ABSTRACT

Objectives. Little information is available on the incidence and mortality of cancer among the Aboriginal population in the Province of Québec, Canada. Cancer was likely rare in this population historically, but recent life-style changes suggest that this may no longer be the case. The purpose of this study was to estimate incidence and mortality rates among Aboriginal people living on reserves and in northern villages in Québec during the period 1988–2004, and to compare these estimates with those of the general population.

Study design. Incidence and mortality data were extracted respectively from the provincial tumour registry and death file.

Methods. Aboriginal people were identified based on geographic residence codes. Population data were taken from the Canadian census of 1991, 1996 and 2001. Incidence and mortality rates were calculated and age-standardized according to the World Standard Population.

Results. The Aboriginal incidence and mortality rates for cancer, all sites combined, was 321.8 per 100,000 (95% confidence interval 304.5–339.2) and 160.3 per 100,000 (95% CI 147.8–172.8), respectively. These rates are not significantly different from those of the general population of Québec. However, there are differences according to cancer site and sex. Aboriginal men had a higher risk for liver, lung and kidney cancers and a lower risk for prostate, bladder, leukemia and non-Hodgkin's lymphoma cancers, whereas Aboriginal women had a higher risk for colorectal, lung, cervix and kidney cancers, and a lower risk for breast, uterus, bladder, brain, leukemia, stomach and pancreas cancers.

Conclusions. Aboriginal people in Québec now experience an overall cancer risk comparable to the general population. The observed differences in specific sites suggest exposure to unique environmental risk factors. Basic surveillance specific to this population is necessary for the planning and evaluation of cancer preventive and curative services.

(Transl Jan 2010)
INTRODUCTION

Little is known about cancer incidence and mortality among the Aboriginal population of Québec. A study examining the creation of a cancer registry during the 1970s and 1980s found that cancer was relatively rare within this population (1). Studies in Canada and the United States suggest that the pattern of cancer among Aboriginal people is different from the general population, with a lower overall incidence and mortality (1–11). In Canada, the Inuit, First Nations (or North American Indians) and Metis are recognized as Aboriginal people by the Constitution. In this paper, Aboriginal people refer only to the Inuit and First Nations.

An increase in cancer incidence and mortality over time has been observed in some regional groups of Aboriginal people (2,3,5), which is likely attributable to the considerable changes in life-style that these populations have undergone in recent decades. This change should be of concern to public health authorities.

In Québec there are 59 Inuit and First Nations communities. The First Nations belong to some 10 different cultural and linguistic groups: the Abenaki, Algonquin, Atikamekw, Cree, Huron-Wendat, Innu (or Montagnais – not to be confused with the Inuit), Malecite, Micmac, Mohawk and Naskapi (Fig. 1). First Nation communities are also known as “Indian reserves.” (“reserve” is the term used in Canada, while “reservation”...
is used in the United States). The Inuit do not live on reserves, and their communities are designated as “northern villages.” It should also be recognized that Aboriginal people can be found in many cities among non-Aboriginal people, and considerable in- and out-migration occurs between their home communities and the cities. Cancer surveillance among Aboriginal people in Québec is problematic because there is nothing in the various health care databases to distinguish them from the rest of the population. While we were unable to study cancer among the total population of Aboriginal people living throughout the province, in this paper we attempted to describe the pattern of cancer among all residents of designated Indian reserves and northern villages where the great majority of the residents are Aboriginal people.

MATERIAL AND METHODS

The data on the incidence of cancer diagnosed between 1988 and 2004 were derived from the Fichier des tumeurs du Québec (Québec Tumour File, QTF), which is based on hospitalization and day surgery records. Cancers are coded according to the ninth revision of the International Classification of Diseases (ICD-9). The cancer codes used are from 140 to 208, excluding code 173 (skin cancer other than melanoma) because this cancer is very under-reported in the QTF.

Data on individuals who died from cancer between 1988 and 2004 were obtained from the Fichier des décès du Québec (Québec Mortality File, QMF). From 1988 to 1999, the causes of death were coded according to the ICD-9, and from 2000 to 2004 according to the tenth revision of the International Classification of Diseases (ICD-10). Unlike other Canadian provinces and territories, the incidence and mortality files in Québec are not integrated into a single cancer registry.

These two databases, QTF and QMF, also contain information on the individuals’ municipality of residence. Indian reserves and northern villages have different residence codes than municipalities where most non-Aboriginal people live. A list of the Indian reserve and northern village codes was supplied by the Ministère de la Santé et des Services sociaux du Québec.

The source of data on the Aboriginal population is the Canadian Census of 1991, 1996 and 2001. For the calculation of age-standardized rates, the reference population is that of the World Standard Population used by the International Agency for Research on Cancer. It should be noted that certain reserves refuse to participate in the census, and others are uninhabited or have few residents. Population data were available for only 45 reserves in 1991, 46 in 1996 and 49 in 2001. Where possible, the population of the missing years was estimated by applying the annual rate of change calculated from the available census years. However, for some groups, such as the Mohawks and Malecites, no population data were available for any community, and they were excluded from consideration in this paper. For groups such as the Algonquins, Atikamekw and Innus, population data were missing for 1 or 2 communities.

Age-specific and age-standardized rates (by the direct method) of the incidence and mortality of cancer were calculated by sex and cancer site. To examine temporal trends, 3 periods were studied: 1988–1993, 1994–1998.
and 1999–2004. For comparison between residents of Aboriginal communities and the total population of Québec, rates based on the total period of 1988–2004 as well as their 95% confidence intervals were calculated.

RESULTS

Cancer incidence and mortality rates increase with age (Fig. 2). More than half (56%) of cancer cases, and more than two-thirds (68%) of cancer deaths occurred among those 60 years of age and older. Men experienced higher rates than women overall.

Among men, lung, prostate, colorectal and kidney cancer were the leading sites in terms of both incidence and mortality; while lung, breast, colorectal and cervical cancer were the most common sites among women (Table I).

As for site-specific rates, Aboriginal men show a higher incidence rate than men across Québec for liver, lung and kidney cancer. With Aboriginal women, higher rates for colorectal,
lung, cervical and kidney cancer were reported. In terms of mortality, Aboriginal men were at increased risk for liver cancer while Aboriginal women showed a higher rate of lung and cervical cancer compared with the general population of Québec (Table I).

On the other hand, Aboriginal men experienced a significantly lower incidence rate of prostate and bladder cancer along with leukemia, as well as lower mortality rates for colorectal cancer, non-Hodgkin’s lymphoma and leukemia. For women, a lower incidence rate of breast, uterine, bladder and brain cancer along with leukemia was found. Lower mortality rates for colorectal, stomach, pancreatic, breast, bladder and brain cancers were reported as well, relative to all women across Québec (Table I).

When all cancer sites are combined, no statistically significant increase over the 3 time periods was detected (Fig. 2). Compared to the general population of Québec, the Aboriginal population reported similar incidence and mortality rates. However, some groups such as the Atikamekw and Innu (both men and women) and Huron-Wendat men had incidence rates significantly higher than all of Québec, while Algonquin men and women, Cree men, Naskapi women and Abenaki women

### Table I. Number of cancer cases and deaths and age-standardized incidence and mortality rates per 100,000 by selected cancer site and sex: Residents of Indian Reserves and Northern villages compared to the general population of Québec, 1988 to 2004.

| Cancer Site | Incidence | Mortality |
|-------------|-----------|-----------|
|             | Residents of Indian Reserves and Northern Villages | Québec general population |
|             | Number (%) | ASR (95% CI) | Number (%) | ASR (95% CI) |
| LUNG        |           |           |
| Male        | 188 (27.2) | 98.2 (84.0–112.3) | 80.3 (79.6–80.9) | 154 (42.4) | 81.6 (68.7–94.6) |
| Prostate    | 88 (12.7)  | 47.4 (37.5–57.3) | 67.1 (66.5–67.7) | 28 (7.7)  | 15.2 (9.6–20.9) |
| Colorectal  | 81 (11.7)  | 40.6 (31.7–49.6) | 48.1 (47.6–48.6) | 28 (7.7)  | 14.7 (9.2–20.3) |
| Kidney      | 46 (6.7)   | 22.1 (15.6–28.6) | 12.4 (12.2–12.7) | 12 (3.3)  | 5.7 (2.4–9.1)  |
| Female      | 131 (19.1) | 64.1 (53.0–75.1) | 35.2 (34.9–35.6) | 102 (35.7) | 50.3 (40.5–60.1) |
| Breast      | 119 (17.3) | 53.0 (43.3–62.7) | 83.6 (82.9–84.2) | 26 (9.1)  | 11.6 (9.0–15.9) |
| Colorectal  | 100 (14.6) | 46.9 (37.5–56.2) | 35.3 (35.0–35.7) | 24 (8.4)  | 11.1 (6.6–15.6) |
| Cervix      | 46 (6.7)   | 17.0 (11.9–22.1) | 6.5 (6.5–6.9)    | 24 (8.4)  | 11.1 (6.6–15.6) |
| Kidney      | 35 (5.7)   | 17.1 (11.6–22.6) | 6.9 (6.7–7.1)    | 9 (2.5)   | 5.1 (1.1–9.9)   |
| Ovary       | 23 (3.4)   | 10.2 (5.9–14.4)  | 11.5 (11.3–11.7) | 11 (3.8)  | 5.1 (2.0–8.2)   |
| Body of Uterus | 20 (2.9)  | 7.9 (4.3–11.5)   | 13.8 (13.6–14.0) | 10 (2.9)  | 7.9 (4.3–11.5)  |
| Non-Hodgkin’s Lymphoma | 20 (2.9)  | 8.5 (4.7–12.3)   | 10.8 (10.6–11.1) | 5 (1.7)   | 2.5 (0.3–4.8)   |
| Leukemia    | 13 (1.9)   | 4.6 (2.0–7.2)    | 7.8 (7.6–8.0)    | 7 (2.4)   | 2.6 (0.6–4.6)   |
| Pancreas    | 11 (1.6)   | 5.1 (2.0–8.2)    | 7.1 (6.9–7.2)    | 5 (1.7)   | 2.5 (0.3–4.8)   |
| Stomach     | 10 (1.5)   | 4.2 (1.5–6.9)    | 5.3 (5.1–5.4)    | 4 (1.4)   | 1.9 (0.0–3.7)   |
| Brain       | 9 (1.3)    | 2.9 (0.9–4.9)    | 5.0 (4.9–5.2)    | 6 (2.1)   | 2.0 (0.4–3.7)   |
| Liver       | 4 (0.6)    | 1.6 (0.0–3.2)    | 1.9 (1.8–2.0)    | 7 (2.4)   | 3.4 (0.9–6.0)   |
| Bladder     | 4 (0.6)    | 2.0 (0.0–4.0)    | 7.2 (7.0–7.4)    | 0 (0)     | 0.0 (0.0–0.0)   |
| Other sites | 137 (20.0) | 59.5 (49.2–69.7) | 45.0 (44.5–45.4) | 62 (21.7) | 30.4 (22.8–38.1) |
| All sites   | 686 (100)  | 304.5 (281.2–327.8) | 283.2 (282.1–284.3) | 286 (100) | 160.3 (147.8–172.8) |

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showed lower cancer rates. Mortality trends tend to mirror incidence, although Inuit men and women were also at increased risk (Table II).

**DISCUSSION**

In the absence of ethnic identifiers in the QTF and QMF, this study examined the possibility of using residency location to describe the epidemiological pattern of cancer among the Aboriginal people of Québec. Clearly, not all Aboriginal people can be covered by this method, especially those who do not live on designated Indian reserves or in northern villages. Among cancer cases and deaths occurring in the designated communities, there are likely some who were non-Aboriginal people, although the proportion is probably very small. Despite these drawbacks, the approach using residence codes offers a relatively inexpensive and quick tool for cancer surveillance in a population that is otherwise completely ignored.

Many Canadian studies have analysed the cancer patterns in Aboriginal people. While they have used different methodologies for identifying the target population, these studies have generally found that Aboriginal people were at reduced risk for cancer compared to the general

### Table II. Number of cancer cases and deaths and age-standardized incidence and mortality rates per 100,000 by sex and cultural/linguistic group for all cancer sites combined: Residents of Indian Reserves and Northern Villages, 1988 to 2004.

| Cultural/linguistic group | Incidence | | Mortality | |
|---------------------------|-----------|----------------|-----------|----------------|
|                           | Males     | Females        | Males     | Females        |
|                           | Number    | ASR (95% CI)   | Number    | ASR (95% CI)   |
| Abenakis                  | 18 (2.6)  | 340.2 (182.8–497.7) | 13 (1.9)  | 179.5 (77.6–281.4) |
| Algonquins                | 42 (6.1)  | 203.6 (141.1–266.0) | 45 (6.6)  | 197.8 (139.4–256.1) |
| Atikamekw                 | 54 (7.8)  | 616.4 (443.2–789.6) | 52 (7.6)  | 631.7 (449.1–814.2) |
| Cree                      | 155 (22.4)| 263.6 (221.5–305.7) | 152 (22.2)| 248.8 (208.1–289.5) |
| Hurons-Wendat             | 42 (6.1)  | 806.6 (560.4–1052.8) | 21 (3.1)  | 316.9 (180.2–453.6) |
| Micmacs                   | 31 (4.5)  | 290.4 (187.8–392.9) | 46 (6.7)  | 357.0 (253.2–460.8) |
| Innus                     | 213 (30.8)| 430.6 (372.2–489.0) | 216 (31.5)| 388.4 (335.8–441.0) |
| Naskapis                  | 7 (1.0)   | 237.7 (55.3–420.1) | 2 (0.3)   | 83.3 (0.0–206.7)   |
| All                       | 691 (100.0)| 342.2 (281.2–368.2) | 686 (100.0)| 304.5 (281.2–327.8) |
| Aboriginal                |           |                |           |                |
Canadian population (2,4–6,8–10). However, these studies reflect the situation 3 or 4 decades ago, and our present study showing Aboriginal people in Québec having a risk of cancer overall similar to that of all Québec residents may represent a relatively recent trend.

The excessive risk for kidney and cervical cancer among Aboriginal people in Québec has been observed in other parts of Canada (3,5,7,8,10,11). The lower risk for lung and colorectal cancers has also been reported elsewhere (4,7,9,10), although there is some indication that lung cancer rates are increasing (3,4).

The cancer pattern of this population can be expected to undergo further changes in the future, as exposure to various known risk factors change (e.g. smoking, alcohol, physical activity, obesity, sexual behaviour, use of preventive services), resulting in some cancers increasing and others decreasing. Establishing a surveillance system is essential to the proper planning and evaluation of cancer prevention and treatment services for this population.

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