Mental Health Visits Among Physicians in their Early Career in Ontario, Canada - Observational Retrospective Cohort Study

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Preface

Sarah Syed was the primary author of all content included in this thesis. Study design was formulated in collaboration with Dr. Manish Sood. The cohort was assembled by Sarah Syed and Samantha Yoo. Sarah Syed developed the protocol for the project which was approved by the School of Epidemiology and Public Health. Sarah Syed conducted the literature review, created the dataset creation plan, was responsible for obtaining the health administrative data from ICES with appropriate privacy training, conducted the analysis, and wrote the manuscript-based thesis. Dr. Manish Sood provided supervision in all aspect of the thesis. Dr. Sood and the Thesis Advisory Committee members (Dr. Claire Kendall, Dr. Marco Solmi, Dr. Daniel Kobewka, and Dr. Peter Tanuseputro), provided critical feedback throughout the project. All authors reviewed the manuscripts included in the thesis.

Ethics Review and Approval

The thesis project has been submitted and approved by ICES uOttawa (TRIM: 0901-122-001). The project only used de-identified data; thus, individual consent is waived because this project is conducted under section 45 of Ontario's Personal Health Information Protection Act. This section grants ICES the authority to collect personal health information without explicit consent for the purpose of health system evaluation and improvement. Projects conducted under section 45, by definition, do not require review by an institutional research ethics board. Access to the data is regulated by policies approved by the Information and Privacy Commissioner of Ontario, and all data sets used in this study are securely stored in coded form at ICES. Due to binding data-sharing agreements with data providers, including healthcare organizations and government entities, ICES cannot release these data sets publicly. However, confidential access may be

granted to eligible individuals through ICES, accessible at www.ices.on.ca/DAS (email: das@ices.on.ca). The complete data set creation plan and analytic code are available upon request from the author.

Abstract

Background: Physician mental health is an emerging concern within the medical profession. This study focused on examining sex-based differences in mental health visits among early-career physicians compared to non-physicians.

Methods: This retrospective, population-based study was conducted using linked administrative data from Ontario, Canada, from April 1, 2004, to March 31, 2018.

Results: Among 10,925 early-career physicians, 19.0% had an outpatient mental health visit. Female physicians were found to be at a higher risk for mental health visits compared to male physicians (23.0%vs.15.0%; adjusted hazard ratio [HR] 1.44; 95% CI, 1.35-1.54). However, early-career physicians, regardless of their sex, had a lower likelihood of mental health visits when compared to non-physicians (female physicians: [HR] 0.89; male physicians: [HR] 0.81).

Conclusion: Mental health visits are common among females regardless of their physician status. While early-career physicians experience a higher risk of mental health visits, this risk is relatively lower than the matched non-physicians.

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To Begin….

"In no relationship is the physician more often derelict than in his duty to himself."

- Sir William Osler

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List of Abbreviations

ASTHMA: Ontario Asthma dataset

CAPE: Client Agency Program Enrollment

CI: Confidence Interval

CMA: Canadian Medical Association

CPSO: College of Physicians and Surgeons of Ontario

DAD: Discharge Abstract Database

DAG: Directed Acyclic Graph

DSM-1V: Diagnostic and Statistical Manual of Mental Disorders

EC: Early Career

ED: Emergency Department

HR: Hazard Ratio

HYPER: Ontario Hypertension Dataset

ICD-9: The Ninth Revision of the International Classification of Disease

ICD-10-CA: Canadian implementation of the International Classification of Diseases, 10th Revision

ICES: Institute for Clinical and Evaluative Science

IKN: ICES Key

IPDB: ICES Physicians Database

MHV: Mental Health Visit

NACRS: National Ambulatory Care Reporting System

ODD: Ontario Diabetes Dataset

OHIP: Ontario Health Insurance Plan

OMHRS: Ontario Mental Health Reporting System

PCCF: Postal Code Conversion File

RPDB: Registered Persons Database

SD: Standard Deviation

STROBE: Strengthening the Reporting of Observational Studies in Epidemiology

WHO: World Health Organization

WMA: World Medical Association

Chapter One: Introduction

1.1 Rationale and research questions

In recent years, there has been increasing attention on the alarming prevalence of mental health conditions, including anxiety and depression, among physicians worldwide [1,2,3]. The medical profession is demanding in nature, which is coupled with the contextual factors that are present in both workplace and systemic environments, imposing a mental health burden [1]. Physicians are continuously exposed to a range of stressors, both emotional and systemic including dealing with patient suffering, the frustration and sense of failure when illness progresses, and the uncertainty inherent in clinical practice [4]. These challenges are further exacerbated by heavy workloads, extended work hours, limited autonomy, poor work-life balance, increasing demands with limited resources, practice management, and the complexities of the practice and training environment [1]. Additionally, physicians are within a medical culture that emphasizes perfectionism, denial of personal vulnerability, and delayed gratification [5]. Physicians may also possess traits such as compulsiveness, guilt, and self-denial, which can increase their risk of stress [5]. While physicians focus on healing others, they often lose sight of the importance of maintaining their health and well-being [6,7].

Research demonstrates physician health and well-being can impact individual and systemic outcomes, including the quality of care they provide to their patients [1]. Physicians with chronic stress are more likely to reduce their clinical hours, retire earlier, or leave their practices, which increases physician shortage, impairs access to care, and poses a threat to the sustainability of the healthcare system. [1,8]. The Canadian Medical Association (CMA) reports that physicians suffering from mental distress are 1.4 times more likely to reduce clinical hours

compared to their peers [2]. The estimated total cost of burnout among Canadian physicians is $213.1 million [9]. The healthcare system faces challenges due to human resource shortages and increasing wait times [9]. Thus, it is important to understand that physician well-being is crucial for a functional healthcare system.

Factors such as the physician's gender and career stage can influence mental health [2]. Previous studies suggest male and female physicians may be exposed to different stressors in their professional environments [2]. Female physicians report lower levels of psychological well-being compared to male physicians [2]. Female physicians are more likely to face gender-specific workplace stressors, such as discrimination, pay inequity, harassment, bullying, and microaggressions, which can further impact their mental health and create barriers to seeking support [2]. Additionally, compared to male physicians, female physicians are more likely to provide caregiving responsibilities for children or aging parents (52.0% for females versus 41.0% for males), which can add to their mental health burden [2]. The early career stage (including residents and newly practicing physicians) represents a unique stage in a physician's professional journey. During this period, physicians face intense professional development marked by the transition from training to practice, an increase in responsibilities, and the pressure to establish themselves within the profession [10]. During this stage, physicians are exposed to additional stressors such as understanding the new work environments, handling greater patient loads, and often balancing educational and administrative tasks alongside clinical duties [10].

Little is known regarding the mental health of early career physicians [1,2,5,8]. Previous studies rely on self-reported surveys to assess early-career physician stress, which can limit the

accuracy and scope of outcome measures [1,2,8]. A population-based, multicenter approach focusing on healthcare utilization by physicians approach could provide more precise estimates of mental health service needs and addresses the limitations of survey-based studies, offering highly generalizable findings. To our knowledge, no studies exist examining differences in mental health service use among early-career female and male physicians. While it has been known that physicians are at an increased risk for mental health outcomes, it remains unclear if their mental health concerns are due to occupational stressors or reflective of the general population. There are certain protective factors from which physicians can benefit, such as greater access to healthcare and higher socioeconomic status, which could buffer against some mental health challenges [2]. However, there is stigma surrounding mental health within the profession, which could mask the true extent of the mental health burden experienced by physicians, leading to underreporting or unmet needs in this population [10]. Therefore, it is essential to investigate how mental health trends among physicians compare to those observed in the general population. The objectives of my thesis research are as follows:

Objective 1

To examine sex-based outpatient mental health visits among early career physicians in Ontario, Canada.

Objective 2

To examine sex-based mental health visits among early career physicians relative to non-physicians in Ontario, Canada.

1.2 Structure of dissertation

This dissertation follows a paper-based structure and is divided into six chapters. In this introductory chapter, I discuss the rationale for the study and the guiding research questions. Findings from objectives 1 and 2 (outlined in Chapters 4 and 5) presented as journal articles. At the time of submission, the manuscript corresponding to objective 1, titled *Gender-Based Mental Health Visits Among Early Career Physicians*, has been submitted to BMJ for publication. The manuscript associated with objective 2, *Mental Health Service Utilization Among Early Career Physicians Compared to Non-Physicians: A Gender-Stratified Population-Based Cohort Study*, is currently under preparation for submission to JAMA.

Chapter 2 provides a literature review focused on the mental health of early-career physicians. Chapter 3 provides an overview of the study context and data sources, while subsequent chapters present further details regarding the study population, data sources, and statistical methodologies used in addressing each objective. Chapters 4 and 5 are the journal articles. Finally, Chapter 6 presents the overall discussion with policy implications of the findings and directions for future research.

Chapter Two: Background

2.1 Mental Wellbeing

In Canada, 1 in 3 individuals experience mental health conditions each year [11]. The World Health Organization (WHO) defines mental health as a "state of mental well-being that enables people to cope with the stresses of life, realize their abilities, learn well and work well, and contribute to their community" [12.] Mental health conditions range from mental disorders and psychosocial disabilities that can have varying durations, with some being short-term and resulting in temporary limitations in functioning, while others persist over an extended period [1, 11,12]. These longer-lasting conditions may lead to significant stress, impair daily functioning and increase the risk of self-harm [11,12,13]. The Canadian Medical Association (CMA) recommends that national data related to health and wellness indicators be regularly evaluated to facilitate precise targeting and evaluation of initiatives aimed at promoting the mental well-being of an individual [1].

2.2 Physicians' vs the General Population

Mental health conditions can affect individuals across various demographics, including age, educational background, culture, and income levels [14]. However, certain groups show greater vulnerability to developing a mental health condition [14]. Among these groups, physicians across all career stages have been found to experience a higher prevalence of psychological symptoms of depression and anxiety, when compared to the general population [10, 15]. According to the CMA, the topic of physician mental health and wellbeing has been identified as a rising global concern within the medical profession [1], given the growing body of evidence indicating elevated levels of mental health conditions among physicians [16]. According to the Association of American Medical Colleges (2023), the depression rate among physicians is 29.0%, which is

significantly higher than 8.0% rate observed among the general population [17]. This elevated risk can be attributed to high stress levels experienced by physicians due to the demanding nature of their profession [17,18]. The COVID-19 pandemic has further exacerbated the risk of mental health conditions among physicians [19]. A recent study analyzing Ontario healthcare data (housed at ICES) revealed a significant increase in outpatient visits for mental health and substance use among physicians in Ontario during the first 18 months of the pandemic, with a 23.0% increase compared to a 10.0% increase among the general public [19].

2.3 Importance of Physician's Wellbeing

Physician mental wellness is not a contemporary issue with initial reports going back centuries [6,20]. The Greek physician Galen introduced the proverb "physician health thyself" in 130-200 A.D. He said, "That physician will hardly be thought very careful of the health of his patients if he neglects his own." [6,20] This sentiment is also emphasized in an epitaph of an Athenian physician from 2 A.D.: "First... to heal his mind and to give help to himself before giving it to anyone else." [21] Both highlight the long-standing recognition that physician self-care is essential for effective patient care. Recently, the Institute of Healthcare Improvement introduced the Triple Aim concept, which focused on three healthcare transformation aspects: patient experience, better outcomes, and lower costs [22]. The idea evolved into the "Quadruple Aim," which included taking care of physicians' well-being to enhance overall population health while lowering healthcare costs, which has since expanded into what we now call the "Quintuple Aim." [23] This underscores the notion that physicians must be in good health to provide effective patient care [23].

Physicians' mental health affects their well-being and the quality of care they provide to their patients [1]. Previous studies identified that a physician's approach to their health can influence the counseling and care they offer to patients [24]. Physician distress has been linked to lower patient satisfaction, diminished enthusiasm for work, a reduced sense of personal accomplishment, and early retirement [25]. The turnover cost for a single-family physician is estimated to be $250,000 [25]. These consequences, in turn, impose significant financial burdens on the healthcare system [8]. Therefore**,** poor mental health is not just an individual concern but also important in providing effective patient care [1]. In an era where the world is facing a shortage of healthcare professionals, there needs to be a call for system-wide interventions focusing on reducing occupational stressors and improving physicians' mental well-being at the workplace. Considering growing concerns about physician well-being, the World Medical Association (WMA) amended the Declaration of Geneva, known as the modern version of the Hippocratic Oath taken by physicians around the world [26,27]. This revised declaration now emphasizes the importance of personal health, incorporating in the oath: "I WILL ATTEND TO my own health, well-being, and abilities in order to provide care of the highest standard." [26,27] This addition was introduced at the 68th WMA General Assembly held in Chicago in October 2017, reflecting a growing recognition of the importance of physician self-care in delivering quality patient care [26, 27].

2.4 Physician Mental Health History

Studies on physician mental health began emerging in the late 20th century [21,28,29]. A 20-year prospective longitudinal study from 1969 found that compared to other professions, physicians had higher rates of mental health issues, substance abuse, and poor marriages [28]. A similar

finding from Scotland (1963-1972) reported the annual first admission rate for psychiatric illness among physicians was 431 per 100,000 per physician compared to 189 per 100,000 per non-physician [29]. A 1993 survey of Canadian physicians conducted by Medical Post found that 76% of the physicians reported experiencing significant stress, 65.0% indicated that their stress had increased over the previous five years, and 31.0% experienced depression [21].

2.5 Physician Characteristics and Mental Wellbeing

Several risk factors have been identified as contributing to an increased likelihood of mental health concerns among physicians. These factors include sociodemographic characteristics such as sex, age, specialty, and career stage [30,31]. According to a survey by the Canadian Medical Association (CMA), female physicians, younger physicians (aged 35–54), and those with fewer than 10 years of practice were more likely to score lower on psychological well-being compared to male physicians, older physicians, and those with over 30 years of practice [31]. These factors are explored in greater depth in the subsequent sections.

2.6 Early Career and Physicians' Mental Health

Preliminary studies suggest physicians in training and those in early career stages may exhibit higher prevalence rates of mental health concerns compared to later-career physicians [30,31]. Residency is an intense training period for the physicians, which can range from two to six years depending on the chosen speciality [22]. As physicians transition into the early stages of their careers, they encounter new challenges and increased responsibilities in patient care [22]. Key challenges during this period include managing interactions with patients and their families, applying clinical knowledge to make diagnoses, and navigating the emotional demands of

alleviating suffering [22]. This phase requires balancing both technical and emotional aspects of medical practice as they integrate their training into real-world clinical settings [22,31]. Additionally, substantial demands are placed on them at this career stage, including extended work hours, on-call requirements, sleep deprivation, and limited control over their schedules [30]. Many residents also balance personal life transitions, such as establishing relationships, marriage, and starting a family, which can add further complexity to this critical stage of their development [22]. The transition from residency to early practice introduces a unique set of stressors as physicians take on increased clinical responsibilities, such as managing patient care, securing office space, and handling administrative and on-call duties [22]. This stage also requires navigating essential financial matters, including retirement planning, insurance policies, incorporation, and contractual agreements [22]. Additionally, early-career physicians must make decisions regarding academic appointments (career path, type and level of supervision, etc.) and professional development strategies (identifying mentors and identifying knowledge gaps) [22].

A systematic review found that nearly 43.0% of physicians in training were dissatisfied with their work-life integration [30]. Physicians were twice as likely (40.0%) to report dissatisfaction with work-life balance compared to non-physician professionals (23.0%) [30]. Previous research indicates that early-career physicians often suffer from significantly higher rates of chronic stress and exhaustion as compared to the age-matched population [15, 32]. This is often attributed to a range of workplace stressors, including frequent exposure to patient suffering and death, the need to make complex decisions in high-pressure clinical settings, extended working hours leading to sleep deprivation, heavy workloads, and social isolation [15, 32]. Additionally, early-career physicians may overcommit as they may feel they need to respond to external perceptions of performance, which further exacerbates these challenges, contributing to

their heightened risk of chronic stress [15, 32]. In addition to the demands of their professional journey, early career physicians also contend with financial obligations of paying off the education debt as well as personal responsibilities, further increasing their vulnerability to mental health conditions [33]. Chronic stress among physicians is associated with higher rates of depression, anxiety, and fatigue [34]. Beckman et al. (2012) reported physicians in training had lower well-being scores when compared to the aged, matched population (mean scores of 46.6 vs. 50.5, $P < .0001$) [35]. Poor mental health negatively impacts a physician's ability to perform complex procedures, which can lead to decreased job satisfaction and increased absenteeism [34, 36]. Previous studies have linked depression to a higher incidence of major medical errors [32, 37]. Resident physicians persevere through the rigorous demands of their training programs with the expectation that their efforts will culminate in becoming attending physicians who embody the roles of healers, leaders, and teachers. However, transitioning into a clinical setting can often be a stark realization of the complexities and challenges inherent in medical practice [32].

2.7 Social Challenges Faced by Female vs Male Physicians

Previous research has demonstrated sex and gender differences in mental health symptoms and diagnoses [38]. While sex refers to biological distinctions such as hormonal differences between males and females, gender is a socially constructed concept encompassing the norms, roles, behaviors, and attributes associated with being a woman and a man in society [38, 39]. Gender operates within a hierarchical structure, thus giving rise to gender inequality [38]. Gender expectations and inequality have been shown to have a profound influence on mental health [40]. Gender inequality is faced by women, including but not limited to longer working hours, unpaid caring work, domestic violence, and sexual abuse [41], placing their health and well-being at higher

risk [40]. The gender bias deeply rooted in the healthcare system adversely affects the mental health of physicians [42]. Historically, medicine has been predominantly male dominated, and although there has been a more recent increase in the number of women in medicine, they continue to be underrepresented in higher-level positions, leading to power imbalances in the field [41]. Although, we recognize that the mental health differences between women and men physicians are predominantly influenced by socially constructed roles, behaviors, experiences, and identities (i.e., gender-based) rather than biological, physical, or physiological reasons (i.e., sex-based) [43], sex is often used as an imperfect proxy for gender in research studies.

2.8 Sex Influence on Early Career Physicians' Mental Health

Females make up 58.0% of medical school enrollees, thus it is essential to understand sex-specific differences within the profession [44]. In the early years of practice, both female and male physicians commonly experience a significant surge in mental health symptoms and diagnosis [45]. Nevertheless, female physicians have disproportionately higher rates of mental health conditions such as depression, and anxiety, while also exhibiting lower rates of professional satisfaction when compared to male physicians [6, 19, 45]. During the COVID-19 pandemic, healthcare visits for mental health and substance use were higher among female physicians (1,059 per 1000 physicians) as compared to male physicians (596 per 1000 physicians) [19]. Findings from a prospective longitudinal Intern Health Study reported that, within 6 years of practice, nearly 75% of female physicians indicated a reduction in their work hours to part-time or expressed consideration for part-time work [46]. Female physicians in the early stages of their careers encounter unique challenges, including implicit gender bias from their patients, learners, and colleagues, increased discrimination, workplace harassment, and inadequate representation of

female in leadership roles, which collectively lead to insufficient support during career transitions and hindered career advancement [34,47]. According to a prospective study, female physicians reported a lack of professional support ($p < 0.05$) compared to male physicians [48]. Female physicians are often expected to display greater levels of empathy and are penalized when patients perceive them as lacking in this regard [49]. In comparison, male physicians face a primary expectation of competence, with a lower expectation for empathy [49]. Additionally, female physicians frequently encounter microaggression and are more frequently asked to undertake tasks beyond their designated scope of practice, leading to an overall increase in their workload [50]. This disparity in expectations and treatment has been associated with elevated levels of occupational distress, increased career exhaustion, and higher attrition rates among female physicians [49]. Family responsibilities involve maintaining the home, and fulfilling caregiving duties are also laid upon females based on societal constructs [51]. In addition, female physicians who are in a period of transition may also encounter challenges related to family planning and infertility, which can further impact their mental health [52]. These challenges ultimately lead to career disruption and underrepresentation in leadership positions [53].

2.9 Physician Speciality and Mental Health

Mental health concerns may differ between specialities. There is emerging evidence in the literature reporting a shortage of family physicians as they are closing their practice due to high emotional and psychological distress, often stemming from high workload, administrative burden, the complexity of patient care, feeling undervalued, and financial concern [54 55]. Additionally, several studies have highlighted a greater prevalence of symptoms like depression and anxiety among surgeons compared to other specialties [1,56,57]. Surgeons are faced with unique

stressors such as unpredictable working hours, including the night on calls, and dealing with life and death decisions daily, which puts surgeons at risk for psychological distress [56]. Other studies have reported that when compared to other medical specialties, emergency physicians endure the highest levels of post-traumatic stress disorder and symptoms of depression, largely attributed to the demanding and high-pressure nature of their work environment [33, 58, 59,60]. Additionally, number of studies have indicated that internal medicine, specifically oncologists, face a higher risk of experiencing emotional distress and depression compared to their colleagues in other subspecialities of internal medicine [32,61,62, 63]. Few studies provide comparative examinations of mental health between the medical specialities so questions remain which medical specialities may require targeted interventions.

2.10 Physicians' and Mental Health Visits

As mentioned previously, there has been a surge in the number of outpatient mental health and substance use visits by physicians during the pandemic, thus suggesting a worsening of physician mental health [64]. During the pandemic, the percentage of physicians requiring one or more visits for mental health and substance use increased from 12.3% to 13.4% [19]. There are two types of mental health visits: outpatient and inpatient. Outpatient visits are OHIP visits, including all visits to psychiatrists and primary care physicians using modified ICD-9 codes related to mental health [64.] Inpatient visits include hospitalization and emergency department visits related to mental health and addiction care [64]. Mental health visits capture the actual utilization of mental health services offering a broader view of mental health support-seeking behavior. Mental health visits represent actual utilization of mental health services, providing a broader perspective on support-seeking behavior. Among physicians, these visits serve as an objective measure, often reflecting more severe conditions compared to survey-based metrics, such as self-reported

depressive symptoms. However, mental health visits may be underestimated within the profession due to stigma surrounding help-seeking. Physicians may not seek traditional healthcare and choose alternative privately paid services (counseling, psychotherapy, and etc.). By closely examining the utilization of mental health care visits, healthcare providers and policymakers can better understand the needs of individuals seeking support for mental health and guide resource allocation and service provision decisions [64].

Chapter Three: Cohort Description and Data Source Overview

3.1 Study design and Setting

We utilized a retrospective population-based cohort study design in Ontario, Canada, to examine mental health visits among early-career female and male physicians compared to female and male nonphysicians. The study was conducted using data held at the ICES (Institute for Clinical and Evaluative Science) in Ontario.

3.2 Study Population

We included all Ontario physicians and nonphysicians between April 1, 2004, and March 31, 2018. Physicians who registered with the College of Physicians and Surgeons of Ontario (CPSO) between 1990 and 2018 were included. All physicians in Ontario must register with the CPSO as a licensing requirement to practice or enter residency. The date of initial CPSO registration served as the study index date. The study period was selected based on data availability. The study timeline does not include the COVID-19 era because physicians were at the forefront of the pandemic, which significantly increased their risk of mental health visits [19]. Our focus was on pre-pandemic mental health service utilization rates, given the extensive research already documenting the changes in service use during and after the pandemic [19].

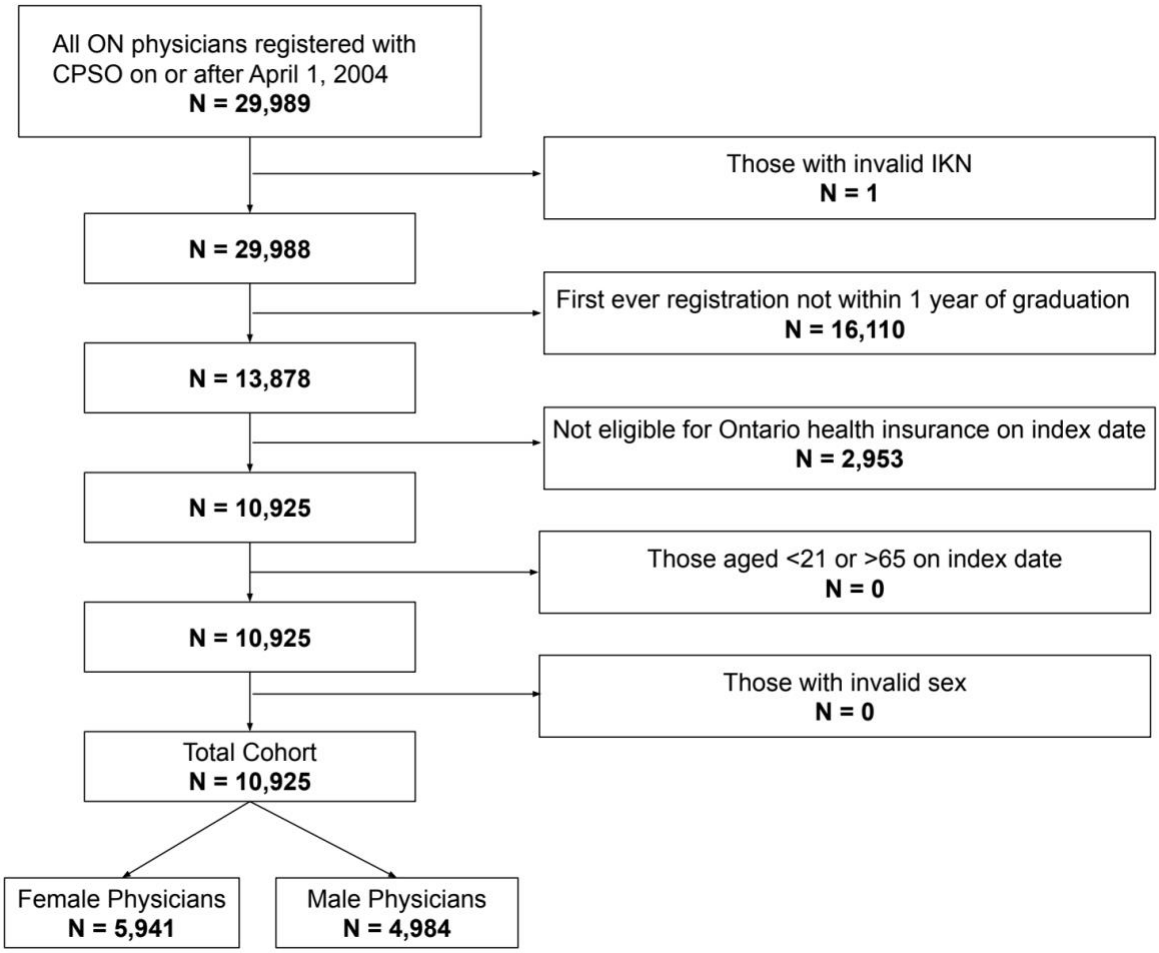
The study cohort was identified using the Registered Persons Database (RPDB). Early-career physicians, defined as those within the first five years of CPSO registration (including residents and newly practicing physicians), were linked to the RPDB database. The comparison cohort from the general population was constructed from individuals who were alive during the study's accrual period and had no CPSO registration or physician status. Pseudo-index dates were created and randomly assigned to the nonphysicians cohort ensuring a distribution comparable to

that of the physician group [19]. Once the physician and non-physician cohorts were created, exclusion criteria were applied with appropriate justifications:

1) Invalid ICES Key Number (IKN), which is a unique identifier assigned to each person to allow linkage across data set.
2) Aged < 21 years old or > 65 years old on index date: Early-career physicians were the primary population of interest in this study. The minimum age of 21 was chosen because it reflects the earliest age at which individuals typically complete medical school in Canada. The upper limit of 65 was selected to focus on early-career physicians, as the typical age range for residents is between 27 and 40, and newly practicing physicians generally fall within the 31 to 47 age range [65,66]. To ensure comparability, a similar age cut-off was chosen for the non-physician cohort.
3) Those not eligible for OHIP on index date: Given that this research is based in Ontario, it was essential to limit the cohort to those with Ontario health insurance coverage, ensuring access to the healthcare services relevant to the study's focus.
4) Invalid sex: the study focusses on sex stratified analysis. Individuals with missing or invalid sex information were not included to ensure the integrity of the stratified analysis.
5) Physicians whose first ever registration with CPSO was not within one year of medical school graduation: This criterion was implemented to increase the reliability that these physicians were indeed early career and to eliminate the potential inclusion of mid-career or late-career physicians who may have transferred from regions outside Ontario.
6) For the non-physician cohort, I excluded any individuals registered with the College of Physicians and Surgeons of Ontario (CPSO) to ensure that no physicians were included in the cohort.

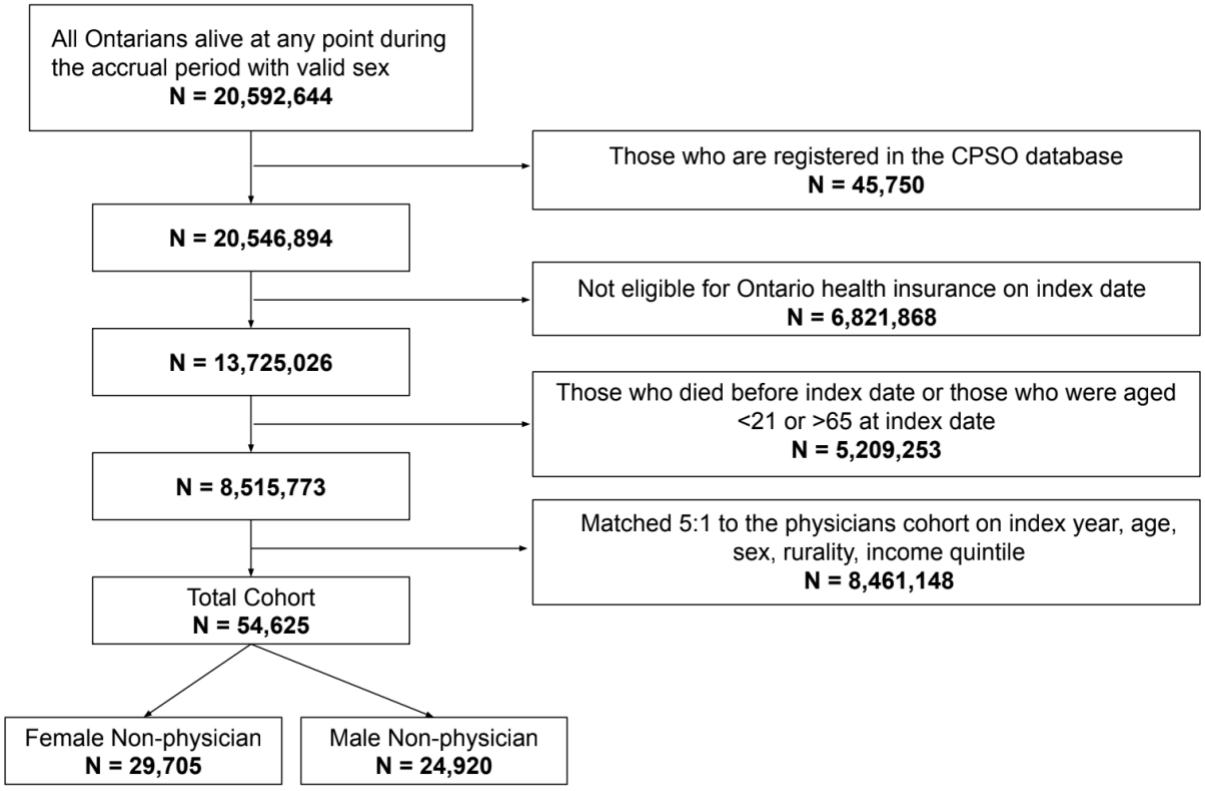
The physician cohort flow diagram (Figure 1) and the non-physician cohort flow diagram (Figure 2) illustrate the exclusion criteria for obtaining the final study populations.

Figure 3-1: Cohort creation diagram for early career physicians in Ontario between 2004 to 2018



Abbreviation: N: count, ON: Ontario, IKN: ICES key number, CPSO: College of Physicians and Surgeons of Ontario.

Figure 3-2: Cohort creation diagram for non-physicians in Ontario between 2004 to 2018



Abbreviation: N: count, ON: Ontario, IKN: ICES key number, CPSO: College of Physicians and Surgeons of Ontario.

3.3 Matching Physicians to the General Population

Table 1 compares the physician cohort (10,925) to the matched non-physicians' cohort (54,625) from the general population. Physicians were 1:5 frequency matched to the general population based on index year, sex, age, neighbourhood rurality, and neighbourhood income quintile. This approach was considered because physicians typically represent a more advantaged group based on income and rurality due to their profession. Thus, tying them with people of comparable socio-economic statuses would provide a more comparable and accurate mental health service utilization assessment. Given that our cohort comprises early-career and younger individuals, the prevalence of chronic conditions is generally lower within this population. However, asthma and

hypertension are the two most observed chronic conditions among younger adults [20,21]. Both conditions were slightly more prevalent in non-physicians (asthma: 0.6%; hypertension: 0.5%) than in physicians (asthma: 0.4%; hypertension: 0.3%). In contrast, physicians had higher rates of previous mental health history (25.3%) compared to non-physicians (21.9%). For detailed sex-specific distributions by physicians' status, refer to Chapters 4 and 5.

Table 3-1: Demographics characteristics of the physicians and nonphysician cohort

Variables	Physicians	Non-Physicians	Total
Total - % (n)	16.7 (10,925)	83.3 (54,625)	100 (65,550)
Age (years) – % (n)			
Overall – Mean (SD)	27.2 (3.0)	27.2 (3.0)	27.2 [3.0]
21-25	27.7 (3,023)	27.7 (15,115)	27.7 (18,138)
26-30	61.9 (6,765)	61.9 (33,825)	61.9 (40,590)
31-35	8.0 (876)	8.0 (4,380)	8.0 (5,256)
36-40	1.7 (182)	1.7 (910)	1.7 (1,092)
41+	0.7 (79)	0.7 (395_	0.7 (474)
Chronic Conditions - % (n)			
Asthma	0.4 (40)	0.6 (311)	0.5 (351)
Hypertension	0.3 (36)	0.5 (280)	0.5 (316)
Mental Health History - % (n)			
Yes	25.3 (2,760)	21.9 (11,964)	22.5 (14,724)
No	74.7 (8,165)	78.1 (42,661)	77.5 (50,826)
Rurality - n (%)			
Rural	2.5 (277)	2.5 (1,385)	2.5 (1,662)
Urban	97.5 (10,648)	97.5 (53,240)	97.5 (63,888)
Income Quintiles - % (n)			
1 (lowest)	14.2 (1,554)	14.2 (7,770)	14.2 (9,324)
2	16.7 (1,828)	16.7 (9,142)	16.7 (10,970)
3	18.2 (1,987)	18.2 (9,935)	18.2 (11,922)
4	18.1 (1,973)	18.1 (9,865)	18.1 (11,838)
5 (highest)	31.7 (3,460)	31.7 (17,300)	31.7 (20,760)
Missing	1.1 (123)	1.1 (615)	1.1 (738)

3.5 Data Sources and Linkages

This thesis was achieved using the population-based routinely collected administrative data in Ontario held at the ICES. ICES Data Repository is a non-profit research institute formerly known as the Institute for Clinical Evaluative Sciences (https://www.ices.on.ca/). Since 1986, nearly all Ontario residents, including indigenous Canadians, citizens, permanent residents, immigrants, and refugees, are covered by the Ontario Health Insurance Plan (OHIP) [67]. OHIP is a universal healthcare plan that covers access to publicly funded healthcare services, including visits to physicians, hospital visits and stays, emergency care, ambulance services, and publicly funded home care and long-term care [67]. The health, clinical, and administrative data collected from people's interactions with healthcare services are routinely gathered, anonymized, coded, and linked at ICES [68]. Individuals covered under OHIP are assigned an ICES key number (IKN), a unique encoded identifier generated from the individual's encrypted health card number [69]. IKN number links different databases, thus offering a comprehensive understanding of healthcare utilization patterns and population demographics [69]. Linkage of all datasets was conducted at ICES uOttawa. Section 45 of Ontario's Personal Health Information Protection Act grants ICES the authority to collect personal health information without explicit consent for health system evaluation and improvement [70]. By definition, projects conducted under section 45 do not require review by an institutional research ethics board.

3.5.1 College of Physicians and Surgeons of Ontario (CPSO)

The College of Physicians and Surgeons of Ontario is the regulatory college for the medical profession, and physicians must register and renew their membership yearly to practice in Ontario [71]. For this study, we collected the following physician variables from the CPSO dataset:

CPSO license number, unique identifier number, registration status, registration class, medical school location, graduation year, and specialty[71].

3.5.2 Registered Persons Database (RPDB)

The Registered Persons Database (RPDB) includes demographic information on all individuals assigned an Ontario health card number [72]. These data are provided by the Ontario Ministry of Health and Long-Term Care, with additional information supplemented from in-house datasets at ICES. The RPDB includes key variables such as age, sex, address, and individual key numbers (IKNs) [73]. For this study, we utilized the following variables from the RPDB: age, sex, rurality, and income. Postal codes were used to determine area-level income and rurality by linking them to the Postal Code Conversion File (PCCF)

The College of Physicians and Surgeons of Ontario (CPSO) dataset was linked to the RPDB using the AutoMatch program, which applies a multi-pass approach to data linkage. In each pass, the program matches blocks of records based on specific linking variables (index year, sex, age, neighbourhood rurality, and neighbourhood income quintile) then checks these matches across all variables to confirm valid pairs. This process is fine-tuned to maximize the number of accurate matches. By using multiple passes, the approach increases the accuracy of identifying correctly linked records. Additional details on the data linkage process can be found in Supplementary Table S-1.

3.5.3 Postal Code Conversion File (PCCF)

The PCCF dataset links Canada Post Corporation (CPC) six-digit postal codes to Statistical Canada's standard geographical areas 75. PCCF was used to determine neighbourhood rurality

and area-level median household income quintiles by linking postal codes from RPDB and PSTLYEAR.

3.5.4 Ontario Health Insurance Plan (OHIP)

The OHIP database includes healthcare billing data for both inpatient and outpatient visits for the purpose of reimbursement made by the physicians. The information recorded in this database includes the type of health service received, the date of service received, the diagnosis, and the fee code associated with the health service received. The mental health service feed code was used to determine if a physician had a visit related to mental health and the type of diagnosis received [76].

3.5.5 Discharge Abstract Database (DAD)

DAD contains administrative, clinical, and demographic data for all hospital discharges [77]. DAD records have been classified using standardized diagnostic ICD-10-CA codes (Canadian implementation of the International Classification of Diseases, 10th Revision) [77]. DAD was used to identify any hospitalization visits related to mental health.

3.5.6 National Ambulatory Care Reporting System (NACRS)

The NACRS database provides hospital-based and community-based ambulatory care data, including day surgeries, outpatient clinics, and emergency departments [78]. The database was used to obtain information on emergency visits related to mental health.

3.5.7 Ontario Mental Health Reporting System (OMHRS)

The OMHRS database collects and reports data submitted to the Canadian Institute for Health Information (CIHI) on individuals receiving adult mental health services in Ontario [79]. OMHRS contains detailed information on mental and physical health, social supports, service utilization, care planning, outcome measurement, quality improvement, and case-mix funding applications [79]. This study used OMHRS to capture data on previous mental health-related visits.

3.5.8 Comorbidities (ASTHMA and HYPER)

ASTHMA is the Ontario Asthma dataset that reports the burden of asthma in Ontario [73]. HYPER is the Ontario Hypertension Dataset that reports the prevalence of hypertension among Ontarians [73]. The two datasets are chronic condition cohorts developed at ICES using linked data algorithms.

3.6 Study Variables

Physician status (physician/nonphysician) and sex (female/male) were the two exposures in the study. Physician status was identified using the CPSO registration, and sex was identified using the RPDB dataset. The primary outcome was the time to a first outpatient mental health visit in early career female and male physicians compared to female and male nonphysicians. Mental health outpatient visits were defined as any healthcare encounter associated with a physician fee code or ICD diagnostic code for a mental health condition [80]. Mental health visits were ascertained through ICD 10 and DSM-1V codes in the Ontario Mental Health Reporting System. We further classified mental health-related visits into broader diagnostic categories based on primary or principal diagnosis (see Table 3-2 for more details)

Table 3-2: Mental Health Diagnosis Study Outcomes: Adapted from "Mental Health and Addictions System Performance in Ontario (Technical Appendix)

Hospitalizations	ED visits (ICD 10, NACRS)	Outpatient visits (OHIP algorithm)
Mood disorders	F30−F34, F38, F39, F53.0	311: Depressive disorder
Anxiety disorders	F40−F43, F48.8, F48.9	300: Anxiety neurosis, hysteria, neurasthenia, obsessive-compulsive neurosis, reactive depression
Other disorders	F20 (excluding F20.4), F22−F25, F28, F29, F53.1 Secondary diagnoses fields X60−X84, Y10−Y19, Y28 when primary diagnosis is not F04−F99	• 295: Schizophrenia • 296: Manic-depressive psychoses, involutional melancholia • 297: Other paranoid states • 298: Other psychoses Non-psychotic disorders • 299: Childhood psychoses• 301: Personality disorders • 302: Sexual deviations • 306: Psychosomatic illness • 307 and 309: Adjustment reaction 303: Alcoholism • 304: Drug dependence Social problems • 313 - 315: Behavioural and neuro-development disorders • 897: Economic problems • 898: Marital difficulties • 899: Parent-child problems • 900: Problems with aged parents or in-laws • 901: Family disruption/divorce • 902: Education problems • 904: Social maladjustment • 905: Occupational problems • 906: Legal problems • 909: Other problems of social adjustment

3.6.1 Covariates

Drawing on prior research and consultations with expert investigators and clinical scientists, we identified several covariates as potential confounders in the relationship between the exposures (sex and physician status) and the outcome (mental health visits). These covariates include age,

rurality, specialty, medical school location, previous mental health history, chronic conditions such as asthma and hypertension, and neighborhood income quintile [19,66]. The index date for this thesis was the initial CPSO registration date. Chronic condition and mental health history were determined by a 2-year lookback period from the index date, using relevant diagnostic codes from the International Classification of Diseases, 9th Revision (ICD-9). Figure 1 illustrates the hypothesized directed acyclic graph (DAG) of the potential direct and indirect pathways between the two exposures, sociodemographic covariates, and outpatient mental health visits.

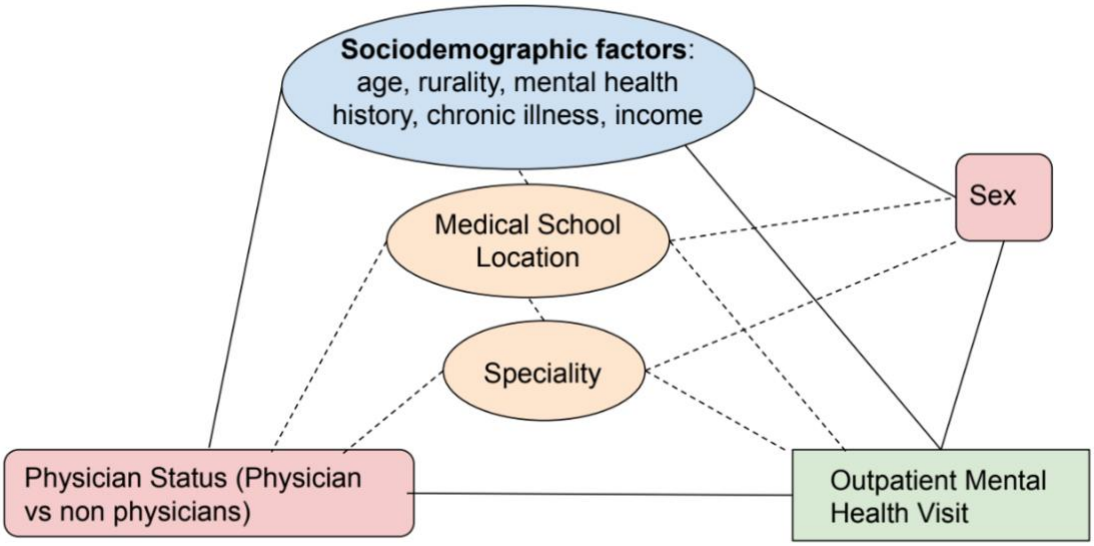


Figure 3-3: Directed acyclic graph (DAG) for outpatient mental health visit

Sex and Physician status are the primary exposure of the study, and it was hypothesized that they directly contribute to outpatient mental health visits.

Physicians and nonphysician sociodemographic factors, including age, rurality, mental health history, chronic illness, and neighborhood income quintile, are associated with sex and

physician status and outpatient mental health visits. These factors may also be associated with specialty and medical school locations (Canadian medial or international schools).

Physician specialty and medical school location are both specific to physicians. Different specialties come with varying levels of work-related stress, and therefore, high-stress specialties may have higher rates of outpatient mental health visits. Medical school location refers to where the physicians received their medical school education (Canadian or International). Medical school location may indirectly affect mental health outcomes by shaping physicians' early training environment.

Chapter Four: A comparison of mental health service utilization among early career physicians in females versus males: retrospective, population-based cohort study

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Running Head: Physician early career mental health

Preface

This chapter outlines the findings from objective 1 examining sex-based outpatient mental health visits among early career physicians in Ontario, Canada. Authors contributions and ethics approval are present at the end of the chapter. This manuscript was prepared to be summitted to the BMJ journal, and hence, there may be redundancies in the introduction, methods and discussion sections.

4.1 Key Findings

WHAT IS ALREADY KNOWN ON THIS TOPIC

- There is growing evidence highlighting the mental health challenges faced by physicians, driven by demanding work environments, long hours, and high levels of occupational stress.
- Small-scale, self-reported studies indicate that early-career physicians and female physicians are at a higher risk for mental health outcomes such as anxiety and depression.

WHAT THIS STUDY ADDS

- In this large population-based cohort of 10,925 early career physicians, we found that approximately one in five required a healthcare visit with a mental health condition diagnosis during the early career period.
- The increased risk was more pronounced among female physicians compared to male physicians.
- Further research is needed to examine sex-based differences in mental health service utilization among early-career physicians compared to the general population.

4.2 ABSTRACT

Importance

Early career physicians may experience significant stressors impacting mental health, and this may differ by sex.

Objective

To examine mental health visits among early career physicians

Design, Setting, and Participants

We conducted a retrospective population-based cohort study using linked administrative data from Ontario, Canada, for all early career practicing physicians who registered with CPSO between April 1, 2004, and March 31, 2018. Early career was defined as the first 5 years of medical practice after graduation from medical school (would include residency).

Main Outcomes and Measures

We compared hazard ratios of a mental health care visit among female physicians, defined by any diagnostic or billing code for a mental health condition, for early career physicians compared to males.

Results

From April 1, 2004, to March 31, 2018, among 10,925 physicians (mean [SD] age, 27.2 [3.0] years; 5,941 [54.37%] female), 19% had a mental health visit during their early career. Female physicians had a higher risk of a mental health visit compared to male (23% female vs 15%

male; adjusted hazard ratio [HR], 1.44; 95% CI: 1.35-1.54). The risk was higher for females (males reference) with no previous mental health care (no mental health history: HR, 1.63; 95% CI: 1.49-1.78; mental health history: HR, 1.21; 95% CI: 1.10-1.34) and consistent across medical specialities (surgery HR, 1.81; 95% CI: 1.37-2.39; medicine HR, 1.73; 95% CI: 1.39-2.14; psychiatry HR, 1.72; 95% CI: 1.25-2.36; family medicine HR, 1.29; 95% CI: 1.15-1.45) except anesthesiology and radiology (radiology HR, 1.57; 95% CI: 0.88-2.79; anesthesiology HR, 1.14; 95% CI: 0.70-1.86).

Conclusions and Relevance

Nearly 1 in 5 physicians had a mental health visit during their early career, and this was consistently higher in females compared to males. Screening and support programs tailored to early career physicians, with consideration for sex-specific strategies, may improve overall mental health.

4.3 INTRODUCTION

Physician mental health and well-being are a growing global concern,[1,2] reinforced by increasing evidence of rising mental health issues within the profession.[3] Poor physician mental health leads to reduced clinical hours, decreased productivity, early retirement, and diminished job satisfaction,[4] imposing substantial financial burdens on healthcare systems.[5] In Canada, the ongoing shortage of family physicians is, in part, a direct consequence of these challenges. The overwhelming demands placed on family physicians exemplify how mental health issues within this profession contribute to workforce shortages.[6] The impact of physicians' mental health extends beyond their personal well-being to affect healthcare delivery and society at large.[2] The "Quintuple Aim" put forward by the Institute of Healthcare Improvement, is a framework for advancing and improving healthcare.[7,8] This concept emphasizes improving patient experience, improving health outcomes, lowering costs, and promoting health equity while also recognizing physician well-being as an essential element for providing effective patient care and overall population health improvement.[7,8]

Early career physicians, encompassing residents, exhibit higher rates of emotional exhaustion, depersonalization, depressive symptoms, and fatigue as compared to middle and late-career physicians,[1,9,10] often attributed to long work hours, sleep deprivation, and clinical inexperience.[9,11] Additionally, early career and resident physicians face financial limitations and personal responsibilities such as paying off debt, work-life balance, managing relationships, and family responsibilities, which collectively predispose them to poor mental health.[12] Beyond the inherent stressors of medical practice, resident physicians encounter additional pressures contributing to elevated stress levels. These include transitioning into new professional roles, prolonged working hours, limited autonomy, heavy patient care loads, excessive administrative

tasks, fear of making errors, and insufficient time for self-care.[13] Notably, 43% of residents screen positive for moderate to severe depression, with roughly 40% to 50% of early-career physicians also reporting symptoms of depression and severe fatigue.[13,14.]

Mental health issues may occur differentially between female and male physicians.[15] Female physicians, constituting a growing proportion of the workforce, face distinct challenges, including caregiver responsibilities, domestic violence, pay inequity, and underrepresentation in senior positions.[16] These factors may compound and lead to higher rates of mental health-related conditions such as depression and anxiety, along with lower professional satisfaction among female relative to male physicians.[10, 16, 17] Despite recognition of the early career stress, how physicians utilize mental health services during this critical period, particularly focusing on the differences between female and male physicians, remains unknown. To address this, we conducted a population-based, retrospective cohort study of early career physicians in Ontario, Canada with the aim of investigating sex-based outpatient mental visits among early career physicians.

4.4 METHODS

4.4.1 Study design and settings

We conducted a retrospective population-based cohort study using data held at the ICES (Institute for Clinical and Evaluative Science) in Ontario and linked all physicians upon registration with the College of Physicians and Surgeons of Ontario (CPSO). The cohort and health databases were linked using a unique identifier and all identifying information was deidentified before the data was analyzed. [See Table S-1 for methodological details for data linkage]. All physicians in Ontario must register with the CPSO as a licensing requirement to

practice or enter residency. This project was conducted under section 45 of Ontario's Personal Health Information Protection Act which grants ICES the authority to collect personal health information without explicit consent for health system evaluation and improvement. This study followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) reporting guideline observational studies [See supplemental Appendix A for STROBE checklist]

4.4.2 Study population

All practicing physicians with initial CPSO registration between 1990 and 2018 (n=10,925) entered the cohort. Physicians were assessed for cohort eligibility between April 1, 2004, to March 31, 2018. We identified all newly registered physicians based on their first CPSO registration date within one year of medical school graduation and we defined early career as the first five years after registration. To increase the reliability that these physicians were indeed early career, we excluded those whose first-ever registration was not within one year of medial school graduation. This would eliminate any mid-career or late-career physicians who transferred from another region outside Ontario. Additionally, we excluded physicians if they did not have a valid unique identifier number (ICES Key Number), were not eligible for OHIP, were aged < 21 years old or > 65 years old, or had no data reported on sex. [see Figure 3-3]. The date of CPSO registration served as the study index date. Our cohort captured both medical residents and newly practicing physicians. As most residency training programs are 5 years or greater, the newly practicing physicians would mostly be family physicians.

4.4.3 Outcomes

Our primary outcome was an outpatient mental health visit captured by any physician. Mental health outpatient visits included any healthcare encounter with a physician fee code or revised

ICD-9/10 diagnostic coding for a mental health condition [See Table 3-2 for physician fee code or revised ICD-9/10 diagnostic coding for a mental health condition]. We focused on outpatient visits as inpatient mental health visits among physicians were exceedingly rare (<1% of total visits).

4.4.4 Physician Characteristics

Demographic characteristics such as gender, age, rurality, specialty, medical school location, previous mental health history, chronic illness (asthma and hypertension), and neighborhood income quintiles were collected at the time of first registration with the CPSO (index date). These covariates were selected based on empirical evidence, as they have been identified in previous research as important factors that require adjustment to minimize potential confounding effects.[10, 18, 19] Sex was classified as either female or male. Age was grouped into four categories (21-25, 26-30, 31-35, 36-40, 41+ years) to represent the age ranges of early career physicians. Given the younger demographic of our cohort, comorbidities are relatively rare, with asthma and hypertension being the most prevalent conditions observed.[20, 21] Chronic illness and previous mental health history were determined by a 2-year lookback period from index date, using relevant diagnostic codes from the International Classification of Diseases, 9th Revision (ICD-9). Where possible, validated diagnostic algorithms were employed.

The medical school location variable indicates the country where the physician completed their education and was categorized as either a Canadian or International medical school graduate. Neighbourhood rurality and income status were obtained from Statistics Canada using geospatial data based on an individual's postal code. Physician specialty was categorized

into eight broad groups based on primary speciality (categorized as family medicine, psychiatry, anesthesia, internal medicine, surgery, radiology, missing or other) [See Table S-2 for list of all physician specialities]. Additional details regarding the data sources for each variable can be found in the supplement [see Table S-3].

4.4.5 Statistical analysis

We described and compared baseline characteristics between female and male physicians. We calculated the annual proportion and rate of the first mental health visit for females and males between 2004 and 2018.

We performed time-to-event-adjusted analyses using Cox proportional hazard regression models to examine physician sex and the first outpatient mental health visit. Physicians were censored at the first mental health visit, death, loss to follow-up, or maximum follow-up of the study period (March 31, 2022). Models were adjusted for age, chronic condition (asthma and hypertension), previous mental health history, specialty, rurality, income, and medical school location.

The history of previous mental health visits is strongly associated with further visits, we conducted a stratified analyses based on a previous mental health visit (yes/no mental health history from a 2-year lookback period from the index date). Mental health and sex balance may differ by medical specialities, we further stratified by physician speciality. As psychiatry residents may engage in mental health visits as part of their residency training (promoted in some programs), we repeated our speciality-stratified models excluding psychiatry. These additional analyses were adjusted for the covariates listed previously.

All analyses were conducted using the SAS Enterprise guide version 7.1 (SAS Institute Inc., Cary, NC, USA).

4.4.6 Public and patient involvement

While cohort members played a crucial role in this research, we did not involve them and members of the public in the design, conduct, reporting, or dissemination phase due to time constraints.

4.5 RESULTS

Our cohort included 10,925 physicians of whom 54.4% were female (Table 1). The mean (SD) age of the cohort was 27.2 (3.0) years, with no difference between female (27.1 years, SD = 3.0) and male (27.3 years, SD = 3.1). The prevalence of chronic conditions was low, with a slightly higher proportion of asthma among females (0.4 vs 0.3%), and a higher proportion of hypertension among males (0.5% vs 0.2%). Having a previous mental health visit was higher among female physicians compared to males (27.1% vs 23.1%). Most physicians lived in urban regions at the time of registration (97.5%). The distribution across income quintile neighborhoods was similar between female and male physicians, with the highest proportion of physicians in the 5th quintile (highest income) for both (females: 32.0%, males: 31.3%). Family medicine was the most common medical speciality (33.7%), followed by internal medicine (12.0%) and surgery (8.2%). Females were more commonly in family medicine and psychiatry and less commonly in surgery, internal medicine, anaesthesia, and radiology compared to males. Most physicians (84.5%) graduated from Canadian medical schools with a slight difference between females (84.9%) and males (84.0%).

Table 4-1. Baseline characteristics of physicians at time of the start of practice

	Physicians		
Variables	**Female**	**Male**	**Total**
Total - % (n)	54.4 (5,941)	45.6 (4984)	10,925
Age (years) – % (n)			
Overall – Mean (SD)	27.1 (3.0)	27.3 (3.1)	27.2 (3.0)
21-25	28.2 (1,678)	27.0 (1,345)	27.7 (3,023)
26-30	62.1 (3,692)	61.7 (3,073)	61.9 (6,765)
31-35	7.3 (432)	8.9 (444)	8.0 (876)
36-40	1.6 (93)	1.8 (89)	1.7 (182)
41+	0.8 (46)	0.7 (33)	0.7 (79)
Chronic Conditions - % (n)			
Asthma	0.4 (24)	0.3 (16)	0.4 (40)
Hypertension	0.2 (13)	0.5 (23)	0.3 (36)
Mental Health History - % (n)			
Yes	27.1 (1,609)	23.1 (1,151)	25.3 (2,760)
No	72.9 (4,332)	76.9 (3,833)	74.7 (8,165)
Rurality - n (%)			
Rural	2.9 (174)	2.1 (103)	2.5 (277)
Urban	97.1 (5,767)	97.9 (4,881)	97.5 (10,648)
Neighbourhood Income Quintiles - % (n)			
1 (lowest)	13.8 (819)	14.8 (735)	14.2 (1,554)
2	16.7 (992)	16.8 (836)	16.7 (1,828)
3	17.6 (1,043)	18.9 (944)	18.3 (1,987)
4	18.7 (1,113)	17.3 (860)	18.1 (1,973)
5 (highest)	32.0 (1,900)	31.3 (1,560)	31.7 (3,460)
Missing	1.3 (74)	1.0 (49)	1.1 (123)
Medical School - % (n)			
Canadian	84.9 (5,045)	84.0 (4,185)	84.5 (9,230)
International	15.1 (896)	16.0 (799)	15.5 (1,695)
Physician specialty - % (n)			
Family medicine	37.8 (2,247)	28.8 (1,436)	33.7 (3,683)
Anaesthesia	2.0 (121)	3.0 (148)	2.5 (269)
Psychiatry	3.5 (210)	2.2 (108)	2.9 (318)
Surgery	6.6 (390)	10.2 (506)	8.2 (896)
Medicine	11.1 (659)	13.2 (656)	12.0 (1,315)
Radiology	0.8 (49)	2.6 (131)	1.7 (180)
Other	7.9 (469)	6.8 (337)	7.4 (806)
Missing	30.2 (1,796)	33.4 (1,662)	31.7 (3,458)

Abbreviations: (n) count, % Percentage, SD standard deviation.
*Data are reported as percentage (count) of individuals unless otherwise indicated.
*An income quintile of 1 is the lowest, and 5 is the highest.

*Characteristics of physicians were obtained at the time of first registration with the College of Physicians of Ontario (index date)

4.5.1 Mental health visits among early career female and male physicians

In the first five years of practice, 19.3% of physicians had an outpatient mental health visit with a higher proportion in females compared to males (female: 23.4%, 30.0/100 person years; male: 14.8%, 18.6/100 person years) (Table 2). Examining the crude rates of mental health visits over time from 2004 to 2018, the rates were consistently higher for female physicians (Figure 1). Rates of an early career mental health visit were between 24.4 to 40.3/100 person years among females and 13.6 to 25.7/100 person years among males. The adjusted hazard ratio for a mental health visit among female physicians was 1.44 (95% CI: 1.35-1.54, referent male). The survival plot depicts a higher probability of a mental health visit for female physicians beginning immediately into the early career and persisting during the entire period (Figure 2).

Table 4-2: Crude rates and adjusted hazard ratios for mental health visits among early career female and male physicians

	First outcome event (n) [c]	Crude % [d]	Crude Rate (Per 100 days) [e]	Adjusted hazard ratio [95% CI] [f]
Male Physicians	3,681	14.8	18.6	1.0 (ref)
Female Physicians	6,490	23.4	30.0	1.44 [1.35 to 1.54]
Total	10,171	19.3	24.3	n/a

Abbreviations: n: count, %: percentage,
c: First outcome event: after registering with CPSO, first ever visit related to mental health. Sum of the first outcome vents for female and male physicians for each year.
d: Crude%: (Total first outcome events / Total Population) * 100
e: Crude rate (per 100-person year): (Total first outcome events/Total person time) * 100
f: Model was adjusted for age, chronic conditions (asthma and hypertension), previous history of mental health visits, speciality, rurality, income, medical school location.

4.5.2 Additional analysis

Early career female physicians had a higher risk for a mental health visit independent of a previous mental health visit (Table 3). Female physicians without a previous mental health visit had a higher relative rate of a visit during the early career period (HR of 1.63 95% CI:1.49-1.78) compared to male.

Table 4-3 – Early career mental health visits for female and male physicians by previous mental health history

	Female Physician - First Mental Health Visit		**Male Physician (ref) - First Mental Health Visit**		
Previous mental health visit	First Mental Health Visit – % (n)	No First Visit – % (n)	First Mental Health Visit - % (n)	No First Visit – % (n)	Adjusted HR (95% CI)
Yes	8.2 (2,268)	12.8 (3,553)	5.7 (1,407)	12.5 (3105)	1.21 (1.10 - 1.34)
No	15.2 (4,222)	63.8 (17,665)	9.1 (2,274)	72.7 (18,093)	1.63 (1.49 - 1.78)
Total	23.4 (6,490)	76.6 (21,218)	14.8 (3,681)	85.2 (21,198)	n/a

Abbreviation: n=count, %=percentage, HR=Hazard ratio, CI=Confidence Interval
*Model was adjusted for age, chronic conditions (asthma and hypertension), speciality, rurality, income, medical school location

When examining physician specialty, females were more proportionally likely to have an early career mental health visit across all specialities, with absolute differences ranging from 5.3% in anaesthesia to 22.0% in psychiatry compared to male. In adjusted models, the HR for a mental health visit for female physicians was higher across all specialities except anaesthesiology and radiology [radiology HR of 1.57 (95% CI: 0.88-2.80)]; anaesthesiology HR of 1.14 (95% CI: 0.70 - 1.86)]. The risk was highest in surgery [HR of 1.81 (95% CI: 1.37 - 2.39) followed by internal medicine [HR of 1.73 (95% CI: 1.39 - 2.14)], psychiatry [HR of 1.72 (95% CI: 1.25-

2.36)] and family medicine [HR of 1.29(95% CI: 1.15-1.45)]. The results were consistent in analyses excluding psychiatry (Table 4).

Table 4-4 - Early career mental health visits for female and male physicians by physician speciality

All Specialities						**Excluding Psychiatry**
	Female Physician - First Mental Health Visit		**Male Physician (ref) - First Mental Health Visit**			
	Yes %(n)	No %(n)	Yes %(n)	No %(n)	Adjusted HR for Female (95% CI)	Adjusted HR for Female (95% CI)
**Psychiatry	74.76 (157)	25.2 (53)	52.8 (57)	47.2 (51)	1.72 (1.25 - 2.36)	n/a
Anaesthesia	28.9 (35)	71.1 (86)	23.7 (35)	76.4 (113)	1.14 (0.70 - 1.86)	1.14 (0.70-1.86)
Family medicine	39.5 (887)	60.5 (1,360)	31.1 (432)	69.9 (1,004)	1.29 (1.15 - 1.45)	1.29 (1.15 - 1.45)
Radiology	38.0 (19)	61.2 (30)	29.8 (39)	70.2 (92)	1.57 (0.88 - 2.80)	1.57 (0.88 - 2.80)
Surgery	33.6 (131)	66.4 (259)	18.0 (91)	82.0 (415)	1.81 (1.37 - 2.39)	1.81 (1.37 - 2.39)
Internal Medicine	33.5 (221)	66.5 (438)	20.9 (137)	79.1 (519)	1.73 (1.39 - 2.14)	1.73 (1.39-2.14)
Other	33.9 (159)	66.1 (310)	21.7 (73)	78.3 (264)	1.71 (1.29 - 2.27)	1.71 (1.29 - 2.27)
Missing	41.8 (750)	58.2 (1,046)	31.9 (529)	68.1 (1,131)	1.39 (1.24 - 1.55)	1.39 (1.24 - 1.55)

Abbreviation: n=count, %=percentage, HR=Hazard ratio, CI: Confidence Interval
*Model was adjusted for age, chronic conditions (asthma and hypertension), previous mental health history, rurality, income, medical school location
**Psychiatrists undergo mental health visit as part of their professional training

4.6 DISCUSSION

4.6.1 Principal findings

The residency and early career period for physicians is viewed as a particularly stressful time and may be associated with mental health issues. In this population-based retrospective study of

10,925 early career physicians, nearly 1 in 5 physicians underwent an outpatient visit for a mental health issue (19.3%). Mental health visits were more common among early career female physicians compared to males (23.0% vs 15.0%; absolute risk difference 8.0%, adjusted hazard rate [HR] of 1.44; 95% CI: 1.35 to 1.54). This was consistent independent of previous mental health history and across medical specialities. Our findings suggest early career physicians seek and require mental health support, and this differs by sex, which is consistent with the pattern seen in the general population.[22, 23] Females in the general population have reported worse mental health outcomes and are more than twice as likely as men to be diagnosed with depression.[22, 23] This increased risk is largely attributed to challenges and inequalities including unpaid caregiving responsibilities, domestic violence, and sexual abuse, placing their health and well-being at higher risk.[24] These results coincide among physicians with female physicians being at higher risk for mental health conditions when compared to male physicians.[2]

4.6.2 Comparison with other studies

Our findings are consistent with and reinforce the findings of previous survey-based studies. Self-reported chronic stress, anxiety, and depression in physicians during the early career stage are high due to increased patient care responsibilities, extended working hours, additional management and educational tasks, and the need to adapt to new workplaces alongside unfamiliar colleagues.[2,12,25,26] Buddeberg-Fischer et al., 2008 reported 30.0% of young physicians had significantly higher levels of chronic stress, which was associated with adverse mental health outcomes such as depression and anxiety.[27] Similarly, 24.0% of young physicians in training reported requiring mental health services, with an 11.0% prevalence of mental health issues occurring in the first year, increasing to 17.0% by the fourth early career year.[28] Additionally, in

the United States, a study examining depression among medical residents reported a 19.5% prevalence of depressive episodes during internship.[29] Comparably, we found that 19.3% of early career physicians underwent a mental health visit. Our findings expand on previous studies, which were limited by small cohort size and outcome ascertainment by self-reported surveys as opposed to measuring actual healthcare visits. Our findings are population-based, multicentre, and encompass a large cohort of early career physicians and their mental health care visits. Our findings can be used to estimate the mental health services needed to support early career physicians and expand on survey-based studies as our findings are highly generalizable.

We demonstrated notable differences in mental health service utilization between early career female and male physicians. Other studies have also identified sex-based differences in self-reported mental health outcomes.[2,21] Canadian National Physician Health Survey (2021) found that significantly more female physicians reported lower resilience, higher emotional exhaustion, and depression compared to male physicians.[30] Similar sex-based differences were reported in other jurisdictions.[31] The consistency of reports from different countries suggests that female physicians may experience a differential risk for a mental health condition and/or are more likely to actively seek medical experts for mental health care. Conversely, the lower risk among male physicians may serve as a proxy of a lower disease burden or lower health seeking behaviours. Males, in general, are less likely to seek healthcare due to greater stigma associated with masculine norms and may endure mental health concerns silently.[32] A number of studies have shown that this is particularly true when it comes to mental health.[33-35] Males are more reluctant to seek help for psychological distress, often perceiving it as a sign of weakness.[33] This reluctance to seek support contributes to the alarming suicide rates, which are four times higher among males compared to females in the United States.[35] In a self-reported study, a higher

percentage of male physicians (51.0%) compared to female physicians (44.0%) indicated that the reason for not seeking wellness support was due to feelings of shame.[30]

It is plausible that sex-based differences may exist in terms of severity or seeking of alternative mental health supports that are not covered by OHIP (e.g., psychologists). Interestingly, among physicians with no previous mental health history, females had a higher risk for an early career mental health visit compared to males, and the sex difference was more pronounced compared to physicians with a previous mental health visit. This suggests a higher risk for de novo mental health conditions in female physicians. A confluence of risk factors seems to occur in the early career that may impact female physicians' mental health.[16] These include implicit bias, pay disparities, discrimination, workplace harassment, and inadequate representation of female physicians in leadership roles.[16] In comparison to male, female physicians on average receive lower evaluation scores, are perceived as less capable by medical students, and are less frequently addressed as "Doctor".[16] Additionally, many residents are likely to become pregnant and childbearing during training.[36] Female physicians who become mothers during this period encounter various stressors and challenges related to pregnancy and parenting. These include sleep deprivation, difficulties with finding childcare, breastfeeding problems, lack of support from partners, heightened discrimination during pregnancy, and feelings of guilt for taking time off work.[36]

Our finding provides quantitative support to these qualitative insights, suggesting that the need for mental health resources may reflect the cumulative impact of these challenges on female physicians' mental well-being. Although our findings support the literature, we acknowledge that the discrepancies in healthcare visits between female and male physicians may be influenced by

the differences in health-seeking behaviors. While our data suggests female physicians exhibit increased health-seeking behaviour which may explain the greater rates of visits among female physicians as compared to male, it raises the possibility that males may be undertreated. This highlights the need for targeted initiatives aimed at reaching out to male physicians and addressing the stigma surrounding help-seeking behavior.

A higher requirement for mental health services among female physicians occurred consistently across medical specialities with the highest magnitude in surgery, internal medicine, and psychiatry. A qualitative study identified workplace gender bias as a major theme specific to female surgeons, who faced daily challenges from patients and colleagues and encountered different expectations based on gender.[37] In comparison, male surgeons did not report gender-related workplace barriers.[37] Additionally, a systematic review highlighted that being a female was identified as risk factors for increased anxiety and depression among surgeons.[38] Tan et al (2023), reported that female surgeons were 1.4 times more likely to screen positive for anxiety and 1.3 times more likely to screen positive for depression relative to male surgeons.[39] High number of visits by psychiatrists can be partly explained by previous studies indicating that many psychiatrists undergo therapy as part of their professional training to enhance both personal and professional development.[40] However, our findings indicate that female psychiatrists remain at a higher risk for mental health issues compared to male psychiatrists. This is consistent with research that has suggested that female psychiatrists were at an elevated risk of depression (relative risk: 1.1, 95% CI:1.0–1.2) and burnout (relative risk: 1.1, 95% CI: 1.0–1.2) when compared to male psychiatrists.[41]

4.6.3 Policy implications

Given that the early career period seems to be a particularly vulnerable time, targeted interventions and systemic changes are needed, along with a cultural shift, to improve physician health and wellbeing. Further education across medical speciality training programs, comprehensive screening and easy to access, anonymous, support programs specifically targeting early career physicians are required. Addressing these core issues is crucial for establishing a sustainable framework for physician well-being, to reduce attrition and increase job satisfaction. A recent report advocated for systemic reforms which include discontinuing the normalization of excessive work and stress as inherent aspects of the physician profession, de-stigmatizing mental health by encouraging physicians to seek mental health services and providing routine mental health screenings and counseling services.[42] Special attention should be directed towards vulnerable subgroups, particularly female physicians, who are at a higher risk of experiencing stress.[42] Future research should consider reporting sex-related differences in the most prevalent mental health conditions among physicians. Although there is substantial literature suggesting that physicians are at higher risk for developing mental health conditions than the general population [14, 43], further cohort studies are needed to examine gender-based differences in mental health service utilization among early-career physicians compared to the general population.

4.6.4 Strengths and limitations

The current study has some limitations. First, outpatient mental health visits among early career physicians may be underreported as we captured visits through OHIP billing, as such we could not account for care received through alternative pathways, such as self-care practices, hallway medicine, and privately paid services (counseling, psychotherapy, etc.). Second, our cohort was

limited to early career physicians and utilized a stringent criterion (one year graduation from medical school) for inclusion. This would have excluded individuals who may have delayed onset of college registration who may undertake additional training during that period (e.g. research). Third, career stage was established based on medical school graduation year; thus, we could not distinguish for the first five years of the period whether, for example, they did two years of family medicine and went on to become early staff or whether they were continuing their training/residency. However, both early career and residents have been identified at a higher risk of mental health conditions when compared to mid and later-career physicians.[26] Fourth, our method of identifying mental health visits (diagnostic or billing codes) is chart validated in Ontario just not in the physician population. It is plausible visits related to mental health issues by physicians may be incorrectly coded by providers due to concerns about discrimination from regulatory bodies and the stigma associated with mental health within the profession. Finally, as this was an observational study, we could not determine causality. However, despite results not inferring causality, our cohort is large, over a diverse region, multicentre and comprehensive.

4. 7 CONCLUSION

In a population-level cohort study of 10,925 early career physicians we found approximately one in five required a health care visit with a mental health condition diagnosis during the early career period, and this was consistently higher among female compared to male physicians. Adequate screening and support programs should be considered for physicians with recognition that early career is a particularly susceptible time.

4. 8 FIGURES

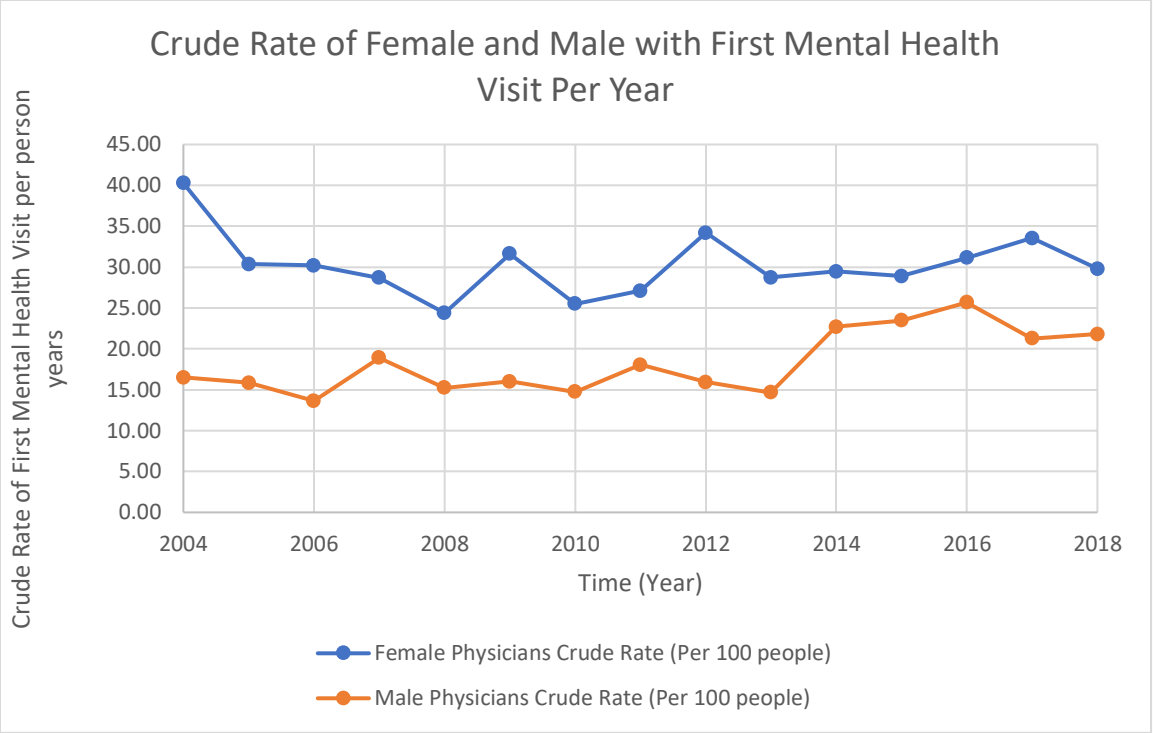

Figure 4-1: Crude rate (per person years) of physicians by sex with an early career, mental health visit over a 14-year period in Ontario, Canada

*Crude rate (per person years): (Total first outcome events/ Total person time) * 100

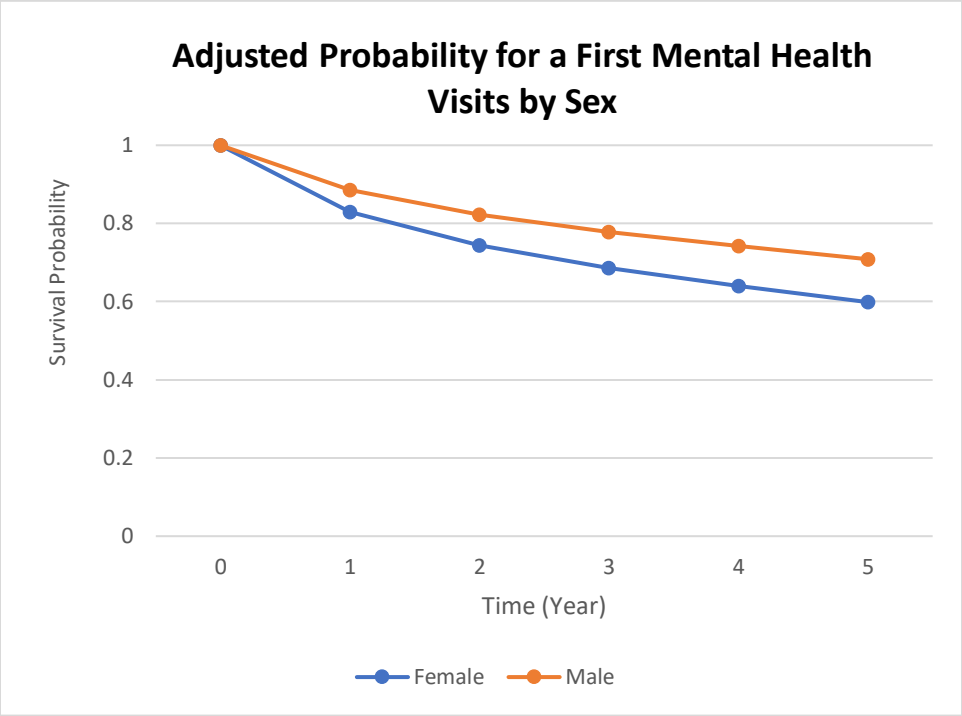

Figure 4-2: Survival probability physicians of a mental health visit for female and male physicians during the early career period

*Model was adjusted for age, chronic conditions (asthma and hypertension), speciality, rurality, income, medical school location

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4.10 Contributors

SS, MMS and PT were involved in the conceptualization and design of the study. SS contributed to the acquisition, analysis, and the interpretation of data. SS drafted the manuscript, with all authors providing critical revisions for important intellectual content. SS was primarily involved in the statistical analysis of the data. SY provided administrative and technical support. MMS is the guarantor, takes responsibility for the integrity of the data and accuracy of data analysis. MMS also attests that all listed authors meet the authorship criteria.

4.11 Funding

none

4.12 Competing interests

MMS has received consultancy fees from AstraZeneca, Bayer, Otsuka, and GlaxoSmithKline. Besides this, all authors have declared no competing interest.

4.13 Ethical approval

Institute of Clinical Evaluative Sciences is an independent, non-profit research institute and it has a legal status under Ontario's health information privacy law, which allows it to collect, analyse healthcare and demographic data for health system evaluation and improvement. This project is under section 45 of Ontario's Personal Health Information Protection Act (PHIPA), which does not require a review by a research ethics board.

4.14 Data sharing

This study's dataset is securely held in coded form at the Institute of Clinical Evaluative Sciences. "Relevant data" includes all anonymized data on which the analysis, results and conclusions reported in the paper are based. While legal data sharing agreements between the Institute of Clinical Evaluative Sciences and data providers (e.g., healthcare organizations and government) prohibit the institute from making the dataset publicly accessible. Access may be provided to individuals who meet specific criteria for confidential access, as outlined at www.ices.on.ca (contact: das@ices.on.ca). The dataset creation plan and analytic code can be requested from the authors, though users should be aware that the programs may rely on coding templates or macros unique to the Institute for Clinical Evaluative Sciences, which may be inaccessible or require adaptation. The lead author, as the guarantor of this manuscript affirms that the manuscript is an honest, accurate, and transparent account of the study being reported.

4.15 Open Access

Chapter Five: Mental health services use by early career physicians compared to non-physicians: A sex-stratified population-based cohort study

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Preface

This chapter outlines the findings from objective 2 examining sex-based mental health visits among early career physicians relative to non-physicians. This manuscript was prepared to be summitted to the JAMA journal, and hence, there may be redundancies in the introduction, methods and discussion sections. This project is under section 45 of Ontario's Personal Health Information Protection Act (PHIPA), which does not require a review by a research ethics board.

SS, MMS and PT were involved in the conceptualization and design of the study. SS contributed to the acquisition, analysis, and the interpretation of data. SS drafted the manuscript, with all authors providing critical revisions for important intellectual content. SS was primarily involved in the statistical analysis of the data. SY provided administrative and technical support. MMS is the guarantor, takes responsibility for the integrity of the data and accuracy of data analysis. MMS also attests that all listed authors meet the authorship criteria.

5.1 KEY POINTS

Question: Are there sex-based differences in mental health visits among early-career physicians compared to non-physicians?

Findings: In a cohort of 65,550 participants, including 10,925 early-career physicians (including residents) and 54,625 matched non-physicians, after adjusting for known confounders early career physicians had lower mental health visits compared to matched nonphysicians. Females had higher risk of mental health visits compared to males with similar patterns observed among physicians and nonphysicians.

Meaning: Mental health visits are less common among early career physicians either male or female compared to nonphysician counterpart.

5.2 ABSTRACT

Importance While there is an increasing focus on physician mental health the degree to which these challenges are being driven by profession specific factors compared to broader societal change is unclear. Early career physicians (up to 5 years after medical school graduation) and female physicians seem to face increased pressures and stressors that put them at higher risk.

Objective To examine sex-based mental health visits among early career physicians relative to non-physicians.

Design, Setting, and Participants We conducted a retrospective, sex-stratified, population-based cohort study of early career physicians matched (1:5 on index year, sex, age, rurality, and income quintile) to non-physicians between April 1, 2004, to March 31, 2018.

Main Outcomes and Measures Mental health visit during the five-year early career period defined by any diagnostic or billing code for a mental health condition, compared to non-physicians.

Results We included 10,925 early-career physicians and 54,625 matched non-physicians (mean [SD] age, 27.2 [3.0] years; 5,941 [54.4%] female physicians; 4,984 [45.6%] male physicians). 19.3% of EC physicians had a mental health visit compared to 21.7% of nonphysicians. Anxiety was the most common diagnosis across all groups and was highest among female physicians (67.4% of all visits). During the first five years of practice, female physicians were less likely to have a mental health visit compared to female non physicians (23% vs. 24%; adjusted hazard ratio [HR], 0.89; 95% CI, 0.85-0.93), and this was similar in male physicians compared to male nonphysicians (15% vs. 17%; adjusted hazard ratio [HR], 0.81; 95% CI, 0.76-0.85). Differences

were also noted between the sexes when further stratified by individuals with and without a previous mental health history.

Conclusions and Relevance: Early career female and male physicians have lower mental health service utilization than nonphysicians counterparts. Future research should explore the underlying reasons for these lower visit rates, whether they indicate true differences in mental health burden or are shaped by factors such as stigma, access barriers, or the unique demands of the medical profession.

5.3 INTRODUCTION

Survey results continually suggest mental health conditions such as anxiety and depression are more common in physicians compared to the general population [1,2,3]. Unique stressors associated with their profession, including extended working hours, the burden of life-or-death decisions, a stressful work environment, and lack of work-life integration are known as key contributors.[1,4] The early career period, defined as the first five years after medical school graduation, is a particularly challenging time for physicians as they are trying to establish themselves in the profession, have increased responsibility for patient care, encounter additional management and educational tasks, and are challenged to adapt to a new workplace alongside unfamiliar colleagues.[5,6,7] We recently reported the early career (EC) period, to be particularly high risk, with approximately 1 in 5 physicians undergoing a healthcare visit for mental health purposes and this was especially prominent in female physicians (23.4% vs. 14.8%).[8]

Despite the substantial evidence indicating an elevated risk of mental health issues among physicians, there is limited direct comparison between physicians and general population mental health outcomes. Occupational stressors may lead to a higher risk of mental health challenges faced by physicians [4]. However, protective factors such as higher socioeconomic status and access to mental health resources may mitigate these risks [4]. Determining whether the mental health burden for physicians is higher than that experienced by their counterparts in the general population would facilitate and guide screening and interventions.[9,10] We conducted a population-based, retrospective cohort study to investigate sex-based differences in outpatient mental health visits among early-career physicians and the general population, in Ontario, Canada.

5.4 METHODS

5.4.1 Study Design and Settings

We conducted a retrospective population-based cohort study comparing all early career Ontario physicians to a matched cohort of the general population eligible for the Ontario Health Insurance Plan (OHIP) from April 1, 2004, to March 31, 2018. Early career physicians (including medical residents and newly practicing physicians) were identified based on their first registration date with the College of Physicians and Surgeons of Ontario (CPSO), a licensing requirement to practice medicine. Newly practicing physicians are primarily family physicians, as all Royal College specialty training programs are 5 years or greater. This study was reported using the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines [See eTable 1].

5.4.2 Description of Participants

We assessed cohort eligibility between April 1, 2004, and March 31, 2018. Our cohort included 10,925 newly practicing physicians and medical residents registered with CPSO between January 1, 1990, and March 31, 2018. We defined early career as the first five years following registration with the CPSO. Physicians were excluded if OHIP ineligible on index date (first registration with the CPSO), the first-ever CPSO registration date was not within one year of medical school graduation, were aged <21 years old or >65 years old, had no reported sex, or had an invalid ICES key number (IKN). We included 54,625 non-physician Ontario residents who were not registered with CPSO during our study. Non-physicians were excluded if they were not eligible for OHIP on the index date, were aged <21 years old or >65 years old or had no reported sex. Physicians were matched 1:5 to the general population based on registration year,

sex, age, rurality, and income quintile. The general population was created from a pool of individuals who were alive during the study accrual period and those who were not identified in the physician cohort. Pseudo-index dates were created and randomly assigned to these individuals to have the same distribution as physicians. [13]

5.4.3 Data Sources and Covariates

To facilitate data linkage, we used unique, encoded identifiers to link physician registry information from the CPSO to health administrative data held at ICES (previously the Institute for Clinical and Evaluative Science). Additional methodological details regarding data linkage and cohort creation can be found in Table S-1. ICES, an independent, not-for-profit research institute, operates under section 45 of Ontario's Personal Health Information Protection Act, which grants the authority to collect personal health information without explicit consent for the purposes of health system evaluation and improvement. All identifying information was deidentified before the data was analyzed. We obtained covariates including individuals' sex (female or male), age (21-25, 26-30, 31-35, 36-40, 41+), neighborhood rurality, previous mental health history, chronic illnesses (such as hypertension and asthma), and neighbourhood income quintiles at the index date. We also included physician-specific characteristics, such as medical school location (Canadian or international) and specialty (family medicine, psychiatry, anesthesia, internal medicine, surgery, radiology, missing or other) [See Table S-2 for a list of all physician specialities]. We defined previous mental health history and chronic illness by a 2-year lookback period from the index date, using relevant diagnostic codes from the International Classification of Diseases, 9th Revision (ICD-9) and International Statistical Classification of Diseases and Related Health Problems, 10th Revision (ICD-10). These covariates have

previously been identified in the literature as important factors that require adjustment to minimize potential confounding effects.[11, 12] Additional details regarding the data sources for each variable can be found in the supplement [see Table S-3].

5.4.4 Exposure

Physician status and sex were the two main exposures. All individuals registered with the CPSO were considered physicians, while those not registered were considered non-physicians. Both physicians and non-physicians were stratified by sex (female/male) to examine potential differences in outcomes across these groups. Sex was identified using the RPDB dataset.

5.4.5 Outcomes

Our primary outcome was the first outpatient mental health visit in early career female and male physicians compared to female and male non-physicians. Mental health outpatient visits were defined as any healthcare encounter associated with a physician fee code or ICD diagnostic code for a mental health condition [see Table 3-2]. In our analysis, we included both outpatient and inpatient visits. However, our analysis focused on outpatient visits, as inpatient mental health visits were exceedingly rare (<1% of total visits) among physicians.

5.4.6 Statistical Analysis

We presented baseline characteristics of physicians and matched non-physicians as means and standard deviations for normally distributed continuous data (e.g., age). We calculated the proportions of the first five years of practice and analyzed trends in first mental health visit by

comparing the annual rates of first mental health visit for female and male physicians and non-physicians from 2004 to 2018.

We described the type of mental health conditions (anxiety, mood disorders/depression, other mental health diagnoses, and unknown diagnosis) by sex for physicians and non-physicians. To investigate the association between physician status and the first outpatient mental health visit, we performed time-to-event analyses using Cox proportional hazards regression. Individuals were censored at the occurrence of a first mental health visit, loss to follow-up, death, or the end of the study period. As mental health utilization differs between the sexes, analyses were sex stratified. As previous mental health visits may be associated with recurrent visits, we further conducted stratified analyses by individuals with or without a previous mental health visit (2 year look back). Models were additionally adjusted for chronic conditions (asthma, hypertension, and previous mental health history). The model with stratified analyses by previous mental health visit was adjusted for chronic conditions (asthma and hypertension). We further examined mental health visits by medical speciality (family medicine, psychiatry, anesthesia, internal medicine, surgery, radiology, missing or other). As psychiatrists may engage in mental health visits as part of their residency training [11], which is promoted in some programs, we repeated our analyses after excluding psychiatrists.

All analyses were conducted using SAS software, SAS Enterprise Guide version 7.1 (SAS Institute Inc., Cary, NC, USA).

5.5 RESULTS

Our cohort consisted of 65,550 participants; 10,925 physicians matched to 54,625 non-physicians [see **Figures 3-1 and 3-2**]. The average age across both groups was 27.1 years

(SD=3.0). Within the 10,925 physicians, 5,941 (54.4%) were female physicians, and 4,984 (45.6%) were male physicians. Most of the participants resided in urban areas (97.3%). Participants were evenly distributed across neighbourhood income quintiles, with a slightly higher number (31.7%) of participants in the 5th quintile (highest income). The prevalence of asthma was slightly higher among non-physicians (0.7% in females and 0.4% in males) compared to physicians (0.4% in females and 0.3% in males). Hypertension was highest among male non-physicians (0.6%) and male physicians (0.5%). Female physicians had a higher prevalence of the past 2 years of mental health visit (27.1%) compared to female non-physicians (25.3%). Similarly, male physicians had a higher prevalence of mental health history (23.1%) compared to male non-physicians (17.9%). Among the physicians, family medicine was the most common specialty (37.82% female physicians and 28.8% male physicians). Most physicians (84.5%) graduated from Canadian medical schools (84.9% of female, 84.0% of male) (See **Table 1**).

5.5.1 Mental Health Visits Among Physicians Compared to Nonphysicians

Table 2 displays the rates and adjusted hazard ratios for outpatient mental health visit among physicians and non-physicians. Female physicians were less likely to have a mental health visit in during their first five years of early career compared to matched individuals in the general population (female physicians 30.0/100 person- years (23.4%); female non-physicians 31.2/100 person-days (24.3%); adjusted HR:0.89 95% CI 0.85-0.93). This was consistent when comparing male physicians to matched non-physicians (18.6/100 person-years (14.8%) vs. 31.2/100 person-years (16.7%), adjusted HR: 0.81 95% CI 0.76-0.85).

Examining trends in mental health visits over 14 years (**Figure 1**), females (both physicians and non-physicians) had consistently higher incident rates of a mental health visits compared to males. During the study period, there appears to be a significant overlap between female physicians and female non-physicians mental health visits. However, when looking at trends among male physicians and nonphysicians, there is an increase in the incidence rate of mental health visit among male physicians over time.

Anxiety-type disorder was the most common across all groups (**Figure 3**). Proportionally, anxiety was the highest among female physicians (67.4% of all visits), followed by female non-physicians (66.3%), 57.3% among male physicians, and 55.1% among male non-physicians. Other mental health diagnoses, which encompassed psychotic disorders, substance use, social and family problems, behavioural and neuro-developmental disorders, were most common among male physicians (32.1%) and male non-physicians (28.5%), followed by female physicians (22.4%) and female non-physicians (20.0%). Mood disorder diagnoses were greatest among female nonphysicians (9.0%), followed by female physicians (8.3%), male physicians (7.5%), and male nonphysicians (7.3%).

In adjusted models examining mental health visits across all four groups, the incident rate of mental health visit was highest among female non-physicians [HR:1.63 [95%CI 1.54-1.72], followed by female physicians [HR:1.45; 95%CI 1.36-1.55], male non-physicians [HR:1.22; 95%CI 1.15-1.29]. The sex-stratified probability of time to a mental health visit compared to non-physicians over the study period is presented in Figure 2. Females (both physicians and non-physicians have shorter time for mental health visit relative to males. These findings were consistent after excluding psychiatry as a speciality for physicians.

Female physicians with a previous mental health history were less likely to have a first mental health visit than female non-physicians (8.2% vs. 8.4%), with an adjusted HR of 0.79 (95% CI: 0.74–0.85, Table 3). Among females without a previous mental health visit, no difference was noted between physicians and non-physicians. Male physicians with a previous mental health visit were also at a lower risk for a mental health visit in the early career period compared to male non-physicians (5.7% vs. 5.0%), with an adjusted HR of 0.73 (95% CI: 0.67–0.80). No difference was noted among male physicians with a previous mental health visit compared to male non-physicians (9.1% vs. 11.8%; HR of 0.89 (95% CI: 0.83–1.00).

5.6 DISCUSSION

There are emerging concerns regarding a possible mental health epidemic among physicians [6,11,12]. However, existing studies are limited by small cohort sizes, reliance on self-reported surveys, and a lack of direct comparison with the general population [6,7,15]. Our population-based study examines a large cohort of both early-career physicians and a matched cohort of the general population, comparing mental health-related outpatient visits between early-career physicians and non-physicians. In data from over 65,000 individuals, including 10,925 early-career physicians, we found mental health visits were more frequent among non-physicians, with female non-physicians in the general population being at the greatest risk, followed by female physicians, male non-physicians, and male physicians.

Previous studies based on self-report data consistently suggested physicians have higher rates of mental health conditions compared to the general population.[6,7,29] In contrast, we found that physicians had lower rates of mental health visits compared to a matched general population.

A meta-analysis study including data from 31 cross-sectional studies and 23 longitudinal studies reported a pooled prevalence of depression among resident physicians of 28.8% compared to 8.0% in non-physicians. [14] Similarly, a survey-based study conducted in the United States found that the prevalence of anxiety among residents was eight times higher than that observed in the general population, while the prevalence of depression was five times higher among residents compared to the general population.[15] Canadian survey data suggest physicians and medical residents were twice as likely to experience stress and had significantly higher rates of burnout compared to the general population (53.0% vs. 38.0%).[4] However, physicians were less likely to be screened as positive for depression compared to the general population (48.0% vs 56.0% general population).[4] Discrepancies between survey-based studies and healthcare utilization measures may be based on study design, health expertise, self-awareness, and/or differences in health seeking behaviours. Self-reported studies are often anonymous, report a spectrum of symptoms ranging from less to more severe, and have not been validated in physician populations. This lack of validation raises the possibility that reporting of conditions by self-report may not translate to clinical conditions among physicians as per the non-physician population where they were originally developed. Furthermore, healthcare visits may not accurately reflect mental health among physicians with lower visits due to stigma, self-treatment, and confidentiality concerns, including fears regarding career repercussions and licensing implications.[16] These factors may create barriers to seeking mental health care, leading to fewer outpatient visits despite a higher burden of disease suggested by self-reported surveys (the survey-utilization paradox).[16,17] Conversely, physicians are often better informed about methods of early prevention and health-preserving techniques, they have greater access to wellness supports, such as primary care physicians, mental health professionals, and mentorship

programs, which may serve as protective factors.[4] Their relatively stable socioeconomic position, characterized by financial and job security, may also partially offset mental health concerns compared to the general population.[4] These protective factors, in conjunction with barriers to seeking mental health care, may be occurring simultaneously and explain the lower rates of outpatient mental health visit observed in our study.

Females, whether physician or not, were associated with a higher risk of mental health visit compared to males.[20,21] While our findings support that female physicians have a higher risk of outpatient mental health visit compared to male physicians and male nonphysicians, they also reveal that female physicians have a slightly lower risk of outpatient mental health visit relative to female non-physicians (adjusted HR: 0.89; 95% CI: 0.85-0.93). Interestingly, among female physicians and non-physicians with no previous mental health history, the risk for a mental health was similar, suggesting a higher risk for new mental health conditions in female physicians. Females, in general, are known to have a greater risk of poor mental health than males due to a range of sociocultural factors.[22] These include systemic inequalities in income and occupational positions, higher exposure to intimate-partner violence, and balancing a demanding career with a disproportionate burden of caregiving responsibilities.[22] In addition to sociocultural factors, female physicians may also face unique occupational stressors such as limited control over their workload, extended working hours, and higher incidents of workplace intimidation, bullying, harassment, and microaggressions.[4] However, females, in general, pose greater mental health seeking behaviour, which could also explain the higher number of mental health visit among females .[23] A lower risk of mental health visit among both male physicians and the male general population could be due to lower health-seeking behavior or greater stigma associated with masculine norms.[23] For example, a study conducted in Canada found that males with

depression often avoided seeking help due to the perception that it was emasculating and stigmatized, resulting in suffering in silence.[24]

When comparing physicians and nonphysicians with previous mental health history to those with no previous mental health history, we found that physicians with no previous mental health history had a similar risk of mental health visits when compared to nonphysicians. However, we found that physicians with a previous mental health visit had lower rates of mental health visit when compared to nonphysicians, suggesting a higher risk for de-novo mental health conditions in physicians. This seems counterintuitive, as one might expect continued service use among those with a mental health history.[25] However, it highlights potentially complex dynamics unique to physicians, including stigma within the medical field that may discourage ongoing treatment for known mental health concerns.[26] Physicians may fear being perceived as vulnerable or impaired, with potential career repercussions.[26] As a result, they might avoid continuing their care after registering with CPSO, opting instead for self-management or privately paid services (counseling, psychotherapy, etc.).[26,27] Conversely, early-career physicians without a previous mental health history may be more inclined to seek help for initial symptoms of distress, recognizing burnout in the high-pressure environments of medical training and practice.[28]

Anxiety, mood disorders, and depression are the most prevalent diagnoses among both physicians and the general population, which is consistent with our findings.[28, 29,30] We found female physicians and female nonphysicians had higher rates of anxiety and mood disorders, including depression, compared to both male physicians and nonphysicians. Female physicians had slightly higher rates of anxiety compared to female nonphysicians. Similarly, male

physicians had slightly higher rates of anxiety-related visits when compared to non-physicians. Recent studies on the impact of COVID-19 have shown that anxiety rates are similar among physicians and the general population (25.8% vs 26.9%).[31] However, survey data suggests that depression rates were lower among physicians (48.0%) compared to the general population (56.0%).[4] We also found that male physicians and male nonphysicians had higher rates of other mental health diagnoses relative to their female counterparts, consistent with previous research showing that males are more frequently hospitalized for addictive disorders, whereas females are more often diagnosed with mood and anxiety disorders.[7]

5.6.1 Implications

Our findings challenge the notion that physicians are unique in experiencing a mental health crisis [2,3,6,14], suggesting instead that the broader population is equally affected. Targeted intervention and systemic changes are required to improve the mental health and well-being of all. It is crucial to ensure that screening and wellness programs are accessible, and that public awareness of available resources is increased to encourage greater participation. Additionally, system level policies should focus on reducing occupational stressors, including reducing administrative workload, providing flexible working hours, and providing a culture that promotes effective leadership, self-compassion, and a growth mindset [27,32]. Although our data indicate slightly lower rates of mental health visit among physicians, previous studies have reported high levels of stress and burnout documented within this group highlighting the need for more convenient, accessible, and confidential mental health services [1,3,6]. Further studies specifically designed to validate self-reported screening tools in physicians would aid in interpretation. Addressing stigma and concerns over career repercussions is important to

providing physicians with the support they need. Moreover, special consideration should be directed toward vulnerable subgroups, particularly females, who are at a higher risk of mental health visit.

5.6.2 Strengths and Limitation

Our study has several strengths, including a large sample size (>10,000 physicians), a matched non-physician group for comparison (>50,000), and a longitudinal design capturing data over a 14-year period. We used health administrative data from OHIP that captures almost all outpatient mental health-related visits.

The current study has a few limitations. First, although we matched and adjusted for variables such as age, chronic conditions, previous history of mental health visit, rurality, and income, we expected residual differences in socioeconomic status between physicians and nonphysicians. Second, mental health visit may be underreported for physicians and nonphysicians as we lacked information on alternative pathways, such as self-care practices, hallway medicine, and privately paid services (including counseling and psychotherapy). It is unclear whether this would be a differential between physicians and non-physicians. Third, our outcome of a mental health visit with a healthcare professional does not facilitate interpretation regarding illness severity. Fourth, the career stage was determined using the medical school graduation year; as a result, for the first five-year period, we could not differentiate whether physicians completed a two-year family medicine program and transitioned to early staff or if they were still in training or residency. Finally, while we had access to gender data for our

primary group of interest (physicians), gender was not available for the non-physician cohort, as ICES does not collect this variable. As a result, we used sex as a proxy for gender.

5.7 CONCLUSION

In this population-based study examining 10,925 physicians we found early career physicians consistently had lower outpatient mental health visit compared to matched non-physicians; this was consistent in sex-stratified analyses with females having more mental health visit compared to males. Future research should focus on collecting data on mental health symptoms and diagnoses to confirm these findings and explore the underlying reasons for these lower visit rates, whether they indicate true differences in the prevalence of mental health issues or are shaped by factors such as stigma, access barriers, or the unique demands of the medical profession. Future interventions that prioritize developing accessible support programs aimed at enhancing the well-being of all residents, with particular attention to subgroups identified as being at higher risk, are indicated.

5.8 Funding/Support

none

5.9 Disclaimer

The analyses, conclusions, opinions and statements expressed herein are solely those of the authors and do not reflect those of the funding or data sources; no endorsement is intended or should be inferred.

5.10 Data Sharing

Part of the dataset from this study are held securely in coded form at ICES. While legal data sharing agreements between ICES and data providers (e.g., healthcare organizations and government) prohibit ICES from making the dataset publicly available, access may be granted to those who meet pre-specified criteria for confidential access, available at www.ices.on.ca/DAS (email: das@ices.on.ca). The full dataset creation plan and underlying analytic code are available from the authors upon request, understanding that the computer programs may rely upon coding templates or macros that are unique to ICES and are therefore either inaccessible or may require modification.

5.11 TABLES

TABLES AND FIGURES

Table 1 - Baseline characteristics of physicians and non-physicians at index date

	Female		**Male**		
Variables	**Physician**	**Non-Physician**	**Physician**	**Non-Physician**	**Total**
Total - % (n)	9.1 (5,941)	45.3 (29,705)	7.6 (4,984)	38.0 (24, 920)	65,550
Age (years) – n (%)					
Overall – Mean (SD)	27.1 [3.0]	27.1 [3.0]	27.3 [3.1]	27.3 [3.1]	27.2 [3.0]
21-25	28.2 (1,678)	28.2 (8,390)	27.0 (1,345)	27.0 (6,725)	27.7 (18,138)
26-30	62.1 (3,692)	62.1 (18,460)	61.7 (3,073)	61.7 (15,365)	61.9 (40,590)
31-35	7.3 (432)	7.3 (2,160)	8.9 (444)	8.9 (2,220)	8.0 (5,256)
36-40	1.6 (93)	1.6 (465)	1.8 (89)	1.8 (445)	1.7 (1,092)
41+	0.8 (46)	0.8 (230)	0.7 (33)	0.7 (165)	0.7 (474)
Chronic Conditions - n (%)					
Asthma	0.4 (24)	0.7 (206)	0.3 (16)	0.4 (105)	0.5 (351)
Hypertension	0.2 (13)	0.4 (127)	0.5 (23)	0.6 (153)	0.5 (316)
Mental Health History - n (%)					

Yes	27.1 (1,609)	25.3 (7,505)	23.1 (1,151)	17.9 (4,459)	22.5 (14,724)
No	72.9 (4,332)	74.7 (22,200)	76.9 (3,833)	82.1 (20,461)	77.5 (50,826)
Rurality - n (%)					
Rural	2.9 (174)	2.9 (870)	2.1 (103)	2.1 (515)	2.5 (1,662)
Urban	97.1 (5,767)	97.1 (28,835)	97.9 (4,881)	97.9 (24,405)	97.46 (63,888)
Income Quintiles - n (%)					
1 (lowest)	13.8 (819)	13.8 (4,095)	14.8 (735)	14.8 (3,675)	14.2 (9,324)
2	16.7 (992)	16.7 (4,960)	16.8 (836)	16.8 (4,180)	16.7 (10,970)
3	17.6 (1,043)	17.6 (5,215)	18.9 (944)	18.9 (4,720)	18.2 (11,922)
4	18.7 (1,113)	18.7 (5,565)	17.3 (860)	17.3 (4,300)	18.1 (11,838)
5	32.0 (1,900)	32.0 (9,500)	31.3 (1,560)	31.3 (7,800)	31.7 (20,760)
6 (highest)	1.3 (74)	1.3 (370)	1.0 (49)	1.0 (245)	1.12(738)
Physician speciality					
Family medicine	37.8 (2,247)	n/a	28.8 (1,436)	n//a	5.6 (3,683)
Anaesthesia	2.0 (121)	n/a	3.0 (148)	n//a	0.4 (269)
Psychiatry	3.5 (210)	n/a	2.2 (108)	n//a	0.5 (318)
Surgery	6.6 (390)	n/a	10.2 (506)	n//a	1.4 (896)
Medicine	11.1 (659)	n/a	13.2 (656)	n//a	2.0 (1,315)
Radiology	0.8 (49)	n/a	2.6 (131)	n//a	0.3 (180)
Other	7.9 (469)	n/a	6.8 (337)	n//a	1.2 (806)
Missing	30.2 (1,796)	n/a	33.4 (1,662)	n//a	5.3 (3,458)
Medical School - n (%)					
Canadian	84.9 (5,045)	n/a	84.0 (4,185)	n/a	14.1 (9,230)
International	15.1 (896)	n/a	16.0 (799)	n/a	0.3 (1,695)

Abbreviations: (n) count, % Percentage, SD standard deviation.

*Data are reported as percentage (count) of individuals unless otherwise indicated.

*An income quintile of 1 is the lowest, and 5 is the highest.

*Characteristics of physicians were obtained at the time of first registration with the College of Physicians of Ontario (index date)

*Characteristics of nonphysicians were obtained at pseudo index dates (created and randomly assigned to nonphysicians to have the same distribution as physicians)

Table 2 - Comparison of Crude Rates and Adjusted Hazard Ratios for First Outpatient Mental Health Visits Among Physicians and Non- Physicians

	Female		Male	
	Physicians	**Nonphysicians (Ref)**	**Physicians**	**Nonphysicians (Ref)**
Population (n)	27,708	136,422	24,879	123,526
Person-time (years)	21,664.3	106,205.2	19,787.4	97915.1
Mental Health Visit	6,490	33,096	3,681	20,680
Crude %	23.4	24.3	14.8	16.7
Crude Rate (Per 100 person time)	30.0	31.2	18.6	21.1
Adjusted HR [95% CI]	0.89 (0.85 - 0.93)	ref	0.81 (0.76 - 0.85)	ref

a: Sum of the population of physicians and non-physicians for each year
b: Sum of the total amount of time (person-days) each physician and non-physicians was observed during the study.
c: First outcome event: after registering with CPSO or at Index date, first ever visit related to mental health. Sum of the first outcome events for female physicians and non-physicians for each year.
d: Crude%: (Total first outcome events / Total Population) * 100
e: Crude rate (per 100 people): (Total first outcome events. Total person time) * 100
f: Model was adjusted for chronic conditions (asthma, hypertension), and previous history of mental health visits.
* The population size here is larger compared to Table 1, this was because the participants were counted annually up until their first outpatient mental health visit occurred, leading to an increased population size.

Table 3- Adjusted outpatient mental health visits by previous mental health history comparing physicians and non-physicians

	Female Non-physicians – mental health visit (Ref)		**Female Physician – mental health visit**			**Male Non-physicians - mental health visit (Ref)**		**Male Physician - mental health visit**		
Previous mental health visit	First Mental Health Visit	No First Visit	First Mental Health Visit	No First Visit	Adjusted HR (95% CI)	First Mental Health Visit	No First Visit	First Mental Health Visit	No First Visit	Adjusted HR (95% CI)
Yes	8.4 (11,511)	9.5 (12,938)	8.2 (2,268)	12.8 (3,553)	0.79 (0.74 - 0.85)	5.0 (6138)	7.5 (9230)	5.7 (1,407)	12.5 (3105)	0.73 (0.67 - 0.80)
No	15.8 (21,585)	66.3 (90,388)	15.2 (4,222)	63.8 (17,665)	1.00 (0.94 - 1.06)	11.8 (14,542)	75.8 (93,616)	9.1 (2,274)	72.7 (18,093)	0.89 (0.83 – 1.00)

Abbreviation: n=count, %=percentage, HR=Hazard ratio, CI=Confidence Interval
*Model was adjusted for chronic conditions (asthma, and hypertension)

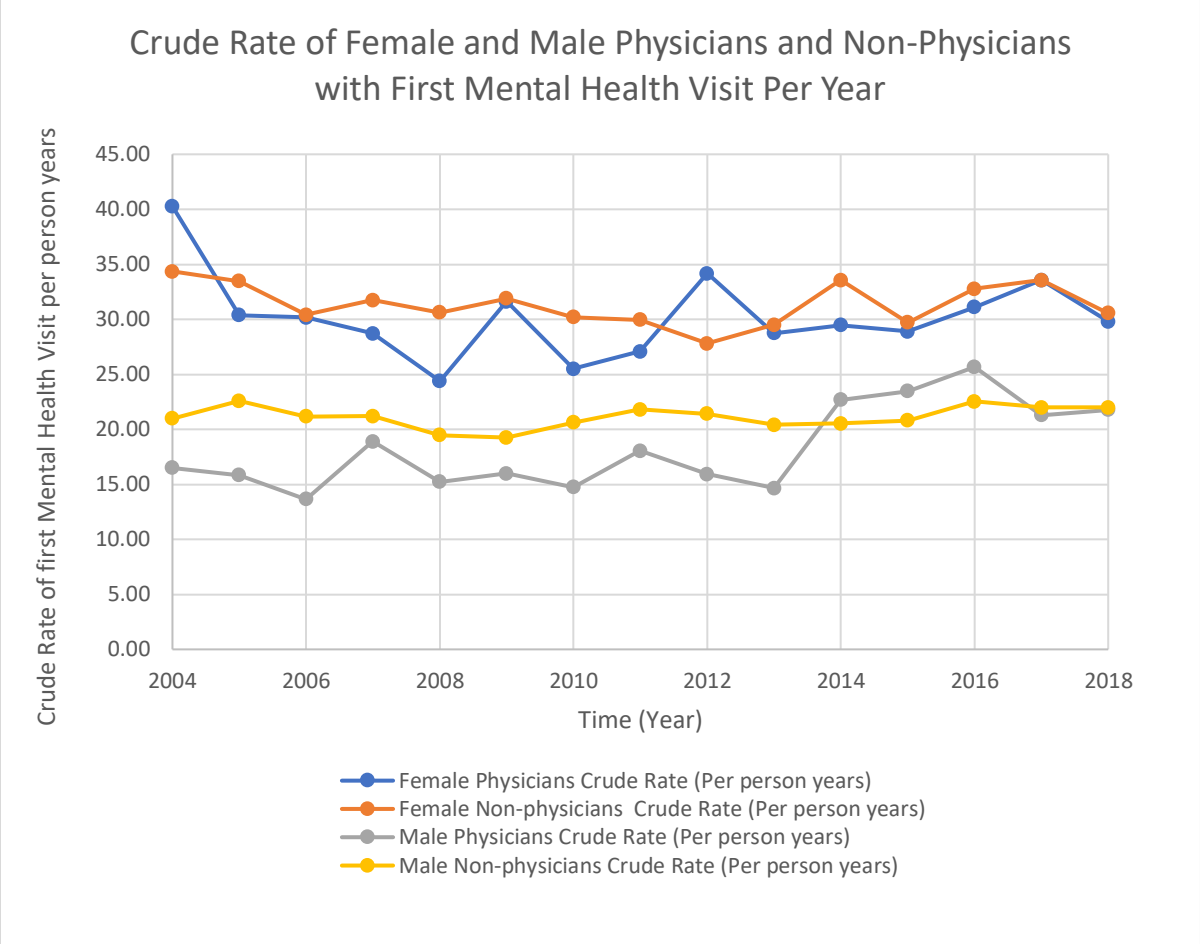


Figure 1 - Crude rate (per person years) of physicians and non-physicians by sex with first mental health visits in the past years

*Crude rate (per person years): (Total first outcome events/ Total person time) * 100

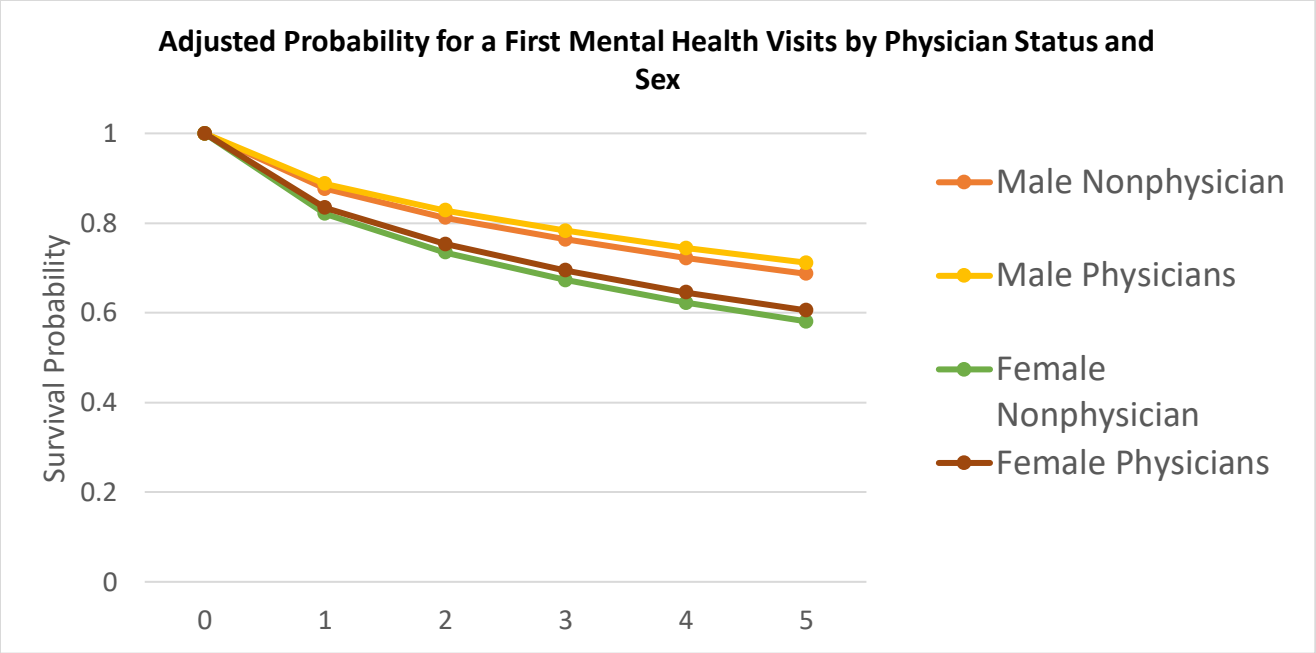


Figure 2 – Adjusted Probability for a First Mental Health Visits by Physician Status and Sex

The graph illustrates the survival probability over a 5-year period for mental health visits among physicians and non-physicians. The graph shows a steeper decline in survival probability for female non-physicians compared to other groups, suggesting that they have the highest cumulative risk of mental health visits over time. In contrast, male physicians show highest survival probability, suggesting a lower risk for mental health visits. This visual emphasizes that female non-physicians are at a greater risk for mental health visits compared to their physician and male counterparts.

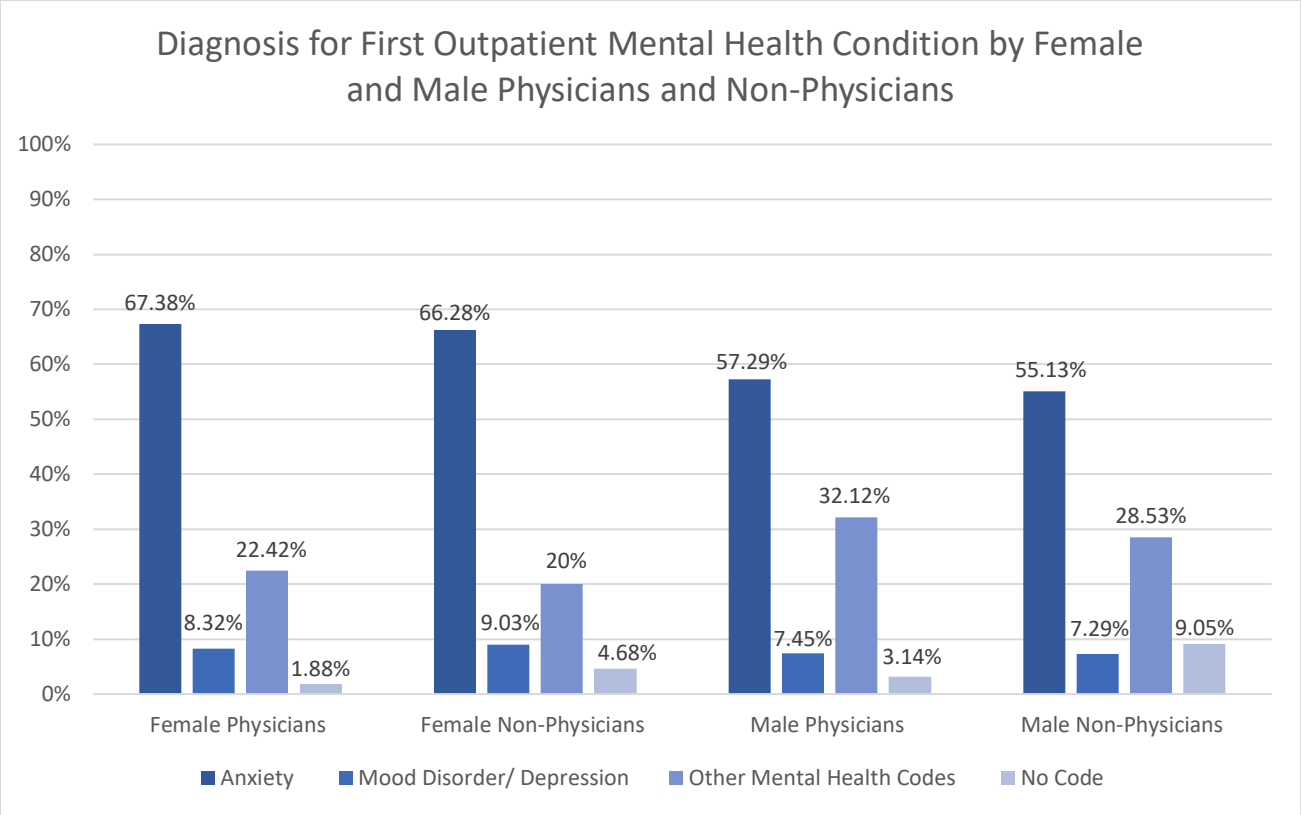


Figure 3 - Diagnosis for First Outpatient Mental Health Condition by Female and Male Physicians and Non-Physicians

5.12 Supplementary tables and figures

Table S5-1 - Adjusted outpatient mental health visits by previous mental health history comparing female and male physicians and non-physicians

	Female		Male		Total
	Physicians	**Nonphysicians**	**Physicians (REF)**	**Nonphysicians**	
Population (n)	27,708	136,422	24,879	123,526	164,130
Person-time (years)	21,664.3	106,205.2	19,787.4	97915.1	127,869.5
Mental Health Visit	6,490	33,096	3,681	20,680	39,586
Crude %	23.4	24.3	14.8	16.7	24.1
Crude Rate (Per 100 person time)	30.0	31.2	18.6	21.1	30.1
Adjusted HR [95% CI]	1.45 (1.36 - 1.55)	1.63 (1.54 - 1.72)	REF	1.22 (1.15 - 1.29)	n/a

Abbreviations: n: count, %: percentage, HR: Hazard ratio

a: Sum of the population of physicians and non-physicians for each year

b: Sum of the total amount of time (person-year) each physician and non-physicians was observed during the study.

c: First outcome event: after registering with CPSO or at Index date, first ever visit related to mental health. Sum of the first outcome events for physicians and non-physicians for each year.

d: Crude%: (Total first outcome events / Total Population) * 100

e: Crude rate (per 100 people): (Total first outcome events. Total person time) * 100

f: Model was adjusted for chronic conditions (asthma and hypertension), and previous history of mental health visits

* The population size here is larger compared to Table 1, this was because the participants were counted annually up until their first outpatient mental health visit occurred, leading to an increased population size.

Table S5-2: Adjusted outpatient mental health visits by previous mental health history comparing male and female physicians and non-physicians

	Male Physician (ref) - First Mental Health Visit			Male Non-physicians - First Mental Health Visit			Female Physician - First Mental Health Visit			Female Non-physicians - First Mental Health Visit		
Previous mental health visit	First Mental Health Visit	No First Visit	Adjusted HR (95% CI)	First Mental Health Visit	No First Visit	Adjusted HR (95% CI)	First Mental Health Visit	No First Visit	Adjusted HR (95% CI)	First Mental Health Visit	No First Visit	Adjusted HR (95% CI)
Yes	5.7 (1,407)	12.5 (3105)	Ref	5.0 (6138)	7.5 (9230)	1.38 (1.26 - 1.50)	8.2 (2,268)	12.8 (3,553)	1.24 (1.13 - 1.37)	8.4 (11,511)	9.5 (12,938)	1.57 (1.44 - 1.70)
No	9.1 (2,274)	72.7 (18,093)	Ref	11.8 (14,542)	75.8 (93,616)	1.12 (1.04 - 1.21)	15.2 (4,222)	63.8 (17,665)	1.65 (1.51 - 1.80)	15.8 (21,585)	66.3 (90,388)	1.65 (1.53 - 1.78)

Abbreviation: n=count, %=percentage, HR=Hazard ratio, CI=Confidence Interval
*Model was adjusted for chronic conditions (asthma, hypertension, diabetes)

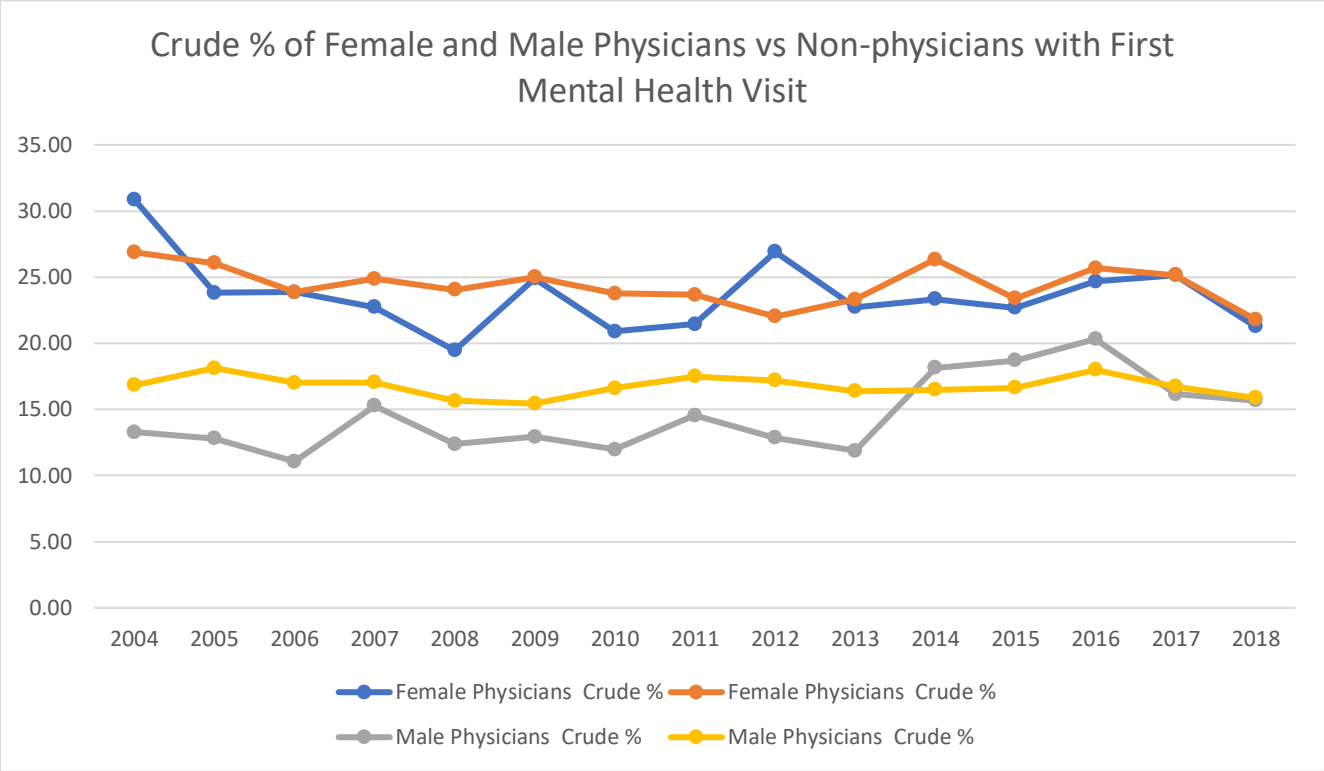
Table S5-3: Trends over time in mental health visits among early-career female physicians and female non-physicians

	Female Physicians					Female Gen Pop				
Year	Population (n)	Person Time-Years	First outcome event	Crude %	Crude Rate (Per 100 people)	Population	Person time - years	First Outcome event	Crude %	Crude Rate (Per 100 people)
2004	946	725.1	292	30.87	40.3	4997	3908.3	1343	26.88	34.4
2005	1339	1050.4	319	23.82	30.4	6575	5118.5	1713	26.05	33.5
2006	1387	1096.7	331	23.86	30.2	6730	5279.1	1606	23.86	30.4
2007	1545	1222.8	351	22.72	28.7	7479	5859.6	1860	24.87	31.7
2008	1639	1308.1	319	19.46	24.4	7752	6081.2	1863	24.03	30.6
2009	1718	1353.6	428	24.91	31.6	8537	6692.5	2134	25.00	31.9
2010	1859	1478.2	377	20.89	25.5	8969	7054.4	2131	23.76	30.2
2011	2093	1658.0	449	21.45	27.1	10437	8242.6	2469	23.66	30.0
2012	2225	1752.8	599	26.92	34.2	11104	8789.9	2445	22.02	27.8
2013	2477	1959.5	563	22.73	28.7	12168	9606.6	2835	23.30	29.5
2014	2309	1829.6	539	23.34	29.5	10974	8608.6	2889	26.33	33.6
2015	2196	1722.7	498	22.68	28.9	11157	8782.5	2610	23.39	29.7
2016	2095	1661.5	517	24.68	31.1	10151	7958.5	2608	25.69	32.8
2017	2140	1603.4	538	25.14	33.6	10824	8111.9	2722	25.15	33.6
2018	1740	1242.0	370	21.26	29.8	8568	6111.1	1868	21.80	30.6
Total	27708	21664.3	6490	23.42	30.0	136422	106205.2	33096	24.26	31.2

Table S5-4: Trends over time in mental health visits among early-career male physicians and male non-physicians

	Male Physicians					Male Gen Pop				
Year	Population	Person Time	First Outcome event	Crude %	Crude Rate (Per 100 people)	Population	Person Time	First Outcome event	Crude %	Crude Rate (Per 100 people)
2004	1093	878.0	145	13.3	16.5	5444	4371.1	917	16.8	21.0
2005	1101	890.7	141	12.8	15.8	5315	4263.7	963	18.1	22.6
2006	1275	1033.7	141	11.2	13.6	6154	4941.7	1046	17.0	21.2
2007	1296	1048.5	198	15.3	18.9	6220	4997.2	1059	17.0	21.2
2008	1366	1108.7	169	12.4	15.2	6545	5254.7	1024	15.7	19.5
2009	1640	1324.9	212	12.9	16.0	8003	6419.7	1236	15.4	19.3
2010	1847	1499.9	221	12.0	14.7	9073	7307.4	1506	16.6	20.6
2011	1720	1386.2	250	14.5	18.0	8549	6852.9	1495	17.5	21.8
2012	1914	1545.1	246	12.9	15.9	9401	7546.3	1616	17.2	21.4
2013	1954	1584.0	232	11.9	14.6	9431	7570.8	1545	16.4	20.4
2014	1994	1595.1	362	18.2	22.7	10107	8105.5	1665	16.5	20.5
2015	1945	1550.3	364	18.7	23.5	9928	7938.8	1651	16.6	20.8
2016	1988	1573.9	404	20.3	25.7	10211	8152.7	1837	18.0	22.5
2017	1825	1386.5	295	16.2	21.3	9295	7080.0	1556	16.7	22.0
2018	1921	1381.8	301	15.7	21.8	9852	7112.5	1564	15.9	22.0
Total	24879	19787.4	3681	14.8	18.6	123528	97915.1	20680	16.7	21.1

Figure S5-1 – Crude Percentage of Female and Male Physician and Non-physician Outpatient Mental Health Visit



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Chapter Six: General Discussion and Conclusions

Survey-based studies continue to report high levels of physician burnout and mental distress [1-5,10]. However, there remains a paucity of population-based research that measures mental health service utilization among early-career physicians. There is a lack of studies examining how female and male physicians differ in their use of mental health services during the early career stage. Additionally, while the mental health risks associated with the medical profession are well recognized, the extent to which these risks compare to those faced by the general population is still not well understood. This thesis aimed to further our understanding of physician mental health using large health administrative data to identify sex-based mental health visits among early career physicians in Ontario, Canada, and compare them to non-physicians in Ontario, Canada.

6.1 Main Findings

6.1.1 Objective 1: Mental Health Visit Among EC Physicians

Findings from objective 1 (chapter 4) showed that in Ontario, nearly 1 in 5 early career physicians (19.3%) had an outpatient visit for a mental health concern. We found that during the study period, female physicians had consistently higher risk of mental health visits when compared to male physicians. Regardless of previous mental health history, female physicians had a higher risk of mental health visits relative to male physicians. However, female physicians without a previous history of mental health, compared to female physicians with a previous mental health history, had a higher risk of mental health visits, suggesting that many of these cases represent new-onset conditions among early-career females. The utilization of mental

health services among female physicians was consistent across specialties, with the highest rates observed in surgery, internal medicine, and psychiatry.

6.1.2 Objective 2: Mental Health Visit Among EC Physicians Compared to Nonphysicians

After investigating mental health visits among early-career physicians and analyzing sex-based differences, we extended our comparison to examine mental health outcomes between physicians and the general population. While previous literature has emphasized a potential mental health crisis within the physician workforce, our findings indicated that physicians are at a lower risk for outpatient mental health visits compared to nonphysicians. Females, both physician and nonphysician, were at a higher risk of mental health visits compared to males, regardless of previous mental health history. However, female physicians and nonphysicians with no previous mental health history had a similar risk of mental health visits, suggesting a higher risk for de-novo mental health conditions in female physicians. Anxiety, mood disorders, and depression were the most prevalent mental health diagnoses among both physicians and the general population, with female physicians and female nonphysicians having higher rates of anxiety and mood disorders, including depression, compared to both male physicians and male nonphysicians. In contrast, both male physicians and male nonphysicians were more likely to be diagnosed with other mental health conditions.

6.2 Discussion of findings in context of previous knowledge

6.2.1 Trends of mental health service use

From 2004 to 2018, mental health visit rates among early-career physicians in Ontario show a relatively stable trajectory, with only subtle shifts over time (Figure 4.8). Throughout the study period, female physicians consistently exhibited higher crude rates of first mental health visits

compared to male physicians. This aligns with previous research indicating that female physicians may be at an increased risk for mental health challenges, potentially due to a combination of occupational stressors, work-life balance demands, and potential underreporting or lack of care-seeking behaviors among male physicians [2,34,47]. Notably, after 2013, there is a slight upward trend in mental health service utilization among male physicians. This may indicate that this rise reflects changing attitudes, with male physicians increasingly accessing mental health services, perhaps due to a growing awareness of mental health needs and an evolving openness within the medical community towards discussing and addressing mental health challenges. This trend underlines the need for continued action to reduce stigma and promote mental health care across the physician population. In comparison, mental health service use among the general population also appears largely stable over time. Male non-physicians had slightly higher rates of mental health visits compared to male physicians up until 2013; after 2013, male physicians' rate of mental health visits increased. The rates among female physicians and female non-physicians remain relatively comparable over time.

In contrast, recent systematic reviews indicate that over the past three decades, physicians have experienced a gradual increase in mental health challenges, with risk factors on the rise and protective factors diminishing [16]. Physicians' sense of control and autonomy has progressively declined due to growing administrative demands, inflexible scheduling, the burden of electronic health records, and increasing systemic constraints [16]. In the past year, there has been a surge in studies focusing on the mental health impact of COVID-19 on healthcare professionals [16,19,81-83]. Many of these studies report heightened mental health service utilization during and after the pandemic, as physicians on the front lines faced overwhelming patient loads, shortages of

personal protective equipment, and increased risk of infection [16,19,81-83]. Additionally, a recent study by our group reported a 27.0% increase in the crude annual rate of outpatient mental health and substance use visits by physicians between March 1, 2017, and March 9, 2021, corresponding to the shift from the pre-pandemic to the pandemic period. This increase remained significant at 13.0% when adjusted, highlighting the pandemic's substantial impact on physicians' mental health service utilization [19].

6.2.2 Previous mental health history

When comparing physicians with previous mental health history to those with no previous mental health history, we found that those with no previous mental health history (female physcians:15.2%; male physicians: 9.1%) had higher rates of outpatient mental health visits compared to those who had previous mental health history (female physicians: 8.2%; male physicians: 5.7%). This appears counterintuitive, as one might logically expect that physicians with a history of mental health visit would exhibit continued or even increased service use, reflecting a continued need for care [84]. However, this finding could indicate complex dynamics at play within this population. One possible explanation is that stigma surrounding mental health care within the medical field may still discourage ongoing treatment among physicians with known mental health issues [10]. These individuals may avoid seeking continued care to avoid being perceived as vulnerable or impaired by colleagues and supervisors, as they may fear that ongoing service use could negatively impact their career progression or reputation [10]. This stigma could lead them to adopt alternative strategies, such as self-management techniques or use privately paid services (counseling, psychologist, psychotherapy, etc.), to manage their mental health without engaging in outpatient mental health services [85]. In contrast, early-career physicians without a history of mental health challenges may be more inclined to seek support

when they encounter initial symptoms of distress. The high-stress environment of medical training and early practice, characterized by long working hours, academic pressure, and frequent examinations, may prompt these individuals to seek early intervention as they recognize the signs of burnout or other mental health challenges [16,31].

6.2.3 Physician health programs and policies

In response to the growing body of research on physician mental health, several medical organizations have advocated for and implemented initiatives to support physician wellbeing [16]. At the organizational level, there has been a recognition of systemic roots behind mental health challenges among physicians; however, despite this understanding, physician health initiatives mostly focus on individual-level interventions, primarily focusing on supporting distressed physicians through mental health resources and peer support programs [86]. The idea of taking care of yourself has become frustrating for physicians, as this approach fails to address the underlying problem within the practice environment, including excessive administrative burden and longer working hours [86]. Based on the Ontario College of Family Physicians 2023 survey, on average, family physicians spend 19.1 hours a week on administrative tasks [87]. Tait D. Shanafelt (2021) has introduced the concept of Physician Wellbeing 2.0, which emphasizes proactive, system-oriented interventions aimed at tackling the fundamental sources of occupational distress [86]. This framework involves prioritizing the wellbeing of physicians and cultivates an organizational culture that values effective leadership, professionalism, and teamwork, a culture that promotes self-compassion and growth mindset, open communication, creating sustainable workload and flexibility [86]. The 2021 CMA survey found that 75.0% of medical residents and 54.0% of practicing physicians said their current workplace offered wellness support [31]. However, 37.0% of medical residents and 47.0% of practicing physicians responded that they had not accessed

any wellness support or programs [31]. While most of the physicians had the knowledge of the mental health resources available at the workplace, a significant number of physicians had not utilized these services due to reasons such as not having time (75.0%), believing the situation was not serious (55.0%), feeling ashamed to seek help (47.0%), confidentiality (30.0%), and fearing of losing medical license and ability to practice (21.0%) were the several barrier that physicians cited with regards to not accessing mental health support [31].

6.3 Strengths

6.3.1 Large population-base study

We had a large sample size of physicians (>10,000) and matched the non-physician group for comparison (>50,000). Unlike previous studies, which have primarily relied on smaller, survey-based samples, our approach minimizes the limitations associated with self-reported data. Survey studies often face recruitment challenges due to physicians' demanding schedules and workload, which can restrict sample sizes. Additionally, self-reported surveys introduce the risk of response bias, as physicians may underreport mental health concerns due to concerns about stigma, job security, or licensure, contributing to social desirability bias. The large, population-based sample, allowed us to conduct sophisticated analyses of subgroups, maintaining sufficient statistical power and enhancing the generalizability of our findings to jurisdictions with comparable healthcare structures.

6.3.2 Health administrative data

Linked health administrative data enabled us to capture comprehensive records of all mental health visits for individuals eligible for healthcare in Ontario. This data source allows for the timely and systematic collection of information that is challenging to obtain through surveys or

other data collection methods. First, the administrative health records began in 1991, which provided a unique opportunity to investigate long-term trends in mental health across several decades. Second, the data are linkable, thus enabling us to assess a range of covariates, such as demographic factors, to enhance our understanding of participants' healthcare utilization patterns.

6.3.3 Study design

Our study was a retrospective population-based cohort study with a multicenter and longitudinal approach. It allowed us to analyze existing mental health-related health records over 14 years, thus enhancing the statistical power of our findings while reducing the resources and time usually needed by prospective studies. The study's retrospective nature mitigates potential biases in recruiting participants because it includes all eligible individuals in the defined cohort, thereby offering a better sample representation.

6.4 Limitation

Along with strengths, there are some limitations that are important to take into consideration.

6.4.1 Outcome Underreported

The outpatient mental health visits data was captured through OHIP billing. Due to confidentiality concerns or stigma associated with mental health within the profession, many physicians may receive care through alternative pathways, such as self-care management, hallway medicine, and privately paid services (counseling, psychotherapy, etc.). Therefore, our outcomes may be underreported.

6.4.2 Exclusion criteria

Our physician cohort was limited to early-career physicians. To increase the reliability that these physicians were truly early careers, we excluded those whose first-ever registration was not within one year of medical school graduation. This approach aimed to minimize the possibility of including mid- or late-career physicians who may have transferred to Ontario from other regions. However, this criterion would have excluded individuals who may have delayed CPSO registration to obtain additional training during that period (e.g., research).

6.4.3 Differentiating resident and newly practicing physicians

Previous research indicates that both resident and early-career physicians face a heightened risk of mental health challenges compared to middle or late-career physicians [37]. However, our study was unable to differentiate between residents and early-career physicians. As career stages were defined solely by medical school graduation dates, we could not determine whether individuals in the first five years of practice had completed two years of family medicine and transitioned to an early career or were continuing their training/residency.

6.4.4 Mental health codes/ severity

In the physician population, the diagnostic and billing code used to identify mental health visits is not validated in Ontario; as such, mental health-related visits may be inaccurately coded, potentially influenced by stigma and discrimination from regulatory bodies. Furthermore, the severity of mental illness cannot be inferred from mental health visits alone.

6.4.5 Residual confounding

Although we controlled for key variables such as age, chronic illness, previous mental health history, neighbourhood income, neighbourhood rurality, speciality, medical school location, other unmeasured confounders may still exist between males and females, as well as between physicians and non-physicians, which could influence our findings.

6.4.6 Sex vs Gender

We acknowledge that mental health differences between women and men physicians are predominantly influenced by gender-based socially constructed roles rather than sex-based [18]. However, due to the unavailability of gender variables in ICES, we resorted to using sex as a proxy for gender.

6.5 Implication for public health and future studies

This thesis research aligns with previous findings that early career is a critical period for physicians, with female physicians at higher risk when compared to male physicians. However, our results add new aspects by showing that physicians are not alone in their mental health crises; similar problems are also visible in the general population.

Each objective's policy and practical implications have been examined within the respective papers. This section will focus on actionable recommendations for transforming health systems, policies, and practices to better support the mental health and well-being of physicians and non-physicians. Both physicians and non-physicians face an array of stressors contributing to a broader mental health crisis. While understudied physician mental health has the potential to impact patient (non-physician) mental health [88]. Mental health challenges among physicians can

undermine their capacity to maintain focus and actively engage with patients, and can increase absenteeism, limiting their ability to provide consistent care and potentially disrupting patient services [88].

As absenteeism rises and the shortage of primary care physicians grows, the detrimental effects on patient mental health care become increasingly evident, given that family doctors often serve as the first point of contact for individuals experiencing mental illness [89]. Efforts to improve access to mental health care for common disorders must focus on equipping physicians with the ability to recognize mental illness in patients and provide appropriate referrals [90]. However, if physicians experience stigma or do not seek mental health services themselves, it can adversely affect their capacity to treat their patients effectively [88,90]. Therefore, the system needs to recognize prioritizing physicians' mental well-being as this will foster their motivation and commitment to delivering patient-centered care.

Canadian pioneers in physician health care have developed programs and policies aimed at educating physicians on how to navigate the unique challenges they encounter [22]. Nevertheless, it is crucial to identify the critical barriers within organizations that can be effectively addressed and transformed [22,91]. Organizations must recognize the occupational factors contributing to physicians' mental health concerns [91,92]. By implementing meaningful changes in areas such as flexibility, support from supervisor, community at work, and the sense of meaning in their roles, organizations can significantly enhance the work environment [91,92]. This includes reducing clerical burdens, addressing workload issues, and fostering a culture that aligns with physicians' values [91,92.]

Our research has provided foundational insights into the mental well-being of physicians and has served as a starting point for future investigations. Future studies should investigate the reasons behind this higher rate of mental health issues in female physicians compared to male physicians. In addition, it is also worthy to explore the influence of physician mental well-being on patient outcomes, especially whether physicians who perceive mental health as stigmatizing are more or less likely to refer their patients to mental health services. Furthermore, future studies should identify existing interventions, programs, and policies aiming at enhancing physicians' mental well-being and appraise their effectiveness.

6.6 Conclusion

In our population-level cohort study of 10,925 early-career physicians, we found that about one in five had a healthcare visit with a diagnosis for a mental health condition, with female physicians showing consistently higher rates compared to their male counterparts. Interestingly, early-career physicians demonstrated lower rates of outpatient mental health visits overall than matched nonphysicians. This pattern was stable across analyses stratified by sex. With the given vulnerability of early-career physicians, especially regarding mental health, it is crucial to implement adequate screening and support programs focused to their needs. Future research ought to investigate the reasons underlying the observed lower visit rates, including whether they reflect actual differences in the prevalence of mental health visits or are influenced by factors such as stigma, barriers to access, or the unique pressures of a medical career. Also, interventions must focus on creating accessible support programs to enhance the wellbeing of all residents, more so for subgroups at a higher risk.

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Supplementary Material

Table S-1: Probabilistic linkage of Ontario Physicians Health Study (CPSO Data) to the Ontario Registered Persons Database

Pass	Block	Match Type	No. of Matches
1	Surname + Given Name + DOB† + Gender	Deterministic	41553
2	First Initial of Surname + First Initial of Given Name + DOB† + Gender	Probabilistic	2177
3	DOB† + Gender	Probabilistic	1682
4	First Initial of Surname + First Initial of Given Name + Birth Year + Gender	Probabilistic	175
5	First Initial of Surname + First Initial of Given Name + Birth Month + Birth Day + Gender	Probabilistic	60
6	NYSIIS‡ (surname) + Birth Year	Probabilistic	970
7	Birth Month + Birth Day + First 3 Initials of Surname + Gender	Probabilistic	6
Total			46623

†Date of birth, ‡ Phonetic encoding of surname

The multi-pass linkage matched 46623 of 55537 records (83.6%) to the Ontario RPDB. The first blocking scheme used exact (deterministic) matching. Subsequent passes (up until pass 7) utilized a probabilistic blocking scheme, which generated both matched pairs and a grey area of possible matched pairs. The results, broken down bypass number, are described in table 1 below. Final matched pair total: n=46623 records with Health Card Number (including dups).

Physician Linkage between CPSO and ICES: Physicians were linked to health care visits using unique, encoded identifiers from the CPSO. Deterministic followed by probabilistic linkage (based on name, date of birth, and sex) was performed by a small, specialized group at ICES (formerly known as the Institute for Clinical and Evaluative Sciences). All identifying

information was removed before data were sent to the study team. This is done to mitigate any privacy breaches. ICES is an independent, non-profit research institute that houses routinely collected health data from Ontario's publicly funded health care system. ICES is a prescribed entity under section 45 of Ontario's Personal Health Information Protection Act. Section 45 authorizes ICES to collect personal health information, without consent, for the purpose of health system evaluation and improvement. Projects conducted under section 45, by definition, do not require review by a specific institutional research ethics board. This project was conducted under section 45 and approved by ICES's Privacy and Legal Office.

Table S-2: List of All Physician Specialities.

Study Specialty Groups *	**CPSO Specialties**
Family Medicine	'CCFP - Family Medicine', 'CCFP- Family Medicine (Emergency Medicine)', 'CPSO – Family Medicine', 'RCPSC - geriatric medicine
General Internal Medicine and Medicine Specialties**	'NO CERT - Maternal-Fetal Medicine', 'RCPSC - Cardiology', 'RCPSC - Clinical immunology and Allergy', 'RCPSC - critical care medicine', 'RCPSC - endocrinology and metabolism', 'RCPSC - gastroenterology', 'RCPSC - General internal medicine', 'RCPSC - gynecological reproductive endocrinology and infertility', 'RCPSC - hematology', 'RCPSC - infectious diseases', 'RCPSC - internal medicine', 'Rasps - medical microbiology', 'RCPSC - medical oncology', 'RCPSC - nephrology', 'RCPSC - neurology', 'RCPSC - respirology', 'RCPSC - hematology'
Surgery	'CPSO - Obstetrics and Gynaecology', 'RCPSC - Cardiac surgery', 'RCPSC - Colorectal Surgery', 'RCPSC - General Surgery', 'RCPSC - General Surgical Oncology', 'RCPSC – Gynecologic Oncology', 'RCPSC- Neurosurgery', 'RCPSC - Obstetrics and Gynecology', 'RCPSC - Ophthalmology', 'RCPSC - Orthopedic Surgery', 'RCPSC - Otolaryngology - head and neck surgery', 'RCPSC- Plastic Surgery', 'RCPSC - Urology', 'RCPSC - Vascular Surgery'
Psychiatry	'CPSO - Psychiatry', 'RCPSC - Child and adolescent psychiatry', 'RCPSC - Forensic psychiatry', 'RCPSC - geriatric psychiatry', 'RCPSC - Psychiatry'
Anesthesiology	CPSO - Anesthesiology, RCPSC - Anesthesiology
Radiology	'RCPSC - diagnostic radiology', 'RCPSC - neuroradiology'
Other	FRCPC – FRCPC, FRCPC – FRCPC(MSC), FRCSC, OTHER PGT – Pediatric Emergency medicine, RCPSC – Adolescent Medicine, RCPSC – Anatomical

	Pathology, RCPSC – Clinical Pharmacology and Toxicology, RCPSC – Community Medicine, RCPSC – Dermatology, RCPSC – Developmental pediatrics, RCPSC – Emergency Medicine, RCPSC- Forensic Pathology, RCPSC – General Pathology, RCPSC – Hematological Pathology, RCPSC – Medical Biochemistry, RCPSC – Medical Genetics, RCPSC – Neonatal-Perinatal Medicine, RCPSC – Neuropathology, RCPSC – Nuclear-Medicine, RCPSC – Pediatric Emergency Medicine, RCPSC – Paediatric Haematology/ Oncology, RCPSC – Physical Medicine and Rehabilitation, RCPSC – Public health and Preventive Medicine, RCPSC – Radiation Oncology

* Note: The trainee/recent graduate group was defined as CPSO registrants with missing specialty information, where the year of graduation from medical school was between 2013 and 2018.

Table S-3: Data sources for each variable

Database	Description	Variables
College of Physicians and Surgeons of Ontario (CPSO)	Regulatory college for the medical profession. Physicians must register and renew their membership yearly in order to practice in Ontario.	• Specialty • Medical school location • Graduation year
Discharge Abstract Database (DAD)	Administrative, clinical, and demographic data on all hospital discharges in Ontario.	• Previous mental health history • Mental health conditions
ICES Physicians Database (IPDB)	Comprises information from the Ontario Health Insurance Plan (OHIP), Corporate Provider Database (CPDB), the Ontario Physician Human Resource Data Centre (OPHRDC) database, and the OHIP database of physician billings. The CPDB contains information on physician demographics, specialty training and practice location. The data in the CPDB is validated against the OPHRDC database, which verifies physician specialty and practice location information through	• Specialty

	periodic telephone interviews with physicians.	
Ontario Health Insurance Plan (OHIP) Claims Database	Physician billings: Claims for physicians in Ontario – includes claims in both inpatient and outpatient settings. Non-physician billings: Health professionals for provincial insured services, such as select midwives, oral surgeons, chiropractors, optometrists, and physiotherapists. Some care may occur for inpatients. Laboratory: Outpatient laboratory services. Does not include laboratory services for inpatients.	• Outpatient mental health visits
Ontario Mental Health Reporting System (OMHRS)	The Ontario Mental Health Reporting System (OMHRS) analyzes and reports on information submitted to CIHI about all individuals receiving adult mental health services in Ontario, as well as some individuals receiving services in youth inpatient beds and selected facilities in other provinces. OMHRS includes information about mental and physical health, social supports and service use, as well as care planning, outcome measurement, quality improvement and case-mix funding applications.	• Previous mental health history • Mental health conditions

Registered Persons Database (RPDB)	Data on individuals registered under OHIP and who are eligible for the Ontario Drug Program.	• Age • Sex • Rurality • Income status
The National Ambulatory Care Reporting System (NACRS)	Data on hospital-based and community-based ambulatory care including: day surgery, outpatient and community-based clinics, emergency departments	• Previous mental health history • Mental health conditions
ASTHMA	Ontario Asthma dataset	• Asthma
HYPER	Ontario Hypertension dataset	• Hypertension