Increasing Prevalence and Stable Incidence Rates of Inflammatory Bowel Disease Among First Nations: Population-Based Evidence From a Western Canadian Province

Juan Nicolás Peña-Sánchez, MD, MPH, PhD,* **Jessica Amankwah Osei, MHEM, MSc,***
Jose Diego Marques Santos, MSc,* **Derek Jennings, MEd, PhD,***
Mustafa Andkhoie, MPH, PhD(c),† **Colten Brass,‡** **Germain Bukassa-Kazadi, MD, MSc,§**
Xinya Lu, MPH, PhD,¶ **Michelle Johnson-Jennings, MEd, PhD,** **Linda Porter,**** **Rob Porter,††**
Carol-Lynne Quintin,‡‡ **Rhonda Sanderson,§§** **Ulrich Teucher, PhD,¶¶** **and Sharyle Fowler, MD, FRCPC**

From the *Department of Community Health and Epidemiology, College of Medicine, University of Saskatchewan, Saskatoon, Saskatchewan, Canada
†School of Public Health, University of Saskatchewan, Saskatoon, Saskatchewan, Canada
‡Muskoday First Nation, Saskatchewan, Canada
§Health Surveillance and Assessment Unit Service, Department of Indigenous Services Canada, Regina, Saskatchewan, Canada
¶Saskatchewan Health Quality Council, Saskatoon, Saskatchewan, Canada
Department of Indigenous Studies, College of Arts and Science, University of Saskatchewan, Saskatoon, Saskatchewan, Canada
**One Arrow First Nation, Saskatchewan, Canada
††York Factory First Nation, Manitoba, Canada
‡‡Crohn's and Colitis Canada, Saskatchewan Chapter, Saskatoon, Saskatchewan, Canada
§§James Smith Cree Nation, Saskatchewan, Canada
¶¶Department of Psychology, College of Arts and Science, University of Saskatchewan, Saskatoon, Saskatchewan, Canada
Division of Gastroenterology, College of Medicine, University of Saskatchewan, Saskatoon, Saskatchewan, Canada

Address correspondence to: Juan Nicolás Peña-Sánchez, MD, MPH, PhD, Room 3232 E-Wing Health Sciences, 104 Clinic Place, Saskatoon, SK S7N 5E5, Saskatchewan, Canada (juan.nicolas.ps@usask.ca).

Background: There is limited to no evidence of the prevalence and incidence rates of inflammatory bowel disease (IBD) among Indigenous peoples. In partnership with Indigenous patients and family advocates, we aimed to estimate the prevalence, incidence, and trends over time of IBD among First Nations (FNs) since 1999 in the Western Canadian province of Saskatchewan.

Methods: We conducted a retrospective population-based study linking provincial administrative health data from the 1999-2000 to 2016-2017 fiscal years. An IBD case definition requiring multiple health care contacts was used. The prevalence and incidence data were modeled using generalized linear models and a negative binomial distribution. Models considered the effect of age groups, sex, diagnosis type (ulcerative colitis [UC], Crohn disease [CD]), and fiscal years to estimate prevalence and incidence rates and trends over time.

Results: The prevalence of IBD among FNs increased from 64/100,000 (95% confidence interval [CI], 62-66) in 1999-2000 to 142/100,000 (95% CI, 140-144) people in 2016-2017, with an annual average increase of 4.2% (95% CI, 3.2%-5.2%). Similarly, the prevalence of UC and CD, respectively, increased by 3.4% (95% CI, 2.3%-4.6%) and 4.1% (95% CI, 3.3%-4.9%) per year. In contrast, the incidence rates of IBD, UC, and CD among FNs depicted stable trends over time; no statistically significant changes were observed in the annual change trend tests. The ratio of UC to CD was 1.71.

Conclusions: We provided population-based evidence of the increasing prevalence and stable incidence rates of IBD among FNs. Further studies are needed in other regions to continue understanding the patterns of IBD among Indigenous peoples.

Key Words: inflammatory bowel disease, ulcerative colitis, Crohn disease, epidemiology, Indigenous people, population group

Introduction

Ulcerative colitis (UC) and Crohn disease (CD) are the 2 main types of inflammatory bowel disease (IBD), presenting chronic, idiopathic, and relapsing-remitting disease characterized by inflammation of the gastrointestinal tract. Multiple epidemiological studies have described the rising prevalence and incidence rates of IBD worldwide.[1-8] Researchers have estimated that the global prevalence of IBD increased by 31% from 1990 to 2017, reaching 89.6 cases per 100,000 people.[5] Although the incidence of IBD has achieved a plateau in developed countries, developing countries have experienced an increase in the number of new IBD diagnoses.[5, 9] However, the highest prevalence and incidence rates of IBD are still reported in European and North American countries, especially in Canada.[4-6, 9, 10]

The incidence rate of IBD in Canada ranges from 18.7 per 100,000 people in the Pacific province of British Columbia to 51.8 per 100,000 people in the Atlantic province of Nova Scotia; the latter of which has the highest IBD rates reported worldwide.[11] Moreover, population-based evidence shows that the prevalence of IBD in Canada increased from 233,000 in 2012[12] to 270,000 in 2018.[13] This number is predicted to be 403,000 people by 2030, an increase that will challenge health care systems if they fail to prepare for the rising disease burden.[13] This preparation includes a better understanding of the disease patterns among different ethnic groups.

Traditionally, IBD has been considered a condition that is more predominant among Caucasians.[14] However, the diagnosis of IBD is now becoming more frequent across ethnicities and geographical locations.[14, 15] Despite the epidemiological evidence of IBD in the general Canadian population, there is limited evidence on the prevalence and incidence rates of IBD among Indigenous peoples, specifically among First Nations (FNs). The term *FNs* refers to the original inhabitants of the land that is now Canada who are not Inuit or Métis, a group of Indigenous peoples that encompasses approximately 1 million people from more than 600 communities and >60 languages.[16] Indeed, the available evidence in North America is focused on the concept that IBD is a rare condition among FNs.[17-20]

In 2001, Blanchard et al[17] noted that FNs had a lower risk of both UC and CD than the general population. Similarly, 2 other Canadian studies have reported higher rates of IBD in the general population than those observed among FNs.[19, 20] This limited understanding of IBD among FNs and other Indigenous peoples could result in health inequities. Indigenous peoples encounter disproportionally high health inequities relative to the general population[16, 21] and experience barriers in accessing health care because of multiple factors including the impacts of colonization, differences between Western ways and Indigenous ways of knowing and healing,[21] and language.[22] As such, detailed evidence of the prevalence and incidence rates of IBD among FNs is needed to promote disease awareness, overcome barriers, and improve specialized health care access to this population.

In partnership with Indigenous patients and family advocates (IPFAs—Indigenous patients living with IBD and family members who advocate for an Indigenous person with IBD), we aimed to estimate the prevalence, incidence, and changes over time of IBD among FNs since 1999 in the Canadian province of Saskatchewan.

METHODS

Setting and Data Source

This study was part of the patient-oriented research initiative entitled "Understanding and Advocating for *miyo-māhcihowin* [Cree for 'good health and well-being'] Among Indigenous Peoples Living With IBD," which aims to advocate for better health care and wellness for Indigenous peoples living with IBD through community-based evidence. This research was developed applying a collaborative framework with IPFAs in its core and had knowledge users (eg, health care providers and decision makers) and Indigenous and non-Indigenous scholars as research team members (Fig. 1).[23] This approach had as its foundational framework the Indigenous medicine wheel, supported by cultural safety and patient-oriented research principles and guided by 2 specific Truth and Reconciliation Commission (TRC) of Canada Calls to Action. The first call to action is TRC 18, which calls for ac-

Figure 1. Collaborative framework to advocate for *miyo-m*ā*hcihowin* among Indigenous peoples living with IBD.[23]

knowledging the current state of Aboriginal health and recognizing and implementing the health care rights of Aboriginal peoples. The second call to action is TRC 19, which calls for the government, in consultation with Aboriginal peoples, to establish goals to identify and close the gaps in health outcomes.[24] Within this framework, the research team members have been working within a collaborative environment fostering the principles of relationships, appreciating Indigenous ways of knowing and healing, and understanding the impacts of colonization, reconciliation, and advocacy for IBD care for Indigenous peoples.

Within this framework, we conducted a retrospective population-based study that linked administrative health data from the province of Saskatchewan, Canada, between April 1, 1999 and March 31, 2017 (fiscal years 1999-2000 to 2016-2017). Saskatchewan is a Western Canadian province with a population of 1.1 million inhabitants, of whom 16.3% are FNs. Saskatchewan has a universal single-payor health care system and administrative health databases that record all health services utilization. We accessed 3 datasets to conduct this study: the Person Health Registration System (PHRS), the Discharge Abstracts Database, and the Medical Service Branch dataset. We derived sociodemographic and health coverage information from the PHRS. We extracted acute-care hospital information from the Discharge Abstracts Database and outpatient physician visits from the Medical Service Branch. The latter has data on fee-for-service billings submitted by physicians regarding services provided to patients in the province, along with health care provision data of physicians whose payment is not on a fee-for-service basis (eg, salary basis). These databases were accessed through the Saskatchewan Health Quality Council and were electronically linked using encrypted, unique identification numbers.

IBD Definition and Study Population

For IBD case ascertainment, the International Classification of Diseases-9 and -10 codes (ICD-9 and ICD-10) for CD (ICD-9 555.x and ICD-10-CA K50.xx) and UC (ICD-9 556.x and ICD-10-CA K51.xx) were used. An algorithm that required multiple health care contacts was applied to identify patients diagnosed with IBD.[25] According to this algorithm, a patient with IBD should have at least 5 separate health care contacts (ie, either outpatient physician visits or hospitalizations) with a diagnosis of IBD within 2 years of continuous health care coverage. Individuals with <2 years of coverage were considered as having IBD if they had ≥3 separate health care contacts of IBD.[25] This case definition was previously validated, showing high accuracy against self-reported and chart review data,[25] and it was tested across multiple Canadian provinces.[26] In addition, this case definition has been recognized as the most accurate algorithm to identify adults with IBD when using Canadian administrative health databases[27] and has been used in multiple population-based IBD studies in Saskatchewan.[13, 26, 28-30]

Individuals meeting the IBD case definition were classified as CD or UC cases based on the most frequent diagnosis.[30] The date of diagnosis was defined as the first eligible health care contact of the case definition. The self-declared FNs status variable of the PHRS was used to differentiate IBD cases with FNs status from IBD cases from the general population. Those FNs residing in rural Saskatchewan locations were de-

scribed as those living in Census Agglomeration or Census Metropolitan Areas with 15,000 or more inhabitants.[28]

To differentiate between prevalent and incident cases of IBD, a washout period of 8 years was required before the date of diagnosis: specifically, 8 years of continuous health care coverage before this date without IBD health care contacts (either outpatient physician visits or hospitalizations with the diagnosis of UC or CD). This 8-year disease-free period has been used in previous studies in the field of IBD to differentiate incident from prevalent cases of IBD.[28, 31, 32] Consequently, we defined patients with prevalent cases as self-declared FNs aged ≥18 years who met the case definition. Patients with incident cases were defined as self-declared FNs aged ≥18 years who met the case definition and had 8 years of provincial health care coverage without IBD health care contacts before the date of diagnosis.

The self-declared FNs status variable of the PHRS was used to determine the population at risk, defined as all individuals aged ≥18 years with self-declared FNs status and provincial health insurance coverage.

Statistical Analysis

Counts of the IBD prevalence and incidence cases were categorized by age groups (ie, ages 18-29, 30-49, and ≥50 years), sex, type of diagnosis (UC or CD), and fiscal year. The prevalence and incidence data were modeled using the negative binomial distribution of the generalized linear models. The negative binomial distribution was suitable for the overdispersed nature of the data based on a model fit assessment. The model fit of the models was evaluated using a Pearson χ^2/residual of the degree of freedom ratio, which should be close to 1.[33] To account for correlation among prevalence data, generalized estimating equations with an exchangeable correlation structure were included in the prevalence models.

Age groups, sex, diagnosis type, and fiscal year were the covariables included in the prevalence and incidence models. Fiscal year was included in the model as a continuous predictor to estimate the average percentage changes of the IBD prevalence and incidence rates over time. The natural logarithm of the total self-declared FNs population was used as the model offset. Prevalence and incidence rates along with their 95% confidence intervals (95% CI) were reported. The level of significance for all the analyses was α = 0.05. Modeling was done in PROC GENMOD using SAS software, version 9.4 (SAS Institute, Cary, NC).

Sensitivity Analysis

We conducted a sensitivity analysis using other IBD case definitions to overcome potential limitations of the Bernstein case definition that was used in this study.[25] We used the IBD case definition developed by Rezaie et al,[34] which required 4 physician claims within 2 years or 1 hospitalization with a diagnosis of IBD, and an algorithm validated in Ontario by Benchimol, Guttmann, and colleagues,[27] which required 5 outpatient physician contacts or hospitalizations within 4 years. Furthermore, we applied 3 modifications to the Bernstein IBD case definition[25] used in this study, reducing the required number of health care contacts within 2 years of health care coverage and adding a prescription medication claim to the case definition criteria. Subsequently, we modeled the prevalence and incidence data obtained with each of these case definitions as conducted in the main data analysis. This

sensitivity analysis aimed to evaluate whether other case definitions changed the estimated IBD prevalence and incidence rates among FNs and the corresponding trends over time.

Ethics

This research was conducted in compliance with the University of Saskatchewan's Behavioural Research Ethics Board, which approved this study under identification #977.

RESULTS

There were 140 FNs individuals meeting the IBD case definition between 1999-2000 and 2016-2017. The majority of these patients were between ages 30 and 49 years (54.3%), had UC (64.3%), and were female (57.1%; Table 1). The UC-to-CD ratio of prevalent cases was 1.80.

In total, 114 incident IBD cases were identified during the study period, with a mean age at diagnosis of 41.43 years (standard deviation, 15.18; median, 41; interquartile range, 31-51). The ratio of UC (n = 72; 63.2%) to CD (n = 42; 36.8%) was 1.71, and the female (n = 68; 59.7%)-to-male (n = 46; 40.3%) ratio was 1.48. The majority of the IBD cases were living in urban areas (n = 65; 57.0%). By region, at the date of diagnosis, considerable numbers of patients with IBD were living in the 2 largest cities and surrounding areas and in central Saskatchewan (Fig. 2).

The model-based prevalence estimates of IBD among FNs increased from 64 (95% CI, 62-66) per 100,000 people in 1999-2000 to 142 (95% CI, 140-144) per 100,000 people in 2016-2017 (Fig. 3), with an average annual increase of 4.2% (95% CI, 3.2%-5.2%). We also observed increasing prevalence trends over time for both UC and CD between 1999-2000 and 2016-2017 (Fig. 3).

During the study period, the prevalence of UC increased from 37 (95% CI, 36-38) per 100,000 people to 87 (95% CI, 86-89) per 100,000 people, and the prevalence of CD increased from 28 (95% CI, 27-29) per 100,000 people to 53 (95% CI, 52-55) per 100,000 people. Similar to the IBD trends, the average annual prevalence of UC and CD among FNs increased by 3.4% (95% CI, 2.3%-4.6%) and 4.1% (95% CI, 3.3%-4.9%), respectively.

The model-based incidence rates of IBD among FNs depicted a stable trend during the study period, showing incidence rates of 11 (95% CI, 5-25) per 100,000 people in 1999-

2000, 12 (95% CI, 6-23) per 100,000 people in 2007-2008, and 3 (95% CI, 1-11) per 100,000 people in 2016-2017. As presented in Table 2, whereas the annual incidence rates of UC among FNs fluctuated between 0 and 4/100,000 people, this rate for CD varied between 3/100,000 and 7/100,000 people. No statistically significant annual average percentage changes were observed in the incidence rates over time for IBD, UC, and CD (Table 2).

In the sensitivity analysis, the other 2 validated definitions and the 3 modified algorithms captured similar numbers of IBD cases. These definitions yielded comparable results regarding the prevalence and incidence rates and corresponding trends over time (Fig. 4). In comparison to the original Bernstein IBD algorithm used in this study,[25] only 1 of the modified case definitions was able to capture more IBD cases among FNs, providing slightly higher annual prevalence estimates: specifically, the modified definition that required 4 IBD contacts within 2 years of health care coverage or 3 IBD contacts within <2 years of coverage. Notably, the prevalence and incidence rates across the applied case definitions were quite consistent. The linear trends consistently showed an increasing prevalence and stable incidence rates of IBD among FNs. Only the model that used the cohort created with the case definition of Benchimol et al[27] suggested a declining trend in the incidence of IBD. This decline could be associated with the low number of patients with IBD captured by this specific case definition at the end of the study period.

Discussion

This study is the first to estimate the annual prevalence and incidence rates of IBD and determine their trends over time among FNs, the largest group of Indigenous peoples in Canada. We provided population-based evidence of the increasing prevalence of IBD among FNs and their stable incidence rates since 1999 in the Western Canadian province of Saskatchewan.

Despite the limited literature on IBD among Indigenous peoples, we consider it relevant to compare our findings with studies from different countries and regions involving Indigenous communities. A recent literature review by Day et al[35] highlighted the low numbers of IBD among Indigenous Australasian populations, Aboriginal people of Australia, and Māori peoples in New Zealand. Iyngkaran et al[36] used hospital data from the Northern Territory of Australia and also identified a low number of IBD cases among Indigenous Australians (3 out of 64,560). These results are congruent with the conclusions from 2 population-based studies from Manitoba, Canada, that reported low rates of IBD among individuals with Indigenous background.[19, 20] These studies considered Indigenous and non-Indigenous populations in their research and focused on contrasting IBD numbers between Indigenous peoples and those observed in the general population, mainly those with European background. In contrast to previous evidence, our study provided detailed information on IBD prevalence and incidence rates and trends over time among FNs.

We consider it relevant to contrast our results among FNs with the epidemiology of IBD in the general population. The increasing prevalence rate of IBD described in our study mirrors the evolution of IBD in Canada[11, 13] and around the world.[2, 4, 6-8] For example, data from Canadian provinces estimated an IBD prevalence of 0.5% in 2006.[26] This number

Table 1. Descriptive Characteristics of FNs With IBD Diagnosis in Saskatchewan, Canada, Between Fiscal Years 1999-2000 and 2016-2017 (n = 140)

| Variable	n (%)
Age group, y	
≤29	34 (24.3)
30-49	76 (54.3)
≥50	30 (21.4)
Disease type	
UC	90 (64.3)
CD	50 (35.7)
Sex	
Female	80 (57.1)
Male	60 (42.9)
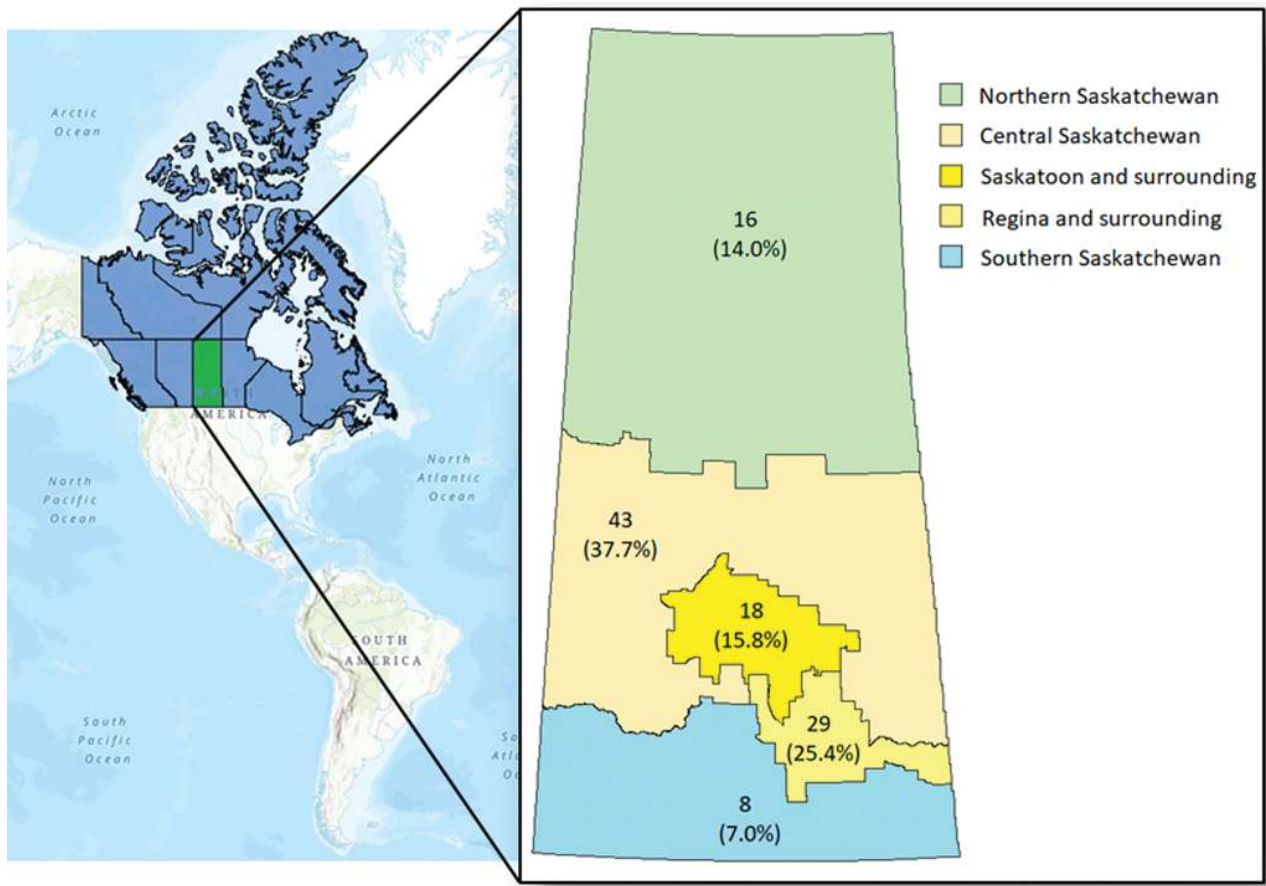
Figure 2. Region of residence of FNs at the time of diagnosis with IBD, Saskatchewan, Canada, between fiscal years 1999-2000 and 2016-2017 (n = 114).

was updated to 0.7% in 2018 and is forecast to rise to 1% of the population by 2030.[13] In international studies, researchers[8] observed that the prevalence of IBD among people in 195 countries increased from 3.7 million in 1990 to >6.8 million in 2017. The regions with the highest number of patients with IBD include North American and European countries.[2, 8] All of these studies agree on the increasing prevalence of IBD across regions and population groups. However, when comparing our findings with population-based studies in the general population, we observed that the average annual increase in the prevalence of IBD among FNs (4.2%) was higher than that among the general population of Saskatchewan (3.4%)[37] and Canada (2.9%).[13] This comparison highlights the potentially higher rate of increase in the prevalence of IBD among FNs in comparison to the rate in the general population. This discrepancy may be explained by the differences in trends in IBD incidence rates between these 2 groups.

We identified stable incidence rates of IBD among FNs. Previous Canadian population-based studies (ie, in the provinces of Saskatchewan and Nova Scotia) reported significant declining trends in the incidence rates of IBD in the general population.[28, 38] In Saskatchewan, the incidence rates of IBD in the general population dropped from 75/100,000 in 1999 to 15/100,000 in 2016.[28] These numbers contrast with the stable trend of IBD among FNs reported in this study (eg, 11/100,000 population in 1999 and 3/100,000 in 2015). In

addition, we found in this study that most of the FNs diagnosed with IBD were living in urban areas at the date of diagnosis. This finding concurs with the higher rates of IBD described among people living in urban centers compared to rural residents.[39, 40] In addition, population-based studies around the world have uncovered stable or decreasing incidence rates of IBD among many high-income countries.[4, 9] However, evidence has also revealed the increasing incidence rates of IBD in newly industrialized countries in Africa, Asia, and South America, in which societies have become more Westernized and urbanized.[9] These phenomena may also be occurring among Indigenous communities in North America.

The evolution of IBD as a global disease has been classified into 4 epidemiological stages: emergence, acceleration in incidence, compounding prevalence, and prevalence equilibrium.[4] Our work suggests that the epidemiology of IBD among FNs could be in the compounding prevalence stage. In this stage, the incidence of IBD is stable, whereas the prevalence increases steeply.[4] In other words, we are observing a continuous increase in the number of FNs living with IBD despite the number of FNs newly diagnosed with IBD seeming to be stable over time. These trends could be explained by the chronic nature of IBD, its incurability and low mortality, and that IBD is commonly diagnosed among adolescents and young adults.[1, 2, 4, 13] In fact, the combined increasing IBD prevalence and stable or even declining incidence of IBD is
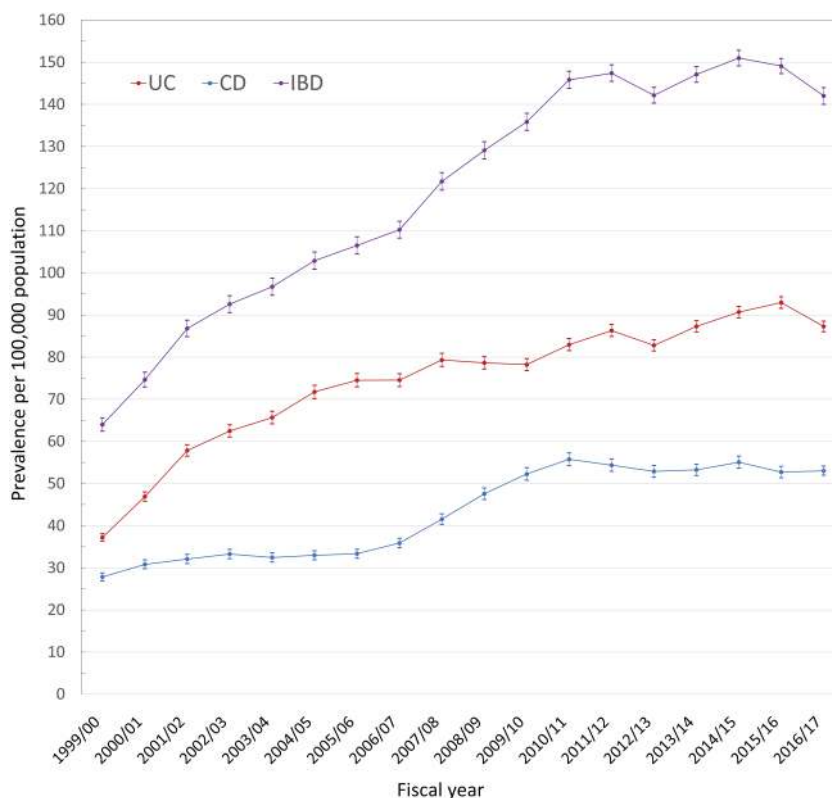
Figure 3. Model-based prevalence estimates with 95% CI of IBD, UC, and CD among FNs in Saskatchewan, Canada, from fiscal years 1999-2000 to 2016-2017.

a phenomenon described by multiple researchers around the world.[4, 6, 7, 10, 11, 13]

We also observed a higher rate of female FNs diagnosed with IBD in comparison to their male counterparts (female-to-male ratio = 1.48). This ratio among FNs is similar to the female-to-male ratios observed in other countries[6, 8] and across Canadian provinces (specifically, from 1.20 to 1.30).[11, 28] In contrast, we observed a higher incidence of UC than CD among FNs (UC-to-CD ratio = 1.71). Most of the Canadian provinces have UC-to-CD ratios around 1 in the general population; a considerable predominance of CD versus UC has only been reported in the eastern province of Quebec.[11] UC is a predominant disease among countries in Asia, with studies reporting a UC-to-CD ratio of between 0.9 and 15.6.[40, 41] This ratio not only varies across regions, but it also changes over time.[4, 40] For example, population-based data from Taiwan reported a significant decline in the UC-to-CD ratio, from 4.32 in 2001-2005 to 2.03 in 2010-2015.[41] These numbers highlight the variability in the diagnosis rates of UC and CD across regions and populations. Consequently, subsequent IBD studies among Indigenous communities should monitor the UC-to-CD ratio, contrasting the numbers across regions and evaluating its evolution over time.

Given that Indigenous peoples face health care barriers and experience health inequities,[16, 21] subsequent studies evaluating differences in access to IBD care and health care utilization patterns between FNs and the general population are also needed. This evidence is required to develop holistic strategies that can address different disease patterns among

Table 2. Model-Based Adjusted Incidence Rates With 95% CI of IBD, UC, and CD Among FNs in Saskatchewan, Canada, from Fiscal Years 1999-2000 to 2016-2017

Fiscal Year	IBD	UC	CD
1999-2000	11 (5-25)	4 (1-15)	7 (2-18)
2000-2001	16 (8-31)	13 (6-27)	3 (1-13)
2001-2002	10 (5-23)	5 (2-17)	5 (1-15)
2002-2003	13 (7-27)	10 (5-23)	3 (1-12)
2003-2004	11 (5-24)	10 (4-23)	1 (0-11)
2004-2005	11 (5-23)	10 (4-22)	1 (0-10)
2005-2006	5 (1-14)	3 (1-13)	1 (0-10)
2006-2007	6 (2-16)	3 (1-12)	3 (1-11)
2007-2008	12 (6-23)	6 (2-16)	5 (2-14)
2008-2009	8 (4-19)	4 (1-13)	4 (1-12)
2009-2010	6 (2-15)	1 (0-10)	4 (1-12)
2010-2011	8 (4-18)	7 (3-16)	1 (0-9)
2011-2012	6 (3-16)	4 (1-12)	2 (1-10)
2012-2013	6 (3-15)	4 (1-12)	2 (1-9)
2013-2014	7 (3-17)	5 (2-13)	2 (1-9)
2014-2015	15 (9-27)	10 (5-19)	5 (2-13)
2015-2016	11 (5-20)	9 (5-19)	1 (0-8)
2016-2017	3 (1-11)	0 (0-0)	3 (1-10)
Trend estimates*	–2.7 (–6.2 to 0.8)	–2.7 (–7.4 to 2.2)	–2.2 (–7.8 to 3.7)

*Annual average percentage change with corresponding 95% CI.

Prevalence
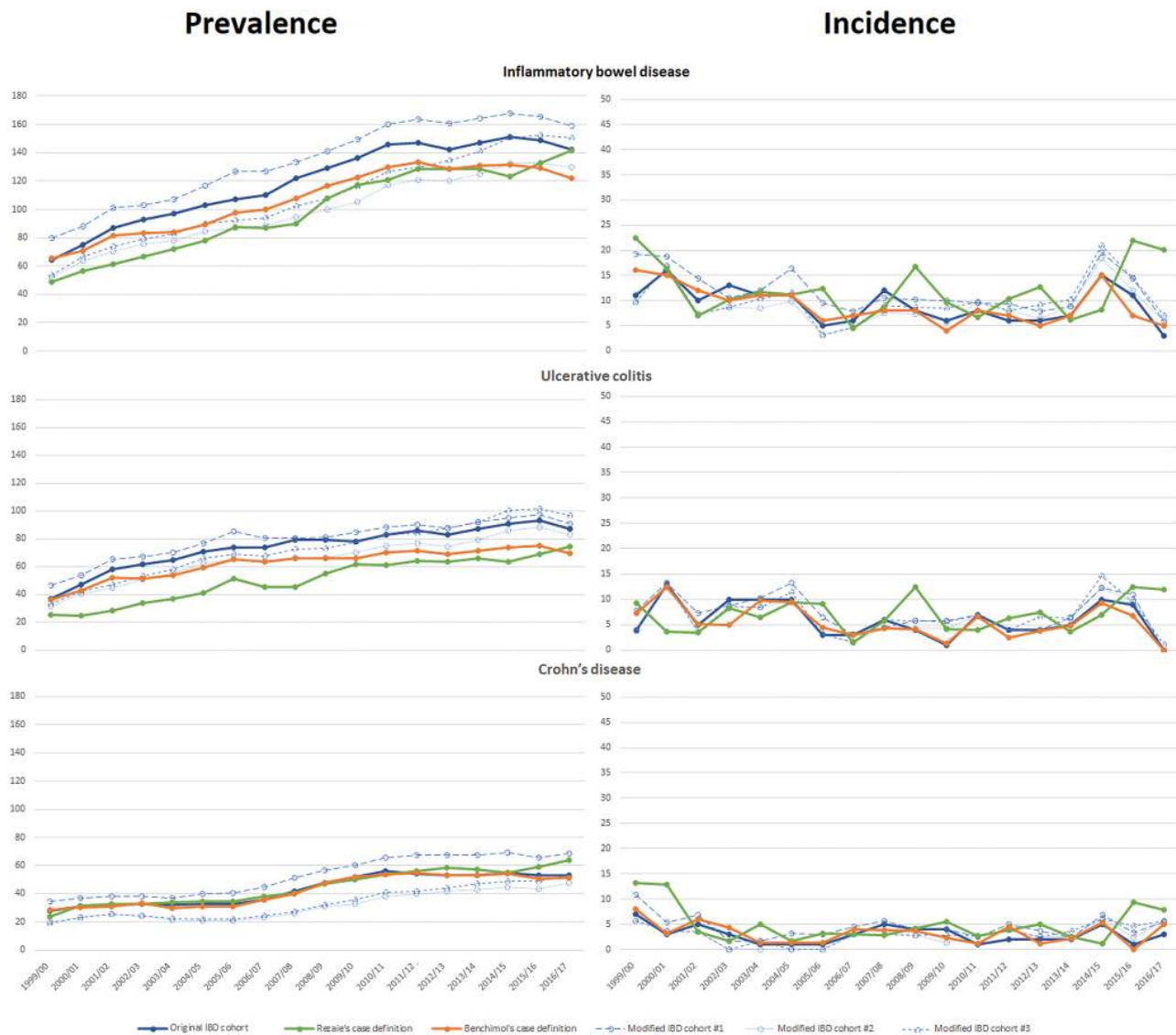
Incidence

Figure 4. Sensitivity analysis results. Model-based prevalence and incidence estimates of IBD, UC, and CD among FNs in Saskatchewan, Canada, from fiscal years 1999-2000 to 2016-2017, applying different case definitions.

different ethnic groups. The IPFAs who are part of this patient-oriented research initiative believe that as the number of FNs living with IBD increases, health care providers should be more attentive regarding IBD among Indigenous peoples so that people can receive diagnoses and access to care more quickly to enjoy a better quality of life. In addition, IPFAs consider that increases in the prevalence of IBD are alarming and may be linked to the susceptibility of FNs to IBD, dietary changes, and evolving disease awareness. The IPFAs have stated that FNs may either become more susceptible to IBD or have been misdiagnosed for years, given that Indigenous health has not always been a priority for mainstream medicine. In addition, dietary changes could play a role in the increasing trends of IBD among FNs, because Indigenous peoples have been shifting from a traditional diet to a Western diet. Therefore, subsequent studies should explore these issues to better understand IBD among Indigenous peoples. Finally, further epidemiological studies of IBD among different ethnic groups, such as our study, could inform health care professionals and decision makers

to adopt policies that improve the health and well-being of Indigenous peoples living with IBD.

Our study has some limitations because of the case definition and data source. We used a validated and well-recognized algorithm to identify patients with diagnosed IBD.[25, 27] This definition required multiple IBD health care contacts to overcome potential misclassification bias and limitations of using administrative health databases. Although this case definition was originally developed and validated in the general population, its accuracy may vary among FNs. To overcome this limitation, we completed a sensitivity analysis using other validated IBD case definitions and modified the study's algorithm. Despite the slight variations in the estimates, the sensitivity analysis results were reassuring because comparable prevalence and incidence rates were obtained, and consistent trends over time were observed across case definitions.

Another limitation is related to the self-declared FNs status variable from the PHRS. This legal identity variable is captured by eHealth (the provincial organization that supports health care in Saskatchewan) when individuals apply for health cover-

age, specifically when they apply for their provincial health card. New Saskatchewan residents are required to register themselves and their dependents for a Saskatchewan Health Card to receive health benefits. Applicants are asked to declare whether they have FNs status and to provide the supporting document (ie, certificate of Indian Status). Since 2010, individuals have had the option to declare whether they have FN status. Consequently, the prevalence and incidence estimates reported in this study could be underestimated. It is important to highlight that non-FNs individuals could not be included in this study, given the described process and requirements.

An additional potential limitation is misclassification between the incident and prevalent IBD cases, which could occur given that IBD can relapse.[25] However, we applied an 8-year disease-free period (before 1999) to identify incidence from prevalence cases correctly. In addition, we discarded available data from the 1998-1999 and 2017-2018 fiscal years because the numbers of prevalent and incident cases may be inaccurate. In addition, a small number of incident cases was observed during the study period. We acknowledge that the numbers in the incidence rates may influence the ability to detect statistically significant changes over time.

We also want to highlight the population-based nature of this research and the study period as strengths of this work, along with the robust methodological approach to estimate prevalence and incidence rates controlling by multiple confounding variables. Thus, our collaborative framework and methodology can be adopted by other national and international studies aiming to establish the epidemiology of IBD among Indigenous populations.

Conclusions

In Saskatchewan, Canada, we observed an average annual increase of 4.2% in the prevalence of IBD among FNs between 1999 and 2017. This increase in the prevalence of IBD among FNs was greater than that observed in the general population. The incidence rates of IBD among FNs depicted stable trends over time. Our findings also illustrated the predominance of UC relative to CD among FNs. Further epidemiological studies are needed in other regions in North America and worldwide to understand the evolution of UC and CD among Indigenous individuals. Such studies are fundamental to advocate for better wellness and health care for Indigenous peoples living with IBD and to promote awareness and a better understanding of IBD among Indigenous peoples.

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