Chronic Diseases and Risk Factors in Canada's Northern Populations: Longitudinal and Geographic Comparisons

Kathleen N. Deering, MSc,[1] Lisa M. Lix, PhD,[2] Sharon Bruce, PhD,[3] T. Kue Young, MD, PhD[4]

ABSTRACT

Objective: Chronic diseases are the leading cause of death and disability worldwide and place considerable burden on the Canadian health care system. This research investigates the self-reported prevalence of major chronic diseases and risk factors in northern Canadian populations and compares their prevalence to southern Canadian populations over time.

Methods: Canadian Community Health Survey (CCHS) cycle 1.1 (2000/01) and 3.1 (2005) data were used for the analyses. Respondents 20 years old or greater in the Yukon, Northwest Territories, and Nunavut comprised the northern Canadian sample. Respondents in the same age group in the rest of Canada comprised the southern Canadian sample. Unadjusted and adjusted weighted prevalence estimates and confidence intervals were calculated and tested for significance using z-tests.

Results: Northern Canadian respondents had significantly lower crude prevalence of self-reported hypertension, arthritis/rheumatism, diabetes, heart disease and stroke than southern Canadian respondents, although these associations did not remain significant after adjusting for age and sex. Northern Canadian respondents had significantly lower adjusted prevalence of any chronic disease. However, northern Canadian respondents had significantly higher adjusted prevalence of obesity and smoking than southern Canadian respondents at both time periods. The prevalence of any chronic disease increased significantly from 2000/01-2005 for both northern and southern Canadian respondents.

Discussion: The higher prevalence of key chronic disease risk factors in northern Canadian populations and the increasing prevalence for many chronic diseases in both southern and northern populations signal a need for continual monitoring of chronic diseases and the development of appropriate prevention and management strategies.

Key words: Chronic disease; Yukon Territory; Northwest Territories; Nunavut; surveillance; health surveys

La traduction du résumé se trouve à la fin de l'article.

Can J Public Health 2009;100(1):14-17.

Chronic diseases are a significant health problem worldwide and in Canada, and appear to be on the rise. In the National Population Health Survey (1996/97), 57.5% of Canadian residents (excluding Canadians in the three northern territories) reported having at least one chronic condition.[1] Among respondents, 10.1% reported having high blood pressure, 3.9% had heart disease and 3.2% had diabetes. In recent studies (2000/01), 13.0% of all Canadians reported having high blood pressure, 5.0% had heart disease and 4.2% had diabetes.[2,3]

While chronic diseases are also common in northern Canadian (NC) populations, some diseases, including heart disease,[2] hypertension and diabetes,[3] have been found to be lower in NC than in the rest of Canada, although there have been limited comparisons across multiple diseases. However smoking, a major risk factor for chronic diseases, has been shown to be higher in northern residents (49%) compared with non-northern residents (29%).[4]

Northern populations in the circumpolar region have begun to experience the emergence of chronic diseases such as cardiovascular diseases, diabetes and obesity, which have occurred in other populations undergoing rapid social, cultural and economic transition.[5] While there are many urgent health concerns affecting northern populations, strategically the time to conduct research into chronic disease prevention is now, when the problem is still relatively limited in scope. This research investigates the self-reported prevalence of multiple major chronic diseases and chronic disease risk factors in NC populations, including Nunavut and the Northwest and Yukon Territories, comparing their prevalence to southern Canadian (SC) populations over time.

METHODS

This research uses data from the Canadian Community Health Survey (CCHS) cycles 1.1 and 3.1. The CCHS is a national health survey that covers approximately 98% of the Canadian population aged 12 years or older.[6] The CCHS is conducted by Statistics Canada to provide regular and timely cross-sectional estimates of health determinants, health status, and health system utilization for a total of 136 health regions in Canada, including the territories.[6] CCHS cycle 1.1 data were collected between September 2000 and November 2001[6] and cycle 3.1 data were collected in 2005.[7] Access to the CCHS data was obtained from the Public Use Microdata Files (PUMF) through the Statistics Canada Data Liberation Initiative. Individuals in the Yukon, Northwest Territories, and Nunavut who were respondents to one of two CCHS cycles (cycle 1.1 or 3.1) and 20 years or older comprise the NC sample. Individuals who were not residents of the Yukon, Northwest Territories, or Nunavut comprise the SC sample. Ethics approval for this project was obtained from the University of Manitoba Health Research Ethics Board.

Author Affiliations

1. School of Population and Public Health, University of British Columbia, Vancouver, BC
2. School of Public Health, University of Saskatchewan, Saskatoon, SK
3. Department of Community Health Sciences, University of Manitoba, Winnipeg, MB
4. Department of Public Health Sciences, University of Toronto, Toronto, ON

Correspondence: Kathleen N. Deering, Department of Health Care and Epidemiology, Faculty of Medicine, University of British Columbia, 5804 Fairview Avenue, Vancouver, BC V6T 1Z3, Tel: 604-314-4350, E-mail: kdeering@interchange.ubc.ca

Reprint requests: Lisa M. Lix, School of Public Health, University of Saskatchewan, 107 Wiggins Road, Saskatoon, SK S7N 5E5, Tel: 306-966-1617, Fax: 306-966-7920, E-mail: lisa.lix@usask.ca

Acknowledgements: This research was supported by a CIHR team grant, "CIHR Team in Circumpolar Chronic Diseases Prevention".

Table 1. Age- and Sex-adjusted Prevalence (%) of Chronic Diseases and Risk Factors in the Canadian Community Health Survey

	Cycle 1.1 (2000/2001)				Cycle 3.1 (2005)			
	NC		SC		NC		SC	
	Estimate (%)	95% CI	Estimate (%)	95% CI	Estimate (%)	95% CI	Estimate (%)	95% CI
Any chronic disease	62.0†§	[59.3 – 64.7]	67.0†§	[66.5 – 67.5]	67.2‡§	[64.5 – 69.9]	71.5‡§	[71.1 – 71.9]
Arthritis	18.9	[16.6 – 21.2]	18.0§	[17.6 – 18.4]	19.8	[16.6 – 23.0]	18.6§	[18.2 – 18.9]
Asthma	8.1	[6.7 – 9.5]	7.8	[7.5 – 8.1]	7.9	[6.3 – 9.6]	7.8	[7.5 – 8.1]
Chronic bronchitis	3.0	[1.9 – 4.1]	3.1§	[2.9 – 3.3]	2.7	[1.4 – 4.0]	2.7§	[2.5 – 3.0]
Diabetes	4.6	[2.9 - 6.3]	4.8§	[4.6 – 5.0]	5.6	[3.6 – 7.5]	5.5§	[5.2 – 5.7]
Heart disease	6.7	[5.0 – 8.4]	6.0§	[5.8 – 6.3]	5.3	[2.7 – 7.9]	5.4§	[5.2 – 5.6]
Hypertension	14.5	[12.2 – 16.8]	15.0§	[14.7 – 15.3]	15.7	[12.9 – 18.6]	16.9§	[16.2 – 17.7]
Stroke	0.9	*	1.3	[1.2 – 1.4]	1.6	*	1.3	[1.2 – 1.4]
Alcohol consumption								
Regular	53.0†§	[50.7 – 55.3]	60.4†§	[59.9 – 60.9]	57.9‡§	[55.3 – 60.4]	63.9‡§	[63.5 – 64.3]
Body Mass Index								
Underweight	5.7†§	[4.5 – 6.9]	8.0†§	[7.7 – 8.3]	1.6‡§	[0.8 – 2.4]	2.6‡§	[2.5 – 2.8]
Normal weight	38.8†	[36.2 – 41.4]	43.4†§	[42.8 – 44.0]	40.5‡	[37.2 – 43.7]	47.1‡§	[46.5 – 47.6]
Overweight	33.4	[30.9 – 35.9]	33.3§	[32.8 – 33.8]	34.0	[30.9 – 37.3]	34.3§	[33.8 – 34.8]
Obese	22.1†	[19.9 – 24.4]	15.3†§	[14.9 – 15.7]	23.9‡	[21.0 – 26.8]	16.0‡§	[15.6 – 16.4]
Physical activity (leisure)								
Active	23.2†§	[21.2 – 25.2]	19.9†§	[19.5 – 20.3]	20.5‡§	[18.1 – 22.9]	23.8‡§	[23.3 – 24.2]
Moderately active	21.8§	[19.8 – 23.8]	23.4§	[22.9 – 23.9]	25.9§	[23.2 – 28.5]	25.4§	[25.0 – 25.8]
Inactive	55.1	[51.8 – 58.4]	56.7§	[56.1 – 57.3]	53.6	[49.9 – 57.4]	50.9§	[50.2 – 51.5]
Physical activity (total)								
Regular	57.9	[55.4 – 60.5]	58.2§	[57.6 – 58.8]	60.3‡	[57.6 – 62.9]	64.9‡§	[64.5 – 65.3]
Occasional	12.9†	[11.2 – 14.6]	17.9†§	[17.5 – 18.3]	13.9‡	[11.7 – 16.0]	16.2‡§	[15.8 – 16.6]
Infrequent	29.1†	[26.5 – 31.7]	23.8†§	[23.3 – 24.3]	25.8‡	[22.7 – 28.9]	18.9‡§	[18.5 – 19.3]
Smoking								
Daily	35.8†§	[33.7 – 38.0]	22.3†§	[21.9 – 22.7]	31.2‡§	[28.4 – 34.0]	17.8‡§	[17.4 – 18.2]

* Sample size was too small to estimate coefficients of variation
† adjusted prevalence in NC population is significantly different from SC population in cycle 1.1 (2000/01), $p<0.05$
‡ adjusted prevalence in NC population is significantly different from SC population in cycle 3.1 (2005), $p<0.05$
§ adjusted prevalence was significantly different between cycle 1.1 to 3.1, $p<0.05$

Prevalence estimates, 95% confidence intervals (CIs) and z-tests of significance were calculated. Sampling weights were used to compute all estimates. Both crude and sex- and age-adjusted estimates were calculated; the latter were obtained by the direct standardization method using the age and sex distribution of the Canadian population (age strata: 20-24, 25-29,…,80+).[8] Coefficients of variation (CVs), produced by Statistics Canada and derived from the variance formula for simple random sampling and the design effect, were used to calculate 95% confidence intervals.[6] CVs are estimated using CV "look-up" tables for the PUMF for cycle 1.1[6] and 3.1.[7] Approximate CVs are based on the size of the estimate calculated from the survey data (weighted numerator and prevalence).[6,7] Ratios of cycle 3.1 to cycle 1.1 prevalence estimates were computed for both SC and NC respondents.

Definitions

Prevalence estimates were produced for diagnoses of diabetes, heart disease, stroke, hypertension, arthritis, asthma, chronic bronchitis and any chronic condition. Chronic disease risk factors that were investigated include body mass index (BMI), smoking status, alcohol consumption, and physical activity level. Three categories of BMI were investigated: normal weight (BMI ≥20 and <25), overweight (≥25 and <30) and obese (≥30).[9,10] The percentage of daily smokers and regular drinkers was investigated.[9,10] Questions about leisure activity participation were used to estimate energy expenditure and categorize respondents as active, moderately active or inactive.[9,10] Leisure physical activity includes activities such as walking, jogging, bowling, weight-training and team sports.[9,10] Respondents also provided their monthly frequency of all physical activity lasting 15 minutes or more, categorized as frequent, regular or infrequent.[9,10]

RESULTS

In CCHS cycle 1.1 (2000/01), there were 2,074 respondents in the NC sample and 111,249 respondents in the SC sample; in cycle 3.1 (2005), there were 2,275 and 117,629 respondents in the NC and SC samples, respectively.

The most common chronic diseases in both populations were arthritis, hypertension, and asthma. In both cycles, NC populations had significantly lower crude prevalence of arthritis, hypertension, diabetes, heart disease and stroke and of any chronic condition compared with SC populations; prevalence of asthma was not significantly different between the two populations. However, after adjusting for age and sex, only the prevalence of any chronic disease remained significantly lower for NC than for SC populations in both cycles (Table 1).

In NC populations, comparisons over time revealed that only the adjusted prevalence of any chronic disease significantly increased from cycle 1.1 (2000/01) to 3.1 (2005) (Table 1). In contrast, in SC populations, the prevalence of diabetes, high blood pressure and arthritis and of any chronic condition significantly increased over time; the prevalence of heart disease decreased significantly. However, the relative increase in prevalence was greater for NC than for SC populations for any chronic condition, asthma, diabetes and stroke and was lower for NC than SC populations for hypertension (Table 2). The relative decrease in heart disease was greater for NC populations and for chronic bronchitis was smaller (Table 2).

In both cycles, NC populations had significantly lower crude prevalence of people of normal weight, and more people who were obese and overweight (significantly for the former). There was a significantly higher crude prevalence of people who were daily smokers in NC populations, but fewer people who reported being regular or occasional drinkers (significantly for the former).

In cycle 1.1, there was a significantly lower crude prevalence of inactive NC compared to SC respondents (classified based on leisure physical activity), and more NC respondents were active or moderately active (significantly for the former). However, in cycle 3.1, more NC than SC respondents were classified as being inactive or

Table 2. Ratio of Chronic Disease Prevalence and Percentage Change in Prevalence for NC and SC Populations in the Canadian Community Health Survey

	NC Population (% change)	SC Population (% change)
Any chronic disease	8.39%	6.72%
Arthritis	4.76%	3.33%
Asthma	-2.47%	0.00%
Chronic bronchitis	-10.00%	-12.90%
Diabetes	21.74%	14.58%
Heart disease	-20.90%	-10.00%
Hypertension	8.28%	12.67%
Stroke	77.78%	0.00%
Alcohol consumption		
Regular	9.25%	5.79%
Body Mass Index		
Underweight	-71.9%	-67.5%
Normal weight	4.38%	8.53%
Overweight	1.80%	3.00%
Obese	8.14%	4.58%
Physical activity (leisure)		
Active	-11.64%	19.60%
Moderately active	18.81%	8.55%
Inactive	-2.72%	-10.23%
Physical activity (total)		
Regular	4.15%	11.51%
Occasional	7.75%	-9.50%
Infrequent	-11.34%	-20.59%
Smoking		
Daily	-12.85%	-20.18%

Note: % change is calculated for the Canadian Community Health Survey cycle 1.1 (2000/01) and cycle 3.1 (2005)

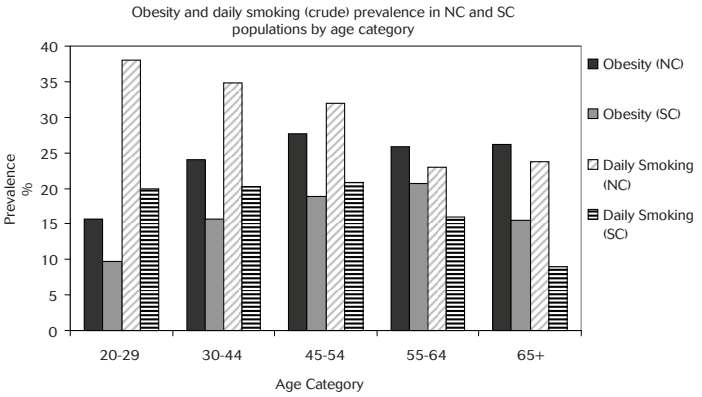
moderately inactive, and fewer were active (none significantly). In cycle 1.1, more NC than SC respondents were classified as having infrequent and regular physical activity (based on total physical activity), but fewer NC respondents had occasional physical activity (no comparisons were significant). In cycle 3.1, however, significantly more NC than SC respondents had infrequent physical activity and fewer had occasional or regular physical activity (not significant).

Even after adjusting for age and sex, many risk factors for chronic diseases remained higher in NC populations in both cycles, including levels of obesity *(*$p<0.05$*)* and overweight; significantly fewer NC respondents were of normal weight (Table 1). Age-specific estimates of obesity (Figure 1) reveal that the difference between the two populations persisted at all age groups. The prevalence of obesity did not increase significantly over time for either population (Table 1).

There were significantly more daily and occasional smokers in NC compared with SC populations after adjusting for age and sex. Smoking was highest in the youngest age group, with 38.0% of NC residents who were 20 to 29 years in 2005 reporting daily smoking (Figure 1). In both populations, the prevalence of daily smoking decreased significantly between cycles 1.1 and 3.1 (Table 1). The prevalence of regular drinkers remained significantly higher in the south compared with the north in both cycles, but both NC and SC respondents reported a significantly higher prevalence of regular drinking in cycle 3.1 compared with 1.1 (Table 1).

In cycle 1.1, significantly more NC respondents were classified as active compared with SC respondents (based on leisure physical activity); however, again, this association had reversed for cycle 3.1, where fewer NC respondents were active (Table 1). The adjusted prevalence of active NC respondents decreased significantly from cycle 1.1 to 3.1, while this increased significantly in SC respondents. The prevalence of infrequent physical activity was significantly higher in NC compared with SC respondents in both cycles,

Figure 1. Age-specific estimates of obesity and daily smoking among NC and SC populations in the Canadian Community Health Survey



Note: Data are from the Canadian Community Health Survey cycle 3.1 (2005)

and decreased significantly from cycle 1.1 to 3.1 for SC respondents.

DISCUSSION

According to two waves of population-based health survey data, the prevalence of multiple major chronic diseases was not significantly different in northern and southern Canadian residents. The prevalence of having any chronic disease was significantly higher in SC compared with NC respondents in both waves; however having any chronic disease increased significantly in both populations over time. As well, the prevalence of several key chronic disease risk factors, including smoking and obesity, was significantly higher in NC than SC respondents. Although NC respondents were more active than SC respondents in cycle 1.1, as defined by leisure physical activity, they had higher prevalence of infrequent physical activity, as defined by all physical activity. In addition, NC respondents were less physically active than SC respondents on both measures of physical activity in cycle 3.1.

High levels of chronic disease risk factors represent a major threat to the long-term health of northern Canadians and reducing them is a significant public health challenge. The risk of developing many chronic diseases increases with excess weight[3,11] and smoking.[3] Sedentary lifestyles contribute to gaining weight and also the risk for developing some chronic diseases.[11] The decreases in heart disease and smoking over time in each area seem promising; however, the increase in overweight and obesity levels suggest that chronic diseases, particularly in the north, may remain a problem in the future. In addition, when assessing the burden of diseases where a high proportion of cases are fatal (such as heart disease and stroke), many cases would not be "captured" in a cross-sectional survey such as the CCHS. In effect, these surveys measure the prevalence of "survivors", inaccurately decreasing prevalence.

There were several limitations to this study. The data used to estimate change over time were for two different samples, not for the same sample followed longitudinally. The study relied on self-report data about chronic diseases and risk factors, which may result in different estimates than those obtained from other sources of chronic disease data, including registries and administrative data files. Sensitive issues such as weight, alcohol use and smoking may be under-reported. Chronic disease prevalence may also be under-

reported in remote populations if access to health care and screening for diseases is limited.[12]

There are several opportunities for further research on chronic diseases in northern Canadian populations. It would be of value to evaluate how having one chronic disease impacts the development of another; this link has been demonstrated in the past with heart disease, hypertension and stroke.[13] Also, the PUMF aggregates data from the three northern territories and from all ethnic groups; disaggregating the data will be useful for assessing regional and ethnic variation in chronic disease prevalence and risk factors, which may be useful in developing geographically- and culturally-targeted disease prevention and management strategies. For example, diabetes has become an increasing burden on the health of Canadian Aboriginal populations, and rates of diabetes among Aboriginal people in Canada are 3-5 times higher than those of the general Canadian population.[14] Some Canadian Aboriginal populations show higher prevalence of chronic disease risk factors, such as obesity/overweight[15,16] and of smoking.[4] Nevertheless, because the health care system in northern Canada is not ethnically based, obtaining a territorial-wide picture remains important for assessing the overall burden of chronic disease.

Records of disease diagnoses from administrative data could provide further information about chronic disease prevalence and incidence in Canada's northern populations,[15] and their relation to health services use. Administrative data have been used in similar research.[12,17,18]

This study's strengths are that it relies on population-based data and investigates multiple health conditions over time. The CCHS is the only national survey providing reliable estimates of disease prevalence for Canada's three northern regions. This research provided information useful from a policy perspective about factors that increase the vulnerability of developing chronic diseases in northern Canada.

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Received: October 2, 2007
Accepted: June 4, 2008

RÉSUMÉ

Objectif : Les maladies chroniques sont la principale cause de mortalité et d'invalidité dans le monde et font peser un fardeau considérable sur le système de santé canadien. Notre étude porte sur la prévalence autodéclarée des grandes maladies chroniques et de leurs facteurs de risque dans la population du Nord canadien et compare leur prévalence à celle de la population du Sud du Canada au fil du temps.

Méthode : Pour nos analyses, nous avons utilisé les données de l'Enquête sur la santé dans les collectivités canadiennes (ESCC), cycles 1.1 (2000-2001) et 3.1 (2005). L'échantillon du Nord se composait de répondants de 20 ans et plus du Yukon, des Territoires du Nord-Ouest et du Nunavut. L'échantillon du Sud se composait de répondants du même groupe d'âge dans le reste du Canada. Les estimations pondérées de la prévalence, rajustées et non rajustées, et les intervalles de confiance ont été calculés, et leur signification statistique testée à l'aide de tests z.

Résultats : Les répondants du Nord canadien affichaient une prévalence brute autodéclarée significativement plus faible pour l'hypertension artérielle, l'arthrite ou les rhumatismes, le diabète, les maladies coronariennes et les AVC que les répondants du Sud canadien, bien que ces associations ne soient plus significatives après rajustement des données selon l'âge et le sexe. Les répondants du Nord affichaient une prévalence rajustée significativement plus faible pour toutes les maladies chroniques. Cependant, les répondants du Nord avaient une prévalence rajustée significativement plus élevée pour l'obésité et le tabagisme que les répondants du Sud sur les deux périodes. La prévalence des maladies chroniques a significativement augmenté entre 2000-2001 et 2005, tant pour les répondants du Nord que du Sud.

Discussion : La prévalence plus élevée des facteurs de risque des grandes maladies chroniques dans la population du Nord canadien et la prévalence croissante de nombreuses maladies chroniques dans les populations du Nord et du Sud montrent qu'il est nécessaire d'assurer une surveillance continue des maladies chroniques et de mettre au point des stratégies de prévention et de traitement appropriées.

Mots clés : maladies chroniques; Territoire du Yukon; Territoires du Nord-Ouest; Nunavut; surveillance; enquêtes sur la santé