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Prescribing Nature for Human Health: An Examination of Public Interest, Barriers, and Enablers Related to Nature Prescription Programming in Canada

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ABSTRACT

Nature prescriptions are emerging as a promising preventive healthcare strategy. Despite their proliferation in recent years, limited research exists on public awareness, interest, and the factors that may influence the success of such programs. For the first time in the Canadian context, we examine public awareness of nature prescription programs and explore the barriers and enablers that may impact their uptake. Using a cross-sectional, online survey of 3,593 respondents, we reveal that over 75 % of participants would be more likely to visit natural areas if recommended by a healthcare professional. However, >92 % of respondents reported being unaware of nature prescription programs. We also reveal several structural, intrapersonal, and interpersonal barriers to accessing nature, which are particularly pronounced for certain subpopulations, including Newcomers, BIPOC, young adults, individuals who self-identify, and individuals with children. We identify the key enablers that could reduce such barriers, including health insurance coverage, free park access, and subsidized transportation. Finally, we discuss the ways in which strategically employing these enablers could help reduce disparities in access to nature and enhance the overall effectiveness of nature prescription programs as they expand in Canada and indeed globally. Effectively leveraging the high levels of public trust and expertise that exist within both the healthcare and conservation sectors in the co-design of programs, as well as more effective policy uptake by health insurance providers, will be essential to advancing this promising frontier in preventative health care and nature conservation.

1. Introduction

Most people attribute better health to the healthcare system (Braveman and Gottlieb, 2014; McGinnis et al., 2002). Despite this widespread belief, it has been estimated that only 10–20 % of human health is attributable to clinical care. The remaining 80–90 % of health outcomes are dependent on social, economic, and environmental determinants of health (Hood et al., 2016). Globally, the World Health Organization (WHO) estimates that healthier environments could prevent almost one-quarter of the burden of disease (WHO, 2016). At a local and regional scale, human exposure to natural settings that range from urban parks to large, remote wilderness areas produces known positive effects on mental, physical, social, and cognitive health (Geary et al., 2023; Twohig-Bennett and Jones, 2018). While the strength of evidence varies (Nguyen et al., 2023), mechanisms contributing to improved health include increased levels of physical activity (Hunter et al., 2019), reduced stress (Twohig-Bennett and Jones, 2018), improved social health (e.g., prosocial behaviour) (Arbuthnott, 2023), cognitive development (White et al., 2013), and vitality (van den Berg et al., 2016). In fact, 92 % of studies in a recent scoping review on the health benefits of nature contact demonstrated consistent improvements across *any* health outcome where individuals engaged with nature (Nejade et al., 2022).

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Despite known benefits of nature contact, decades of research has documented inequities in the distribution and accessibility of high-quality natural areas (Astell-Burt et al., 2023). Across literatures examining health equity and nature-based recreation, the concept of a barrier describes the gap between a person's motivation to engage in a particular experience and their ability to do so (McKercher and Darcy, 2018). Barriers (or constraints) can depend on situational and functional characteristics, cultural backgrounds, socioeconomic circumstances, and individual life histories (R. Buckley, 2023). Classically, barriers are categorized as intrapersonal (individual psychological states/-attributes), interpersonal (relationships or interactions), and (most commonly) structural (such as cost, time, and awareness) (Nyaupane and Andereck, 2008). Barriers can be exacerbated by place of residence, age, gender, race, income, and education (Jackson, 2005). Just as there are inequities in access to natural resources, there are inequities in health status that are not coincidental – but shaped by socially stratifying determinants of health (O'Neill et al., 2014).

A rapidly expanding interest in the immense potential of nature contact in preventative healthcare relates to nature prescriptions. Specifically, nature prescriptions are written directives from health professionals for visits to natural settings (either individually or in groups) (Buckley, 2023; Kondo et al., 2020). Nature prescriptions are considered a form of social prescribing, an approach that connects individuals with non-clinical services and supports to improve health and well-being, typically through community-based resources and activities (Bickerdike et al., 2017). Increasingly used to address social needs, such as those related to loneliness, housing instability, and mental health challenges, social prescribing is considered to have the potential to give individuals the knowledge, motivation, skills, and confidence to manage their own health and well-being (Morse et al., 2022).

Positioned at the nexus of human health and nature conservation, this novel preventative healthcare tool is increasingly used as an alternative or complementary approach to mainstream medicine. Nature prescriptions have been posited to contribute to preventative healthcare and support a more cost-effective healthcare system. Indeed, a recent systematic review linked numerous health benefits to nature prescription programmes, including a reduction in systolic blood pressure, large effects on depression and anxiety scores, and greater increases in daily physical activity (Nguyen et al., 2023). Nature prescriptions are also increasingly characterized as a mechanism to support biodiversity conservation and other ecosystem service benefits (e.g., climate change mitigation and adaptation) – as they hold potential to reconnect people with nature in ways that promote pro-environmental behaviours (Mackay and Schmitt, 2019).

The potential benefits of nature prescriptions are of growing interest to organisations that work in and between the public health and environmental sectors, including the WHO and International Union for the Conservation of Nature (IUCN) (King et al., 2023). In Canada, >15,000 health care professionals are already prescribing nature to patients (B.C. Parks Foundation, 2021) Notably, in 2022 the Canadian Medical Association (CMA) became the first national medical organization to officially endorse nature prescriptions through the PaRx program (B.C. Parks Foundation, 2022). PaRx is a national nature prescription program where trusted healthcare professionals (e.g., family doctor, other licensed healthcare professionals) provide written prescriptions to increase the time people spend in nature. The goal is to improve patients' health and well-being regardless of health status or place of residence. As part of the broader social prescribing framework, nature prescriptions are stated to offer a holistic, preventative model of care that complements mainstream medical treatments, promoting a more integrated and sustainable approach to public health (Jimenez et al., 2021; White et al., 2019).

At least nine countries now have nature prescription programs of some form (World Economic Forum (WEF), 2022). This rapid scaling is largely unfolding in a vacuum of evidence on what constitutes effective implementation of such programs. The extant literature provides very little support for decision-makers about how to maximize health benefits and health equity by promoting nature contact through nature prescriptions. Canada is a relevant context for this work because thousands of people have been prescribed nature to enhance their health and well-being to-date. Given this rapid proliferation in patient uptake, the objectives of this article are to examine empirically:

1) the public's awareness of and interest in nature prescription programming in Canada;
2) the perceived intrapersonal, interpersonal, and structural barriers that inhibit public participation in such programming; and,
3) the types of enablers that could enhance public uptake in nature prescription programs.

By addressing the objectives above, the article offers the first known national assessment of public participation in nature prescription programming. Based on findings derived from a sample of 3593 respondents, we offer evidence-based recommendations to policymakers, practitioners, and other stakeholders for developing and implementing effective nature-based preventative healthcare and health promotion policies, programs, and interventions.

2. Methods

2.1. Study design

This study utilized data from a cross-sectional online survey which was part of a larger project aiming to gather and share information about the population health impacts of nature in Canada. The project focuses on assessing public awareness and interest in park prescription programs in Canada, exploring how demographic characteristics, aspects of health and well-being status and time spent in nature influence perceptions of and participation in nature prescription programming. It also seeks to identify barriers, particularly among diverse populations, and determine preferred enablers to enhance equitable participation in such programs, as detailed here. The project was reviewed and approved by the Wilfrid Laurier University Research Ethics Board (#8546).

2.2. Participants

Data were obtained from a web-based (Qualtrics^{XM}) survey of Canadian residents that was conducted between July and August 2023. Respondents were recruited from the Leger Opinion (LEO) panel comprised of >400,000 adults. This panel is designed to provide representative data of the Canadian population via random recruitment and probability sampling. From the LEO panel, a random sample of 29,161 people was drawn, and respondents were contacted by email and invited to participate in the study. According to census data, demographic characteristics of panel members are comparable to the population of Canadian residents that have internet access (Leger, 2022). Quotas for each province and ethnic minorities were employed to ensure a large enough sample size. To be eligible to participate in the study, respondents had to be 18 years of age or older, reside in Canada, have internet access, and be able to communicate in English or French. Participation was voluntary and anonymous, and no questions were mandatory.

2.3. Survey design

The questionnaire consisted of four sections: 1) Socio-demographic characteristics (13 questions); 2) Health and well-being status (9 questions); 3) Time spent in nature (8 questions); and, 4) Perceptions of nature and nature prescriptions (10 questions). Questions largely used 5-point Likert type response scales and were framed around Canada's leading nature prescription program, PaRx (see Supplemental Material 1 for all questions and scales used). Because the focus of this article is

largely on barriers and enablers to public participation in the PaRx nature prescription program, we do not report on all the questions but rather focus on questions central to the focus of this study to maintain scope, clarity, and methodological integrity.

2.4. Statistical methods

Data were uploaded into Excel, where a database of all survey responses was created and cleaned. No imputation of missing data occurred, and missing answers were handled by pairwise deletion. This approach ensured that each analysis utilized the maximum number of available responses for each variable, resulting in varying sample sizes across different questions, depending on the number of valid responses for each variable.

Consolidation of groups occurred for sexual identity (straight, non-straight), ethnicity (BIPOC, White), and income (low, medium, high). These groupings were made to ensure sufficient sample sizes for each category and to facilitate comparisons across groups. For further analysis, responses to 25 barrier statements were grouped into three categories: structural, intrapersonal, and interpersonal barriers. The specific consolidation of barriers can be found in Supplement 2.

Statistical analyses were performed using SPSS version 26. Descriptive statistics were first calculated for all variables, including frequency counts and proportions for each response category. No outliers were identified in the data. Given the ordinal nature of the survey responses for testing variables (ranging from “not at all/extremely unlikely” to “extremely/extremely likely”), non-parametric tests were used to compare responses across socio-demographic groups. Subgroup analyses were conducted to explore how different socio-demographic groups responded to visit likelihood, barriers, and enablers.

Kruskal-Wallis H tests were conducted for comparisons across multiple groups, while Mann-Whitney U tests were used for pairwise group comparisons. These tests were selected due to the ordinal nature of the data and to account for non-normal distribution. A significance level of $p \leq 0.05$ was used for all tests. In terms of reliability, the sample has a margin of error of ±2.2 %, 19 times out of 20 (95 % confidence).

Mean ranks were used to interpret the differences between socio-demographic subgroups for each testing variable. This method was chosen due to the ordinal nature of the survey responses. Higher mean ranks indicated that group responses tended to be more towards the higher end of the scale (i.e., more likely to report “extremely/extremely likely”), while groups with lower mean ranks tended to respond more towards the lower end (i.e., more likely to report "not at all/extremely unlikely"). Post hoc testing among groups were not conducted.

3. Results

3.1. Survey response and socio-demographic characteristics

The survey was sent out to 29,161 individuals. A total of 3667 individuals opened the survey (2956 English, 711 French) with 3593 completing the survey, yielding a total response rate of 12.3 % and a completion rate of 98.0 %. The number of responses for the survey questions used in this analysis ranged from 2402 to 3573 (66.9 % - 99.4 %).

Table 1 presents the socio-demographic characteristics of the study sample. Compared to the 2021 Canadian Census, the sample was mostly consistent with the broader Canadian population, with the exception of the sample of Canadian Citizens by birth and naturalization, which overrepresents the population by about 3.0 % and 1.5 % respectively, and those who are not Canadian citizens, who are underrepresented by 4.6 % according to census data (Statistics Canada 2023).

Table 1
Individual survey responses of socio-demographic information of sample.

Variable	Survey Response	Frequency	Percent
Age (n = 3573)	18–25	233	6.5
	26–34	485	13.6
	35–44	466	13.0
	45–54	625	17.5
	55–64	754	21.1
	65+	1010	28.3
Gender (n = 3566)	Male	1806	50.6
	Female	1748	49.0
	Self-Identify	12	0.3
Sexual Identity (n = 3557)	Straight	3243	91.2
	Gay	122	3.4
	Lesbian	23	0.6
	Bisexual	107	3.0
	Self-Identify	62	1.7
Citizenship (n = 2581)	Canadian Citizen by Birth	1999	77.5
	Canadian Citizen by Naturalization	473	18.3
	Not Canadian Citizen	109	4.2
Ethnicity (n = 2573)	Black	93	3.6
	East Asian	239	9.3
	Indigenous	48	1.9
	Latin American	44	1.7
	Middle Eastern	50	1.9
	South Asian	129	5.0
	White	1774	68.9
	Other/Self-Identify	196	7.6
Children Under 18 (n = 2573)	Yes	551	21.4
	No	2022	78.6
Income (n = 2562)	<$20K	129	5.0
	$20 - 39,999	336	13.1
	$40 - 59,999	378	14.8
	$60 - 79,999	360	14.1
	$80 - 99,999	319	12.5
	$100 - 119,999	248	9.7
	$120 - 139,999	140	5.5
	$140 - 149,999	94	3.7
	$150+	296	11.6
	Prefer not to say	262	10.2

3.2. Awareness of and interest in nature prescription programs

Interest in nature prescription programs in Canada is high. A total of 76.1 % (n = 1908/2507) of respondents indicated that they would “Likely” or “Extremely Likely” visit green and/or blue spaces more often if their trusted healthcare professional suggested it would be good for their health. Despite this, awareness of nature prescriptions among the Canadian public appears to be very low. A total of 91.8 % (n = 2298/2503) of participants had not heard of the nature prescription program, PaRx. Of the 8.2 % (n = 205/2503) that had heard of PaRx, 29.8 % (n = 61/205) heard about it through social media, followed by 27.3 % (n = 56/205) via television.

Although interest in nature prescriptions is high generally, it varies by subpopulation. Results indicate significant differences by subpopulation in the likeliness of a person to visit their preferred green and/or blue space at the suggestion of their trusted healthcare professional. This includes differences across age groups ($p \leq 0.01$), citizenship status ($p \leq 0.01$), ethnic groups ($p \leq 0.01$), and among individuals with and without children under 18 years of age ($p = 0.03$). Notably, 35–44-year-olds, non-Canadian Citizens, BIPOC, and those with children under 18 years of age would be most likely to visit a green/blue space if suggested by their healthcare professional (see Supplemental Material 2 for detailed results). No significant differences were found among gender, sexual identity, and income groups.

3.3. Barriers to participation in nature prescription programs

Respondents were asked to rate the extent to which perceived barriers impacted their ability to participate in nature prescription programming. These groupings reflect longstanding theory related to the relation of *structural, intrapersonal,* and *interpersonal* barriers that shape participation across various social spheres (Supplemental Material 1)

(McKercher and Darcy, 2018; Nyaupane and Andereck, 2008). An overview of the significant differences found among barriers to participate in prescription programs with various socio-demographic groups is presented in Table 2.

Significant differences in all three types of perceived barriers were identified among age groups (structural $p \leq 0.01$, intrapersonal $p \leq 0.01$, interpersonal $p \leq 0.01$). The grouping of 18–25-year-olds reported being most impacted by structural and intrapersonal barriers, indicating they had the largest mean rank values. By contrast, 26–34-year-olds reported being most impacted by interpersonal barriers. Respondents 65 and older reported being the least impacted across all barriers, indicating they had the smallest mean rank values. Among gender groupings, a significant difference was found only for interpersonal barriers ($p \leq 0.01$). Those who self-identify report being the most impacted. Males report being the least impacted. Between sexual identity groups, a significant difference was found for structural barriers ($p = 0.025$), with non-straight individuals being more impacted compared to straight individuals.

Significant differences were also found among citizenship status. Non-citizens, and Canadian Citizens by naturalization were the most impacted by structural ($p \leq 0.01$), intrapersonal ($p \leq 0.01$) and interpersonal barriers ($p \leq 0.01$) respectively. Canadian Citizens by birth were least impacted for all three barrier groups.

Significant differences were also found between different ethnicities, and between individuals with or without children under 18, with structural ($p \leq 0.01$), intrapersonal ($p \leq 0.01$) and interpersonal barriers ($p \leq 0.01$). BIPOC, and those with children report being more impacted compared with, White respondents, and those without children under 18 for all three barrier groups. No significant differences were found among income groups (Supplemental Material 2).

In addition to revealing patterns about types of barriers to participation, results identify which specific barriers were the most challenging. "Lack of Time" was the highest barrier to visiting preferred green and/or blue spaces with 22.8 % of respondents answering, "Quite a lot" and "Extremely" ($n = 565/2477$), followed by "Unfavourable weather" (21.2 %) ($n = 513/2420$), and spaces being "Too crowded" (18.6 %) ($n = 454/2437$). "Cultural barriers" (2.7 %) ($n = 67/2448$), "Fear of prejudice" (3.7 %) ($n = 91/2432$), and "Conflict with others" (4.2 %) ($n = 101/2432$) were the lowest barriers to visiting (Fig. 1).

These results were not uniform across all demographic groups. Despite results at the sample scale, Respondents aged 65 and older report being the least restricted by time constraints ($p \leq 0.01$). Likewise, non-Canadian Citizens identified "Cultural barriers" to be significantly higher ($p \leq 0.01$) than Canadian Citizens (birth and naturalization). "Fear of prejudice" was also ranked significantly higher across BIPOC respondents ($p \leq 0.01$) compared to those who identified as White. Cost of entry ($p < 0.01$), lack of transportation ($p = 0.017$), and lack of equipment ($p < 0.01$) were ranked higher in low-income groups and lowest in high-income groups. Full results of individual and aggregated barriers and socio-demographic data are available in Supplemental Material 2.

3.4. Enablers to participate in nature prescription programs

The most preferred enablers to participate in nature prescription programs were all cost-related, even though cost was infrequently perceived as a barrier (Fig. 2). For instance, 32.0 % ($n = 786/2458$) respondents indicated they would be "Likely" or "Extremely Likely" to visit green and/or blue spaces if there were options for a free pass and 24.9 % ($n = 604/2494$) with a discounted pass. Results were similar for free or discounted transport, 25.6 % ($n = 621/2425$) and 19.2 %, ($n = 466/2426$) respectively. A separate question focused on the role of insurance coverage also revealed that 36.1 % ($n = 890/2463$) of respondents "Agree" or "Strongly Agree" they would prefer a health insurance provider who included coverage for prescribed nature time.

A total of 54 statistically significant differences emerged across nine enablers (including insurance) and seven socio-demographic variables (Supplemental Material 2). Our findings indicate that as age increases, the desire for any enabler to participate in nature prescription programs declines. Though individuals with children under 18 indicated a stronger desire for enablers than individuals without children.

Among gender groups, significant differences were found in all enablers with females and individuals who self-identify having larger mean ranks than males. As such, they reported a stronger desire for enablers. Significant differences in support of 8/9 enablers emerged across sexual identity groupings (all except "App"). Individuals identifying as Not-straight consistently reported a greater desire for enablers. With respect to citizenship status and ethnicity, significant differences emerged for all but one enabler (insurance). Canadian Citizens by naturalization, non-Canadian Citizens, and BIPOC groups reported a stronger desire for enablers to participate in nature prescription programs compared to Canadian Citizens by birth and White respondents.

Significant differences were found between households with and without children under the age of 18; households with children under the age of 18 reported higher desire than those living in households without children. Finally, three enablers ("Free Pass", "Free Transport", and "App") have significant differences among income groups. Those in the high-income group reported a higher desire for free passes, and an app (to describe the features and amenities of the green/blue space), while those in the low-income group reported the highest desire for free transportation.

4. Discussion

The aim of the current study was to assess the public's awareness of and interest in nature prescription programs in Canada, identifying the barriers hindering participation, and determine preferred enablers to enhance equitable public participation in such programs. Our results

Table 2
Perceived barriers to participating in nature prescription programs by significant differences in socio-demographic groups.

	Structural			Intrapersonal			Interpersonal		
Variable	P-value	Most impacted group	Least impacted group	P-value	Most impacted group	Least impacted group	P-value	Most impacted group	Least impacted group
Age	$p \leq 0.01$	18–25	65+	$p \leq 0.01$	18–25	65+	$p \leq 0.01$	26–34	65+
Gender	0.123	N/A	N/A	0.921	N/A	N/A	$p \leq 0.01$	Self-identify	Male
Sexual Identity	0025	Non-straight	Straight	0.902	N/A	N/A	0.206	N/A	N/A
Citizenship	$p \leq 0.01$	Non-Citizens	Citizen by Birth	$p \leq 0.01$	Citizen by Naturalization	Citizen by Birth	$p \leq 0.01$	Citizen by Naturalization	Birth CC
Ethnicity	$p \leq 0.01$	BIPOC	White	$p \leq 0.01$	BIPOC	White	$p \leq 0.01$	BIPOC	White
Children under 18	$p \leq 0.01$	With children	Without children	$p \leq 0.01$	With children	Without children	$p \leq 0.01$	With children	Without children

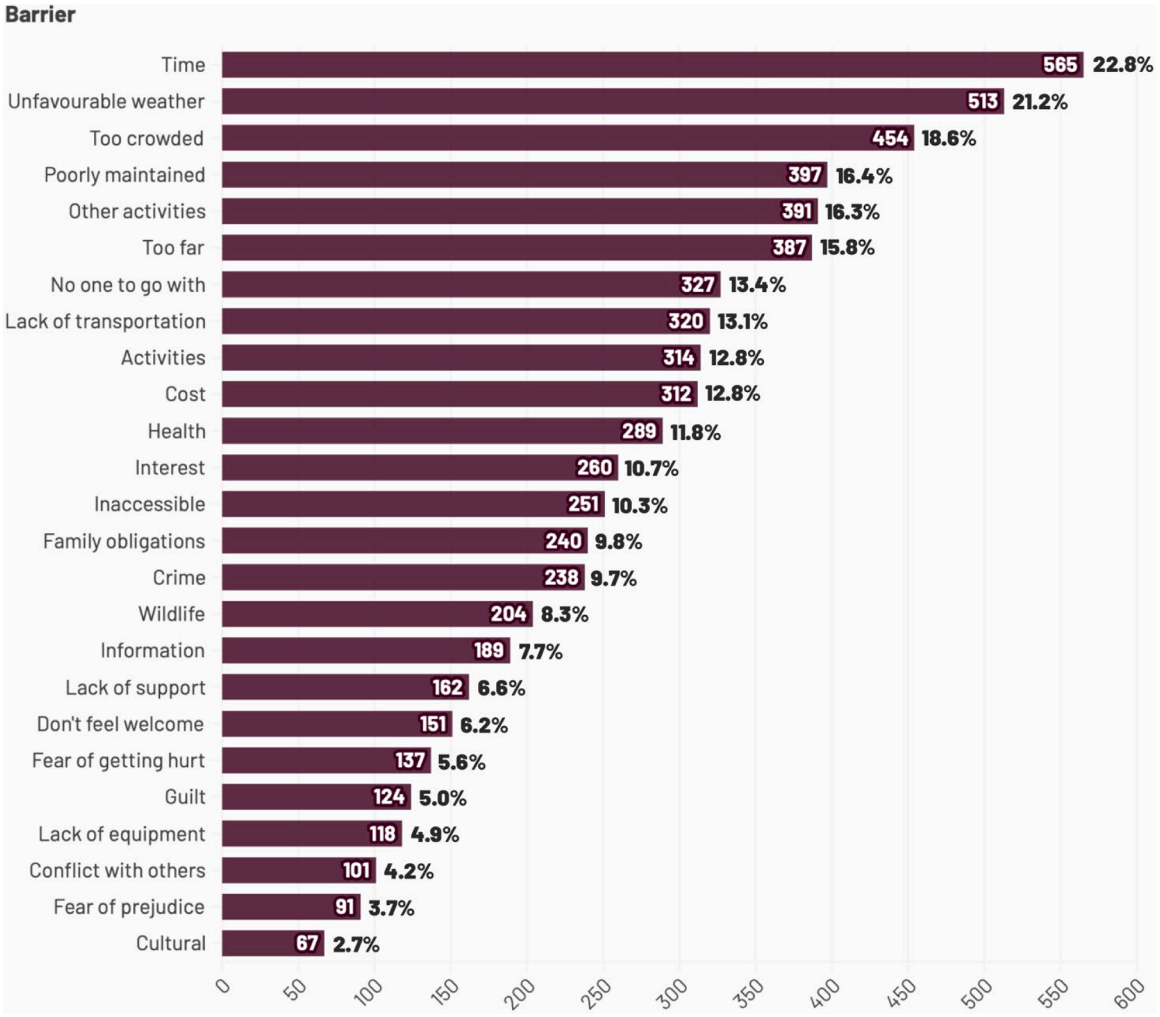

Fig. 1. Bar graph of barriers impacting ability to visit preferred green and/or blue spaces at the suggestion of trusted healthcare professionals (# of respondents indicating "quite a lot" and "extremely").

reveal the majority of respondents would be more likely to visit nature areas if recommended by a healthcare professional. However, the vast majority of respondents were unfamiliar with nature prescription programs. Our findings highlight several structural, interpersonal, and intrapersonal barriers to accessing nature, especially among subpopulations, including individuals who identify as Newcomers, BIPOC, young adults, individuals who self-identify, and individuals with children. Furthermore, our results also reveal that enablers such as health insurance coverage, free access to parks, and free transportation could reduce access disparities and support more effective nature prescription programs.

PaRx has received widespread coverage on social media and news media sources in Canada, including television, internet, and radio. Despite this, most Canadians have not heard of this nature prescription program. This is significant as results here indicate that interest in nature prescription programming is very high. As such, there appears to be a disconnect between public awareness and interest in nature prescription programming in Canada. Work is clearly needed to understand why current communication approaches are not punching through to reach the Canadian consciousness.

The apparent desire amongst the Canadian public for nature prescription programming also speaks to the unique value of PaRx as a program that spans conservation and health boundaries. Research has consistently found that healthcare practitioners are the world's most trustworthy professionals (Ipsos, 2022). Our results illustrate the immense value of this high level of trust as both a health and conservation asset. For example, respondents illustrated substantial willingness to increase nature contact if the motivating factor was at the recommendation of a healthcare practitioner. This trust will be an essential element of successful nature prescription programming. Our results suggest that the healthcare practitioner community appears best positioned to empower people to strengthen their autonomous motivation for increased contact with nature (Astell-Burt et al., 2024).

Protecting this trust as a conservation asset will also be critical. Connection to the natural world developed through nature contact can promote reciprocal maintenance of human and environmental health (Gallagher et al., 2021). As people become more connected with nature, they may develop a greater sense of environmental stewardship, leading to behaviors that support sustainability and conservation efforts (Mackay and Schmitt, 2019). Indeed, health cannot be separated from other goals, including those related to environmental challenges such as climate change and biodiversity loss (King et al., 2023). By helping people become aware of the benefits of nature contact or overcome the lack of motivation to spend time in natural settings, PaRx practitioners are stewarding the reciprocal maintenance of both human health and nature.

However, to reach this potential, our results revealed that significant barriers to expanding the conservation value and health equity of public participation in nature prescription programs must be addressed. Many structural, intrapersonal, and interpersonal barriers currently prohibit

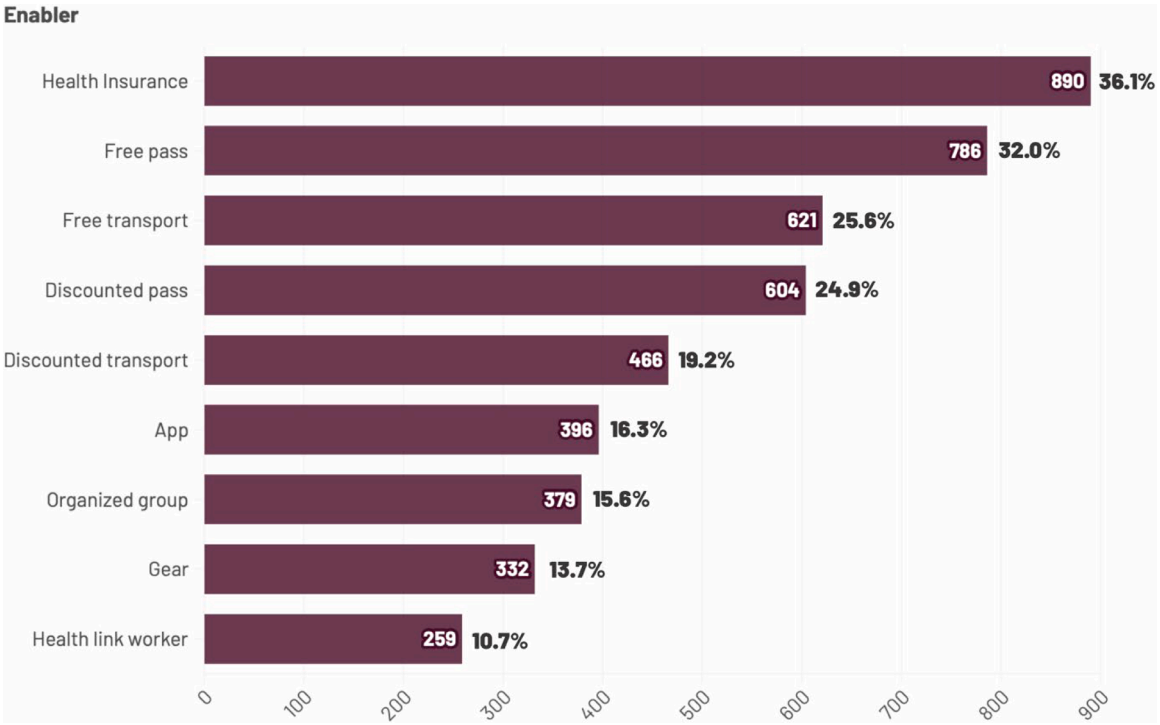

Fig. 2. Bar graph of enablers affecting the likelihood of visiting preferred green and/or blue spaces at the suggestion of trusted healthcare professionals (# of respondents indicating "likely" and "extremely likely" or "agree" and "strongly agree").

participation in nature prescription programming. In Canada, these barriers appear to be organized most acutely along a suite of socio-demographic and subpopulation lines. Newcomers, members of the BIPOC community, those who self-identify, young adults, and those with children consistently reported higher barriers to participation. Nature interventions that preferentially benefit people in more privileged societal positions could ultimately widen health inequities (Astell-Burt et al., 2023). Natural settings have the potential to provide an accessible and low-cost supplement to medical care regarding population health and well-being. As they expand, it will be important for the conservation and health practitioner communities to identify ways to minimize and where possible remove the widespread barriers identified in our study.

Public organizations such as those related to the establishment and management of parks and other forms of protected areas (e.g., national/provincial parks) strive to achieve quality visitor experiences. They are well-situated to provide the skills and expertise for safe and effective nature prescription products and to overcome barriers (e.g., identification of appropriate sites or activities given socio-demographic considerations) (R. Buckley, 2023). Like healthcare practitioners, these organizations are comparatively trusted divisions within government. For example, nine in 10 Canadians support Parks Canada's mandate (the federal agency responsible for national parks, national marine conservation areas, and national historic sites in Canada). Canadians also consider Parks Canada one of the most trusted federal organizations (ranked #3 overall) (Parks Canada Agency, 2021).

Providing enablers will be an important aspect of any nature prescription program that leverages public trust in the health and parks sectors to reduce unequal barriers to participation. The most desirable enablers to participation were mostly cost-related – indicating enablers like free/discounted access to parks would increase likelihood of participation. Among non-Canadians and racialized groups, our results identified cultural barriers and fear of prejudice as significant barriers to accessing nature. These barriers are structural and systemic. Overcoming them will require the coordinated mobilization of policy, partnerships, and programming.

Important work is already underway in this regard. For example, Ontario Parks recently introduced Canoo. This mobile app helps new Canadians celebrate their citizenship by providing a complimentary daily vehicle permit at most of Ontario's 300 provincial parks. Newcomers and individuals under the age of 17 also enjoy one full year for free access to all Parks Canada administered sites. PaRx programs have expanded this access by prescribing patients annual Parks Canada Discovery Passes free of charge. Finally, PaRx and Evo Car Share have teamed up to make it easier for people in the Greater Vancouver and Victoria areas to access nature, where possible (B.C. Parks Foundation, 2024). Patients with a PaRx prescription can register for a free Evo membership and receive 100 min of free drive time. These initiatives should be sustained or scaled up where possible.

Self-organized groups promoting equity-deserving people's access to nature and outdoor activities/skills are also emerging. Programming is raising awareness and enhancing autonomous motivation and group-based activities to visit natural areas. Groups like Black Canadian Hiker connect underrepresented populations through nature activities to improve health and well-being and build community. In British Columbia, B.C. Parks' new 'Commitment to Inclusion' promotes tools like standards for visual materials as a mechanism to promote inclusive and diverse language and cultural connections (B.C. Parks, n.d.). The B. C. Parks Foundation has also partnered with MOSAIC B.C., an immigrant and refugee settlement agency. This partnership is providing programming for vulnerable Newcomers to Canada – 99 % of whom are refugees – to connect with nature, enjoy the outdoors and create connections in a safe and supportive environment (Government of B.C., 2023).

Despite this progress, much of the work focusing on expanding equitable access to natural areas through nature prescriptions is clearly in the nascent stages. Efforts are fragmented and limited to certain regions. Programs lack adequate/sustained resourcing, are more often than not at a patient's own cost, and/or rely heavily on a patient's autonomous, self-motivation.

Given the current state of nature prescriptions in Canada, there are clearly lessons to be learned from other countries and other related dimensions of health care. Some nature-based public health interventions have been attempted in the United States and the United Kingdom and

have experienced implementation challenges for similar reasons detailed here (R. C. Buckley and Cooper, 2022). For example, the U.K. introduced a (2-year) £5.77 million Green Social Prescribing Programme in 2021 supporting people to engage in nature-based interventions and activities to improve their mental and physical health. A goal of this programme was to reduce health inequalities and reduce demands on the health and social care system (N.H.S. England, n.d.). However, a recent study evaluating green social prescribing in rural Scotland and northeast England revealed that social disadvantages and chronic health issues limit easy access to green and blue spaces (Fixsen and Barrett, 2022). The study also revealed that those in the most socially economically deprived areas received the lowest quality of healthcare (Fixsen and Barrett, 2022).

Relatedly, research has also shown that the effectiveness of prescribing outdoor physical activity was linked to the amount of time a healthcare provider spent discussing physical activity with parents and patients (in this instance, children), which was directly tied to insurance reimbursement (Christiana et al., 2017). Healthcare providers highlighted the need for adequate reimbursement to justify the time required for these discussions, ensuring they could thoroughly address outdoor physical activity without financial constraints (Christiana et al., 2017). Other research focused on park prescriptions specifically has revealed similar barriers, including lack of time to discuss benefits of physical activity in parks with patients, and a lack of insurance reimbursement for promoting physical activity in parks, both of which hinder effective program implementation among healthcare practitioners (Besenyi et al., 2020).

Our results indicate that incorporating access to nature in health insurance/benefits programs was highly desired by the Canadian public. Reimbursement of costs by health insurance companies would further legitimize nature prescriptions as an effective form of preventative healthcare and health promotion (James et al., 2019). As a starting point, national programs like PaRx could advocate for insurance companies to integrate the costs of accessing nature into benefit plans. Despite some plans offering benefits (more often in the form of incentives or rewards) (e.g., Manulife in Canada offers a Vitality Health Program that includes wellness rewards for participating in various health-related activities, including outdoor physical activities, monitored with a recording device) (Manulife, n.d.), attempts to mainstream access to nature as a healthcare function within the insurance realm has been limited. The effectiveness of such programs is also poorly understood.

There is a clear need for more effective multisectoral collaboration to promote program uptake, particularly where interventions may be required (King et al., In press). Despite the strong evidence of the protective benefits of regular physical activity against leading non-communicable diseases (NCDs) and mental health, implementation of related policies has been poor. Disconnects include poor communication and coordination among implementing authorities, as well as a lack of understanding of social and cultural barriers (World Health Organization (WHO), 2022). Nature prescription programs should work to integrate coordinating mechanisms to support multisectoral collaboration that enhances public uptake and program implementation. Widespread public uptake will require that interrelated supply and demand related barriers are addressed. Co-design might ultimately be needed as the health sector is best placed to work with stakeholders to increase demand for nature prescriptions through advocacy, practitioner training, and public promotion, while the parks and conservation sector is best positioned to address supply-related barriers like cost of entry, safety, and program offerings (Buckley and Cooper, 2022; King et al., In press).

The study detailed here represents the first-ever examination of public interest in, and barriers and enablers to, nature prescription programs in Canada and represents a significant contribution to the growing body of research on nature-based health interventions. By surveying a diverse and substantial number of participants, the study provides a comprehensive overview of Canadian public attitudes toward nature prescription programs, capturing the perspectives of individuals from various geographic, cultural, and demographic backgrounds. Despite this, there are a few limitations to acknowledge, most of which are common to surveying approaches. First, respondents were asked to retrospectively respond to some questions and given that respondents may not accurately recall past behaviour, our results could be subject to recall bias. Second, we relied on a panel (Leger's LEO panel) for participant recruitment, which may have introduced potential selection bias. Third, Leger's panel has a relatively low number of panelists who live within the Canadian territories. As a result, our sample for Yukon, the Northwest Territories, and Nunavut is relatively small compared to the more highly populated provinces. Finally, while the survey was administered online in both of Canada's official languages and inclusive of the large majority of the Canadian population, it excluded individuals without internet access, as well as those who are unable to read or write in either of these languages. According to available data, approximately 2 % of the Canadian population cannot conduct a conversation in either English or French, meaning they would likely be unable to read or write in either language at a functional level; this translates to around 600,000 Canadians based on recent census figures (Statistics Canada, 2020). Despite these limitations, the large, nationally representative sample size ensures that the results are reflective of the broader Canadian public's perceptions, making the findings relevant and actionable for policymakers, healthcare providers, and others who are working in the realm of nature prescription program design and implementation.

5. Conclusions

Nature prescription programming in Canada has emerged as an innovative approach to addressing mental and physical health challenges. By formally prescribing outdoor activities and nature-based interventions, healthcare providers aim to leverage the therapeutic benefits of natural environments to improve health and well-being. Such programs are grounded in the growing body of evidence supporting the positive impacts of nature on mental health, including reduced stress, anxiety, and depression. In Canada, several pilot initiatives have been introduced, encouraging individuals to engage with nature as part of their personal healthcare plans. These programs often involve collaboration between healthcare providers, community organizations, and parks and protected areas organizations, fundamentally promoting the benefits of green and blue spaces.

Despite its promise, challenges remain in scaling and sustaining nature prescription programs in a way that promotes equitable access to nature as a health resource. We have shown that tailoring nature prescriptions to the specific needs, preferences, and barriers of diverse populations will be crucial for their effectiveness. The article also compliments and advances the research done in Canada on the health benefits of nature contact (Groulx et al., 2022; Lemieux et al., 2016, 2022; Reining et al., 2021), and underscores the need for continued research as initiatives rapidly unfold across the nation. Examination of patient motivations and barriers along with strategies for initiative design, implementation, and evaluation will be critical research needs as patient engagement grows (King et al., In press).

Increasing the participation and involvement of key stakeholders (e.g., the health community, the outdoor recreation industry, and end-users (or patients), particularly already marginalized populations) will also be required to strengthen innovation, equitable implementation, and the overall success of this rising population health initiative. Understanding the logistics and policy implications for private insurers to cover non-mainstream, nature-based interventions will be crucial for broader adoption if nature prescription program aspirations to reduce the burden on the healthcare system, improve patient outcomes, and promote preventive healthcare, are to be achieved.

Declarations

Declaration of Generative AI and AI-assisted technologies in the writing process: AI and AI-assisted technologies were not used in the writing process.

Data Statement: The datasets generated and/or analysed during the current study are not publicly available as per Wilfrid Laurier University Research Ethics Board (#8546) policy.

Ethics statement

All procedures were performed in compliance with relevant laws and institutional guidelines and have been approved by the Wilfrid Laurier University Research Ethics BoPlease check funding information and confirm its correctness.ard (#8546).

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CRediT authorship contribution statement

Christopher J. Lemieux: Writing – review & editing, Writing – original draft, Project administration, Methodology, Funding acquisition, Data curation, Conceptualization. **Calin Lazarescu:** Writing – original draft, Formal analysis. **Catherine E. Reining:** Writing – original draft. **Mark W. Groulx:** Writing – original draft. **Melissa Lem:** Writing – review & editing. **Thomas Astell-Burt:** Writing – review & editing. **Xiaoqi Feng:** Writing – review & editing.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Supplementary materials

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