SMOKING-ATTRIBUTABLE MORTALITY AMONG BRITISH COLUMBIA’S FIRST NATIONS POPULATIONS

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ABSTRACT

Objectives. First Nations (FN) people have high smoking rates and there is a need to examine their mortality related to smoking.

Methods. Smoking-attributable fractions and smoking-attributable mortality (SAM) rates were calculated for the FN and British Columbia (BC) populations during 1997 and 2001.

Results. Among FN adults, total age- and gender-adjusted SAM rates were 39.9 and 28.6 per 10,000 during 1997 and 2001, with potentially 19.0% and 17.3% of all deaths being preventable if smoking were eliminated. Among the BC adult population, total SAM age- and gender-adjusted rates were 27.8 and 25.3 per 10,000 during 1997 and 2001, and up to 21.8% and 20.8% of deaths were potentially preventable if smoking were eliminated. Among FN infants, SAM crude rates were 6.8 and 3.6 per 10,000 during 1997 and 2001, with 8.0% and 8.3% of infant deaths being potentially preventable if smoking were eliminated. Infant SAM crude rates among the general population were 1.4 per and 1.0 per 10,000 during 1997 and 2001 and 2.8% and 2.3% of deaths were potentially preventable if smoking were eliminated.

Conclusions. Total adult age- and gender-adjusted SAM rates for both populations were substantive. Additional interventions that prevent and reduce tobacco use by FN people are indicated, particularly given their high rates of smoking. The high total SAM rates for FN infants also suggest the need for interventions. (Int J Circumpolar Health 2004; 63: 81-92)

Key Words: First Nations, Aboriginal, Smoking, Mortality

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INTRODUCTION

More than 45,000 people will die this year in Canada due to smoking. Smoking is well established as a major cause of chronic airways disease, lung cancer, ischemic heart disease and stroke (1). Among the First Nations (FN) populations, who in part comprise the indigenous people in Canada, smoking is a significant problem and, in British Columbia (BC) their rates are more than double that of the general population (2,3). The high rate of smoking by FN people is thought due to several factors, including the influence of family members who smoke (4) and access to tobacco products at a very young age (5). Furthermore, tobacco products purchased within FN communities are exempt from taxation; in some cases, tobacco products sold on-reserve cost 50% less. Smoking risk factors, such as lower socio-economic status (6) and younger age (7), are disproportionately represented among FN people (8), further explaining their high rates. Unfortunately, very little research has been published that examines why FN people smoke at higher rates.

Given their high rates of smoking, it is possible that smoking-attributable mortality (SAM), or mortality that could be prevented if exposure to smoking was eliminated (9), amongst the FN population is significant. However, because FN populations are younger and more likely to suffer death at a younger age (8), the SAM impact among FN people is somewhat unclear. Mortality related to smoking is important information for public health officials and policy makers for purposes of prioritizing resources and program planning.

For this report, SAM includes death from neoplastic, cardiovascular and respiratory conditions among persons older than 34 years of age, as well as 4 diseases among children of less than one year of age. For a listing of the 19 adult and 4 infant conditions, see tables 1-7. These conditions are based on the International Classification of Disease, 10th Revision. Smoking-Attributable Mortality was examined among the BC First Nations and general populations during 1997 and 2001.
METHODS

The smoking-attributable fraction (SAF) is the proportion of deaths that would be prevented if smoking were eliminated, assuming smoking is causally related to the disease under consideration (9). The equation for calculating the adult SAF is as follows: \( \text{SAF} = \frac{p_0 + p_1 (RR_1) + p_2 (RR_2)}{p_0 + p_1 (RR_1) + p_2 (RR_2)} - \frac{1}{p_0 + p_1 (RR_1) + p_2 (RR_2)} \), where \( p_0 \) = percentage of never smokers, \( p_1 \) = percentage of current smokers, \( p_2 \) = percentage of former smokers, \( RR_1 \) = relative risk for current smokers (relative to never smokers), and \( RR_2 \) = relative risk for former smokers (relative to never smokers) (10). This formula is derived from the standard attributable risk (AR) formula (11): \( \text{AR} = \frac{p (RR - 1)}{p (RR - 1) + 1} \). Estimates for the relative risks of death for adult smoking-related deaths from neoplastic, cardiovascular and respiratory conditions are based on current and former smokers (compared with risks for non-smokers) (11-17).

For this study, 1997 smoking rates were utilized, as these were the most current rates for both populations during a given year. Estimates for FN smoking rates in BC during 1997, as determined by a self-reported cross-sectional survey, were: 45% current smokers, 26% former smokers and 29% abstainers (2). The BC general population smoking rates for 1997, as determined by a self-reported cross-sectional survey, were: 22% current smokers, 30% former smoker and 48% never/past experimenter/beginner (3). These rates were utilized to calculate the SAFs.

In order to increase the validity of the study findings, a year more recent to 1997 was examined: therefore, the total number of deaths during 2001 was examined. Deaths within the general BC population (which includes both First Nation and non-First Nation people) in the years 1997 and 2001 were extracted from the BC Vital Statistics Registry. A complex linking process, including the use of using Indian status numbers, was undertaken to extract FN mortality data. Indian status is determined by federal registration under the Indian act. It is acknowledged that some individuals of Indian, or Aboriginal, ancestry are not federally registered as status Indians. However, in this study, when we refer to First Nations individuals or groups, we are referring to status Indians.

Population projections from 1997 and 2001 (8), death counts, as provided by the BC Vital Statistics Agency and the 2001 Canadian census population counts were used to calculate age and gender ad-
justed SAM rates for both populations through the use of direct standardization techniques (9) as follows:

\[
\text{Age and Gender Expected Death Counts} = \frac{\text{Gender Crude Death Counts}}{\text{Gender Specific Population Estimates}} \times \text{Standard Population}\]  

*In 5-year intervals older than 34-years of age  

**2001 Canadian Population older than 34-years of age in 5-year intervals (n=16,277,485)

The expected deaths by age were summated to provide total number of expected deaths for each disease. The total expected number of deaths for each disease was divided by the total standard population older than 34-years of age to estimate the age and gender adjusted death rates for each disease.

To estimate the total adult adjusted SAM rate for both populations, the following calculation was completed:

\[
\text{Total Adult Adjusted SAM Rate} = \sum (\text{Adult Disease SAFs} \times \text{Age and Gender Adjusted Death Rate})
\]

The adult Proportional Mortality Ratio (PMR) for smoking was also calculated for both the FN and BC populations as follows:

\[
\text{PMR} = \frac{\sum (\text{Adult Disease Gender SAF} \times \text{Crude Death Counts})}{\text{Crude Adult Death Counts}}
\]

To calculate SAM rates among infant populations, a number of calculations were carried out. The following formula was utilized to calculate the incidence of death not attributable to smoking: \( I_1 = I_2 / [(RR)(p2) + p1] \), where \( I_1 \) = incidence of infant death when there was no exposure to second-hand smoke, \( I_2 \) = incidence of infant death when there was and was not exposure to second-hand smoke, \( RR \) = relative risk of death for the particular condition, \( p1 \) = prevalence of infants who were not exposed to second-hand smoke, \( p2 \) = prevalence of infants who were exposed to second-hand smoke (9). The relative risks of mortality due to the 4 conditions among infants, as estimated by McIntosh, were utilized (18). Second-hand smoke refers to exposure in-utero and environmental tobacco smoke exposure up to one year of age. The prevalence of smoking for both FN and general populations were utilized for the infant calculations, because smoking rates during
pregnancy were not available; hence, a different formula for calculating the incidence of infant death was utilized than that used for the adult populations.

To estimate the incidence of infant death among those exposed and not exposed to second-hand smoke, the number of deaths due to the particular disease, as provided by the Vital Statistics Agency, was divided by the total number of infants within each population (8). In short, the incidence of infant death among those not exposed to second-hand smoke and the incidence of infant death among infants exposed and not exposed to second-hand smoke were determined. The incidence of infant death among those exposed to second-hand smoke could then be estimated by subtracting the incidence of infant death among those not exposed to second-hand smoke from the incidence of infant death among those exposed and not exposed to second-hand smoke.

Infant SAM rates for each of the 4 diseases were summated and estimated the total infant SAM rate. Finally, the infant PMR, or the percentage of deaths that could be prevented if second-hand smoke were eliminated, was calculated by dividing the total number of deaths attributable to smoking, as determined in the above calculation, by the total number of infant deaths within that population.

Confidence Intervals were calculated for the SAM rates through the use of the following formula: 95% Confidence Intervals = \( p \pm 1.96\sqrt{\frac{p(1-p)}{n}} \), where \( p \) = SAM rate per 10,000 and \( n \) = the adult standard population and the infant population for the FN and BC populations.

RESULTS

During 1997, 643 out of 47,779 (1.3%) FN persons older than 34 years of age died, and during 2001, 606 out of 58,318 (1.0%) FN persons older than 34 years of age died. In 1997, 26,010 out of 2,003,068 (1.3%) persons within the general population older than 34 years of age died, and during 2001, 27,231 out of 2,188,487 (1.2%) died.

See tables 1-7 for individual disease SAFs and SAM rates. Among the FN population older than 34 years of age, the total age- and gender-adjusted SAM rate was 39.9 per 10,000 people during 1997, and 28.6 per 10,000 during 2001. The elimination of smoking would potentially have reduced death among FN adults older than 34 years of
age by 19.0% (122 smoking-related deaths) during 1997 and 17.3% (105 smoking-related deaths) in 2001. For the general population in BC older than 34 years of age, the total age- and gender-adjusted SAM rate was 27.8 per 10,000 during 1997, and 25.3 per 10,000 in 2001. The elimination of smoking would have potentially reduced deaths among the general population by 21.8% (5679 smoking-related deaths) in 1997, and 20.8% (5653 smoking-related deaths) in 2001.

Among the FN population of less than one year of age, the total SAM crude rate was 6.8 per 10,000 in 1997, and 3.6 per 10,000 in 2001. The elimination of smoking would have reduced FN infant deaths 8.0% in 1997, and by 8.3% in 2001. Among the general population of less than one year of age, the total SAM rate was 1.4 per 10,000 during 1997, and 1.0 per 10,000 during 2001. The elimination of smoking would have reduced infant deaths among the general population by 2.8% during 1997 and 2.3% during 2001.

Table I. Smoking-attributable fractions (SAF) for neoplasms among the First Nations (FN) and British Columbia’s (BC) general populations older than 34 years of age.

| Disease Category         | FN SAF |       | BC SAF |       |
|--------------------------|--------|-------|--------|-------|
|                          | Males  | Females | Males  | Females |
| Lip, oral cavity, pharynx (C00-C14) | 0.93 | 0.72 | 0.89 | 0.60 |
| Esophagus (C15)          | 0.81   | 0.83 | 0.74 | 0.72 |
| Pancreas (C25)           | 0.87   | 0.91 | 0.82 | 0.87 |
| Larynx (C32)             | 0.84   | 0.91 | 0.76 | 0.87 |
| Trachea, Lung and Bronchus (C33-C34) | 0.92 | 0.85 | 0.87 | 0.77 |
| Cervix Uteri (C53)       | 0      | 0.42 | 0     | 0.32 |
| Urinary bladder (C67)    | 0.52   | 0.49 | 0.39 | 0.37 |
| Kidney, other urinary    | 0.54   | 0.19 | 0.41 | 0.11 |
| (C64 – 66, C68)          |        |      |       |       |

*International classification of disease, tenth revision – specific codes are included between brackets. Smoking-attributable mortality for the conditions examined was identified as such by the Centers for Disease Control (17)
Table II. Smoking-attributable fractions (SAF) for circulatory diseases among the First Nations (FN) and British Columbia’s (BC) general populations older than 34 years of age.

| Disease Category                  | FN SAF   | BC SAF   |
|-----------------------------------|----------|----------|
|                                   | Males    | Females  | Males    | Females  |
| Hypertensive Diseases (I10-I13)   | 0.33     | 0.27     | 0.21     | 0.16     |
| Ischemic heart disease (I20-I25)  |          |          |          |          |
| Persons aged 35-64 yrs            | 0.50     | 0.50     | 0.37     | 0.34     |
| Persons aged ≥ 65 yrs             | 0.26     | 0.26     | 0.16     | 0.16     |
| Other heart diseases              |          |          |          |          |
| (I01-I09, I27, I30-I52)           | 0.33     | 0.27     | 0.21     | 0.16     |
| Cerebrovascular disease (I60-169) |          |          |          |          |
| Persons aged 35-64 yrs            | 0.57     | 0.64     | 0.40     | 0.47     |
| Persons aged ≥ 65 yrs             | 0.33     | 0.18     | 0.21     | 0.08     |
| Atherosclerosis (I70)             | 0.63     | 0.49     | 0.51     | 0.33     |
| Aortic aneurysm (I71)             | 0.63     | 0.49     | 0.51     | 0.33     |
| Other arterial diseases           |          |          |          |          |
| (I26, I28, I72-I78)               | 0.63     | 0.49     | 0.51     | 0.33     |

*International classification of disease, tenth revision – specific codes are included between brackets. Smoking-attributable mortality for the conditions examined was identified as such by the Centers for Disease Control (17).

Table III. Smoking-attributable fractions (SAF) for respiratory diseases among the First Nations (FN) and British Columbia’s (BC) general populations older than 34 years of age.

| Disease Category                          | FN SAF   | BC SAF   |
|------------------------------------------|----------|----------|
|                                          | Males    | Females  | Males    | Females  |
| Pneumonia, influenza (J10-J18.1, J18.8-J18.9) | 0.38     | 0.39     | 0.27     | 0.26     |
| Chronic bronchitis, emphysema (J40-J43)  | 0.86     | 0.85     | 0.81     | 0.79     |
| Chronic airway obstruction (J44)         | 0.86     | 0.85     | 0.81     | 0.80     |
| Other respiratory diseases               |          |          |          |          |
| (A15 – A19, J45-J46)                     | 0.38     | 0.39     | 0.27     | 0.26     |

*International classification of disease, tenth revision - specific codes are included between brackets. Smoking-attributable mortality for the conditions examined was identified as such by the Centers for Disease Control (17).
### Table IV. Age- and gender-adjusted smoking-attributable mortality (SAM) rate (per 10,000) for neoplasms among the First Nations (FN) and British Columbia’s (BC) general populations older than 34 years of age during 1997 and 2001.

| Disease Category* | FN Age- and Gender-Adjusted SAM Rates | BC Age- and Gender-Adjusted SAM Rates |
|-------------------|---------------------------------------|--------------------------------------|
|                   | 1997 Males | Females | 2001 Males | Females | 1997 Males | Females | 2001 Males | Females |
| Lip, oral cavity, | 0.69 | 0.72 | 0.60 | 0 | 0.70 | 0.27 | 0.73 | 0.25 |
| pharynx (C00-C14) | (0.63, 0.75)** | (0.66, 0.78) | (0.54, 0.65) | | (0.72, 0.85) | (0.24, 0.31) | (0.67, 0.79) | (0.22, 0.28) |
| Esophagus (C15)   | 0.48 | 0.44 | 1.38 | 0 | 1.15 | 0.36 | 1.05 | 0.33 |
|                  | (0.43, 0.52) | (0.40, 0.49) | (1.29, 1.46) | | (1.07, 1.22) | (0.32, 0.40) | (0.98, 1.12) | (0.29, 0.37) |
| Pancreas (C25)    | 0.38 | 0.75 | 0.55 | 2.17 | 1.57 | 1.51 | 1.39 | 1.45 |
|                  | (0.33, 0.42) | (0.69, 0.80) | (0.50, 0.61) | (2.07, 2.27) | (1.48, 1.66) | (1.43, 1.59) | (1.31, 1.48) | (1.37, 1.53) |
| Larynx (C32)     | 0.62 | 0 | 1.08 | 0.33 | 0.36 | 0.04 | 0.35 | 0.05 |
|                  | (0.57, 0.68) | | (1.01, 1.15) | (0.29, 0.36) | | (0.31, 0.40) | (0.03, 0.05) | (0.31, 0.39) | (0.04, 0.07) |
| Trachea, Lung and | 7.04 | 8.32 | 4.85 | 3.34 | 10.07 | 6.05 | 9.02 | 5.62 |
| Bronchus (C33-C34) | (6.86, 7.23) | (8.13, 8.52) | (4.69, 5.00) | (3.21, 3.46) | (9.85, 10.29) | (5.88, 6.21) | (8.81, 9.23) | (5.47, 5.78) |
| Cervix uteri (C53) | 0 | 0.09 | 0 | 0 | 0 | 0.16 | 0 | 0.19 |
|                  | (0.08, 0.12) | | | | | (0.14, 0.19) | | (0.16, 0.22) |
| Urinary bladder (C67) | 0 | 0 | 0.23 | 0 | 0.35 | 0.22 | 0.52 | 0.20 |
|                  | (0.20, 0.27) | | (0.19, 0.26) | | (0.19, 0.26) | | (0.47, 0.57) | | (0.17, 0.23) |
| Kidney, other urinary (C64-66, C68) | 0.71 | 0 | 1.05 | 0 | 0.46 | 0.74 | 0.38 | 0.06 |
|                  | (0.65, 0.77) | (0.98, 1.13) | (0.41, 0.51) | (0.55, 0.92) | (0.34, 0.43) | | (0.05, 0.08) |

* International classification of disease, tenth revision - specific codes are included between brackets. Smoking-attributable mortality for the conditions examined was identified as such by the Centers for Disease Control (17).

** 95% Confidence Interval calculations.

### Table VI. Age- and gender-adjusted smoking-attributable mortality (SAM) rate (per 10,000) for respiratory diseases among the First Nations (FN) and British Columbia’s (BC) general populations older than 34 years of age during 1997 and 2001.

| Disease Category* | FN Age- and Gender-Adjusted SAM Rates | BC Age- and Gender-Adjusted SAM Rates |
|-------------------|---------------------------------------|--------------------------------------|
|                   | 1997 Males | Females | 2001 Males | Females | 1997 Males | Females | 2001 Males | Females |
| Pneumonia, influenza (J10-J18.1, J18.8-J18.9) | 4.91 | 2.88 | 2.44 | 2.29 | 1.69 | 1.76 | 1.50 | 1.62 |
|                  | (4.75, 5.06)** | (2.77, 2.99) | (2.33, 2.55) | (2.19, 2.39) | (1.60, 1.78) | (1.67, 1.85) | (1.42, 1.59) | (1.53, 1.70) |
| Chronic bronchitis, emphysema (J40, J43) | 1.77 | 0.93 | 1.10 | 0 | 0.95 | 0.63 | 0.84 | 0.56 |
|                  | (1.68, 1.86) | (0.87, 1.00) | (1.02, 1.17) | | (0.88, 1.02) | (0.57, 0.68) | (0.78, 0.91) | (0.51, 0.61) |
| Chronic airway obstruction (J44) | 6.33 | 1.79 | 5.91 | 0.93 | 4.21 | 3.14 | 3.90 | 2.88 |
|                  | (6.15, 6.51) | (1.70, 1.88) | (5.74, 6.00) | (0.87, 1.00) | | (4.07, 4.36) | (3.02, 3.26) | | (3.77, 4.04) | (2.76, 2.99) |
| Other respiratory diseases | 0.28 | 0.82 | 0.24 | 0.54 | 0.06 | 0.14 | 0.07 | 0.11 |
|                  | (0.24, 0.32) | (0.76, 0.88) | (0.21, 0.28) | (0.49, 0.58) | (0.04, 0.08) | (0.12, 0.17) | (0.05, 0.09) | (0.09, 0.13) |

* International classification of disease, tenth revision - specific codes are included between brackets. Smoking-attributable mortality for the conditions examined was identified as such by the Centers for Disease Control (17).

** 95% Confidence Interval calculations.
### Table V. Age- and gender-adjusted smoking-attributable mortality (SAM) rate (per 10,000) for circulatory diseases among the First Nations (FN) and British Columbia’s (BC) general populations older than 34 years of age during 1997 and 2001.

| Disease Category* | FN Age- and Gender-Adjusted SAM Rates | BC Age- and Gender-Adjusted SAM Rates |
|-------------------|---------------------------------------|--------------------------------------|
|                   | 1997        | 2001        | 1997        | 2001        |
|                   | Males | Females | Males | Females | Males | Females | Males | Females |
| Hypertensive Diseases | 0   | (0.14, 0.19) | 0.06 | 0.15 | 0.17 | 0.13 | 0.14 | 0.19 |
| (I10-I13)           | (0.14, 0.19) | (0.12, 0.17) | (0.05, 0.08) | (0.12, 0.17) | (0.11, 0.16) | (0.14, 0.19) |
| Ischemic heart disease (I20-I25) | 5.90 | 4.97 | 4.47 | 4.11 | 2.02 | 1.58 | 3.17 |
| Persons aged 35-64 yrs | (5.74, 6.07)** | (4.63, 4.30) | (0.46, 0.57) | (1.93, 2.12) | (0.42, 0.51) | (1.50, 1.67) | (0.30, 0.39) |
| Persons aged ≥ 65 yrs | 6.88 | 7.45 | 4.29, 4.58 | 4.40 | 3.05 | 3.29 |
| Other heart diseases | 6.79 | 3.96 | 3.49 | 1.89 | 1.64 | 1.66 |
| (I01-I09, I27, I30-I52) | (6.42, 6.98) | (3.49, 3.76) | (3.36, 3.62) | (1.79, 1.99) | (1.56, 1.73) | (1.57, 1.75) | (1.41, 1.57) |
| Cerebrovascular disease (I60-I69) | 2.05 | 1.23 | 0.42 | 1.29 | 0.47 | 0.30 | 0.33 | 0.31 |
| Persons aged 35-64 yrs | (1.96, 2.15) | (1.15, 1.31) | (0.38, 0.47) | (1.21, 1.37) | (0.42, 0.51) | (0.26, 0.35) | (0.29, 0.36) | (0.27, 0.34) |
| Persons aged ≥ 65 yrs | 2.89 | 2.25 | 1.67 | 1.67 | 1.83 | 1.12 | 1.67 | 1.04 |
| Atherosclerosis (I70) | 0.47 | 0 | 0.81 | 0.34 | 0.23 | 0.21 | 0.20 | 0.20 |
| (I71) | (0.42, 0.52) | (0.75, 0.88) | (0.30, 0.38) | (0.20, 0.26) | (0.18, 0.24) | (0.17, 0.23) | (0.17, 0.23) |
| Aortic aneurysm | 0.47 | 1.07 | 0 | 0.68 | 0.96 | 0.31 | 0.83 | 0.29 |
| (1.00, 1.14) | (0.42, 0.52) | (0.62, 0.73) | (0.89, 1.03) | (0.27, 0.35) | (0.77, 0.89) | (0.25, 0.32) |
| Other arterial diseases | 0 | 0.40 | 1.69 | 0 | 0.33 | 0.20 | 0.38 | 0.23 |
| (I26, I28, I72-I78) | (0.36, 0.45) | (1.60, 1.79) | (0.29, 0.37) | (0.17, 0.23) | (0.33, 0.42) | (0.20, 0.27) |

* International classification of disease, tenth revision - specific codes are included between brackets. Smoking-attributable mortality for the conditions examined was identified as such by the Centers for Disease Control (17).

** 95% Confidence Interval calculations.

### Table VII. Smoking-attributable mortality (SAM) rate (per 10,000) for the First Nations and general populations of less than one year of age during 1997 and 2001.

| Disease Category* | First Nations 1997 | General Population 1997 | First Nations 2001 | General Population 2001 |
|-------------------|---------------------|-------------------------|---------------------|-------------------------|
| Short gestation low birth weight (P07) | 0.83 (0.40)** | 0.65 (0.608) | 0.41 (0.102) | 0.43 (0.111) |
| Respiratory distress syndrome (P22) | 0 | 0 | 0.24 | 0.12 |
| Other respiratory conditions | (0.71) | (0.47) | (0.26) | (0.12) |
| of newborn | (P28.2-28.9) | (0.385) | (0.201) | (0.44) | (0.48) |
| Sudden infant death syndrome (R95) | 5.20 | 1.71 | 0.59 | 0.34 |
| (0.13) | (0.624) | (0.132) | (0.093) |

* International classification of disease, tenth revision - specific codes are included between brackets. Smoking-attributable mortality for the conditions examined was identified as such by the Centers for Disease Control (17).

** 95% Confidence Interval calculations.
DISCUSSION

There are four principal study limitations that need to be taken into account or this discussion. First, the reported smoking-attributable mortality (SAM) figures were derived from self-reported smoking rates in 1997, whereas actual smoking-attributable deaths were the result of smoking during previous decades, when smoking rates were higher. Second, smoking rates during pregnancy were not available for the estimation of the infant SAM rates. Third, deaths attributable to cigar smoking, pipe smoking and smokeless tobacco use were not considered. Fourth, the relative risk estimates employed here do not control for confounding factors that are relevant to FN populations and smoking. For example, diabetes occurs at a higher rate among FN people (19), and tobacco use has been shown to increase diabetes complications, including myocardial infarction and cerebrovascular incidents (20-22), which are also consequences of tobacco use. Therefore, there is a need to consider the prevalence of concurrent diseases within certain populations when estimating the relative risk of death related to smoking. Perhaps modifying the smoking-attributable relative risks is indicated when applying relative risk to rations populations that were not used to derive the ratios (23).

Nevertheless, this study showed that mortality related to smoking is significant for both FN and BC populations and the elimination of smoking would potentially reduce FN population deaths by 19% and 17.3%, and by 21.8% and 20.8% among the general population. For comparison, in the US during 1990, the median adult SAM rate was 36.3 per 10,000, with a median percentage of all deaths attributable to smoking of 19.2% (16). For further comparison, among the FN population in BC, 26.3% of deaths during 1991-2001, were due to external causes, 23.3% resulted from the circulatory system diseases, and 15.1% from cancer, while in the BC general population 37.0% of deaths were related to circulatory system diseases, 27.2% to cancer and 10.3% to respiratory system diseases. In summary, SAM is significant in both populations, especially in comparison to other disease proportional mortality ratios (PMRs).

Although the prevalence of smoking is much higher among the FN population, the FN total adult age- and gender-adjusted SAM rate similar to the general population rate. Perhaps the lower than expected FN SAM rate, given their higher rates of smoking, are due to the fact that FN populations are younger than the general population and die at younger ages - 28.8% of FN population deaths occurred between the ages of 20-44 years,
versus 14.7% for the general population (8). Given that the FN population is aging (18), SAM may in fact increase. Thus, with the current significant impact of SAM among FN populations, and its potentially even greater future impact, health planners must not miss this opportunity to prevent SAM. Culturally sensitive prevention and control strategies are indicated (24), including implementation of cessation services. Furthermore, tobacco control policies, such as the taxation of tobacco products, need to be considered.

Another important finding in this study is that the FN total infant SAM crude rates are up to 3 times higher than that of the general population. Also of note is the FN Sudden Infant Death Syndrome SAM rate, which was almost 9 times higher than the BC rate. As mentioned, the infant SAM rates are based on population smoking rates, because smoking rates during pregnancy were not available. In spite of this limitation, the SAM rates do raise the issue that smoking rates during pregnancy need examination among FN populations. Furthermore, interventions that reduce smoking during pregnancy and children’s exposure to second-hand smoke are needed.

In conclusion, SAM rates among both the FN and general populations within British Columbia during 1997 and 2001 are substantial, especially among FN children of less than one year of age. Based on the very high FN smoking rates and their expected increase in SAM, there is a need for culturally sensitive tobacco prevention and cessation programs.

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