

# The Link Between Difficulty in Accessing Health Care and Health Status in a Canadian Context

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**ABSTRACT:** Much of the Canadian population reports some level of difficulty in accessing health care services. Despite being a recognized determinant of health, the relationship between access to health care and overall health has not been examined extensively. This study is an analysis of the Canadian Community Health Survey 2016 database. A composite score for difficulty in accessing health care was constructed based on several survey questions. Self-rated health (SRH), the measure of general health status, was compared between individuals with and without difficulty in accessing health care services by estimating prevalence rate ratios adjusting for age, sex, education, income, urban/rural status, race, and Indigenous status. After adjustment for pertinent confounders, difficulty in accessing health care was not statistically significantly associated with SRH. However, in stratified models, difficulty accessing health care was associated with a 12% lower probability of reporting good SRH among non-white individuals. Test of interactions for other social determinants was not significant. For racial minorities, inequalities in access to health care are associated with lower self-rated health. Further research to investigate causes underlying difficulties in accessing health care could lead to public health programs ensuring all Canadians receive equal health care services.

**KEYWORDS:** Access to health care, Canada, self-rated health, Poisson regression, social determinants of health, race

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## Background

While Canada's health care system is commonly regarded as superior to that of the United States,<sup>1</sup> it ranks as being only slightly better by the World Health Organization.<sup>2</sup> In Canada there are many discrepancies in health outcomes, which can be attributed to a variety of physical and social factors.<sup>3</sup> While human health is a notoriously complex issue,<sup>4</sup> many of these important factors that affect health can be classified under the social determinants of health (SDH) framework, which are factors that affect the health of people and their environments.<sup>5</sup>

Among these determinants is access to health care, though in Canada, it has been assumed to not be an important determinant due to the presumption of equal access to services<sup>6</sup>; however, in 2013 roughly 30% of Canadians reported difficulties accessing health care.<sup>7</sup> Further, assumption of equal access has been shown to be incorrect after population stratification, with particular groups experiencing inequities in accessing health care services.<sup>6</sup> Access to health care in Canada can be seen in 3 modes: social location, point of care, and systemic contexts, all of which may lead to differential levels of care.<sup>6</sup> Social location contexts are based on how an individual's characteristics impact their access to care.<sup>6</sup> Point of care is how individuals are treated when they do seek care, and systemic context are related to the cultural and social upstream factors that have created the current society.<sup>6</sup> These factors affect the experiences an individual in a society has, and may inhibit their success in accessing health care services. A North American study indicated that individuals who had "unmet health needs" reported lower levels of SRH.<sup>8</sup> While "unmet health needs" is not necessarily the equivalent of *access to health care*, a broad term encompassing many different issues,<sup>9</sup> it serves as a reasonable basis to examine

the relationship between access to health care and SRH. SRH itself has been shown to be a good indicator of overall mortality.<sup>10</sup> Accessibility is 1 of the 5 program criteria outlined in the Canada Health Act that Provinces must fulfill in order to qualify for full funding from the Canada Health Transfer.<sup>11</sup> This component of the Act is to ensure that Canadians have access to medical services, unimpeded by income or discrimination based on other factors.<sup>11</sup> This does not mean that all locations are required to have specialized services, but rather that all those within a Province are to have access to that service regardless of where it is offered.<sup>11</sup> While this legislation has the purpose of ensuring all Canadians have equal access to care, it is uncertain whether this is true in practice. In this paper, access to health care is described by ability to obtain services when needed. If an individual requires a service and has barriers preventing that access, this is determined to be a difficulty accessing health care. As such, those who do not require access will not be described of having difficulty, even if those barriers do exist.

The main objective of this study is to examine how access to health care affects SRH in Canada, as well as the role of other SDH in this relationship. It was hypothesized that those who experience difficulty accessing health care would have lower SRH than those who do not.

## Methods

### Data

This study is based on the 109 659 unique respondents to the Canadian Community Health Survey (CCHS), conducted in 2016. The CCHS is a cross-sectional biennial survey performed by the Canadian Institute for Health Information



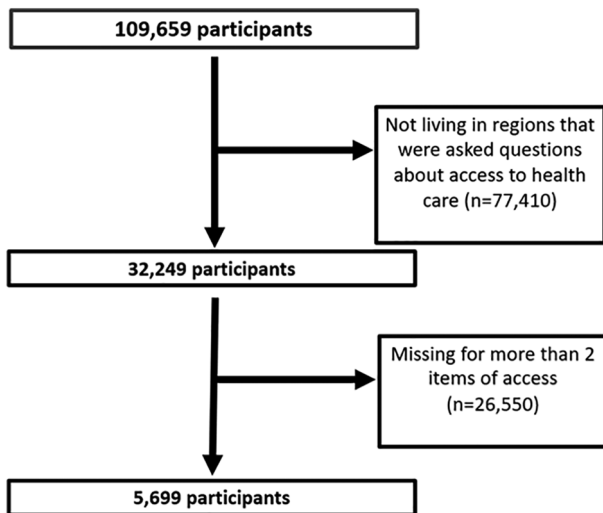


Figure 1. Sample size after participant reduction.

(CIHI), Statistics Canada, and Health Canada with the objective of providing data for health research and supporting health programs through surveillance.<sup>12</sup> The target population for the CCHS are individuals 12 years old and over in each of the 10 Provinces and 3 Territories, excluding members from the Canadian Forces, persons living in institutional settings (eg, prisons), youth (12–17 years) living in foster care, and those living in certain health regions in Quebec (specifically Région du Nunavik and Région des Terres-Cries-de-la-Baie-James).<sup>12</sup>

The CCHS 2016 results were accessed through the Ontario Data Documentation, Extraction Service and Infrastructure,<sup>13</sup> a website granting open access to datasets for research. While all regions were involved in this survey, questions regarding difficulty in accessing health care services were only asked in Quebec, New Brunswick, Nova Scotia, and Yukon; thus resulting in a sample of 32 249 respondents (Figure 1).

### Measures

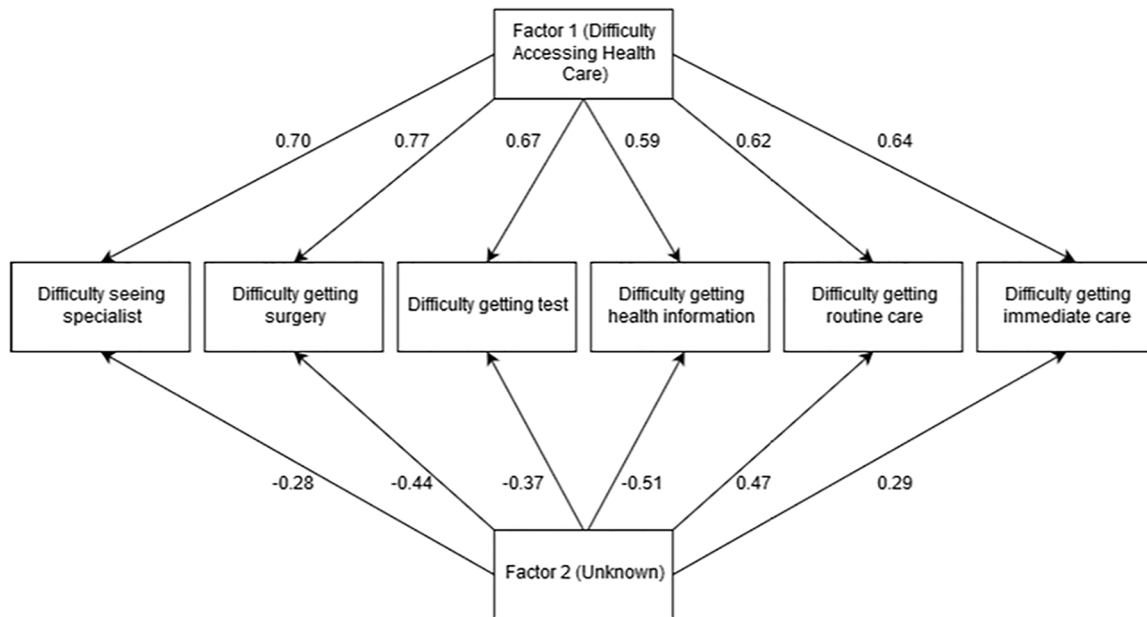
**Dependent variable.** The main outcome variable measured in this study was SRH, called “perceived health” in the CCHS 2016. SRH has been repeatedly shown to be an accurate measure of overall health and mortality.<sup>10</sup> The common convention when using this variable is to collapse the ordinally scaled answers into a dichotomous outcome of “Good” if scored Excellent, Very Good, or Good, and “Poor” if scored Fair or Poor.<sup>14</sup> While there is some debate regarding the validity of this convention,<sup>15</sup> it was applied in this study.

**Independent variables.** The primary exposure variable was “access to health care.” Though no specific question in the CCHS directly targets overall access to health care, there are a series of questions that target *difficulty* in accessing specific types of health care (ie, difficulty seeing specialist, difficulty getting surgery, difficulty getting a test, difficulty getting health information, difficulty getting routine care, difficulty getting

immediate care). Participants were asked if they had experienced any difficulty in the previously mentioned areas, and given the options of: *yes*, *no*, or *don't know*. If responses were missing for more than 2 of the 6 variables, that participant observation was excluded from the study. The choice to remove individuals who were missing greater than 2 of the sub-components was based on that being classified as *high* levels of missing data.<sup>16</sup> While multiple imputation methods allow for accurate imputation in these circumstances, given a highly correlated auxiliary variable, the authors chose not to include variables exhibiting high levels of missing data. Missing data in these questions refer to individuals either not being asked that particular question, or else them not answering it in a way that could be coded as *yes* or *no*. This resulted in a sample size of 5699, representing 18% of respondents from the 4 jurisdictions (see Figure 1). Answered questions were coded into a binary of *yes* = 1 and *no* = 0. Responses of *don't know* were coded as missing and imputed for. Since the missing data (in fewer than 3 items) did not show any obvious patterns (analyses not shown), they were assigned using multiple imputation by the Markov chain Monte Carlo method. “Geography” as indicated by Province of residence was used as the auxiliary variable for the imputation process, since it was not included as part of the regression models.

After imputing for the missing values, a principle component analysis was performed on the now binary-coded difficulty variables to determine if a latent variable (ie, *overall* difficulty in accessing health care) representing all the sub-components exists. The goal was to create a single composite explanatory variable representing difficulty in accessing care that could be used. Composite variables such as this have been commonly used in health care research<sup>17</sup> and were as appropriate to describe the outcome variable of interest. The scree plot of the Principal Component Analysis (PCA) (not shown) had 2 latent variables with eigenvalues exceeding 1, indicating the presence of 2 latent variables in the sub-components. All items except *difficulty in accessing health care information* showed a strong loading on a single factor (Figure 2). This item may be more in line with education and health care literacy<sup>18</sup> than to health care access, and as such was not included in the calculation of the composite variable.

The remaining 5 sub-components were summed into a variable indicating “number of areas of difficulty accessing health care,” ranging from 0 to 5. There were no instances of difficulty for 60% of individuals, 1 instance of difficulty for 18% of individuals, 2 types of difficulty in 10% of individuals, and 3 or more types of difficulty in 12% of individuals. This continuous variable was then collapsed into a binary variable for the presence or absence of any difficulty in accessing health care. The decision to create a binary variable was based on the small proportions of individuals experiencing multiple different types of difficulty, and the lack of statistical power that would result from their analysis. Additionally, the measure was to determine whether an individual experienced difficulty accessing health



**Figure 2.** Loadings from principal component factor analysis.

care rather than the number of different types of difficulty experienced.

In addition to the main exposure variable, other recognized SDH variables were included in the multivariate analyses. Income was divided into 3 categories, 40 000/year, \$40 000 to 80 000/year, >\$80 000/year, based on commonly accepted divisions by Statistics Canada.<sup>19,20</sup> Education was divided into categories of less than university versus university or higher, as education is highly correlated with health status.<sup>21</sup> Sex (female, male), race (white, non-white), and Indigenous status (yes/no)<sup>22</sup> were all defined based on self-reported inclusion of those categories.

Using dichotomous measures in the CCHS, data was extracted on marital status (married, unmarried), with common-law being considered married, and divorced/widowed considered as unmarried. Age was categorized as youth, those having not yet entered the workforce, or just entering (12-24 years), adults, those of working age (25-64 years), and elderly, those who are no longer in the work force (65+ years). Urban/Rural status was based on place of residence and population percentage living in rural areas in each public health unit area, and were classified into 3 groups: urban (0% living in rural areas), semi-urban (1%-40% living in rural areas), and rural (>40% living in rural areas).<sup>23</sup> In previous studies, individuals living in areas with up to 40% rurality were coded as urban,<sup>23</sup> but in this study it was determined that a semi-urban category may provide added insight into access to health care.

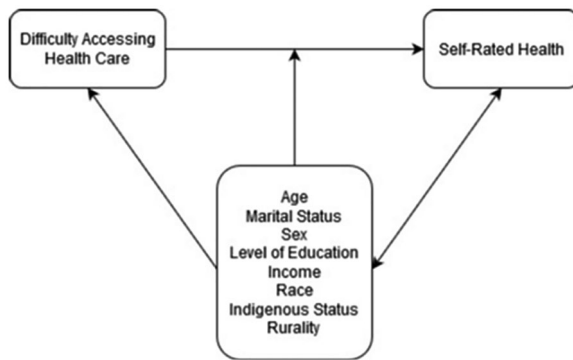
*Analysis strategy.* The data analysis was started with a descriptive exploration of frequency distributions of variables. Bivariate relationships between all covariates and the exposure and the outcome variables were examined by calculation of (unadjusted) Prevalence Rate Ratios.

Unbiased relationships between access to health care and SRH were examined by construction of multiple regression Poisson models to directly estimate Prevalence Rate Ratios (PRR) adjusted for all significant covariates. Poisson regression was selected over logistic regression, as is commonly used for direct estimation of prevalence rate ratios, which are the appropriate effect estimated for cross-sectional data.<sup>24</sup> The Poisson model has been shown to be a good approximation of a binomial model without the common convergence difficulties seen in binomial algorithms.<sup>25</sup> Robust estimates were used to increase the likelihood of appropriate model fit.<sup>26</sup> Despite some technical issues, such as poor fit and overdispersion of variance,<sup>27</sup> Poisson models remain the best approximation for binomial data and therefore were used in this study. Correlation between variables were examined to determine inclusion into the final model. Multicollinearity between variables was examined during the model building process and managed prior to the final model, to ensure changes in each variable were not affected by correlations. Results were reported with corresponding 95% confidence interval (CI), with reference groups selected as those with assumed lower SRH. Following SDH theories,<sup>6</sup> effects of all included variables on the relationships between access to health care and SRH (Figure 3) were tested for.

All analyses were performed using SAS Studio Edition 3.8.<sup>28</sup>

## Results

Table 1 shows that over half of the sample was male, married, and had completed some university; 80% identified as white. Most respondents (61%) were between the ages of 25 and 64 years. Annual income categories were evenly distributed (over one third made under \$40 000, just under one third between \$40 000 and \$80 000, and one third made over \$80 000). Most lived in either semi-rural (44%) or rural (41%)



**Figure 3.** Initial full model of relationship between access to health care and SRH.

areas. About 3 quarters of the sample rated their health as good. Fewer than half had experienced difficulty accessing at least 1 type of health care; among these, 22% experienced difficulty in 2 or more areas.

The bivariate (unadjusted) relationship between difficulty in accessing health care and SRH was not significantly significant (PRR = 1.01; 95% CI: 0.98, 1.04). However, difficulty in accessing health care varied significantly for measured covariates (see Table 2). Those who more commonly experienced difficulty accessing health care included: university educated, identifying as white or Indigenous, living in more urban areas, and earning \$40 000 to \$80 000 per year.

Similarly, although less extreme than those seen in access to health care, some significant results were seen in the examinations of bivariate relationships between variables and SRH. In particular, higher SRH was more common among those who were female, younger, non-Indigenous, married, more educated, higher income, and living in rural or semi-rural areas.

Most of the covariates showed statistically significant bivariate relationships with the exposure and/or the outcome (Table 2), and those that did not were theoretically important (eg, sex); as such, none were removed during model building processes.<sup>29</sup>

After adjustment for all covariates, there was no significant relationship between SRH and difficulty accessing health care. Testing for interactions between all covariates and the main exposure revealed that it interacted only with race; this interaction was included in the final model. The addition of this interaction term further reduced the strength and significance of the relationship between difficulty in accessing health care and SRH (PRR = 0.99; 95% CI: 0.96, 1.00).

The same models were then constructed separately by race. Non-white individuals were more likely to have better SRH if they did not have difficulty in accessing health care, but when they did experience such difficulty, their SRH tended to be lower than that of those identifying as white. According to the adjusted stratified models (Table 3), there was no statistically significant relationship between difficulty in accessing health care and SRH for respondents identifying as white (PRR = 0.99; 95% CI: 0.95, 1.02). However, a statistically significant a

**Table 1.** Frequency distribution of variables.

VARIABLE	%
Sex	
Male	40.1
Female	59.9
Marital status	
Unmarried	43.9
Married	56.1
Age	
12-24	7.3
25-64	60.8
65+	31.8
Education	
Less than University	40
University or higher	60
Race	
White	79.6
Non-white	20.4
Indigenous status	
Indigenous	3
Non-indigenous	97
Rurality	
Urban (0% Rural) (ref.)	14.9
Semi-rural (1%-40% Rural)	44
Rural (>40% Rural)	41
Household income	
<\$40000/y	36.6
\$40000-80000/y	30.4
>\$80000/y	32.9
Difficulty accessing healthcare	
No difficulty	60.4
Difficulty	39.6
Self rated health	
Good	76.2
Poor	23.8

relatively strong relationship was observed for those who were non-white, where the prevalence of reporting good SRH was 12% lower among those who had difficulty accessing health care (PRR = 0.88; 95% CI: 0.95, 1.02).

**Table 2.** Relative prevalence ratios for difficulty accessing care and SRH.

VARIABLE	DIFFICULTY ACCESSING HEALTH CARE			POSITIVE SRH		
	95% CONFIDENCE INTERVAL			95% CONFIDENCE INTERVAL		
	ESTIMATE	LOWER	UPPER	ESTIMATE	LOWER	UPPER
<b>Sex</b>						
Female	1.29	1.20	1.39	1.03	1.00	1.06
Male (ref.)	1.00			1.00		
<b>Marital status</b>						
Married	1.07	1.00	1.14	1.13	1.09	1.17
Unmarried (ref.)	1.00			1.00		
<b>Education</b>						
University or higher	1.61	1.49	1.72	1.19	1.16	1.24
Less than University (ref.)	1.00			1.00		
<b>Race</b>						
White	2.13	1.90	2.40	0.96	0.93	1.00
Non-white (ref.)	1.00			1.00		
<b>Indigenous status</b>						
Non-indigenous	0.83	0.70	0.99	1.34	1.16	1.54
Indigenous (ref.)	1.00			1.00		
<b>Age</b>						
12-24	1.46	1.25	1.70	1.29	1.22	1.36
25-64	1.80	1.65	1.97	1.17	1.13	1.22
65+ (ref.)	1.00			1.00		
<b>Household income</b>						
>\$80000/y (ref.)	1.45	1.33	1.58	1.35	1.30	1.40
\$40000-80000/y	1.33	1.22	1.46	1.18	1.13	1.23
<\$40000/y (ref.)	1.00			1.00		
<b>Rurality</b>						
Urban (0% Rural)	1.30	1.18	1.43	1.13	1.08	1.18
Semi-rural (1%-40% Rural)	1.15	1.07	1.24	1.14	1.11	1.19
Rural (>40% Rural) (ref.)	1.00			1.00		
<b>Difficulty accessing care</b>						
Yes	–			1.01	0.98	1.04
No (ref.)	–			1.00		

## Discussion

While it seems obvious that individuals who experience difficulty in accessing health care should have lower levels of SRH, this relationship was only observed in non-white Canadians.

This result is similar to a previous Canadian study,<sup>30</sup> but conflicts with an American study examining a similar question<sup>31</sup>—though this may be due to the differences in health care systems between countries.

**Table 3.** Adjusted relative prevalence rate ratios for positive SRH, full and stratified models.

VARIABLE	FULL MODEL			WHITE MODEL			NON-WHITE MODEL		
	95% CONFIDENCE INTERVAL			95% CONFIDENCE INTERVAL			95% CONFIDENCE INTERVAL		
	ESTIMATE	LOWER	UPPER	LOWER	UPPER	LOWER	UPPER		
Difficulty accessing health care vs no difficulty	0.97	0.94	1.00	0.99	0.95	1.02	0.88	0.80	0.97
Sex									
Female vs Male	1.03	1.00	1.03	1.03	1.00	1.07	1.00	0.94	1.06
Marital status									
Married vs Unmarried	1.08	1.04	1.12	1.08	1.04	1.13	1.08	1.01	1.16
Education									
University or higher vs less than University	1.16	1.11	1.22	1.18	1.12	1.25	1.10	1.02	1.20
Race									
White vs Non-White	0.85	0.80	0.89	–	–	–	–	–	–
Indigenous status									
Non-Indigenous vs Indigenous	1.43	1.23	1.64	–	–	–	1.39	1.19	1.59
Age									
12-24 vs 65+	1.28	1.21	1.35	1.31	1.23	1.39	1.22	1.10	1.36
25-64 vs 65+	1.07	1.03	1.11	1.07	1.02	1.12	1.06	0.99	1.15
Household income									
\$40000-\$80000/y vs <\$40000/y	1.15	1.10	1.20	1.20	1.14	1.27	1.02	0.94	1.10
>\$80000/y vs <\$40000/y	1.28	1.21	1.32	1.31	1.24	1.38	1.16	1.08	1.25
Rurality									
Urban vs Rural	1.09	1.04	1.14	1.12	1.06	1.18	1.02	0.94	1.12
Semi-Rural vs Rural	1.12	1.08	1.16	1.12	1.08	1.16	1.09	1.01	1.18

The lower levels of SRH for non-white people experiencing difficulty in accessing health care may be a result, for some in this category, of also being new immigrants. New immigrants are known to have difficulty navigating the Canadian health care system.<sup>32</sup> Another issue that arises with immigrants to Canada is the language barriers which have been shown to affect both initial access to care, as well as quality of care received.<sup>33</sup> For non-immigrants classified as non-white, other issues related to accessing health care may arise. Implicit racial biases have been demonstrated to be present in medical practitioners of many countries,<sup>34</sup> including Canada.<sup>35</sup> These biases and difficulties in managing language barriers may be the reasons why individuals who are non-white experience lower SRH when accessing health care services. While these individuals may receive some level of care, they may feel it is inadequate for their needs, a topic that required further research. A deep examination of the underlying societal factors leading to lower

levels of access to health care, along with lower SRH in non-white individuals in Canada should also be examined. The disparity for Indigenous individuals also requires more research both on this particular population as well as the indicator itself, and how different communities view health.<sup>36</sup> Putting all Canadians on an equal footing is the first step to solving many of the problems associated with discrepancies in health care in Canada. The statistically significant results for non-white individuals highlight some important areas for public health campaigns; furthermore, the significant influences from other SDHs such as income, education, and rurality on SRH also open avenues for future investigation.

As expected, being married, belonging to younger age groups, and having higher income were all significantly associated with better SRH after proper adjustments via multivariate models; however, in both racial groups, as degree of rurality increased, levels of difficulty accessing health care went down,

contrary to what had been expected.<sup>37</sup> The other unexpected effect of a SDH was observed from education. In contrast to other studies,<sup>38</sup> higher education was associated with more likelihood of reporting difficulty is access to care. It is important to note that all respondents report their own level of difficulty in accessing health care, which may have led to people in certain social groups described above as having higher expectations of care that they feel are being unmet.<sup>39</sup> The interplay between each of these SDHs on each other may illuminate areas of public health that are underfunded and would be worth examining and building programs upon.

Some limitations of this study may make the results not applicable to other regions in Canada, or may be affected by the limitation of data collected by the CCHS. The access to care questions asked in the CCHS was compiled under the assumption that all individuals have equal desire to access health care, and so were given equal weight for their access difficulty. However, there may be individuals who do not experience difficulty only because they do not seek out any health care. Additionally, certain individuals may overuse the health care system unnecessarily, and despite adequate care feel they have access difficulties. Each of these scenarios would skew the data away from the expected effect of access to health care on SRH. Another limitation is that the variables included in the summation of the composite variable of difficulty may not have been exhaustive, and there might have been other aspect of care that were not captured by the available question in CCHS. If other items were included there may have been a different distribution of the data and perhaps different results. The larger proportion of rural individuals in this study compared to the Canadian population may not accurately represent trends seen across the country, as there were nearly twice as many rural participants in this study compared to the Canadian average. Additionally, the very low proportion of Indigenous participants involved in this study makes drawing any conclusions about that population something that should only be done with extreme caution.

These results can not be interpreted as causal because of the cross-sectional data and limited access to additional data that may explained the complexity of the observed relationship. To better determine causative effects, were any to exist, between the difficulty in accessing health care in Canada and SRH, a different database with additional variables or longitudinal data is needed.

## Conclusion

While the effect of difficulty in accessing healthcare was not as large as expected, there is still much to be gained from this study. To better understand the shortcomings, present in the Canadian health care system, it is important to understand if users of the system have difficulty accessing care. The unmet needs of those users will directly affect the health of affected individuals, and the population as a whole. Additionally, by reporting difficulties

it is possible to suggest roadmaps for targeted public health interventions. Better understanding of where public health measures can be implemented will lead to the best use of scant resources. Additionally, non-white people may receive greater benefits from increased access to care. Finally, the revealed relationships between other SDHs and SRH are valuable avenues for future research, and may lead to public health campaigns for at-risk groups.

## Author Contributions

MG conceived and designed the analysis, performed the analysis and wrote the paper.

AV contributed to analysis tools, writing, and interpretation of results.

LM contributed to writing and interpretation of results.

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