Examining the impact of two patient navigation models within a social prescribing program on self-reported health service utilization and health-related quality of life

by

Joël Pitre

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Thesis Examiners/Examinateurs de thèse:

Dr. Alain Gauthier
(Supervisor/Directeur(trice) de thèse)

Dr. Simone Dahrouge
(Committee member/Membre du comité)

Dr. Diana Urajnik
(Committee member/Membre du comité)

Dr. Patrick Timony
(Committee member/Membre du comité)

Approved for the Faculty of Graduate Studies
Approuvé pour la Faculté des études supérieures
Dr. Alain Simard
Dean of Graduate Studies and International
Doyen des Études supérieures et de la stratégie internationale
Laurentian University / Université Laurentienne

Dr. Sylvie Larocque
(External Examiner/Examinateur externe)

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Abstract

Background: Social prescribing programs have shown promise for addressing the healthcare system fragmentation and the negative impact of certain social determinants of health. They entail primary care providers referring patients with unmet health or social needs to community resources, a process that is mediated by a lay navigator, who assists patients in identifying barriers and facilitating access to the appropriate resources. Although Ontario 211 and the Access to Resources in the Community (ARC) intervention both utilize lay navigators to assist their patients, the former provides informational services to its patients, whereas the latter offers more comprehensive and reoccurring support to patients.

Study Objective: This study compared the impact of both navigation models within a social prescribing program setting on patient self-reported health service utilization and health-related quality of life.

Methods: A secondary analysis was conducted using data collected in 2018/19 during the randomized control trial (RCT) comparing ARC and Ontario 211 navigation. Three hundred and twenty-six patients were enrolled in the study, and 237 patients completed the post-intervention questionnaire. Participants were adults who had identified an unmet health or social need and frequented a primary care provider. Health service utilization outcomes included the number of emergency department (ED) visits and hospitalizations, while the health-related quality of life was assessed with the validated Veterans RAND 12 questionnaire. Unadjusted and adjusted regression analyses were conducted to compare outcomes between both navigation models, controlling for socio-demographic characteristics.

Results: Although none of the results reached statistical significance, participants assigned to the ARC navigation intervention had an apparent higher odds of ED visits and modestly improved

physical quality of life yet had relatively similar odds of hospitalization and improvement in mental quality of life compared to those in the Ontario 211 arm.

Conclusion: Despite not demonstrating statistically significant associations, the results provide insight into the emerging field of social prescribing in Canada. In today's political and economic landscape, with a healthcare system focused on addressing social determinants of health, there remains an ongoing need for innovative evaluations of preventative interventions. While effects may not always be observed immediately, as in these findings, with continued research, social prescribing programs show potential for leading the way to equitable care.

Keywords: Social prescribing, emergency department, hospitalization, health-related quality of life, patient navigation

Résumé

Contexte : Les programmes de prescription sociale se sont révélés prometteurs pour remédier à la fragmentation du système de santé et à l'impact négatif de certains déterminants sociaux de la santé. Ils consistent pour les prestataires de soins primaires à orienter les patients ayant des besoins sociaux ou de santé non satisfaits vers des ressources communautaires, un processus qui est facilité par un navigateur, qui aide les patients à identifier les obstacles et à accéder aux ressources appropriées. Bien que le programme Ontario 211 et l'intervention Accès aux ressources communautaires (ARC) aient tous deux recours à des navigateurs pour aider leurs patients, le premier fournit des services d'information à ses patients, tandis que le second offre un soutien plus complet et récurrent aux patients.

Objectif : Cette étude a comparé l'impact des deux modèles de navigation dans le cadre d'un programme de prescription sociale sur l'utilisation des services de santé et sur leur qualité de vie.

Méthodes : Une analyse secondaire a été réalisée à partir des données recueillies en 2018-2019 dans le cadre de l'étude contrôlée randomisée comparant les services de navigation ARC et Ontario 211. Trois cent vingt-six patients ont été recrutés pour l'étude, et 237 ont rempli le questionnaire post-intervention. Les participants étaient des adultes qui avaient identifié un besoin social ou de santé non satisfait et qui fréquentaient un fournisseur de soins primaires. Les résultats en matière d'utilisation des services de santé comprenaient le nombre de visites aux urgences et d'hospitalisations, tandis que la qualité de vie liée à la santé a été évaluée à l'aide du questionnaire validé Veterans RAND-12. Des analyses de régression non ajustées et ajustées ont été menées afin de comparer les résultats entre les deux modèles de navigation, en tenant compte des caractéristiques sociodémographiques.

Résultats : Bien qu'aucun des résultats n'ait atteint une signification statistique, les participants assignés à l'intervention de navigation ARC avaient apparemment plus de chances de se rendre aux urgences et ont légèrement amélioré leur qualité de vie physique, mais avaient des chances relativement similaires d'être hospitalisés et d'améliorer leur qualité de vie mentale par rapport à ceux du groupe Ontario 211.

Conclusion : Bien qu'ils ne démontrent pas d'associations statistiquement significatives, les résultats fournissent un aperçu du domaine émergent de la prescription sociale au Canada. Dans le contexte politique et économique actuel, où le système de santé se concentre sur les déterminants sociaux de la santé, il reste nécessaire d'évaluer de manière innovante les interventions préventives. Même si les effets ne sont pas toujours observables immédiatement, comme le montrent ces résultats, les programmes de prescription sociale, grâce à la poursuite des recherches, pourraient ouvrir la voie à des soins équitables.

Mots clés : prescription sociale, services des urgences, hospitalisations, qualité de vie liée à la santé, navigation du patient

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List of Abbreviations

ARC: Access to Community Resources

CHA: Canada Health Act

COPD: Chronic Obstructive Pulmonary Disease

CI: Confidence Interval

CSDH: Commission on Social Determinants of Health

aDID: Adjusted Difference-in-Difference

DID: Difference-in-Difference

aDiff: Adjusted Difference

Diff: Difference

ED: Emergency department

HRQoL: Health-related quality of life

HSU: Health service utilization

IDF: Inclusive definition of Francophone

MIZ: Metropolitan influenced zone

OECD: Organization for Economic Co-operation and Development

aOR: Adjusted Odds Ratio

OR: Odds Ratio

PCP: Primary care provider

SDoH: Social determinants of health

WHO: World Health Organization

1. Introduction

The health of the Canadian population is unequally distributed (Raphael, 2016). While some health inequalities are expected and just (e.g., the health of a younger person tends to be better than the health of an older person), most health inequalities stem from the unfair and unjust distribution of social determinants of health (SDoH) across social groups within the population, termed health inequities (Raphael, 2016). The unfair and unjust distribution of SDoH is manifested as social needs and is the fundamental cause of health needs (Nowak & Mulligan, 2021). Vulnerable populations, such as official language minorities (Nyqvist *et al.*, 2021), homeless or unemployed individuals, gender minorities, racial/ethnic minorities, and older adults are more likely to live with undesirable SDoH and social needs that travel downstream to create health needs (Nowak & Mulligan, 2021; Raphael, 2016). Thus, undesirable SDoH can create an unnecessary burden on the Canadian healthcare system by increasing the likelihood of hospitalizations (Canterberry *et al.*, 2022; Waller & Rosella, 2020) and emergency department (ED) utilizations (Canterberry *et al.*, 2022; Khan *et al.*, 2011). Addressing these undesirable SDoH via health and social programs can reduce the burden placed on the healthcare system (Canterberry *et al.*, 2022; Jaworsky *et al.*, 2016). Unfortunately, the primary health care sector is faced with complex barriers interfering with treating social needs. These include information barriers (i.e., providers relying on out-of-date resources and ineffective search methods like frequently consulting social services), structural barriers (i.e., lack of a referral system to social services or community resources), time constraints (i.e., many primary care providers reserve 15 minutes per appointment), inadequate staffing to help with referrals, and lack in awareness of available community resources from both the provider's and the patient's perspectives (Doty *et al.*, 2020; Kiran *et al.*, 2020; Nova *et al.*, 2022; Ploeg *et al.*, 2017). Social prescribing programs are designed to decrease the burden felt by

primary care providers since they allow these providers to delegate the support needed to address unmet health and social needs to a third-party layperson, commonly called a link worker. This layperson helps patients navigate the overwhelming community resources sector to ensure access barriers are reduced and unmet health and social needs are addressed.

2. Background

Recently, social prescribing programs have gained popularity in the literature as a potential solution for unmet health and social needs (Teggart *et al.*, 2023). Social prescribing originated in the 1990's in a once deprived borough of East London, England, named Tower Hamlets in response to its population's health disparities in the 1980's (Davis-Hall, 2018). Since then, social prescribing programs have been adopted globally (Morse *et al.*, 2022) and have been defined as the process of "enabling healthcare professionals to refer patients to a link worker, to co-design a non-clinical social prescription to improve their health and well-being" (Polley *et al.*, 2017, p.13). Essentially, social prescribing programs allow primary care providers to prescribe services traditionally outside their scope of practice to target non-clinical needs, mainly unmet social needs. Although there are no homogenous social prescribing programs worldwide, there is a universal model consisting of three key components: i) a healthcare professional that refers patients; ii) a link-worker consulting with patients, and iii) a collection of community resources accepting referrals (Polley *et al.*, 2017; Sandhu *et al.*, 2022). The second component of the model, the link-worker, is crucial for successful social prescribing because it acts as the bridge between the primary health care sector (i.e., primary care providers) and the community sector (i.e., community resources; Polley *et al.*, 2017). A link-worker is a lay person with no clinical training that engages and collaborates with patients to determine their goals and needs, and to facilitate access to resources that address their priorities (Polley *et al.*, 2017). They also provide motivational and

emotional support to patients and will address potential access barriers (Morse *et al.*, 2022; Polley *et al.*, 2017). There are many names used to refer to a link-worker, such as health advisor, social prescribing coordinator, and community navigator (Polley *et al.*, 2017), but in North America, the term lay navigator is mostly used (Carter *et al.*, 2018; Reid *et al.*, 2020; Spooner *et al.*, 2021).

Social prescribing was not the only revolutionary social intervention to come from the 1990's. First conceptualized by Harold Freeman in the 1990's to combat higher cancer incidence and mortality rates among African Americans, patient navigation has been shown to significantly increase the access of health care services (e.g., cancer screenings, adherence to treatment plan and diagnostic tests) by reducing barriers (Ali-Faisal *et al.*, 2017; Freeman *et al.*, 1995). Although there is no exact definition found in the literature, patient navigation generally aims toward assisting patients in navigating the healthcare system by removing social barriers (Carter *et al.*, 2018; Peart *et al.*, 2018; Reid *et al.*, 2020; Spooner *et al.*, 2021). Furthermore, two types of navigation models have emerged over the years. These include: i) professional navigation; and ii) lay navigation (Reid *et al.*, 2020). Professional navigators are healthcare providers (e.g., registered nurses, social workers, etc.) that use their clinical expertise to provide navigation services for health needs requiring medical care (Carter *et al.*, 2018; Reid *et al.*, 2020). They typically have a higher level of education and experience in the health field (Reid *et al.*, 2020). In contrast, lay navigators do not have a clinical education, but they are formally trained and acquire knowledge of community resources to provide navigation services for non-clinical needs, such as non-medical health needs and social needs (Carter *et al.*, 2018; Reid *et al.*, 2020). Therefore, the difference in the type of needs addressed between both navigation models suggests that lay navigators may be better suited than professional navigators to address undesirable SDoH of its target population.

Since its creation, patient navigation programs have evolved to be used across different clinical populations (e.g., chronic diseases, mental illnesses, and addictions, etc.), but in Canada, there are many patient navigation programs targeting populations with specific diseases (Walkinshaw, 2011). For example, Wells *et al.* (2008) noted that there were programs targeting different types of cancers whereas Arputhanathan *et al.* (2022) discuss a patient navigation program specifically for wound care needs. Although such specific programs may be effective for patient outcomes, they may inadvertently contribute to further fragmentation of the healthcare system because a primary care provider would have to refer the same patient to separate navigation services. Furthermore, patient navigation programs in Canada most commonly employ professional navigators rather than lay navigators, suggesting that chronic diseases are prioritized rather than their fundamental cause (i.e., the patients' SDoH; Carter *et al.*, 2017), unlike a social prescribing program. Considering that the number of unmet social needs is positively correlated with the likelihood of having a chronic disease (Heller *et al.*, 2021), there is a growing need to implement social prescribing programs in the Canadian healthcare system that target the SDoH and social needs of patients.

2.1 ARC Social Prescribing Study

In 2016, an Ontario team of researchers in partnership with policymakers, clinicians and patients established the Access to Resources in the Community (ARC) initiative as a means to address the inequities in the individual's abilities to access community resources (Dahrouge et al., 2019). The ARC social prescribing model applies a patient-centered approach to address the unmet health and social needs of patients and is not disease specific (Dahrouge et al., 2019). This holistic approach enabled navigators to focus on enhancing the connectivity between primary care and community health enabling services (e.g., community resources, social workers, etc.; Dahrouge et

al., 2022) The lay navigators participate in a training programme consisting of 25 hours of either in-person or virtual learning with a focus on patient-centered communication and navigation (Toal-Sullivan *et al.*, 2021). Recruitment criteria for the navigators included being capable of speaking and writing in French and English (Gauthier *et al.*, 2022).

In 2018 the ARC study team conducted a multi-site, prospective randomized controlled trial of a social prescribing program that compared two lay navigation services, a pre-existing and primarily informational service provided by Ontario 211 (i.e., the control), and the comprehensive and reoccurring navigation services provided by the ARC navigator. In that study, patients with health and social needs whom the primary care provider deemed could benefit from navigation services were referred to the study. After providing consent and completing a baseline survey, patients were randomized to the ARC or Ontario-211 navigation services. Patients assigned to the ARC intervention were contacted by an ARC navigator whereas patients assigned to the Ontario 211 intervention were informed of the Ontario 211 services by a member of the ARC study team (Dahrouge *et al.*, 2025).

2.1.1 ARC Intervention

Those randomized to the ARC arm were offered an appointment with the navigator at the time of enrollment. The first meeting was encouraged to be in person, at the primary care practice. Subsequent encounters were i) in-person in the practice or public (e.g., library, café) setting; ii) by telephone (i.e, phone call or text); iii) or by email (Dahrouge *et al.*, 2025). Patient-navigator interactions occurred frequently over time to provide longitudinal support to the patient. These interactions allowed the navigators to fulfill their roles, which included understanding the needs, expectations, and barriers perceived by the patients, establishing a relationship of trust, offering emotional support, identifying appropriate community resources, and overcoming access barriers

to these resources (Dahrouge *et al.*, 2025). To facilitate and ensure continuity of information between the primary care team and the community care sector, the navigators provided reports to the primary care provider (PCP) at the end of the services indicating whether their patient accessed a community resource or not (Dahrouge *et al.*, 2025).

2.1.2 Ontario 211 Intervention

The Ontario 211 navigation model is a lay navigation service that was inaugurated in 2002 for the residents of Toronto and became a provincial service in late 2011 (Ontario 211 Services, 2013). In 2022, 354,341 Ontarians contacted a 211 navigator and 626,282 visited the website, which approximates to 2.5% and 4% of the provincial population for that same year (Government of Ontario, 2023; Ontario 211 Services, 2022). Like ARC, the Ontario 211 navigation model addresses the health and social needs of the population. It is a web-based and telephone service available 24 hours a day wherein the navigator responds only to in-bound calls (i.e. relies on the patients to initiate contact; Ontario 211 Services, n.d.). There are no in-person communications in between the lay navigator and the patient. No records are kept of the interactions for a follow-up to be done in the future.

2.1.3 Priority Population

In Ontario, Francophones, defined using the Inclusive Definition of Francophone, comprise 4.7% of the population (Government of Ontario, 2021), making them a minority population. That said, Francophones in Ontario are more likely to face language barriers when accessing health care services due to the inadequate distribution of French-speaking physicians in Ontario (Timony *et al.*, 2013). Language discordance during patient-physician interactions can have an impact on patient health outcomes (Cano-Ibáñez *et al.*, 2021), primary care visits (Timony *et al.*, 2016) and patient satisfaction (Timony *et al.*, 2022). Thus, compared to Anglophones,

Francophones in Ontario are a vulnerable population. To ensure adequate representation of the Francophone community, the priority population of the study, the study was conducted in the Greater Sudbury and eastern Ottawa regions where the Francophone population is greater than 25%.

Thus far, the ARC social prescribing study has examined and compared the impact of both navigation models on patient access to community resources, patient abilities to access resources, and patient experiences with the navigation process (Dahrouge *et al.*, 2025). However, it has yet to examine the impact of the two navigation models on self-reported health service utilization and health-related quality of life. Guided by the World Health Organization (WHO) SDoH Framework and the Access Framework, the purpose of the current study is to compare the impact of two navigation models within a social prescribing program on self-reported health service utilization and health-related quality of life.

3. Literature Review

The following sections of this paper will contextualize the relevant literature pertaining to concepts such as health, social determinants of health, access, along with the social prescribing literature using health service utilization and health-related quality of life (HRQoL) as outcomes in order to rationalize the necessity of the current study.

3.1 Health

For many years, health was conceptualized according to the biomedical model as the "absence of physical signs of a disease" (Rocca & Anjum, 2020). In this model, the etiology of all diseases can be linked to a physical abnormality. Simplifying the disease and restricting the search for the cause to only the physical domain makes it easier to invent treatments to cure the diseases with the use of physical pharmacological therapy (Rocca & Anjum, 2020). To illustrate, according

to the biomedical model, depression is caused by a neurotransmitter imbalance to which pharmacological treatments are administered, most commonly with selective serotonin reuptake inhibitors, to re-establish a balance and improve health (Rocca & Anjum, 2020; Tian *et al.*, 2022). Therefore, the biomedical model is a reactive approach of healthcare services because healthcare professionals wait for patients to become unhealthy (i.e., showing physical signs of disease), at which time they would treat these physical signs. Meanwhile, the holistic model of health, defined by the World Health Organization (WHO; n.d.) as health being the "state of complete physical, mental and social well-being and not merely the absence of disease or infirmity", presents a more preventative approach to healthcare services by moving beyond the physical domain to identify the root cause of an illness. In this model, health is multidimensional, being composed of physical, mental and social aspects. Although there is a trend to move away from the biomedical model in medicine and to use the holistic health model, as seen with the myriad public health initiatives for health promotion, education and disease prevention (e.g., cancer screening, oral hygiene and sex education in schools, vaccines, etc.), Canada's healthcare system is still reflective of the biomedical model (e.g., the healthcare system's funding, the existence of hospitals and walk-in clinics, etc.). That said, when examining Canadian population health, it is important to consider health beyond the physical dimension.

Many indicators, notably reproductive health, life expectancy and mortality, are used by Statistics Canada and independent organizations like the Organization for Economic Co-operation and Development (OECD) to represent the health status of the Canadian population (OECD, 2023; Statistics Canada, 2023). These provide an overall sense of a population's health, starting from births and early life to the expected length of life, and to deaths and their causes. The reproductive health of a population can be judged based on the total fertility rate. Total fertility rate is defined

by Statistics Canada (2023) as “an estimate of the average number of live births a woman can be expected to have in her lifetime” (p. 13). It is the preferred reported birth rate because it is easy to interpret (i.e., births per woman) and because it is useful in determining the population’s replacement level (Hartnett, 2016). It is universally accepted that a fertility rate of 2.1 is necessary to exactly replace a population, when ignoring the effects of migration (Hartnett, 2016). The total fertility rate in Canada has been declining from 1.71 in 1992 to 1.33 in 2022 (Statistics Canada, 2024a). Despite observing a small rise in fertility rates in the mid to late-2000’s, all provinces shared this decline (Statistics Canada, 2024a). Furthermore, not only are women giving birth to less children, but they are also giving birth later in their lives (Statistics Canada, 2023).

Meanwhile, life expectancy measures the number of years one has left to live with reference to their current age (Edigi & Spizzichino, 2008). This general health indicator is commonly used in the literature to compare population health across countries (Edigi & Spizzichino, 2008). Therefore, a higher life expectancy indicates better general population health. In 2021, when comparing life expectancy at birth to other member countries of the OECD, Canada ranked 17th of 38 and fared marginally better than the OECD average (81.6 years vs 80.3 years, respectively; OECD, 2023). Finally, the mortality rate in Canada has been gradually increasing from 7.0 deaths per 1000 people in 1991 to 7.6 deaths per 1000 people in 2019 (Statistics Canada, 2024c). In 2020, when the COVID-19 pandemic reached Canada, the mortality rate saw a more pronounced increase to 8.1 deaths per 1000 people and reached 8.6 deaths per 1000 people in 2022, before returning to 8.1 deaths per 1000 people in 2023 (Statistics Canada, 2024c). COVID-19 was ranked third in leading causes of death in Canada in 2020 and was the only communicable disease to be among the top 10 (Statistics Canada, 2023). Also included in this list were non-communicable chronic diseases like cancer, heart diseases, strokes, diabetes, etc. (Statistics Canada, 2023).

Romero *et al.* (2013) discuss the use of HRQoL in the literature to measure health of an individual and argue that this indicator could be useful in not only reflecting the health status of a population, but for the comparison of health status between countries. Overall, Canadians score well on measures of HRQoL (Hopman *et al.*, 2000; 2009; Trenaman *et al.*, 2024), and scores are similar to certain European countries such as Wales (Alzahrani *et al.*, 2023), Switzerland (Roser *et al.*, 2019), and Sweden (Jörngården *et al.*, 2006). The Swedish study found that both the young men and women (aged 13 to 23 years old) reported higher physical health than they did for mental health (Jörngården *et al.*, 2006). These results are in line with those of Hopman *et al.* (2009), who examined the HRQoL of a Canadian sample of people aged 16 to 24 years old. The Canadian study also found that the men had a tendency to report better physical and mental health than their female counterparts, although this difference was not significant. However, an almost identical study conducted previously by Hopman *et al.* (2000) and a recent study by Trenaman *et al.* (2024) on Canadians aged 25 and older, and 18 and older, respectively, found the same trends, but with significant differences between genders in favour of men for physical and mental health. These studies also found that physical health decreased while mental health increased with age, regardless of gender (Hopman *et al.*, 2000; Trenaman *et al.*, 2024). Meanwhile, studies conducted in Switzerland (Roser *et al.*, 2019) and Wales (Alzahrani *et al.*, 2023) found similar results as the Canadian studies. Although the Swiss and Welsh studies examined the HRQoL of participants aged 18 to 75 years old, and 16 and older, respectively, results suggested that Swiss and Welsh men reported better physical and mental health than their female counterparts, and that when stratifying by age groups, physical health scores decreased while mental health scores increased with age, regardless of gender (Alzahrani *et al.*, 2023; Roser *et al.*, 2019). Therefore, the literature suggests that the HRQoL of the Canadian population is comparable to that of certain European

countries. It also suggests that men tend to have better HRQoL when compared to women, and that age has an inversely proportional association with physical HRQoL, and a proportional association with mental HRQoL.

The literature also examines other predictors of HRQoL. Herman *et al.* (2012) used data from adults aged 18 years and older who completed the Canadian Community Health Survey administered in 2005 and found that one's physical activity and body mass index are both strong predictors for HRQoL. These findings are supported by Cohen *et al.* (2016), who used more recent data (i.e., from the same survey but administered in 2015) from a slightly older sample of the population (i.e., adults aged 30 and older). Meanwhile, Dai *et al.* (2019) used data from adults living with chronic conditions who completed the Canadian Community Health Survey administered in 2015 and found that extreme sleep duration, (i.e., less than 6 hours, and 9 or more hours per night) and insomnia, (i.e., having trouble sleeping or falling asleep) were associated with higher odds of severe HRQoL impairment. They also found that around one in four respondents living with chronic conditions suffered a severe impairment to their HRQoL. When considering the impact of these predictors while examining population statistics for physical activity, weight, sleep and chronic conditions, it becomes apparent that the Canadian population is at risk of a worsened quality of life. In 2021, only 53.9% of Canadian adults met the recommended physical activity guidelines of 150 minutes per week, which decreased since 2015 (Statistics Canada, 2024b). When comparing genders, more men have a tendency to meet this guideline compared to women (Statistics Canada, 2024b). For weight, in 2022 around 65% of adults were considered overweight or obese, representing an increase since 2015, and more men met this criterion than women (Statistics Canada, 2024b). The respective time and gender trends for physical activity and weight are also seen in children aged 12 to 17 years (Statistics Canada, 2024b). Furthermore,

among adults aged 18 to 64 years, around only 55% met the sleep guidelines of 7-9 hours per night in 2021 (Statistics Canada, 2023), a decrease from the year prior (Wang *et al.*, 2022). Also, around 20% reported having trouble sleeping or falling asleep in 2021 (Statistics Canada, 2023). Meanwhile, in 2021, around 45% reported living with one or more chronic conditions (Statistics Canada, 2023). Considering the rates of physical inactivity and overweight/obesity along with the prevalence of inadequate sleep quantity and quality, and chronic conditions, it can be suggested that, if these trends persist, the Canadian population is at risk of observing a decrease in HRQoL in the future, which can be influence by SDoH.

3.2 SDoH

The holistic model of health states that one's health is determined by more than physical and mental dimensions. Rather, health is also determined by the social dimension (WHO, n.d.). The social dimension includes factors that can impact, positively or negatively, a person's health, which are commonly referred to as social determinants of health (Public Health Agency of Canada, 2024). Social determinants of health (SDoH) "refers to the social and economic conditions that shape whether people and groups of people are healthy or ill" (Raphael, 2016, p. 4). They include factors such as income, working and living conditions, education, childhood experience along with race, gender, culture, etc. (Public Health Agency of Canada, 2024). When these SDoH are unequally distributed among a population, they create health inequities (Newman *et al.*, 2015), which are defined as avoidable and unnecessary health differences, deemed immoral and unjust, and are not to be confused with health inequalities, which are general descriptions of health differences without moral judgement (Arcaya *et al.*, 2015). Health inequities have existed in Canada for many years, and these were reduced when the universal healthcare plan (i.e., the Canada Health Act, CHA) was implemented in the late 1960's (James *et al.*, 2007).

Despite the fact that Canada has been making progress in advancing health equity through the establishment and implementation of councils, interventions and social programs since the publishing of the Lalonde Report in 1974 (Jackson & Hutson, 2016), trends in mortality and health suggest that disparities are increasing. Although James *et al.* (2007) observed decreasing income-related disparities in mortality amenable to medical care and ischaemic heart disease from 1971 to 1996, likely due to the CHA facilitating access to hospital services, they also observed increasing income-related disparities in mortality amenable to public health intervention, suggesting that the implementation of the CHA may not have proactively treated the health needs of the population (i.e., the SDoH). This trend of worsening income-related disparities, along with worsening education-related disparities, was observed by Hajizadeh *et al.* (2016), Bushnik *et al.* (2020), Shahidi *et al.* (2020), and Tjepkema & Wilkins (2011). Hajizadeh *et al.* (2016) conducted a retrospective cohort study examining the socioeconomic disparities in health using biennial population data of Canadian adults aged 25 or older, from 1998/99 to 2010/11. They found significant worsening of disparities in income and education, in which people with higher income and a higher level of education had better health than people with lower income and less education over time. A few years later, Bushnik *et al.* (2020) conducted a retrospective cohort study examining the socioeconomic disparities in life expectancy (LE) and health-adjusted life expectancy (HALE) using population data of Canadian adults aged 25 or older, from 1996 and 2011. Results suggest that disparities in LE and HALE have worsened over time, in which people with a higher level of education or a higher income have longer life expectancies and are expected to spend a greater portion of those years in good health compared with those with less education or with a lower income. Results also suggested that being simultaneously poor and uneducated was associated with worse health than being either poor or uneducated. Meanwhile, Shahidi *et al.*

(2020) examined the socioeconomic disparities in mortality rates using population data of Canadian adults aged between 25 and 74 years old, from 1991 to 2016. The results suggest that premature mortality rates, defined as a death occurring before age 75, decreased over time for both genders, implying that there was an increase in LE, since a smaller proportion of the population died prematurely. However, only the income-related disparity in male premature mortality improved over time while the income-related disparity in women, and the education-related disparities in men and women worsened over time. In all disparities, those with higher income and a higher level of education were more advantaged.

However, the distribution of income and education are not the only SDoH examined among the Canadian population within the literature. In fact, living condition and Indigenous status have been the focus of a few studies (Tjepkema *et al.*, 2019; Tjepkema & Wilkins, 2011). While examining the socioeconomic disparities in remaining LE at age 25 by using population data of Canadian adults aged 25 or older, from 1991 to 2006, Tjepkema & Wilkins (2011) found that health disparities based on the unequal distribution of living conditions and on Indigenous status still exist. Along with finding that people in lower income quintiles and with lower levels of education were associated with shorter LE at age 25 for both genders, the authors found that those with poor living conditions (i.e., residents of shelters, rooming houses and hotels) had a considerably shorter LE at age 25 than did other Canadians, for both genders. To add, men had lower LE at age 25 and higher disparity than women for income, education, and living conditions. When investigating Indigenous status, Tjepkema & Wilkins (2011) found that LE at age 25 was shorter for respondents self-reporting as Indigenous compared to non-Indigenous respondents. Although both Indigenous men and women were associated with this shorter LE, Status First Nations men had lower LE than any other subcategory of Indigenous status, regardless of gender,

whereas non-status First Nations women had higher LE than any other subcategory of Indigenous status, regardless of gender. Similarly, Tjepkema *et al.* (2019), while comparing the LE of Indigenous peoples with that of non-Indigenous peoples using quinquennial population data of Canadians of all ages between 1991 and 2011, found that Indigenous men and women, subcategorized according to First Nation, Métis or Inuit status, have lower LE at age 1 compared to non-Indigenous men and women. A smaller proportion of Indigenous men and women were expected to survive to age 75 compared to non-Indigenous men and women. To add, although the LE for all groups increased over time, this increase was either favouring non-Indigenous men over First Nation men or not favouring either group. This suggests that health disparities between Indigenous and non-Indigenous people are remaining constant or widening, in which non-Indigenous people are more advantaged. In sum, not only does this literature suggest that health inequities still exist in Canada and that they are worse than in the past, but it also suggests that different SDoH can intersect with one another to further disadvantage one individual more than another. This is shown by Bushnik *et al.* (2020), who found that income and education status intersected, in which people with lower income and a lower education were more disadvantaged than those in either group, and by Tjepkema & Wilkins (2011), who found that gender intersected with income, with education, with living conditions, and with Indigenous status, in which men who were poor, who were uneducated, who had poor living conditions and who were Indigenous, were more disadvantaged than any other group.

Social determinants of health, such as income, education, living conditions and Indigenous status, are not the only factors influencing Canadians' health. In fact, language is an important part of the daily lives of the majority of Canadians, seeing as it is the most frequently used means of communication. Canada is one of the several countries globally to have more than one official

language (World Population Review, n.d.) and these official language groups tend to be placed within a social hierarchy. This is indicated in the literature regarding the health of official language minorities in Canada. Most of this literature comprises of studies conducted in Québec, the only province in which Francophones are a majority, and reveals a phenomenon of inverse linguistic health disparity in which the majority Francophone populations in Québec are more disadvantaged than their minority Anglophone counterparts (Auger *et al.*, 2012a; Auger *et al.*, 2012b; Auger *et al.*, 2013; Lo *et al.*, 2018). The cause of this counterintuitive phenomenon is unclear, but Auger *et al.* (2012a) hypothesize that Anglophones being the majority linguistic group across Canada may be a factor in improving the social status of Anglophones living in Québec, despite their minority status in this province.

Meanwhile, not many studies have examined the health disparities of Francophones living in a minority situation (i.e., outside Québec). Bouchard *et al.* (2009) and (2013) conducted retrospective cohort studies in Canada comparing the health of Francophone populations living outside Québec with that of the majority Anglophone populations. In both studies, a Francophone was defined by language of conversation, mother tongue, language of interview, and preferred language for the interview. Despite both studies targeting different age groups (i.e., Bouchard *et al.* (2009) targeted adults aged 25 or older, while Bouchard *et al.* (2013) targeted older adults aged 65 or older), they both suggest that language is an important determinant of health for minority Francophones. Bouchard *et al.* (2009) found that minority Francophones are less likely to perceive their health as good when compared to the majority Anglophones. They also found that language may be a more important determinant for Francophone men compared to Francophone women. This aligns with the results found in Tjepkema & Wilkins (2011) in which gender seems to intersect with another SDoH. To add, Bouchard *et al.* (2013) found that older minority

Francophones were more at risk of being in the lowest income quintile, have less formal education and live predominantly in rural settings compared to their Anglophone counterparts. Considering the findings regarding income and education as SDoH made by Hajizadeh *et al.* (2016), Bushnik *et al.* (2020), Shahidi *et al.* (2020), and Tjepkema & Wilkins (2011), it is no surprise that Bouchard *et al.* (2013) found that this minority group was less likely to report having good to excellent health compared to the older majority Anglophones. Despite the scarcity of studies examining linguistic health disparities among official language populations in Canada outside Québec, one study has attempted to identify the determinants of health of Francophone minority populations in Canada. In Alimezelli *et al.* (2013), a Francophone was defined as a person who either had French as their mother tongue, their first official language spoken, or the language used during their interview. Results suggest that having a partner, living in a western province (i.e., British Columbia, Alberta, Saskatchewan or Manitoba), feeling a sense of belonging to the Francophone community along with having a higher education, a higher literacy, a higher income and good social support were all associated with Francophones outside Québec having a better self-rated health. These results, alongside the findings that the majority of the Francophone population living outside Québec is found in Ontario (Canadian Heritage, 2024) corroborate with the findings of Bouchard *et al.* (2009; 2013) and suggest that the self-rated health of Francophones living in Ontario is inferior to their Anglophone counterparts. Therefore, it can be inferred that the Francophone group living in Ontario have a lower socioeconomic position and more unfavourable SDoH that are negatively impacting their health. Social interventions are designed to target the unfavourable SDoH of their patients and help treat the social needs that they may have. Such interventions may be beneficial for this linguistic minority group.

3.3 Access

In order to conceptualize access in the context of healthcare, one must first understand the policies that govern the healthcare system. These policies can be at the federal or provincial level, and their primary objective is to "protect, promote and restore the physical and mental well-being of residents of Canada and to facilitate reasonable access to health services without financial or other barriers" (Canada Health Act [CHA], 1985, s. 3). The Canada Health Act is a federal legislation that serves as the foundation of the Canadian healthcare system. This is accomplished by compelling the provinces to satisfy the five criteria outlined in the CHA with annual federal funding, known as the Canada Health Transfer (CHA, 1985). The five criteria are the following: i) public administration; ii) portability; iii) universality; iv) comprehensiveness; and v) accessibility. The public administration criterion states that the health insurance plan of a province must be run on a non-profit basis by a public authority (CHA, 1985). In Ontario, that public authority is the Ministry of Health (Government of Ontario, 2025). The criterion of portability states that the health insurance plan of a province must follow a resident of that province should they move to another province or travel outside Canada (CHA, 1985). The universality criterion, arguably the more renowned of the five, states that all residents of a province are entitled to the health insurance plan of that respective province. A resident of a province is a person that has resided in a province for a minimum of three months and excludes members of the Canadian Armed Forces and those in a correctional facility (CHA, 1985). Therefore, a province's health insurance plan is not limited to Canadian citizens but is also applicable to newcomers. Meanwhile, the comprehensiveness criterion states that the health insurance plan of a province must insure all medically necessary hospital and physician services, including surgical-dental services performed exclusively in hospitals (CHA, 1985). The final criterion of accessibility is defined as the

requirement that the health insurance plan of a province must provide all residents of that province with (undefined) reasonable access to the insured services without financial barriers (CHA, 1985). It is important to note that this criterion does not enforce availability or presence of providers in a region (i.e., rural communities are not breaching this criterion simply because they have less available services). In the United States, where the majority of healthcare services are privatized, a study was conducted to examine the impact of unmet social needs on utilization of services by low-income adults (Cole & Nguyen, 2020). The authors found that those with four or more unmet social needs had a significantly lower probability of having a check-up within the last year, receiving a flu shot in the last year and having a personal doctor, and a higher probability of being unable to see a doctor due to cost (Cole & Nguyen, 2020). This suggests that privatized healthcare may create access barriers. That said, by defining the uniform parameters of a publicly administered health system, the CHA effectively prevents a two-tier system for services defined as "medically necessary". However, its narrow definition of "medically necessary" creates a privatized healthcare system in which other services (e.g., dental, vision, mental health, prescription drugs, etc.), arguably necessary for holistic health and quality of life, are not covered and are subject to the very thing the CHA was trying to prevent: financial barriers. Considering the role of social prescribing and patient navigation programs, it could be said that where the limits of the CHA ends is where the scope of the navigator begins.

The literature often uses two indicators to measure access, namely unmet health needs and utilization. Perceived unmet health needs represent access barriers because they signify the inability of a patient to obtain services they felt were required (Sibley & Weiner, 2011). Utilization represents a patient having successfully obtained a required service (Sibley & Weiner, 2011). Overall, the literature concerning Canada suggests that access barriers are related to certain

unfavourable SDoH, such as low income, unstable housing, place of residence and language minorities. There are many studies that have analyzed the association between income and access. Bartram (2019) conducted a cross-sectional population-based study using data from the Canadian Community Health Survey (2013-14) consisting of Canadians aged 12 years and older. The objective of the study was to examine the distribution of income across utilization of mental health services and compare the income distribution between unmet physical and mental health needs. The author found income inequities in access to mental health services. These inequities were attributed to Canada's two-tier healthcare system of private and public services, where the mainly privatized services, such as psychologists, were found to be used more frequently by high-income individuals, whereas services that are publicly funded, such as general practitioners, psychiatrists, and nurses, or those more tailored to marginalized populations, like social workers, were used more frequently by low-income individuals. The author also found that there was a more pronounced income inequity for unmet mental health needs compared to unmet physical health needs, suggesting that although there is a skewed distribution of both unmet health needs towards the lower income group, this larger income inequity for unmet mental health needs is likely due to intersecting factors, such as the social stigma of mental health.

Several years earlier, a retrospective population-based study was conducted in Ontario to examine the impact of socioeconomic status on the stage of cancer at diagnosis, specifically for breast, colon, rectal, nonsmall cell lung, cervical and laryngeal cancers (Booth *et al.*, 2010). For all six types of cancers combined, participants in the lowest income quintile were less likely to have their cancer diagnosed at stage 1 and more likely to get it diagnosed at stage 4 compared to all the other income quintiles. This suggests that socioeconomic status may determine the level of accessibility to care one may have, leading to the cancer being diagnosed at different stages.

Considering that a patient must be referred to an oncologist by a PCP, it is possible that this delay in cancer diagnosis stems from poor access to a primary care provider rather than to an oncologist. A qualitative study by Goodridge *et al.* (2019) conducted in Saskatoon supports this idea. Participants living with Chronic Obstructive Pulmonary Disease (COPD) who refused to participate in a disease management program were interviewed to help identify access barriers. One emerging theme was that poverty influenced their participation in the program. Due to poverty, participants felt that their health needs could not be prioritized over their everyday living concerns until they became seriously ill, after which their illness would impair them from taking care of their everyday concerns (e.g., paying bills), causing them more trouble. They also felt that poverty impaired their access to health care providers due to lack of resources (e.g., transportation, means of communication, etc.). Conversely, Khan *et al.* (2011) conducted a cross-sectional study using data from the Canadian Community Health Survey (2000-01) restricted to Ontarians aged 20 to 74 years old linked with Ontario Health Insurance Plan (OHIP) data examined the impact of socioeconomic status on ED utilization. They found that having a lower income was associated with a higher likelihood of utilizing the ED. Additionally, using weighted population estimates, the authors estimated that 59.1% of Ontario's ED utilizations were classified as less urgent or nonurgent. Although ED utilizations can be interpreted as beneficial since one is accessing care and addressing a health need, non-urgent ED utilizations are unfavourable and places a burden on the healthcare system.

Meanwhile, de Jager *et al.* (2023) were interested in examining the impact of social disadvantage on wait times for one of seven common elective surgical procedures (i.e., knee arthroplasty, hip arthroplasty, knee arthroscopy, benign uterine surgery, cataract surgery, inguinal hernia repair and cholecystectomy) in Ontario and found that income was not significantly

associated with exceeded wait time. However, place of residence seems to have an influence. Participants residing outside of Toronto had a significantly higher likelihood of exceeding target wait times across all seven surgical procedures. Surprisingly, Northern Ontario residents, despite being at the furthest geographical distance from Toronto compared to other geographical groups in the study, did not consistently have the highest likelihood of exceeding target wait times across surgical procedures. In fact, this only occurred for cholecystectomies and inguinal hernia repairs. Similarly, Harrington *et al.* (2013) identified predictors of having difficulty accessing specialist services in Ontario using data from the 2010 Canadian Community Health Survey. They could not show that income was a significant predicator for having difficulty accessing specialist services. Although they also could not show that having a family doctor was a significant predictor, there was a trend suggesting that it might decrease the likelihood of having difficulty accessing specialist services. However, they found that living outside Toronto was associated with an increased likelihood of having difficulty accessing specialist services. These results suggest that once a patient has accessed the healthcare system (i.e., saw a PCP and were referred to secondary care services) certain factors such as income become less influential and other factors such as place of residence become more influential barriers.

Sibley & Weiner (2011) support de Jager *et al.* (2023) and Harrington *et al.* (2013) by also finding that place of residence was an access barrier. They conducted a cross-sectional population-based study using data from the Canadian Community Health Survey (2003) to examine the impact of place of residence on five access measures (i.e., having seen a specialist in the past year, having seen a family physician in the past year, having had an influenza vaccination in the past two years, perceived unmet need in the past year and having a regular medical doctor) among a sample of Canadians aged 20 and older. Place of residence was defined as a rural-urban continuum in

accordance with a Statistics Canada report (du Plessis *et al.*, 2002). Urban was sub-divided into census metropolitan areas and census agglomerations, with the former considered more urban. Rural was sub-divided into strong metropolitan influenced zones (MIZ), moderate MIZ and weak to no MIZ, with the latter being the most rural. For the access measure of specialist visits, urban residents had higher odds of visiting a specialist than their rural counterparts. This is not surprising considering that there is a higher proportion of specialists working in urban centres, meaning there is more availability for urban residents compared to rural residents. However, there were no significant differences in odds throughout the rural-urban continuum for family physician visits. Although this finding suggests that there was equal access to family physicians regardless of place of residence, the authors did not compare the groups by northern and southern Ontario. As highlighted in Wenghofer *et al.* (2014), using a "blanket" statement for rural communities can mask the reality in different rural communities. It is possible that rural north residents may have lower access to a family physician than rural south residents and that this difference was not observed because the comparison was not made. The authors also found that only the most rural community had a significantly lower odds of having had an influenza vaccination in the past two years compared to urban residents. The Ontario population also had increased odds of having had an influenza vaccination compared to other provinces. The authors suggested that this may be due to Ontario's influenza vaccine having been publicly funded since the 2000-01 influenza season. It is unclear what the distribution of this vaccination is across the rural-urban continuum in Ontario since the study did not examine this. All three rural categories had lower odds of reporting unmet needs compared to the census agglomeration category, whereas no statistical difference in odds was found between both urban categories. The authors attributed these findings as rural residents having a different expectation of the healthcare system and a different view of health compared to

urban resident, causing them to have a higher threshold at which they would report unmet needs. Interestingly, the most urban and most rural categories had the lowest odds of having a regular medical doctor. This may be a function of income inequalities, since lower income individuals may be more likely to live in highly urbanized inner cities whereas higher income individuals may be more likely to live in the suburbs, which are often categorized as census agglomerations or strong MIZ. This idea is supported by the Canadian Institute for Health Information (2024a; CIHI), since it shows that persons in the lowest income quintile had a lower prevalence of having a regular medical doctor compared to all other income quintiles. Rural centres may also face higher physician turnover, preventing residents from having a regular medical doctor.

Income and place of residence are not the only potential access barriers to healthcare. Language barriers can also impede access. A mixed-method study by de Moissac & Bowen (2017) involving Francophones[1] living in minority situation from four provinces (i.e., Newfoundland and Labrador, Saskatchewan, Alberta and Ontario) was undertaken to examine the impact of language barriers on healthcare access. Despite over half (54.8%) of participants reporting they have very good to excellent access to overall health and social services, about 3 in 4 participants (76.8%) reported having weak or inexistent access to health and social services in French. When questioned about actions taken to access French Language Services (FLS), 51.5% stated that they did their best without linguistic assistance. To add, approximately 2 in 5 participants (39.4%) reported having actively searched for health services in French, with most using the Internet. However, some reported that unsuccessful searches discouraged them from requesting or seeking further services in French. Furthermore, about 1 in 5 (21.2%) participants did not seek health services if these were not available in French, and fewer participants requested interpretation (3%),

[1] de Moissac & Bowen (2017) did not define Francophone in their study.

complained when services were not available in French (2%), or reported incidents when care provided was inadequate because of language issues (1.7%). This is concerning because it may give policymakers the illusion that such services are not needed and therefore these services may become harder to access due to less availability. Lastly, almost half of participants reported having access to a bilingual family physician, but participants expressed that "it is not sufficient", since specialists or other allied health professionals may not be able to provide services in French.

3.4 Health Service Utilization

Despite patient navigation programs for clinical patients in hospitals existing for nearly two decades, not much is known in regard to their effect on health service utilization. Various patient navigation models, which will be described individually, were compared to care as usual groups, henceforth referred to as the control arm. In one randomized controlled study, Gryczynski *et al.* (2021) examined the effect of professional navigators (i.e., social worker) on adults living with comorbid substance use disorders when navigation started at bedside. The authors found a significant difference between both treatment arms at 12 months follow-up for hospital readmissions and ED visits, in which the intervention arm had less events than the control arm in that period. In another RCT, Kelley *et al.* (2020) evaluated the impact of professional navigators (i.e., registered nurse) on adults who were frequent users of health services covered by Medicaid when navigation began in the ED. In a period from 12 months pre-enrollment to 12 months post-enrollment, these authors found significant reductions in hospitalizations and ED visits for the intervention arm when compared to the control arm, but no significant between-group difference was found for outpatient visits (i.e., primary and specialty care) since visits increased for both groups on this outcome. This can be interpreted as a positive finding, since less utilization of EDs along with more utilization of outpatient services may suggest better access to appropriate care. In

a third RCT, Seaberg *et al.* (2017) examined the impact of lay navigators for adult patients who were frequent users of health services when navigation was initiated in the ED. The authors found significant differences between arms in terms of ED visits and PCP visits, where the intervention arm had less ED visits and more PCP visits than the control arm. Although these studies suggest that patient navigation programs reduce hospitalizations and ED visits and increase PCP visits when navigation begins in a clinical setting (e.g., hospital, ED), they do not inform the impact of navigation on health service utilization when patients are referred by a PCP (i.e., social prescription).

Although the literature involving social prescribing programs and health service utilization is scarce, it does reveal interesting results. Boult *et al.* (2013) examined the impact of professional navigators (i.e., registered nurse) on a sample of older American adults and found no significant differences in health service utilization (e.g., PCP visits, ED visits, hospital admissions, and 30-day hospital readmissions), except for home health care services, with fewer used in the intervention arm compared to the control arm at 32-months follow-up. The intervention lasted the entire duration of the study (i.e., 32 months) and was designed to potentially follow patients for the rest of their lives, depending on needs. Furthermore, navigators did not provide health education to the patients. Proper health education could have helped patients understand when to seek health services as well as which one is most appropriate to seek based on the health need, which consequentially could have reduced health service utilization. This idea is supported by Kangovi *et al.* (2018), who included some form of health education in their intervention and found significant results for various health service utilization outcomes. They evaluated the impact of lay navigators, who referred patients back to their PCP for health education, on a sample of middle aged and largely low-income, female, chronically ill and African American adults throughout a 6-

month intervention. When comparing the intervention with the control arm, the authors found differences in total days spent in a hospital. Patients in the intervention arm had a significantly shorter average length of stay and lower mean number of hospitalizations than those in the control arm. To add, the intervention arm had significantly lower odds of readmissions, measured in repeat hospitalizations and 30-day readmissions at 9 months.

The literature suggests that shorter social prescribing interventions employing lay navigators that provide health education to middle- and older-aged patients are contributing to appropriate health service utilization (Boult *et al.*, 2013; Kangovi *et al.*, 2018). Furthermore, the literature suggests that certain vulnerable populations (e.g., populations who are older, chronically ill, or have lower income) may benefit from social prescribing interventions (Kangovi *et al.*, 2018). However, little is known about the impact of social prescribing on other vulnerable populations, such as communities of official language minority, prevalent in Canada. Therefore, additional research is warranted to understand the impact of social prescribing on health service utilization for communities of official language minority.

3.5 Health-Related Quality of Life

Similar to the patient navigation literature on health service utilization, the literature on HRQoL is relatively sparse and mainly focuses on cancer patients, despite patient navigation programs having expanded to serve other patients/populations with specific illnesses. An RCT by Ramirez *et al.* (2020a) compared the effect of culturally tailored team navigation (i.e., two professional and one lay navigator) with traditional team navigation on adult Latina Americans who survived breast cancer. They found significant differences in mean scores for social well-being, emotional well-being, functional well-being, and breast cancer-related quality of life at 6 months follow-up, in which the intervention arm had better scores than the control arm.

Meanwhile, Ramirez *et al.* (2020b) compared culturally tailored lay navigation with traditional lay navigation on adult Latino Americans who survived one of several cancers (e.g., colorectal, prostate, breast). The authors found a significant positive association among male colorectal cancer survivors and a negative association among breast cancer survivors between the intervention and HRQoL. However, these associations disappeared once the intervention ceased, suggesting the interventions did not have a long-term effect on HRQoL. The authors did not find any association for the prostate or female colorectal cancer survivors. Additionally, two RCT's examined health-related quality of life for a sample of newly diagnosed cancer patients. Hendren *et al.* (2012) used lay navigators to target colorectal and breast cancer and found no significant change in quality of life over time when comparing both treatment arms (i.e., control arm was usual care). Berezowska *et al.* (2021) used professional navigators (i.e., oncology nurses) to target mainly ovarian, vulvar, endometrial, melanoma stage III/IV, lung, and renal cancers and found no significant effect of the intervention over time when comparing both treatment arms (i.e., control arm was usual care). These studies suggest that patient navigation programs may not improve the HRQoL of newly diagnosed cancer patients. However, they reveal conflicting results regarding the impact of patient navigation programs on the HRQoL of cancer survivors. Not only are these studies specific to the cancer population, but they are also specific to patients in a clinical setting and provide little insight on the impact of patient navigation on the HRQoL of patients referred by a PCP (i.e., social prescription).

Most RCT's examined the impact of social prescribing on the quality of life of older adults. Of these, all but one were unable to find significant results. Boult *et al.* (2013) examined the impact of professional navigators (i.e., registered nurse) on a sample of older American adults. The intervention lasted the entire duration of the study (i.e., 32 months) and navigators provided home-

based assessments of patients' needs and goals, care planning and coordination, proactive monitoring, transitional care, self-management education, caregiver support, and access to community resources. Similarly, Taube *et al.* (2017) examined the impact of professional navigators (i.e., registered nurse and physiotherapist) on a sample of community-dwelling older Swedish adults. Their intervention lasted 12 months and provided care coordination, navigation of the healthcare system, health education, linkage to community resources, emotional support, and advocacy to patients. Despite the similarities in the services rendered by the navigators and the different navigation models used in these studies, no significant effects were found on HRQoL. However, Spoorenberg *et al.* (2018) found significant results when examining a sample of older Dutch adults with varying levels of care needs. They screened and stratified participants among three levels in increasing order of risk profiles for complexity of care needs, with "robust" being the lowest risk of having complex care needs, "frail" being second, and "complex care needs" as highest risk. Their intervention, lasting 12 months, used professional navigators (i.e., registered nurse and social workers) who provided individualized care coordination and support to the frail and complex care needs strata. The robust stratum attended group meetings where health education was provided by community organizations. Results showed that quality of life in the robust stratum significantly decreased over time whereas no statistical significance was found for that of the other strata, but this may be attributed to the absence of individualized meetings with the navigators in the robust stratum. Despite all the different types of social prescribing interventions, no positive effects on quality of life were found when applied to older adults. It is possible that another factor (e.g., loneliness, grief, chronic pain, etc.) is confounding the results. This avenue of research is important considering the aging population that Canada faces today but falls outside the scope of this current study.

Studies examining samples of middle-aged adults found conflicting results. A dated study by Grant *et al.* (2000) examined the impact of trained patient navigators[2] on a sample composed primarily of female and middle-aged English adults. The intervention consisted of a minimum of two encounters with a navigator, who provided support and encouragement for patients to access community resources. The authors found significant differences for anxiety, pain, emotional function, daily activities and overall health in favour of the intervention arm. Results were non-significant between both treatment arms (i.e., control arm was usual care) for depression, physical fitness and perceived social support. Although Grant *et al.* (2000) did not directly measure quality of life, they measured proxy indicators. Thus, it can be inferred that the quality of life of those in the intervention arm moderately improved. In contrast, Kangovi *et al.* (2018) examined the impact of lay navigators compared to care as usual on a sample of middle-aged and primarily low-income, female, chronically ill and African American adults. The intervention lasted 6 months and navigators provided coaching, social support, advocacy, and linkage to community resources along with referrals to clinicians for health education, if needed. There were no significant differences between treatment arms for the mental and physical composite scores, indicating no improvement of HRQoL. Although social prescribing interventions seem not to have an impact on the quality of life of older adults, the extent to which these interventions may impact other age groups is unknown. Furthermore, only one RCT examined its impact in a Canadian setting. More research is warranted to better understand how social prescribing may influence the HRQoL in populations of patients within a Canadian context.

[2] Grant *et al.* (2000) did not specify the type of navigator used in their study.

4. Thesis Frameworks

This study was guided by a combination of the Social Determinants of Health (SDoH) Framework proposed by the World Health Organization's (WHO) Commission on Social Determinants of Health (CSDH; Solar & Irwin, 2010) and the Access Framework proposed by Levesque *et al.* (2013). First, the SDoH Framework identifies the mechanisms of health inequities, in which the structural determinants within a society work downstream to influence equity in health and well-being among individuals. The structural determinants are social determinants of health inequity and consist of social, economic and political factors that give rise to a social hierarchy. Groups within a society are created and stratified along this hierarchy based on socioeconomic status, power, and prestige. Structural determinants are mediated by intermediary determinants, which are more proximal social determinants of health. Intermediary determinants, such as material circumstances (e.g., living and working conditions, etc.), psychosocial factors (e.g., debt, social support, coping mechanisms, etc.), and behavioural and biological factors (e.g., smoking, substance consumption, physical exercise, age, genetics, etc.), are experienced differently based on the socioeconomic position held by an individual due to differential exposure and vulnerability to health-compromising conditions and differential social, economic and health consequences of illness. Differential exposures, vulnerabilities and consequences give rise to access barriers and directly impact the health and well-being of an individual, but differential consequences have the potential of creating a cycle in which consequences from an illness can further lower one's socioeconomic position, and, thereby, further worsen one's health.

However, socioeconomic position is not the only factor influencing social determinants of health. In fact, the health system can also have an impact on social determinants of health because it has the power to "address differences in exposure and vulnerability not only by improving

equitable access to care, but also in the promotion of intersectoral action to improve health status" (Solar & Irwin, 2010, p.40). Essentially, the health system plays a role in the reduction of access barriers through its judicious implementation of interventions that target the SDoH. By reducing access barriers, these SDoH interventions increase access to health services, and in doing so, the health system indirectly improves patient health by satisfying health and social needs.

Access within a health system can be illustrated by the Access Framework (Levesque *et al.*, 2013). The Access Framework defines access as the "opportunity to reach and obtain appropriate health care services in situation of perceived need for care" (Levesque *et al.*, p.4). The key term "reach and obtain" alludes to access as being the result of the interaction between demand-side factors (i.e., individual and population characteristics enabling one to reach care) and supply-side factors (i.e., provider and institutional characteristics enabling the provision of care) within a health system. There are five dimensions of accessibility to services in this framework. On the supply side, these are: i) approachability; ii) acceptability; iii) availability and accommodation; iv) affordability; and v) appropriateness. On the demand side, these are: i) ability to perceive; ii) ability to seek; iii) ability to reach; iv) ability to pay; and v) ability to engage. Therefore, by implementing a SDoH intervention that also enhances the patient's five abilities to access care, the health system can further increase its impact on equitable access to care, which further contributes to patient health. Nevertheless, people with lower socioeconomic positions may have more complex health and social needs and may be more likely to "slip through the cracks". Thus, not only is the relationship between the health system and patient health mediated by access, but the relationship between the health system and access is moderated by the patient's socioeconomic position (for a schema of these relationships, see Appendix A). These frameworks

were used to organize and operationalize key independent variables (i.e. covariates) and outcome measures, guide the data analytic strategy, and the interpretation of the results.

5. Study Rationale

There is evidence that Canadian health indicators are worsening (Hopman *et al.*, 2000; Statistics Canada, 2024c; Trenaman *et al.*, 2024), gaps in HRQoL are at risk of growing (Cohen *et al.*, 2016; Dai *et al.*, 2019; Herman *et al.*, 2012; Statistics Canada, 2024b), the distribution of SDoH among the population is widening (Bushnik *et al.*, 2020; Tjepkema & Wilkins, 2011), and that access barriers are more likely to impact vulnerable populations (Booth *et al.*, 2010; Sibley & Weiner, 2011). There is also evidence that Francophones living in a minority situation may have a lower socioeconomic position, more intersecting unfavourable SDoH and more access barriers compared to the majority English-speaking population that are negatively impacting their health (Bouchard *et al.*, 2009; de Moissac & Bowen, 2017). Moreover, there is evidence that social prescribing programs tend to work for vulnerable populations (e.g., populations who are older, chronically ill, or who have lower income) in improving health service utilizations (Kangovi *et al.*, 2018), yet there have been some conflicting results in the literature regarding their effects on HRQoL (Grant *et al.*, 2000; Kangovi *et al.*, 2018). However, no study has compared two patient navigation models in the context of a social prescribing program. The authors of the ARC social prescribing study also conceptualized and implemented its own patient navigation model, making it the first of its kind. It is also the first social prescribing study to incorporate Francophones living in a minority situation as a variable. By using secondary data from the ARC study, this current study adds to the literature to help bridge gaps in knowledge in terms of social prescribing programs and patient navigation models in Canada, especially in terms of healthcare utilization and HRQoL, along with how these programs might impact official language minorities living

outside Québec. The current study will also add to the primary study's ultimate goal to implement the ARC navigation model at the provincial level so that it may work alongside the existing Ontario 211 navigation model, where the former would address the more complex health needs cases. Finally, the results of the current study along with the main ARC study could help raise PCP's awareness on the potential benefits of social prescription, not only in terms of their patients' health, but also to lighten their workload and reduce their likelihood of burnout.

6. Methods

6.1 Study Design

This study consisted of a secondary analysis of data obtained from the ARC randomized controlled trial (Dahrouge *et al.*, 2025), which applied a pre-post design. The following sub-sections describe the recruitment, sample size and data collection process of the primary study (see Dahrouge *et al.*, 2025 for further details).

6.2 Recruitment

All practices offering comprehensive primary care services in which at least one primary care provider agreed to participate were eligible (Dahrouge *et al.*, 2025). Community Health Centres were excluded from the study because many already have pre-existing navigation support personnel. Primary care providers (i.e., family physicians and nurse practitioners) working in an eligible practice were eligible.

All patients of participating primary care providers with a health and/or social need(s) and consenting either directly or via substitute decision maker were eligible. Patients unable to communicate either in English or French were offered the services of a translator. Patients were excluded from the study if they had an uncontrolled medical condition requiring immediate attention.

Recruitment began in October 2018 in Ottawa and February 2019 in Sudbury and was open for 12 months in each region. It was a multi-step process involving primary practices, primary care providers and patients, respectively (Dahrouge *et al.*, 2025). Potentially eligible practices were identified via pre-existing lists obtained from the former[3] Champlain and Northeastern LHINs, online searches, and telephone inquiries. Practices located in neighbourhoods with a higher proportion of Francophones were prioritized and approached first. The approach consisted of sending invitation letters and information brochures, via email or mail, to the primary practices. A reminder email was sent two weeks later. Finally, a telephone call was directed to the practice manager or an equivalent three weeks after the initial invitation was sent. If a member of the practice was interested, all practice members were invited to an information session where the study details were provided and consent collected.

When a provider identified that a patient had unmet health and/or social need(s), they would introduce the study and asked for the patient's verbal consent for a study team member to contact them. The provider then completed a referral form in which the patient's needs were identified. The study coordinator followed up with the patient, explained the study details, ascertained eligibility, and obtained informed consent.

6.3 Sample Size

The ARC Social Prescribing research team estimated that a sample size of 318 participants was required to detect a difference of 20% in access to resources between study arms accounting for a 30% attrition rate. They recruited 12 primary practices, 8 in the Ottawa area and 4 in the Greater Sudbury area (Dahrouge *et al.*, 2025).

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[3] In April 2021, the Local Health Integration Networks became the Home and Community Care Support Services (HCCSS). However, the geographic boundaries during the transfer did not change and all 14 regions retained their names (e.g., the North East LHIN became the HCCSS North East; Ministry of Health, n.d.).

6.4 Research Questions & Hypotheses

6.4.1 Primary Questions

a) RQ 1: What is the impact of the ARC navigation intervention compared to the Ontario 211 navigation services on self-reported health service utilization rates (i.e., ED visits and hospitalization)?

- Hypothesis: The ARC navigation intervention (experimental group) will be associated with lower odds of health service utilization than the Ontario 211 navigation services (control group).

b) RQ 2: What is the impact of the ARC navigation intervention compared to the Ontario 211 navigation services on the self-reported quality of life?

- Hypothesis: The ARC navigation intervention (experimental group) will be associated with better quality of life than the Ontario 211 navigation services (control group).

6.4.2 Secondary Questions

c) RQ 3: Is the impact of a navigation intervention (i.e., ARC navigation or Ontario 211 navigation) on health service utilization rates comparable for Francophones and non-Francophones?

- Hypothesis: Francophones and non-Francophones assigned to the same navigation intervention will be associated with similar odds of health service utilization.

d) RQ 4: Is the impact of a navigation intervention (i.e., ARC navigation or Ontario 211 navigation) on health-related quality of life comparable for Francophones and non-Francophones?

- Hypothesis: Francophones and non-Francophones assigned to the same navigation intervention will be associated with similar changes in HRQoL scores.

6.5 Data Collection

The participants who had consented to participate in the ARC social prescribing study were asked structured questions (Dahrouge *et al.*, 2025). Two questionnaires were administered to participants in both groups based on the timeline of the study intervention. One questionnaire was provided before study randomization to acquire the baseline measurements. The second questionnaire was scheduled to be administered three months after the intervention began. Data collected from this questionnaire served as the post-intervention data. The questionnaires were conducted over the phone and lasted from 20 to 30 minutes. Participant socio-demographic information was collected at baseline to understand the profile of the population (Appendix B). The outcome measures for this study were obtained from sections titled "Needs/Difficulties/Use of healthcare" (Appendix C) and "Quality of Life Veterans RAND-12" (Appendix D) were collected in the baseline and post-intervention questionnaires.

All collected data were stored in a secure, encrypted, password-protected online database. All data were devoid of any identifiable information belonging to the participant and were identified using a unique study code. A separate database, also secure and password-protected with limited access, was created containing information linking the study code to the participants' identities strictly for communication purposes between the participants and the research team. The full database was only accessible to certain members of the study team. In this study, only the data from the patient surveys were accessed.

6.6 Data Analyses

6.6.1 Outcome Measures

Health service utilization was measured by asking "In the past 3 months, how many visits have you had to an emergency department?" and "In the past 3 months, what is the total number of days counting overnight stays (if any), that you have spent in a hospital?". The large number of zeros recorded for ED visits and hospitalization days resulted in over-dispersion of that count data. For that reason, these variables were dichotomous into zero or one or more ED visits or days spent in the hospital.

Health-related quality of life was evaluated via the Veterans RAND 12-Item Health Questionnaire (VR-12). The 12 items in the VR-12 correspond to seven physical and mental health domains: general health perception, physical functioning, role limitations due to physical and emotional problems, bodily pain, vitality/mental health, and social functioning (Iqbal *et al.*, n.d.). The 12 items are summarized into two composite scores: the physical component score (PCS) and the mental component score (MCS) and are indicators of the physical and psychological status of the participants. The physical health domains contributing to the PCS are general health perception, physical functioning, role limitations due to physical problems and bodily pain. The mental health domains contributing to the MCS are role limitations due to emotional problems, vitality/mental health and social functioning. Scores range from 0 to 100. The algorithm to calculate the PCS and MCS is available upon request to the original authors, free of charge (Iqbal *et al.*, n.d.). Such request was made, and the algorithm was received. The ARC research team made slight modifications to the VR-12 questionnaire. There was one word that was changed (i.e., "problems" in physical or emotional problems was changed to "difficulties"). Also, the scale for the social functioning domain was originally a 5-point Likert scale (i.e., "All of the time" to "None

of the time") and was modified to a 6-point scale (i.e., "A good bit of the time" was added). Since the algorithm provided was for the original version with the 5-point scale, the scale was reduced to its original 5-point structure by merging the "A good bit of the time" with "Some of the time" categories. These modifications were not validated.

Recognizing the modifications made to the Likert scale were arbitrary and could have biased the results, a sensitivity analysis was conducted by merging the "A good bit of the time" with "Most of the time" categories.

6.6.2 Focal Independent Variable

Study arm served as the main independent variable in this study.

6.6.3 Covariates

Consistent with the SDoH Framework, we used the following socioeconomic factors collected at baseline: age, gender, race/ethnicity, education, financial situation, and Francophone status as covariates. The role of Francophone status as a moderator variable was also examined. Age was derived by subtracting the birth year from the survey date. This was categorized into three intervals (<35, 35-64 and 65+). A dummy variable of the age measure was also created. Gender was reported as either "Male", "Female", or "I do not identify". Due to the small sample size, it was dichotomized into "Female" and "Other". Race/ethnicity was reported using categorical variables of various racial/ethnic groups. Participants selected all options that applied. For groups not listed, participants could specify their racial/ethnic group. This variable was then dichotomized into "Caucasian" and "Other". Education was measured via the highest level of education completed, ranging from high school to professional school and was dichotomized into "Completed a university degree" or "Did not complete a university degree". Financial situation was measured on a 6-point Likert scale of phrases that best described the participant's financial

situation ranging from “Poor” to “Very comfortable”. This variable was then dichotomized into “Poor to Tight”, composed of the “Poor”, “Very tight” and “Tight” scores, and “Modestly Comfortable to Very Comfortable”, composed of the “Modestly comfortable”, “Comfortable” and “Very comfortable” scores. Originally, household income had been selected to serve as an indicator of participants’ income. However, due to the missing data for this variable (i.e., 22.4% of cases in this variable had missing data), financial situation was chosen to represent the income status of participants.

Finally, the definition of Francophone status was inspired by the Inclusive Definition of Francophone (IDF), which is a more inclusive definition because it goes beyond defining Francophones as those whose mother tongue is French by including those whose mother tongue is neither French nor English, but who have a good knowledge of French and who speak French often at home (Office of Francophone Affairs, 2009). Therefore, the IDF includes newcomers in Ontario and by doing so, is more representative of the diverse Franco-Ontarian community (Office of Francophone Affairs, 2009). However, the Regroupement des Entités de planification des services de santé en français de l’Ontario (2013) notes that three questions may not be appropriate in a questionnaire and recommends using two questions while maintaining the spirit of the IDF: i) “What is your mother tongue?”, and ii) “If your mother tongue is not French or English, in which of Canada’s official languages are you most comfortable?”. In this study, Francophones were defined as those whose mother tongue is French, or those who are allophones and comfortable speaking French. Participants who reported English as their mother tongue or those who are allophones and comfortable speaking English were defined as non-Francophones (see Appendix E for flowchart). There were only two cases with missing values for one of the two aforementioned

questions. Both were defined as non-Francophones because they were allophones with an unknown level of comfort for either official language.

6.6.4 Primary Analyses

Outcome measures and participant characteristics are reported using descriptive statistics (i.e., frequency and percentage for categorical data, and mean and standard deviation for continuous data). Unadjusted and adjusted odds ratios (OR and aOR, respectively) are reported for logistic regression models and parameter estimates for linear regression models with 95% confidence intervals (CI). Odds ratios represent the odds of the ARC intervention over the odds of the Ontario 211 intervention. The parameter estimates represent the difference-in-difference (DID) of the outcome measures where the Post-Pre score of the ARC intervention is subtracted from the Post-Pre score of the Ontario 211 intervention. Adjusted and unadjusted difference-in-difference (DID and aDID, respectively) are presented.

We conducted a multiple logistic regression for each health service utilization outcome and a multiple linear regression for each quality of life outcome. For the health service utilization analyses, the regression model included, in order by block, the study arm (block 1, unadjusted), the baseline outcome measure (block 2), and the covariates listed in Section 6.6.3 (block 3). For the quality of life analyses, the regression model included, in order by block, the study arm (block 1, unadjusted) and the covariates (block 2). All analyses were conducted in SPSS version 29.

6.6.5 Secondary Analyses

To assess whether the impact of the ARC and Ontario 211 interventions were similar for Francophones and non-Francophones, we repeated the analyses described above stratified by arm. Adjusted and unadjusted differences (Diff and aDiff, respectively) are presented.

6.6.6 Imputation

The ARC study data contained 14 imputations for missing data, as this was the largest proportion of missing records for any variable (Dahrouge *et al.*, 2025). Because household income data was missing in 24% of cases and was strongly associated with financial situation (Dahrouge *et al.*, 2025), household income was dropped from the analyses.

7. Ethical Considerations

Ethics approval for secondary data analysis was received from the Laurentian University Research Ethics Board (Ref.# 6011536; See Appendix F). Due to its nature as a secondary data analysis, the current study did not require additional informed consent to participate. Consent was obtained in the primary study and allowed researchers to conduct multiple studies with the data. Additionally, the data used were completely anonymous since the primary research team used a unique study code to identify the data, ensuring participant confidentiality was maintained in all studies derived from the data.

8. Results

8.1 Sample Statistics

A total of 454 patients were referred by their PCP, and 326 were enrolled (71%). Reasons for exclusion were: i) unable to reach patient (n=77); ii) patient declined to participate (n=50), and iii) patient were not eligible (n=5). The intervention arm consisted of 161 participants, and the control arm contained 165 participants, all of whom completed the baseline questionnaire. Two hundred and thirty-seven participants completed the post-intervention questionnaire (ARC: 123, Ontario 211: 114).

Some data were missing due to participants that did not complete some outcome questions. As a result, less than 237 cases could be used in the regression analyses, 211 for ED visits, 207 for hospitalizations, and 220 for both change in physical and mental HRQoL.

We checked all assumptions for a logistic and linear regression prior to the analyses. All were respected (see Appendix G).

The sample was mostly composed of adults between the ages of 35 and 64 years old (58.3%), female (70.9%), Caucasian (74.3%), not having completed a university degree (68.5%), non-Francophone (70.9%), and in a tight financial situation (56.7%). The available sample profile was similar to the baseline sample profile. See Table 1 for more details on the descriptive statistics of the sample.

8.2 ED Visits

See Appendix H for a description of the regression model performance.

8.2.1 Main Outcome

Participants assigned to the ARC navigation intervention had a 23.1% risk of having at least one ED visit at baseline and an 18.1% risk at post-intervention (see Table 2). Participants assigned to the Ontario 211 intervention had a 23.5% risk of having at least one ED visit at baseline and a 12.6% risk post-intervention. The likelihood of having at least one ED visit was not statistically significant between study arms in the unadjusted ($OR_{ARC/211}$=1.63, 95% CI: 0.77 to 3.47) and adjusted analyses ($aOR_{ARC/211}$=1.68, 95% CI: 0.75 to 3.74).

8.2.2 Other Findings

The likelihood of having at least one ED visit was statistically significant for baseline events ($aOR_{Yes/No}$=3.18, 95% CI: 1.41 to 7.20) and education ($aOR_{University\ degree/No\ university\ degree}$=0.34, 95% CI: 0.12 to 0.96), shown in Appendix I. This indicates that participants who had

visited an ED prior to the intervention had over 3 times higher odds of visiting an ED after the intervention compared to those who did not have prior ED visits. Participants who completed a university degree had 0.34 times lower odds of visiting an ED after the intervention compared to those who did not complete a university degree.

8.2.3 Stratified Analysis

Within the ARC navigation intervention, Francophones had a 25.0% risk of having at least one ED visits at baseline and a 22.9% risk at post-intervention while non-Francophones had a 22.3% risk at baseline and a 16.0% risk at post-intervention (see Table 4). In the Ontario 211 intervention, Francophones had a 16.3% risk of having at least one ED visit at baseline and a 6.5% risk at post-intervention whereas non-Francophones had a 26.4% risk at baseline and a 15.3% risk at post-intervention.

After stratifying by study arm, Francophone status was not significantly associated with the likelihood of having at least one ED visit in the unadjusted ($ARC_{Franco/Non\text{-}Franco}$: OR=1.55, 95% CI: 0.57 to 4.20; Ontario 211: $OR_{Franco/Non\text{-}Franco}$= 0.38, 95% CI: 0.08 to 1.81) and the adjusted analyses (ARC: $aOR_{Franco/Non\text{-}Franco}$=1.86, 95% CI: 0.59 to 5.85; Ontario 211: $aOR_{Franco/Non\text{-}Franco}$=0.38, 95% CI: 0.07 to 1.92), shown in Table 4.

8.3 Hospitalization

See Appendix H for a description of the regression model performance.

8.3.1 Main Outcome

Participants assigned to the ARC navigation intervention had a 9.0% risk of having at least one hospitalization at baseline and an 8.8% risk post-intervention (see Table 2). Participants assigned to the Ontario 211 intervention had a 7.9% risk of having at least one hospitalization at baseline and an 8.8% risk post-intervention. The likelihood of being hospitalized was not

statistically significant between study arms in the unadjusted ($OR_{ARC/211}$=1.21, 95% CI: 0.46 to 3.20) and adjusted analyses ($aOR_{ARC/211}$=1.08, 95% CI: 0.35 to 3.27).

8.3.2 Other Findings

As shown in Appendix J, the likelihood of being hospitalized was statistically significant for baseline events ($aOR_{Yes/No}$=14.45, 95% CI: 4.30 to 48.55). This indicates that participants who were hospitalized prior to the intervention had roughly 14.5 higher odds of being hospitalized after the intervention compared to those who did not have a prior hospitalization.

8.3.3 Stratified Analysis

Within the ARC navigation intervention, Francophones had an 11.4% risk of being hospitalized at baseline and an 11.8% risk at post-intervention while non-Francophones had an 8.1% risk at baseline and a 7.6% risk at post-intervention (see Table 4). In the Ontario 211 intervention, Francophones had a 2.3% risk of being hospitalized at baseline and a 3.2% risk at post-intervention whereas non-Francophones had a 10.1% risk at baseline and a 11.3% risk at post-intervention.

After stratifying by study arm, Francophone status was not significantly associated with the likelihood of being hospitalized in the unadjusted (ARC: $OR_{Franco/Non\text{-}Franco}$=1.62, 95% CI: 0.42 to 6.18; Ontario 211: $OR_{Franco/Non\text{-}Franco}$= 0.30, 95% CI: 0.04 to 2.55) and the adjusted analyses (ARC: $aOR_{Franco/Non\text{-}Franco}$=1.15, 95% CI: 0.24 to 5.58; Ontario 211: $aOR_{Franco/Non\text{-}Franco}$=0.35, 95% CI: 0.02 to 6.19), shown in Table 4.

8.4 Change in Physical HRQoL

See Appendix H for a description of the regression model performance.

8.4.1 Main Outcome

Participants assigned to the ARC navigation intervention reported a score of 35.30 at baseline and 37.41 at post-intervention (see Table 3). The mean of the pre-post differences for the ARC intervention was 1.45. Participants assigned to the Ontario 211 intervention reported a baseline score of 38.39 and a post-intervention score of 37.70. The mean of the pre-post differences for the Ontario 211 intervention was 0.19. Change in physical HRQoL was not significantly associated between study arms in the unadjusted ($DID_{ARC–211}$=1.26, 95% CI: -1.41 to 3.92) and adjusted analyses ($aDID_{ARC–211}$=1.35, 95% CI: -1.34 to 4.03).

8.4.2 Other Findings

Gender was significantly associated with a change in physical HRQoL ($aDID_{Female/Other}$=3.24, 95% CI: 0.35-6.13), shown in Appendix K

8.4.3 Sensitivity Analysis

Sensitivity analysis shows the same pattern of results (see Appendix L) and similar regression model performance (see Appendix H).

8.4.4 Stratified Analysis

In the ARC navigation intervention arm, Francophones and non-Francophones reported a baseline score of 33.33 and 36.08, respectively, and a post-intervention score of 33.21 and 39.18, respectively (see Table 5). Francophones had a mean of the pre-post difference of -0.75 whereas non-Francophones had a mean of the pre-post difference of 2.39. In the Ontario 211 intervention arm, Francophones and non-Francophones reported a baseline score of 36.18 and 39.11, respectively, and a post-intervention score of 36.21 and 38.35, respectively. The mean of the pre-post differences for the Francophones was 0.51 and it was 0.05 for the non-Francophones.

After stratifying by study arm, Francophone status was not significantly associated with a change in physical HRQoL in the unadjusted (ARC: $Diff_{Franco–Non\text{-}Franco}$=-3.23, 95% CI: -7.47 to 1.01; Ontario 211: $Diff_{Franco–Non\text{-}Franco}$=0.47, 95% CI: -3.70 to 4.63) and adjusted analyses (ARC: $aDiff_{Franco–Non\text{-}Franco}$=-3.35, 95% CI: -7.67 to 0.97; Ontario 211: $aDiff_{Franco–Non\text{-}Franco}$=0.41, 95% CI: -3.79 to 4.61), as shown in Table 5.

8.5 Change in Mental HRQoL

See Appendix H for a description of the regression model performance.

8.5.1 Main Outcome

Participants assigned to the ARC navigation intervention reported a baseline score of 35.36 and a post-intervention score of 38.07 (see Table 3). The mean of the pre-post differences for the ARC intervention was 3.51. Participants assigned to the Ontario 211 intervention reported a score of 31.83 at baseline and 37.43 at post-intervention. The mean of the pre-post differences for the Ontario 211 intervention was 4.02. Change in mental HRQoL was not significantly associated between study arms in the unadjusted ($DID_{ARC–211}$=-0.51, 95% CI: -3.82 to 2.81) and adjusted analyses ($aDID_{ARC–211}$=-0.40, 95% CI: -3.75 to 2.95).

8.5.2 Other Findings

No statistically significant associations were found between each covariate and the change in mental HRQoL (see Appendix M).

8.5.3 Sensitivity Analysis

Sensitivity analysis shows the same pattern of results (see Appendix N) and similar regression model performance (see Appendix H).

8.5.4 Stratified Analysis

In the ARC navigation intervention arm, Francophones and non-Francophones reported a baseline score of 38.04 and 34.31, respectively, and a post-intervention score of 40.19 and 37.18, respectively (see Table 5). Francophones had a mean of the pre-post difference of 2.71 whereas non-Francophones had a mean of the pre-post difference of 3.85. In the Ontario 211 intervention arm, Francophones and non-Francophones reported a baseline score of 32.30 and 31.65, respectively, and a post-intervention score of 41.99 and 35.47, respectively. The mean of the pre-post difference for the Francophones was 6.95 and 2.76 for the non-Francophones.

After stratifying by study arm, Francophone status was not significantly associated with a change in mental HRQoL in the unadjusted (ARC: $Diff_{Franco–Non\text{-}Franco}$=-1.17, 95% CI: -6.36 to 4.02; Ontario 211: $Diff_{Franco–Non\text{-}Franco}$=4.30, 95% CI: -0.99 to 9.59) and adjusted analyses (ARC: $aDiff_{Franco–Non\text{-}Franco}$=-1.15, 95% CI: -6.36 to 4.05; Ontario 211: $aDiff_{Franco–Non\text{-}Franco}$=4.18, 95% CI: -1.22 to 9.58), as shown in Table 5.

Table 1. *Sample profile with frequency and proportion.*

Variable	Baseline Sample Frequency (%)		Available Sample Frequency (%)	
	ARC Intervention (N=161)	Ontario 211 (N=165)	ARC Intervention (N=123)	Ontario 211 (N=114)
Age				
34 years and younger	38 (23.9)	38 (23.0)	29 (24.0)	19 (16.7)
35 to 64 years old	87 (54.7)	101 (61.2)	64 (52.9)	73 (64.0)
65 years and older	34 (21.4)	26 (15.8)	28 (23.1)	22 (19.3)
Gender				
Female	106 (65.8)	115 (69.7)	86 (69.9)	82 (71.9)
Other	55 (34.2)	50 (30.3)	37 (30.1)	32 (28.1)
Race/Ethnicity				
Caucasian	123 (76.4)	124 (75.2)	92 (74.8)	84 (73.7)
Non-Caucasian	38 (23.6)	41 (24.8)	31 (25.2)	30 (26.3)
Education				
Completed a university degree	49 (30.8)	42 (25.5)	39 (32.2)	35 (30.7)
No university degree	110 (69.2)	123 (74.5)	82 (67.8)	79 (69.3)
Financial Situation				
Modestly comfortable to Very comfortable	68 (45.3)	54 (36.2)	53 (45.3)	44 (41.1)
Poor to Tight	82 (54.7)	95 (63.8)	64 (54.7)	63 (58.9)
Francophone Status				
Francophone	44 (27.3)	46 (27.9)	35 (28.5)	34 (29.8)
Non-Francophone	117 (72.7)	119 (72.1)	88 (71.5)	80 (70.2)

Table 2. *Logistic regression predicting the odds of reporting a health service utilization, by block.*

Outcome	**N**	**Baseline Risk (%)**		**Post Risk (%)**		**Bi-variate Analysis[a, c]**	**Multivariate Analysis[b, c]**
		ARC	211	ARC	211	**Odds Ratio (CI)**	**Adjusted Odds Ratio (CI)**
ED Visits	211	23.1	23.5	18.1	12.6	1.63 (0.77, 3.47), *p*=0.201	1.68 (0.75, 3.74), *p*=0.206
Hospitalizations	207	9.0	7.9	8.8	8.8	1.21 (0.46, 3.20), *p*=0.700	1.08 (0.35, 3.27), *p*=0.899

CI: 95% Confidence Intervals

[a] Bi-variate logistic regression of outcome and study arm

[b] Multivariate logistic regression adjusting for all sociodemographic characteristics available

[c] Reference: Ontario 211 navigation intervention

Table 3. *Linear regression predicting the change in health-related quality of life, by block.*

Outcome	**N**	**HRQoL Score ARC Navigation**			**HRQoL Score Ontario 211**			**Unadjusted Difference (ARC-211)[a]**	**Adjusted Difference (ARC-211)[b]**
		Base	**Post**	**Diff**	**Base**	**Post**	**Diff**		
Physical HRQoL	220	35.30	37.41	1.45	38.39	37.70	0.19	1.26 (-1.41, 3.92), *p*=0.355	1.35 (-1.34, 4.03), *p*=0.326
Mental HRQoL	220	35.36	38.07	3.51	31.83	37.43	4.02	-0.51 (-3.82, 2.81), *p*=0.763	-0.40 (-3.75, 2.95), *p*=0.815

Base: Baseline

Diff: Difference; Mean of the difference between the post and pre scores

CI: 95% Confidence Intervals

[a] Bi-variate linear regression of outcome and study arm

[b] Multivariate linear regression adjusting for all sociodemographic characteristics available

Table 4. *Logistic regression predicting the odds of reporting a health service utilization, stratified by study arm.*

Outcome	**N**	**Baseline Risk (%)**		**Post Risk (%)**		**Bi-variate Analysis[a, c]**	**Multivariate Analysis[b, c]**
		Franco	Non-Franco	Franco	Non-Franco	**Odds Ratio (CI)**	**Adjusted Odds Ratio (CI)**
ED Visits							
ARC	109	25.0	22.3	22.9	16.0	1.55 (0.57, 4.20), *p*=0.388	1.86 (0.59, 5.85), *p*=0.288
Ontario 211	102	16.3	26.4	6.5	15.3	0.38 (0.08, 1.81), *p*=0.222	0.38 (0.07, 1.92), *p*=0.239
Hospitalizations							
ARC	106	11.4	8.1	11.8	7.6	1.62 (0.42, 6.18), *p*=0.481	1.15 (0.24, 5.58), *p*=0.862
Ontario 211	101	2.3	10.1	3.2	11.3	0.30 (0.04, 2.55), *p*=0.270	0.35 (0.02, 6.19), *p*=0.473

Franco: Francophone
CI: 95% Confidence Intervals
[a] Bi-variate logistic regression of outcome and Francophone status, by study arm
[b] Multivariate logistic regression adjusting for all sociodemographic characteristics available, by study arm
[c] Reference: Non-Francophone
See Appendix O for full results of the ED visits analysis; Appendix P for full results of the hospitalizations analysis

Table 5. *Linear regression predicting the change in health-related quality of life, stratified by study arm.*

Outcome	**N**	**HRQoL Score Francophone**			**HRQoL Score Non-Francophone**			**Francophone Status Unadjusted Difference[a, c]**	**Francophone Status Adjusted Difference[b, c]**
		Base	**Post**	**Diff**	**Base**	**Post**	**Diff**		
Physical HRQoL									
ARC	117	33.33	33.21	-0.75	36.08	39.18	2.39	-3.23 (-7.47, 1.01), *p*=0.135	-3.35 (-7.67, 0.97), *p*=0.129
Ontario 211	103	36.18	36.21	0.51	39.11	38.35	0.05	0.47 (-3.70, 4.63), *p*=0.826	0.41 (-3.79, 4.61), *p*=0.848
Mental HRQoL									
ARC	117	38.04	40.19	2.71	34.31	37.18	3.85	-1.17 (-6.36, 4.02), *p*=0.658	-1.15 (-6.36, 4.05), *p*=0.664
Ontario 211	103	32.30	41.99	6.95	31.65	35.47	2.76	4.30 (-0.99, 9.59), *p*=0.111	4.18 (-1.22, 9.58), *p*=0.129

Base: Baseline
Diff: Difference; Mean of the difference between the post and pre scores
CI: 95% Confidence Intervals
[a] Bi-variate linear regression of outcome and Francophone status, by study arm
[b] Multivariate linear regression adjusting for all sociodemographic characteristics available, by study arm
[c] Reference: Non-Francophone
See Appendix Q for full results of the physical HRQoL analysis; Appendix R for full results of the mental HRQoL analysis

9. Discussion

9.1 Main Outcomes

There was no advantage in any of the outcomes for individuals randomized to the ARC arm. Rather, we observed a trend towards higher self-reported ED visits for individuals assigned to the ARC arm although this did not reach statistical significance. Differences in the physical and mental HRQoL measures before and after the intervention were neither statistically nor clinically significant.

Interestingly, the trends in health service utilization contradicted our hypothesis, suggesting that participants assigned to the ARC navigation arm had higher odds of visiting an ED. This could be explained by the possibly improved patient self-efficacy and motivation that the ARC navigator promoted during their encounters. Consequently, this could have caused an increase in ED visits before seeing a decrease. Considering the data were collected on average four months after enrollment, this may not have been enough time for the effects of the intervention to be captured in the data. Another study, also derived from the ARC primary study, supports this argument of a latent effect. Mahbub *et al.* (2024) linked participants' OHIP number to the Institute for Clinical Evaluative Sciences (ICES) data to examine health service utilizations (i.e., outpatient and primary care visits, ED visits and hospitalizations) from two years before and after enrollment. Although not significant, results suggest that the ARC intervention may have reduced health service utilization progressively over two years after enrollment, with trends of more outpatient and primary care visits along with increased odds of ED visits and hospitalizations by those assigned to the Ontario 211. Aside from latency potentially explaining these results, it is possible that the ARC intervention caused practice-level change in which PCP were more sensitized to community resources and to social prescribing. In Sudbury, the practices introduced a professional

navigator after the ARC study ended. Such practice-level change could be responsible for the long-term reductions in hospital service utilization seen in Mahbub *et al.* (2024).

It is difficult to contextualize our study within the social prescribing literature because of methodological differences. Napierala *et al.* (2022) report reductions in PCP visits and ED visits in a systematic review, but these results stemmed largely from uncontrolled trials. In their systematic review, Cooper *et al.* (2022) highlight the abundance of pre-post design in the social prescribing literature. Specific to quality of life outcomes, they found three studies with significant improvement to quality of life, only one of which used a difference-in-difference approach with usual care as a control (Afuwape *et al.*, 2010). The literature on hospital service utilization also used a difference-in-difference approach with usual care as a control (Heisler *et al.*, 2022; Kangovi *et al.*, 2017; Kangovi *et al.*, 2018). However, our study used an active intervention as a control group (i.e., Ontario 211), which may have influenced our interpretation of the results. At first glance, the non-significant effects for study arm across all outcomes suggests that the ARC intervention was not superior to the Ontario 211 intervention. Upon further interpretation, a non-significant between-group difference can mean that participants may have benefited from both interventions equally. This is true for our HRQoL findings. We observed an increase in physical and mental HRQoL for both study arms, suggesting that the participants benefited from both the ARC and Ontario 211 interventions relatively equally. This differs from what Kiely *et al.* (2022) found in their systematic review. They identified four studies with HRQoL as an outcome, two of which were RCTs, and concluded that social prescribing may have little to no impact on HRQoL with low certainty of evidence. However, both RCTs (Kangovi *et al.*, 2017; Kangovi *et al.*, 2018) did not use a social prescribing program model because the primary care provider was not the one referring patients to the link worker. The other two studies (Dickens *et al.*, 2011; Mercer *et al.*,

2019) were quasi-experimental trials, which calls into question if their findings were truly due to social prescribing.

9.2 Stratified Analyses

Although the results did not reach statistical significance, Francophones randomized to the ARC navigation intervention had apparent higher odds of having ED visits than non-Francophones, while those randomized to the Ontario 211 intervention had apparent lower odds. Comparatively, the odds of Francophones having an ED visit were 5.20 times higher in the ARC navigation intervention than the Ontario 211 intervention (data shown in Appendix S). Similarly, Francophones assigned to the ARC navigation intervention had relatively similar odds of being hospitalized as non-Francophones, whereas Francophones assigned to the Ontario 211 intervention had apparent lower odds of being hospitalized, although this was not statistically significant. When comparing both arms, Francophones had apparent 2.41 higher odds of being hospitalized in the ARC intervention than the Ontario 211 intervention (data shown in Appendix T).

Along with not achieving statistical significance, the results for physical and mental HRQoL were clinically insignificant. Francophones assigned to the ARC navigation intervention had an apparent smaller improvement in physical HRQoL than non-Francophones, while those assigned to the Ontario 211 intervention had similar improvement with their non-Francophone counterparts. The comparative difference between study arms also suggest that Francophones had relatively similar improvements from both interventions (data shown in Appendix U). The same was observed in the results for mental HRQoL. Francophones assigned to the ARC navigation intervention had an apparent smaller improvement than non-Francophones, whereas those assigned to the Ontario 211 intervention had an apparent bigger improvement than non-Francophones. Comparatively, Francophones assigned to the ARC navigation intervention had an

apparent smaller improvement than those in the Ontario 211 intervention (data shown in Appendix V).

At first glance, Francophones seem to benefit more from the Ontario 211 intervention whereas non-Francophones seemed to benefit more from the ARC navigation intervention, although this is not the case. For the health service utilization outcomes, the study arms were not balanced at baseline, likely due to attrition. In the ARC arm, Francophones had a higher risk of visiting an ED or being hospitalized at baseline whereas they had a lower risk in the Ontario 211 arm compared to non-Francophones. In other words, Francophones in the ARC arm were sicker and those in the Ontario 211 arm were healthier. Since sick people tend to use health services more often than healthy people, this could explain why the Francophones assigned to the ARC navigation intervention had apparent higher odds of utilizing health services.

For the HRQoL outcomes, the mean of the pre-post difference tell an interesting story. For physical HRQoL, these were all near zero. This could be explained by the short interval of four months on average between the baseline and post-intervention questionnaire, preventing the impact from being observed. Meanwhile, for mental HRQoL, the means were positive for Francophones and non-Francophones alike, regardless of study arm. Therefore, it seems more likely that Francophones and non-Francophones benefited relatively similarly from both interventions for both physical and mental HRQoL, especially when considering that the Ontario 211 intervention was an active intervention instead of usual care. This is consistent with the findings made by Dahrouge *et al.*, 2025, where, in terms of accessing a community resource, Francophones[4] benefitted equally from both the ARC navigation intervention and the Ontario 211 intervention as did Anglophones. To our knowledge, no other social prescribing study has

[4] Dahrouge *et al.* [2025] defined Francophone by language spoken at home.

examined the effect such an intervention has on the health service utilization rates or the HRQoL of an official language minority like Francophones living outside Québec.

9.3 Other Findings

9.3.1 Prior Health Service Utilization

Our findings that prior health service utilization was statistically associated with the likelihood of future health service utilization validates our analytical decision to adjust for baseline events in our regression models.

9.3.2 Education

Level of education was significantly associated with lower odds of ED visits in favour of participants who completed a university degree or greater. The same trend was observed for hospitalizations, although not significant. Hajizadeh *et al.* (2016), Bushnik *et al.* (2020), Shahidi *et al.* (2020), and Tjepkema & Wilkins (2011) all discuss the social advantage that people with higher education have in terms of their health. Therefore, participants with a higher level of education enrolled in this study could have had less clinical needs than participants with a lower level of education, causing them not to use health services. This aligns with the findings by Mitchell *et al.* (2012) that American adults with low health literacy ($\leq 6^{th}$ grade level) are more likely than those with adequate health literacy ($\geq 9^{th}$ grade level) to return to the hospital or emergency department within 30 days of their discharge

9.3.3 Gender

Interestingly, females improved their physical HRQoL significantly more than other gender identities, yet their mental HRQoL had an apparent similar improvement. To our knowledge, no social prescribing study has examined the impact of gender on quality of life. Further research in this area could help clarify why we found that females improved their physical

HRQoL significantly more than other gender identities over time, yet there was no difference in change in mental HRQoL

9.4 Strengths & Limitations

This is the first social prescribing study known to us that compares two lay navigation models and to examine the impact of a social prescribing program on Francophones living in a minority situation. Social prescribing is relatively new to Canada, so we provide important data to help understand its impact on system-oriented and patient-oriented outcomes. Also, the data was obtained from a randomized controlled trial, which increased the robustness of the study.

This study should be interpreted in light of certain limitations. First, the design chosen for this study influenced the analyses by having previously established variables. The modifications to the VR-12 questionnaire may have influenced the results because participants could have interpreted the wording differently than what the questionnaire had been validated for. The design also prevents us from making changes to the recruitment and improve the sample size to account for missing data and unbalanced groups at baseline, and to increase the power needed to perform the intended analysis.

Second, the intervention lasted three months with a single post-intervention questionnaire administered at an average of four months after enrollment. This may not have been enough time to capture the effect of the ARC intervention on the outcomes nor the observe if it was sustained over time. There were also 89 people who were lost to follow-up. It is possible that they were in need of the most help. Had they completed the study, their data could have yielded different results. Moreover, some of the completed post-intervention questionnaires were administered after the state of emergency of the COVID-19 pandemic was declared on March 11, 2020. The order to stay indoors may have deterred participants from utilizing health services as well as impacted the way

participants perceived their health-related quality of life, particularly their mental HRQoL from the stress associated with the pandemic of a novel virus.

Third, the health service utilization data were self-reported, meaning there is the possibility of recall bias. Moreover, the health service utilization questions ask the participants how many ED visits and hospitalizations they had in the past three months. However, the ARC intervention lasted three months and the post-intervention questionnaire was administered on average four months after enrollment, creating an overlap in the timeline. This means that the participant who reported accessing a community resource and having a health service utilization in the post-intervention questionnaire could have accessed a health service before accessing a community resource, in which case the impact of access to a community resource on health service utilization would not be captured. The quality of life questions were not of concern because they referred to the past four weeks, avoiding an overlap in the timeline.

Finally, the linguistic variable is a subject of controversy, since there is no consensus in the literature on exactly how to define a Francophone (Regroupement des Entités de planification des services de santé en français de l'Ontario, 2013). Our definition of a Francophone was inspired by the Inclusive Definition of Francophone as per the Entités de planifications's recommendation. However, a different definition (e.g., first official language spoken) could have yielded different results.

9.5 Future considerations

This study added valuable information to the social prescribing literature yet there remain several gaps that warrant further investigation. Due to the growing interest in social prescribing programs in Canada, future research should aim to expand the literature by investigating these outcomes over multiple follow-up periods. Other measures of health services utilization (e.g.,

return PCP visits, outpatient visits, etc.) matched with the reason for utilization (e.g., urgent versus non-urgent ED visits) can help distinguish the healthcare sectors that are more frequently used and if they are being used appropriately. This could be done using a zero-inflated Poisson or negative binomial regression model to account for the excess zeros present in health service utilization data. A cost-effectiveness analysis of health service utilization can also help inform budgetary and policymaking decisions.

Additionally, future social prescribing studies in Canada should include the linguistic variable alongside other SDoH. This would not only improve the representation of language minorities in the literature, but it would explore the effectiveness of social prescribing programs in improving equity for these groups.

On another note, considering that an estimated 17% of Canadian adults do not have access to a regular health care provider (Canadian Institute for Health Information [CIHI], 2024b) and the most recent data shows that there are around 2.5 million Ontarians now living without a family physician (Ontario College of Family Physicians, 2024), it could be worthwhile to expand the ARC social prescribing program beyond the primary care sector and into the emergency department, where 1 in 7 visits were for health conditions that could have been managed by a primary care provider (CIHI, 2024b). These directions can help inform a more equitable and preventative model of care within the Canadian healthcare system.

10. Conclusion

This study aimed to compare the impact of two patient navigation models in the context of a social prescribing program on health service utilization and health-related quality of life. Despite not demonstrating statistically significant associations between navigation models or official language groups for either outcome, the results provide insight into the emerging field of social

prescribing in Canada. In today's political and economic landscape, with a healthcare system focused on addressing social determinants of health, there remains an ongoing need for innovative evaluations of preventative interventions. While effects may not always be observed immediately, as in these findings, with continued research, social prescribing programs show potential for leading the way to equitable care.

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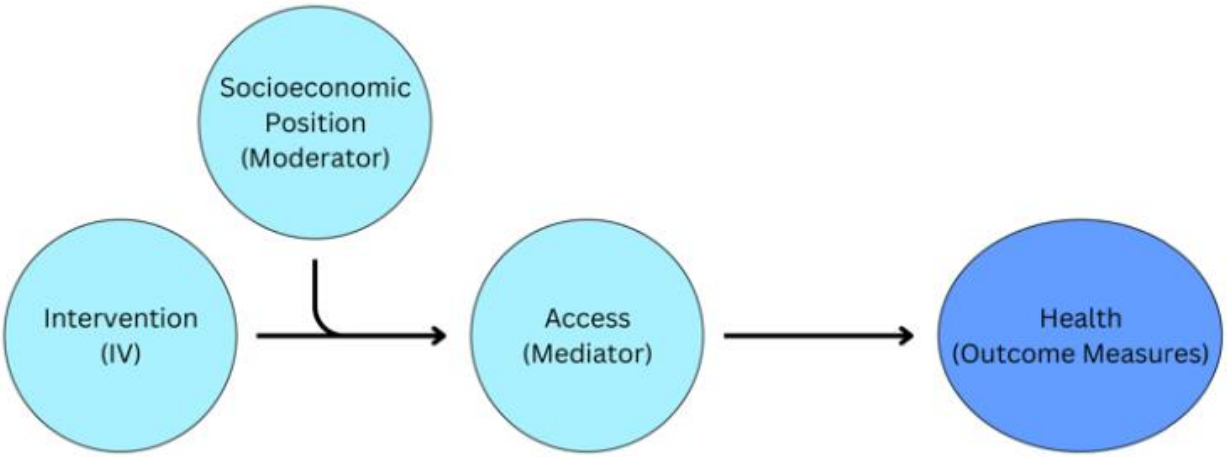
Appendices

Appendix A. *A Schema of the Relationships Between the Health System, Access, and Health*



Appendix B. *Patient Socio-Demographic Information*

Pati_A00_Sex
The first question asks if you are a Male, Female, or you do not identify?

- ❍ Male
- ❍ Female
- ❍ I do not identify
- ❍ Other, please specify _____
- ❍ Refusal

Pati_H01 - Could you tell me in what year you were born? _____

Pati_I02 - What racial or cultural groups do you belong to? (Check all that apply. Don't read but you may prompt)

☐ White (Caucasian/European) ☐ Aboriginal First Nation Status ☐ Aboriginal First Nation Non-Status
☐ Aboriginal Metis ☐ Aboriginal Inuit ☐ South Asian (East Indian, Pakistani, Sri Lankan)
☐ Chinese ☐ Black ☐ Filipino
☐ Latin American ☐ Arab ☐ Southeast Asian (Vietnamese, Cambodian, Malaysian, Laotian)
☐ West Asian (Iranian, Afghan) ☐ Korean ☐ Japanese
☐ Other group – Please specify: _____
☐ Don't know ☐ Refusal

Pati_H04 - What is the highest level of education you have completed? *Don't read/Select the highest level.*

☐ Completed a graduate or professional degree (Master, MD, DMD, DVM, OD, PhD)
☐ Completed a bachelor's degree (e.g. B.A., B.Sc., B.S.N.)
☐ Had some university education or completed a community college, technical college, or postsecondary program (e.g. trade, technical or vocational school, CEGEP)
☐ Secondary school or high school completed
☐ Secondary school or high school not completed
☐ Don't know
☐ Refusal

Pati_I10 - What phrase best describes your financial situation?

☐ Poor ☐ Very tight ☐ Tight ☐ Modestly comfortable
☐ Comfortable ☐ Very Comfortable ☐ Don't know ☐ Refusal

Pati_H02_02 - What is your mother tongue? *Check one*

☐English ☐French ☐Another language, please specify: _____ ☐ Refusal

Pati_H02_03 - If your mother tongue is not French or English, which of Canada's official languages are you most comfortable?

☐ English ☐ French ☐ Refusal

Appendix C. *Section B: Needs/Difficulties/Use of healthcare*

Health Service Utilization

B_Text2 - These next questions are about health services you have used or needed in the last 3 months, that is since *[month, year]*

Pati_B02 - In the past 3 months, how many visits have you had to an emergency department?

Pati_B03 - In the past 3 months, what is the total number of days counting overnight stays (if any), that you have spent in a hospital? _____days

Appendix D. *Quality of Life VR-12 Questionnaire*

The following questions ask for your views about your health—how you feel and how well you are able to do your usual activities. There are no right or wrong answers; please choose the answer that best fits your life right now.

Pati_F01 - In general, would you say your health is:

☐ Poor ☐ Fair ☐ Good ☐ Very good ☐ Excellent ☐ Refusal

Pati_F02 - The following questions are about activities you might do during a typical day. Does your health now limit you in these activities? If so, how much?

a. Moderate activities, such as moving a table, pushing a vacuum cleaner, bowling or playing golf?

☐ No, not limited at all ☐ Yes, limited a little ☐ Yes, limited a lot
☐ Don't know ☐ Refusal

b. Climbing several flights of stairs?

☐ No, not limited at all ☐ Yes, limited a little ☐ Yes, limited a lot
☐ Don't know ☐ Refusal

The following questions are about how you feel and how things have been with you during the past four (4) weeks.

Pati_F03 - During the past four (4) weeks,

☐ None of the time ☐ A little of the time ☐ Some of the time
☐ Most of the time ☐All of the time ☐ Don't know ☐ Refusal

- Pati_F03_01 Have you accomplished less than you would like with your work or other regular daily activities as a result of your physical health?
- Pati_F03_02 Were you limited in the kind of work or other activities?
- Pati_F03_03 Have you accomplished less than you would like with your work or other regular daily activities as a result of any emotional difficulties(such as feeling depressed or anxious)?
- Pati_F03_04 Have you not done work or other activities as carefully as usual as a result of any emotional difficulties (such as feeling depressed or anxious)?

Pati_F04 - During the past four (4) weeks, how much did pain interfere with your normal work (including both work outside the home and housework)?

☐ Not at all ☐ A little bit ☐ Moderately ☐ Quite a bit ☐ Extremely ☐ Don't know ☐ Refusal

Pati_F05 - For each of the following questions, please give the one answer that comes closest to the way you have been feeling.

☐ None of the time ☐ A little of the time ☐ Some of the time ☐ A good bit of the time
☐ Most of the time ☐ All of the time ☐ Refusal

How much of the time during the past four (4) weeks:

a. Pati_F05_01 Have you felt calm and peaceful?

b. Pati_F05_02 Did you have a lot of energy?
c. Pati_F05_03 Have you felt downhearted and blue?

Pati_F06 - During the past four (4) weeks, has your physical health or emotional difficulties interfered with your social activities (like visiting with friends, relatives, etc.)?

☐ None of the time ☐ A little of the time ☐ Some of the time ☐ A good bit of the time
☐ Most of the time ☐ All of the time ☐ Refusal

Now, we'd like to ask you some questions about how your health may have changed.
Compared to three months ago,

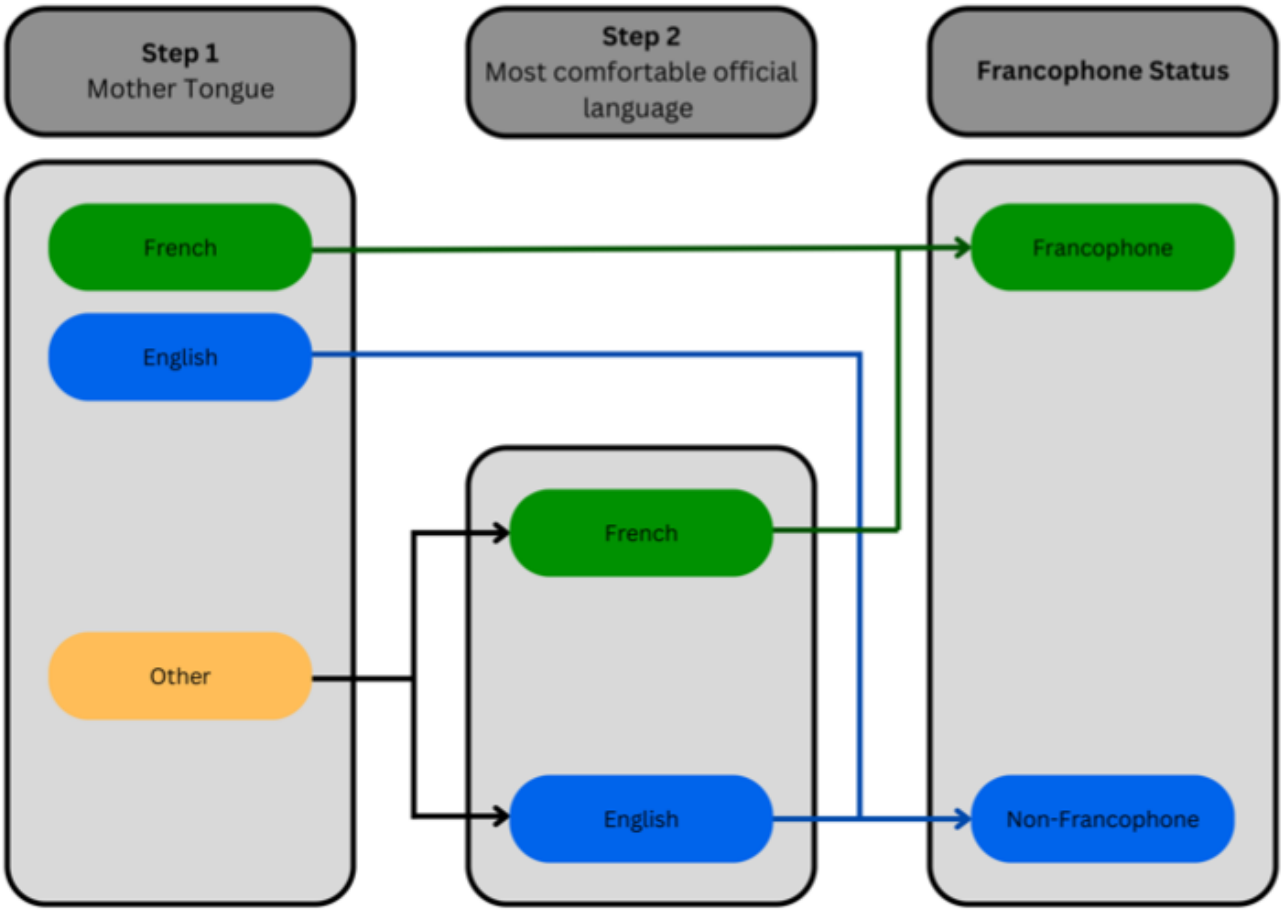
Pati_F07_01 - How would you rate your physical health in general now?

☐ Much worse ☐ Slightly worse ☐ About the same ☐ Slightly better ☐ Much better ☐ Refusal

Pati_F07_02 - How would you rate your emotional difficulties (such as feeling anxious, depressed or irritable) now?

☐ Much worse ☐ Slightly worse ☐ About the same ☐ Slightly better ☐ Much better ☐ Refusal

Appendix E. *Flowchart inspired by the Inclusive Definition of Francophone as recommended by the "Regroupement des Entités de planification des services de santé en français de l'Ontario"*



Appendix F. *Ethics Approval from the Laurentian University Research Ethics Board*

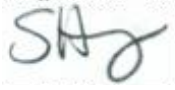
APPROVAL FOR CONDUCTING RESEARCH INVOLVING HUMAN SUBJECTS
Research Ethics Board – Laurentian University

This letter confirms that the research project identified below has successfully passed the ethics review by the Laurentian University Research Ethics Board (REB). Your ethics approval date, other milestone dates, and any special conditions for your project are indicated below.

TYPE OF APPROVAL / New x /	Modifications to project / Time extension
Name of Principal Investigator and school/department	Joël Pitre (Graduate student, Rural and Northern Health), Dr. Simone Dahrouge (Co-Investigator), Dr. Timony (Co-Investigator), Diana Urajnik (Co-Investigator), Dr. Alain Gauthier (Supervisor)
Title of Project	Examining the impact of two patient navigation models on self-reported health service utilization and quality of life among adults in two Ontario cities.
REB file number	6021536
Date of original approval of project	February 16, 2024
Date of approval of project modifications or extension *(if applicable)*	
Final/Interim report due on: *(You may request an extension)*	February 16, 2025
Conditions placed on project	

During the course of your research, no deviations from, or changes to, the protocol, recruitment or consent forms may be initiated without prior written approval from the REB. If you wish to modify your research project, please refer to the Research Ethics website to complete the appropriate REB form.

All projects must submit a report to REB at least once per year. If involvement with human participants continues for longer than one year (e.g. you have not completed the objectives of the study and have not yet terminated contact with the participants, except for feedback of final results to participants), you must request an extension using the appropriate LU REB form. In all cases, please ensure that your research complies with Tri-Council Policy Statement (TCPS). Also please quote your REB file number on all future correspondence with the REB office.
Congratulations and best wishes in conducting your research.



Sandra Hoy, PHD, Chair, *Laurentian University Research Ethics Board*

Appendix G. *Assumptions of the Regression Models*

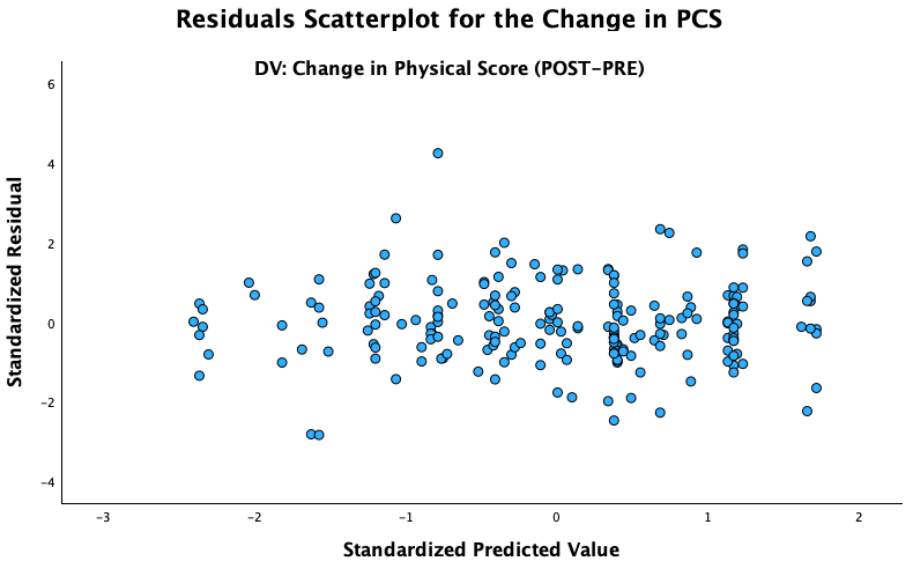
Assumptions of a logistic regression include a sufficient predictor to observations ratio[5], linearity in the logit, absence of multicollinearity, lack of outliers among the predicted values, and independence of observations (Tabachnick & Fidell, 2007). Since there were only discrete predictors included in the health service utilization analyses, the assumption of the linearity in the logit was not applicable. The remaining assumptions were respected. Eight independent variables were included in the models for a sample of 237 participants, thus respecting the assumption of the predictor to observation ratio. There were no inflated standard errors for parameter estimates, suggesting the absence of multicollinearity. An analysis of residuals revealed that there were no outliers in the predicted values. The assumption of independence of observations was respected because the baseline risk was accounted for in the regression model.

Assumptions of a linear regression include a sufficient predictor to observations ratio, multicollinearity, outliers among the variables and the predicted values, the normality, linearity and homoscedasticity of residuals, and independence of errors (Tabachnick & Fidell, 2007). All of these assumptions were respected. Eight predictors were included in the models for a sample size of 237 participants, making the ratio approximately 1:30, thus respecting the assumption of the predictor to observations ratio. There were no inflated standard errors for regression coefficients, suggesting the absence of multicollinearity. No multivariate outliers ($p>0.001$) were found using the Mahalanobis distance, suggesting an absence of outliers among the variables. There were no outliers among the predicted values as observed in the residual analysis of the scatterplot. A list of standardized residuals for individual cases showed that predicted values were between -2.65 and 2.04 as well as between -3.26 and

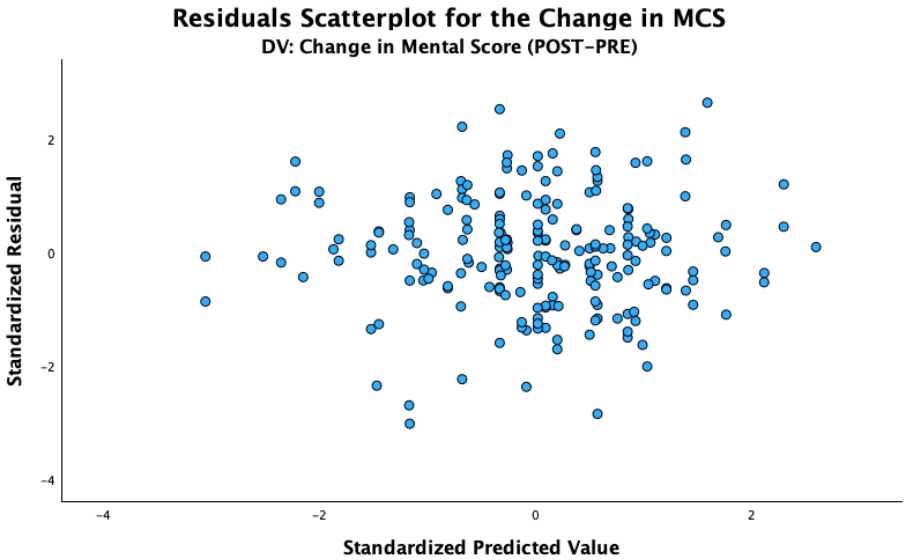
[5] For a multiple regression, Tabachnick & Fidell (2007) recommend the use of the formula: $N \geq 50 + 8m$, where N represents the sample size and m represents the number of predictors in the regression model.

2.62, for the physical and mental quality of life outcomes, respectively. Normality, linearity and homoscedasticity in the residuals was also observed in the scatterplots for the physical quality of life and mental quality of life outcomes (see below). The assumption of independence of errors was respected because baseline outcome measures were subtracted from the post-intervention outcome measures (i.e., Post - Pre).

Residuals Scatterplot of the Change in the Physical HRQoL



Residuals Scatterplot of the Change in Mental HRQoL



Appendix H. *Description of the Regression Model Performances*

For the ED visits outcome, the first block explained between 0.8% (Cox & Snell R^2) and 1.3% (Nagelkerke R^2) of the variance in ED visits and correctly classified 83.9% of cases. It was not statistically significant [$X^2(1, N=211)=1.67$, $p=0.196$], indicating that it was not capable of distinguishing between participants who reported having and not having visited an ED. The addition of the second block was statistically significant [$X^2(1, N=211)=10.10$, $p=0.001$], but the addition of the third block was not [$X^2(7, N=211)=8.88$, $p=0.261$]. The full model explained between 9.3% (Cox & Snell R^2) and 15.9% (Nagelkerke R^2) of the variance in ED visits and correctly classified 84.4% of cases. It was statistically significant [$X^2(9, N=211)=20.66$, $p=0.014$], indicating that it was capable of distinguishing between participants who reported having and not having visited an ED.

For the hospitalizations outcome, the first block explained between 0.1% (Cox & Snell R^2) and 0.2% (Nagelkerke R^2) of the variance in hospitalizations and correctly classified 91.3% of cases. It was not statistically significant [$X^2(1, N=207)=0.15$, $p=0.699$], indicating that it was not capable of distinguishing between participants who reported having and not having been hospitalized. The addition of the second block was statistically significant [$X^2(1, N=207)=21.44$, $p<0.001$], but the addition of the third block was not [$X^2(7, N=207)=1.18$, $p=0.991$]. The full model explained between 10.4% (Cox & Snell R^2) and 23.3% (Nagelkerke R^2) of the variance in hospitalizations and correctly classified 92.8% of cases. It was statistically significant [$X^2(9, N=207)=22.76$, $p=0.007$], indicating that it was capable of distinguishing between participants who reported having and not having been hospitalized.

For the physical HRQoL outcome, the first block explained 0.4% of the variance in the change in physical HRQoL score. The second block increased the total variance in the change in physical HRQoL score by 3.1%, although this change was not significant [F change$(7, 207) = 0.97$, $p=0.458$]. The full

model was not significant, [$F(8, 207)=0.95$, $p=0.476$], suggesting a poor ability to predict the change in physical HRQoL score.

After conducting the sensitivity analysis, the first block still explained 0.4% of the variance in the change in physical HRQoL score and the second block increased the total variance in the change in physical HRQoL score by 3.2%, yet this change was not significant [F change$(7, 207)=0.97$, $p=0.457$]. The full model was not significant [$F(8, 207)=0.95$, $p=0.475$], indicating that this regression model did not have a better predicting ability for change in physical HRQoL.

For the mental HRQoL outcome, the first block did not explain any variance (0.0%) in the change in mental HRQoL score. The second block increased the total variance in the change in mental HRQoL score by 2.5%, although this change was not significant (F change$(7, 207) = 0.75$, $p=0.629$). The full model was not significant, [$F(8, 207)=0.67$, $p=0.719$], suggesting a poor ability to predict the change in mental HRQoL score.

After conducting the sensitivity analysis, the first block still explained 0.00% of the variance in the change in mental HRQoL score and the second block increased the total variance in the change in mental HRQoL score by 2.8%, although this change was still not significant [F change$(7, 207)=0.83$, $p=0.563$]. The full model was not significant [$F(8, 207)=0.74$, $p=0.657$], indicating that this regression model did not have a better predicting ability for change in mental HRQoL.

Appendix I. *Table Presenting the Odds of Reporting an ED Visit, by Block*

		B	S.E.	*p*	Odds Ratio	95% CI
Block 1	Study Arm[1]	0.49	0.38	0.201	1.63	0.77 – 3.47
	Constant	-1.92	0.30	< 0.001	0.15	0.08 – 0.26
Block 2	Study Arm[1]	0.54	0.40	0.168	1.72	0.79 – 3.74
	Baseline Events[2]	1.27	0.39	0.001	3.57	1.65 – 7.74
	Constant	-2.37	0.352	<0.001	0.09	0.05 – 0.19
Block 3	Study Arm[1]	0.52	0.41	0.206	1.68	0.75 – 3.74
	Baseline Events[2]	1.16	0.42	0.005	3.18	1.41 – 7.20
	Age (35-64)[3]	-0.38	0.54	0.477	0.68	0.24 – 1.95
	Age (65+)[3]	0.29	0.59	0.622	1.34	0.42 – 4.23
	Gender[4]	-0.35	0.43	0.412	0.70	0.31 – 1.63
	Race/Ethnicity[5]	0.12	0.51	0.813	1.13	0.41 – 3.10
	Education[6]	-1.08	0.53	0.041	0.34	0.12 – 0.96
	Financial Situation[7]	-0.61	0.46	0.183	0.54	0.22 – 1.34
	Francophone Status[8]	-0.02	0.44	0.963	0.98	0.42 – 2.31

Constant	-1.52	0.74	0.040	0.22	0.05 – 0.93

Reference group:

1. *Ontario 211 navigation services*
2. *No baseline events*
3. *Aged 34 years and younger*
4. *Other (Males and Did not identify*
5. *Non-Caucasian*
6. *No completed university degree*
7. *Tight*
8. *Non-Francophone*

Appendix J. *Table Presenting the Odds of Reporting a Hospitalization, by Block*

		B	S.E.	*p*	Odds Ratio	95% CI
Block 1	Study Arm[1]	0.19	0.50	0.700	1.21	0.46 – 3.20
	Constant	-2.45	0.37	< 0.001	0.09	0.04 – 0.18
Block 2	Study Arm[1]	0.09	.54	0.867	1.10	0.38 – 3.18
	Baseline Events[2]	2.69	0.56	<0.001	12.67	4.91 – 43.85
	Constant	-3.03	0.45	<0.001	0.05	0.02 – 0.12
Block 3	Study Arm[1]	0.07	0.57	0.899	1.08	0.35 – 3.27
	Baseline Events[2]	2.67	0.62	<0.001	14.45	4.30 – 48.55
	Age (35-64)[3]	-0.07	0.76	0.925	0.93	0.21 – 4.12
	Age (65+)[3]	-0.15	0.86	0.864	0.86	0.16 – 4.64
	Gender[4]	-0.18	0.57	0.748	0.83	0.27 – 2.56
	Race/Ethnicity[5]	-0.37	0.64	0.561	0.69	0.20 – 2.41
	Education[6]	-0.29	0.66	0.658	0.75	0.21 – 2.72
	Financial Situation[7]	0.48	0.62	0.440	1.62	0.48 – 5.50
	Francophone Status[8]	-0.16	0.61	0.793	0.85	0.26 – 2.83

Constant	-2.65	0.95	0.005	0.07	0.01 – 0.45

Reference group:

1. *Ontario 211 navigation services*
2. *No baseline events*
3. *Aged 34 years and younger*
4. *Other (Males and Did not identify*
5. *Non-Caucasian*
6. *No completed university degree*
7. *Tight*
8. *Non-Francophone*

Appendix K. *Table Presenting the Change in Physical Health-Related Quality of Life, by Block*

		Difference in Difference	95% CI	S.E.	t	*p*
Block 1	Study Arm[1]	1.26	-1.41 – 3.92	1.35	0.93	0.355
	Constant	0.24	-1.63 – 2.11	0.95	0.25	0.802
Block 2	Study Arm[1]	1.35	-1.34 – 4.03	1.37	0.98	0.326
	Age (35-64)[2]	1.27	-2.11 – 4.64	1.72	0.74	0.462
	Age (65+)[2]	2.12	-2.11 – 6.35	2.16	0.98	0.325
	Gender[3]	3.24	0.35 – 6.13	1.47	2.20	0.028
	Race/Ethnicity[4]	-0.20	-3.45 – 3.08	1.65	-0.11	0.910
	Education[5]	-0.34	-3.43 – 2.75	1.58	-0.22	0.829
	Financial Situation[6]	0.14	-2.80 – 3.08	1.50	0.09	0.927
	Francophone Status[7]	-1.53	-4.53 – 1.46	1.53	-1.00	0.316
	Constant	-2.52	-7.03 – 1.98	2.30	-1.20	0.273

Reference group:

1. *Ontario 211 navigation services*
2. *Aged 34 years and younger*
3. *Other (Males and Did not identify*
4. *Non-Caucasian*
5. *No completed university degree*
6. *Tight*
7. *Non-Francophone*

Appendix L. *Table Presenting the Results from the Sensitivity Analysis of the Change in Physical HRQoL Score*

		B	S.E.	t	*p*	95% CI
Block 1	Study Arm[1]	1.25	1.36	0.92	0.357	-1.41 – 3.91
	Constant	0.25	0.95	0.26	0.797	-1.62 – 2.12
Block 2	Study Arm[1]	1.34	1.37	0.98	0.327	-1.34 – 4.02
	Age (35-64)[2]	1.27	1.72	0.74	0.462	-2.11 – 4.64
	Age (65+)[2]	2.10	2.16	0.97	0.331	-2.13 – 6.32
	Gender[3]	3.25	1.47	2.21	0.027	0.36 – 6.13
	Race/Ethnicity[4]	-0.20	1.66	-0.12	0.907	-3.46 – 3.07
	Education[5]	-0.35	1.57	-0.22	0.824	-3.44 – 2.73
	Financial Situation[6]	0.14	1.50	0.10	0.925	-2.80 – 3.08
	Francophone Status[7]	-1.53	1.53	-1.00	0.315	-4.52 – 1.46
	Constant	-2.51	2.30	-1.10	0.274	-7.02 – 1.99

Reference group:

1. *Ontario 211 navigation services*
2. *Aged 34 years and younger*
3. *Other (Males and Did not identify*
4. *Non-Caucasian*
5. *No completed university degree*
6. *Tight*
7. *Non-Francophone*

Appendix M. *Table Presenting the Change in Mental Health-Related Quality of Life, by Block*

		Difference in Difference	95% CI	S.E.	t	*p*
Block 1	Study Arm[1]	-0.51	-3.82 – 2.81	1.69	-0.30	0.763
	Constant	4.00	1.62 – 6.31	1.18	3.40	< 0.001
Block 2	Study Arm[1]	-0.40	-3.75 – 2.95	1.71	-0.23	0.815
	Age (34-65)[2]	-2.06	-6.28 – 2.17	2.15	-0.95	0.340
	Age (65+)[2]	-4.81	-10.10 – 0.47	2.70	-1.79	0.074
	Gender[3]	-0.97	-4.58 – 2.64	1.84	-0.53	0.598
	Race/Ethnicity[4]	0.88	-3.39 – 5.15	2.18	0.41	0.685
	Education[5]	1.95	-1.91 – 5.80	1.97	0.99	0.323
	Financial Situation[6]	-1.29	-4.96 – 2.39	1.87	-0.69	0.492
	Francophone Status[7]	1.69	-2.05 – 5.43	1.91	0.89	0.375
	Constant	5.53	-0.14 – 11.20	2.89	1.91	0.056

Reference group

1. *Ontario 211 navigation services*
2. *Aged 34 years and younger*
3. *Other (Males and Did not identify*
4. *Non-Caucasian*
5. *No completed university degree*
6. *Tight*
7. *Non-Francophone*

Appendix N. *Table Presenting the Results from the Sensitivity Analysis of the Change in Mental HRQoL Score*

		B	S.E.	t	*p*	95% CI
Block 1	Study Arm[1]	-0.53	1.70	-0.31	0.757	-3.86 – 2.81
	Constant	4.16	1.20	3.48	< 0.001	1.81 – 6.50
Block 2	Study Arm[1]	-0.40	1.72	-0.23	0.817	-3.77 – 2.97
	Age (35-64)[2]	-2.10	2.17	-0.97	0.333	-6.34 – 2.15
	Age (65+)[2]	-5.24	2.71	-1.94	0.053	-10.55 – 0.07
	Gender[3]	-0.98	1.85	-0.53	0.597	-4.61 – 2.65
	Race/Ethnicity[4]	0.79	2.19	0.36	0.717	-3.51 – 5.09
	Education[5]	1.85	1.98	0.94	0.349	-2.03 – 5.73
	Financial Situation[6]	-1.19	1.88	-0.63	0.529	-4.88 – 2.51
	Francophone Status[7]	1.86	1.92	0.97	0.331	-1.89 – 5.62
	Constant	5.79	2.91	1.99	0.046	0.09 – 11.49

Reference group:

1. *Ontario 211 navigation services*
2. *Aged 34 years and younger*
3. *Other (Males and Did not identify*
4. *Non-Caucasian*
5. *No completed university degree*
6. *Tight*
7. *Non-Francophone*

Appendix O. *Table Presenting the Odds of Reporting an ED Visit, Stratified by Study Arm*

			B	S.E.	*p*	Odds Ratio	95% CI
Block 1	ARC Navigation	Francophone Status[1]	0.44	0.51	0.388	1.55	0.57 – 4.20
		Constant	-1.58	0.31	<0.001	0.21	0.11 – 0.38
	Ontario 211	Francophone Status[1]	-0.98	0.80	0.222	0.38	0.08 – 1.81
		Constant	-1.70	0.33	<0.001	0.18	0.10 – 0.35
Block 2	ARC Navigation	Francophone Status[1]	0.48	0.54	0.373	1.62	0.56 – 4.67
		Baseline Events[2]	1.69	0.52	0.001	5.42	1.94 – 15.16
		Constant	-2.15	0.40	<0.001	0.12	0.05 – 0.25
	Ontario 211	Francophone Status[1]	-0.89	0.81	0.269	0.41	0.08 – 1.20
		Baseline Events[2]	0.60	0.63	0.340	1.82	0.53 – 6.27
		Constant	-1.90	0.41	<0.001	0.15	0.07 – 0.33
Block 3	ARC Navigation	Francophone Status[1]	0.62	0.58	0.288	1.86	0.59 – 5.85
		Baseline Events[2]	1.66	0.59	0.005	5.24	1.65 – 16.61
		Age (35-64)[3]	-0.16	0.71	0.822	0.85	0.21 – 3.44
		Age (65+)[3]	0.52	0.77	0.498	1.69	0.37 – 7.70

	Gender[4]	-0.43	0.61	0.487	0.65	0.20 – 2.17
	Race/Ethnicity[5]	0.10	0.70	0.882	1.11	0.28 – 4.39
	Education[6]	-0.99	0.71	0.164	0.37	0.09 – 1.50
	Financial Situation[7]	-1.49	-0.67	0.027	0.23	0.06 – 0.85
	Constant	-1.25	0.95	0.187	0.29	0.05 – 1.83
	Francophone Status[1]	-0.98	0.83	0.239	0.38	0.07 – 1.92
	Baseline Events[2]	0.64	0.67	0.342	1.90	0.51 – 7.10
	Age (35-64)[3]	-0.38	0.89	0.671	0.69	0.12 – 3.92
	Age (65+)[3]	0.16	1.02	0.873	1.18	0.16 – 8.63
Ontario 211	Gender[4]	-0.44	0.66	0.508	0.65	0.18 – 2.36
	Race/Ethnicity[5]	0.02	0.81	0.985	1.02	0.21 – 5.00
	Education[6]	-1.15	0.84	0.170	0.32	0.06 – 1.63
	Financial Situation[7]	0.33	0.71	0.637	1.40	0.35 – 5.56
	Constant	-1.27	1.07	0.233	0.28	0.04 – 2.27

Reference group:

1. Non-Francophone
2. No baseline events
3. Aged 34 years and younger
4. Other (Males and Did not identify)
5. Non-Caucasian
6. No completed university degree
7. Poor to tight

Appendix P. *Table Presenting the Odds of Reporting a Hospitalization, Stratified by Study Arm*

			B	S.E.	*p*	Odds Ratio	95% CI
Block 1	ARC Navigation	Francophone Status[1]	0.48	0.68	0.481	1.62	0.42 – 6.18
		Constant	-2.43	0.43	<0.001	0.09	0.04 – 0.20
	Ontario 211	Francophone Status[1]	-1.20	1.09	0.270	0.30	0.04 – 2.55
		Constant	-2.20	0.40	<0.001	0.11	0.05 – 0.24
Block 2	ARC Navigation	Francophone Status[1]	0.33	0.72	0.650	1.39	0.34 – 5.69
		Baseline Events[2]	1.96	0.75	0.009	7.07	1.63 – 30.65
		Constant	-2.79	0.49	<0.001	0.06	0.02 – 0.16
	Ontario 211	Francophone Status[1]	-0.69	1.21	0.570	0.50	0.05 – 5.41
		Baseline Events[2]	3.51	0.90	<0.001	33.47	5.72 – 195.98
		Constant	-3.21	0.64	<0.001	0.04	0.01 – 0.14
Block 3	ARC Navigation	Francophone Status[1]	0.14	0.81	0.862	1.15	0.24 – 5.58
		Baseline Events[2]	2.04	0.92	0.027	7.72	1.27 – 47.13
		Age (35-64)[3]	2.24	1.41	0.112	9.43	0.59 – 150.29
		Age (65+)[3]	1.65	1.41	0.241	5.22	0.33 – 82.83

	Gender[4]	-0.52	0.80	0.513	0.59	0.12 – 2.85
	Race/Ethnicity[5]	-1.46	0.88	0.095	0.23	0.04 – 1.29
	Education[6]	-0.89	0.93	0.34	0.41	0.07 – 2.52
	Financial Situation[7]	-0.26	0.85	0.761	0.77	0.15 – 4.11
	Constant	-2.83	1.44	0.049	0.06	0.00 – 0.99
	Francophone Status[1]	-1.05	1.47	0.473	0.35	0.02 – 6.19
	Baseline Events[2]	-	-	-	-	-
	Age (35-64)[3]	-	-	-	-	-
	Age (65+)[3]	-2.02	1.56	0.196	0.13	0.01 – 2.82
Ontario 211	Gender[4]	2.24	1.67	0.180	9.41	0.36 – 249.11
	Race/Ethnicity[5]	1.36	1.51	0.365	3.91	0.20 – 74.73
	Education[6]	1.78	1.35	0.189	5.90	0.42 – 83.50
	Financial Situation[7]	1.05	2.44	0.468	2.85	0.17 – 47.87
	Constant	-5.74	2.57	0.026	0.00	0.00 – 0.51

Reference group:

1. Non-Francophone
2. No baseline events
3. Aged 34 years and younger
4. Other (Males and Did not identify)
5. Non-Caucasian
6. No completed university degree
7. Poor to tight

Appendix Q. *Table Presenting the Change in Physical Health-Related Quality of Life, Stratified by Study Arm*

			Difference	95% CI	S.E.	t	*p*
Block 1	ARC Navigation	Francophone Status[1]	-3.23	-7.47 – 1.01	2.16	-1.49	0.135
		Constant	2.33	0.12 – 4.54	1.13	2.06	0.039
	Ontario 211	Francophone Status[1]	0.47	-3.70 – 4.63	2.12	0.22	0.826
		Constant	0.06	-2.13 – 2.26	1.12	0.06	0.957
Block 2	ARC Navigation	Francophone Status[1]	-3.35	-7.67 – 0.97	2.20	-1.52	0.129
		Age (35-64)[2]	1.65	-3.16 – 6.46	2.46	0.67	0.502
		Age (65+)[2]	2.03	-3.71 – 7.77	2.93	0.69	0.489
		Gender[3]	3.18	-0.89 – 7.24	2.07	1.53	0.125
		Race/Ethnicity[4]	1.02	-3.69 – 5.72	2.40	0.42	0.672
		Education[5]	-0.46	-4.70 – 3.78	2.17	-0.21	0.832
		Financial Situation[6]	2.60	-1.50 – 6.70	2.09	1.24	0.213
		Constant	-2.88	-9.15 – 3.39	3.20	-0.90	0.368
	Ontario 211	Francophone Status[1]	0.41	-3.79 – 4.61	2.14	0.19	0.848
		Age (35-64)[2]	0.76	-4.05 – 5.57	2.45	0.31	0.757

	Age (65+)[2]	2.58	-3.76 – 8.91	3.23	0.80	0.426
	Gender[3]	3.44	-0.72 – 7.60	2.12	1.62	0.105
	Race/Ethnicity[4]	-0.97	-5.69 – 3.76	2.41	-0.40	0.688
	Education[5]	-0.05	-4.61 – 4.50	2.32	-0.02	0.983
	Financial Situation[6]	-2.56	-6.83 – 1.71	2.18	-1.18	0.240
	Constant	-1.52	-7.58 – 4.54	3.09	-0.49	0.623

Reference group:

1. Non-Francophone
2. Aged 34 years and younger
3. Other (Males and Did not identify)
4. Non-Caucasian
5. No completed university degree
6. Poor to tight

Appendix R. *Table Presenting the Change in Mental Health-Related Quality of Life, Stratified by Study Arm*

			Difference	95% CI	S.E.	t	*p*
Block 1	ARC Navigation	Francophone Status[1]	-1.17	-6.36 – 4.02	2.65	-0.44	0.658
		Constant	3.83	1.12 – 6.54	1.38	2.77	0.006
	Ontario 211	Francophone Status[1]	4.30	-0.99 – 9.59	2.70	1.59	0.111
		Constant	2.82	0.03 – 5.61	1.42	1.98	0.047
Block 2	ARC Navigation	Francophone Status[1]	-1.15	-6.36 – 4.05	2.65	-0.43	0.664
		Age (35-64)[2]	-5.38	-11.19 – 0.43	2.96	-1.82	0.069
		Age (65+)[2]	-8.66	-15.58 – -1.75	3.53	-2.46	0.014
		Gender[3]	-1.34	-6.23 – 3.56	2.50	-0.53	0.593
		Race/Ethnicity[4]	2.95	-3.04 – 8.94	3.05	0.97	0.334
		Education[5]	-0.40	-5.51 – 4.71	2.61	-0.15	0.879
		Financial Situation[6]	-0.77	-5.70 – 4.17	2.52	-0.30	0.761
		Constant	7.72	0.10 – 15.34	3.89	1.99	0.047
	Ontario 211	Francophone Status[1]	4.18	-1.22 – 9.58	2.75	1.52	0.129
		Age (35-64)[2]	1.08	-5.10 – 7.25	3.15	0.34	0.732

	Age (65+)[2]	0.07	-8.06 – 8.20	4.15	0.02	0.987
	Gender[3]	-0.09	-5.43 – 5.25	2.72	-0.03	0.973
	Race/Ethnicity[4]	-1.69	-7.17 – 3.79	2.80	-0.60	0.546
	Education[5]	4.19	-1.66 – 10.04	2.998	1.41	0.160
	Financial Situation[6]	-1.69	-7.17 – 3.79	2.80	-0.60	0.546
	Constant	3.14	-4.63 – 10.90	3.96	0.79	0.428

Reference group:

1. Non-Francophone
2. Aged 34 years and younger
3. Other (Males and Did not identify)
4. Non-Caucasian
5. No completed university degree
6. Poor to tight

Appendix S. *Table Presenting the Odds of Reporting an ED Visit, Stratified by Francophone Status*

			B	S.E.	*p*	Odds Ratio	95% CI
Block 1	Francophone	Study Arm[1]	1.54	0.84	0.067	4.64	0.90 – 23.90
		Constant	-2.67	0.73	<0.001	0.07	0.02 – 0.29
	Non-Francophone	Study Arm[1]	0.12	0.45	0.792	1.13	0.47 – 2.71
		Constant	-1.70	0.33	<0.001	0.18	0.10 – 0.35
Block 2	Francophone	Study Arm[1]	1.50	0.84	0.074	4.47	0.86 – 23.19
		Baseline Events[2]	0.50	0.80	0.530	1.65	0.34 – 7.94
		Constant	-2.77	0.75	<0.001	0.06	0.01 – 0.28
	Non-Francophone	Study Arm[1]	0.24	0.47	0.611	1.27	0.51 – 3.18
		Baseline Events[2]	1.51	0.47	0.001	4.50	1.80 – 11.28
		Constant	-2.31	0.42	<0.001	0.10	0.04 – 0.23
Block 3	Francophone	Study Arm[1]	1.65	0.94	0.080	5.20	0.82 – 32.90
		Baseline Events[2]	1.02	0.96	0.29	2.77	0.42 – 18.20
		Age (35-64)[3]	-0.77	1.17	0.51	0.464	0.05 – 4.63
		Age (65+)[3]	1.08	1.14	0.34	2.94	0.32 – 27.15

	Gender[4]	-0.46	092	0.62	0.632	0.10 – 3.82
	Race/Ethnicity[5]	-0.90	0.88	0.307	0.41	0.07 – 2.29
	Education[6]	0.74	0.97	0.445	2.10	0.31 – 14.12
	Financial Situation[7]	-2.08	1.08	0.054	0.13	0.02 – 1.03
	Constant	-1.44	1.67	0.391	0.24	0.01 – 6.32
	Study Arm[1]	0.21	0.50	0.671	1.23	0.47 – 3.26
	Baseline Events[2]	1.54	0.53	0.003	4.65	1.66 – 13.00
	Age (35-64)[3]	-0.29	0.65	0.653	0.75	0.21 – 2.68
	Age (65+)[3]	-0.02	0.77	0.984	0.99	0.22 – 4.44
Non-Francophone	Gender[4]	-0.30	0.52	0.562	0.74	0.27 – 2.05
	Race/Ethnicity[5]	0.63	0.69	0.357	1.88	0.49 – 7.24
	Education[6]	-1.91	0.78	0.014	0.15	0.03 – 0.68
	Financial Situation[7]	-0.23	0.57	0.682	0.79	0.26 – 2.41
	Constant	-1.92	0.90	0.034	0.15	0.03 – 0.86

Reference group:

1. Ontario 211 navigation services
2. No baseline events
3. Aged 34 years and younger
4. Other (Males and Did not identify)
5. Non-Caucasian
6. No completed university degree
7. Poor to tight

Appendix T. *Table Presenting the Odds of Reporting a Hospitalization, Stratified by Francophone Status*

			B	S.E.	*p*	Odds Ratio	95% CI
Block 1	Francophone	Study Arm[1]	1.46	1.15	0.205	4.29	0.45 – 40.70
		Constant	-3.40	1.02	<0.001	0.03	0.01 – 0.24
	Non-Francophone	Study Arm[1]	-0.23	0.58	0.693	0.79	0.25 – 2.49
		Constant	-2.20	0.40	<0.001	0.11	0.05 – 0.24
Block 2	Francophone	Study Arm[1]	1.12	1.20	0.355	3.03	0.29 – 31.52
		Baseline Events[2]	1.90	1.09	0.080	6.69	0.80 – 56.05
		Constant	-3.55	1.04	<0.001	0.03	0.00 – 0.22
	Non-Francophone	Study Arm[1]	-0.16	0.65	0.803	0.85	0.24 – 3.05
		Baseline Events[2]	2.88	0.67	<0.001	17.83	4.84 – 65.76
		Constant	-2.94	0.52	<0.001	0.05	0.02 – 0.15
Block 3	Francophone	Study Arm[1]	0.88	1.45	0.545	2.41	0.14 – 41.27
		Baseline Events[2]	2.59	1.81	460.153	13.35	0.38 – 466.76
		Age (35-64)[3]	-	-	-	-	-
		Age (65+)[3]	-	-	-	-	-

	Gender[4]	0.34	1.38	0.805	1.41	0.09 – 21.22
	Race/Ethnicity[5]	-1.76	2.01	0.384	0.17	0.00 – 9.17
	Education[6]	1.40	1.44	0.330	4.04	0.24 – 67.30
	Financial Situation[7]	1.05	1.64	0.523	2.85	0.11 – 70.94
	Constant	-	-	-	-	-
	Study Arm[1]	-0.05	0.70	0.945	0.95	0.24 – 3.77
	Baseline Events[2]	2.92	0.77	<0.001	18.44	4.06 – 83.85
	Age (35-64)[3]	-0.62	0.90	0.487	0.54	0.09 – 3.10
	Age (65+)[3]	-1.28	1.22	0.292	0.28	0.03 – 3.01
Non-Francophone	Gender[4]	-0.35	0.71	0.620	0.71	0.18 – 2.81
	Race/Ethnicity[5]	0.29	0.89	0.745	1.34	0.23 – 7.62
	Education[6]	-1.43	1.13	0.206	0.24	0.03 – 2.19
	Financial Situation[7]	-0.12	0.77	0.874	0.89	0.20 – 4.02
	Constant	-2.08	1.05	0.047	0.13	0.02 – 0.97

Reference group:

1. Ontario 211 navigation services
2. No baseline events
3. Aged 34 years and younger
4. Other (Males and Did not identify)
5. Non-Caucasian
6. No completed university degree
7. Poor to tight

Appendix U. *Table Presenting the Change in Physical Health-Related Quality of Life, Stratified by Francophone Status*

			Difference	95% CI	S.E.	t	*p*
Block 1	Francophone	Study Arm[1]	-1.26	-6.55 – 4.03	2.70	-0.48	0.640
		Constant	0.46	-3.24 – 4.15	1.89	0.24	0.808
	Non-Francophone	Study Arm[1]	2.33	-0.72 – 5.39	1.56	1.50	0.135
		Constant	0.14	-2.01 – 2.29	1.10	0.13	0.898
Block 2	Francophone	Study Arm[1]	-0.87	-6.34 – 4.60	2.79	-0.31	0.754
		Age (35-64)[2]	-2.39	-9.69 – 4.92	3.73	-0.64	0.522
		Age (65+)[2]	-1.09	-9.20 – 7.01	4.13	-0.27	0.791
		Gender[3]	3.80	-2.06 – 9.66	2.99	1.27	0.204
		Race/Ethnicity[4]	-1.84	-8.69 – 5.02	3.50	-0.53	0.599
		Education[5]	0.07	-6.45 – 6.59	3.33	0.02	0.984
		Financial Situation[6]	-4.00	-10.29 – 2.29	3.21	-1.25	0.212
		Constant	2.47	-8.02 – 12.96	5.35	0.46	0.644
	Non-Francophone	Study Arm[1]	2.21	-0.87 – 5.28	1.57	1.41	0.160
		Age (35-64)[2]	2.15	-1.68 – 5.98	1.95	1.10	0.271

	Age (65+)[2]	3.74	-1.22 – 8.70	2.53	1.48	0.139
	Gender[3]	3.01	-0.32 – 6.33	1.70	1.77	0.076
	Race/Ethnicity[4]	0.31	-3.49 – 4.10	1.94	0.16	0.874
	Education[5]	-0.53	-4.05 – 2.98	1.7	-0.30	0.766
	Financial Situation[6]	1.74	-1.57 – 5.06	1.69	1.03	0.303
	Constant	-4.51	-9.44 – 0.41	2.51	-1.80	0.073

Reference group:

1. Ontario 211 navigation services
2. Aged 34 years and younger
3. Other (Males and Did not identify)
4. Non-Caucasian
5. No completed university degree
6. Poor to tight

Appendix V. *Table Presenting the Change in Mental Health-Related Quality of Life, Stratified by Francophone Status*

			DID	95% CI	S.E.	t	*p*
Block 1	Francophone	Study Arm[1]	-4.24	-10.14 – 1.66	3.01	-1.41	0.159
		Constant	6.78	2.66 – 10.90	2.10	3.22	0.001
	Non-Francophone	Study Arm[1]	1.09	-2.91 – 5.09	2.04	0.54	0.592
		Constant	2.80	-0.02 – 5.61	1.44	1.95	0.051
Block 2	Francophone	Study Arm[1]	-4.41	-10.53 – 1.72	3.12	-1.41	0.158
		Age (35-64)[2]	-3.01	-11.19 – 5.16	4.17	-0.72	0.470
		Age (65+)[2]	-2.69	-11.77 – 6.38	4.63	-0.58	0.560
		Gender[3]	-4.92	-11.48 – 1.65	3.35	-1.47	0.142
		Race/Ethnicity[4]	3.35	-4.54 – 11.24	4.02	0.83	0.405
		Education[5]	4.02	-3.28 – 11.32	3.72	1.08	0.280
		Financial Situation[6]	03.22	-10.26 – 3.81	3.59	-0.90	0.369
		Constant	10.14	-1.67 – 21.96	6.03	1.68	0.092
	Non-Francophone	Study Arm[1]	1.29	-2.77 – 5.35	2.07	0.62	0.836
		Age (35-64)[2]	-2.11	-7.17 – 2.94	2.58	-0.82	0.412

	Age (65+)[2]	-6.22	-12.76 – 0.32	3.34	-1.86	0.062
	Gender[3]	0.46	-3.92 – 4.85	2.24	0.21	0.836
	Race/Ethnicity[4]	0.04	-5.02 – 5.09	2.58	0.01	0.989
	Education[5]	1.16	-3.48 – 5.80	2.37	0.49	0.624
	Financial Situation[6]	-0.71	-5.08 – 3.67	2.23	-0.32	0.752
	Constant	4.59	-1.91 – 11.09	3.32	1.38	0.167

Reference group:

1. Ontario 211 navigation services
2. Aged 34 years and younger
3. Other (Males and Did not identify)
4. Non-Caucasian
5. No completed university degree
6. Poor to tight