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Cancer patterns in Inuit Nunangat: 1998–2007

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Objectives. To compare cancer incidence patterns between residents of Inuit Nunangat and the rest of Canada.

Study design. Cancer cases were geographically linked to either Inuit Nunangat or the rest of Canada using postal codes or other geographic information. Population estimates were derived from the 2001 and 2006 censuses.

Methods. Cancer cases were combined from 1998 to 2007 for Inuit Nunangat and the rest of Canada. Age-standardised incidence rates were calculated for all site cancers and sub-sites by sex. Standardised rate ratios between these 2 areas were calculated for all site cancers and sub-sites.

Results. The age-standardised incidence rate for all cancer sites (1998–2007) was 14% lower for the Inuit Nunangat male population and 29% higher for the female population by comparison to the rest of Canada. Cancers of the nasopharynx, lung and bronchus, colorectal, stomach (males), and kidney and renal pelvis (females), were elevated in the Inuit Nunangat population compared to the rest of Canada, whereas prostate and female breast cancers were lower in the Inuit Nunangat population.

Conclusions. Cancers with potentially modifiable risk factors, such as buccal cavity and pharynx, nasopharynx, lung and bronchus, and colorectal cancer were elevated in the Inuit Nunangat population compared to the rest of Canada. Besides greater smoking prevalence within Inuit Nunangat by comparison to the rest of Canada, distinct socioeconomic characteristics between respective area populations including housing, and income may have contributed to incidence differentials. This study demonstrated that a geographic approach can be used in cancer surveillance when populations of interest are spatially distinguishable, and reside across distinct jurisdictions whose combined cancer registries will not completely provide information to identify the population of interest.

Keywords: *Aboriginal identity*; *cancer incidence*; *mortality*; *vital statistics*

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Life expectancy of residents of Inuit Nunangat is 11 years shorter than that of other Canadians, with almost half of this difference due to deaths from cancer (1). Cancer incidence has increased substantially among all circumpolar Inuit living in Canada, Alaska, and Greenland (2). This trend is especially true for lung cancer where rates for Inuit men and women are the highest in the world (2). The pattern of cancer observed among Inuit include higher risk for cancers that are comparatively rare in the general population such as cancer of the nasopharynx, and a lower risk for cancers more common in the general population, such as breast and prostate (3). Evidence indicates that these patterns may be changing, possibly due to changes to diet and lifestyle in recent decades, so that previously relatively rare cancers among Inuit are increasingly experienced. Trends between 1969–73 and 1999–2003 have shown substantial increases in colorectal cancer among Inuit of either sex in Canada, but especially for Inuit men, and increases also in breast cancer among Inuit women, especially post-menopausal women (3). Cancer surveillance of Inuit remains important given that changing patterns of cancer incidence may provide evaluative feedback for cancer control strategies such as cancer screening, education and policy strategies for modifiable cancer risk factors such as smoking.

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For the purpose of providing new information regarding cancer incidence within areas primarily populated by Inuit in Canada, this study has compiled incidence within a geographic region, Inuit Nunangat, for comparison to cancer incidence for the rest of Canada. In Canada, about 4 in 5 Inuit reside in Inuit Nunangat, furthermore the total population within this area is predominately Inuit (4). Yet an important limitation to this geography-based approach is that resulting cancer rates cannot ultimately be interpreted as representing cancers of the Inuit populations. Many individuals in this area are non-Aboriginal for example, and whether or not a cancer record patient in fact self-identities as Inuit or not has not been verified. The value of this analysis is that it follows from evidence regarding decreased life expectancy due primarily to cancer within this same geography (1). Additionally, this paper extends previous research by including cases of cancer up to 2007, and from all 4 regions of Inuit Nunangat, to include Nunatsiavut (northern coast of Labrador). Inuit Nunangat is a geographic area of Canada consisting of 4 settled Inuit land-claim regions: Nunavut (the entire territory); Nunavik (northern Quebec); Inuvialuit region (north western part of the Northwest Territories); and Nunatsiavut. The geographic area covered in this analysis included all communities in Inuit Nunangat (5). According to the 2006 Census, there were 48,015 persons residing in Inuit Nunangat: Nunavut (29,325), Nunavik (10,570), Inuvialuit region (5,705), and Nunatsiavut (2,415). About 82% of all residents of Inuit Nunangat self-identified as Inuit (Table I). The proportion of Inuit by region ranged from a low of 55% in the Inuvialuit region to 91% in Nunavik. The 2006 Census enumerated 50,485 Inuit in Canada, of which just over three-quarters (78%) lived in Inuit Nunangat (4).

Cancer incidence rates were calculated for all residents of the Inuit Nunangat region of Canada and compared to rates for the population in the rest of Canada in order to identify cancers that are more and less common in the Inuit Nunangat region.

Table I. Population size and percentage reporting Inuit identity by region, 2006

Region	Population	% Inuit
Inuit Nunangat	48,015	82
Nunavut territory	29,325	84
Nunavik	10,570	91
Inuvialuit	5,705	55
Nunatsiavut	2,415	89
Rest of Canada	31,193,010	<0
Canada	31,241,030	<0

Source: 2006 Census of Population, Statistics Canada.

Material and methods

Data sources

Canadian Cancer Registry records and census population estimates were used to calculate cancer incidence for residents living within, or outside of Inuit Nunangat. Information regarding incident cancer events was extracted from the national Canadian Cancer Registry maintained by Statistics Canada. The Canadian Cancer Registry is a dynamic patient-oriented database that provides information about all cancers diagnosed in Canada. This registry is compiled from all provincial and territorial cancer registries of all Canadian residents, alive or dead, who have been diagnosed with cancer since 1992. This includes new primary (incident) cancers occurring within previous cancer patients. For this analysis, incident all-site cancer events, as well as selected site-specific incident cancers were pooled between 1998 and 2007. Incident cancer events were compiled for analysis on the basis of recorded Canadian postal code that represented patients' usual place of residence at the time of tumour diagnosis.

By-year population estimates for all census-subdivisions (CSD) in Canada were used to approximate person-years at risk, (the denominator for the cancer incidence rates). These population estimates are based on the 2001 and 2006 Canadian Censuses of Population. Demography Division at Statistics Canada provided inter-censal CSD population counts for Canada and for Inuit Nunangat, adjusting for net under-coverage and components of population growth. Person-years at risk were estimated by pooling the population by sex and age for all 10 years of data (1998–2007).

Methods

Since cancer registries do not record information to verify Inuit identity in every jurisdiction, CSD codes created by Statistics Canada were used to geographically link cancer events and census population counts in order to estimate person-years at risk for cancer incidence within and outside of the CSDs used to define Inuit Nunangat. This geographical link was determined by using the postal code conversion file plus application (version 5G) developed at Statistics Canada (6) to map a postal code for each incident tumour record to a corresponding 2006 CSD code. Incident cancer events were then classified as having occurred either in Inuit Nunangat or in the rest of Canada. Cancer events that could not be mapped because of missing, incomplete or invalid postal code information were then examined for presence of other geographical information (place of residence name, submitting province for example) in order to attempt to classify the records appropriately. Otherwise these records were "unclassifiable". The extracted incident cancer case count from the CCR between 1998 and 2007 was 1,459,780.

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Of these cancer events, 15,985 (1.1%) could not be mapped to a 2006 CSD and therefore were excluded from the study. None of the geographically unclassifiable records were from Nunavut. The age–sex distributions of cancers that could not be mapped were used to likewise subtract counts from population estimates for the rest of Canada. This aligned population estimates used as denominators in rate calculations with pooled cancer incidence counts compiled to represent numerators for rates.

A file containing records of invasive cancer cases and *in situ* bladder cancer cases (the latter are not included for Ontario) was created using the multiple primary coding rules of the International Agency for Research on Cancer (IARC) (7). Cancer cases were classified based on the *International Classification of Diseases for Oncology, Third Edition* (8) and grouped using Surveillance, Epidemiology, and End Results (SEER) Program grouping definitions (available from authors upon request). Cancer incidence was calculated separately for males and females. For each sex-by-age group combination, the incidence rate was calculated as the pooled number of primary cancer cases divided by the pooled estimated person-years at risk. Sex-specific rates were age-standardised using the direct method to the age distribution of the World Population as reported by the International Agency for Research on Cancer (IARC) (9) as the standard. Standard errors necessary to compute 95% confidence intervals for crude rates were derived based on the method described in chapter 2 of the 1994 IARC (World Health Organization) Scientific Publication (10) in order to adjust for rare event counts. Standard errors and computation of 95% confidence intervals for age-standardised incidence rates shown in the results (Table II) used the Fay and Feuer method (11). Rate results for Inuit Nunangat were used as the numerator rate to calculate Incidence Rate Ratios (RR) for comparison to rates found for the areas representing "rest of Canada" (denominator rate).

Results

The 1998–2007 age-standardised incidence rate for all cancer sites combined was 289 per 100,000 for male residents of Inuit Nunangat and 357 per 100,000 for female residents. Compared to the rest of Canada, these rates were 14% lower for the male residents and 29% higher for female residents (Table II). This translated into 45 fewer cancer cases per 100,000 for males and 80 more cases per 100,000 for females residing in Inuit Nunangat. The most frequent cancer types in the Inuit Nunangat male population were lung and bronchus (36% of all cancers), followed by colorectal (21%), prostate (6%), nasopharynx (5%) and stomach (5%). For the female population, cancers of the lung and bronchus (27%) were the most frequent followed by colorectal (16%), breast (16%), nasopharynx (4%), and cervical (4%) cancers. In the rest of Canada, prostate cancer was most frequent (24%) for males and breast cancer (28%) for females.

While the all-site cancer rate was lower in the Inuit Nunangat male population compared to the male population in the rest of Canada, certain cancers rates were statistically higher within the Inuit Nunangat male population. These include cancers of the nasopharynx (RR = 16.44), lung and bronchus (RR = 2.23), and colorectal cancer (RR = 1.45). In contrast, rates were statistically lower for cancers of the prostate (RR = 0.20), non-Hodgkin's lymphoma (RR = 0.29), and brain and other parts of the nervous system (RR = 0.34).

For females, cancers of the nasopharynx (RR = 44.93), lung and bronchus (RR = 3.70), kidney and renal pelvis (RR = 2.03), and colorectal (RR = 1.87), were elevated within the Inuit Nunangat population compared to the female population in the rest of Canada. Diagnosed cancer rates were statistically lower for breast (RR = 0.56) for females in Inuit Nunangat than elsewhere in Canada.

Among cancers with elevated rates in Inuit Nunangat, absolute differences (as measured by rate differences between Inuit Nunangat and the rest of Canada) were largest for cancer of the lung and bronchus (RD = 62.4 per 100,000 for males and RD = 89.9 per 100,000 for females) followed by colorectal cancers (RD = 19.3 for males and RD = 26.8 for females) and cancer of the nasopharynx (RD = 11.3 for males and RD = 14.1 for females).

Table II also grouped digestive system cancers (not shown) and cancers of the buccal cavity and pharynx together. In both groupings, rates were higher for the Inuit Nunangat population compared to the population in the rest of Canada. In particular, the rate of cancer of the buccal cavity and pharynx were more than 4 times higher among females in Inuit Nunangat than among females in the rest of Canada (RR = 4.67).

Discussion

Compared to the rest of Canada, cancer incidence (all sites) during the period 1998–2007 was higher for female residents of Inuit Nunangat and lower for male residents. For male residents of Inuit Nunangat, lower cancer rate was partly attributable to their lower rate of diagnosed prostate cancer. If prostate cancer is removed from the analysis, the rate for remaining cancers combined would be similar between the 2 populations (RR = 1.09, 95% CI from 0.99 to 1.21).

Differences to incidence rates between Inuit Nunangat and Canada may be partly explained by socioeconomic differences in the population within each of these geographies. For example, within Inuit Nunangat over

Table II. Number of cancer cases, age-standardised incidence rates[a] (ASIR) per 100,000, Incidence Rate Ratios (RR) for residents in Inuit Nunangat and the rest of Canada, 1998–2007 by sex and cancer site

	Inuit Nunangat				Rest of Canada						
Sex and cancer site	Number of cases	ASIR	95% CI		Number of cases	ASIR	95% CI		RR	95% CI	
Males											
All sites	461	288.5	260.4	316.5	752,283	334.0	333.2	334.7	0.86	0.78	0.95
Lung and bronchus	167	113.2	95.1	131.3	118,253	50.9	50.6	51.1	2.23	1.90	2.61
Prostate	28	17.0	11.9	24.1	197,694	85.2	84.9	85.6	0.20	0.14	0.30
Colorectal	98	62.6	49.5	75.8	99,715	43.3	43.0	43.6	1.45	1.17	1.78
Stomach	21	13.0	8.5	19.5	18,540	8.0	7.9	8.2	1.62	1.02	2.56
Pancreas	6	4.3	1.8	9.0	16,703	7.3	7.1	7.4	0.60	0.26	1.39
Buccal cavity and pharynx[b]	31	17.6	12.4	24.6	21,629	9.9	9.8	10.0	1.78	1.22	2.60
Nasopharynx	22	12.0	7.9	18.0	1,492	0.7	0.7	0.8	16.44	10.46	25.82
Kidney and renal pelvis	16	10.3	6.3	16.4	23,324	10.6	10.5	10.7	0.97	0.58	1.65
Non-Hodgkin lymphoma	9	4.3	2.2	8.3	31,653	14.7	14.5	14.8	0.29	0.15	0.58
Brain and other nervous system	6	2.3	1.0	5.5	13,035	6.7	6.6	6.8	0.34	0.15	0.76
Females											
All sites	496	357.3	322.6	392.0	690,555	276.8	276.2	277.5	1.29	1.17	1.42
Lung and bronchus	135	123.2	101.2	145.2	89,448	33.3	33.1	33.5	3.70	3.09	4.42
Female breast	78	45.3	34.3	56.3	193,467	80.7	80.3	81.0	0.56	0.44	0.72
Cervix	22	11.3	7.3	17.7	13,414	6.4	6.3	6.6	1.76	1.10	2.81
Colorectal	80	57.6	43.7	71.5	85,459	30.8	30.6	31.0	1.87	1.47	2.38
Stomach	10	5.6	2.7	10.9	10,553	3.8	3.7	3.9	1.46	0.72	2.96
Pancreas	12	11.9	6.7	19.8	17,241	6.0	6.0	6.1	1.97	1.10	3.55
Buccal cavity and pharynx[b]	30	19.2	13.3	27.5	10,168	4.1	4.0	4.2	4.67	3.13	6.97
Nasopharynx	22	14.4	9.3	21.9	674	0.3	0.3	0.3	44.93	28.09	71.86
Kidney and renal pelvis	19	12.2	7.6	19.3	15,113	6.0	5.9	6.1	2.03	1.23	3.35
Non-Hodgkin lymphoma	9	6.4	3.1	12.3	26,880	10.6	10.5	10.8	0.60	0.29	1.23
Brain and other nervous system	7	2.8	1.3	6.8	10,270	4.9	4.8	5.0	0.57	0.27	1.20

Sources: Canadian Cancer Registry (CCR) Database (July 2010 file), Demography Division (population estimates), Statistics Canada.

[a]Note: Rates have been age-standardised to the World Population. Cancer incidence in 5 continents (9).

[b]Includes primary cancers within the following sites: lip, tongue, major salivary gland, floor of mouth, gum and other mouth, nasopharynx, oropharynx, hypopharynx, other buccal cavity.

half (55%) of the population between the ages of 15–64 years had not completed high school compared to 20% of the population these ages within the rest of Canada. If educational attainment is associated with increased health literacy, or to patterns of health determinant behaviours that may be protective against cancer, then associations to educational attainment may indirectly account for some of the higher cancer incidence within Inuit Nunangat.

By comparison to results previously reported for Canada's circumpolar region within the Circumpolar Inuit Cancer Review (2), with some exceptions, our geography-based method yielded broadly similar age-standardised incidence rates for each sex for different

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cancer sub-sites. The present study produced slightly lower ASIRs for cancers of the lung and bronchus and slightly higher ASIRs for colorectal and female breast cancers. These differences may be partly attributable to different study areas (exclusion/inclusion of Nunatsiavut), reference periods (1989 to 2003 for the review versus 1998–2007 for the present study) and methodologies (individual versus area-based analysis). Cancer trends, in particular for colorectal cancer, may account for the higher ASIR reported in the present study. A noted limitation to our geography-based rates is that cancer incidence is compiled for all residents within Inuit Nunangat (i.e. Inuit and non-Inuit individuals). This may have attenuated lung cancer rates that may have resulted had Inuit identifiers been available on our cancer records. For other sub-sites, rates presented here were similar, to those previously reported. Furthermore, our rates for several cancer sub-sites situate within the reported ASIR rate confidence interval bounds presented within that previous review (2).

Given similarities to the previous evidence (2), our study shows that, with some limitations, the geographical approach may provide a feasible, alternate method to track site-specific cancers within areas predominantly inhabited by Inuit. In Canada, ethnic identifiers available in the Northwest Territories and Nunavut have previously been used to report incidence for Inuit individuals (12–14). Yet, an advantage to instead only using a specified geographic region relevant to a population of interest is that by classifying cancer records as having occurred either within, or outside of defined regions, we have avoided introducing bias in the results that can occur when information compiled from cancer registries (rate numerators) and census data (rate denominators) represent slightly different populations.

The cancer Incidence Rate Ratios calculated in this study (RR = 0.86 males, RR = 1.29 females) were substantially lower than rate ratios for cancer mortality for residents of Inuit Nunangat (RR = 1.68 males, RR = 2.27 females) compared to other residents of Canada (15). Taken together, this suggests that cancer detection and survival may be lower in Inuit Nunangat than the rest of Canada. This interpretation is consistent to previous findings that attributed more than half of the excess mortality in Inuit Nunangat to cancer (1) and would be consistent to earlier evidence that confirms significant, excess mortality rates among Alaska Natives by comparison to Whites in the US (16).

Cancer survival depends on numerous factors including type of cancer, disease stage and progression, age at diagnosis, health status, and availability of cancer treatments and screening (13). Similarly, cancer incidence differentials should be interpreted in the context of the ways in which access to health care in Inuit Nunangat may be affected by a number of intervening factors, including remoteness, availability of specialised services and screening programs, and language barriers (4,17,18). Therefore, while all reported results represent detected cancer incidence, results within Inuit Nunangat may have been more likely underestimated than those for the rest of Canada where a relatively smaller proportion of the population would have experienced issues of access and availability of screening programs relating to remoteness of location.

The ranking of cancer incidence was different in Inuit Nunangat compared to the rest of Canada (19). For example, following lung cancer, cancers of the prostate and breast were the most frequent cancers for the population in the rest of Canada, whereas these cancers ranked third behind lung and colorectal cancers in Inuit Nunangat. Our results did show that residents of Inuit Nunangat were at substantially elevated risk for cancers that tend to become more prevalent in economically developing countries (20) specifically lung, bronchus, and colorectal cancers compared to the rest of Canada. Incidence and mortality for these cancers have been attributed to changes in population health behaviours including increased smoking, changes to dietary patterns and less physical activity (20). Smoking and diet are important risk factors for many types of cancers (21–23).

Among all circumpolar Inuit, rates of lung and colorectal cancers have increased substantially in recent decades (2,12). In Canada, about two-thirds of Inuit (15 years of age and older) reported daily smoking in 2006 (17). This represents a proportion that is about 3 times higher than other Canadians (4). Diet can offer protective modifications against cancer (21). Specifically foods of plant-origin and low energy-intensity foods are protective against cancer (24). However, a range of factors create barriers to accessing sufficient quality and quantity of both country-harvested food and market-purchased, particularly perishables such as vegetables, among individuals residing in the north, particularly Inuit (25). Given that Inuit within Inuit Nunangat experienced lower median household income by comparison to residents in the rest of Canada (Table III), cost could be a barrier to purchasing perishable foods. Therefore smoking prevalence and reduced access to protective foods may in part explain the higher rates of lung, bronchus, and colorectal cancers in Inuit Nunangat compared to the rest of Canada.

As mentioned earlier, the rate of breast cancer was lower among female residents of Inuit Nunangat compared to female residents in the rest of Canada. This lower rate could represent an actual difference in breast cancer incidence. Women within Nunavut and Northwest Territories have highest fertility rates in Canada, and more births at younger ages (26). More specifically, by comparison to women in the rest of the country, Inuit-inhabited areas in Canada have higher proportions of

Table III. Selected socio-demographic characteristics for the "Rest of Canada"[a] and population within Inuit Nunangat, 2006

		Inuit Nunangat			
	Rest of Canada[a]	Total	Inuit	Other Aboriginal	Non-Aboriginal
Total population (#)	31,193,015	48,010	39,540	1,410	7,060
Sex (%)					
Male	49.1	51.0	50.5	47.2	54.6
Age (%)					
0–14	17.8	33.3	37.0	27.7	13.3
15–24	13.5	19.0	20.9	17.4	8.8
25–44	28.1	29.1	26.4	31.6	43.3
45–64	27.5	15.6	12.5	19.1	32.1
65+	13.1	3.1	3.1	4.3	2.6
Education (15–64) (%)					
No high school completion	20.2	54.7	66.2	40.1	11.3
High school	37.2	21.5	20.3	28.6	25.1
Post-secondary non-university	18.5	13.3	10.8	19.8	22.2
University degree	24.1	10.6	2.8	12.0	41.5
Employment (15+) (%)					
Labour force unemployed	6.5	17	21.7	14.3	4.3
Labour force participation	66.8	66.3	60.2	72.4	90.1
Occupation (15+) (%)					
Management	9.3	8.8	5.7	9.1	18.4
Professional	16.1	16.2	11.2	14.5	31.6
Skilled	29.4	27.3	27.4	29.7	26.6
Semi-skilled	31.5	24.4	26.8	29.1	16.4
Unskilled	13.7	23.3	28.9	18.2	7.1
Income ($)					
Median household income	53,628	60,544	52,158	80,486	95,727
Housing					
In need of major repairs (%)	7.5	23.9	27.5	26.2	13.3
Average household size	2.5	3.6	4.2	3.3	2.5

Source: 2006 Census of Population, Statistics Canada.
[a]The area representing the "rest of Canada" includes all 2006 census-subdivisions (CSD) excluding those used to define Inuit Nunangat.

both mothers younger than twenty years of age, and multiparous mothers (27); both of these factors are protective against breast cancer. Another reason to explain lower breast cancer could be that it indicates lower access to, or lower uptake of breast cancer screening procedures (mammography) as reflected among women aged 50 to 69 years in the Northwest Territories and Nunavut (28). Failure to detect cancers would lower the incidence rate.

This study showed cancer of the cervix was the fourth most frequent cancer diagnosed in Inuit Nunangat. This result was different from earlier evidence that reported cancer of the cervix within Nunanvut as the most common type of cancer (12). By comparison to females in the rest of Canada, higher rates of diagnosed cervical cancer among female residents of Inuit Nunangat may be due to successful uptake in cervical cancer screening in the Northwest Territories and Nunavut relative to percentage of Canadian women overall (28), thus reflecting a greater chance of detection of cervical cancers. In addition to differences in uptake of screening, twice greater prevalence of high-risk human papilloma virus (HPV) infection has been reported among women within Nunavut with evidence to establish the association between oncogenic HPV and cervical cancer precursors (29).

This analysis found that cancers of the buccal cavity and pharynx were significantly elevated for either sex in Inuit Nunangat compared to the rest of Canada, as has other research (2). Several studies have attempted to explain these elevated cancer rates by implicating genetic differences, and/or exposures to, for example the Epstein-Barr Virus as being etiologically important in the development of nasopharynx carcinoma and major salivary gland cancers (30). As well, HPV infection, previously mentioned as more common among Inuit

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(29) may be involved in the etiology of head and neck cancers at some sites (31). Our study showed that, female residents of Inuit Nunangat had a higher risk of kidney, renal pelvis cancers in comparison to females in the rest of Canada consistent with other research (32). Smoking as well as elevated body fat (24) have been cited as probable cause of increased kidney cancer risk. Both of these cancer risk factors are more common among Inuit in Canada (17) which may partially explain our findings.

Rates for stomach cancer were higher among male residents of Inuit Nunangat by comparison to males in the rest of Canada. Future attention to stomach cancer may be warranted given other evidence regarding associations between crowded living conditions and increased risk of Helicobacter pylori bacteria infection (33), and links between this bacterial infection and stomach cancer. In Greenland, measured seroprevalence for Helicobacter pylori is high (33) and the rate of stomach cancer has increased among Inuit, which contrasts global trends for this cancer (3). As reported in Table III, residents of Inuit Nunangat, particularly Inuit, experience comparatively more crowded living conditions to that for Canada overall which possibly increases risk for this infection.

Limitations

These results are based on diagnosed cases of cancer. If access to the heath care system and cancer screening is lower in Inuit Nunangat compared to the rest of Canada, then cancer rates for Inuit Nunangat may be underestimated, therefore comparatively lower because some cancers have not been diagnosed. Cancers that are part of routine screening such as prostate and breast cancer may be particularly underestimated.

Information to verify Inuit identity was not available from cancer registry records for all jurisdictions where Inuit primarily reside, or from national cancer registry records at Statistics Canada used in this study. The results of this study are based on all residents of Inuit Nunangat including both Inuit and non-Inuit residents. Cancer patterns may have been different if it had been possible to restrict the analysis to the Inuit population only. However, geography-based results are useful from a cancer education, screening and service planning perspective; irrespective of population identity.

Due to small counts, years were combined and specific cancer sites grouped. As a result, this study could not measure trends in cancer incidence or calculate rates for less common cancers.

By using a geographic approach, this study demonstrated that age and sex-specific incidence rates for certain types of cancer – buccal cavity and pharynx, lung and bronchus, and colorectal – were substantially elevated among residents of Inuit Nunangat compared to residents in the rest of Canada. There are many potentially modifiable risk factors for these cancers, including smoking behaviours for which the rate is more than 3 times higher among Inuit in Canada compared to other Canadians. The inclusion of Inuit indicators in all cancer registries would allow for more precise determination of the incidence of cancer among all Aboriginal groups including Inuit in Canada regardless of residence. This study has shown that the geographic approach could be used for cancer surveillance for the Inuit Nunangat region where cancer has been shown to be a major contributing cause to differences in mortality and life expectancy by comparison to the rest of Canada.

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