indices developed serve as starting points to allow schools to leverage open access population health data to better identify relevant priority health needs. This initial step in identifying community needs is imperative to advancing the social accountability agenda of health professions schools and may begin to close the gap between education and society. There are a number of ways in which this study might be used in the selection and teaching of medical students. From a programmatic standpoint these indices may be used by schools to better identify societal health needs, create community profiles, inform educational priorities, and modify curricular activities and/or practices⁷¹ to ensure better alignment between education and societal needs.^{3,72} While priority health concerns are to be identified collaboratively alongside key stakeholders,¹ these indices may be used to establish more impactful collaborations with local health stakeholders.⁷¹ Furthermore, schools may elect to use these indices during the admissions process by creating more targeted application components and/or interview questions asking potential applicants about their perceptions of community health needs. Lastly, schools may also decide to use these indices in combination with other internal data to assist in identifying community-based learning opportunities and areas of need.⁷¹

The aim of developing the indices was to provide guidance to advance social accountability in health professions education. The consequential validity of the index lies in its ability to provide insight into the health needs of a respective region. This information may be used by schools to help inform educational practices and perhaps provide the initial steps in being able to generate actionable recommendations to improve population health outcomes. Leveraging open access population health data in a systematic approach serves as a valuable tool for identifying relevant societal needs. This approach could lead to the development of regionally sensitive health profiles, increased agreement of relevant community health needs, more purposeful conversations with community stakeholders, as well as more targeted resource allocation.⁷¹ The use of data to support educational improvements has been shown to be effective in improving medical training.^{5,6} Despite calls in the literature to better utilize open access data collected by governments to improve medical training, schools struggle to make these links.⁵⁻⁷ Few seminal population-based outcome studies have examined the relationship between health professions training and health outcomes.⁷³⁻⁸⁵ However, this paper provides an example of how schools can begin to utilize open access, secondary data to create reliable health indices as a means to empirically identify regional population health needs.

Findings of this study utilized open access data to identify priority health needs. Although open access data remains readily available, cost-effective, and generalizable, there are a number of limitations to consider. Despite continual global government invest in the quality and accessibility of publicly available data, the system remains imperfect.⁸⁶ Open access datasets are designed to be representative of the larger population there are often several data control methods and restrictions imposed for confidentiality and anonymity, limiting access to information and variables at smaller levels of geography. Although access to neighbourhood-level data would allow for greater specificity and comparisons across smaller geographical areas, this study identified universal health needs from open access data, accessible to all schools. Further research could include replicating these analyses using restricted data available through affiliated academic research data centres (e.g., Statistics Canada's

Research Data Centres (RDC) or Federal Statistical Research Data Centers (FSRDC) in the United States). Additionally, the speed at which up-to-date data is available is often delayed, which could impact the reliability of the indices over time. While this study utilized the most up-to-date available data at the time of analysis, more timely access to current data should be made more readily available to researchers. These indices should be updated and modified with the release of new CCHS cycle data (approximately every 4 years) to reflect accurate and timely population health needs. This timeline aligns to previous research stating that the half-life of most health professions curricula is 5 years, at which time necessitates the need to examine and revise content.²⁶ However, caution should be used when combining CCHS cycles across years as modules and question response categories often change.⁸⁷

The indicators included in this study were selected based on their alignment to the CIHF conceptual model. However, the selection of indicators was limited by data availability and may not necessarily reflect a comprehensive list of all possible health indicators. Due to missing data issues, analyses were aggregated to the health region level, reflecting population means, reducing the analytical sample. However, health region level aggregation was deemed appropriate from a theoretical and epistemological perspective. This paper presents a reliable, nationally relevant, regionally sensitive health index measured at administrative regions responsible for administering and delivering health care in Canada. Additionally, there are also several potential other important factors that may be necessary to validate the use of a regional health profile to advance social accountability in medical education, including stakeholder engagement¹ (e.g., community members, healthcare providers, and policy makers, etc.), contextual factors⁸⁸ (e.g., broader social, economic, and geo-political contexts), longitudinal data (e.g., track changes in health outcomes over time), interprofessional collaboration⁸⁹ (e.g., promotion of collaboration among various health professions teams and disciplines), and resource allocation² (e.g., financial and human resources). Lastly, the CCHS is representative of self-reported data, and the presence of chronic health conditions cannot be confirmed and may be under/over reported. However, self-reported health metrics are often used as general proxies for health status as they are inexpensive, readily available⁹⁰⁻⁹² and associated with lifestyle-related diseases, lifestyle habits as well as mortality.⁹³⁻⁹⁶

Conclusion

The development of a health index is imperative to initiate quality processes to empirically identify societal needs and serves as a starting point to establish stronger relationships between education and society.⁵ Despite the importance of secondary population health and demographic databases in other fields, health professions education has largely overlooked their use. This study demonstrates how open access, secondary data can be utilized to create reliable health indices that identify population health needs. These indices can be used to align resources, services, and research activities, and inform admissions criteria and curricular design.

Future research should focus on how health professions schools can better utilize secondary data to better inform and understand priority health needs as well as the socio-demographic composition of the populations they serve. This information may be used to better inform health workforce need, admission processes, underservice areas, future health care needs, and curricular design to ensure social determinants of health are integrated throughout the curriculum. Schools must utilize their resources in a more purposeful way and ensure that

graduates acquire the competencies most relevant to societal needs.⁹ Additionally, future work could also focus on how schools can better identify their mandated geographic service areas using preidentified government regions or administrative areas such as health regions, census divisions or subdivisions.

This study provides an example of a systematic and iterative approach to developing a socially accountable health index using pan-national open access secondary data. The indices created in this study serve as a proxy for societal health needs and perhaps may provide a starting point for establishing stronger relationships between education and society. It is important for schools to utilize their resources more purposefully and ensure that graduates are equipped with the competencies needed to address societal needs.⁹⁷ Closing the gap between education and society has the potential to improve health outcomes,⁵ and promote a more socially accountable health professions education system.

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Appendix I.

Canadian Provinces and Territories and Affiliated Health Regions included in the Canadian Community Health Survey (CCHS) 2017-18 Public Use Micro-Data File (PUMF) (n=97).

Province or Territory^a	Health Regions^b
Newfoundland & Labrador	Eastern Regional Central Regional Western Regional Health Authority & Labrador-Grenfell Regional Health
Prince Edward Island	Prince Edward Island
Nova Scotia	Zone 1 - Western Zone 2 - Northern Zone 3 - Eastern Zone 4 - Central
New Brunswick	Zone 1 (Moncton area) Zone 2 (Saint John area) Zone 3 (Fredericton area) Zone 4 (Edmundston area) & Zone 5 (Campbellton area) Zone 6 (Bathurst area) & Zone 7 (Miramichi area)
Quebec	Bas-Saint-Laurent Capitale-Nationale Chaudière-Appalaches Région de Laval Région de Lanaudière Région des Laurentides Saguenay - Lac-Saint-Jean L'Estrie Gaspésie - Îles-de-la-Madeleine Mauricie et du Centre-du-Québec Région de Montréal Montérégie L'Outaouais L'Abitibi-Témiscamingue Côte-Nord
Ontario	Brant County Health Unit City of Hamilton Health Unit Niagara Regional Area Health Unit Waterloo Health Unit North Bay Parry Sound & Timiskaming Northwestern Health Unit Porcupine Health Unit Renfrew County and District Health Unit Sudbury and District Health Unit The District of Algoma Health Unit Thunder Bay District Health Unit City of Ottawa Health Unit Eastern Ontario Health Unit Haliburton, Kawartha, Pine Ridge District Health Unit Leeds, Grenville and Lanark District Health Unit Hastings and Prince Edward Counties Health Unit Kingston, Frontenac and Lennox and Addington Health Unit City of Toronto Health Unit Durham Regional Health Unit Halton Regional Health Unit Peel Regional Health Unit Peterborough County-City Health Unit Simcoe Muskoka District Health Unit Wellington-Dufferin-Guelph Health Unit York Regional Health Unit Chatham-Kent Health Unit Elgin-St Thomas Health Unit

Appendix I.

Canadian Provinces and Territories and Affiliated Health Regions included in the Canadian Community Health Survey (CCHS) 2017-18 Public Use Micro-Data File (PUMF) (n=97).

Province or Territory^a	Health Regions^b
	Grey Bruce Health Unit Haldimand-Norfolk Health Unit Huron & Perth Health Unit Lambton Health Unit Middlesex-London Health Unit Oxford County Health Unit Windsor-Essex County Health Unit
Manitoba	Winnipeg Regional Health Authority Prairie Mountain Health Interlake-Eastern Regional Health Northern Regional Health Area Southern Health
Saskatchewan	Sun Country Regional Health Authority & Five Hills Regional Health Authority & Cypress Regional Health Authority Regina Qu'Appelle Regional Health Authority Sunrise Regional Health Authority & Kelsey Trail Regional Health Authority Saskatoon Regional Health Authority Heartland Regional Health Authority & Prairie North Regional Health Authority Prince Albert Parkland Regional Health Authority
Alberta	South Zone Calgary Zone Central Zone Edmonton Zone North Zone
British Columbia	East Kootenay Health Service Delivery Area Kootenay-Boundary Health Service Delivery Area Okanagan Health Service Delivery Area Thompson/Cariboo Health Service Delivery Area Fraser East Health Service Delivery Area Fraser North Health Service Delivery Area Fraser South Health Service Delivery Area Richmond Health Service Delivery Area Vancouver Health Service Delivery Area North Shore/Coast Garibaldi Health Service Delivery Area South Vancouver Island Health Service Delivery Area Central Vancouver Island Health Service Delivery Area North Vancouver Island Health Service Delivery Area Northwest Health Service Delivery Area Northern Interior Health Service Delivery Area Northeast Health Service Delivery Area
Yukon	Yukon
Northwest Territories	Northwest Territories
Nunavut	Nunavut

Notes. ^a There are 10 provinces and 3 Territories in Canada.

^b Health Regions refer to administrative areas defined by the provincial ministries of health and are used to make health care decisions.

Chapter 5

Medical School Service Regions in Canada: Exploring Graduate Retention Rates Across the Medical Education Training Continuum and into Professional Practice

Barber C, van der Vleuten C, Chahine S. *Under Review*, Health Policy Journal.

Abstract

Purpose. To create medical school service regions and examine national in-region graduate retention patterns across the medical education continuum and into professional practice, as one approach to advance social accountability in medical education.

Methods. Medical school service regions were created in Canada using publicly available data and mapped using Geographic Information System (GIS). Population size and density for each service region was calculated using census data. Retroactive data of medical graduates who completed their medical degree between 2001-2015 (n = 19,971) were obtained from a centralized data repository and used to analyze in-region retention rates by medical speciality across the training continuum and 5-years into professional practice.

Results. Significant spatial inequities were observed across medical school service regions. Graduate retention patterns also varied across service regions and medical specialties. Quebec (86.5%) and Ontario (80.4%) had above-average retention proportions across the medical education training continuum. Family medicine had the highest retention rates from undergraduate to postgraduate training (81.9%), while psychiatry had the highest retention rate across the training continuum and into professional practice (71.2%). Alberta and British Columbia service regions demonstrated high retention proportions across the training continuum and into professional practice and medical specialties, except for retention from undergraduate to postgraduate medical education.

Conclusion. This study highlights the importance of considering medical specialty and practice location of graduates when planning and retaining physician workforce. The observed retention patterns among medical graduates are a critical aspect of addressing societal needs and represent an intermediate step towards achieving health equity. Furthermore, these retention patterns serve as an outcome measure for medical schools to demonstrate their commitment to social accountability. By tracking and monitoring graduate outcomes, schools may begin to actively collaborate with government agencies responsible for healthcare policy, which may improve physician workforce planning and perhaps promote more equitable healthcare access.

Background

Medical schools are expected to be socially accountable to their local communities by directing their education, research, and service activities towards addressing priority health needs.¹⁻³ This includes determining the appropriate number, mix, and distribution of physicians necessary to meet societal needs.⁴ This paper aims to provide a methodological approach for creating medical school service regions and investigates the variation of graduate retention patterns within these regions.

Considerable research has been conducted to examine the retention patterns of medical graduates internationally.⁵⁻¹³ Most of this literature has predominantly focused on primary care and rural practice settings.¹⁴⁻²⁰ Despite efforts to encourage physicians to practice in rural regions where needs are often greatest,^{4,21,22} regional scarcities persist, contributing to overall shortages and maldistribution of medical specialists.²³ Several factors have been identified as influencing the ultimate location of professional practice, including, personal, family and professional factors, rural upbringing, location of postgraduate training, and medical specialty.^{16,20} Medical school characteristics have also shown to play a potential role in influencing graduate specialty choice and practice location.²⁴ Growing evidence suggests that targeted socially accountable rural, and local admission pathways, as well as curricular exposure to primary care practice/principles and extended community-based training, foster graduates committed to primary care, making them more likely to practice in local communities.^{5-13,25,26} Furthermore, rural upbringing and longitudinal rural community-based placements have significantly increased the number of graduates practicing in rural settings.^{15,27-35}

Moving beyond the focus on rural practice choice, many studies have documented the association between graduate practice location and location of postgraduate training.^{16,20,32-35} Primary care graduates are often more likely than specialists to practice in the same location as their postgraduate training.^{19,20} For example, Koehler et al.,³² conducted a study in the United States that examined the likelihood of graduates practicing in the same state where they completed their residency training. The study suggests that graduates with local connections, such as local hometown origin, completing both undergraduate and postgraduate medical training in the same region, being married, and graduated from a primary care medical specialty, were more likely to practice in-state.³² Additionally, primary care graduates were more likely to practice in the same region where they completed their residency training than other hospital-based specialties.³² Similarly, Seifer et al.,¹⁶ examined the relationship between residency training and practice location. The study identified personal characteristics, location of medical training, and financial incentives as factors influencing the practice location of physicians. Their findings suggests that general practitioners (i.e., family medicine, internal medicine, and pediatrics physicians) were also more likely to practice in the same state where they completed their residency compared to non-primary care physicians.

The purpose of this study was to create medical school service regions and evaluate in-region graduate retention patterns to advance social accountability in medical education. Service regions may be characterized as geographical areas served by a school or 'intended area(s) of primary responsibility' (adapted from Singleton et al.,³⁶). While these regions are not intended to act as absolute boundaries but rather general regions from which medical schools

are mandated to serve. This evaluative process can serve as a model to better understand school service regions and evaluate graduate retention patterns as an initial step to advance social accountability in medical education.

Methods

Study Setting. There are 17 medical schools in Canada, with 6 located in the province of Ontario, 4 in Quebec, 4 in the Prairie provinces (Manitoba, Saskatchewan, and Alberta), 1 in British Columbia, and 2 in Atlantic Canada (Nova Scotia and Newfoundland & Labrador). All Canadian medical schools engage in some form of distributed medical education and community-based training.³⁷ In Canada, physicians must complete a 3- or 4-year Doctor of Medicine degree (MD), followed by 2 to 5+ years of residency training and pass a series of regulatory licensing examinations prior to entering unsupervised medical practice.³⁸

Creating Medical School Service Regions. To create medical school service regions in Canada, federal administrative health region boundaries³⁹ were used, along with the location of all medical schools and information on schools' distributed campuses, community training sites, health authorities, or rural and regional education and training opportunities. Health regions are established by provincial ministries of health and are used to make healthcare decision.⁴⁰

The process of creating medical school service regions involved several steps. First, health regions boundaries were identified for each province using Statistics Canada 2018 Census geographic units.⁴⁰ This was followed by grouping the physical location of each medical school by province. Next, the geographic area of primary responsibility that each medical school served were developed using information obtained from institutional websites,⁴¹⁻⁵⁷ including distributed campuses, community training sites, and rural and regional education and training opportunities. Once this information was collected, each medical school's geographic areas were assigned to a corresponding health region. Finally, the health regions assigned to each respective school's regions were aggregated to create medical school service regions (depicted in 'Supplemental Appendix I').

Data Sources. Publicly available digital boundary files for 2018 health regions, compatible with Geographic Information System (GIS) mapping software, were obtained from Statistics Canada website.⁴⁰ GIS is an increasingly recognized tool for mapping and spatial analysis with applications to health systems planning,⁵⁸ and was used to map medical school service regions. Additionally, Statistics Canada's 2016 Census of Population⁵⁹ was also used to provide data on population counts, population density per square kilometer (km²), and land area in km² for each health region. Statistics Canada's Census of Population is a mandatory cross-sectional survey of the population, conducted every 5 years.⁶⁰

To examine graduate retention patterns, data from the Canadian Post-M.D. Education Registry (CAPER) on medical graduates who completed their MD degree in Canada between 2001-2015 (n = 19,971) was obtained. CAPER is an initiative of the Association of Faculties of Medicine of Canada (AFMC) and serves as a central data repository for all postgraduate medical residents, fellows, and practicing physicians in Canada.⁶¹

Analysis. The analyses were conducted based on the primary area of responsibility of medical schools using school location and their broader service areas, as well as health regions boundaries.

The medical school service region map was generated using GIS ESRI ArcGIS Desktop 10.8.1. Population counts, land area in km², and population density per km² were calculated for each medical school region by aggregating values obtained from corresponding health regions. Retention rates were calculated based on the proportion of graduates practicing in the same service region where they completed their undergraduate and/or postgraduate medical training. Mean retention values were compared by medical specialty across the training continuum and 5 years into professional practice.

To ensure confidentiality, medical school service regions were aggregated into the following service region groups: Atlantic, Quebec, Ontario, Manitoba & Saskatchewan, and Alberta & British Columbia. Retention patterns for Canadian medical graduates were calculated for each service region group using the following outcomes: (1) the proportion of graduates who remained in the same service region group for both undergraduate and postgraduate training, (2) the proportion of graduates who practiced in the same service region group where they received their undergraduate and postgraduate medical training, (3) the proportion of graduates who practiced in the same region where they completed their undergraduate training, and (4) the proportion of graduates who practiced in the same service region where they completed their postgraduate training.

Ethics approval was obtained from Maastricht University (Approval No. FHML-REC/2020/101).

Results

Medical School Service Regions

Findings from our map (depicted in Figure 1) suggest that medical school service regions in Canada were not uniform, and spatial inequities were observed in terms of total population, land area in km², and population density/km² (shown in Table 1). Ontario served the largest population (13,371,698), most of whom resided in the University of Toronto service region (7,380,462), while the smallest population resided in Queen's University service region (354,543). The University of British Columbia was the only medical school located in the province of British Columbia and served a total population of 4,648,055. The Territories (Nunavut, Yukon, and Northwest Territories) represented 40% of Canada's land mass and approximately 3% of the total population.⁶² While no faculties of medicine reside in the Territories, residency training opportunities have recently become more available, but the responsibility of these service regions resides in a handful of schools.

Table 1.

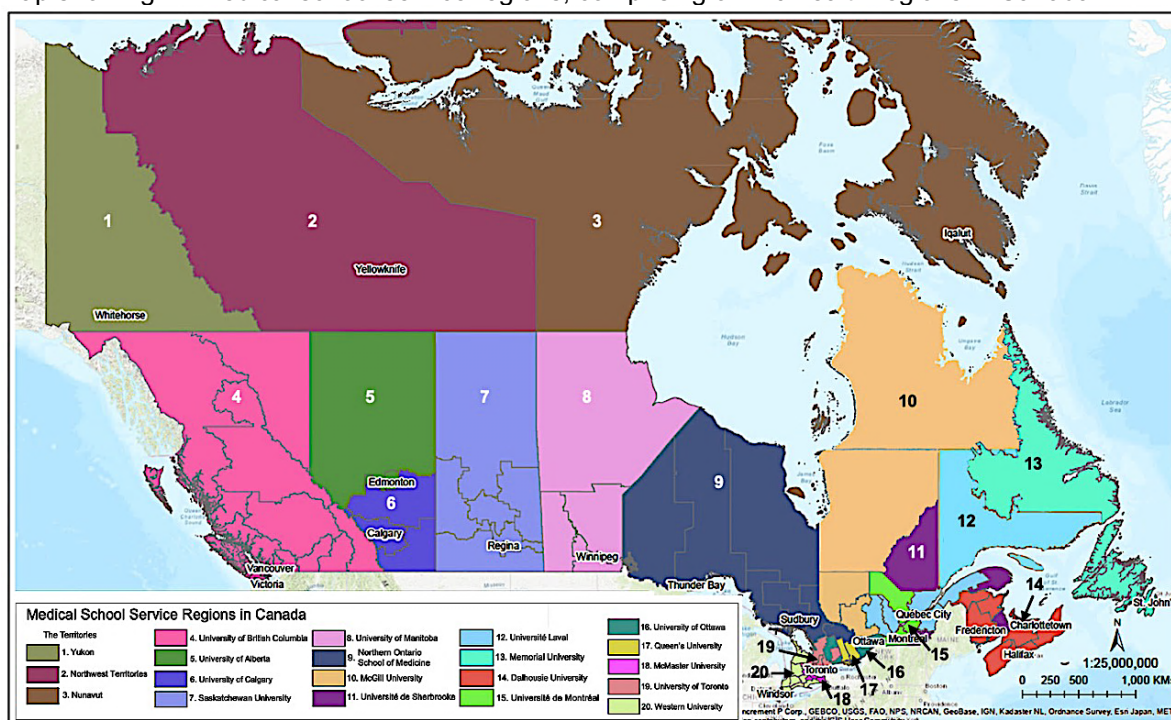
Total Population, Land Area in Square Kilometres (km²) and Population Density per Square Kilometres (km²) by Medical School Service Region in Canada using 2018 Health Regions Boundaries in Canada

Medical School Service Region	Total Population^a	Land area (km²)^b	Population Density (km²)^c
<i>Atlantic Service Region</i>			
Memorial University of Newfoundland	519,716	370,514	1.4
Dalhousie University	1,604,350	119,990	13.4
Atlantic Service Region Total	2,124,066	490,504	4.3
<i>Quebec Service Region</i>			
Université de Sherbrooke	1,048,550	141,800	7.4
Université Laval	2,854,653	89,568	31.9
Université de Montreal	3,804,014	51,892	73.3
McGill University	666,400	1,083,392	0.6
Quebec Service Region Total	8,373,617	1,366,652	6.1
<i>Ontario Service Region</i>			
McMaster University	1,654,902	5,469	302.6
Northern Ontario School of Medicine	882,534	810,295	1.1
University of Ottawa	1,485,332	23,589	63.0
Queen's University	354,543	13,782	25.7
University of Toronto	7,380,462	23,922	308.5
Western University	1,613,925	29,424	54.9
Ontario Service Region Total	13,371,698	906,481	14.8
<i>Manitoba & Saskatchewan Service Region</i>			
University of Manitoba	1,278,365	552,371	2.3
University of Saskatchewan	1,133,805	846,387	1.3
Manitoba & Saskatchewan Service Region Total	2,412,170	1,398,758	1.7
<i>Alberta & British Columbia Service Region</i>			
University of Calgary	2,304,541	195,241	11.8
University of Alberta	1,762,634	445,089	4.0
University of British Columbia	4,648,055	922,503	5.0
Alberta & British Columbia Service Region Total	8,715,230	1,562,833	5.6
<i>Territories</i>			
Yukon	35,874	474,713	0.1
Northwest Territories	41,786	1,143,794	0.0
Nunavut	35,944	1,877,779	0.0
Territories Total	113,604	3,496,286	0.0
Canada	35,151,728	8,965,588.85	3.9

Note. data was obtained online from Statistics Canada 2016 Census of the Population.⁶⁰

Figure 1.

Map showing 17 medical school service regions, comprising of 126 health regions in Canada



We analyzed 19,971 practicing physicians in Canada who graduated with a Canadian M.D. between 2001 and 2015. Descriptive statistics across the training continuum and into professional practice by medical specialty were categorized according to service region groups (depicted in Table 2). Most graduates received their undergraduate (UME) and postgraduate medical education (PME) training in Ontario (UME = 34.6%, PGME = 38.0%) or Quebec (UME = 31.8%, PME = 29.3%).

Table 2.

Descriptive Statistics of Practicing Medical Graduates in Canada (2001-2015)

Variable Names	No. (%) out of a total of n = 19,971
<i>Undergraduate Medical Education Service Region Groups</i>	
Atlantic Region	1,391 (7.0)
Quebec Region	6,354 (31.8)
Ontario Region	6,915 (34.6)
Manitoba & Saskatchewan Region	1,378 (6.9)
Alberta & British Columbia Region	3,933 (19.7)
<i>Postgraduate Medical Education Service Region Groups</i>	
Atlantic Region	1,100 (5.5)
Quebec Region	5,854 (29.3)
Ontario Region	7,590 (38.0)
Manitoba & Saskatchewan Region	972 (4.9)
Alberta & British Columbia Region	4,455 (22.3)
<i>Year 5 Practice Location Service Region Groups</i>	
Atlantic Region	871 (4.4)
Quebec Region	4,102 (20.5)
Ontario Region	5,156 (25.8)
Manitoba & Saskatchewan Region	730 (3.7)
Alberta & British Columbia Region	3,540 (17.7)
Territories	76 (0.4)
<i>Medical Specialty</i>	
Family Medicine	10,894 (54.5)

Table 2.

Descriptive Statistics of Practicing Medical Graduates in Canada (2001-2015)

Variable Names	No. (%) out of a total of n = 19,971
Internal Medicine & Subspecialties	3,170 (15.9)
OB/Gyn & Subspecialties	754 (3.8)
Paediatrics & Subspecialties	1,177 (5.9)
Psychiatry & Subspecialties	1,197 (6.0)
Surgical Specialities (excl. OB/Gyn)	2,779 (13.9)

Approximately 30% of all year-5 practice location data was missing from our sample, primarily observed in 2013, where the file provided by the Canadian Medical Association was missing a significant proportion of postal codes. However, of the 14,475 graduates, one-quarter of all graduates 5 years into professional practice were practicing in Ontario (25.8%), followed by Quebec (20.5%), Alberta & British Columbia Region (17.7%), the Atlantic Region (4.4%), Manitoba & Saskatchewan Regions (3.7%), and only 0.4% of graduates were practicing in the Territories. In terms of medical specialty, half of all graduates in our sample were family physicians (54.5%), followed by internist and subspecialties (15.9%), surgical specialists (13.9%), psychiatrists (6.0%), paediatrics (5.9%), and the remaining 3.8% practiced in obstetrics and gynecologists.

Retention Patterns

Graduate retention patterns for Canadian medical school service groups across the training continuum and 5 years into professional practice by medical specialty are depicted in Table 3. Our findings suggest that graduate retention patterns varied significantly across the training continuum and into professional practice, depending on the service region group and medical specialty.

Table 3.

In-service region group retention by medical specialty (n = 19,971)

Medical Specialty & Service Region Group	In-Service Region Group Retention % (\pm 95% CI)			
	UGME & PGME ^a	UGME, PGME & Year 5 Practice Region ^b	UGME & Year 5 Practice Region ^c	PGME & Year 5 Practice Region ^d
<i>All Specialties</i>				
Manitoba & Saskatchewan	48.3 (2.6)	58.6 (3.7)	21.9 (3.0)	29.4 (5.1)
Atlantic	49.2 (2.6)	62.2 (3.6)	20.7 (3.0)	28.4 (4.3)
Alberta & British Columbia	71.9 (1.4)	68.1 (1.7)	32.7 (2.8)	48.7 (2.4)
Ontario	80.4 (0.9)	68.6 (1.2)	21.7 (2.2)	38.6 (2.1)
Quebec	86.5 (0.8)	67.1 (1.2)	26.1 (2.9)	30.2 (4.8)
National Avg.	76.3 (0.6)	67.2 (0.8)	24.9 (1.2)	39.9 (1.4)
<i>Family Medicine</i>				
Manitoba & Saskatchewan	58.7 (3.6)	58.2 (4.7)	17.9 (4.4)	27.7 (7.7)
Atlantic	61.2 (3.5)	62.9 (4.4)	16.6 (4.3)	32.0 (6.1)
Alberta & British Columbia	77.4 (1.8)	67.8 (2.3)	33.3 (4.2)	54.8 (3.7)
Ontario	81.6 (1.3)	71.2 (1.6)	20.8 (3.1)	47.8 (3.6)
Quebec	93.4 (0.8)	66.5 (1.6)	12.8 (4.2)	28.3 (6.9)
Family Medicine Avg.	81.9 (0.7)	67.7 (1.0)	21.8 (1.8)	45.5 (2.2)
<i>Internal Medicine & Subspecialties</i>				
Manitoba & Saskatchewan	27.7 (6.0)	54.2 (12.7)	18.8 (6.2)	37.8 (15.6)
Atlantic	31.7 (6.5)	63.5 (11.9)	23.5 (7.1)	30.0 (16.4)
Alberta & British Columbia	68.1 (3.6)	67.4 (4.4)	29.4 (6.3)	48.2 (5.3)
Ontario	80.7 (2.3)	70.6 (2.9)	19.0 (5.2)	32.6 (4.4)
Quebec	80.8 (2.5)	67.2 (3.3)	27.0 (6.3)	37.9 (11.7)
Internal Medicine & Subspecialties Avg.	71.6 (1.6)	68.2 (1.9)	23.6 (2.8)	39.0 (3.2)

Table 3.
In-service region group retention by medical specialty (n = 19,971)

Medical Specialty & Service Region Group	In-Service Region Group Retention % (\pm 95% CI)			
	UGME & PGME ^a	UGME, PGME & Year 5 Practice Region ^b	UGME & Year 5 Practice Region ^c	PGME & Year 5 Practice Region ^d
<i>OB/Gyn & Subspecialties</i>				
Manitoba & Saskatchewan	56.9 (12.7)	60.6 (16.7)	20.0 (15.7)	33.3 (17.8)
Atlantic	50.0 (11.7)	68.6 (15.4)	11.4 (10.5)	20.7 (14.7)
Alberta & British Columbia	68.4 (7.8)	75.3 (8.8)	39.5 (14.6)	48.0 (11.3)
Ontario	77.0 (5.0)	65.9 (6.4)	17.7 (9.5)	40.7 (10.7)
Quebec	75.9 (5.7)	69.5 (7.0)	32.1 (12.6)	16.7 (29.8)
OB/Gyn & Subspecialties Avg.	71.1 (11.7)	68.6 (15.4)	24.8 (5.7)	39.0 (6.47)
<i>Paediatrics & Subspecialties</i>				
Manitoba & Saskatchewan	38.6 (9.5)	64.1 (15.1)	32.3 (11.6)	26.5 (14.8)
Atlantic	32.3 (9.5)	50.0 (17.9)	31.7 (11.5)	24.0 (16.7)
Alberta & British Columbia	66.7 (6.0)	67.1 (7.3)	30.4 (10.1)	48.2 (8.4)
Ontario	75.4 (4.1)	60.0 (5.4)	16.5 (7.2)	35.6 (7.1)
Quebec	70.1 (5.0)	63.5 (6.2)	23.5 (8.4)	31.3 (16.1)
Paediatrics & Subspecialties Avg.	65.6 (2.7)	62.3 (3.5)	25.7 (4.3)	38.0 (4.7)
<i>Psychiatry & Subspecialties</i>				
Manitoba & Saskatchewan	55.3 (10.6)	68.1 (6.3)	7.9 (8.6)	50.0 (28.3)
Atlantic	51.4 (11.7)	69.4 (15.0)	5.9 (7.9)	29.4 (15.3)
Alberta & British Columbia	68.8 (5.2)	80.9 (11.2)	27.7 (9.0)	54.8 (12.4)
Ontario	85.0 (3.6)	71.7 (4.9)	19.0 (10.1)	52.4 (8.1)
Quebec	84.7 (3.7)	71.3 (5.1)	33.3 (12.6)	26.1 (17.9)
Psychiatry & Subspecialties Avg.	76.8 (2.4)	71.2 (2.9)	21.6 (4.8)	47.8 (15.3)
<i>Surgical Specialties (excl. OB/Gyn)</i>				
Manitoba & Saskatchewan	32.8 (6.4)	44.8 (11.9)	33.6 (7.9)	24.2 (10.3)
Atlantic	29.9 (6.2)	54.0 (12.3)	27.0 (7.2)	20.3 (9.5)
Alberta & British Columbia	59.5 (4.2)	69.3 (5.1)	36.3 (6.4)	34.4 (5.3)
Ontario	77.1 (2.6)	59.6 (3.4)	30.6 (5.9)	25.2 (4.0)
Quebec	72.5 (3.1)	68.8 (3.8)	38.0 (6.4)	29.2 (11.1)
Surgical Specialties (excl. OB/Gyn) Avg.	65.6 (1.8)	63.5 (2.2)	33.5 (3.0)	28.0 (2.9)

Notes. ^aRefers to the retention proportion of graduates who remained in the same service region group for both undergraduate and postgraduate medical education training.

^bRefers to the retention proportion of graduates who completed both their undergraduate and postgraduate training in the same service and remained in the same service region group 5-years into professional practice.

^cRefers to the retention proportion of graduates who completed their undergraduate and postgraduate training in different service region groups, and returned to the service region group where they completed their undergraduate medical training 5-years into professional practice.

^dRefers to the retention proportion of graduates who remained in the same service region 5-years into professional practice where they completed their postgraduate training.

Overall, 76.3% of all graduates completed both undergraduate and postgraduate medical training in the same service region. Quebec (86.5%) (possibly due to language) and Ontario (80.4%) had above-average retention proportions across the medical education training continuum. However, the retention rate dropped to 67.2% for medical graduates who remained in the same service region where they completed both their undergraduate and postgraduate training 5 years into professional practice. Furthermore, 24.9% of all graduates practiced in the same service region where they completed their undergraduate medical training, with Alberta & British Columbia region (32.7%) and Quebec (26.1%) demonstrated higher-than-average retention proportions for graduates who returned to practice in the same service region where they completed their undergraduate medical training. Moreover, approximately 40% of all graduates 5 years into practice remained in the same service region where they completed their residency, with Alberta & British Columbia regions having higher-than-average

retention (48.7%) for graduates who practiced in the same service group where they completed their residency.

Retention patterns also varied across medical specialty. Family medicine (81.9%) had the highest retention rates from undergraduate to postgraduate training, with Quebec retaining 93.4% of all family medicine graduates from undergraduate to postgraduate training, followed by Ontario (81.6%). Psychiatry (71.2%) had the highest retention rate across the training continuum and into professional practice, with Alberta & British Columbia retaining 81%, followed by Ontario (71.7%) and Quebec (71.3%). Paediatrics had the highest retention from undergraduate medical education training into professional practice, with Manitoba & Saskatchewan retaining the highest proportion of graduates (32.3%), followed by the Atlantic region (31.7%). Lastly, psychiatry had the highest retention rate from postgraduate training into professional practice (47.8%), with the Alberta & British Columbia region having the highest retention proportion (54.8%) followed by Ontario (52.4%).

Overall, Manitoba & Saskatchewan and the Atlantic region had lower retention rates than the national average across the training continuum and into professional practice and medical specialties. However, these regions showed above-average retention rates for certain medical specialties. Specifically, in paediatrics, the Atlantic region (31.7%) and Manitoba & Saskatchewan (32.3%) had retention rates higher than the national average from undergraduate medical education into professional practice. Additionally, Manitoba & Saskatchewan demonstrated a higher-than-average retention rate (50.0%) in psychiatry from postgraduate training into professional practice. On the other hand, Alberta & British Columbia had high retention rates across the training continuum into professional practice and medical specialties, except for retention from undergraduate to postgraduate medical education.

Discussion

This study introduces a methodological approach for creating school service regions and analyzes in-region graduate retention patterns by medical specialty across the medical education training continuum and into professional practice. Additionally, this study also offers important insights into social accountability, shedding light on extent to which schools are able to retain graduates in their mandated service regions. Identifying service regions enables medical schools to gain a deeper understanding of their roles within specific areas and customize their programs to effectively address local healthcare needs. Moreover, this process aligns with the social accountability mandate of medical schools, as it facilitates the assessment of their success in retaining graduates within their designated regions and fulfilling their responsibility to serve the local community.

The findings reveal that certain regions were more successful than others in retaining graduates in their respected service regions. Consistent with previous literature, our findings suggest that graduates tend to practice in the same region where they completed their medical training.^{16,32-34,63} However, attending both undergraduate and postgraduate medical education in the same region yielded higher professional practice retention proportions, compared to postgraduate training alone. Conversely, the location of postgraduate training produced higher in-region practice retention proportions, compared to the proportion of graduates who returned to the service region where they completed their undergraduate medical training.⁶⁴ This finding may be of particular concern for smaller schools that offer few or limited postgraduate training

opportunities, as graduates may be required to obtain specialized training elsewhere, making them less likely to return to practice where they completed their undergraduate medical training. However, regions with lower graduate retention rates may opt to implement local or rural admissions pathways and/or community-based training opportunities that have been shown to be associated with retaining graduates locally.

Although Canada's graduate retention rate from postgraduate medical education into professional practice was slightly lower than what was reported in the United States in 2019 (54.6%),⁶⁵ the national retention proportion across the medical education continuum into professional practice was higher (67.2%). However, it is important to exercise caution when making comparisons between countries due to differences in data sources and sample characteristics. In contrast to previous literature reporting higher in-region retention rates for family medicine graduates,^{19,66} our findings suggest that psychiatry had higher retention rates across the medical training continuum into professional practice. Nonetheless, further research is warranted to examine the number of available psychiatry postgraduate training opportunities nationally and differences that may exist in residency selection.

Population size may also strongly influence the number of medical specialists that can be sustained in a particular service region.⁶⁷⁻⁶⁹ This may be more extreme for traditional hospital-based specialties, as the population size of a given region may strongly affect future practice locations. Our findings suggest that very few medical graduates in our sample practiced in the Territories. This finding aligns with previous studies suggesting that lower retention rates are often observed in sparsely populated regions.^{6,63,64,70} However, additional factors, such as graduates' social-cultural considerations and the suitability of available opportunities, may also contribute to the trend.^{64,70} Further research is needed to examine the relative importance of a region's population density, number of postgraduate training opportunities, and graduate demographics on retention patterns.

The study's implications extend beyond education to health human resources and workforce planning, as policymakers can use graduate retention patterns to identify potential physician shortages and geographic maldistributions.^{68,69} Perhaps one potential solution schools can begin to meet these expectations is by creating educational service regions. This study uses Canada as an example to demonstrate how schools can create geographic areas of primary responsibility likely to be served by each medical school using institutional websites and pre-existing administrative geographical boundaries. With service regions in place, schools can begin to better understand their primary regions of responsibility and identify areas of need relevant to their local context.

This paper provides a national overview of medical school service regions and graduate retention trends across 15 years of data. However, it is also important to acknowledge that graduate retention, specialty selection and future practice location are multifaceted and influenced by a variety of personal, political, and economic factors beyond the control of medical schools.⁶ Additionally, there are several other possible explanations of graduate retainment that were not captured, such as hometown origin, socioeconomic status, and rural or urban practice location. Nonetheless, medical schools can contribute to their local communities by creating school service regions they can better understand their primary regions of responsibility and identify areas of need.⁶⁸ Graduate retainment may also be influenced by production-related factors, such as the availability of postgraduate training

opportunities.⁷⁰ Therefore, it is important to consider the relationship between medical education, population health needs, and future capacity when determining production targets or the number of allocated training seats for health professionals.^{71,72} Unfortunately, these relationships are seldomly explored.⁶⁷ While graduate retention rates may not fully capture regional physician needs beyond location, they do provide a valuable measure of medical schools' accountability to the communities they serve. However, it is important to acknowledge that retention rates are only one aspect of the complex factors that affect regional physician needs and healthcare delivery. Future research could further explore these factors and inform the development of more comprehensive strategies to meet the needs of underserved communities.

Although the findings from this paper are not prescriptive, they can help policymakers better identify and predict physician specialty shortages and geographic maldistributions. One strategy for school to encourage graduates to practice in their local communities is through local admissions pathways throughout the medical education continuum.⁷¹ While the number of undergraduate and postgraduate medical education opportunities are often determined by national and local governments, medical schools could work collaboratively with governing bodies to ensure the appropriate number, mix, and distribution of physicians needed to meet community needs.^{1-3,68}

In addition, the use of pre-existing health region boundaries to identify medical school service regions may have limited our ability to examine local-level differences between population health needs. Nonetheless, health regions are continuously used by health authorities for planning, distribution, and allocation of health services and provide high-level understandings of population health needs and outcomes. However, future research could examine graduate retention using smaller geographic units. Lastly, while this paper uses Canada as an example for creating service regions and examining graduate retention patterns, the methodology can be replicated in other contexts.

Conclusion

This study created medical school service regions, examined graduate retention rates across the training continuum and into professional practice, and presented regional comparisons and national benchmarks by medical specialty. Furthermore, this study highlights how schools can advance social accountability by examining the extent to which graduates practice within their respective service region.

Findings from this study have important implications for medical schools, policymakers, and physician workforce planning. School service regions can be used to better track graduate outcomes and perhaps begin to evaluate the extent to which rural and local admissions pathways and extended community-based training foster graduates more likely to practice in their local communities. Additionally, medical schools may opt to consider their service region as a tool to better identify and serve local health needs. This includes monitoring and tracking graduate outputs and ensuring graduates and medical specialists are geographically dispersed.^{4,69} However, despite ongoing efforts by schools to improve graduate retention, the effectiveness of these initiatives remains unknown and un-evaluated.^{37,73}

Poor graduate retention poses significant healthcare delivery challenges internationally, including persistent physician shortages, and geographic and speciality maldistribution.^{64,74} This study underscores the importance of creating educational service regions to examine in-region graduate retention. However, further research is warranted to examine national in-region graduate retention trends, especially when health human resources continue to weigh heavily on policymakers.³³ From a policy perspective, fostering graduates into local practice requires national and local government support to secure adequate undergraduate and postgraduate opportunities across all medical specialties in respective regions.⁷⁵ Providing training opportunities across the medical education continuum seeks to further strengthen graduate retainment to the region.⁷⁵ Graduate retention represents an intermediate step to advancing health equity, as it serves as an outcome measure and pathway through which medical schools may contribute to social accountability, as one key actor in addressing societal needs.

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Supplemental Appendix I.

Medical School Service Region Groups, Provinces and Territories, Medical School Service Regions (n=17) and 2018 Health Region Boundaries and Correspondence with Census Geography in Canada.

Medical School Service Region Groups	Province or Territory^a	Medical School Service Regions^b	Health Regions^c
Atlantic Region	Newfoundland & Labrador	Memorial University	Eastern Regional Health Authority
			Central Regional Health Authority
	Prince Edward Island	Dalhousie University	Western Regional Health Authority
			Labrador-Grenfell Regional Health Authority
			Prince Edward Island
Nova Scotia	Dalhousie University	Zone 1 - Western	
		Zone 2 - Northern	
New Brunswick	New Brunswick	Université de Sherbrooke	Zone 3 - Eastern
			Zone 4 - Central
			Zone 1 (Moncton area)
			Zone 2 (Saint John area)
			Zone 3 (Fredericton area)
			Zone 4 (Edmundston area)
			Zone 5 (Campbellton area)
Zone 6 (Bathurst area)			
Quebec Region	Quebec	Université Laval	Zone 7 (Miramichi area)
			Région du Bas-Saint-Laurent
			Région de al Capitale-Nationale
			Région du Chaudière-Appalaches
		Université de Sherbrooke	Région de Laval
			Région de Lanaudière
			Région des Laurentides
		Université de Montreal	Région des Terres-Cries-de-la-Baie-James
			Région du Saguenay-Lac-Saint-Jean
			Région de l'Estrie
McGill University	Région de al Gaspésie-Îles-de-la-Madeleine		
	Région de al Mauricie et du Centre-du-Québec		
	Région de Montréal		
	Région de al Montérégie		
Ontario Region	Ontario (Public Health Regions)	McMaster University	Région de l'Outaouais
			Région de l'Abitibi-Témiscamingue
			Région de la Côte-Nord
			Région du Nord-du-Québec
		Northern Ontario School of Medicine	Région du Nunavik
			Brant County Health Unit
Ontario Region	Ontario (Public Health Regions)	McMaster University	City of Hamilton Health Unit
			Niagara Regional Area Health Unit
			Waterloo Health Unit
			North Bay Parry Sound Health Unit
Ontario Region	Ontario (Public Health Regions)	Northern Ontario School of Medicine	Timiskaming Health Unit
			Northwestern Health Unit

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Medical School Service Region Groups	Province or Territory^a	Medical School Service Regions^b	Health Regions^c
			Porcupine Health Unit Renfrew County and District Health Unit Sudbury and District Health Unit The District of Algoma Health Unit Thunder Bay District Health Unit
		University of Ottawa	City of Ottawa Health Unit Eastern Ontario Health Unit Haliburton, Kawartha, Pine Ridge District Health Unit Leeds, Grenville and Lanark District Health Unit
		Queen's University	Hastings and Prince Edward Counties Health Unit Kingston, Frontenac and Lennox and Addington Health Unit
		University of Toronto	City of Toronto Health Unit Durham Regional Health Unit Halton Regional Health Unit Peel Regional Health Unit Peterborough County-City Health Unit Simcoe Muskoka District Health Unit Wellington-Dufferin-Guelph Health Unit York Regional Health Unit
		Western University	Chatham-Kent Health Unit Grey Bruce Health Unit Haldimand-Norfolk Health Unit Huron County Health Unit Perth District Health Unit Lambton Health Unit Middlesex-London Health Unit Oxford Elgin St. Thomas Health Unit Windsor-Essex County Health Unit
Manitoba and Saskatchewan Region	Manitoba	University of Manitoba	Winnipeg Regional Health Authority Prairie Mountain Health Interlake-Eastern Regional Health Authority Northern Regional Health Authority Southern Health
	Saskatchewan	University of Saskatchewan	Sun Country Regional Health Authority Five Hills Regional Health Authority Cypress Regional Health Authority

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Medical School Service Region Groups	Province or Territory^a	Medical School Service Regions^b	Health Regions^c
			Regina Qu'Appelle Regional Health Authority Sunrise Regional Health Authority Kelsey Trail Regional Health Authority Saskatoon Regional Health Authority Heartland Regional Health Authority Prairie North Regional Health Mamawetan Churchill River Regional Health Authority Keewatin Yatthé Regional Health Authority Athabasca Health Authority Mamawetan/Keewatin/Athabasca Regional Health Authorities Prince Albert Parkland Regional Health Authority
Alberta & British Columbia Region	Alberta	University of Calgary	South Zone Calgary Zone Central Zone
		University of Alberta	Edmonton Zone North Zone
	British Columbia	The University of British Columbia	East Kootenay Health Service Delivery Area Kootenay-Boundary Health Service Delivery Area Okanagan Health Service Delivery Area Thompson/Cariboo Health Service Delivery Area Fraser East Health Service Delivery Area Fraser North Health Service Delivery Area Fraser South Health Service Delivery Area Richmond Health Service Delivery Area Vancouver Health Service Delivery Area North Shore/Coast Garibaldi Health Service Delivery Area South Vancouver Island Health Service Delivery Area Central Vancouver Island Health

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Medical School Service Region Groups, Provinces and Territories, Medical School Service Regions (n=17) and 2018 Health Region Boundaries and Correspondence with Census Geography in Canada.

Medical School Service Region Groups	Province or Territory^a	Medical School Service Regions^b	Health Regions^c
			Service Delivery Area
			North Vancouver Island Health Service Delivery Area
			Northwest Health Service Delivery Area
			Northern Interior Health Service Delivery Area
			Northeast Health Service Delivery Area
Territories	Yukon	Yukon	
	Northwest Territories	Northwest Territories	
	Nunavut	Nunavut	

Notes: ^a There are 10 provinces and 3 Territories in Canada.

^b Medical School Service Regions refer to geographically sensitive areas schools have a responsibility to serve.

^c Health Regions refer to administrative areas defined by the provincial ministries of health and are used to make health care decisions.



Chapter 6

General Discussion

Social accountability stands as a fundamental priority within health professions education reform and accreditation standards.^{1,2} This concept emphasizes the importance of identifying societal needs and actively striving to address them.³⁻⁵ However, progress in understanding the relationship between educational inputs, processes, outcomes, and societal impacts has made limited progress the last forty years.⁶⁻⁸ This lack of progress may be attributed to the lack of valid and reliable indicators, hindering the evaluation of social accountability in practice.^{6,9} In light of these challenges, two main research questions were identified:

1. *What indicators may support the operationalization of social accountability?*
2. *How might these indicators be used to better support social accountability in practice at the regional and school level?*

To address the first research question, a narrative review of prominent social accountability frameworks in health professions education was conducted to establish an initial set of operational constructs. Common themes were synthesized across frameworks and characterized using the context-input-process-product (CIPP) evaluation model, presented in Chapter 2. This review uncovered concerns regarding the operationalization of social accountability in practice, leading to further exploration in subsequent studies. Secondly, an online survey was developed and implemented in Chapter 3. Focusing on institutional practices and administrative perceptions, this chapter surveyed an international representative sample of English-speaking undergraduate medical schools. Findings revealed gaps in the evaluation and measurement of social accountability, with schools predominantly focusing on educational inputs and processes rather than outcomes or impacts. Consequently, the effects on the local community remain unknown and not evaluated.

The last two chapters built upon insights gained from Chapters 2 and 3, presenting an approach to measure social accountability through large-scale, pan-national census data. These chapters addressed the second research question. In Chapter 4, open access secondary pan-national population health data were employed to identify societal needs. Building upon this, Chapter 5 established medical school service regions, comprised of mandated geographical areas schools were obligated to serve. This chapter also explored national in-region graduate retention patterns across the medical education training continuum and into professional practice by medical specialty. The approaches used in these chapters offer a systematic, data-driven approach to implement and measure social accountability outcomes. Overall, this thesis identified indicators to facilitate the operationalizing of social accountability in practice at the regional and school level.

Lastly, the General Discussion (Chapter 6) synthesized and examined the empirical findings of these studies in relation to existing literature. The evidence and insights from the four previous chapters are interpreted using systems-in-evaluation, a program evaluation approach.¹⁰ This evaluative framework addresses the complexities of social accountability, and the interconnected relationships between educational components, and their influence on the local community. Applying principles of systems-in-evaluation (interrelationships, perspectives, boundaries, and dynamics), this thesis enhances the interpretation of empirical findings, contributing to the advancement social accountability in health professions education. This discussion chapter also synthesizes the strengths and limitations of the approach taken in this thesis and provides practical implications for health professions education and future research.

Systems-in-Evaluation Perspective

The investigation of social accountability in health professions education is a complex endeavour. As a result, the concept needed to be further divided into smaller components to better understand social accountability. The concept of systems-in-evaluation¹⁰ was used to synthesize the findings in this thesis. Table 1 presents the main and sub-research questions addressed by chapter, relating them to the four principles of systems-in-evaluation (interrelationships, perspectives, boundaries, and dynamics). The empirical studies conducted in this thesis emphasize that social accountability should be viewed as a comprehensive system with interconnected components, rather than isolated efforts.¹¹⁻¹⁴

Table 1.

Main research questions by thesis chapter, sub-research questions and system-in-evaluation principles (interrelationships, perspectives, boundaries, and dynamics)

Main Research Question	Chapter	Sub-Research Questions	Systems-in-Evaluation			
			I ^a	P ^b	B ^c	D ^d
<i>RQ1: What indicators may support the operationalization of social accountability?</i>	2	What are the common and unique elements across large-scale social accountability policies? How do these frameworks operationalize social accountability?	✓	✓	✓	✓
	3	What are the institutional practices and administrative perceptions of social accountability in medical education?	✓	✓		✓
<i>RQ2: How might these indicators be used to better support social accountability in practice at the regional and school level?</i>	4	To what extent can secondary population health data be used to identify societal health needs?	✓	✓	✓	✓
	5	Can administrative boundaries be used to create medical school service regions of responsibilities? To what extent do medical schools retain graduates within their service regions across the training continuum and into professional practice? To what extent do retention patterns differ by medical specialty?	✓	✓	✓	

Notes. ^ainterrelationships underscores the interconnectedness between different components within a system.

^bperspectives incorporates diverse viewpoints and involves various stakeholders.

^cboundaries involves examining how a system interacts with its external environment.

^ddynamics of a system over time is emphasized.

Derived from a program evaluation perspective, systems-in-evaluation¹⁰ was used to provide a more comprehensive understanding of the complex interplay between the different educational components of social accountability. The systems-in-evaluation approach encompasses four guiding principles: interrelationships, perspectives, boundaries, and dynamics.¹⁰ These principles explore the connections and interactions between different elements within a system, incorporates multiple viewpoints and perspectives, defines its scope, and limits, and recognizes its dynamic nature over time.¹⁰ Applying these principles facilitates the systematic application of systems concepts during the evaluation process and enhances the effectiveness of social accountability initiatives.¹⁴

Interrelationships. The principle of interrelationships refers to the connections and interactions between different components within a system.¹¹ Within the context of social accountability, this principle recognizes the interconnectedness between educational inputs, processes, products, and their collective impact on local community. For instance, documented examples in the literature illustrate how targeted admissions pathways (inputs) and community-based training (processes) influence the distribution and specialty mix of graduates (products), ultimately shaping physician workforce planning and population health outcomes (impacts).

The principle of interrelationship is evident throughout Chapters 2 to 5 of this thesis. In Chapter 2, the narrative review of prominent social accountability frameworks reveals the direct connection between performance indicators and components of the CIPP model. The CIPP model was selected due to its interrelated component design and integration of feedback loops. Additionally, this study highlights the interrelationship between the core values of social accountability³ (relevance, quality, effectiveness, and equity) across all components of the CIPP model. The interplay of these core values with performance indicators linked to the CIPP model illustrates how social accountability is holistically integrated into the entire health professions education system.

Chapter 3 was intended to investigate the interrelationship between institutional practices and administrative perceptions of social accountability. The survey findings reveal that institutions predominantly focus on educational inputs and processes, while the effects of these practices on the community remain unknown and not evaluated. This finding suggests that evaluating social accountability is not effectively achieved through isolated efforts but requires a holistic understanding of how the outcomes of these practices impact the local community.

Chapters 4 and 5 explore the interrelationships between open-source health data, community needs, and geographic boundaries. These chapters demonstrate the importance of the interconnectedness of these factors to the local community, emphasizing the broader context and interactions of the health professions education system. For example, Chapter 4 focused on the interrelationship between publicly available health data and community needs, and how these needs can be effectively integrated throughout educational components. Furthermore, this chapter highlighted the consequential validity of using population health data to identify societal needs, showcasing the interconnectedness between educational components and their alignment to community needs.

Chapter 5 further explored the interrelationships between geographic boundaries and graduate outcomes, focusing on the connection between graduate retention, location of medical training, and their impact on the local community. The analysis sheds light on how the geographic location of training influences future practice retention rates and their alignment with the need to serve the local community. This chapter emphasized the importance of recognizing the interrelationships between geographical context, educational components, and community impacts. Additionally, it highlighted the potential influence and interconnection between graduate retention and training/practice opportunities across various medical specialties in different regions.

Perspectives. The perspectives principle emphasizes the need to incorporate multiple viewpoints and engage various stakeholders throughout the evaluation process.¹⁵ This

collaborative principle plays a central role throughout this thesis. Chapter 2 emphasizes the importance of engaging stakeholders throughout the evaluation process, highlighting the benefits of establishing community partnerships with local stakeholders and other health systems. Through fostering effective community partnerships, schools can enhance the overall effectiveness of their efforts and ensure they are effectively aligned with community needs.³

In Chapter 3, the principle of perspective is further exemplified by the specific focus on community engagement as a core attribute social accountability. The survey developed in this chapter examines schools' efforts in collaborating with local community agencies to provide healthcare in the community, working with local partners to identify population needs, collaborating with government agencies responsible for health care, contributing to healthcare policy, and involving community members in educational decision-making. This chapter also considers the perspectives of medical school administrators across 31 institutions in 14 countries, capturing an international representation of social accountability perspectives and practices.

Chapters 4 and 5 offer practical applications of the perspectives principle by employing various data sources to gather empirical evidence from multiple viewpoints. Using secondary population health and administrative data, these chapters psychometrically validate a regional health index, create medical school service regions, and explore national in-region graduate retention rates. In Chapter 4, a multidimensional model of health was development, encompassing several indicators related to health status, non-medical determinants of health, health system performance, and community and health system characteristics. In Chapter 5, pre-existing geographic regions defined by governments, national census population data were utilized to create and compare medical school service regions geographically. Additionally, graduate trainee data obtained from a centralized data repository for all residents, fellows and practicing physicians in Canada was obtained to explore in-region graduate retention by medical specialty.

Through stakeholder engagement and the collection of diverse perspectives using data, a more comprehensive understanding of a system of social accountability is achieved. This inclusive approach enhances the validity and relevance of educational outcomes and facilitates the development of strategies reflective of both stakeholder and community needs through data.

Boundaries. Boundaries play a critical role in understanding how a system interacts with its external environment.¹⁶ In the context of social accountability in health professions education, defining system boundaries involves examining the interactions between education components and the local community, healthcare organizations, and the broader healthcare system. These interactions are often highly influenced by community characteristics and needs across different geopolitical, socio-economic, and cultural settings.¹⁷

The studies conducted throughout this thesis reveal that most operational complexities of social accountability often reside predominantly within the broader context and interactions between the education and the local community. In Chapter 2, the context-dependent nature of social accountability was identified, capturing the interactions between educational components and the community.¹⁸⁻²¹ This principle reinforces the essential need for schools

to align their programs with the priority needs of the local community and tailor their programs to address these needs.

Chapters 4 and 5 further emphasize the significance of the broader context and interactions of the health professions education system with the local community. The utilization of pan-national data in these chapters demonstrates the importance of considering geographic boundaries and institutional-specific service regions to identify and address specific needs and characteristics within these respective regions. Identifying and understanding geographic boundaries enable schools to better align their efforts with community needs, allowing for a comprehensive understanding of the interconnectedness and interdependencies that shape social accountability in health professions education.

In Chapter 5, the use of pan-national data to create medical school-specific service regions further emphasizes the importance of considering physical geographic boundaries during the evaluation process. The methodological approach highlighted in Chapters 4 and 5 allows for the evaluation process to come full circle, starting with the identification of community needs within the geographic boundaries of a school's service region and ending with evaluating the extent to which they meet those needs. As a result, programs can tailor their educational components (inputs, processes, and products) to reflect these needs, leading to better alignment between education and society and providing a way to measure the community impacts of these processes. This comprehensive approach ensures that health professions education remains responsive to the evolving needs of the community they serve.

Dynamics. The dynamics principle acknowledges the emerging and evolving interactions within a system.²² In the context of social accountability in health professions education, dynamics refer to changes, feedback loops, and patterns over time that influence the local community. These dynamics may be reflective through the overall quality of care provided by graduates or the community impacts resulting from educational inputs and processes.

Chapters 2 through 4 of this thesis highlights the dynamic nature of social accountability and its evolving relationship with society. Chapter 2 incorporates feedback loops in the CIPP model for quality improvement. This chapter also highlights the need to adapt efforts to include current and future global health movements and rapidly changing societal needs. Chapter 3 explored social accountability perceptions and administrative practices of social accountability across 14 countries, capturing an international representative sample of English-speaking undergraduate medical schools. Findings from this chapter emphasize the need to examine the entire system of accountability, beyond inputs and processes, and understand how the outcomes of these components collectively impact the community.

In Chapter 4, the iterative process of using large-scale census data collected by governments allows for a dynamic analysis of societal needs. This chapter highlights the consequential validity of these indices, providing insights into relevant health needs of respective regions to advance social accountability by informing educational practices. Additionally, this chapter also recognized the evolving and dynamic nature of societal needs, emphasizing the importance of updating and modifying social health indices to reflect accurate and timely population health needs.

The dynamics principle also prompts the ongoing need to adapt and respond to external educational changes and emerging societal needs. Understanding how the system adjusts its educational processes and outcomes to address evolving healthcare demands, societal expectations, and advancements in knowledge and technology is essential for ensuring the continued relevance, effectiveness, and sustainability of social accountability efforts.

Integrating systems-in-evaluation enhances the evaluation process and provides a more nuanced understanding of social accountability in health professions education. Adopting systems-in-evaluation explores the interconnectedness between educational components and their collective impact on the local community.

The systematic application of systems-in-evaluation, guided by the four core principles of interrelationships, perspectives, boundaries, and dynamics, has yielded a comprehensive understanding of social accountability in health professions education. A key contribution of systems-in-evaluation was the recognition of the context-dependent nature of social accountability and the need to tailor approaches to address specific challenges and disparities within different regions. Understanding the dynamics of social accountability and how it evolves over time is critical in evaluating its overall impact on the local community and the quality of care provided by graduates. Embracing systems-in-evaluation has led to a more comprehensive understanding of social accountability in health professions education, highlighting its interconnectedness with the local community and the dynamics of its implementation. Looking ahead, the continued application of systems-in-evaluation will be essential to foster sustainable social accountability efforts and ensure alignment with evolving societal needs.

Overall, the incorporation of systems-in-evaluation, rooted in its interdisciplinary nature, systematic approach, and consideration of interconnected components, has enriched the interpretation of insights and evidence from this thesis. This approach provides valuable insights for advancing social accountability efforts. As the landscape of healthcare and education continues to evolve, adopting a systems approach in program evaluation remains essential for fostering meaningful and sustainable social accountability efforts. The continued application of systems-in-evaluation serves as a valuable approach in advancing social accountability initiatives and improving alignment between education and society.

Advancing Social Accountability: Implications and Future Research

Throughout this thesis, a deeper perspective on how schools address societal needs has been provided. The empirical studies conducted in this thesis offer valuable insights into social accountability, paving the way for future research. Moreover, the integration of systems-in-evaluation increases our capacity to comprehensively evaluate the intricate dynamics of social accountability. This integrated approach enhances the insights derived in this thesis and strengthens the depth and breadth of social accountability in health professions education.

The incorporation of systems-in-evaluation provides a comprehensive framework that guides the trajectory of future research in health professions and its interaction with societal needs. In Chapter 2, measurement and evaluation gaps in social accountability were highlighted,

emphasizing the need to incorporate systems-in-evaluation to strengthen the interrelationships between inputs, processes, products, and community impacts. Building upon these foundations, Chapter 3 documented a global gap, suggesting that social accountability efforts in practice focus predominately on educational inputs and processes. This observation highlights a common tendency where institutions often approach social accountability as isolated efforts, rather than as a comprehensive and interconnected system. Future research should incorporate systems-in-evaluation principles to strengthen data collection and incorporate outcomes and impacts that extend beyond fragmented policy and curricular efforts. A more comprehensive and participatory evaluation approach should be taken to show schools how educational outcomes can be more effectively integrated within their system.

Moreover, leveraging large-scale data offers a valuable opportunity for future research and can provide a comprehensive understanding of societal needs and institutional initiatives within a broader context. This data-driven approach allows for evidence-based decision-making, targeted interventions, and improvements anticipated in education, bridging the gap between education and societal needs. For instance, as outlined in Chapter 4, future research could continue to explore the possibilities of combining educational data to large-scale population health and demographic datasets to develop more educationally sensitive population health and socio-demographic profiles. Further research should validate the use of health profiles and strengthen their utility in informing health workforce needs, identifying underserved areas and future healthcare needs, and informing curricular design.

To enhance the robustness of the school service regions (Chapter 5), future studies should aim to further validate these regions and design context-sensitive interventions tailored to specific service area needs. Additionally, further investigation is warranted to explore the relative importance of population density as well as medical education training and future professional practice opportunities in influencing in-region graduate retention. Understanding these factors will provide valuable insights into effective graduate retention strategies and their implications for regional physician needs, informing government policy about the allocation of training seats for healthcare professionals. Moreover, to gain a more nuanced understanding of graduate retention and their impact on regional physician needs, future research could focus on retention patterns in smaller geographic units and the correlation between community-based training opportunities and future professional practice locations. This analysis would provide detailed insights into specific areas of need, facilitating the development of targeted strategies to address disparities and ensure healthcare professionals are retained in areas where they are most needed.

Overall, future research should adopt a systems-in-evaluation approach, as described in this chapter, to move beyond isolated efforts and capture the multifaceted nature of the social accountability. Schools should consider working together, drawing on multiple data sources, and involving stakeholders in a more programmatic way to comprehensively address social accountability challenges. This inclusive framework may lead to a deeper understanding of its overall effectiveness and impact on local communities, ensuring better alignment between education and society.

A Programmatic Approach: The Way Forward

A programmatic approach serves as a practical operationalization of systems-in-evaluation for social accountability. This approach can also be considered an extension of programmatic assessment^{44,46} but at the institutional or program level. The programmatic approach calls for information to be continually collected and analyzed from multiple perspectives, with the intention to assess the extent to which schools are socially accountable.^{44,46}

Throughout this thesis, the challenge of evaluating social accountability is evident, and its practical implementation remains limited and lacks empirical evidence. To overcome these limitations, the systems-in-evaluation perspective offers a comprehensive approach to examining and studying social accountability. A programmatic approach is needed as previous efforts to investigate social accountability in health professions education, as discussed in Chapter 2, have often been sporadic and/or performative.^{23,24} These efforts have frequently relied on isolated measures, such as widening admissions criteria or implementing community-based training opportunities (Chapter 3). However, these isolated initiatives provide limited insights and fail to comprehensively assess community impact.²⁵⁻²⁷ While widening admissions criteria is useful and a step in the right direction, it remains unclear if these changes reflect the local socio-demographic composition of school's service region.²⁸⁻³³ Additionally, uncertainties persist regarding the effectiveness of these measures in encouraging graduates to practice in underserved areas.³⁴⁻³⁹ Furthermore, the extent to which community-based opportunities are provided in areas of need, and their influence on graduates' future practice location remains largely unexplored.⁴⁰⁻⁴³ To overcome these limitations, a programmatic approach is needed to evaluate the collective impact of these efforts more effectively on the local community.

The proposed programmatic approach integrates systems-in-evaluation perspectives with programmatic assessment⁴⁴ and programmatic evaluation.⁴⁵ Adopting a programmatic approach is intended to provide a more comprehensive understanding of social accountability. This approach views social accountability as an interconnected system comprised of various components within the broader community. Embracing systems-in-evaluation principles, this approach acknowledges the dynamic relationship between educational inputs, processes, and products, and their cumulative impact on the community. Unlike isolated measures, this approach seeks to enhance the validity and reliability of the entire system by incorporating multiple perspectives over time.⁴⁴ This mirrors the concept of programmatic assessment, where a single data point cannot meaningfully determine learner competence.⁴⁶ Similarly, evaluating the effectiveness of a program and its graduates necessitates a comprehensive approach that encompasses quantitative and qualitative data, stakeholder feedback, and community engagement.²⁵

Programmatic evaluation is intrinsic to health professions,⁴⁷ offering a higher-level approach, focused on the institution to ensure programs remain responsive to the needs of their target populations.^{25,26} This perspective systematically evaluates and enhances the planning, implementation, and effectiveness of health professions programs.^{13,48-50} It embraces a longitudinal view that spans the entire program lifecycle and its interactions with the broader community,⁴⁷ addressing aspects such as relevance, efficiency, effectiveness, sustainability, and alignment with societal needs.^{25,26} Integrating both formative and summative evaluation,

this perspective ensures continuous quality improvement of institutional outcomes and the quality of graduates⁵⁰ using dynamic feedback loops.¹³

The overall effectiveness of social accountability relies on the integration and interaction of all educational components. The strength of the system is determined by achieving a balanced distribution across all components. Neglecting or overemphasizing specific components can compromise the entire system. Given the context-dependent nature of social accountability, it is important to recognize that schools may adapt different institutional practices.⁵¹ Thus, schools may excel or underperform in specific components depending upon their unique circumstances. For instance, a school may excel in a particular component by successfully meeting their intended objectives or goals. Conversely, schools may also underperform in a specific area if they fail to meet their intended objective or goals. This variance across components highlights the inherent diversity among schools in implementing and evaluating social accountability components. While performance indicators may vary across geo-political, socio-economic, and cultural contexts,¹⁷ alignment with local community needs remains a common theme.⁹ To establish a robust social accountability framework, it is critical to identify and strengthen weaker components.

Evaluating social accountability necessitates a contextual approach^{20,21,52} that connects each component of the CIPP model with the specific needs and characteristics of the local community. The programmatic framework proposed offers a more nuanced evaluation of social accountability, capturing the collective impact of educational efforts on the local community while navigating diverse contextual complexities.⁵³ This transformative framework aims to reinforce connections between education and societal needs. Embracing this approach can deepen insights into addressing community-specific needs, overcome challenges, and achieve more relevant outcomes and impacts. As a transformative lens, the programmatic approach accommodates school-specific variations and emphasizes ongoing feedback through formative and summative evaluation. Advancing social accountability evaluation in health professions education requires an integrated, programmatic, and contextual approach. Emphasizing community impact, the evaluation of social accountability can enrich the connection between education and society, paving the way for more effective and responsive educational products.

Practical Implications

The empirical findings of this thesis yield important practical implications for the advancement of social accountability in health professions education. These implications offer valuable insights for health professions schools, policymakers and accreditation, and researchers.

Health Professions Schools. The insights derived from this thesis emphasize the importance of transitioning beyond isolated efforts to a more comprehensive and programmatic approach to social accountability. Schools should consider adopting systems-in-evaluation perspective, viewing social accountability as an interconnected system encompassing contextual-sensitive educational inputs, processes, and products, and their collective impact on the local community. This shift may lead to a more holistic understanding of how their efforts ultimately influence the local communities through continuous quality improvement. Moreover, integrating programmatic systems-in-evaluation into curricular design can better align educational outcomes more effectively with societal needs. Schools should consider

leveraging secondary data to create community sensitive population health and socio-demographic profiles (depicted in Chapter 4) to better inform admissions policies and curricular reforms. Furthermore, schools should also consider defining the scope and boundaries of their service regions (Chapter 5) to allow for more targeted interventions aligned to community needs. These regions can also aid in tracking graduate outcomes and evaluating the effectiveness inputs and processes.^{54,55}

Policymakers and Accreditation. Social accountability principles have been increasingly incorporated into accreditation standards and processes to evaluate schools' commitment to addressing the priority health concerns of the local population they are mandated to serve.^{1,56,57} While this is a positive advancement, the measurement and evaluation gaps identified in Chapters 2 and 3 necessitates educational outcomes and impacts be considered more broadly,^{56,57} where the where the focus of evaluation is on impacts. This thesis has revealed that social accountability to date, has largely been treated as programmatic checklists rather than fundamental elements.^{23,24} Accreditation bodies should view social accountability as a measurable activity and assess schools based on their ability to meet societal needs and acknowledge the limited scope of isolated and perhaps performative measures. These insights emphasize the importance of moving beyond isolated efforts towards a more comprehensive and programmatic approach to social accountability. Adapting a programmatic systems-in-evaluation approach advocated in this chapter offers a systematic method to evaluate the cumulative impact of various initiatives on the local community. This perspective can inform robust accreditation standards and evaluation frameworks that move beyond superficial measures.

Moreover, policymakers could leverage medical school service regions to enhance their ability to identify potential physician shortages and geographic maldistributions.^{55,58} This information could then guide potential adjustments in the allocation of health professions training seats within specific regions. It is also important to consider the link between medical education, population health needs, and future capacity when determining production targets or the number of allocated training seats for health professionals.^{59,60}

Researchers. The identified gaps in evaluating social accountability point to future operational and academic related research. Researchers should continue to build the foundational steps towards future outcome studies that examine the relationship between health professions education and population health outcomes. Linking educational-level outcomes with population health impacts using national and clinical datasets could also be explored to better understand the impacts health profession schools have on community health outcomes. Additionally, given the importance of community engagement, researchers could investigate factors that facilitate or hinder effective community collaboration and identify best practices for engaging community stakeholders.

Overall, the practical implications of this thesis offer tangible guidance for decision-making and practice, urging a transformative paradigm shift in education delivery and professional training. Schools, accrediting bodies, and researchers are called upon to move beyond the commitment to address societal needs.⁶¹ The thesis not only identifies gaps in social accountability measurement and evaluation (Chapters 2 and 3), but also lays the groundwork for initiating quality processes, emphasizing the use of secondary data (Chapters 4 and 5).

Integrating the proposed approaches, schools can comprehensively evaluate their alignment with societal needs and make more meaningful contributions to the local community.

Limitations and Strengths

There are a number of limitations to consider in this thesis. The limitations specific to each study have been addressed within individual chapters. Overall, there are three main limitations (scope, context, and linearity). Additionally, the timing of this thesis was impacted by the COVID-19 pandemic. These limitations, as well some of the strengths, are discussed below.

Scope. This thesis prioritizes social accountability in health professions education, specifically emphasizing improvements in education and training. However, it does not explicitly explore or address other important aspects of social accountability, such as research and service activities. Nonetheless, the alignment between health professions education and societal needs is recognized as a key pathway for improving population health.^{3,4} Furthermore, the studies presented in this thesis do not explicitly evaluate or assess societal impact. However, Chapters 2 through 5, facilitate the initial steps towards evaluating social accountability in practice. These studies identified performance indicators and provided a methodological approach to enable schools to utilize secondary data to foster a deeper social awareness of societal needs. They also highlight the significance of the local community as the central unit of analysis, allowing schools to recognize their primary areas of responsibility, identify local societal needs, and begin to examine graduate outcomes.

The initial steps depicted in this thesis allow schools to establish meaningful relationships between educational inputs, processes, and products, all of which are linked to the local community. This, in turn, may facilitate the examination of graduate outcomes, such as the mix and distribution of graduates. These steps may provide schools with the opportunity to create a system of social accountability and gather empirical evidence towards how their inputs, processes and outcomes impact the local community.

Context. The studies presented in Chapters 4 and 5 of this thesis were conducted within the Canadian context, which may limit their generalizability to other countries with different health systems and medical education structures. The formal measurement, evaluation, and assessment of social accountability in health professions schools are highly influenced by the geopolitical, socio-economic, and cultural landscapes of society.¹⁷ However, the methodological approach presented can be easily replicated in other contexts.

Furthermore, it is important to acknowledge that the generalizability of Chapter 3 may be limited to English-speaking countries and undergraduate medical education programs. This limitation stems from the linguistic variation in the term 'social accountability' and challenges often associated with direct translation from one language to another. Direct translation of the English language often fails to capture the distinct structures, grammatical rules, idiomatic expressions, and cultural nuances presented in different languages.⁶² However, insights from Chapter 3 are based on an international representative sample and represents first comprehensive study to examine perceived administrative perceptions and institutional practices of social accountability on a global scale. Additionally, these findings offer empirical

evidence to support that very few schools are socially accountable as institutional efforts focus primarily on inputs and processes.

Linearity. The program evaluation logic model approach used in this thesis assumes a linear causal relationship between program components and intended outcomes.⁶³ While this assumption provides a conceptual model for understanding the relationship between inputs and outcomes, it may oversimplify the complexities and interrelations among program elements.⁶⁴⁻⁶⁶ Although the link between education and society has been established in the literature, there is a general assumption that educational activities influence the type and quality of care provided by graduates, which will ultimately impact society.⁶⁷⁻⁷⁰ However, there is a lack of empirical literature directly examining the association between educational outcomes and societal impacts.

This thesis provides valuable insights into the identification of indicators for evaluating social accountability in health professions education. The adoption of a logic model approach facilitated the systematic identification of social accountability performance indicators. However, it is important to acknowledge that the indicators identified in Chapter 2 are not a comprehensive list of all possible social accountability indicators. This conceptual framework facilitated the identification of performance indicators necessary for evaluating educational inputs, processes, and outcomes.⁷¹

The selected conceptual framework served as an initial framework to identify of performance indicators necessary for evaluating educational effectiveness and accountability. However, it is important to acknowledge that this framework assumes a top-down, systems approach to education, where inputs are transformed into outputs. In contrast to traditional linear models, the CIPP model employed in Chapter 2 acknowledges the continuous and interrelated nature of program inputs, processes, and outcomes, reflecting the complexities inherent in educational programs.⁷²

COVID-19 Pandemic Challenges. This thesis was conducted during the COVID-19 pandemic, which imposed significant challenges and limitations in data collection and accessibility. The online survey developed in Chapter 3 was distributed at the beginning stages of the pandemic, which proved challenging as academic leadership faced competing clinical responsibilities and rapidly changing academic priorities. Consequently, we had to extend our data collection period by several months to gather a useable response rate.

Furthermore, the pandemic introduced further challenges as provincial-wide lockdowns and university closures in Canada limited the accessibility to secondary pan-national data used in Chapters 4 and 5. In response, Statistics Canada's Public Use Microdata Files (PUMF) were used as they served as readily available, cost-effective, generalizable data, representative of the larger Canadian population.⁷³ Statistics Canada serves as Canada's national statistical bureau. While the inclusion of neighbourhood-level data could have allowed for more specific comparisons across smaller geographical areas, the methodological approach adopted in Chapters 4 and 5 enables replication across smaller levels of geography. However, this study serves as an example of how schools can utilize secondary data collected by governments to identify societal needs and improve the alignment between health professions education and society.

Strengths. This research has several strengths. First, it contributes to the broader literature in health professions education by creating an initial set of performance indicators for evaluating social accountability. The multidisciplinary, multi-methods approach enhances the depth and comprehensiveness of the research. Additionally, this thesis offers a national overview of medical school service regions and provides insights into graduate retention trends over a 15-year period. This thesis emphasizes the importance of utilizing population health data to bridge the gap between education and society, allowing schools to identify indicators to assess community impact. This approach could provide a more comprehensive understanding of how educational processes ultimately influence the type and quality of care provided by graduates.

The methodological approach presented in Chapters 4 and 5 can be easily replicated in other contexts. Moreover, the research conducted in this thesis provides practical implications for health professions education and sets the stage for future research on social accountability outcomes. These findings and insights can inform institutional policies, curriculum development, and program evaluation, contributing to the advancement of social accountability.

A Final Word

Social accountability in health professions education is not a distant goal or mere aspiration, it is a call to action. This thesis emphasizes the need for health professions education to surpass their commitment to social accountability and integrate outcomes aligned to community needs into regular practice. Simply endorsing the values of social accountability falls short and necessitates actionable measures. However, the means by which schools provide empirical evidence of social accountability in practice has experienced minimally advancements over the past four decades.

This thesis disentangled the complexities associated evaluating social accountability using a programmatic systems-in-evaluations approach. It calls for a shift in focus from inputs and processes to outcomes and impacts. This thesis explored frameworks, examined administrative perceptions and institutional practices, and utilized secondary data to enhance the relationship between educational inputs, processes, outcomes, and community impact. Overall, this research highlights the significance of bridging the gap between education and society using secondary data to identify population health performance indicators to cultivate a robust system of social accountability.

In essence, the research presented in this thesis significantly contributes to the advancement of social accountability in health professions education. It highlights the importance of establishing meaningful relationships between educational inputs, processes, outcomes and impacts, and the need to establish strong links between each component and the local community. By adopting comprehensive frameworks, leveraging reliable data sources, and prioritizing continuous improvement, health professions schools can strengthen system of accountability through and plays a pivotal role in addressing community health needs in a more relevant, effective, and equitable manner.

The ultimate aim of health professions education is to produce competent graduates who are prepared to provide culturally relevant, evidence-based care to local communities in an

equitable and cost-effective manner.^{3,74} Social accountability embodies the idea of a comprehensive system comprising various attributes and components that interact and influence one another. However, the strength of any system ultimately depends on its weakest link. This thesis has made it evident that societal impact represents the weakest link. This highlights the need for schools to identify evaluation gaps and ensure that all educational components (inputs, processes, products, and impacts) are adequately represented. By strengthening these links, schools can enhance their social accountability systems and effectively address community needs.

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Summary

Social accountability plays a fundamental role in health professions education by aligning education, research, and service activities towards priority community health needs. While this thesis primarily focuses on the educational perspective of social accountability in health professions training, it recognizes the interconnectedness of education, research, and service within the broader context of societal needs. The link between education and society has been well-established in the literature, acknowledging that the quality of medical training provided to graduates is thought to impact the type and care delivered, ultimately influencing population health. Despite the recognized importance of social accountability and its alignment with societal needs, there is a notable gap in the literature directly examining the association between educational outcomes and societal impacts. As introduced in Chapter 1, evaluating social accountability is conceptually and operationally complex. While social accountability has become an institutionalized goal that most schools strive towards, measuring its effectiveness remains a global struggle. The core principle of social accountability commences in identifying societal needs and concludes in meeting those needs. However, the practical implementation of social accountability remains elusive due to the lack of measurable performance indicators, making it challenging to assess the impact of education on society. Furthermore, there is a lack of empirical literature directly examining the association between educational outcomes and societal impacts, and limited progress has been made to understand the relationship between what programs do in training and how these activities translate into practice. The absence of valid and reliable performance indicators has hindered the evaluation of social accountability in practice. Furthermore, the lack of robust performance measures in population health perpetuates the assumption that health professions education programs address societal needs. While the importance of aligning education with societal needs is widely recognized, the lack of measurable performance indicators and empirical research hinders the evaluation of its impact.

The primary aim of this thesis was to investigate social accountability in health professions and facilitate its operationalization in practice at the regional and school level. To achieve this goal, this thesis addressed the following research questions: “What indicators may support the operationalization of social accountability?” and “How might these indicators be used to better support social accountability in practice at the regional and school level?” To answer these questions, this thesis employed a program evaluation logic model to systematically evaluate social accountability for quality improvement. Through this logic-model approach, the interconnections between program inputs, activities, and desired outcomes must be examined, and how these elements work together to achieve desired goals should be considered.

Chapter 2 presents a narrative review of prominent social accountability frameworks in health professions education. This chapter synthesized common themes and indicators across prominent frameworks to develop initial operational constructs for evaluating social accountability in health professions education. Using an iterative search of the literature, frameworks, and policy documents, 33 documents were identified. Four key social accountability frameworks were selected and analyzed. These frameworks represent the foundational values, principles, and parameters, and have been cited in subsequent papers to conceptualize social accountability. The review utilized the context–input–process–product

(CIPP) program evaluation model as an organizational framework to characterize descriptive themes. Six themes with subthemes emerged, encompassing key concepts related to shared values, professionalism, academic freedom, clinical autonomy, and core social values (relevance, quality, effectiveness, and equity). Additionally, five indicators aligned with the CIPP model were identified: context, inputs, processes, products, and impacts. Contextual factors included background information such as mission statements, community partnerships, and active contributions to health care policy. These factors help identify institutional needs, objectives, and opportunities. Inputs referred to material and human resources necessary for effective functioning. They play a critical role in determining the appropriate actions required to achieve program goals and objectives. Diversity and equity in recruitment and/or selection and community population health profiles were recognized as essential considerations for ensuring the effectiveness of health professions programs. Processes guide program implementation and involve various curricular activities and community-based clinical training opportunities or learning exposures. Products focus on the quality of student learning and its usefulness for society. They are used to measure outcomes and encompass physician resource planning, quality assurance, program evaluation, and accreditation. Lastly, impacts, included as a subcomponent of products, encompassed overall improvement in community health outcomes, reduction/prevention of health risks, and morbidity/mortality of community diseases. This review sets the stage for evaluating social accountability and serves as a critical foundation for understanding the complexities of social accountability and its translation from theory to practice. The chapter concludes with the need to create meaningful connections between program inputs, processes, products, and impacts. The identified overarching themes and subthemes provide a holistic view of the dimensions that contribute to social accountability, offering a roadmap for systematically evaluating social accountability in health professions education. However, further research on community impact is needed to better understand how educational inputs, processes, and products ultimately improve population health.

In Chapter 3, institutional practices, and administrative perceptions of social accountability in health professions education were explored. To gain insights into how social accountability is operationalized in practice, an online survey was developed and distributed to a purposeful sample of medical school deans and program directors/leads across 265 institutions in 14 countries between February and June of 2020. The survey consisted of 38-items linked to social accountability indicators, categorized using the CIPP model and focused on program mission statements, admission processes, curricular content, and educational outcomes. A total of 81 medical schools from 14 countries responded to the survey, representing a response rate of 31%. This survey represents the first known survey of administrative perceptions and institutional practices of social accountability, providing an international representation of perceived social accountability indices. The findings revealed several commonalities in social accountability practices. Notably, all respondents expressed a high importance of social accountability, and most reported that their school had an explicit social accountability mandate. Moreover, most institutions reported having a primary care or family medicine general practitioner departments or facilities and provided training and learning opportunities in community health centers or clinics. Exploratory Factor Analysis (EFA) was used to assess the inter-relationship among 28 Likert scale survey items, and the reliability and internal consistency of these items were evaluated using McDonald's Omega (ω). The survey's 28 Likert scale items displayed excellent internal consistency ($\omega = 0.946$). However, the means and standard deviations of these items varied. For instance, as items moved from

internal practices (e.g., mission statements, admission policies, and curricular activities) to external practices (e.g., stakeholder engagement and partnerships, and involvement in health human resources), response means dropped considerably. This suggests that institutional practices of social accountability predominantly focus on inputs and processes, while evidence related to community context and educational products are lacking. Findings from the EFA identified four factors aligned with the CIPP domains, accounting for 70.76% of the total variance. These factors represented 'Selection & Recruitment' (four items, aligned to inputs), 'Institutional Mandates' (four items, aligned to inputs), 'Community Awareness' (three items, aligned to context) and 'Institutional Activities' (three items, aligned to processes). All factors demonstrated acceptable internal consistency and reliability ($\omega \geq 0.75$). These findings align with previous literature, indicating that most institutions do not adequately evaluate graduate outcomes or empirically validate the extent to which schools meet their intended goals. This study offers programs and educators a new survey tool to aid in the operationalization and reliability of evaluating socially accountable indicators. Despite expanding awareness of social accountability, how it is translated into practice remains uncertain. While institutional commitment to social accountability is evident, the impact of these outcomes on the community remains unknown and not evaluated. Future research is warranted to establish meaningful relationships between medical school outcomes and community impact. Additionally, further investigation should focus how medical schools operationalize social accountability in practice, assess the quality of these practices, and measure their impact on population health.

The next step in advancing the operationalization of social accountability in health professions education was to examine how to effectively leverage publicly available data to identify population health needs. The underutilization of publicly available data in health professions education and lack of robust performance measures in population health prompted the study presented in Chapter 4. This chapter demonstrated how pan-national population health data can be used to create a reliable health index to assist schools in identifying societal needs to advance social accountability in health profession education. Using open-source data, a psychometric evaluation was conducted to examine the factor structure and reliability of the Canadian Health Indicators Framework (CHIF). Comprised of over 80 indicators measured across 4 domains and several factors, the CHIF provides reliable data on the health of Canadians, health care systems, and health determinants. Although this framework has been widely used to guide the development of previous health indicators, it has not been empirically validated. The study employed two publicly available datasets from Statistics Canada: Canadian Community Health Survey (CCHS) Public Use Microdata Files (PUMF), and mortality and vital statistics data. Statistics Canada is Canada's national statistical agency responsible for collecting data on the country's population, economy, society, and culture. The CCHS PUMF is an open access dataset, inclusive of over 1,000 variables related to Canadians' health-status, health care utilization, and health determinants. Additionally, mortality, vital statistics, and community health data were obtained from Statistics Canada's website. A total of 67 variables were identified, recoded, and aggregated to the health region ($n = 97$). To evaluate the factor structure of the CHIF at the health region level, a non-linear confirmatory factor analysis (CFA) was conducted to assess the model fit of the hypothesized 10-factors. Reliability analysis using McDonald's Omega and Pearson's correlation coefficient were used to investigate the inter-relationships between factors. The findings from the nonlinear CFA rejected the original conceptual model structure of CHIF. Exploratory post-hoc modifications were imposed to improve model fit, resulting in a 5-factor multidimensional

model. The 5-factors demonstrated excellent model fit, reducing the number of indicators from 67 to 32, creating a more parsimonious set of indicators. The 5-factors included: Health Conditions (8-indicators); Health Functions (6-indicators); Deaths (5-indicators); nonmedical health Determinants (7-indicators); and Community & Health System Characteristics (6-indicators). The process and indices developed in this paper serves as a starting point to allow schools to systematically leverage open-source population health data to identify regional priority health needs. This initial step is critical in advancing the social accountability agenda of health professions schools and may help narrow the gap between education and society. The chapter concludes by providing practical recommendations for these indices. For example, schools may elect to use these indices to identify societal health needs, create community profiles, inform educational priorities, and modify curricular activities and/or practices to better align with societal needs.

The final phase of advancing the operationalization of social accountability was to explore the feasibility of creating medical school service regions in Canada using preidentified geographic regions or administrative boundaries defined by governments. Identifying medical school regions is essential to accurately measure the impact of educational inputs, processes, and outcomes on the respective community. In Chapter 5, medical school service regions were created and served as the basis for evaluating the distribution and retention patterns of medical graduates. This approach provides valuable insights into advancing social accountability in health professions education by evaluating the impact of educational outcomes on the local community. To create medical school service regions, government administrative health region boundaries were utilized, and the physical locations of all Canadian medical schools were grouped according to the province(s) they reside. Information on school's distributed campuses, community training sites, and rural and regional education and training opportunities were gathered from institutional websites and assigned to corresponding health region. Geographic Information Systems (GIS) was used to visually map the 17 created service regions in Canada. Population size and density for each service region were calculated using population data obtained from Statistics Canada's website. Data from medical graduates who completed their medical degree in Canada between 2001-2015 (n=19,971) were obtained from the Canadian Post-M.D. Education Registry (CAPER) and used to analyze graduate retention patterns. CAPER serves as a national central data repository for all postgraduate medical residents, fellows and practicing physicians in Canada. Retention rates were calculated based on the proportion of graduates practicing in the same service region where they completed their undergraduate and postgraduate medical training. The findings revealed marked spatial inequities in terms of total population, land area, and population density among mapped medical school service regions. Furthermore, graduate retention patterns varied by service region and medical specialty. For instance, graduates who completed both undergraduate and postgraduate medical education in the same region had higher retention proportions in professional practice compared to those who only completed postgraduate training in the region. While previous literature reported higher retention rates for family medicine graduates, psychiatry was reported to have higher retention rates across the medical training continuum into professional practice. The study provided a national overview of medical school service regions and in-region graduate retention trends over a 15-year period. These findings offer valuable insights into using medical school service regions and graduate retention as one approach to evaluating the extent to which schools effectively serve their local community.

Chapter 6 summarizes and synthesizes the results of the previous studies using a comprehensive systems-based evaluation approach. This evaluative approach provides a deeper understanding of the complexities involved in evaluating social accountability and addresses the research questions: "What indicators may support the operationalization of social accountability?" and "How might these indicators be used to better support social accountability in practice at the regional and school level?" Evaluating social accountability is not an easy task, and its practical implementation is limited and lacks empirical evidence. Traditional evaluative approaches have often failed to address the complex interrelationships between educational inputs, processes, products, and their collective impact on the community. Previous efforts have frequently relied on single measures, such as widening admissions criteria or implementing community-based training, to demonstrate social accountability. However, these isolated initiatives provide limited insights and fail to comprehensively capture how these efforts collectively impact the local community. For instance, when schools elect to widen their admissions criteria or pathways, do these changes reflect the underrepresented groups residing in their service region? Have admissions pathways fostered graduates more likely to practice in rural areas or serve underrepresented groups? Are community-based opportunities adequately provided in underserved areas, and has this exposure led to more graduates pursuing professional practice in those areas? In response to these complexities, a comprehensive programmatic approach is proposed to advance social accountability. Reliance on single measure to make decisions about a complex phenomenon is limited and does not fully address the intricacies of accountability as a comprehensive system. However, a programmatic approach addresses these limitations and seeks to provide a more comprehensive evaluation of a program's efforts. This perspective offers a systematic approach needed to capture the collective impact of educational efforts on local communities and addresses these limitations through gathering data from multiple sources and contexts. This approach provides a more nuanced evaluation of social accountability and aligns with the idea that accountability should be viewed as a comprehensive system designed to support ongoing growth and improvement rather than relying on isolated data points. The thesis concludes with recommendations for using this evaluative approach and planning for future research on programmatic evaluation in the context of social accountability. It also acknowledges the limitations of the present studies and suggests that the generalization of the results should be viewed while considering these limitations. In the end, the thesis leaves readers with final thoughts on the importance of embracing a programmatic lens to enhance social accountability in health professions education.



Nederlandse Samenvatting

Maatschappelijke verantwoording speelt een fundamentele rol in het gezondheidszorgonderwijs en heeft als doel het onderwijs, onderzoek en zorgactiviteiten af te stemmen op de prioritaire zorgbehoeften van de gemeenschap. Hoewel in dit proefschrift in eerste instantie vanuit een onderwijsoogpunt wordt gekeken naar maatschappelijke verantwoording binnen gezondheidszorgopleidingen, sluit het de ogen niet voor het feit dat onderwijs, onderzoek en zorg binnen de bredere context van maatschappelijke behoeften nauw met elkaar verbonden zijn. Het verband tussen onderwijs en de maatschappij is al lang bekend in de literatuur, waarin verondersteld wordt dat de kwaliteit van het medisch onderwijs dat afgestudeerden hebben genoten de (soort) zorg beïnvloedt en daarmee uiteindelijk ook een uitwerking heeft op de volksgezondheid. Hoewel het belang van maatschappelijke verantwoording en de afstemming ervan op de behoeften van de maatschappij algemeen wordt erkend, schiet de literatuur opmerkelijk tekort als het gaat om het rechtstreeks onderzoeken van het verband tussen onderwijsind termen en de gevolgen voor de maatschappij. Zoals in Hoofdstuk 1 wordt uitgelegd, laat maatschappelijke verantwoording zich vanuit conceptueel en operationeel oogpunt lastig evalueren. Hoewel maatschappelijke verantwoording tegenwoordig een geïnstitutionaliseerd doel is geworden waar de meeste faculteiten naar streven, blijft het meten van de effectiviteit ervan een wereldwijde strijd. Het basisbeginsel van maatschappelijke verantwoording is dat eerst wordt geïnventariseerd wat de maatschappelijke behoeften zijn om deze ten slotte te vervullen. Door het gebrek aan meetbare prestatie-indicatoren blijft het echter lastig om te bepalen in hoeverre maatschappelijke verantwoording daadwerkelijk in de praktijk is ingevoerd. Dit maakt het een uitdaging om de impact van onderwijs op de samenleving te beoordelen. Daarbij is er een gebrek aan empirische literatuur die rechtstreeks het verband tussen onderwijsind termen en de gevolgen voor de maatschappij onderzoekt en is er beperkte vooruitgang geboekt bij het verkrijgen van inzicht in de relatie tussen wat onderwijsprogramma's in de opleiding doen en hoe deze onderwijsactiviteiten zich vertalen naar de praktijk. Het ontbreken van valide en betrouwbare prestatie-indicatoren heeft de evaluatie van maatschappelijke verantwoording in de praktijk belemmerd. Voorts bestendigt het gebrek aan gedegen prestatie-metingen van de volksgezondheid de aanname dat gezondheidszorgopleidingen op de behoeften van de maatschappij zijn afgestemd. Hoewel het belang van deze afstemming algemeen wordt erkend, belemmert het gebrek aan meetbare prestatie-indicatoren en empirisch onderzoek de evaluatie van de impact ervan.

Dit proefschrift had hoofdzakelijk ten doel om maatschappelijke verantwoording in zorgberoepen te onderzoeken en de operationalisering ervan in de praktijk op regionaal en faculteitsniveau te vergemakkelijken. Om dit doel te bereiken, werden in dit proefschrift de volgende onderzoeksvragen gesteld: "Welke indicatoren kunnen de operationalisering van maatschappelijke verantwoording ondersteunen?" en "Hoe zouden deze indicatoren kunnen worden gebruikt om maatschappelijke verantwoording in de praktijk op regionaal en faculteitsniveau beter te ondersteunen?". Om deze vragen te beantwoorden, werd in dit proefschrift gebruik gemaakt van een logisch programma-evaluatiemodel om maatschappelijke verantwoording systematisch te evalueren voor kwaliteitsverbeteringsdoeleinden. Aan de hand van deze logisch-modelbenadering moesten de onderlinge verbanden tussen opleidingsinput, onderwijsactiviteiten en gewenste

eindtermen worden onderzocht en moest worden nagegaan hoe deze elementen samenwerkten om de gewenste doelstellingen te bereiken.

In Hoofdstuk 2 wordt een narratieve review gepresenteerd van prominente raamwerken voor maatschappelijke verantwoording in het gezondheidszorgonderwijs. Dit hoofdstuk bundelde de thema's en indicatoren die deze raamwerken gemeen hadden zodat eerste operationele constructen konden worden ontwikkeld voor het evalueren van maatschappelijke verantwoording in het gezondheidszorgonderwijs. Door de literatuur, raamwerken en beleidsdocumenten iteratief te doorzoeken, werden 33 documenten gedistilleerd. Uiteindelijk werden er vier belangrijke raamwerken voor maatschappelijke verantwoording geselecteerd en geanalyseerd. Deze raamwerken beschreven de basiswaarden, -beginselen en -parameters en werden in latere publicaties aangehaald om maatschappelijke verantwoording te conceptualiseren. Bij het onderzoek werd gebruik gemaakt van het programma-evaluatiemodel CIPP (context-input-proces-product) als een organisatorisch kader voor het typeren van beschrijvende thema's. Er kwamen zes thema's met subthema's naar voren, waarin begrippen met betrekking tot gedeelde waarden, professionaliteit, academische vrijheid, klinische autonomie en sociale kernwaarden (relevantie, kwaliteit, effectiviteit en gelijkwaardigheid) centraal stonden. Daarnaast werden er vijf indicatoren in kaart gebracht die met het CIPP-model overeenstemden: context, input, processen, producten en gevolgen. De contextuele factoren omvatten achtergrondinformatie zoals missieverklaringen, samenwerkingsverbanden met de gemeenschap en actieve bijdragen aan het gezondheidszorgbeleid. Deze factoren helpen bij het vaststellen van de opleidingsbehoeften, doelstellingen en kansen. "Input" verwees naar de materiële en personele middelen die nodig zijn om effectief te kunnen functioneren. Deze input speelt een cruciale rol bij het bepalen van de acties die nodig zijn om de opleidingsdoelstellingen te bereiken. Hierbij werden diversiteit en gelijkheid bij de werving en/of selectie en de binnen de samenleving bestaande gezondheidsprofielen als essentiële overwegingen gezien voor het garanderen van de doeltreffendheid van gezondheidszorgopleidingen. "Processen" sturen de tenuitvoerlegging van het onderwijs en omvatten verschillende curriculaire activiteiten en klinische opleidingsmogelijkheden of praktijkervaringen in de gemeenschap. "Producten" daarentegen zijn gericht op de kwaliteit van het leren door de student en het nut ervan voor de samenleving. Ze worden gebruikt om te meten in hoeverre eindtermen zijn behaald en omvatten het inplannen van artsen, kwaliteitszorg, programma-evaluatie en accreditatie. Tot slot omvatten de "gevolgen", welke als onderdeel van "producten" werden gezien, de algehele verbetering van gezondheidsuitkomsten, de vermindering/preventie van gezondheidsrisico's en de ziekte-/sterftcijfers van in de samenleving voorkomende ziekten. Deze review bereidt de weg voor het evalueren van maatschappelijke verantwoording en dient als een kritisch uitgangspunt voor het begrijpen van de complexiteit van maatschappelijke verantwoording en de vertaling ervan van theorie naar de praktijk. Het hoofdstuk sluit af met het onderstrepen van de noodzaak om zinvolle verbanden te leggen tussen opleidingsinput, -processen, -producten en -gevolgen. De beschreven overkoepelende thema's en subthema's geven een holistisch beeld van de aspecten die aan maatschappelijke verantwoording bijdragen en kunnen als wegwijzer dienen voor het systematisch evalueren van maatschappelijke verantwoording in het gezondheidszorgonderwijs. Er is echter meer onderzoek nodig naar de gevolgen voor de samenleving zodat we beter kunnen begrijpen hoe opleidingsinput, -processen en -producten uiteindelijk de volksgezondheid verbeteren.

* In Canada is een *fellow* een geregistreerd arts die al een medische vervolgopleiding heeft afgerond, zelfstandig zijn/haar beroep mag uitoefenen, maar onder toezicht een 1 tot 3 jaar durende opleiding (een zgn. fellowship-programma) volgt om nog meer gespecialiseerde kennis en ervaring op te doen in een deelgebied.

In hoofdstuk 3 werd onderzocht hoe het bestuur van gezondheidszorgopleidingen tegen maatschappelijke verantwoording aankeek en wat de opleidingspraktijken hieromtrent waren. Om inzicht te verkrijgen in hoe maatschappelijke verantwoording in de praktijk wordt geoperationaliseerd, werd een online vragenlijst ontwikkeld welke tussen februari en juni 2020 werd verspreid onder een gerichte steekproef van decanen en opleidingsdirecteuren/leiders van 265 geneeskundefaculteiten in 14 landen. De vragenlijst bevatte 38 items die betrekking hadden op indicatoren van maatschappelijke verantwoording, geordend waren aan de hand van het CIPP-model en gericht waren op missieverklaringen van de opleidingen, toelatingsprocedures, curriculaire inhoud en onderwijs eindtermen. In totaal hebben 81 geneeskundefaculteiten uit 14 landen de vragenlijst beantwoord, wat neerkwam op een responspercentage van 31%. Voor zover bekend, is dit onderzoek het eerste dat bestuurlijke percepties en opleidingspraktijken ten aanzien van maatschappelijke verantwoording verkent en een internationaal beeld geeft van de waargenomen indexen voor maatschappelijke verantwoording. Uit de bevindingen bleek dat er een aantal overeenkomsten waren in de facultaire praktijken ten aanzien van maatschappelijke verantwoording. Zo gaven alle respondenten aan veel belang te hechten aan maatschappelijke verantwoording en lieten de meeste weten dat hun faculteit een expliciet mandaat had om maatschappelijke verantwoording af te leggen. Bovendien meldden de meeste faculteiten dat ze over een afdeling of faciliteiten voor eerstelijnszorg of huisartsgeneeskunde beschikten en dat ze opleidings- en leermogelijkheden aanboden in zorgcentra of klinieken in de gemeenschap. Er werd een exploratieve factoranalyse (EFA) gebruikt om het onderlinge verband tussen de 28 Likertschaal items van de vragenlijst vast te stellen, terwijl de betrouwbaarheid en interne consistentie van deze items aan de hand van McDonald's omega (ω) werden berekend. Hoewel de 28 Likertschaal items een uitstekende interne consistentie ($\omega = 0,946$) vertoonden, waren de gemiddelden en standaarddeviaties van deze items nogal variabel. Zo daalden de antwoordgemiddelden aanzienlijk naarmate de items overgingen van interne praktijken (zoals missieverklaringen, toelatingsbeleid en curriculaire activiteiten) op externe praktijken (bijv. betrokkenheid van en samenwerking met belanghebbenden, alsmede betrokkenheid bij zorgpersoneelszaken). Dit duidt erop dat opleidingspraktijken op het gebied van maatschappelijke verantwoording voornamelijk gericht zijn op input en processen, terwijl er geen bewijs is dat er ook aandacht besteed wordt aan de gemeenschapscontext en onderwijsproducten. Uit de EFA kwamen vier factoren naar voren die met de CIPP-domeinen overeenstemden en samen 70,76% van de totale variantie verklaarden. Deze factoren waren "werving & selectie" (vier items die aansloten bij "input"), "opleidingsmandaten" (vier items die aansloten bij "input"), "maatschappelijk bewustzijn" (drie items die aansloten bij "context") en "opleidingsactiviteiten" (drie items die aansloten bij "processen"). Alle factoren vertoonden een acceptabele interne consistentie en betrouwbaarheid ($\omega \geq 0,75$). Deze bevindingen vinden hun weerklink in de bestaande literatuur waarin wordt aangegeven dat de meeste faculteiten onvoldoende evalueren in hoeverre hun alumni de eindtermen hebben behaald of empirisch valideren in welke mate de faculteiten hun beoogde doelen bereiken. Deze studie biedt onderwijsprogramma's en opleiders een nieuw onderzoeksinstrument dat bij het bepalen van de indicatoren van maatschappelijke verantwoording kan helpen het construct te operationaliseren en de betrouwbaarheid te bevorderen. Ondanks het groeiende bewustzijn van maatschappelijke verantwoording, blijft het onzeker hoe dit concept zich naar de praktijk vertaalt. Hoewel de faculteiten zich duidelijk voor maatschappelijke verantwoording inzetten, tasten we nog steeds in het duister als het gaat om de gevolgen van deze inspanningen voor de samenleving en blijven deze onvoldoende onderzocht. Toekomstig onderzoek is geboden voor het leggen van zinvolle verbanden tussen de onderwijs eindtermen van

geneeskundeopleidingen en de gevolgen voor de samenleving. Daarnaast zou verder onderzoek zich moeten richten op hoe geneeskundefaculteiten maatschappelijke verantwoording operationaliseren in de praktijk, hoe zij de kwaliteit van deze praktijken beoordelen en hoe zij de gevolgen ervan voor de volksgezondheid meten.

De volgende stap in het bevorderen van de operationalisering van maatschappelijke verantwoording in het gezondheidszorgonderwijs was om te onderzoeken hoe openbaar beschikbare gegevens effectief kunnen worden benut om de zorgbehoeften binnen de samenleving in kaart te brengen. De onderbenutting van openbaar beschikbare gegevens in het gezondheidszorgonderwijs alsmede het gebrek aan gedegen prestatiemetingen van de volksgezondheid vormden de aanleiding voor het onderzoek in Hoofdstuk 4. Dit hoofdstuk liet zien hoe internationale gegevens over de volksgezondheid gebruikt kunnen worden voor het creëren van een betrouwbare gezondheidsindex die faculteiten kan helpen de maatschappelijke behoeften in kaart te brengen ter bevordering van maatschappelijke verantwoording in het gezondheidszorgonderwijs. Met behulp van opensourcegegevens werd een psychometrische evaluatie uitgevoerd om de factorstructuur en betrouwbaarheid van het Canadese raamwerk van gezondheidsindicatoren, het *Canadian Health Indicators Framework (CHIF)*, te onderzoeken. Het CHIF omvat meer dan 80 indicatoren die over vier domeinen en verschillende factoren worden gemeten en levert betrouwbare gegevens over de gezondheid van Canadezen, zorgstelsels en gezondheidsdeterminanten. Hoewel dit raamwerk op grote schaal is gebruikt als leidraad voor de ontwikkeling van eerdere gezondheidsindicatoren, is het niet empirisch gevalideerd. In het onderzoek werd gebruik gemaakt van twee openbaar beschikbare datasets van Statistics Canada: de bestanden met microdata voor openbaar gebruik uit het onderzoek naar de Canadese volksgezondheid, de *Canadian Community Health Survey (CCHS) Public Use Microdata Files (PUMF)*, en sterfte- en bevolkingsstatistieken. Statistics Canada is het nationale statistische bureau van Canada dat verantwoordelijk is voor het verzamelen van gegevens over de bevolking, economie, samenleving en cultuur van het land. De eerste is een open access dataset die meer dan 1000 variabelen bevat met betrekking tot de gezondheidstoestand, het zorggebruik en de gezondheidsdeterminanten van Canadezen. Daarnaast werden van de website van Statistics Canada sterftecijfers, bevolkingsstatistieken en gegevens over de volksgezondheid verkregen. In totaal werden 67 variabelen in kaart gebracht, opnieuw gecodeerd en per gezondheidsregio ($n = 97$) geaggregeerd. Om de factorstructuur van het CHIF op het niveau van de gezondheidsregio te bepalen, werd een niet-lineaire confirmatieve factoranalyse (CFA) uitgevoerd om de modelfit van de veronderstelde 10 factoren te beoordelen. De onderlinge verbanden tussen de factoren werden onderzocht door een betrouwbaarheidsanalyse uit te voeren op basis van McDonald's omega en Pearson's correlatiecoëfficiënt. De bevindingen uit de niet-lineaire CFA verwierpen de oorspronkelijke modelstructuur van het CHIF. Om de modelfit te verbeteren, werden verkennende post-hocwijzigingen aangebracht, wat resulteerde in een multidimensionaal model met vijf factoren. Deze 5 factoren vertoonden samen een uitstekende modelfit die het aantal indicatoren terugbracht van 67 naar 32, wat voor een meer afgeslankte set indicatoren zorgde. Deze 5 factoren waren respectievelijk: gezondheidstoestand (8 indicatoren); gezondheidsfuncties (6 indicatoren); sterftegevallen (5 indicatoren); niet-medische gezondheidsdeterminanten (7 indicatoren); en kenmerken van de gemeenschap en het zorgstelsel (6 indicatoren). Het proces en de indexen die in dit artikel zijn ontwikkeld, dienen als uitgangspunt voor hoe faculteiten opensourcegegevens over de volksgezondheid systematisch kunnen aanwenden om regionale prioritaire zorgbehoeften in kaart te brengen. Deze eerste stap is van cruciaal belang voor het bevorderen van de

maatschappelijke-verantwoordingsagenda van gezondheidszorgopleidingen en kan helpen de kloof tussen onderwijs en de maatschappij te verkleinen. Het hoofdstuk wordt afgesloten met praktische aanbevelingen voor het gebruik van deze indexen. Faculteiten kunnen er bijvoorbeeld voor kiezen om deze indexen te gebruiken om de maatschappelijke zorgbehoeften in kaart te brengen, gemeenschapsprofielen op te stellen, onderwijsprioriteiten te sturen en curriculaire activiteiten en/of praktijken zodanig aan te passen dat ze beter op de maatschappelijke behoeften zijn afgestemd.

De laatste fase van onze missie om de operationalisering van maatschappelijke verantwoording te bevorderen, bestond erin te onderzoeken in hoeverre het haalbaar was om zorgregio's te creëren voor geneeskundefaculteiten in Canada op basis van vooraf in kaart gebrachte geografische gebieden of door overheden aangeduide bestuurlijke grenzen. Om de gevolgen van opleidingsinput, -processen en -eindtermen voor de desbetreffende gemeenschap nauwkeurig te kunnen meten, is het essentieel dat we weten op welke regio een geneeskundefaculteit betrekking heeft. In hoofdstuk 5 creëerden we daarom voor elke geneeskundefaculteit een zorgregio op basis waarvan we de spreiding en het behoud van geneeskundealumni onderzochten. Door de impact van onderwijseindtermen op de lokale gemeenschap te onderzoeken, biedt deze benadering waardevolle inzichten in hoe we maatschappelijke verantwoording in het gezondheidszorgonderwijs kunnen bevorderen. Voor het creëren van deze zorgregio's gebruikten we de grenzen van nationale bestuurlijke zorgregio's en clusterden we de fysieke locaties van alle Canadese geneeskundefaculteiten op basis van de provincie(s) waarin deze gevestigd waren. Via de websites van de opleidingen verzamelden we informatie over de verspreid gelegen faculteitsgebouwen, opleidingslocaties in de gemeenschap alsmede de regionaal en op het platteland gelegen onderwijs- en opleidingsmogelijkheden en wezen deze toe aan de desbetreffende zorgregio. We gebruikten een geografisch informatiesysteem (GIS) om de 17 gecreëerde zorgregio's in Canada visueel in kaart te brengen. Voor elke zorgregio berekenden we de bevolkingsgrootte en -dichtheid aan de hand van via de website van Statistics Canada verkregen bevolkingsgegevens. Uit het Canadese register van medische vervolgoopleidingen CAPER (dit staat voor *Canadian Post-M.D. Education Registry*) verkregen we de gegevens van alle geneeskundealumni die tussen 2001 en 2015 in Canada hun artsdiploma hadden behaald ($n=19.971$), welke we gebruikten om het behoud van deze alumni te analyseren. CAPER dient als een nationale centrale gegevensbank voor alle artsen in opleiding tot medisch specialist, *fellows** en praktiserend artsen in Canada. We berekenden het percentage alumni dat bleef op basis van de aantallen die in dezelfde zorgregio werkten als waar ze hun opleiding tot basisarts en medische vervolgoopleiding hadden voltooid. De bevindingen brachten aan het licht dat er tussen de in kaart gebrachte zorgregio's opvallende ruimtelijke ongelijkheden bestonden ten aanzien van de totale bevolking, het landoppervlak en de bevolkingsdichtheid. Bovendien verschilden de percentages "blijvers" per zorgregio en medisch specialisme. Zo was dit percentage groter onder de alumni die zowel de opleiding tot basisarts als de medische vervolgoopleiding in dezelfde regio hadden voltooid ten opzichte van degenen die enkel hun vervolgoopleiding in de regio hadden gedaan. Hoewel eerder in de literatuur werd vermeld dat het percentage "blijvers" hoger was onder afgestudeerde huisartsen, bleek het aantal blijvers groter te zijn in de psychiatrie wanneer het hele medische opleidingscontinuüm naar de beroepspraktijk in acht werd genomen. Het onderzoek gaf een nationaal overzicht van de geneeskundefaculteiten en hun zorgregio's alsmede de trends ten aanzien van het behoud van afgestudeerden in deze regio's over een periode van 15 jaar. Deze bevindingen bieden waardevolle inzichten in het gebruik van de zorgregio's waar faculteiten betrekking op hebben

en het behoud van afgestudeerden als één benadering voor het evalueren van de mate waarin faculteiten hun lokale gemeenschap effectief bedienen.

In Hoofdstuk 6 worden de resultaten van de voorgaande studies samengevat en gebundeld aan de hand van een holistische, systematische evaluatiebenadering. Deze benadering biedt meer inzicht in hoe lastig maatschappelijke verantwoording zich laat evalueren en gaat in op de onderzoeksvragen: "Welke indicatoren kunnen de operationalisering van maatschappelijke verantwoording ondersteunen?" en "Hoe zouden deze indicatoren kunnen worden gebruikt om maatschappelijke verantwoording in de praktijk op regionaal en faculteitsniveau beter te ondersteunen?". Het evalueren van maatschappelijke verantwoording is geen eenvoudige taak, en de invoering in de praktijk is beperkt en er ontbreekt empirisch bewijs. Traditionele evaluatiebenaderingen schenken vaak geen aandacht aan de complexe onderlinge verbanden tussen opleidingsinput, -processen, -producten en hun gevolgen voor de samenleving. Eerdere inspanningen waren vaak berust op afzonderlijke maatregelen, zoals het verruimen van toelatingscriteria of het aanbieden van opleidingsmogelijkheden in de gemeenschap, om daarmee maatschappelijke verantwoording aan te tonen. Deze losstaande initiatieven bieden echter maar beperkt inzicht en laten niet goed zien hoe deze inspanningen samen de lokale gemeenschap beïnvloeden. Als faculteiten er bijvoorbeeld voor kiezen om hun toelatingscriteria of -trajecten te verruimen, zijn deze aanpassingen dan ook een weerspiegeling van de ondervertegenwoordigde groepen in hun zorgregio? Hebben toelatingsprocedures ervoor gezorgd dat afgestudeerden eerder in plattelandsgebieden gaan werken of zich ten dienste stellen van ondervertegenwoordigde groepen? Worden er juist daar waar de zorg tekortschiet voldoende mogelijkheden aangeboden om praktijkervaring in de gemeenschap op te doen, en hebben deze ervaringen ertoe geleid dat meer afgestudeerden een beroepspraktijk in die gebieden nastreven? Als antwoord op deze lastige vraagstukken wordt voorgesteld een holistische, programmatische benadering te hanteren om maatschappelijke verantwoording te bevorderen. Op slechts één maatregel vertrouwen voor het nemen van beslissingen over een complex fenomeen is eenzijdig en doet niet volledig recht aan de complexiteit van verantwoording als een veelomvattend geheel. Bij een programmatische benadering worden deze beperkingen echter aangepakt en wordt getracht een uitgebreidere evaluatie van de opleidingsprestaties te geven. Dit perspectief biedt een systematische aanpak die nodig is om de collectieve impact van onderwijsinspanningen op lokale gemeenschappen vast te leggen en pakt deze beperkingen aan door gegevens uit meerdere bronnen en contexten te verzamelen. In plaats van te vertrouwen op afzonderlijke meetpunten, levert deze benadering een meer genuanceerde evaluatie van maatschappelijke verantwoording op welke aansluit bij de gedachte dat verantwoording als een veelomvattend geheel gezien moet worden dat bedoeld is om voortdurende groei en verbetering te ondersteunen. Het proefschrift wordt afgesloten met aanbevelingen voor het gebruik van deze evaluatiebenadering en het plannen van toekomstig onderzoek naar programmatische evaluatie van maatschappelijke verantwoording. Het erkent ook de beperkingen van de onderhavige studies en wijst erop dat deze bij het generaliseren van de resultaten in acht moeten worden genomen. Tot slot laat het proefschrift de lezer achter met laatste overwegingen over het belang van een programmatische bril voor het bevorderen van maatschappelijke verantwoording in het gezondheidszorgonderwijs.



Valorization

This thesis was conducted to support health professions schools in their pursuit of social accountability. The knowledge generated from this thesis aimed to enhance the alignment between education and society, and ultimately improve population health. Overall, the results hold significant importance to health profession schools, professional regulators, policymakers, educators, and researchers. In this section, the process of knowledge translation, its contributions, scientific and social relevance will be discussed as well as the identification of target groups and associated activities and products.

Research. The main objectives of this thesis were to identify indicators to facilitate the operationalization of social accountability and to understand their practical application at the regional and school level. The thesis is organized into six chapters: an introductory chapter, followed by four empirical studies (Chapters 2 to 5), and a concluding synthesis in Chapter 6.

Chapters 2 to 5 offer a breadth of research strategies, spanning from a narrative review of prominent social accountability frameworks to an international survey of social accountability indicators, and an example of applying large-scale data to evaluate social accountability. These chapters build upon each other, transitioning from theoretical foundations to international perspectives, followed by an in-depth examination of the Canadian context. The process of mapping medical school service regions and examining national in-region graduate retention patterns further refines the insights derived from previous chapters. Lastly, Chapter 6 introduces a programmatic systems-in-evaluation approach that deepens the understanding of social accountability by exploring the interconnectedness between educational components and their collective impact of the local community.

The insights derived from this thesis extends previous literature and advances the social accountability agenda of health professions education. The thesis notably identifies critical gaps in the evaluation and measurement of social accountability in practice and showcases an approach using large-scale data to measure social accountability. Additionally, this thesis highlights the pivotal role of the local community context and emphasizes the need to evaluate social accountability at the level of institutional service regions. This novel approach provides a starting point to bridge the gap between theoretical principles and their practical implementation, yielding tangible benefits for both education and society.

Chapters 2 and 3 identified operational gaps, laying the groundwork for targeted quality improvements in how institutions evaluate and measure social accountability. Addressing the lack of focus on educational outcomes and societal impacts, these chapters pave the way for more effective strategies aligning education, research, and service activities with community needs. These chapters highlight areas where institutions may have previously struggled to measure educational outcomes and societal impacts effectively.

Chapters 4 and 5 introduce a data-driven approach that provides institutions with a clear pathway to empirically evaluate their social accountability efforts. This methodology serves as a practical toolkit for institutions to identify societal needs and track outcomes and societal impacts of their graduates. This approach empowers institutions to begin to measure how their educational efforts translate into tangible improvements in population health. Policymakers, community stakeholders, administrative leadership and program directors can harness

reliable data to inform curricular reforms, resource allocation, and strategic planning. The structured methodology also empowers institutions to refine their educational inputs and processes for optimal outcomes and social impact. This method introduces a systematic way for institutions to track their impact over time, facilitate evidence-based decision-making, and inform quality improvements.

Furthermore, social accountability commences with the identification of community needs and concludes in meeting them.¹ Given the context-dependent nature of social accountability, this thesis provides a methodology for schools to identify their geographic regions, reinforcing the idea that the local community should and can serve as the level of analysis. This approach prompts institutions to tailor their educational initiatives to address specific challenges and disparities within specific geopolitical, socio-economic, and cultural context.² Advocating for the evaluation of social accountability at the institutional service region level, this thesis introduces a practical shift in how institutions measure impact. This shift promotes a more holistic understanding of the effect of educational efforts on local populations, fostering community-centric outcomes.

Relevance. The research presented in this thesis contributes to the scientific understanding of social accountability in health professions education and its potential implications for society. The scientific contributions and practical implications hold great promise for addressing societal health needs and promoting equitable and effective healthcare delivery aligned with societal needs.

From a scientific perspective, this thesis translates theoretical concepts into practical attributes, synthesizing prominent social accountability frameworks (Chapter 2), introduces a reliable survey tool (Chapter 3) and presents a methodological approach for utilizing population health data to identify regional health needs (Chapter 4), and establishes medical school service regions (Chapter 5).

On a societal level, the relevance of social accountability extends to its direct societal impact, involving the alignment of education, research, and service activities of health professions schools to address priority community needs. The ultimate aim of health professions education is to produce competent graduates prepared to address community needs.³⁻⁷ Insights from Chapters 4 and 5 may continue to strengthen institutional commitments to the local community. These findings offer a practical approach for institutions to leverage publicly available data to begin to identify institutional service regions as well as the relevant regional health needs to begin to examine the extent to which educational inputs and processes impact population health. Additionally, the programmatic systems-in-evaluation approach proposed in Chapter 6 has the potential to shift the landscape of health professions education. This systematic approach may also influence accreditation standards, moving beyond superficial measures to examine the cumulative effect of various initiatives on the local community.

Overall, this thesis substantially advances the operationalization of social accountability in health professions education. The outcomes of this thesis provide insights into evaluating social accountability, offering a roadmap to begin to systematically evaluate the extent to which schools serve their local communities. These contributions hold great promise for addressing societal health needs and promoting equitable and effective healthcare delivery aligned to community needs.

Target groups. The insights and findings from this thesis are relevant to a wide audience including health professions educators, program directors, medical school administrators, policymakers, and community leaders. These findings offer actionable insights and tools to enhance educational processes and strategic decisions, aligning endeavors with priority community needs. For instance, policymakers may benefit from the insights and data-driven approach presented in Chapter 5 to better inform how medical graduates contribute to the national health workforce, identify physician specialty shortages, and geographic (mal)distributions.⁸⁻¹⁰ These findings may also provide governments with valuable input regarding the allocation of health professions training seats within specific regions.

The insights from this thesis may also hold general relevance for quality enhancement efforts in other professional education programs, such as nursing, social work, dentistry, engineering, law, etc. For instance, the establishment of medical school service regions, presented in Chapter 5, has the potential to create community-centric outcomes. This methodological approach serves as a starting point for institution to begin to assess the extent to which they serve their local communities. These variations may encourage health professions schools to modify their educational inputs and processes to better address identified gaps and/or disparities. Furthermore, this thesis may also shed light on educational priorities and generate normative recommendations for enhancing admission processes related to equity, diversity, and inclusion. Lastly, these finding also have the potential to increase institutional social awareness of community needs, as well as graduate outcomes in terms of practice retention.

Activities and Products. The outcomes of this thesis have been widely disseminated, including publications in academic journals and presentations at various national and international scientific conferences across Canada, Europe, and the United States. Notably, Chapters 2 to 4 have been published in *Academic Medicine*, *Teaching and Learning in Medicine* (open-access), and *Advances in Health Science Education* (open-access), maximizing the potential to reach a large audience of researchers, educational scientist, and physicians. Additionally, Chapter 2 was discussed on KeyLIME (Key Literature in Medical Education) prominent podcast further enhances its exposure to a global audience.

Furthermore, the novel approach taken to identifying medical school service regions and the work on national graduate retention patterns (Chapter 5) attracted the attention of the Canadian Post-M.D. Education Registry (CAPER). This recognition led to an invitation to present this research during their annual spring committee meeting. CAPER is a national central data repository for all postgraduate medical residents, fellows and practicing physicians in Canada. This opportunity provided a platform to share insights with a diverse audience of education scientists, administrative leadership, regulatory bodies, and government agencies.

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Curriculum Vitae

Cassandra Barber is a skilled demographer and quantitative researcher. Her academic journey has been marked by a passion for quantifying social problems and inequities using advanced quantitative methods and large-scale data. She graduated with honours from the University of Western Ontario (London, Ontario, Canada), where she obtained her Bachelor of Arts in sociology. Following her undergraduate studies, she completed a Master of Arts degree in sociology, specializing in migration and ethnic relations, at the University of Western Ontario.

In her professional journey, she has honed her expertise in quantitative research, psychometrics, and program evaluation. Her interest in medical education began in undergraduate medical education administration at the Schulich School of Medicine and Dentistry, University of Western Ontario, where she served a pivotal role in learner assessment and psychometrics.

Throughout her academic career, she has actively participated in several research projects, leveraging large-scale data to generate new insights into the predictive validity of admissions processes, in-program training assessments, licensure examinations, diversity, and equity, as well as educational effectiveness. Collaborating with colleagues, she has engaged in a series of studies that examined cohort effects in licensing examination, established risk indicators, and aimed to better understand how in-program data can be better harnessed to enhance education and training.

Her diverse background and expertise in demography and quantitative methods has provided her with opportunities to work in various academic and industry research capacities and leadership roles. Her multidisciplinary approach and expertise, coupled with her dedication, continues to drive her significant contributions to both academic research and sustainability in practice.



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The SHE Dissertation Series publishes dissertations of PhD candidates from the School of Health Professions Education (SHE) who defended their PhD theses at Maastricht University. The most recent ones are listed below. For more information go to: <https://she.mumc.maastrichtuniversity.nl>

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