Examining access to primary care on Prince Edward Island

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Thesis submitted to the University of Ottawa
in partial fulfillment of the requirements for the degree of
Master of Science in Epidemiology

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Preface

This thesis was undertaken by Alyson MacCormack (AM) as part of the requirements for the Master of Science in Epidemiology degree at the University of Ottawa. Dr. Lise M. Bjerre (LB) was the supervisor for this thesis and thus oversaw the author's work and provided critical methodological guidance and feedback from study conception to completion. Cayden Peixoto (CP) was also a co-author on the scoping review manuscript. Author contributions are described in detail in the preface of each manuscript.

Manuscript 1

Title: Examining access to primary care on Prince Edward Island: A scoping review

Authors: Alyson MacCormack, Cayden Peixoto, Steven Hawken, and Dr. Lise M. Bjerre

Author Contributions: AM, LB, and SH contributed to the study conception and design. AM, CP, and LB conducted screening. AM conducted the data extraction and charting. AM drafted the manuscript which was reviewed by LB, CP and SH.

Required Approvals: None.

Publication: This manuscript has not yet been submitted for publication.

Funding Sources: AM received scholarships from the Canadian Institute for Health Research (Canadian Graduate Student – Master's scholarship) and from the Institut du Savoir Montfort (Master's Scholarship) to conduct this research.

Manuscript 2

Title: Examining the association between having a primary care provider and non-urgent visits to the emergency department on Prince Edward Island: A retrospective, population-based, cross-sectional study

Authors: Alyson MacCormack, Steven Hawken, and Dr. Lise M. Bjerre

Author Contributions: AM, LB, and SH contributed to the study conception and design. AM conducted the statistical analysis. AM and LB contributed to data interpretation. AM drafted the manuscript which was revised by LB and reviewed by SH.

Required Approvals: Ethics approval was obtained from the Montfort Hospital Research Ethics Board (23-24-04-003) and the University of Ottawa Office of Research Ethics and Integrity (H-07-23-9307).

Publication: This manuscript has not yet been submitted for publication.

Funding Sources: AM received scholarships from the Canadian Institute for Health Research (the Canadian Graduate Student – Master's scholarship) and from the Institut du Savoir Montfort (Master's Scholarship) to conduct this research. AM also received the data used to conduct this research free of charge from the Canadian Institute for Health Information (CIHI) via their Graduate Student Data Access Program.

Thesis Abstract

Introduction: Access to primary care on Prince Edward Island (PEI) is declining and primary care research on PEI is limited.

Objective: To describe the state of knowledge on primary care access on PEI and to analyze the impact of access on emergency department (ED) visit acuity.

Methods: We described the published knowledge on access to primary care on PEI using a scoping review. We analyzed the association between primary care access and ED visit acuity using a cross-sectional study of the National Ambulatory Care Reporting System database.

Results: Published literature on access to primary care on PEI is limited. Patients with access to primary care on PEI were less likely to visit the ED for non-urgent reasons compared to patients with no access to primary care.

Conclusion: Our findings demonstrate the need for increased research on access to primary care on PEI as limited access negatively impacts ED services.

(Word limit = **150**; Word count = **149**)

Acknowledgements

I would like to thank my supervisor, Dr. Lise Bjerre, for her unwavering support, patience, and encouragement as I conducted this research. I am so grateful for your mentorship and guidance throughout this process. Thank you to my thesis advisory committee member, Dr. Steven Hawken, for his support, feedback, and guidance. Thank you also to the members of Dr. Bjerre's research team, especially Cayden Peixoto, for their support and expert guidance. I have learned so much from being a part of the research team and am incredibly appreciative of the mentorship I have received.

Thank you to Mary-Ann Standing for providing her PEI health research expertise and to the University of Ottawa Epidemiology and Public Health Librarian, Peter Farrell, for his help with creating the search strategy for my scoping review. Thank you also to the Canadian Institute for Health Research and the Institut du Savoir Montfort for their financial support in the form of scholarships and the Canadian Institute for Health Information for their financial support in the form of data for one of my manuscripts.

Finally, I would like to thank my family and friends for their unwavering support, understanding, and offerings of laughter, snacks, and coffee during this process. I am truly grateful to have so many incredible people in my life. Most importantly, I would like to thank my Mom for her constant encouragement, love, and support. I dedicate this thesis to you.

Chapter 1: Thesis Introduction and Overview

1.1 Background

Prince Edward Island (PEI) is the smallest province in Canada, both geographically and demographically, with an area of 5,660 km^2 and a population of 176,113 as of April 2023 (PEI Statistics Bureau, 2023). Like much of Canada, PEI is currently challenged with providing access to primary care to a growing population while simultaneously experiencing a physician shortage. PEI's physician shortage is the result of a combination of factors, including the more rural and isolated nature of PEI relative to other provinces and the challenges this creates in attracting and retaining physicians (Canadian Medical Association, 2020). Another factor contributing to the physician shortage on PEI and across Canada is the strain that COVID-19 has placed on the healthcare system. The 2021 Canadian Survey on Health Care Workers' Experiences During the Pandemic found that approximately 47% of physicians with less than five years of experience and 27% of physicians with more than five years of experience intend to leave or change their job in the next three years (Government of Canada & Statistics Canada, 2022a).

According to the Canadian Community Health Survey (CCHS), 19% of PEI residents, or Islanders, were without access to a regular healthcare provider in 2021 (Canadian Institute for Health Information, 2023). This is an increase of 4% from 2019 and another 4% from 2015 (Government of Canada & Statistics Canada, 2020). Compared with the rest of Canada, only the Northwest Territories (48%) and Nunavut (76%) have more individuals without access to a regular healthcare provider than PEI (Canadian Institute for Health Information, 2023). As of March 4th, 2024, 21% of Islanders were registered for the PEI Patient Registry, a waiting list for

unattached patients wishing to find a new family doctor or nurse practitioner (Health PEI, 2024). Similar to the CCHS data, the number of patients registered on the Patient Registry per year suggests that Islanders have been increasingly struggling to access primary care on PEI since 2017 (**Figure 1.1**). However, there was a stabilization in the number of patients on the Patient Registry between 2020 and 2021 potentially due to the COVID-19 pandemic.

The Patient Registry data only show the number of patients on the registry and not the length of time these patients have been on the registry. To provide an example of the experience of one Islander on the registry, the Canadian Broadcasting Corporation (CBC) reported that the Islander and her husband have been on the Patient Registry for the past two years (Brun, 2024). Without access to a primary care provider, they and their three young children must rely solely on emergency departments (ED) on PEI for conditions they could otherwise seek treatment for in a primary care setting (Brun, 2024).

In addition to interprovincial differences in access to primary care, evidence suggests that disparities in access to primary care exist within the province of PEI. The PEI Chief Public Health Officer (CPHO) 2021 report found differences in access to primary care across the province as well as differences in health status between types of population centers (rural, small centers, and medium centers) (Morrison et al., 2021). For example, survey responses indicating excellent or very good general health were the lowest among respondents from small centers (55.2%) and highest among respondents from medium centers (66.9%). However, the CPHO 2021 report indicates that the "type of population center" may not be an accurate method of quantifying geographic disparities on PEI. Instead, the report recommends dividing the island into regions to better understand where access to health care is of greatest concern for PEI.

Dividing PEI into regions to examine discrepancies in access to health care would be particularly relevant because of its high heterogeneity in terms of population density. For instance, considering the population densities of the three main census divisions of PEI (**Figure 1.2**), the center of the province (Queens County) has a higher population density of 45.2 people per km^2 than both the western (Prince County) and eastern (Kings County) ends of the province which have population densities of 23.0 people per km^2 and 10.9 people per km^2, respectively (Government of Canada & Statistics Canada, 2022b). Access to primary care could be considerably different for individuals in each of the three counties despite some population centers in these regions being combined when we analyze discrepancies in access to primary care according to "type of population center."

Understanding the landscape of access to primary care on Prince Edward Island is important as a lack of access to a primary care provider can lead to increased pressures on many areas of the healthcare system. Ionescu-Ittu et al. (2007) found that increased ED use in Quebec was associated with a lack of access to a primary care provider or reduced continuity of care with primary care providers, and with residing in rural areas. Similarly, Moineddin et al. (2011) found that the odds of having a non-urgent ED visit in Ontario were greater among those who did not have regular access to a primary care provider and among those who lived in rural areas. On PEI, where a high percentage of Islanders are without access to primary care and where a high percentage of Islanders also reside in rural areas, it is unclear to what extent lack of access to primary care increases the use of EDs.

The significance of my thesis research is two-fold: it provides a much-needed evidence-based description of access to primary care on PEI, and, to my knowledge, it provides a first analysis of the association between access to primary care and urgent health services use (ED

visits) on PEI. A review of nursing roles and resources within primary care in Atlantic Canada revealed that compared with other Atlantic provinces, PEI is relatively underrepresented in the literature, perhaps due to its small population and more isolated geography (Curnew & Lukewich, 2018). Additionally, there is only one university on PEI, which might correlate with a small number of researchers interested and able to do this type of research on PEI. Therefore, my thesis research will demonstrate the feasibility of and provide a framework for conducting primary care access research on PEI given the available data.

1.2 Primary Research Objectives

The primary objective of this thesis was to improve our understanding of primary care access on PEI and contribute to filling gaps in the current literature. Specifically, I sought to:

(1) Describe the current state of knowledge on access to primary care on PEI.
(2) Analyze the impact of primary care access on the severity of ED visits on PEI by comparing ED visit acuity for those with primary care access to those without.

1.3 Overview of Thesis and Included Manuscripts

Chapter 2: Literature Review

This chapter outlines the current state of the literature on access to primary care and the association between access to primary care and ED service use. I present a balanced overview of the factors associated with primary care and the use of ED services. I then used the confounding variables identified in this review to inform variable selection for the logistic regression analysis conducted in Chapter 4.

Chapter 3: Examining access to primary care on Prince Edward Island: A scoping review

This chapter characterizes the current state of the literature on access to primary care on PEI. I conduct a scoping review to identify and summarize the published literature on access to primary care on PEI and identify gaps in the literature to direct future research efforts.

Chapter 4: Examining the association between having primary care access and non-urgent visits to the emergency department on Prince Edward Island: A retrospective, population-based, cross-sectional study

This chapter examines how having primary care access impacts ED visit acuity on PEI. I conducted a retrospective, cross-sectional analysis of the National Ambulatory Care Reporting System (NACRS) database to develop a multivariable logistic regression model of the association between access to primary care and ED visit acuity among ED visitors on PEI.

Chapter 5: Discussion

This chapter summarizes the thesis and integrates key findings from both included manuscripts. I also outline the next steps for future research.

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PEI Statistics Bureau. (2023). PEI Population Report Quarterly. https://www.princeedwardisland.ca/en/information/finance/pei-population-report-quarterly

1.4 Figures

Figure 1.1. Number (No.) of patients on the PEI Patient Registry per year. Data provided by Health PEI on February 9th, 2024, in response to an Access to Information and Privacy (ATIP) request via the Canadian *Access to Information Act* made on January 22nd, 2024.

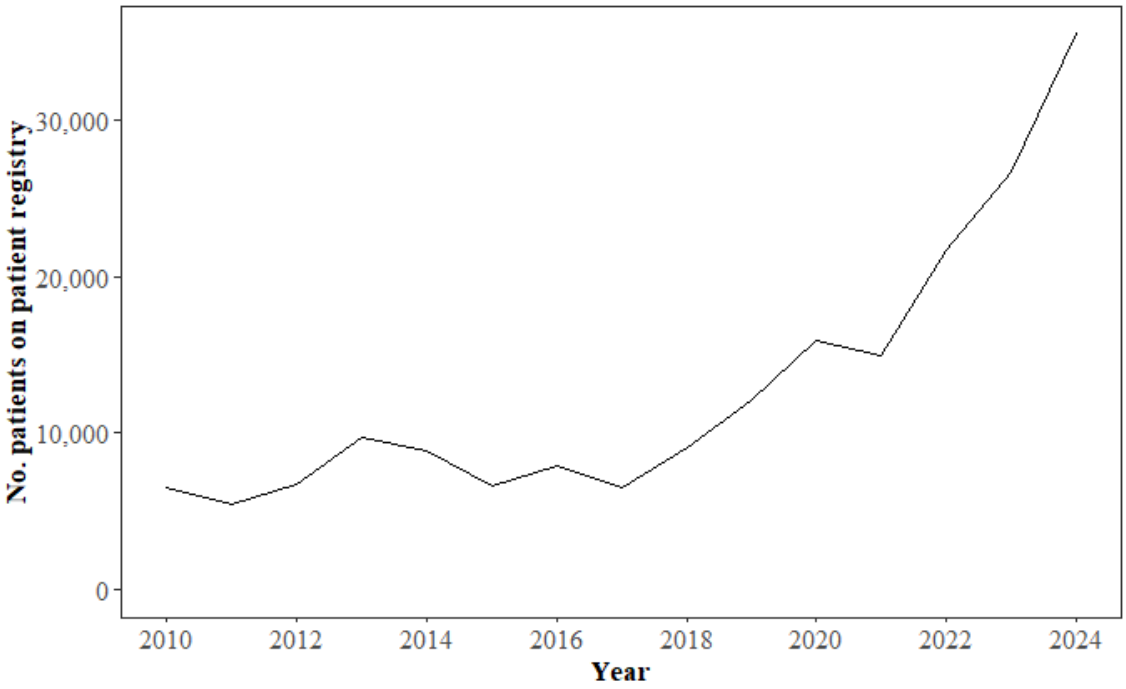
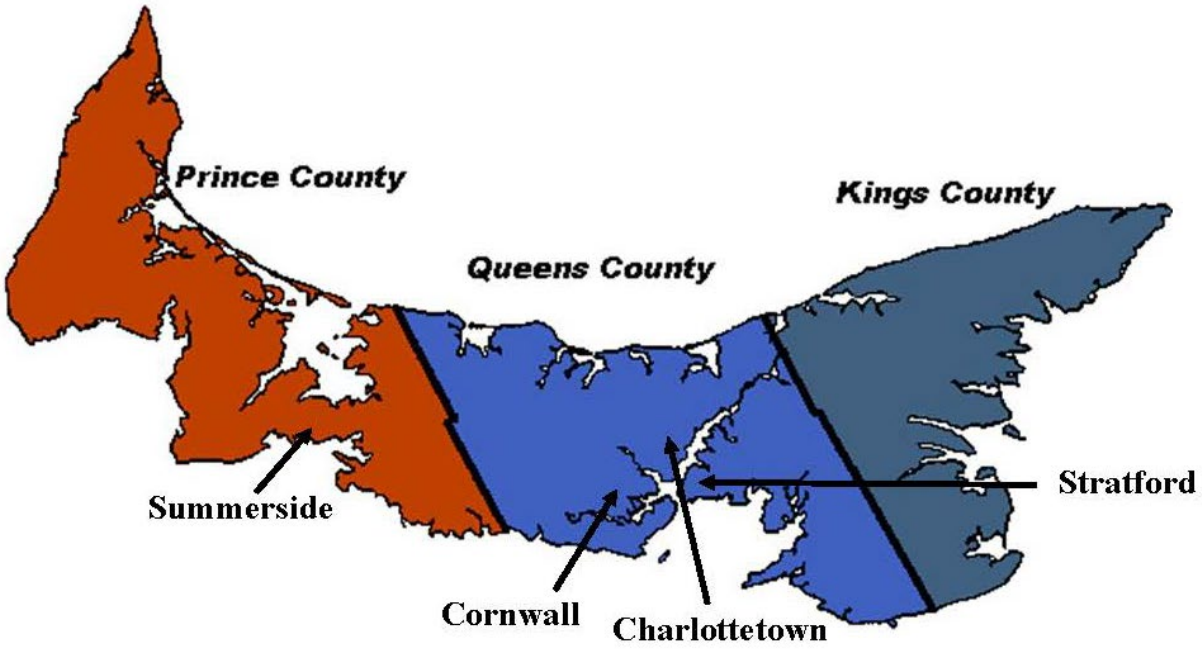


Figure 1.2. Map of Prince Edward Island divided into its three main census divisions (counties). The four census subdivisions with a population of 5,000-plus on PEI are also included. http://www.gov.pe.ca/propertycharges/



Chapter 2: Literature Review

2.1 Introduction: Definition and importance of primary care

Primary care serves as a patient's point of entry into Canada's healthcare system and high-performing primary care is associated with improved equity, efficiency, cost-effectiveness, and health outcomes (Aggarwal & Hutchison, 2021; Shi, 2012). Primary care's significance lies in its capacity to provide comprehensive, accessible, and continuous care to individuals across the lifespan. By focusing on prevention, early detection, and management of health issues, good access to primary care not only improves health outcomes and contributes to healthier populations but also reduces healthcare costs by averting unnecessary hospitalizations and emergency department visits. Overall, primary care forms the foundation of a robust and effective healthcare system, promoting health equity, accessibility, and quality of care for all individuals (World Health Organization, 2023).

The World Health Organization (WHO) and the United Nations International Children's Emergency Fund (UNICEF) define primary care as "a whole-of-society approach to health that aims at ensuring the highest possible level of health and well-being and their equitable distribution by focusing on people's needs and as early as possible along the continuum from health promotion and disease prevention to treatment, rehabilitation and palliative care, and as close as feasible to people's everyday environment" (WHO & UNICEF, 2018). Vanselow et al. (1995) further characterize primary care as a multidimensional practice in which clinicians are responsible for managing their patients' physical, mental, emotional, and social needs. Understanding access to primary care services and the equitability of that access is important for understanding relative disparities in health outcomes and the overall well-being of population groups.

2.2 Access to primary care

According to the 2019-2021 Canadian Community Health Surveys, 14.5% of Canadians reported being without a regular healthcare provider (Government of Canada & Statistics Canada, 2020). A study of seven Commonwealth countries found that compared with Australia, Germany, the Netherlands, New Zealand, and the United Kingdom, Canada and the United States' primary care systems are overburdened (Schoen et al., 2007). Canadian and American respondents were the least likely to report same-day access to care and the most likely to report long wait times, to have gone to an ED, and to have gone to an ED for the care they could have received from their regular healthcare provider if they were available (Schoen et al., 2007). Additionally, compared to all studied countries except the United States, income inequities were only significant in Canada where high-income adults were more likely to have a consistent primary care provider than low-income adults (Schoen et al., 2007). These findings demonstrate that despite Canada's public healthcare system in which Canadians have reasonable access to necessary healthcare services regardless of their ability to pay, income and other socioeconomic-related disparities exist in Canada.

In 1978, Andersen and Aday proposed a framework for understanding access to care and equity of access to care in the United States (1978). Their framework suggests that the utilization of healthcare services by individuals is influenced by variables that are "mutable," or able to be altered and variables that are "immutable," or unable to be altered (Andersen & Aday, 1978). Mutable variables are generally "enabling variables" which include factors such as income, geographic residence, regular primary care provider, health insurance, and availability of health services (Andersen & Aday, 1978). After revisiting the framework in 1995, Andersen defined "potential access" to be the presence and extent of enabling variables (1995). Immutable

variables are “predisposing variables” which include factors such as age, sex, race, and ethnicity (Anderson & Aday, 1978). Healthcare utilization is also influenced by “need” which can be both self-perceived and physician-evaluated (Andersen & Aday, 1978). When these variables are included in a model to assess access to care, equity can be measured according to the relative weights of the determinants of access (Andersen & Aday, 1978). For example, if access to care is explained by race or income, this would be an indication of inequitable access.

2.3 Access to primary care and emergency department use

The ED serves as a “safety net” for patients who are not able to find care elsewhere, especially in the case of vulnerable and marginalized patients (Richardson & Hwang, 2001). Without accessible primary care services, patients may choose to visit the ED for care because it is open 24 hours per day, seven days per week and offers a diverse range of healthcare services, both urgent and non-urgent (Richardson & Hwang, 2001). Thus, patients without a primary care provider or patients with a primary care provider who is inaccessible because of factors such as long wait times for an appointment, lack of evening and weekend hours, or distance to their provider might choose to use the ED as their source of primary care. However, despite the ED being a source of care, it does not provide a continuous source of care where follow-up appointments can be made or where preventive care will be regularly discussed and encouraged. Thus, patients using the ED as a source of primary care might then have an increased risk of developing chronic conditions such as diabetes and cardiovascular disease compared to patients with a designated, accessible, and continuous primary care provider.

A 2014 Canadian Institute for Health Information (CIHI) report found that one in five Canadian ED visits were low acuity and would have been more appropriately treated in a primary care setting (Canadian Institute for Health Information, 2014). Many studies have found

an association between primary care access and ED utilization (Cowling et al., 2013; Fung et al., 2015; Glazier et al., 2008; Haddy, 1987; Hirello et al., 2022; Ionescu-Ittu et al., 2007; Khan et al., 2011; Moineddin et al., 2011; Palmer et al., 2014; Petersen et al., 1998; Smithman et al., 2023; van den Berg et al., 2016). Half of these studies were conducted in Canada and thus their findings are more applicable to the Canadian context (Glazier et al., 2008; Hirello et al., 2022; Ionescu-Ittu et al., 2007; Khan et al., 2011; Moineddin et al., 2011; Palmer et al., 2014). However, several studies have found no association between access to a primary care provider and ED utilization (Afilalo et al., 2004; Carret et al., 2007; Lee et al., 2000). Of the studies that found no association, only the study by Afilalo et al. (2004) was conducted in Canada.

Notably, Carret et al. (2007) found no association between primary care access and "inappropriate" ED use in patients 50 years of age and older, but an association was found for patients 15-49 years of age in a cross-sectional study of 1,647 ED patients conducted in Brazil. However, in patients aged 50 years of age and older, having self-reported chronic diseases was positively associated with inappropriate ED use. As age increases, so does the likelihood of developing chronic diseases and consequently, the likelihood of needing to seek care (Government of Canada & Public Health Agency of Canada, 2021). In patients 15-49 years of age, having a regular doctor was not significantly associated with the prevalence of inappropriate use of ED services compared to appropriate use (Prevalence Ratio (PR) 1.23; 95% Confidence Interval (CI) 0.95, 1.60); however, variables associated with access to that regular doctor such as being unable to make an appointment elsewhere (PR 1.38; 95% CI 1.01, 1.89) and being unable to make an appointment at their regular source of care without a previous appointment (PR 1.44; 95% CI 1.02, 2.02) were significantly associated with the prevalence of inappropriate ED use (Carret et al., 2007). These findings suggest that age is a potential effect modifier of the

relationship between access to a regular doctor and inappropriate ED use and that simply having a primary care provider is not an indication that an individual has access to that primary care provider. However, of the studies reviewed, this was the only study that examined age as a potential effect modifier.

The other studies reporting no association between access to a primary care provider and ED use either did not find a statistically significant association or found associations between ED use and other variables associated with access to primary care. In a cross-sectional secondary analysis of a questionnaire-based study of 1,783 patients, Afilalo et al. (2004) reported that non-urgent ED patients (18 years of age and older) had less ongoing contact with a primary care provider (70%) than urgent patients (75%); however, the difference between these proportions was not statistically significant. In a United Kingdom (UK) cross-sectional interview-based study of 2,410 patients, Lee et al. (2000) found that a higher proportion of non-urgent patients attending an Accident and Emergency (A&E) department had a family doctor (39.3%) compared to non-urgent patients with similar morbidity attending a hospital general outpatient clinic (17.2%). When multiple logistic regression was performed to determine which factors were independently associated with using the A&E for non-urgent reasons compared to patients using the general outpatient clinic, having a family doctor was not among the factors that were independently associated with the outcome. However, the closure of the patient's general practitioner clinic, seeking an efficient diagnosis, feeling the condition was best handled in the A&E, and perceived emergency were independently associated with using the A&E for non-urgent reasons.

2.3.1 Definition of emergency department visit acuity

When patients visit the ED, they are first triaged by a nurse to determine the severity of their presenting condition and the priority they should be given for receiving care (Yancey & O'Rourke, 2023). Triage systems can differ both within and across countries and triage systems can differ in terms of agreement between independent reviewers (Yancey & O'Rourke, 2023). All EDs in Canada use the Canadian Triage and Acuity Scale (CTAS) (Atzema, 2012). The CTAS is a five-level triage system broken down as follows: Level 1 (resuscitation; must be seen by a physician immediately), Level 2 (emergent; must be seen in 15 minutes or less), Level 3 (urgent; must be seen in 30 minutes or less), Level 4 (less urgent; must be seen in 1 hour or less), and Level 5 (non-urgent; must be seen in 2 hours or less) (Beveridge et al., 1999). The CTAS triage system obtained "excellent" rates of agreement (kappa = 0.80) between ED physicians and triage nurses in the seminal study which influenced the adoption of CTAS as the sole triage system in Canada (Beveridge et al., 1999). However, a recent meta-analysis of fourteen studies that assessed the reliability of the CTAS found that it shows only "moderate" levels of reliability in terms of its ability to consistently assign patients to the appropriate triage category when considering that weighted kappa statistics overestimate reliability (Mirhaghi et al., 2015). Previous studies examining ED visit acuity have classified urgent visits as CTAS levels 1-3 and non-urgent visits as CTAS levels 4 and 5 (Khan et al., 2011; Moineddin et al., 2011).

2.4 Predisposing variables that affect primary care access and ED use

2.4.1 Age

As discussed previously, Carret et al. (2007) found that age is an effect modifier of the association between access to a regular doctor and inappropriate ED use, potentially due to the increased presence of chronic diseases being a stronger predictor of ED use with older age.

However, there is considerable variation in the literature regarding this association. Two systematic reviews have found younger age to be associated with non-urgent use of EDs (Carret et al., 2009; Uscher-Pines et al., 2013). An older United States cross-sectional study of 1,696 ED patients by Petersen et al. (1998) found that the odds of non-urgent compared to urgent visits generally decreased with age and were greatest among those aged 31-40 years compared to those older than 60 years (Odds Ratio (OR) 6.5; 95% CI 4.4, 9.5). A more recent Canadian-based study by Moineddin et al. (2011) found that the risk of ED use among patients with less urgent ED visits was 42% higher in patients aged 20-44 compared to patients aged 65 and older in a population-based cross-sectional study of 53,353 patients. In a UK cross-sectional study of 554,564 non-urgent visits to an A&E department, O'Keefe et al. (2018) examined the relationship between age and percent of non-urgent attendance without controlling for confounding factors and found that the percentage of non-urgent attendances decreased from 21% to 3% from ages 16-24 years to ages 85 years and more. However, Alnasser et al. (2023) found that the odds of non-urgent visits compared to less urgent visits increased significantly by 1% per year in a Saudi Arabian cross-sectional study of 18,880 ED visits. Similarly, a Canadian cross-sectional, population-based study with a sample size of 9,323,217 ED visits by Khan et al. (2011) found that the odds of having a less urgent ED visit compared to a more urgent ED visit increased significantly by 2% per year. Age affects the association between primary care access and non-urgent ED use; however, there is some disagreement in the literature regarding the directionality of this effect.

There is similar disagreement in the literature about the effect of age on overall ED utilization (combining both urgent and non-urgent ED visits). Glazier et al. (2008) found that the risk of ED visits among Ontarians with at least one chronic health condition was 27% lower in

patients aged 65 years and older compared to patients aged 20-44 years. In a cross-sectional, practice-level study of 7,856 UK practices, Cowling et al. (2013) found that the rate of self-referred discharged ED visits was only slightly but significantly lower in practices with a greater proportion of patients aged 65 years or over compared to practices with a greater proportion of patients younger than 65 years of age (Relative Risk (RR) 0.99; 95% CI 0.98, 0.99). Due to the practice-level nature of this study, these results cannot be interpreted at the individual level. However, Ionescu-Ittu et al. (2007) conducted a cross-sectional, population-based study of 95,173 patients in Quebec and found that the rate of emergency department use increases by 15% per decade of increase in age.

2.4.2 Sex and Gender

In a systematic review examining factors associated with inappropriate use of ED services, half of the studies that examined the effect of gender on the odds of inappropriate ED visits found that women had greater odds compared to men (Carret et al., 2009). The authors of the systematic review also found that the studies that did not find an association between gender and inappropriate ED visits were univariable analyses or of low quality (Carret et al., 2009). However, a later systematic review examining factors associated with non-urgent visits to the ED found inconsistencies across nine (9) of 26 articles which examined the effect of gender (Uscher-Pines et al., 2013). Four (4) studies found that women were more likely than men to have non-urgent ED visits, two (2) studies found that men were more likely, and four (4) studies found no association (Uscher-Pines et al., 2013). However, study quality was not assessed, and the authors noted that few studies used multivariable statistics (Uscher-Pines et al., 2013).

When assessing studies for inclusion in this literature review, similar inconsistencies were found. Many studies found an association between sex and ED use (Carret et al., 2007; Ionescu-

Ittu et al., 2007; Khan et al., 2011; Moineddin et al., 2011; Palmer et al., 2014; Petersen et al., 1998). However, some studies found no association (Afilalo et al., 2004; Cowling et al., 2013; Glazier et al., 2008; Harris et al., 2011; Khan et al., 2011). Of the studies that found an association, females compared to males had 13-52% increased odds of having a non-urgent ED visit compared to an urgent ED visit (Carret et al., 2007; Khan et al., 2011; Petersen et al., 1998) and had 24% greater odds of being a frequent ED attender (Palmer et al., 2014). However, males had a 6-20% increased rate of ED use compared to females (Ionescu-Ittu et al., 2007; Moineddin et al., 2011) and had 33% greater odds of having a non-urgent visit and 25% greater odds of having any ED visit compared to no ED visit at all (Khan et al., 2011). Similar to the findings of Carret et al. (2009), the studies that found no association between sex and ED use were univariable analyses (Afilalo et al., 2004; Harris et al., 2011) or were examining characteristics associated with ED use at the practice level (Cowling et al., 2013).

2.4.3 Race and Ethnicity

The studies reviewed that considered race did not find a statistically significant association (Carret et al., 2007; Cowling et al., 2013; Petersen et al., 1998). Carret et al. (2007) considered skin colour only and found that patients 15-49 years of age with non-white skin colour have a 20% increased prevalence (PR 1.20; 95% CI 0.96, 1.50) of inappropriate use of emergency services compared to patients with white skin colour. Petersen et al. (1998) found that the odds of non-urgent ED visits compared to urgent ED visits are 1.3 times (95% CI 0.9, 2.0) greater in Latino patients, 1.1 times (95% CI 0.8, 1.5) greater in black patients, and 1.3 times (95% CI 0.7, 2.7) greater in other races compared to white patients. Notably, none of these studies considered ethnicity.

2.5 Enabling variables that affect primary care access and ED use

2.5.1 Continuity of care

Simply having a primary care provider is not enough to reduce non-urgent ED visits. Many studies have found that the majority of non-urgent patients presenting to the ED have a regular primary care provider but have limited access to that provider. A cross-sectional, population-based study of the elderly in Quebec found that 83% of ED patients have a primary physician but for patients with a primary physician, a relationship between continuity of care and ED use was found such that ED use increased as continuity of care decreased (Ionescu-Ittu et al., 2007). A smaller survey-based study of rural ED use in Ontario found that 89% of non-urgent patients had a family doctor; however, most patients cited that their reason for visiting the ED was because they could not access their family doctor or a walk-in clinic, they felt they needed treatment right away, or they felt they needed treatment which could only be offered in the ED (i.e., radiography) (Steele et al., 2008). Another survey-based study in France found that 70.6% of non-urgent ED patients were followed by a general practitioner (GP) and one-third of these patients had tried to contact their GP before deciding to visit the ED (Gentile et al., 2010). These findings suggest that having a primary care provider alone does not protect against non-urgent ED use, but that other factors that influence access to primary care, such as continuity and availability of primary care, are also important factors to consider.

2.5.2 Accessibility of care

Timely and convenient access to care is another important feature of primary care practices in regard to reducing non-urgent ED visits. Based on the UK study discussed previously of over 7,000 general practices, general practices with a greater percentage of patients who were able to see a primary care provider within two weekdays of seeking an appointment

were associated with lower rates of ED visits compared to practices with less timely access to care (Cowling et al., 2013). However, interpretations of these results are limited to the practice level and are not attributable to the individual patients of these practices. A similar individual-level cohort study of 7,850 patients from 353 Medicaid Health Maintenance Organization-affiliated primary care practices in the United States found that ED use could be reduced by 13% if all patients used the ED at the rate that patients from practices with twelve or more weekly evening hours used the ED (Lowe et al., 2005). The reduction in ED use was more pronounced for less urgent visits; however, only 26% of visits could be classified in terms of their level of urgency (Lowe et al., 2005). A cross-sectional study in Brazil also found that primary care clinics open for shorter hours and by appointment only were associated with a higher prevalence of non-urgent ED use in patients less than 50 years of age (Carret et al., 2007). When examining the association between access to primary care and ED use, how soon patients can access care when needed and accessibility of opening hours should be considered in addition to whether the patient has a primary care provider.

2.5.3 Geography

Region of residence is also important to consider when assessing the accessibility of care and its relationship with ED use. A longitudinal, population-based study assessing equity in Canada's healthcare system found that urban Canadians have a 13.8% higher probability of visiting a primary care provider than rural Canadians (Hirello et al., 2022). Moineddin et al. (2011) found that rural residence is associated with a 64% higher probability of visiting the ED and a 23% increased rate of ED visits in Ontario. A similar Ontario population-based study found that rural residents were more likely to access the ED for less urgent reasons (Khan et al., 2011). A cross-sectional, population-based study in Quebec found that reduced continuity of care and

reduced use of primary care services strongly affect ED use in urban areas whereas not having a primary care provider more strongly affects ED use in rural areas (Ionescu-Ittu et al., 2007).

Differences in rural and urban patients' use of EDs and access to primary care providers may be explained by different methods of accessing care and expectations of the health care system between the two populations (Murphy et al., 2019). In New Brunswick, rural patients who were frequent users of the ED were more likely to have access to a primary care provider (Palmer et al., 2014). However, rural community hospitals are staffed by local family physicians meaning rural patients may be going to the ED to see their primary care provider (Palmer et al., 2014). Another potential reason for the increased use of EDs by rural populations is that rural populations are more likely to experience interrupted access to their primary care providers due to greater reliance on locum physicians and high rates of physician turnover in rural areas (Haggerty et al., 2014). A study using Canadian Community Health Survey data also found that rural residents may have different expectations of the healthcare system as they are less likely to report having unmet healthcare needs despite having poorer health status and similar rates of primary care services use as urban residents (Sibley & Weiner, 2011). When comparing differences in access to primary care and ED use between rural and urban populations, we must also consider the impact of their perspectives and expectations and the structure of primary care practices and EDs in these different regions.

2.5.4 Income

Income is another important factor to consider when discussing the relationship between access to primary care and ED use. A study using data from the Canadian Community Health Survey found that Canadians in the lowest-income quartile were less likely to have a regular medical doctor and were more likely to report having unmet health needs (Sibley & Weiner,

2011). However, this association may not hold true in all contexts, as a Canadian longitudinal study found that income inequities in primary care provider use whereby higher-income individuals are more likely to visit a primary care provider increased on PEI and in Quebec but decreased in New Brunswick between 2000 and 2014 (Hirello et al., 2022). A cross-sectional, population-based study in Ontario also found that low income was independently associated with increased ED visits (Khan et al., 2011). Thus, income is an important predictor of both access to primary care and ED use.

2.6 Need-based variables that affect primary care access and ED use

2.6.1 Different perceptions of urgency

ED use is characterized as non-urgent or urgent according to a health professional's triage assignment; however, it is important to note that this does not always reflect the patient's perception of urgency when it comes to their reason for visiting the ED. An older United States cross-sectional questionnaire-based study that prospectively and retrospectively examined ED patient and provider perceptions of urgency found that providers only agreed with patients' perceived urgency in one out of every five cases (20.7%) (Gifford et al., 1980). A more recent survey-based study conducted in Australia found that approximately one out of every two patients who visited the ED (48.5%) expected to be given a higher priority based on their perceived urgency (Toloo et al., 2016). However, only 31% of respondents gave consent for their medical records to be accessed which might have incorporated response bias and the study did not consider other factors which might have contributed to patients' perceptions of urgency such as health literacy and rural versus urban residence (Toloo et al., 2016). Ultimately, patients tend to perceive their level of urgency and thus the priority they should be given to be seen as higher than physicians judge their level of urgency and priority to be.

A descriptive study in Sweden compared non-urgent patients in the ED and patients with a similar level of urgency who use non-scheduled primary care services such as walk-in clinics (Backman et al., 2008). They found that patients who use the ED for non-urgent reasons tended to be more anxious about their symptoms and to have experienced their symptoms for shorter durations than primary care patients (Backman et al., 2008). However, this study discussed the high potential external generalizability of the study to other large urban areas but did not discuss the limitations of the study such as the potential for incorrectly attributing associations found at the practice level to individual patients when interpreting the results due to the descriptive nature of the study (Backman et al., 2008). Similarly, a cross-sectional European study describing non-urgent ED patients found that the factors related to visits classified as "inappropriate" (20.3% of visits) included the perception that their GP could not treat their problem and the perception that treatment was required within 12 hours (Thomson et al., 1995). These findings suggest that non-urgent patients visit the ED because they feel their problem needs immediate attention and that the ED is the best place for them to receive treatment for their problem.

2.6.2 Efficiency and proximity of care

Proximity to care and time to be seen are also factors that influence patients' choice to attend an ED. A cross-sectional study in France that assessed whether non-urgent ED patients would be willing to be redirected to primary care found that approximately two-thirds (68.2%) of these patients would be willing (Gentile et al., 2010). These patients tended to have lower levels of perceived urgency (Gentile et al., 2010). An interview study conducted in the United States examining ED patient perceptions of urgency found that the most common reasons patients chose the ED were because it was closer and faster (Gill & Riley, 1996). There was no difference in these reasons between patients who perceived their problem as urgent and those who

perceived it as non-urgent (Gill & Riley, 1996). Thus, proximity to the ED and the time a patient expects to be seen are also strong drivers for patients seeking care at an ED. The decision a patient makes to seek care in an ED appears to be multifaceted and involves consideration of many factors that are both related and unrelated to the problem they are seeking treatment for.

2.6.3 Education and health literacy

Many studies agree that education is associated with ED utilization. Specifically, several Canadian studies agree that lower levels of education are associated with an increased rate of ED utilization (Glazier et al., 2008; Khan et al., 2011; Moineddin et al., 2011). However, when examining non-urgent use of the ED, there is some disagreement. Carret et al. (2007) found a statistically significant increase in non-urgent ED utilization among patients 15-49 years of age with higher compared to lower levels of education and a statistically nonsignificant increase in patients 50 years of age or older. Petersen et al. (1998) found no association between non-urgent ED utilization and level of education.

Education is also associated with access to primary care; however, the directionality of this association is also inconsistent in the literature. In a cross-sectional study of Canadian Community Health Survey data, Sanmartin and Ross (2006) found that respondents with more than post-secondary level education were more likely to report difficulties accessing routine care compared to those with less post-secondary education, high school education, or less than high school education. However, Sibley and Weiner (2011) also using Canadian Community Health Survey data found that respondents who did not graduate high school and respondents with some level of post-secondary education both have greater odds of having a regular medical doctor than respondents who only graduated high school. Sibley and Weiner (Sibley & Weiner, 2011) also

found that respondents with some level of post-secondary education had greater odds of having a family physician consultation than respondents who either did or did not graduate high school.

2.6.4 Health status

Studies suggest that the rate of ED utilization is greater among individuals with poor health status (Glazier et al., 2008; Moineddin et al., 2011) and among individuals with more comorbidities and chronic diseases including those of the cardiovascular and digestive systems (Ionescu-Ittu et al., 2007). Khan et al. (2011) also found that ED visits of any urgency and non-urgent ED visits were associated with reduced self-perceived health compared to no ED visits and urgent ED visits, respectively. However, Afilalo et al. (2004) found that perceived general health, number of prior medical conditions, and number of hospital admissions in the past three years were reduced for non-urgent patients compared to urgent patients. However, Afilalo et al. (2004) used a descriptive analysis whereas Khan et al. (2011) used a multivariable analysis. An Ontario-based cross-sectional study evaluating the 1,698 responses to the Quality and Costs of Primary Care (QUALICOPC) Patient Experiences Survey found that a higher primary care Composite Access Score was associated with better self-reported health (Premji et al., 2018). Thus, there is evidence that health status is associated with both general ED utilization and ED visit acuity as well as with access to primary care.

2.7 Limitations

We need to consider the limitations of this literature review when interpreting its conclusions. The main limitation is that this literature review used a narrative rather than a systematic review approach and thus does not represent the entire evidence base. This review is likely affected by selection bias due to the lack of systematic search strategies. Selection bias could result in the overemphasis of certain findings or potentially overlooking other important

contributions. Therefore, the findings of this literature review may be challenged or strengthened by a more systematic literature review in the future. However, this literature review aimed to summarize the association between access to primary care and ED visit acuity and to identify important confounding factors which should be adjusted for in a logistic regression analysis. Given this objective, we deemed a narrative literature review an appropriate approach despite the limitations associated with a narrative literature review.

2.8 Conclusion

Access to primary care impacts ED utilization internationally as well as within Canada. However, there are considerable inconsistencies in the literature on the strength and the direction of the impact of predisposing, enabling, and need-based factors on the association between access to primary care and ED visit acuity. There are many possible explanations for this including variations in population characteristics (i.e., age, sex, etc.), regional characteristics (i.e., rurality, availability of primary care, etc.), data availability (i.e., which variables are available to be analyzed), and statistical approach (i.e., descriptive vs. analytical statistics). Analyzing the association between access to primary care and ED visit acuity in various Canadian jurisdictions could help elucidate the impact of these characteristics and pinpoint which factors are most associated with inconsistencies in the literature.

Previous Canadian studies analyzing the association between access to primary care and ED utilization examine larger provinces with more robust data holdings such as Ontario and Quebec. The province of Prince Edward Island (PEI) is Canada's smallest and most rural province and has limited data holdings. Analyzing the association between access to primary care and ED utilization on PEI could provide an example of how factors such as differences in

population characteristics, regional characteristics, and data availability impact the association between access to primary care and the use of ED services for low-acuity health complaints.

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Chapter 3: Examining access to primary care on Prince Edward Island: A scoping review

3.1 Preface

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Author Contributions: AM, LB, and SH contributed to the study conception and design. AM, CP, and LB conducted screening. AM conducted the data extraction and charting. AM drafted the manuscript which was reviewed by LB, CP and SH.

Required Approvals: None.

Publication: This manuscript has not yet been submitted for publication.

Funding Sources: AM received scholarships from the Canadian Institute for Health Research (Canadian Graduate Student – Master's scholarship) and the Institut du Savoir Montfort Master's Scholarship to conduct this research. The opinions, results and conclusions are those of the authors and are independent from the funding sources.

3.2 Abstract

Introduction: Prince Edward Island (PEI) faces challenges in providing access to primary care due to a growing population, a physician shortage, rural isolation, and the impact of COVID-19. Understanding the landscape of access to primary care on PEI is important, but research on this topic is limited, highlighting the need for a scoping review to identify gaps in the literature.

Objective: The objective of this scoping review is to describe the current state of knowledge on access to primary care on PEI and to identify gaps in the literature.

Eligibility criteria: This review assessed published studies, theses, and dissertations conducted focusing on access to primary care or health services associated with primary care on PEI. It included primary quantitative and qualitative studies as well as review studies.

Methods: Searches of scientific databases (MEDLINE, EMBASE, PsychINFO, CINAHL, and Scopus) and theses registries (ProQuest Dissertations and Theses and IslandScholar) were conducted. No limitations on language or publication date were placed on the search. Data from selected studies were extracted using a predeveloped extraction template and presented in tabular format and as frequency counts.

Results: The search yielded 492 results after duplicate removal. Seventeen (17) additional studies were identified through reference lists and forward citation searching. In total, 24 (studies were eligible for inclusion, encompassing various study designs and population characteristics, accessibility dimensions, and contexts. Half of the included studies had a PEI sample size of less than 2% and no studies considered the accessibility dimension of affordability.

Conclusion: Our findings highlight the need for more primary care access research/evaluation on PEI that focuses on the unique needs of Islanders.

3.3 Introduction

Primary care serves as a patient's point of entry into healthcare systems and high-performing primary care is associated with improved equity, efficiency, cost-effectiveness, and health outcomes (Aggarwal & Hutchison, 2021). Primary care is an integrated and multidimensional practice in which clinicians are responsible for managing the physical, mental, emotional, and social needs of their patients (Vanselow et al., 1995). The World Health Organization (WHO) and United Nations Children's Fund (UNICEF) define primary care as "a whole-of-society approach to health that aims at ensuring the highest possible level of health and well-being and their equitable distribution by focusing on people's needs and as early as possible along the continuum from health promotion and disease prevention to treatment, rehabilitation and palliative care, and as close as feasible to people's everyday environment" (2018).

Access to primary care is a complex and dynamic issue and many definitions of access in the context of health care have been put forward (Aday & Andersen, 1981; Gulliford et al., 2002; Levesque et al., 2013). For this review, access to primary care will be defined according to Levesque et al. as "the opportunity to reach and obtain appropriate health care services in situations of perceived need for care" (2013). Levesque et al. further defined five dimensions of accessibility and the corresponding abilities of patients to interact with these dimensions: approachability (ability to perceive), acceptability (ability to seek), availability and accommodation (ability to reach), affordability (ability to pay), and appropriateness (ability to engage) (2013). Assessing access to primary care should involve an examination of all five dimensions of accessibility and abilities. A scoping review would be appropriate for summarizing any gaps in these dimensions in the literature.

Prince Edward Island (PEI) is the smallest province in Canada, both geographically and demographically, with an area of 5,660 km^2 and a population of 176,113 as of April 2023 (PEI Statistics Bureau, 2023). Twenty percent (20%) of the population of PEI was without attachment to a primary care provider as of December 2023 (Health PEI, 2023). Despite PEI being Canada's smallest province, the percentage of Islanders without a primary care provider is over 5% greater than the overall percentage of Canadians without a primary care provider (14.5%) (Government of Canada & Statistics Canada, 2020). PEI is currently experiencing a physician shortage due to a number of factors including the more rural and isolated nature of PEI relative to other provinces and the challenges this creates in attracting and retaining physicians (Canadian Medical Association, 2020). Another factor contributing to the physician shortage in PEI and across Canada is the strain that COVID-19 has placed on the healthcare system.

Understanding the landscape of access to primary care on Prince Edward Island is important as lack of access to a primary care provider can lead to increased pressures on many areas of the health system. However, a review of nursing roles in primary care in Atlantic Canada revealed that compared with other Atlantic provinces, PEI is relatively underrepresented in the literature, perhaps due to its small population and more isolated geography (Curnew & Lukewich, 2018). Additionally, there is only one university on PEI which might translate to a small number of researchers with the interest and ability to do this type of research on PEI. Thus, this scoping review aims to describe the current state of knowledge on access to primary care on PEI and identify gaps in the literature using the five dimensions of healthcare accessibility defined by Levesque et al. (2013). A preliminary search of MEDLINE and JBI Evidence Synthesis shows that there is no scoping review currently published or in progress on the topic.

3.4 Methods

We conducted this scoping review in accordance with the JBI methodology for scoping reviews (Peters, Marnie, et al., 2020) and the seminal recommendations of Arksey and O'Malley (2005). We developed a protocol before the search was conducted; however, this protocol is not currently published. We used the Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) checklist to ensure proper reporting of the scoping review which can be found in **Appendix 3.1** (Tricco et al., 2018).

3.4.1 Eligibility Criteria

Participants

We included PEI residents and immigrants to PEI of all ages.

Concept

We included any study or article referring to the concept of access to healthcare. Access was defined according to Levesque et al. (2013), as "the opportunity to reach and obtain appropriate health care services in situations of perceived need for care". This definition includes the five dimensions defined by Levesque et al. (2013): approachability (ability to perceive), acceptability (ability to seek), availability and accommodation (ability to reach), affordability (ability to pay), and appropriateness (ability to engage).

Context

We included any study or article examining primary care or health services associated with primary care. We defined primary care according to WHO and UNICEF (2018), as "a whole-of-society approach to health that aims at ensuring the highest possible level of health and well-being and their equitable distribution by focusing on people's needs and as early as possible along the continuum from health promotion and disease prevention to treatment, rehabilitation

and palliative care, and as close as feasible to people's everyday environment". Studies or articles examining settings other than primary care, such as acute care, long-term care, or emergency services, were excluded unless the setting was analyzed to examine access to primary care.

Types of Sources

We included experimental and quasi-experimental study designs including randomized controlled trials, non-randomized controlled trials, before and after studies, and interrupted time-series studies; analytical observational studies including prospective and retrospective cohort studies, case-control studies, and analytical cross-sectional studies; descriptive observational studies including case series, case reports, and descriptive cross-sectional studies; and qualitative studies including phenomenology, grounded theory, ethnography, qualitative description, and action research study designs. We also included systematic reviews or other review types such as umbrella or narrative reviews and theses and dissertations. We excluded protocols, abstracts, conference proceedings, news articles, editorials, opinion papers, and secondary reports of primary literature. However, if we found a secondary report, the primary literature reported was sought and considered for inclusion.

3.4.2 Search Strategy

We conducted an initial search of MEDLINE to identify relevant articles. Keywords and relevant Medical Subject Headings terms (MeSH terms) or index terms were developed by examining the titles and abstracts of these articles and the index terms used to describe these articles. We organized the search strategy keywords into two themes: 1) geography and 2) access to primary care. We adapted the search strategy, including all relevant keywords, for each source of evidence searched. The search was conducted on June 29th, 2023.

We placed no date or language restrictions on the searches. A draft search strategy was approved by an Epidemiology and Public Health research librarian at the University of Ottawa. We searched the following databases for relevant literature: MEDLINE(Ovid), EMBASE, PsychInfo, CINAHL, and Scopus. We searched for theses and dissertations using ProQuest Dissertations and Theses and IslandScholar (the institutional database for the University of PEI (UPEI)). The search strategy we used for each database can be found in **Appendix 3.2**. We used reference lists and forward citation searches of each included article to supplement the search.

3.4.3 Study/Source of Evidence Selection

One reviewer conducted title and abstract screening to identify articles that could be potentially included in the review. Two reviewers independently conducted full-text screening of selected articles to assess the article in detail against the inclusion criteria. We recorded and reported reasons for the exclusion of evidence sources at the full-text stage. We conducted title and abstract and full-text screening in Covidence systematic review software (*Covidence Systematic Review Software*, 2024). We reported and presented the results of the search and study inclusion process in a modified PRISMA-ScR flow diagram in **Figure 3.1** (Page et al., 2021; Tricco et al., 2018).

3.4.4 Data Extraction

One reviewer extracted relevant data from the included articles using Covidence (*Covidence Systematic Review Software*, 2024). We created a data extraction template using the JBI scoping review template source of evidence details, characteristics, and results extraction instrument as a reference (Peters, Godfrey, et al., 2020). The data extracted included specific details about the author(s), year of publication, year of data collection, type of study/publication,

population/sample, concept, context, and the data source. See **Appendix 3.3** for a sample data extraction template.

3.4.5 Data Abstraction

We categorized the data according to the five dimensions of accessibility defined by Levesque et al. (2013): approachability (ability to perceive), acceptability (ability to seek), availability and accommodation (ability to reach), affordability (ability to pay), and appropriateness (ability to engage). Beyond this categorization, data abstraction involved an iterative process as included studies revealed useful data categories related to the population, concept, and context of the scoping review (Levac et al., 2010). We presented abstracted data in tabular format and as frequency counts.

3.5 Results

A summary of the search results is included in **Figure 3.1**. Once duplicates were removed by Covidence, 492 search results were returned. Reference list and forward citation searching resulted in full-text review of seventeen (17) additional studies and ten (10) of these studies were included in the review (Alemu, 2022; Allin, 2008; Asada & Kephart, 2007; Blair, 2019; Islam & Kellett, 2022; Pulok & Hajizadeh, 2022; Simkin et al., 2018; Singh et al., 2015; Zygmunt, 2012; Zygmunt & Berge, 2014). After the inclusion and exclusion criteria were applied, 27 studies were eligible for inclusion. Three (3) of the included studies were published theses for which both the publication (McDonald & Sherman, 2010; Starkes et al., 2005; Zygmunt et al., 2015) and thesis (Sherman, 2008; Starkes et al., 2005; Zygmunt, 2012) were found; these studies were merged, and the publication was considered the primary study from which data was extracted. Thus, in the end, 24 studies were eligible for inclusion.

3.5.1 Study Characteristics

Study characteristics and population characteristics can be found in **Table 3.1**. The included literature consisted of five (5) theses in addition to the three (3) theses merged with the published version of the thesis (Alemu, 2022; Blair, 2019; Doran, 2006; Kadish, 2023; Labrosse, 2016). The study designs of the theses included one (1) cross-sectional study (Alemu, 2022), one (1) non-randomized experimental study (Blair, 2019), one (1) descriptive correlational study (Doran, 2006), one (1) case-control study (Kadish, 2023), and one (1) case report (Labrosse, 2016). The other published studies included thirteen (13) cross-sectional studies (Allin, 2008; Asada & Kephart, 2007; Hirello et al., 2022; Islam & Kellett, 2022; Jeon et al., 2021; Khan et al., 2018; McDonald & Sherman, 2010; McLeod & Karim, 2023; Simkin et al., 2018; Singh et al., 2015; Starkes et al., 2005; Zygmunt et al., 2015; Zygmunt & Berge, 2014), two (2) qualitative research studies (MacKinnon, 2000; Van Til et al., 2003), one (1) non-randomized experimental study (MacIntyre et al., 2019), one (1) longitudinal study (Pulok & Hajizadeh, 2022), one (1) retrospective cohort study (Gaudreau et al., 2014), and one (1) scoping review (Curnew & Lukewich, 2018).

3.5.2 Population Characteristics

Eight (8) of the included studies had a PEI-specific context with 100% of the sample size being from PEI (Doran, 2006; Gaudreau et al., 2014; Jeon et al., 2021; Khan et al., 2018; Labrosse, 2016; MacIntyre et al., 2019; MacKinnon, 2000; Van Til et al., 2003). Two (2) studies had an Atlantic or Maritime Canada context with 5% and 5.8% of the sample size being from PEI, respectively (Curnew & Lukewich, 2018; Starkes et al., 2005). Fourteen (14) of the studies had a national context. The majority (12) of the studies with a national context had a PEI sample size ranging from 0.3-1.9% (Alemu, 2022; Allin, 2008; Asada & Kephart, 2007; Hirello et al.,

2022; Islam & Kellett, 2022; Kadish, 2023; McLeod & Karim, 2023; Pulok & Hajizadeh, 2022; Simkin et al., 2018; Singh et al., 2015; Zygmunt et al., 2015; Zygmunt & Berge, 2014); one (1) study had a PEI sample size of 13% (Blair, 2019); and one (1) study did not report the percentage of the sample according to province (McDonald & Sherman, 2010). In terms of other population characteristics, the majority of included studies considered sex (19) and socioeconomic status (17). However, race was only considered in five (5) studies (Alemu, 2022; Asada & Kephart, 2007; Kadish, 2023; McLeod & Karim, 2023; Pulok & Hajizadeh, 2022), language was considered by one (1) study (MacKinnon, 2000), and zero studies considered gender.

3.5.3 Concept Characteristics

Characteristics associated with the concept and context of the scoping review are described in **Table 3.2**. The concept of access to primary care was assessed using the five dimensions of accessibility outlined by Levesque et al. (2013). Approachability was considered by nine (9) studies (Blair, 2019; Curnew & Lukewich, 2018; Doran, 2006; Kadish, 2023; MacIntyre et al., 2019; MacKinnon, 2000; Simkin et al., 2018; Singh et al., 2015; Van Til et al., 2003) and the associated ability to perceive was considered by eighteen (18) studies (Alemu, 2022; Allin, 2008; Asada & Kephart, 2007; Blair, 2019; Curnew & Lukewich, 2018; Doran, 2006; Hirello et al., 2022; Islam & Kellett, 2022; Kadish, 2023; MacKinnon, 2000; McDonald & Sherman, 2010; McLeod & Karim, 2023; Pulok & Hajizadeh, 2022; Simkin et al., 2018; Starkes et al., 2005; Van Til et al., 2003; Zygmunt et al., 2015; Zygmunt & Berge, 2014). Acceptability was considered by six (6) studies (Curnew & Lukewich, 2018; MacIntyre et al., 2019; MacKinnon, 2000; McDonald & Sherman, 2010; McLeod & Karim, 2023; Van Til et al., 2003) and the associated ability to seek was considered by nine (9) studies (Blair, 2019; Doran, 2006; Hirello et al., 2022; MacIntyre et al., 2019; MacKinnon, 2000; McDonald & Sherman, 2010;

McLeod & Karim, 2023; Singh et al., 2015; Van Til et al., 2003). All studies considered availability and accommodation; however, only four (4) studies considered the ability to reach (Asada & Kephart, 2007; MacKinnon, 2000; McDonald & Sherman, 2010; Starkes et al., 2005). No studies considered affordability, but seventeen (17) studies considered the ability to pay (Alemu, 2022; Allin, 2008; Asada & Kephart, 2007; Blair, 2019; Doran, 2006; Hirello et al., 2022; Islam & Kellett, 2022; Kadish, 2023; MacKinnon, 2000; McDonald & Sherman, 2010; McLeod & Karim, 2023; Pulok & Hajizadeh, 2022; Simkin et al., 2018; Singh et al., 2015; Starkes et al., 2005; Zygmunt et al., 2015; Zygmunt & Berge, 2014). Finally, thirteen (13) studies considered appropriateness (Asada & Kephart, 2007; Blair, 2019; Curnew & Lukewich, 2018; Doran, 2006; Gaudreau et al., 2014; Labrosse, 2016; MacIntyre et al., 2019; MacKinnon, 2000; McDonald & Sherman, 2010; McLeod & Karim, 2023; Van Til et al., 2003; Zygmunt et al., 2015; Zygmunt & Berge, 2014) and eight (8) studies considered the ability to engage (Blair, 2019; Doran, 2006; Gaudreau et al., 2014; Kadish, 2023; MacIntyre et al., 2019; MacKinnon, 2000; Simkin et al., 2018; Singh et al., 2015).

3.5.4 Context Characteristics

In terms of the context of included studies, eleven (11) studies considered rural PEI populations (Alemu, 2022; Doran, 2006; Gaudreau et al., 2014; Hirello et al., 2022; Jeon et al., 2021; Kadish, 2023; Khan et al., 2018; MacIntyre et al., 2019; MacKinnon, 2000; Simkin et al., 2018; Van Til et al., 2003). Fourteen (14) studies also considered health services associated with primary care (Blair, 2019; Curnew & Lukewich, 2018; Doran, 2006; Gaudreau et al., 2014; Jeon et al., 2021; Kadish, 2023; Khan et al., 2018; MacIntyre et al., 2019; MacKinnon, 2000; McDonald & Sherman, 2010; Simkin et al., 2018; Singh et al., 2015; Starkes et al., 2005; Van Til et al., 2003). The majority of these studies considered preventive care such as cancer screening

(7) (Blair, 2019; Kadish, 2023; MacIntyre et al., 2019; McDonald & Sherman, 2010; Simkin et al., 2018; Singh et al., 2015; Van Til et al., 2003), three (3) considered emergency department use (Doran, 2006; Gaudreau et al., 2014; Jeon et al., 2021), two (2) considered mental health (MacKinnon, 2000; Starkes et al., 2005), two (2) considered the role of nursing, particularly the role of nurse practitioners and the role of nurses in increasing support for vulnerable populations (Curnew & Lukewich, 2018; MacKinnon, 2000), and two (2) considered eye care (Jeon et al., 2021; Khan et al., 2018).

3.6 Discussion

We aimed to describe the literature on access to primary care on PEI using certain study characteristics, population characteristics, and the five dimensions of accessibility outlined by Levesque et al. (2013). In doing so, we identified concepts and population groups which are underrepresented in the literature. Generally, the published literature available on access to primary care on PEI was limited. The included literature consists of a variety of study designs with cross-sectional studies being the most prevalent. The studies encompassed various population characteristics; however, gender, race, and language characteristics were considered by few studies. Notably, only eight studies had a PEI-specific population context, and half of the studies included a PEI sample size of less than 2%. Except for affordability, all five dimensions of accessibility were explored to some extent across the studies as well as all five (5) of the associated abilities. Almost half of the included studies considered rural PEI populations, while just over half examined health services associated with primary care including preventive care, emergency department use, mental health, nursing roles, and eye care.

While we only considered literature on access to primary care on Prince Edward Island and thus cannot directly comment on the representation of PEI in the literature compared to other

provinces, we can make some indirect comparisons. Curnew and Lukewich (2018) conducted a scoping review to examine the literature on nursing roles in primary care in Atlantic Canada. They included twenty (20) studies: Nova Scotia was represented in eleven (11), Newfoundland and Labrador were represented in six (6), New Brunswick was represented in five (5), and PEI was represented in one (1). We anticipate similar disparities would result if we were to have considered other Atlantic Canadian provinces in our much broader review of primary care access.

Many of the national studies that were reviewed at the full-text stage met the concept and context inclusion criteria but were excluded because PEI data were excluded or data for the Atlantic provinces were aggregated. This is consistent with observations from a study investigating the needs of persons who inject drugs on PEI (McCutcheon & Morrison, 2014). Combining PEI with the other Atlantic provinces is problematic as PEI has a higher percentage of the population living in rural areas and smaller urban centers compared to the other Atlantic provinces (Government of Canada & Statistics Canada, 2022). It is especially problematic in analyses concerning access to primary care as rural populations struggle to access primary care services more than urban populations (Hirello et al., 2022; Ionescu-Ittu et al., 2007; Khan et al., 2011; Moineddin et al., 2011).

3.6.1 Limitations

We did not conduct comprehensive quality assessments of the included studies as per the JBI scoping review methodology (Peters, Marnie et al., 2020). Thus, our review provides a broad overview of the state of the published literature on access to primary care on PEI but not a comprehensive critical appraisal and synthesis of the literature. This limits our ability to identify deficiencies in the literature due to low-quality methodology and reporting.

Another limitation of our study is the comprehensiveness of the search strategy. The search strategy was designed to identify studies with a PEI, Atlantic or Maritime Canada context; however, this resulted in some studies with a national context not being identified by the search strategy. Ten such studies were identified by reference list and forward citation searching. All ten studies used national survey data such as data from the Canadian Community Health Survey and only one study had a PEI sample size of greater than 2% (Blair, 2019). Therefore, while our search strategy effectively captured intended studies, it missed national studies where PEI's contribution to the sample size was relatively small.

Only one reviewer conducted title and abstract screening which might contribute to bias in the results. However, any title/abstract that included the concept of access to primary care was included even if Prince Edward Island was not mentioned. Thus, a conservative approach to screening was taken at this stage to reduce the bias introduced by having only one reviewer. Studies were assessed for the correct population and concept characteristics at the full-text screening stage by two independent reviewers to further minimize bias.

When outlining the population, concept, and context of the review, we intentionally kept the inclusion criteria broad as we predicted the literature would be limited. Due to this decision, there are high levels of heterogeneity among the included studies, especially regarding how access to primary care was assessed. For example, we included studies which assessed various forms of screening rates as this is associated with access to primary care and can be used as a proxy measure (Coughlin & Thompson, 2005; Lofters et al., 2023; Schueler et al., 2008); however, these measures are not directly comparable to studies which measured access to a primary care provider or access to a regular medical doctor. This created challenges in synthesizing the results of the included studies.

Our decision to exclude grey literature except for theses and dissertations from this review could also be a source of bias. This decision limits our ability to generalize our findings and comment on the state of all access to primary care research being conducted on PEI. However, this review intended to characterize the research being conducted on access to primary care on PEI outside of that conducted by the Government of Prince Edward Island or Health PEI. Given that research from these governmental bodies is largely found in the form of reports on the Government of PEI website, the included evidence sources will allow us to fulfill the review objectives.

3.7 Conclusion

In conclusion, our scoping literature review on access to primary care on PEI found limited PEI-specific evidence. Our review also highlighted gaps in the representation of the access dimension of affordability and consideration of language, gender, and race as population characteristics. While efforts to capture a comprehensive view were made, the relative underrepresentation of PEI in comparison to other Canadian provinces, compounded by the aggregation of data at the provincial level, underscores the need for more regional research on PEI. Acknowledging the study's limitations, including the broad search strategy and exclusion of grey literature, future studies should focus on specific outcomes for measuring primary care access, such as having a regular doctor or cancer screening rates, to provide a more comprehensive picture of governmental and non-governmental research being conducted on access to primary care. Furthermore, a systematic review should be conducted on the chosen outcome so that quality assessments of the literature on access to primary care on PEI can be done and a more robust synthesis of the evidence can be obtained.

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3.9 Tables

Table 3.1. Description and population characteristics of included studies.

Study ID	Aim of study	Study design	Data source	Data collection period	Scope of population	Sample size	% of sample from PEI	Age range	Sex considered	Gender considered	Race considered	Socioeconomic status considered	Language considered
Alemu 2022	To examine the determinants of healthcare access using two indicators of access to care: having a family physician and self-reported unmet need of care.	Cross sectional study	Canadian Longitudinal Study on Aging	2011-2018	National	41,135 respondents	0.3	≥45	Yes	No	Yes	Yes	No
Allin 2008	To investigate the level of inequity in healthcare use across the Canadian provinces.	Cross sectional study	Canadian Community Health Survey	2003	National	104,510 respondents	1.5	≥15	Yes	No	No	Yes	No
Asada 2007	To examine whether and where socioeconomic inequities in health care utilization occur in Canada.	Cross sectional study	Canadian Community Health Survey	2000-2001	National	110,923 respondents	Not reported	≥20	Yes	No	Yes	Yes	No
Curnew 2018	To examine and synthesize existing evidence related to nursing roles and resources in PC settings across Atlantic Canada (Newfoundland and Labrador, New Brunswick, Nova Scotia, Prince Edward Island), and associated	Scoping review	Published and unpublished studies	NA-November 2016	Atlantic/Maritime	20 papers	5	NA	NA	NA	NA	NA	NA

	contributions to patient care.												
Doran 2006	To investigate participants' perceptions of the need to access the emergency department for the non-urgent care of their child.	Descriptive correlational	Questionnaire	June 2005-September 2005	PEI-specific	257 participants	100	Those presenting to the emergency department with a child 16 years of age or younger.	Yes	No	No	Yes	No
Gaudreau 2014	To measure the association between attendance at the Asthma Education Center and changes in health care utilization among asthma patients.	Retrospective cohort study	Demographic data obtained from common client registry of provincial health numbers. Asthma-related primary care and emergency department visit frequencies obtained from PEI physicians claims processing database.	January 2003-March 2008	PEI-specific	3,962 patients	100	>1	Yes	No	No	No	No
Hirello 2022	To assess trends in income-related inequities of healthcare utilization in Canada, nationally, provincially and for urban/rural areas, from 2000 to 2014, to	Cross sectional study	Canadian Community Health Survey	2000-2014	National	664,548 respondents	0.43	≥18	Yes	No	No	Yes	No

	determine how equity in healthcare utilization has evolved.												
Islam 2022	To examine provincial variations in not having a regular medical doctor and having unmet healthcare needs among Canadians and to evaluate provincial variations in the impact of not having a regular medical doctor on having unmet health-care needs among Canadians.	Cross sectional study	Canadian Community Health Survey	2014-2018	National	120,345 respondents	0.7	≥12	Yes	No	No	Yes	No
Jeon 2021	To investigate if more patients visited government-insured PCPs and EDs for eye care when local optometric services are government-uninsured and government-insured ophthalmologists are potentially distant.	Cross sectional study	PEI physician billing database	2010-2012	PEI-specific	43,427 patients	100	28-83	Yes	No	No	No	No
Kadish 2023	To identify social determinants of CRC screening and examine their influence on uptake among screen-eligible adults in Canada.	Case control study	Canadian Longitudinal Study on Aging	May 2015-December 2018	National	28,868 respondents	1.9	50-74	Yes	No	Yes	Yes	No

Khan 2018	To examine geographic variations in the clinical assessment and management of diabetic eye exams, glaucoma, and cataracts on Prince Edward Island.	Cross sectional study	PEI physician billing data	2010-2012	PEI-specific	63,245 visits	100	All ages	No	No	No	No	No
Labrosse 2016	To evaluate the effectiveness of integrating the NP role in two primary care collaborative models on PEI and compare collaborative and non-collaborative models with respect to access and quality of care.	Case report	No description of how ED visit and hospital admission data were acquired.	January 2015-September 2015	PEI-specific	4,200 patients	100	All ages	No	No	No	No	No
MacIntyre 2019	To improve osteoporosis care and decrease bone fracture risk in a population of patients 65 years of age and older by evaluating the effectiveness of a self-referral program for bone mineral density testing.	Non-randomised experimental study	Bone mineral density results received from using PEI radiology procedure by the study primary health care center. Historical bone mineral testing data collected from administrative databases (specific databases	July 2009-June 2013	PEI-specific	81 participants	100	≥65	Yes	No	No	No	No

			not indicated).										
MacKinnon 2000	To explore what health means to immigrant and refugee women there and what factors they believe influence their health and to examine the participants' perceptions of their health, their health maintenance patterns, their experiences with Canada's health care system and the significance of the gender of the health care provider.	Qualitative research	Qualitative data from semi-structured interviews	Not specified.	PEI-specific	22 participants	100	21-70	No	No	No	Yes	Yes
McDonald 2010	To identify how mammography use varies across a broader set of rural and urban areas than the simple dichotomous classification used in much of the previous research.	Cross sectional study	Canadian Community Health Survey	2002-2005	National	56,830 respondents	Not reported	40-69	Yes	No	No	Yes	No
McLeod 2023	To examine the relationship between having a diagnosed mood disorder and experiencing unmet healthcare needs using a recent, nationally representative survey.	Cross sectional study	Canadian Community Health Survey	2014	National	52,825 respondents	0.4	≥18	Yes	No	Yes	Yes	No

Pulok 2022	To examine the trends and determinants of income-related inequities in general practitioner (GP), specialist, and any physician visits among older adults (aged 65+) in Canada.	Longitudinal study	Canadian Community Health Survey	1998-2011	National	1,811 respondents	0.5	≥65	Yes	No	Yes	Yes	No
Simkin 2018	To estimate up-to-date colorectal cancer (UTD-CRC) screening across income strata by levels of urbanization.	Cross sectional study	Canadian Community Health Survey	2013-2014	National	22,523 respondents	1.1	50-74	Yes	No	No	Yes	No
Singh 2015	To estimate up-to-date CRC screening rates in 2012 in Canada and assess predictors of up-to-date screening in provinces with and without well-established population-based screening programs, including differences in participation rates by income level.	Cross sectional study	Canadian Community Health Survey	2012	National	61,707 respondents	0.5	≥40	Yes	No	No	Yes	No
Starkes 2005	To examine the determinants of untreated depression in Canada's Atlantic provinces.	Cross sectional study	Canadian Community Health Survey	2000-2001	Atlantic/Maritime	17,836 respondents	5.8	≥12	Yes	No	No	Yes	No
VanTil 2003	To better understand the barriers to cervical cancer screening and their interaction from	Qualitative research	Focus groups	2000	PEI-specific	60 participants	100	45-70	Yes	No	No	Yes	No

	the perspective of older women on PEI.												
Zygmunt 2014	To examine variations in the composition of team-based primary care amongst Canadian provinces in 2008 and identify patient characteristics that may have predicted access.	Cross sectional study	Canadian Survey of Experiences with Primary Health Care	2008	National	9,903 respondents	0.4	≥18	Yes	No	No	Yes	No
Zygmunt 2015	To examine whether team-based care is associated with fewer access problems and less unmet need and whether socioeconomic gradients in access problems and unmet need are smaller in team-based care than in non-team-based care.	Cross sectional study	Canadian Survey of Experiences with Primary Health Care	2008	National	10,858 respondents	0.4	≥18	Yes	No	No	Yes	No

Table 3.2. Concept and context characteristics of included studies.

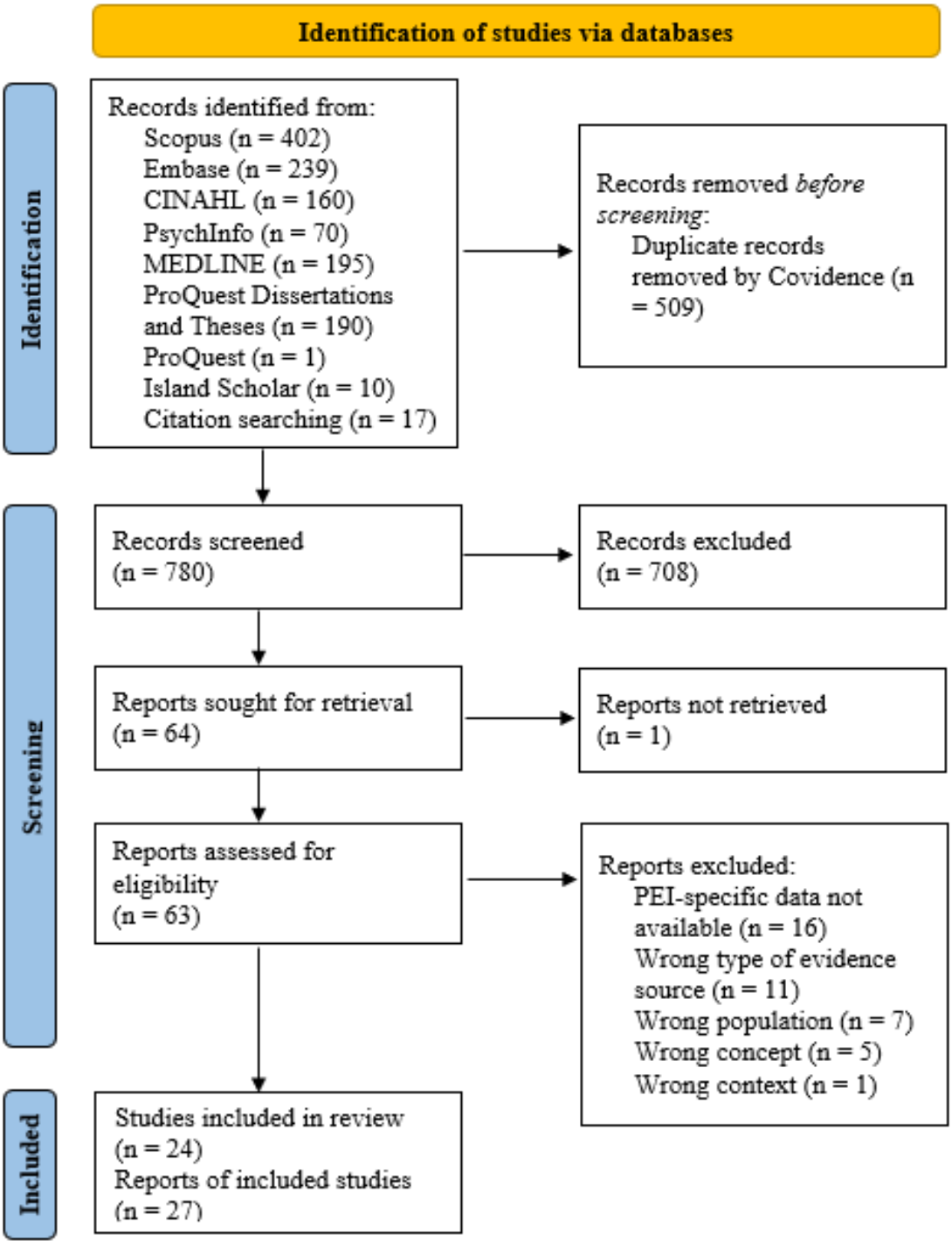
Study ID	Considers approachability	Considers ability to perceive	Considers acceptability	Considers ability to seek	Considers availability and accommodation	Considers ability to reach	Considers affordability	Considers ability to pay	Considers appropriateness	Considers ability to engage	Rural PEI populations considered	Health services associated with primary care considered	Health services considered	Geographic breakdown	Description of geographic breakdown
Alemu 2022	No	Yes	No	No	Yes	No	No	Yes	No	No	Yes	No	NA	Regional	Urban, rural
Allin 2008	No	Yes	No	No	Yes	No	No	Yes	No	No	No	No	NA	Provincial	NA
Asada 2007	No	Yes	No	No	Yes	Yes	No	Yes	Yes	No	No	No	NA	Provincial	NA
Blair 2019	Yes	Yes	No	Yes	Yes	No	No	Yes	Yes	Yes	No	Yes	Preventive care	Provincial	NA
Curnew 2018	Yes	Yes	Yes	No	Yes	No	No	No	Yes	No	No	Yes	Nursing	Provincial	NA
Doran 2006	Yes	Yes	No	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Emergency department	Regional	Prince County Hospital (Urban Prince County)
Gaudreau 2014	No	No	No	No	Yes	No	No	No	Yes	Yes	Yes	Yes	Emergency department; Asthma education	Provincial	NA
Hirello 2022	No	Yes	No	Yes	Yes	No	No	Yes	No	No	Yes	No	NA	Provincial	NA
Islam 2022	No	Yes	No	No	Yes	No	No	Yes	No	No	No	No	NA	Provincial	NA
Jeon 2021	No	No	No	No	Yes	No	No	No	No	No	Yes	Yes	Emergency department; Eye care	Regional	Prince (C0B), Charlottetown (C1A, C1C, C1E), Stratford (C1B), Summersi

															de (C1N), Queens and Kings (C0A)
Kadish 2023	Yes	Yes	No	No	Yes	No	No	Yes	No	Yes	Yes	No	Preventive care	Regional	Rural, small urban, medium urban, large urban
Khan 2018	No	No	No	No	Yes	No	No	No	No	No	Yes	Yes	Eye care	Regional	Charlottetown (C1A, C1C, C1E), Summerside (C1N), Prince (C0B), Queens & Kings (C0A) and Stratford (C1B)
Labrosse 2016	No	No	No	No	Yes	No	No	No	Yes	No	No	No	NA	Regional	Summerside
MacIntyre 2019	Yes	No	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes	Yes	Preventive care	Regional	Location of primary health care centers not indicated.
MacKinnon 2000	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Mental health; Other: Community nursing	Provincial	NA
McDonald 2010	No	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No	No	Yes	Preventive care	Provincial	NA
McLeod 2023	No	Yes	Yes	Yes	Yes	No	No	Yes	Yes	No	No	No	NA	Provincial	NA

Pulok 2022	No	Yes	No	No	Yes	No	No	Yes	No	No	No	No	NA	Provincial	NA
Simkin 2018	Yes	Yes	No	No	Yes	No	No	Yes	No	Yes	Yes	Yes	Preventive care	Regional	Urban, rural, remote residence
Singh 2015	Yes	No	No	Yes	Yes	No	No	Yes	No	Yes	No	Yes	Preventive care	Provincial	NA
Starkes 2005	No	Yes	No	No	Yes	Yes	No	Yes	No	No	No	Yes	Mental health	Provincial	NA
VanTil 2003	Yes	Yes	Yes	Yes	Yes	No	No	No	Yes	No	Yes	Yes	Preventive care	Provincial	NA
Zygmunt 2014	No	Yes	No	No	Yes	No	No	Yes	Yes	No	No	No	NA	Provincial	NA
Zygmunt 2015	No	Yes	No	No	Yes	No	No	Yes	Yes	No	No	No	NA	Provincial	NA

3.10 Figures

Figure 3.1. Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram of search results for the scoping review.



3.11 Appendices

Appendix 3.1. Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) checklist.

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
TITLE			
Title	1	Identify the report as a scoping review.	31
ABSTRACT			
Structured summary	2	Provide a structured summary that includes (as applicable): background, objectives, eligibility criteria, sources of evidence, charting methods, results, and conclusions that relate to the review questions and objectives.	32
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known. Explain why the review questions/objectives lend themselves to a scoping review approach.	33-34
Objectives	4	Provide an explicit statement of the questions and objectives being addressed with reference to their key elements (e.g., population or participants, concepts, and context) or other relevant key elements used to conceptualize the review questions and/or objectives.	34
METHODS			
Protocol and registration	5	Indicate whether a review protocol exists; state if and where it can be accessed (e.g., a Web address); and if available, provide registration information, including the registration number.	35
Eligibility criteria	6	Specify characteristics of the sources of evidence used as eligibility criteria (e.g., years considered, language, and publication status), and provide a rationale.	35-36
Information sources*	7	Describe all information sources in the search (e.g., databases with dates of coverage and contact with authors to identify additional sources), as well as the date the most recent search was executed.	37
Search	8	Present the full electronic search strategy for at least 1 database, including any limits used, such that it could be repeated.	36-37, 64-65
Selection of sources of evidence†	9	State the process for selecting sources of evidence (i.e., screening and eligibility) included in the scoping review.	37
Data charting process‡	10	Describe the methods of charting data from the included sources of evidence (e.g., calibrated forms or forms that have been tested by the team before their use, and whether data charting was done independently or in duplicate) and any processes for obtaining and confirming data from investigators.	37-38
Data items	11	List and define all variables for which data were sought and any assumptions and simplifications made.	38
Critical appraisal of individual sources of evidence§	12	If done, provide a rationale for conducting a critical appraisal of included sources of evidence; describe the methods used and how this information was used in any data synthesis (if appropriate).	NA

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
Synthesis of results	13	Describe the methods of handling and summarizing the data that were charted.	37-38
RESULTS			
Selection of sources of evidence	14	Give numbers of sources of evidence screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally using a flow diagram.	38-39, 61
Characteristics of sources of evidence	15	For each source of evidence, present characteristics for which data were charted and provide the citations.	39-42
Critical appraisal within sources of evidence	16	If done, present data on critical appraisal of included sources of evidence (see item 12).	NA
Results of individual sources of evidence	17	For each included source of evidence, present the relevant data that were charted that relate to the review questions and objectives.	51-60
Synthesis of results	18	Summarize and/or present the charting results as they relate to the review questions and objectives.	38-42
DISCUSSION			
Summary of evidence	19	Summarize the main results (including an overview of concepts, themes, and types of evidence available), link to the review questions and objectives, and consider the relevance to key groups.	42-43
Limitations	20	Discuss the limitations of the scoping review process.	43-45
Conclusions	21	Provide a general interpretation of the results with respect to the review questions and objectives, as well as potential implications and/or next steps.	45
FUNDING			
Funding	22	Describe sources of funding for the included sources of evidence, as well as sources of funding for the scoping review. Describe the role of the funders of the scoping review.	31

Appendix 3.2. Search strategy for each database searched.

Resource	Date searched	Search strategy		
Medline(OVID)	29-Jun-23	Ovid MEDLINE(R) ALL <1946 to June 28, 2023>		
		1	Prince Edward Island/	323
		2	Prince Edward Island.mp.	721
		3	(atlantic adj3 canada).ti,ab,kw.	513
		4	maritime*.ti,ab,kw.	4653
		5	(Atlantic adj3 region).ti,ab,kw.	1157
		6	(eastern adj3 canada).ti,ab,kw.	1031
		7	Health Services Accessibility/	85394
		8	Primary Health Care/	91427
		9	(health adj8 access*).ti,ab,kw.	61487
		10	(primary adj8 care).ti,ab,kw.	183686
		11	(access* adj8 care).ti,ab,kw.	72805
		12	1 or 2 or 3 or 4 or 5 or 6	7880
		13	7 or 8 or 9 or 10 or 11	352186
		14	12 and 13	195
PsychInfo	29-Jun-23	APA PsycInfo <1806 to June Week 3 2023>		
		1	Prince Edward Island.mp.	87
		2	(atlantic adj3 canada).ti,ab.	115
		3	maritime*.ti,ab.	592
		4	(Atlantic adj3 region).ti,ab.	533
		5	(eastern adj3 canada).ti,ab.	183
		6	(access* adj8 care).ti,ab.	20162
		7	(primary adj8 care).ti,ab.	42401
		8	(health adj8 access*).ti,ab.	21075
		9	Primary Health Care/	21219
		10	Health Care Access/	2421
		11	Health Care Utilization/	17783
		12	Health Care Services/	49127
		13	1 or 2 or 3 or 4 or 5	1494
		14	6 or 7 or 8 or 9 or 10 or 11 or 12	126159
		15	13 and 14	70
EMBASE	29-Jun-23	Embase <1974 to 2023 June 28>		
		1	Prince Edward Island/	211
		2	Prince Edward Island.mp.	690
		3	(atlantic adj3 canada).ti,ab,kw.	630
		4	maritime*.ti,ab,kw.	5073
		5	(Atlantic adj3 region).ti,ab,kw.	1322
		6	(eastern adj3 canada).ti,ab,kw.	1101
		7	(access* adj8 care).ti,ab,kw.	101874

		8	(primary adj8 care).ti,ab,kw.	254759
		9	(health adj8 access*).ti,ab,kw.	77921
		10	health care access/	85402
		11	primary health care/	79023
		12	1 or 2 or 3 or 4 or 5 or 6	8603
		13	7 or 8 or 9 or 10 or 11	463854
		14	12 and 13	239
Scopus	29-Jun-23	(ALL ("prince edward island") OR TITLE-ABS-KEY (atlantic W/3 canada) OR TITLE-ABS-KEY (maritime*) OR TITLE-ABS-KEY (atlantic W/3 region) OR TITLE-ABS-KEY (eastern W/3 canada)) AND (TITLE-ABS-KEY (access* W/8 care) OR TITLE-ABS-KEY (primary W/8 care) OR TITLE-ABS-KEY (health W/8 access*))		
CINAHL	29-Jun-23	((MH "Prince Edward Island") OR (MH "Association of Nurses of Prince Edward Island") OR (TX "Prince Edward Island") OR (TI (Atlantic N3 Canada)) OR (AB (Atlantic N3 Canada)) OR (TI maritime*) OR (AB maritime*) OR (TI (Atlantic N3 region)) OR (AB (Atlantic N3 region)) OR (TI (Eastern N3 Canada)) OR (AB (Eastern N3 Canada))) AND ((MH "Access to Primary Care") OR (MH "Health Services Accessibility") OR (TI (access* N8 care)) OR (AB (access* N8 care)) OR (TI (primary N8 care)) OR (AB (primary N8 care)) OR (TI (health N8 access*)) OR (AB (health N8 access*)))		
ProQuest Dissertations and Theses	29-Jun-23	("prince edward island" OR AB,TI(atlantic NEAR/3 canada) OR AB,TI(maritime*) OR AB,TI(atlantic NEAR/3 region) OR AB,TI(eastern NEAR/3 canada)) AND (AB,TI(access* NEAR/8 care) OR AB,TI(primary NEAR/8 care) OR AB,TI(health NEAR/8 access*))		
Island Scholar UPEI	08-Jul-23	Text:(access) AND Text:("primary care")		

Appendix 3.3. Sample data extraction template from Covidence.

General Information
First author (Last name):
Year of publication:
Title:
Methods
Aim of study:
Study design:
- Randomised controlled trial
- Non-randomised experimental study
- Before and after study
- Interrupted time series
- Prospective cohort study
- Retrospective cohort study
- Cross sectional study
- Case control study
- Systematic review
- Scoping review
- Qualitative research
- Prevalence study
- Case series
- Case report
- Economic evaluation
- Thesis
- Dissertation
- Other

Data source:
Start date:
End date:
Study funding sources:
Population Characteristics
Scope of population:
- National
- Atlantic/Maritime
- PEI-specific
- Other

Inclusion criteria:
Exclusion criteria:
Sample size:
% of sample from PEI:
Sample size unit (I.e. patients, papers, etc.):
Age range:
Sex considered:
- Yes
- No
- NA

Gender considered:
- Yes
- No
- NA

Race considered:
- Yes
- No
- NA

Socioeconomic status considered:
- Yes
- No
- NA

Language considered:
- Yes
- No
- NA

Concept Characteristics

Considers approachability (I.e. transparency, outreach, information, screening.
"Approachability relates to the fact that people facing health needs can actually identify that some form of services exists, can be reached, and have an impact on the health of the individual. Services can make themselves more or less known among various social or geographical population groups. Various elements such as transparency, information regarding available treatments and services and outreach activities could contribute to make the services more or less approachable."):
1. Yes
2. No

Considers ability to perceive **(**I.e. health literacy, health beliefs, trust, and expectations.
"The ability to perceive need for care among populations is crucial and determined by such factors such as health literacy, knowledge about health and beliefs related to health and sickness."**)**:
- Yes
- No

Considers acceptability (I.e. professional values, norms, culture, gender.
"Acceptability relates to cultural and social factors determining the possibility for people to accept the aspects of the service (e.g. the sex or social group of providers, the beliefs associated to systems of medicine) and the judged appropriateness for the persons to seek care. For example, a society forbidding casual physical contact between unmarried men and women would reduce acceptability of care and acceptability to seek care for women if health service providers are mostly men. It may be that some services are inequitable in the way they are organized, making them unacceptable to some sections of the community that they are intended to serve [6].."):
- Yes
- No

Considers ability to seek (I.e. personal and social values, culture, gender, autonomy.
"Ability to seek health care relates to the concepts of personal autonomy and capacity to choose to seek care, knowledge about health care options and individual rights that would determine

expressing the intention to obtain health care. A good example would be female discrimination regarding the initiation of care or abuse and neglect discouraging ethnic minorities to seek care. This relates to the challenge of ensuring that care meets the needs of different cultural, socioeconomically disadvantaged, and vulnerable populations. Because different groups may judge appropriateness and quality differently, this is an important challenge [25]."):

- Yes
- No

Considers availability and accommodation (I.e. geographic location, accommodation, hours of opening, appointment mechanisms.
"Availability and accommodation refer to the fact that health services (either the physical space or those working in health care roles) can be reached both physically and in a timely manner. Availability constitutes the physical existence of health resources with sufficient capacity to produce services (existence of productive facilities) [7]. It results from characteristics of facilities (e.g. density, concentration, distribution, building accessibility), of urban contexts (e.g. decentralisation, urban spread, and transportation system) and of individuals (e.g. duration and flexibility of working hours). It also relates to characteristics of providers (e.g. presence of the health professional, qualification) and modes of provision of services (e.g. contact procedure and possibility of virtual consultations). Access is restricted if available resources are unevenly distributed around a country, or across levels of care (with specialty care developed at the expense of primary care) [6]."):

- Yes
- No

Considers ability to reach (I.e. living environments, transport, mobility, social support.
"Ability to reach health care relates to the notion of personal mobility and availability of transportation, occupational flexibility, and knowledge about health services that would enable one person to physically reach service providers. Restricted mobility of the aged and handicapped, or the inability of casual workers to be absent from work to consult medical providers would be examples of these."):

- Yes
- No

Considers affordability (I.e. direct costs, indirect costs, opportunity costs.
"Affordability reflects the economic capacity for people to spend resources and time to use appropriate services. It results from direct prices of services and related expenses in addition to opportunity costs related to loss of income. Furthermore it can vary by type of services and depends on the capacity to generate the resources to pay for care (e.g. mode of payment, mobilisation of resources). Economic studies of utilization models demand using variables such as price of care, travel time and the opportunity costs linked to it, patient’s income, perceived quality of care, provider behaviour, etc. These models give useful information about elasticity of demand for different types of health services [1]."):

- Yes
- No

Considers ability to pay (I.e. income, assets, social capital, health insurance.
"Ability to pay for health care is a widely used concept within the health services and health economics literature [8,26]. It describes the capacity to generate economic resources through income, savings, borrowing or loans - to pay for health care services without catastrophic expenditure of resources required for basic necessities (e.g. sale of home). Poverty, social

isolation, or indebtedness would be examples of factors restricting the capacity of people to pay for needed care."):

- Yes
- No

Considers appropriateness (I.e. technical and interpersonal quality, adequacy, coordination, and continuity.
"Appropriateness denotes the fit between services and clients need, its timeliness, the amount of care spent in assessing health problems and determining the correct treatment and the technical and interpersonal quality of the services provided [7,27]. Adequacy relates to the appropriateness (what services are provided) and quality (the way in which they are provided) of health services and its integrated and continuous nature [7,27]. Clearly, the content and effectiveness of health services and goods one has the opportunity to utilise matters [1]. Opportunity to utilise only services of poor quality in this sense is seen as restriction of access to health care. Some suggest that these dimensions - acceptability and adequacy - should not be part of access [7]. Our reasoning is that one should not have access to health care based on geographical and organisational availability and affordability alone, but that access encompasses the possibility to choose acceptable and effective services. The opportunity for a person to utilise the services of untrained practitioners (e.g. witch doctors, healers) cannot be equated to the opportunity for another person wealthier - to utilise highly specialised services, if these services generate different health outcomes or satisfaction towards services. Utilisation of services with inherently differential technical qualities - either through the utilisation of different types of providers or through differential prescription practices - cannot be seen as equally appropriate care."):

- Yes
- No

Considers ability to engage (I.e. empowerment, information, adherence, caregiver support.
"Ability to engage in health care would relate to the participation and involvement of the client in decision-making and treatment decisions, which is in turn strongly determined by capacity and motivation to participate in care and commit to its completion. This dimension is strongly related to the capacity to communicate as well as notions of health literacy, self-efficacy, and self management in addition to the importance of receiving care that is actually appropriate for the person, given its resources and skills. Access to optimal care ultimately requires the person to be fully engaged in care and this is seen as interacting with the nature of the service actually offered and provided."):

- Yes
- No

Context Characteristics

Rural PEI populations considered:

- Yes
- No

Health services associated with primary care considered:

- Yes
- No

Health services considered (List - if applicable):

- Public health
- Mental health
- Emergency department

- Preventive care
- Not applicable
- Other

Geographic breakdown:

- Provincial
- Regional

Description of geographic breakdown (Not applicable if the geographic breakdown is provincial.):

Other notes:

Chapter 4: Examining the association between having access to primary care and non-urgent visits to the emergency department on Prince Edward Island: A retrospective, population-based, cross-sectional study

4.1 Preface

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Author Contributions: AM, LB, and SH contributed to the study conception and design. AM conducted the statistical analysis. AM and LB contributed to data interpretation. AM drafted the manuscript which was revised by LB and reviewed by SH.

Required Approvals: Ethics approval was obtained from the Montfort Hospital Research Ethics Board (23-24-04-003) and the University of Ottawa Office of Research Ethics and Integrity (H-07-23-9307) (see **Appendix 4.1-4.2**).

Publication: This manuscript has not yet been submitted for publication.

Funding Sources: AM received scholarships from the Canadian Institute for Health Research (the Canadian Graduate Student – Master's scholarship) and the Institut du Savoir Montfort Master's Scholarship to conduct this research. AM also received the data used to conduct this research free of charge from the Canadian Institute for Health Information via their Graduate Student Data Access Program. The opinions, results and conclusions are those of the authors and are independent from the funding sources.

4.2 Abstract

Introduction: Access to primary care on Prince Edward Island (PEI) is declining but the extent of the impact of lack of access to primary care on emergency department (ED) services on PEI is unclear. We aimed to analyze the association between primary care access and ED visit acuity on PEI and to examine the effect of region of residence and the COVID-19 pandemic on this association.

Methods: We used a retrospective, population-based, cross-sectional study design. The National Ambulatory Care Reporting System (NACRS) database was used to identify patients aged 18 years and older who visited a PEI hospital ED from April 1st, 2018, to March 31st, 2022, and who had a PEI-issued health card number. Descriptive statistics and multivariable logistic regression were used to determine the association between access to a primary care provider and ED visit acuity as determined by the Canadian Triage and Acuity Scale (CTAS).

Results: The effect of access to primary care on ED visit acuity, was modified by region of residence. All else held fixed, the odds of having a non-urgent ED visit were significantly lower in patients with access to primary care compared to patients without access to primary care for all regions on PEI. The strongest negative association between having a non-urgent ED visit and access to primary care was in Summerside and Prince and the weakest was in Queens, Kings, and Stratford.

Conclusions: Our study suggests lack of access to primary is negatively impacting non-urgent use of the ED on PEI. Improving access to primary care on PEI may help to reduce ED overcrowding and wait times and thereby improve health outcomes.

4.3 Introduction

Prince Edward Island (PEI) is the smallest province in Canada, both geographically and demographically, with an area of 5,660 km^2 and a population of 176,113 as of April 2023 (PEI Statistics Bureau, 2023). PEI is currently challenged with providing access to primary care to a growing population while simultaneously experiencing a physician shortage. PEI's physician shortage is the result of a combination of factors, including the more rural and isolated nature of PEI relative to other provinces and the challenges this creates in attracting and retaining physicians (Canadian Medical Association, 2020). According to the Canadian Community Health Survey, 19% of PEI residents, or Islanders, were without access to a regular healthcare provider in 2021 (Canadian Institute for Health Information, 2023). This is an increase of 4% from 2019 and another 4% from 2015 (Government of Canada & Statistics Canada, 2020). Compared with the rest of Canada, only the Northwest Territories (48%) and Nunavut (76%) have more individuals without access to a regular healthcare provider than PEI (Canadian Institute for Health Information, 2023).

In addition to these interprovincial differences in access to primary care, evidence suggests that disparities in access to primary care exist within the province of PEI. The PEI Chief Public Health Officer (CPHO) 2021 report found differences in access to primary care across the province (Morrison et al., 2021). PEI's CPHO 2021 report found differences in health status between types of population centers (rural, small centers, and medium centers). For example, survey responses indicating excellent or very good general health were the lowest among respondents from small centers (55.2%) and highest among respondents from medium centers (66.9%). However, the CPHO 2021 report indicates that the "type of population center" may not be an accurate method of quantifying geographic disparities on PEI. Instead, the report recommends dividing the island into regions to better understand where access to health care is of greatest concern for PEI.

Understanding the landscape of access to primary care on PEI is important as lack of access to a primary care provider can lead to increased pressures on many areas of the health system. The impact of lack of primary care access on emergency department (ED) use, particularly non-urgent use, is somewhat inconsistent in the literature. Ionescu-Ittu et al. (2007) found that increased ED use in Quebec was associated with a lack of access to a primary care provider, reduced continuity of care with primary care providers, and residing in rural areas. Similarly, Moineddin et al. (2011) found that the odds of having a non-urgent visit to the ED in Ontario were greater among those who did not have regular access to a primary care provider and those who lived in rural areas. However, another Ontario-based study found that visiting a primary care provider was not associated with ED use when comparing more urgent versus less urgent ED visits but that urban versus rural residence was (Khan et al., 2011). A study examining the association between frequent ED use and having a primary care provider in New Brunswick also found that frequent ED attenders in both rural and urban settings were more likely to have a primary care provider (Palmer et al., 2014). On PEI, it is unclear to what extent lack of access to primary care increases the use of EDs, particularly for non-urgent issues.

The COVID-19 pandemic significantly impacted both ED visits and access to primary care globally. Patients with chronic conditions were more likely to avoid visiting EDs due to fear of being exposed to COVID-19 (Meyerowitz-Katz et al., 2023). Adaptation of primary care functioning to support and aid in response to the pandemic resulted in the rapid implementation of telehealth to improve patient access to primary care (Boxley et al., 2023). However, this also resulted in substantially increased workload, stress, and burnout for primary care professionals due to their pivotal role in the pandemic response (Rawaf et al., 2020). The 2021 Canadian Survey on Health Care Workers' Experiences During the Pandemic found that approximately

47% of physicians with less than five years of experience and 27% of physicians with more than five years of experience intend to leave or change their job in the next three years (Government of Canada & Statistics Canada, 2022). While the pandemic provided an opportunity for the development and implementation of alternative methods of patient care that can be used to improve patient experiences moving forward, it also created considerable anxiety and stress in both patients and providers.

On PEI, the effects of the pandemic on physicians and the health care system are still widespread. A family doctor on PEI who closed his practice in September 2023 said in a letter to his patients: "Practising medicine was difficult before COVID-19, but now it is much worse. I know Health P.E.I. is doing their best, but they are working with limited resources (the largest deficit being human resources). Unfortunately, many doctors, nurses, and medical support personnel have recently left health care, and my name will be part of that growing list" (Ryan, 2023). The physician's 3,400 patients were directed to Maple, the free virtual care service offered to Islanders without a primary care provider (Ryan, 2023). The effect of the pandemic on the association between primary care access and ED use on PEI is currently unknown. We hypothesize that COVID-19 will have had a strong positive effect on the association between lack of access to primary care and ED visit acuity such that, during and after the COVID-19 pandemic, there will be an increased odds of non-urgent ED visits for those with no access compared to those with access to primary care.

The objective of this study is to examine the impact of primary care access on ED visit acuity on PEI. This will be done by analyzing the association between ED visit acuity and access to primary care and by assessing the effect of region of residence and time of visit in relation to the COVID-19 pandemic on this association. We hypothesize that the odds of non-urgent ED visits

will be increased for PEI ED visitors without access to primary care compared to visitors with access to primary care and that the association will be modified by region of residence on PEI and time of visit in relation to the institution of COVID-19 restrictions. Compared with other Atlantic provinces, PEI is relatively underrepresented in the literature, perhaps due to its small population and more isolated geography (Curnew & Lukewich, 2018). Therefore, our study will also demonstrate the feasibility of conducting primary care access research on PEI given the available data.

4.4 Methods

We used routinely collected health administrative data. We received approval from the research ethics boards of the Montfort Hospital and the University of Ottawa for this study (see **Appendix 4.1-4.2**). We reported the results of this study according to the guidance of the REporting of studies Conducted using Observational Routinely-collected health Data (RECORD) statement (Benchimol et al., 2015). The RECORD statement checklist can be found in **Appendix 4.3**.

4.4.1 Study Design and Data Source

We conducted a population-based, retrospective cross-sectional study using individual-level, anonymized health administrative data for PEI, Canada, which had a population of 176,113 as of April 2023 (PEI Statistics Bureau, 2023). We obtained ED visit data from the National Ambulatory Care Reporting System (NACRS), a database of the Canadian Institute for Health Information (CIHI), from April 1st, 2018, to March 31st, 2022; we accessed the data cost-free through the "Graduate Student Data Access Program" (see **Appendix 4.4**). Data cleaning was conducted before we obtained access to the data via CIHI's Secure Access Environment. We did not conduct formal sample size power calculations for this study, as this study comprises not a

sample, but rather the entire eligible PEI population (i.e. adults aged 18 years and over visiting an ED on PEI from April 1st, 2018, to March 31st, 2022).

4.4.2 Participants

We included all visits for patients aged 18 years or older who visited a PEI hospital ED from April 1st, 2018, to March 31st, 2022, resided within a PEI postal code, and had a PEI-issued health card number. We excluded visits by patients admitted to the ED due to an arranged surgery visit, repeat visits on the same day in the same ED, and patients who received a therapeutic abortion. We also excluded visits where the response to the "Triage Level" data element or the "Access to Primary Health Care Code" were recorded as "unknown" or left blank as these were the main outcome of interest and the main exposure of interest, respectively.

4.4.3 Exposure

The primary exposure of interest was access to primary care which we determined by using the "Access to Primary Health Care Code" element of the NACRS database (Canadian Institute for Health Information, n.d.). According to the NACRS metadata dictionary, this code "identifies whether a patient has access to primary health care through a family physician, family health team, walk-in clinic or other setting" (Canadian Institute for Health Information, 2022).

We defined access to primary care as Code 1 (Family Physician - If a patient has access to a family physician as well as a family health team or walk-in clinic.) and Code 2 (Other - Does not specify which "other" primary health care services the patient is accessing care from. For example, a patient who receives primary health care from a nurse practitioner should be grouped into Code 2.) (CIHI, personal communication, 4 June 2024). We defined no access to primary care as Code 3 which should only be captured when it is known that the patient has no access to

primary health care (CIHI, personal communication, 4 June 2024). We excluded visits coded as Code 9 (captures scenarios when it is unknown/unavailable at the time of coding that a patient has access to primary care and includes when a patient arrives to the ED dead or unconscious (CIHI, personal communication, 4 June 2024)) and missing data for the "Access to Primary Health Care Code".

4.4.4 Outcome

The outcome of interest is ED visit acuity which we determined by the "Triage Level" element of the NACRS database (Canadian Institute for Health Information, n.d.). Triage level was measured according to the Canadian Triage Acuity Scale (CTAS) classification system. We defined urgent ED visits as a CTAS score of 1 (resuscitation; must be seen by a physician immediately), 2 (emergent; must be seen in 15 minutes or less), or 3 (urgent; must be seen in 30 minutes or less) and non-urgent ED visits as a CTAS score of 4 (less urgent; must be seen in 1 hour or less) or 5 (non-urgent; must be seen in 2 hours or less) (Khan et al., 2011; Moineddin et al., 2011; Murray, 2003).

4.4.5 Effect Modification

We considered region of residence on PEI as a potential modifier of the association between access to primary care and ED visit acuity. We divided PEI into three regions according to the first three characters of the postal code, also known as forward sortation areas (FSAs): Charlottetown ("C1A," "C1C," "C1E"), Summerside and Prince ("C1N", "C0B"), and Queens, Kings, and Stratford ("C0A", "C1B"). See **Figure 4.1** for the geographic distribution of the PEI FSAs.

We considered the date of the ED visit in relation to when COVID-19 restrictions began and ended as a potential effect modifier. We categorized the date of the visit according to whether the visit occurred before COVID-19 restrictions were implemented (before March 17th, 2020 (Government of Prince Edward Island, Department of Health and Wellness, 2020)), during the implementation of COVID-19 restrictions (on or between March 17th, 2020 (Government of Prince Edward Island, Department of Health and Wellness, 2020)) and April 6th, 2022 (Government of Prince Edward Island, Department of Health and Wellness, 2022)) or after COVID-19 restrictions were lifted (after April 6th, 2022 (Government of Prince Edward Island, Department of Health and Wellness, 2022)).

Prior to April 1st, 2021, only Prince County Hospital (PCH), located in Summerside, was reporting data to the NACRS database. On April 1st, 2021, Queen Elizabeth Hospital (QEH) also began reporting data to the database. Thus, we considered the time of visit in relation to when QEH was added to the database as a potential effect modifier of the association due to the potential for heterogeneity of the data between these two time periods.

4.4.6 Other Variables

We reported patients' sex (male, female, or other) and age in groups of 18-30, 31-40, 41-50, 51-60, 61-70, 71-80 and ≥ 81 years. We calculated and reported the median number of visits per patient per year by determining how many visits each patient made during each fiscal year using a unique but meaningless patient identifier and taking the median number of visits per fiscal year. This number was then categorized into 1 visit, 2-3 visits, or 4 or more visits (Palmer et al., 2014). We reported whether the patient was from an urban or rural/remote geographical region according to the classifications outlined in **Table 4.1**. Finally, we reported whether the patient was admitted via ambulance (air, water, or ground ambulance) or not.

4.4.7 Statistical Analysis

We conducted statistical analyses including descriptive statistics and univariable and multivariable logistic regression using SAS software. We used descriptive statistics to characterize the study population. We reported continuous variables as means with standard deviations (SD), or medians with interquartile ranges (IQR) if the data were not normally distributed. We reported categorical variables as proportions. We reported the percentage (%) of missing data for all variables with missing data.

We used univariable logistic regression to examine the crude association between the outcome and the exposure and other predictor variables, respectively. We used multivariable logistic regression to examine the association between access to primary care and ED visit acuity according to the approach outlined by Kleinbaum and Klein (2010). We adjusted the model for important covariates including age, sex, region of residence, urban versus rural/remote residence, and the median number of emergency department visits per year. We identified confounding variables via literature review and included these variables in the model regardless of the percentage with which they modified the association between the exposure and outcome to reduce bias. We assessed the assumptions of the multivariable logistic regression including linearity, independence of observations, multicollinearity, and influence of outliers for violations. Multicollinearity was determined to be present if the variance inflation factor was greater than 4 or if the condition index was greater than 30 (Kim, 2019; Menard, 2002). If we found influential outliers, we conducted a sensitivity analysis to determine the effect of the outliers on the estimates.

To assess for effect modification, we used a likelihood ratio test to compare a model including all effect modifiers and covariates to a model including only the covariates. The null

hypothesis of the likelihood ratio test was that all the beta coefficients were equal to 0. We conducted backward selection with a cut-off of p = 0.05 to determine which effect modifiers were significant. We reported stratified odds ratio (OR) estimates and 95% confidence intervals (CI) according to the statistically significant effect modifiers. We used a complete case analysis to handle missing values. The statistical significance threshold for all analyses was alpha = 0.05.

4.4.8 Sensitivity Analysis

We conducted a sensitivity analysis for each variable with missing values to determine the nature of the missing values with respect to the outcome, the exposure, and the other predictors. We used the Chi-square (X^2) test of independence to test for statistically significant differences between the proportion of missing and non-missing values of the variables with missing data across each of the outcome, exposure, and predictor variables, respectively.

4.5 Results

4.5.1 Study Sample

A total of 152,878 ED visits were eligible for inclusion in our study. We excluded 67 visits because the access to primary health care code was missing and 1,600 visits by patients with PEI health cards but not residing within a PEI postal code. Thus, 151,211 ED visits were included in our analysis. Population characteristics are described in **Table 4.2**. The majority of visits (80.0%) were by patients reported to have access to primary care. A greater proportion of non-urgent visits to the ED were by patients without access to primary care compared to patients with access (47.2% vs. 37.4%), whereas a lesser proportion of urgent visits to the ED were by patients without access to primary care compared to with access (52.8% vs. 62.6%). More females had access to primary care than males (54.8% vs. 45.1%). Fewer visits among patients

18-50 years of age were by patients with access to primary care compared to patients older than 50 years of age.

A greater proportion of visits by residents of Charlottetown were by patients without access to primary care whereas a greater proportion of visits in Summerside and Prince were made by patients with access to primary care. Visits by residents of Queens, Kings, and Prince were by a similar proportion of patients with and without access to primary care. Additionally, a greater proportion of visits by patients from rural/remote regions of PEI were by patients with access to primary care whereas a greater proportion of visits by patients from urban regions were by patients without access.

Before COVID-19 and the implementation of COVID-19 restrictions, a greater proportion of visits were by patients with access to primary care; however, after COVID-19 restrictions were lifted a greater proportion of visits were by patients without access to primary care. While COVID-19 restrictions were in effect, the proportion of visits by patients with and without access to primary care was similar. Patients who visited the ED more frequently had a greater proportion of access to primary care than patients who visited the ED only once per year.

4.5.2 Missing Data

Three variables included in the analysis were missing data; however, the frequency of missing data for all three variables combined was less than 5%. Age and region of residence both had 1.7% missing data and urban versus rural/remote residence had 0.3% missing data, as can be seen in **Table 4.2**. A greater proportion of missing observations for all variables with missing data were for visits by patients with access to primary care. Visits that were missing age values

were also missing region of residence values. Characteristics of the missing data for each variable containing missing data can be found in **Appendix 4.5-4.7**.

Missing urban versus rural/remote residence values were not associated with the outcome of ED visit acuity ($p = 0.782$, sex ($p = 0.512$), or median number of ED visits per year ($p = 0.142$) but were associated ($p < 0.05$) with the exposure of interest (access to primary care) and the other predictor variables (age, region of residence, time of visit in relation to COVID-19, and time of visit in regard to QEH being added to the NACRS database). Missing values for both age and region of residence were associated ($p < 0.05$) with the outcome, exposure of interest, and all other predictor variables (sex, region of residence, urban versus rural/remote residence, time of visit in relation to COVID-19, time of visit in relation to QEH being added to the NACRS database, and median number of ED visits per year).

4.5.3 Logistic Regression Analysis

We removed observations with missing data (n = 3,089) to conduct a complete case analysis. We removed visits by patients whose sex was recorded as other than male, or female (n = 37) due to considerations about small cell counts. We thus conducted univariable and multivariable regression analyses using 148,085 visits, the results of which can be found in **Table 4.3**. The univariable logistic regression analysis indicates that access to primary care, age, region of residence, urban versus rural/remote residence, time of visit concerning QEH being added to the NACRS database, and median number of ED visits per year were significantly associated with the outcome of ED visit acuity among PEI ED visitors. Sex was not significantly associated with the outcome as the odds of having a non-urgent ED visit were similar for male and female ED visitors (OR 1.018; 95% CI 0.997, 1.040).

We assessed region of residence, time of visit concerning the implementation of COVID-19 restrictions, and time of visit concerning when QEH started reporting to the NACRS database for effect modification. The likelihood ratio test was significant ($p = 0.012$) and thus we conducted backward selection of each of the effect modifier terms. Region of residence and time of visit concerning when QEH started reporting to the NACRS database were significant interaction terms and were included in the final multivariable logistic regression model as effect modifiers of the association between access to primary care and ED visit acuity. We also adjusted the final model for age, sex, region of residence, urban versus rural/remote residence, and median ED visits per year. Although we did not find significant multicollinearity between any predictor variables, we removed time of visit relative to the implementation of COVID-19 restrictions from the final regression model due to concerns of collinearity with time of visit concerning when QEH was added to the database.

Similar to the univariable logistic regression analysis, multivariable logistic regression analysis found a significant negative association between the outcome and the adjusted variables age, urban versus rural/remote residence, and median ED visits per year but not sex. The effect of the exposure of interest (access to primary care) was modified by region of residence and time of visit concerning when QEH was added to the NACRS database. The odds ratio estimates for the exposure of interest stratified by each effect modifier can be found in **Table 4.4**. All else held fixed, before QEH was added to the database, the odds of having a non-urgent ED visit for patients with primary care compared to patients without were reduced by 27% (OR 0.73; 95% CI 0.67, 0.79) for residents of Charlottetown, 28% (OR 0.72; 95% CI 0.680, 0.755) for residents of Summerside and Prince and 20% (OR 0.80; 95% CI 0.74, 0.87) for residents of Queens, Kings, and Stratford. After QEH was added to the database, the odds of a non-urgent visit for patients

with primary care compared to without were reduced by 33% (OR 0.67; 95% CI 0.64, 0.70) for residents of Charlottetown, 34% (OR 0.66; 95% CI 0.63, 0.70) for residents of Summerside and Prince, and 26% (OR 0.73; 95% CI 0.70, 0.78) for residents of Queens, Kings, and Stratford.

4.6 Discussion

Our results demonstrate a strong association between primary care access and ED visit acuity modified by region of residence and time of visit relative to QEH beginning to report to the NACRS database. We found that for all regions of PEI, PEI ED visitors with access to primary care have significantly reduced odds of having a non-urgent ED visit compared to Islanders without access to primary care. Thus, access to primary care appears to act as a protective factor for non-urgent ED visits on PEI. The odds of having a non-urgent visit for ED visitors with access to primary care were also reduced for all regions after April 1st, 2021 (when QEH began reporting data to NACRS). ED visitors with access to primary care in Summerside and Prince had the lowest odds of having a non-urgent visit whereas ED visitors with access to primary care in Queens, Kings, and Stratford had the highest odds of having a non-urgent visit compared to ED visitors without primary care in both regions, respectively. Additionally, older age, rural residence, and having more than one ED visit per year were associated with lower odds of having a non-urgent visit compared to an urgent visit.

Overall, our findings are in agreement with the literature. Similar to our findings, Ionescu-Ittu et al. (2007) found that among elderly Quebec residents, region of residence is an effect modifier of the association between continuity of care with a primary care provider and ED utilization. In an Ontario population-based study, Khan et al. (2011) found that having a regular medical doctor resulted in 39% increased odds of a more urgent (CTAS level 1-3) compared to a less urgent (CTAS 4 or 5) ED visit; however, this association was not statistically significant as in

our study. Khan et al. (2011) also found that rural residence versus urban residence was significantly associated with ED visit acuity such that compared to urban residents, rural residents had lower odds of an urgent (CTAS level 1-3) visit compared to a less urgent (CTAS 4 or 5) visit.

While these studies coded exposure and outcome variables slightly differently than we did, their findings are still in agreement with ours whereby ED visitors with access to primary care use the ED more "appropriately" as they have an alternate means of accessing care for non-urgent problems whereas ED visitors without access to primary care rely on the ED for non-urgent problems as they cannot access care elsewhere. Furthermore, increased non-urgent use of the ED by visitors without access to primary care can contribute to ED overcrowding, increased wait times, and unnecessary testing (Uscher-Pines et al., 2013).

Notably, sex was not associated with the outcome. Khan et al. (2011) found similar results whereby sex was not associated with urgent versus less urgent ED visits, but male sex was associated with overall ED use versus no use. Moineddin et al. (2011) also found that male sex was associated with an increased rate of ED utilization. Two previous systematic reviews investigating factors associated with non-urgent ED visits found that the effect of sex or gender was inconsistent across studies (Carret et al., 2009; Uscher-Pines et al., 2013). Thus, male sex might be associated with increased ED utilization but not necessarily with non-urgent ED use which we examined in our study.

One of the challenges to researching ED visit acuity is the variation in the definition of visit acuity in the literature (Richardson & Hwang, 2001). Classification of urgent versus non-urgent visits ranges from more subjective classification systems according to questions such as "Could this problem be taken care of by a primary care physician?" which obtained only "moderate" levels of agreement (kappa = 0.43) between ED physicians and triage nurses

(Durand et al., 2011), to more objective classification systems according to the CTAS which obtained “excellent” rates of agreement (kappa = 0.80) between ED physicians and nurses (Beveridge et al., 1999). The CTAS triage and ED visit acuity classification system is used nationwide in Canada and has been successfully implemented in other countries such as Saudi Arabia (Arafat et al., 2016). An advantage of this study is our use of this more objective classification system to define the ED visit acuity outcome in concordance with previous similar Canadian studies (Khan et al., 2011; Moineddin et al., 2011).

4.6.1. Limitations

This study is not without its limitations. We were limited to national surveys and health administrative databases when deciding which data source to use to answer our research questions. One such survey is the Canadian Community Health Survey which only reports PEI responses at the provincial level and thus would not allow us to examine regional differences on PEI (Government of Canada, 2013). Alternatively, health administrative databases such as NACRS can provide regional, population-based data for PEI. However, only two out of the four EDs on PEI are currently reporting data to the NACRS database and as mentioned previously, one ED only began reporting to NACRS in April 2021. These EDs are both located in the more populated central regions of PEI (PCH in Summerside and QEH in Charlottetown) whereas the EDs that are not reported are located in the Eastern and Western regions of the island which are more sparsely populated and are only open for approximately 12 hours a day **(Figure 4.1**). This limits the external generalizability of our findings as Islanders from the more rural Western and Eastern regions of the island are likely underrepresented in our analysis.

We investigated several options to access more representative data. We contacted Health PEI regarding the potential to access data from the two missing EDs; however, due to resource

and time constraints, we were told this would not be feasible (Health PEI, personal communication, October 25, 2022). We also contacted researchers at the University of Prince Edward Island (UPEI) Centre for Health and Community Research. They are currently developing a Secure Island Data Repository which will allow researchers to access more comprehensive, record-level, deidentified PEI health data; however, it is still in the final stages of development and was not available for research at the time the present work was conducted. This data repository should help to reduce challenges with conducting health-related research on PEI for future researchers (Secure Island Data Repository, personal communication, April 3, 2023). To the best of our knowledge, the NACRS database was the most comprehensive and appropriate dataset available to answer our research questions.

Another limitation of our findings is the degree to which the region of residence variable is aggregated. For privacy reasons, we were only able to obtain data for region of residence at the level of grouped FSAs rather than single FSAs or postal codes. Due to PEI's small size, it has very few FSAs and two FSAs (C0A and C0B) cover a large percentage of the island, particularly the more rural eastern and western regions of the island (see **Figure 4.1**). The logistic regression analysis was adjusted for urban versus rural residence to account for this; however, we are unable to further differentiate the association between access to primary care and ED visit acuity for the combined urban and rural regions.

There is potential for misclassification of the exposure of interest variable which identifies whether a patient has access to primary care through a family physician, family health team, walk-in clinic, or other setting (Canadian Institute for Health Information, 2022). However, NACRS coders determine whether a patient has access to primary care based on information obtained at the point of registration or from chart notations documented during the ED visit.

Thus, it is likely that, if it occurred, such misclassification bias would be limited and nondifferential, thereby attenuating the strength of the association between the outcome and the exposure. To the best of our knowledge, no studies have examined the validity or reliability of the NACRS "Access to Primary Health Care Code" variable. However, given that the "Access to Primary Health Care Code" variable is determined based on patient report and that the prevalence of the exposure (i.e. no access to primary care) in the study population (20%) approximates the prevalence of the exposure in the population (approximately 21% (Health PEI, 2024)), the validity and reliability of the variable are likely high.

The missing data in this study is likely missing not at random (MNAR) because it is not clear why visits missing age data are also missing region of residence data. While handling MNAR data by complete case analysis is not the recommended approach, the proportion of visits for each variable with missing data in this study is low (less than 2%) and thus the extent to which the missing data biases our results is likely limited (Sainani, 2015).

Another limitation of our study that coincides with the limited availability of data for PEI is that we were unable to examine the impact of enabling factors such as access to walk-in clinics, hours of operation of primary care providers, relational continuity with primary care providers, distance to emergency department versus primary care provider's office, or access to virtual health care. We were also unable to assess the impact of health literacy or education level which are important modifiers of the association between access to primary care and ED visit acuity as they might influence a patient's perception of urgency and thus their decision to access the ED versus primary care (Carret et al., 2007; Glazier et al., 2008; Khan et al., 2011; Moineddin et al., 2011).

4.7 Conclusion

In this study, we analyzed 151,211 emergency department (ED) visits on Prince Edward Island (PEI) to understand the impact of primary care access on ED visit acuity. Our findings revealed that access to primary care appears to act as a protective factor against non-urgent ED use on PEI. Increased non-urgent use among PEI ED visitors without access to primary care may contribute to ED overcrowding and increased wait times which ultimately might result in overall avoidance of the ED as a source of care. We also found that sex was not significantly associated with visit acuity. These results align with previous studies and underscore the importance of primary care access in reducing unnecessary ED visits. Nonetheless, our study has limitations, including the underrepresentation of rural regions in the data, incomplete reporting (only two out of four PEI EDs currently report data to NACRS), and the inability to examine other factors such as access to walk-in clinics or health literacy, which could further inform our understanding of ED visit patterns on PEI. Addressing these limitations in future research could provide valuable insights for healthcare policy and practice on PEI and elsewhere in Canada.

4.8 References

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4.9 Tables

Table 4.1. Urban and rural/remote geographic region coding according to Statistical Area Classifications.

Statistical Area Classification (SAC)			**SAC Type**	**Urban or Rural/Remote**
Census Metropolitan Area (CMA) or Census Agglomeration (CA) – One or more adjacent municipalities centered around a core	CMA	At least 100,000 people, including 50,000 in the core	1	Urban
	CA with at least one census tract	At least 50,000 people in the core	2	
	CA, no census tracts	10,000 to 50,000 people in the core	3	
Metropolitan Influenced Zone (MIZ) - % of employed residents commuting to a CMA/CA	Strong MIZ	At least 30% commute	4	Rural/Remote
	Moderate MIZ	5-30% commute	5	
	Weak MIZ	More than 0% and less than 5% commute	6	
	No MIZ	0% commute	7	
Territories outside CMA/CA	Municipalities in the territories outside of the Yellowknife and Whitehorse CAs		8	

Table 4.2. Population characteristics stratified by the exposure of interest, and access to primary care, and reported as proportions.

Characteristic	Access to primary care		Missing
	Yes (n = 121,465, 80.0%)	**No (n = 29,746, 20.0%)**	**n (% of total)**
Sex, n (%)			NA
Female	66,630 (54.8)	14,095 (47.4)	
Male	54,803 (45.1)	15,646 (52.6)	
Other	32 (<0.1)	5 (<0.1)	
ED visit acuity, n (%)			NA
Non-urgent (CTAS 4, 5)	45,398 (37.4)	14,038 (47.2)	
Urgent (CTAS 1-3)	76,067 (62.6)	15,708 (52.8)	
Age (years), n (%)			2,626 (1.7)
18-30	22,243 (18.3)	8,958 (30.1)	
31-40	14,775 (12.2)	5,478 (18.4)	
41-50	14,739 (12.1)	4,360 (14.7)	
51-60	17,501 (14.4)	4,226 (14.0)	
61-70	19,023 (15.7)	3,378 (11.4)	
71-80	17,942 (14.8)	2,003 (6.7)	
≥81	13,062 (10.7)	897 (3.0)	
Missing	2,180 (1.8)	446 (1.5)	
Region of residence, n (%)			2,626 (1.7)
Charlottetown	24,977 (20.6)	10,223 (34.4)	
Summerside and Prince	66,267 (54.5)	12,056 (40.5)	
Queens, Kings, and Stratford	28,041 (23.1)	7,021 (23.6)	
Missing	2,180 (1.8)	446 (1.5)	
Urban vs. rural/remote, n (%)			491 (0.3)
Urban	78,050 (64.3)	21,569 (72.5)	
Rural/Remote	43,068 (35.4)	8,033 (27.0)	
Missing	347 (0.3)	144 (0.5)	
Time of visit concerning COVID-19, n (%)			NA
Before COVID-19 restrictions[1]	31,721 (26.1)	4,891 (16.4)	
During COVID-19 restrictions[2]	53,736 (44.2)	12,709 (42.8)	
After COVID-19 restrictions[3]	36,008 (29.6)	12,146 (40.8)	
Time of visit concerning QEH reporting to NACRS, n (%)			NA

Before QEH added to NACRS database[4]	46,184 (38.0)	7,203 (24.2)	
After QEH added to NACRS database	75,281 (61.9)	22,543 (75.8)	
Median no. ED visits per year, n (%)			NA
1 visit	40,112 (33.0)	13,297 (44.7)	
2-3 visits	59,164 (48.7)	13,289 (44.7)	
≥4 visits	22,189 (18.3)	3,151 (10.6)	
Admitted via ambulance, n (%)			NA
Yes	23,483 (19.3)	3,620 (12.2)	
No	97,982 (80.7)	26,126 (87.8)	

*CTAS = Canadian Triage Acuity Scale; ED = emergency department; No. = number; QEH = Queen Elizabeth Hospital; NACRS = National Ambulatory Care Reporting System; NA = not applicable.

[1]Prior to March 17th, 2020.

[2]On or between March 17th, 2020, and April 6th, 2022.

[3]After April 6th, 2022.

[4]On or after April 1st, 2021.

Table 4.3. Crude and adjusted multivariable logistic regression analysis results for the association between access to primary care and non-urgent versus urgent emergency department (ED) visits determined according to grouped Canadian Triage and Acuity Scale (CTAS) levels. Maximum likelihood estimates (MLE) and standard (std.) errors are reported along with crude and adjusted odds ratios (ORs) and 95% confidence intervals (95% CI).

	Crude complete case analysis				**Adjusted complete case analysis**			
Predictors	**MLE**	**Std. error**	**Crude OR**	**95% CI**	**MLE**	**Std. error**	**Adjusted OR**	**95% CI**
Access to primary care								
Yes	-0.41	0.01	0.67	0.65, 0.68	-0.32	0.04	-	-
No (reference)	-	-	1.00	-	-	-	1.00	-
Sex								
Female	0.02	0.01	1.02	1.00, 1.04	0.02	0.01	1.02	1.00, 1.04
Male (reference)	-	-	1.00	-	-	-	1.00	-
Age (years)								
18-30 (reference)	-	-	1.00	-	-	-	1.00	-
31-40	-0.22	0.02	0.81	0.78, 0.84	-0.22	0.02	0.81	0.78, 0.84
41-50	-0.30	0.02	0.74	0.71, 0.77	-0.31	0.02	0.73	0.71, 0.76
51-60	-0.39	0.02	0.68	0.66, 0.70	-0.40	0.02	0.67	0.64, 0.69
61-70	-0.52	0.02	0.60	0.58, 0.62	-0.52	0.02	0.60	0.58, 0.62
71-80	-0.65	0.02	0.52	0.50, 0.54	-0.63	0.02	0.53	0.51, 0.56
≥81	-0.70	0.02	0.50	0.48, 0.52	-0.69	0.02	0.50	0.48, 0.52
Region of residence								
Charlottetown (reference)	-	-	1.00	-	-	-	-	-
Summerside and Prince	0.30	0.01	1.35	1.31, 1.38	0.47	0.03	-	-

Queens, Kings, and Stratford	-1.11	0.02	0.90	0.87, 0.93	-0.09	0.03	-	-
Urban vs. rural/remote								
Urban (reference)	-	-	1.00	-	-	-	1.00	-
Rural/Remote	-0.04	0.01	0.96	0.94, 0.98	-0.17	0.01	0.85	0.83, 0.87
Time of visit concerning QEH added to NACRS database								
Before QEH added	-	-	1.00	-	-	-	-	-
After QEH added	-0.16	0.01	0.85	0.83, 0.87	-0.02	0.03	-	-
Median no. ED visits per year								
1 visit (reference)	-	-	1.00	-	-	-	1.00	-
2-3 visits	-0.01	0.01	0.99	0.97, 1.02	-0.07	0.01	0.94	0.91, 0.96
≥4 visits	0.12	0.02	1.13	1.09, 1.16	-0.09	0.02	0.92	0.89, 0.95

*No. = number.

** Estimates for effect modification of access to primary care by region of residence and time of visit in relation to when Queen Elizabeth Hospital (QEH) began reporting to the database (April 1st, 2021) are reported in **Table 4.4**.

Table 4.4. Multivariable logistic regression results of odds of non-urgent ED visits for those with access to primary care compared to those with no access on Prince Edward Island stratified by effect modifier variables region of residence and time of visit concerning when Queen Elizabeth Hospital (QEH) began reporting to the National Ambulatory Care Reporting System database (April 1st, 2021). Estimates are reported as adjusted odds ratios (OR) and 95% confidence intervals (95% CI).

Time of visit	**Region of residence**	**n (%)**	**Adjusted OR**	**95% CI**
Before QEH added	Charlottetown	1,225 (0.8)	0.73	0.67, 0.79
	Summerside and Prince	46,631 (31.5)	0.72	0.68, 0.76
	Queens, Kings, and Stratford	4,132 (2.8)	0.80	0.74, 0.87
After QEH added	Charlottetown	33,743 (22.8)	0.67	0.64, 0.70
	Summerside and Prince	31,519 (21.3)	0.66	0.63, 0.70
	Queens, Kings, and Stratford	30,835 (20.8)	0.74	0.70, 0.78

*Estimates adjusted for sex, age, urban versus rural/remote residence, and median number of ED visits per year.

4.10 Figures

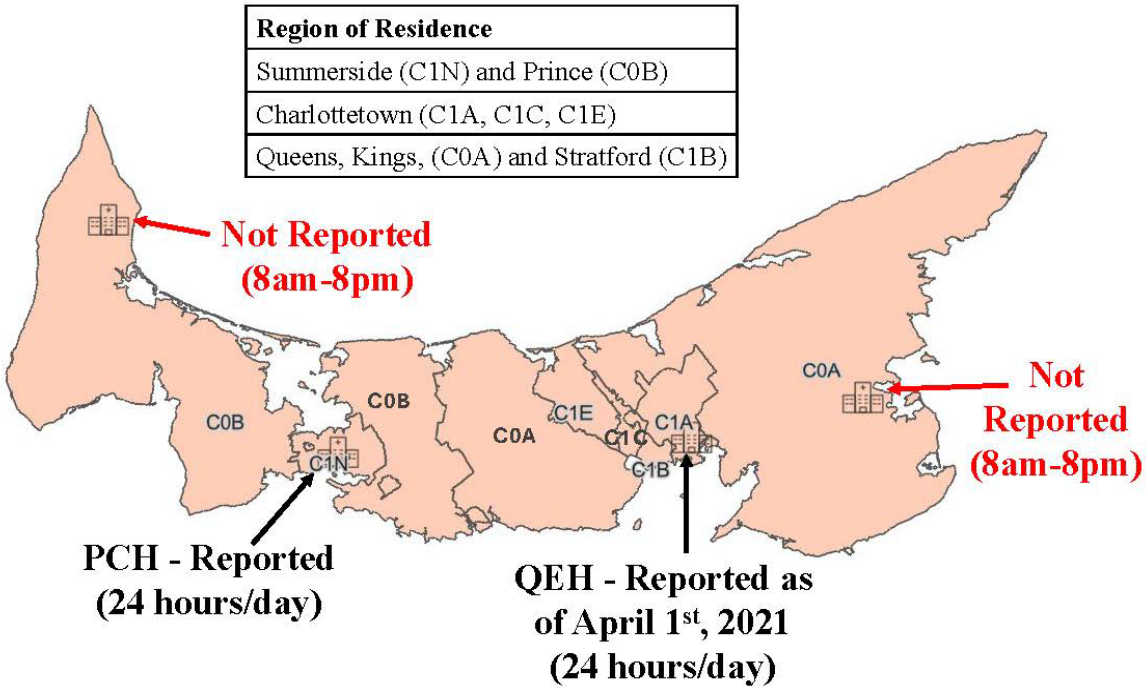
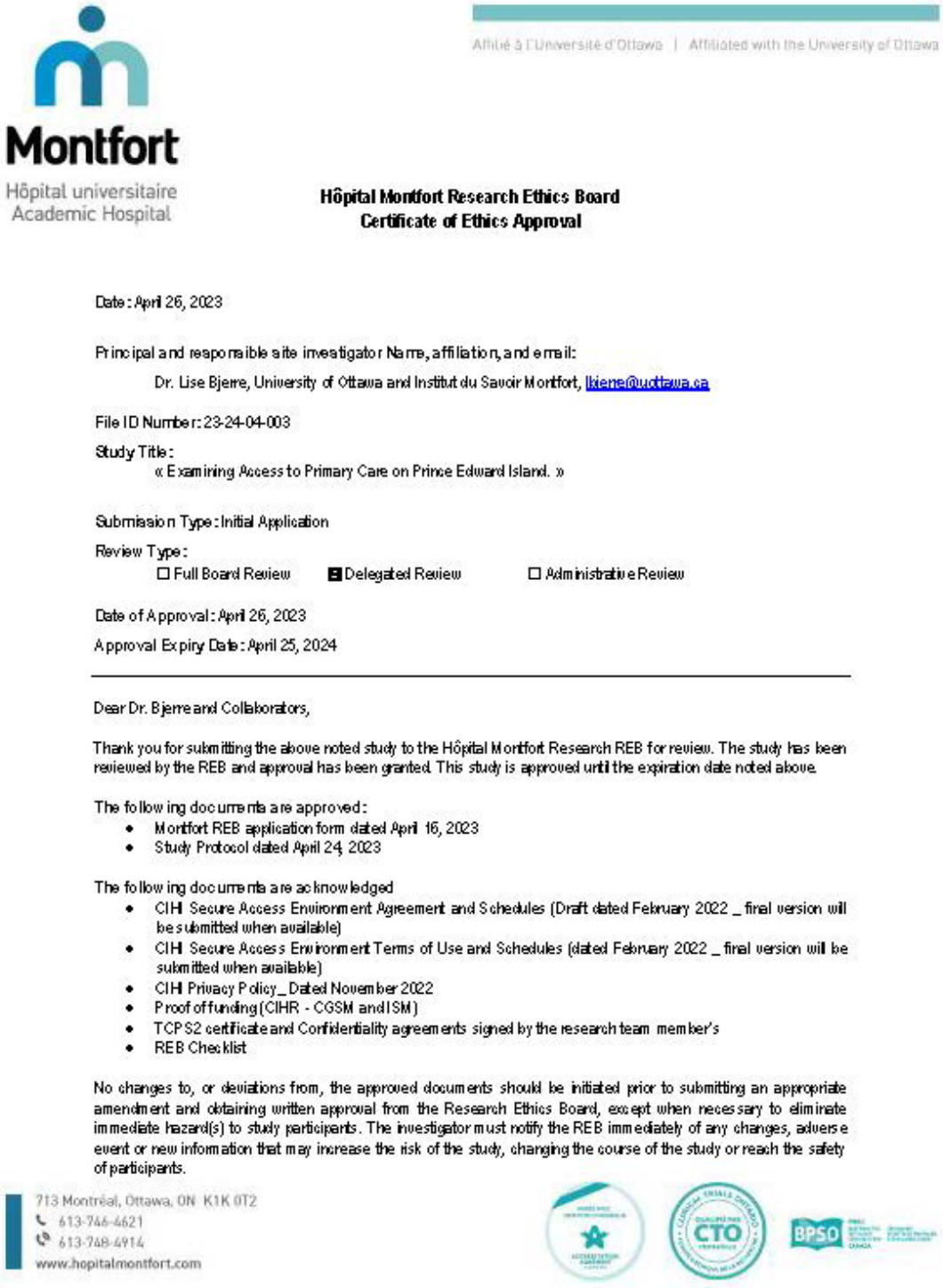


Figure 4.1. Map of Prince Edward Island indicating the geographic distribution of forward sortation areas (FSA) and the locations of emergency departments and whether their data are reported to the National Ambulatory Care Reporting System database. Included emergency departments Prince County Hospital (PCH) and Queen Elizabeth Hospital (QEH) are identified. The legend indicates which FSAs correspond to which region of residence for this study. Map created using ArcGIS Online – content attributable to Canada Post hosted by Esri.

4.11 Appendices

Appendix 4.1. Ethics approval from the Hôpital Montfort Research Ethics Board.



Montfort
Hôpital universitaire
Academic Hospital

Affilié à l'Université d'Ottawa | Affiliated with the University of Ottawa

Hôpital Montfort Research Ethics Board
Certificate of Ethics Approval

Date: April 26, 2023

Principal and responsible site investigator Name, affiliation, and email:

Dr. Lise Bjerre, University of Ottawa and Institut du Savoir Montfort, lbjerre@uottawa.ca

File ID Number: 23-24-04-003

Study Title:
« Examining Access to Primary Care on Prince Edward Island. »

Submission Type: Initial Application

Review Type:
☐ Full Board Review ☒ Delegated Review ☐ Administrative Review

Date of Approval: April 26, 2023

Approval Expiry Date: April 25, 2024

Dear Dr. Bjerre and Collaborators,

Thank you for submitting the above noted study to the Hôpital Montfort Research REB for review. The study has been reviewed by the REB and approval has been granted. This study is approved until the expiration date noted above.

The following documents are approved:

- Montfort REB application form dated April 16, 2023
- Study Protocol dated April 24, 2023

The following documents are acknowledged

- CIHI Secure Access Environment Agreement and Schedules (Draft dated February 2022 _ final version will be submitted when available)
- CIHI Secure Access Environment Terms of Use and Schedules (dated February 2022 _ final version will be submitted when available)
- CIHI Privacy Policy_Dated November 2022
- Proof of funding (CIHR - CGSM and ISM)
- TCPS2 certificate and Confidentiality agreements signed by the research team member's
- REB Checklist

No changes to, or deviations from, the approved documents should be initiated prior to submitting an appropriate amendment and obtaining written approval from the Research Ethics Board, except when necessary to eliminate immediate hazard(s) to study participants. The investigator must notify the REB immediately of any changes, adverse event or new information that may increase the risk of the study, changing the course of the study or reach the safety of participants.

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NOTE: It is the responsibility of the Principal Investigator (or delegate) to submit a request for renewal **four weeks prior to the date of study expiration** if the study will continue beyond the expiration date. If the study is completed by the expiry date noted above, a Study Closure/Termination report must be submitted to the REB. An expired study will be placed on hold until approval has been reinstated. The investigator may submit at any time an end of study form along with a final report.

The Hôpital Montfort REB complies with the requirements of the Tri-Council Policy Statement (TCPS2): Ethical Conduct for Research Involving Humans; the Clinical Practice Guidelines: Consolidated Guidelines of the International Council for the Harmonization of Technical Requirements for the Registration of Pharmaceuticals for Human Use (ICH-GCP E6), Part C, Title 5 of the Food and Drug Regulations, and The applicable regulations, Part 4 of the Natural Health Products Regulations; Part 3 of the Medical Devices Regulations, the "Code of Federal Regulations" of the United States, the Ontario Personal Health Information Protection Act, 2004, and the laws and regulations applicable in Ontario. Montfort's REB is registered with the U.S. Department of Health and Human Services (DHHS) and the Office for Human Research Protection (OHRP).

If you have any questions, please do not hesitate to contact the Research Ethics Office by phone at 613-746-4621 extension 2221 or e-mail at ethique@montfort.on.ca.

Appendix 4.2. Ethics approval from the University of Ottawa Office of Research Ethics and Integrity.

Université d'Ottawa
Bureau d'éthique et d'intégrité de la recherche

University of Ottawa
Office of Research Ethics and Integrity

H-07-23-9307 - OTH-9307 - Lettre d'approbation administrative / Letter of Administrative Approval

(English message follows)

Cher/Chère Alyson MacCormack,

Veuillez trouver la lettre d'approbation administrative pour le projet intitulé «Examining access to primary care on Prince Edward Island».

L'approbation est valide jusqu'au 25-04-2024 (correspond à la date du CÉR primaire). Afin de garder votre dossier à jour, veuillez nous soumettre une copie de toutes demandes de modification, certificats de renouvellement, et/ou autres documents pertinents soumis à et approuvés par le CÉR primaire, dès qu'ils sont disponibles.

Recherche financée : Veuillez faire suivre une copie de cette lettre au Service de gestion de la recherche.

Si vous avez des questions, n'hésitez pas à communiquer avec le Bureau d'éthique à ethique@uottawa.ca ou en composant le 613-562-5387.

Vous pouvez voir votre demande en vous connectant à votre compte eReviews.

Cordialement,

Catherine Paquet
Directeur

Ceci est une réponse automatisée, merci de ne pas répondre à ce courriel.

Dear Alyson MacCormack,

Please find attached the letter of administrative approval for your research project titled "Examining access to primary care on Prince Edward Island".

This approval is valid until 25-04-2024 (corresponds to the date of the Primary REB). In order to keep your file up to date, please submit a copy of all modification requests, project renewals, and/or other relevant documents submitted to and approved by the Primary REB, as they become available.

Funded research: A reminder that you must provide a copy of this letter to Research Management Services.

If you have any questions, please contact the Ethics Office at ethics@uottawa.ca or by telephone at 613-562-5387.

You can view your project at any time by logging into eReviews.

Best regards,

Catherine Paquet
Director

This is an automated message. Please do not reply directly to this email.

Attachement(s) / Attachment(s)
approvalLetter1689256818508.pdf

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613-562-5387 • 613-562-5338 • ethique@uOttawa.ca / ethics@uOttawa.ca
www.recherche.uottawa.ca/deontologie | www.recherche.uottawa.ca/ethics

Appendix 4.3. The REporting of studies Conducted using Observational Routinely-collected health Data (RECORD) statement checklist.

	Item No.	STROBE items	Location in manuscript where items are reported	RECORD items	Location in manuscript where items are reported
Title and abstract					
	1	(a) Indicate the study's design with a commonly used term in the title or the abstract (b) Provide in the abstract an informative and balanced summary of what was done and what was found		RECORD 1.1: The type of data used should be specified in the title or abstract. When possible, the name of the databases used should be included. RECORD 1.2: If applicable, the geographic region and timeframe within which the study took place should be reported in the title or abstract. RECORD 1.3: If linkage between databases was conducted for the study, this should be clearly stated in the title or abstract.	71-72 72 NA
Introduction					
Background rationale	2	Explain the scientific background and rationale for the investigation being reported			73-75
Objectives	3	State specific objectives, including any prespecified hypotheses			75-76

Methods					
Study Design	4	Present key elements of study design early in the paper			76-77
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection			76-77

Participants	6	*Cross-sectional study* - Give the eligibility criteria, and the sources and methods of selection of participants		RECORD 6.1: The methods of study population selection (such as codes or algorithms used to identify subjects) should be listed in detail. If this is not possible, an explanation should be provided. RECORD 6.2: Any validation studies of the codes or algorithms used to select the population should be referenced. If validation was conducted for this study and not published elsewhere, detailed methods and results should be provided. RECORD 6.3: If the study involved linkage of databases, consider use of a flow diagram or other graphical display to demonstrate the data linkage process, including the number of individuals with linked data at each stage.	77-78 NA NA
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable.		RECORD 7.1: A complete list of codes and algorithms used to classify exposures, outcomes, confounders, and effect modifiers should be provided. If these cannot be reported, an explanation should be provided.	77-79

Data sources/ measurement	8	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group			77-79
Bias	9	Describe any efforts to address potential sources of bias			80-81
Study size	10	Explain how the study size was arrived at			76-77
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen, and why			77-80
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding (b) Describe any methods used to examine subgroups and interactions (c) Explain how missing data were addressed (d) *Cross-sectional study* - If applicable, describe analytical methods taking account of sampling strategy (e) Describe any sensitivity analyses			80-81 80-81 80-81 NA 81

Data access and cleaning methods		..		RECORD 12.1: Authors should describe the extent to which the investigators had access to the database population used to create the study population.	76
				RECORD 12.2: Authors should provide information on the data cleaning methods used in the study.	76
Linkage		..		RECORD 12.3: State whether the study included person-level, institutional-level, or other data linkage across two or more databases. The methods of linkage and methods of linkage quality evaluation should be provided.	NA
Results					
Participants	13	(a) Report the numbers of individuals at each stage of the study (*e.g.*, numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed) (b) Give reasons for non-participation at each stage. (c) Consider use of a flow diagram		RECORD 13.1: Describe in detail the selection of the persons included in the study (*i.e.,* study population selection) including filtering based on data quality, data availability and linkage. The selection of included persons can be described in the text and/or by means of the study flow diagram.	81

Descriptive data	14	(a) Give characteristics of study participants (*e.g.*, demographic, clinical, social) and information on exposures and potential confounders (b) Indicate the number of participants with missing data for each variable of interest			96-97 82, 96-97
Outcome data	15	*Cross-sectional study* - Report numbers of outcome events or summary measures			81
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder- adjusted estimates and their precision (e.g., 95% confidence interval). Make clear which confounders were adjusted for and why they were included (b) Report category boundaries when continuous variables were categorized (c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period			98-100

Other analyses	17	Report other analyses done— e.g., analyses of subgroups and interactions, and sensitivity analyses			82-83, 100, 114-118
Discussion					
Key results	18	Summarise key results with reference to study objectives			85
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias		RECORD 19.1: Discuss the implications of using data that were not created or collected to answer the specific research question(s). Include discussion of misclassification bias, unmeasured confounding, missing data, and changing eligibility over time, as they pertain to the study being reported.	87-89
Interpretation	20	Give a cautious overall interpretation of results considering objectives,			90
		limitations, multiplicity of analyses, results from similar studies, and other relevant evidence			86-89
Generalisability	21	Discuss the generalisability (external validity) of the study results			87-89
Other Information					

Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based			71
Accessibility of protocol, raw data, and programming code		..		RECORD 22.1: Authors should provide information on how to access any supplemental information such as the study protocol, raw data, or programming code.	

*Checklist created and provided by (Benchimol et al., 2015).

Appendix 4.4. Confirmation of data access agreement with the Canadian Institute for Health Information and acceptance for the Graduate Student Data Access Program.

Feb 7, 2024

Department of Family Medicine
Faculty of Medicine
University of Ottawa
600 Peter Morand Crescent Room 101 Ottawa,
Ontario
K1G 5Z3

Attention: Lise Bjerre and Alyson MacCormack

Dear Lise Bjerre and Alyson MacCormack:

I am writing to let you know that we have completed the request for your project entitled "*Examining Access to Primary Care on Prince Edward Island (PEI)*". The data will soon be moved into CIHI's Secure Access Environment (SAE).

Access to the SAE is facilitated via secure and encrypted remote desktop connection and use of multi-factor authentication. You will be contacted by the SAE team shortly who will be setting up your SAE user account and guiding you through the process of accessing the data via the SAE.

We strongly advise you to review the entire SAE Agreement and Schedules and the signed Terms of Use before using the data and recommend contacting us should you require any clarification or advice.

Your request is confirmed under CIHI's Graduate Student Data Access Program (GSDAP) and currently GSDAP requests are free for up to 2 users, for a maximum of 2 years. Beyond the 2 years, the fee would be $1500.00 per additional year per user.

If you wish to review data quality information about the source databases, please refer to the CIHI website, in the section pertaining to data quality.
For NACRS specifically, please see: National Ambulatory Care Reporting System (NACRS) metadata | CIHI

If you have any questions, please do not hesitate to contact me.

Yours truly,

Dun Li

Senior Analyst , Data Request Services
Canadian Institute for Health Information (CIHI)

Appendix 4.5. Frequency of missing versus not on age with respect to the outcome, exposure, and predictor variables. The Chi-square (X^2) test of independence was used to assess statistical differences between the proportions of the missing on age variables and each of the other variables and the p-value was reported.

	Missing on Age (n = 2626)		X^2 test
Variable	**Yes, n(%)**	**No, n(%)**	**p-value**
Access to primary care			0.001
Yes	2,180 (83.0)	119,285 (80.3)	
No	446 (17.0)	29,300 (19.7)	
ED visit acuity			<0.001
Non-urgent (CTAS 4,5)	1,271 (48.4)	58,165 (39.2)	
Urgent (CTAS 1-3)	1,355 (51.6)	90,420 (60.8)	
Sex			<0.001
Male	1,112 (42.4)	69,337 (46.7)	
Female	1,514 (57.6)	79,211 (53.3)	
Other	0 (0)	37 (<0.1)	
Urban vs. Rural/Remote			<0.001
Urban	1,850 (70.4)	97,769 (65.8)	
Rural/Remote	748 (28.5)	50,353 (33.9)	
Missing	28 (1.1)	463 (0.3)	
Region of residence			<0.001
Charlottetown	0 (0)	35,200 (23.7)	
Summerside and Prince	0 (0)	78,323 (52.7)	
Queens, Kings, and Stratford	0 (0)	35,062 (23.6)	
Missing	2,626 (100)	0 (0)	
Time of visit in relation to COVID-19			<0.001
Before COVID-19 restrictions	822 (31.3)	35,790 (24.1)	
During COVID-19 restrictions	1,174 (44.7)	65,271 (43.9)	
After COVID-19 restrictions	630 (24.0)	47,524 (32.0)	
Time of visit in relation to QEH added to NACRS			<0.001
Before	1,264 (48.1)	52,123 (35.1)	
After	1,362 (51.9)	96,462 (64.9)	
Median no. ED visits per year			<0.001
1 visit	0 (0)	53,409 (35.9)	
2-3 visits	996 (37.9)	71,466 (48.1)	
≥4 visits	1,630 (62.1)	23,710 (16.0)	

Appendix 4.6. Frequency of missing versus not on region of residence with respect to the outcome, exposure, and predictor variables. The Chi-square (X^2) test of independence was used to assess statistical differences between the proportions of the missing on age variables and each of the other variables and the p-value was reported.

	Missing on Region of Residence (n = 2626)		**X^2 test**
Variable	**Yes, n(%)**	**No, n(%)**	**p-value**
Access to primary care provider			<0.001
Yes	2,180 (83.0)	119,285 (80.3)	
No	446 (7.0)	29,300 (19.7)	
ED visit acuity			<0.001
Non-urgent (CTAS 4,5)	1,271 (48.4)	58,165 (39.1)	
Urgent (CTAS 1-3)	1,355 (51.6)	90,420 (60.9)	
Sex			<0.001
Male	1,112 (42.4)	69,337 (46.7)	
Female	1,514 (57.6)	79,211 (53.3)	
Other	0 (0)	37 (<0.1)	
Age group (years)			<0.001
18-30	0 (0)	31,201 (21.0)	
31-40	0 (0)	20,253 (13.6)	
41-50	0 (0)	19,099 (12.9)	
51-60	0 (0)	21,727 (14.6)	
61-70	0 (0)	22,401 (15.1)	
71-80	0 (0)	19,945 (13.4)	
≥81	0 (0)	13,959 (9.4)	
Missing	2,626 (100)	0 (0)	
Urban vs. Rural/Remote			<0.001
Urban	1,850 (70.4)	97,769 (65.8)	
Rural/Remote	748 (28.5)	50,353 (33.9)	
Missing	28 (1.1)	463 (0.3)	
Time of visit in relation to COVID-19			<0.001
Before COVID-19 restrictions	822 (31.3)	35,750 (24.1)	
During COVID-19 restrictions	1,174 (44.7)	65,271 (43.9)	
After COVID-19 restrictions	630 (24.0)	47,524 (32.0)	
Time of visit in relation to QEH added to NACRS			<0.001
Before	1,264 (48.1)	52,123 (35.1)	
After	1,362 (51.9)	96,462 (64.9)	
Median no. ED visits per year			<0.001
1 visit	0 (0)	53,409 (36.0)	

2-3 visits	996 (37.9)	71,466 (48.1)	
≥4 visits	1,630 (62.1)	23,710 (15.9)	

Appendix 4.7. Frequency of missing versus not on urban versus rural/remote residence with respect to the outcome, exposure, and predictor variables. The Chi-square (X^2) test of independence was used to assess statistical differences between the proportions of the missing on age variables and each of the other variables and the p-value was reported.

	Missing on Urban vs. Rural/Remote (n = 491)		**X^2 test**
Variable	**Yes, n(%)**	**No, n(%)**	**p-value**
Access to primary care			<0.001
Yes	347 (70.7)	121,118 (80.4)	
No	144 (29.3)	29,602 (16.6)	
ED visit acuity			0.782
Non-urgent (CTAS 4,5)	190 (38.7)	59,246 (39.3)	
Urgent (CTAS 1-3)	301 (61.3)	91,474 (60.7)	
Sex			0.512
Male	241 (49.1)	70,208 (46.6)	
Female	250 (50.9)	80,475 (53.4)	
Other	0 (0)	37 (100)	
Age group (years)			<0.001
18-30	175 (35.6)	21,026 (20.6)	
31-40	99 (20.2)	20,154 (13.4)	
41-50	35 (7.1)	19,064 (12.7)	
51-60	44 (9.0)	21,683 (14.4)	
61-70	48 (9.8)	22,353 (14.8)	
71-80	53 (10.8)	19,892 (13.2)	
≥81	9 (1.8)	13,950 (9.3)	
Missing	28 (5.7)	2,598 (1.7)	
Region of residence			<0.001
Charlottetown	227 (46.2)	34,973 (23.2)	
Summerside and Prince	145 (29.5)	78,178 (51.9)	
Queens, Kings, and Stratford	91 (18.5)	34,971 (23.2)	
Missing	28 (5.7)	2,598 (1.7)	
Time of visit in relation to COVID-19			<0.001
Before COVID-19 restrictions	81 (16.5)	36,531 (24.2)	
During COVID-19 restrictions	306 (62.3)	66,139 (43.9)	
After COVID-19 restrictions	104 (21.2)	48,050 (31.9)	
Time of visit in relation to QEH added to NACRS			<0.001
Before	129 (26.3)	53,258 (35.3)	

After	362 (73.7)	97,462 (64.7)	
Median no. ED visits per year			0.142
1 visit	157 (32.0)	53,252 (35.3)	
2-3 visits	257 (52.3)	72,205 (47.9)	
≥4 visits	77 (15.7)	25,263 (16.8)	

Chapter 5: Discussion

5.1 Summary of Findings

The overall object of this thesis was to improve our understanding of primary care access on Prince Edward Island (PEI) and identify gaps in the current literature. To do this, we first conducted a scoping review to identify and characterize the available published studies on access to primary care on PEI (Chapter 3). The key findings of the scoping review were (1) PEI-specific literature was represented by only one-third of the included studies; (2) all five accessibility dimensions examined were explored to some extent across the studies, except for affordability, indicating a significant gap in the literature; and (3) while diverse population characteristics were found among the included studies, characteristics of language, gender, and race are underrepresented.

Next, we sought to fill a gap in the literature on access to primary care on PEI by conducting a population-based, cross-sectional analysis of individual-level, anonymized data to examine the association between access to primary care and emergency department (ED) visit acuity and how it varies regionally on PEI (Chapter 4). We identified important predictors of the association in a literature review (Chapter 2) and, where possible given our data, used these predictors to develop a multivariable logistic regression model of the association between access to primary care and ED visit acuity. The key findings of the cross-sectional analysis were (1) there is an association between access to primary care and ED visit acuity on PEI for all regions of PEI such that Islanders with access to primary care had lower odds of non-urgent ED visits compared to urgent visits; (2) patients with access to primary care had lower odds of non-urgent ED visits in Summerside and Prince and higher odds in Queens, Kings, and Stratford; however, the level of aggregation of these regions of residence limits our ability to comment on differences

in the association between the urban and rural aspects of these regions; and (3) increasing age, rural residence, and more than one ED visit per year were also significantly associated with increased odds of non-urgent ED visits; however, sex was not.

5.2 Strengths and Limitations

The overarching limitations of both our scoping review and our cross-sectional population health data study are the lack of available, accessible, and comprehensive data on access to primary care on PEI and the subsequent impact this has on the lack of research and the quality of research being conducted on access to primary care on PEI. For instance, the quality of our cross-sectional study is limited by the number of EDs reporting data on PEI and the variables and degree of aggregation of variables, we were able to access. The quality of our scoping review was also limited by the high level of heterogeneity among the few included studies which reduced our ability to synthesize the findings of the studies. However, we believe this is an important finding in itself, and we hope that in identifying and describing this limitation, we can help improve future access to primary care research. The Secure Island Data Repository for PEI health data will certainly help researchers progress toward achieving this objective once it becomes available.

5.3 Knowledge Dissemination Plan and Recommendations

My main priority for knowledge dissemination is first, publication of both manuscripts in open-access journals. Second, I will share these publications and our findings with Health PEI and the Government of PEI Department of Health and Wellness along with the following overall recommendations that follow as natural conclusions from the present work:

The Government of PEI should encourage and support:

(1) better access to primary care on PEI, to ensure that the 21% (36,495) of the PEI population currently without access to primary care can be attached to a primary care provider;
(2) better access to more comprehensive data sources about PEI health services use, including ED visits and access to primary care, with the first priority being mandating the reporting of all PEI ED data to the NACRS database;
(3) increase funding for ongoing evaluation and research access to primary care on PEI, including monitoring the impact of the new PEI school of medicine on recruitment and retention of family doctors to PEI; and
(4) consider regional differences in future data collection and analysis efforts.

I will also recommend the Government of PEI and Health PEI commission long-term monitoring systems to examine how the association between primary care access and ED visit acuity changes over time. Further increases in the strength of association between primary care access as a protective factor for non-urgent emergency department visits could indicate further deterioration of access to primary care on PEI and the need for intervention.

5.4 Conclusion and Future Directions

In conclusion, this thesis both highlights and contributes to the limited research on access to primary care on PEI. Future research should address the gaps we identified in the literature and focus on the affordability of accessing primary care on PEI as well as incorporate a more comprehensive assessment of population characteristics, including gender, race, and language, to paint a more complete picture of the current situation, and contribute to ensure equitable

healthcare access for all PEI residents. We also found that primary care access appears to be associated with a protective effect against non-urgent ED use which means that increased access to primary care could potentially help unburden ED services on PEI. Longitudinal monitoring efforts would help confirm if this finding holds true over time, as access to primary care on PEI changes over time. In addition, our finding about differences across PEI regions in the association between access to primary care and ED visit acuity highlights the need for future evaluation and research on PEI to be directed towards addressing regional differences to better understand the unique healthcare needs and challenges faced across PEI.