Fire-related Deaths Among Aboriginal People in British Columbia, 1991-2001

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ABSTRACT

Background: Fire-related mortality rates are known to be higher in Aboriginal people in BC. The purpose of this study was to describe the epidemiology and context of fire-related deaths in this population.

Methods: All death registrations attributable to fires in the province were identified by the B.C. Vital Statistics Agency (1991-2001). Age-specific death rates (ASDR) and age-standardized mortality rates (ASMR) were calculated for Status Indians and other residents. Data from Coroner's reports from the B.C. Coroners' Service (1997-2001) were used to describe the context of Aboriginal fire-related deaths.

Results: The overall fire-related ASMR for Status Indians and other residents were 0.66 deaths and 0.07 deaths/10,000 population respectively. Annual ASMR for both populations were constant over the study period. ASDR were higher in every age category for Status Indians; children and seniors had higher rates in both populations. Twenty-seven Aboriginal fatalities (20 fires) were identified for the contextual analysis. Key findings were: 48% of the total sample had elevated blood alcohol levels; 30% of the fires were caused by lit cigarettes (majority of decedents were intoxicated); 15% of the fires were caused by electric heating sources; at least 34% of fires occurred in homes with absent or non-functional smoke alarms.

Interpretation: Fire-related mortality among Aboriginal people in BC is a preventable public health concern. In this population, fire safety and prevention programs should consider improving the prevalence of functioning smoke alarms, promoting the safe use of heat sources, and decreasing smoking behaviours and the use of alcohol.

MeSH terms: Fires; Indians, North American; mortality; accident prevention

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

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It has been recognized for decades that mortality rates from injuries are higher among Status Indians than among other residents of British Columbia,¹ although there are encouraging signs that this gap in rates is decreasing.² This difference also exists for fire-related mortality, a difference that has also been reported for Aboriginal people in other countries.^{3,4} Studies of fatal fires demonstrate that Aboriginal people are at 2 to 5 times greater risk of dying in fires compared to their non-Aboriginal counterparts.⁵⁻⁷ However, few studies have looked in detail at the context and causes of these fire-related deaths among Aboriginal people or attempted to identify measures for prevention.

The purpose of this study is to describe the epidemiology, context and characteristics of fire-related deaths among Aboriginal people in BC. It is hoped that as a result of this descriptive analysis, factors that may be modifiable by injury-prevention programming will be identified. This approach has been used elsewhere to guide population and community-specific fire prevention and safety interventions, which have in turn been associated with a decrease in the incidence of fires and rates of fire-related injuries.^{8,9}

METHODS

In this paper, "Aboriginal" is an inclusive term used to refer to First Nations, Métis and Inuit people. The term "Status Indian" refers to First Nations people who are entitled to receive the provisions of the *Indian Act* (87.4% of the First Nations population in BC).¹⁰

Two sources of data were used in this study. All deaths directly attributable to exposure to smoke, fire, and flames in the province between January 1, 1991 and December 31, 2001 were identified by the B.C. Vital Statistics Agency (using International Classification of Disease codes¹¹: ICD-9 E8900-E8999 for deaths prior to 2000, ICD10 X00-X09 for deaths in 2000-2001). Fire-related deaths where intoxication with alcohol or other substances was documented were identified using the additional ICD codes listed below.* Deaths were classified as either

* For deaths prior to 2000: ICD-9 codes 291-292, 303-3040-3049, 3050, 3052-3059 and "nature of injury" codes 9600-9779, 9800-9802, 9809. For deaths in 2000-2001: ICD-10 codes F100-F109, F11, F16, F19 and "nature of injury" codes T360-T509, T510-T512, T519.

Status Indian or other resident of BC according to a published protocol.¹² Mortality rates were calculated where appropriate as age-specific death rates (ASDR) or as age-standardized mortality rates (ASMR) with 95% confidence intervals, using direct standardization to the 1991 Canada Census population.

We used data from the B.C. Coroners' Service to describe the context of Aboriginal fire-related deaths (in BC, all deaths caused by fires are investigated by coroners). Reports of deaths caused by fires and identified as Aboriginal that were investigated by coroners between January 1, 1997 and December 31, 2001 were examined. Deaths are identified as Aboriginal in Coroners' reports based on family or physician identification as Aboriginal (i.e., includes but not limited to Status Indians). The Coroners' records contain a Judgement of Inquiry which is completed by the coroner investigating the death, as well as other reports (e.g., fire commissioner and medical records). The Judgement of Inquiry alone is in the public record and was accessible under a research protocol. Details of the deaths were extracted from these reports using a chart extraction tool which was based on a literature review of risk factors associated with fire fatalities and injuries.

RESULTS

Epidemiology of fire-related deaths

Between 1991 and 2001, there were 76 fire-related deaths among Status Indians and 288 fire-related deaths among other residents in BC; the total number of deaths due to external causes (i.e., deaths from accidental or intentional injuries) were 2,126 and 20,454 respectively. The overall fire-related ASMR for Status Indians was 0.66 deaths (95% CI 0.51-0.81) and for other residents was 0.07 deaths (95% CI 0.06-0.08) per 10,000 standard population. When one excludes the high ASMR in 1991 among Status Indians (when there were two large fires accounting for 9 of 18 deaths that year), the fire-related mortality rates for both groups are relatively constant over the study period (Figure 1).

The majority of fire-related deaths were male, with a similar proportion for both populations (51/76, 67% for Status Indians; 184/288, 64% for other resi-

Figure 1. ASMR for fire-related deaths for Status Indians compared to other residents of British Columbia, 1991-2001

Figure 2. ASDR for fire-related deaths for Status Indians compared to other residents of British Columbia, 1991-2001

dents). Fire-related ASDR were higher in every age category for Status Indians (Figure 2). The distribution of deaths across age categories appears similar for both groups: among children, higher death rates are observed for those less than five years, and the highest rates are among seniors >65 years.

The proportion of fire-related deaths with documentation of intoxication from either alcohol or drugs was similar for both Status Indians and other residents of BC (12/76, 16% versus 48/288, 17% of deaths, respectively).

Contextual analysis of fire-related deaths

Between 1997 and 2001, 21 fires with at least 1 Aboriginal fatality were investigated by B.C. Coroners, representing 28 Aboriginal fatalities (and 2 non-Aboriginal fatalities not included in this analysis). One fire with 1 fatality was excluded as the death was classified as a suicide. The remaining 20 fires (27 Aboriginal fatalities) were included in the study. On average, there were 1.5 deaths per fire, with the majority of fires having a single fatality (14/20, 70%).

TABLE I**Causes of Fires with Aboriginal Fatalities in B.C. Coroner's Reports, 1997-2001**

Cause of Fires	Number of Fires (%) N=20	Number of Deaths (%) N=27	Number of Deaths Due to Each Cause with Elevated Blood Alcohol Levels (%)
Lit cigarette or improper disposal of smoking materials	6 (30%)	7 (26%)	6/7 (86%)
Electric heater or radiator (faulty, or close to flammable materials)	3 (15%)	5 (19%)	1/5 (20%)
Electrical appliance (faulty, or not switched off)	2 (10%)	3 (11%)	1/3 (33%)
Overheated cooking oil	2 (10%)	2 (7%)	1/2 (50%)
Other cause (faulty furnace, propane lantern*)	2 (10%)	2 (7%)	1/2 (50%)
Unknown cause†	5 (25%)	8 (30%)	3/8 (38%)

* The propane lantern was in use because the community electricity generator was switched off during night-time hours.

† Suspected causes for these fires were candles close to window coverings, sparks from an open pit fire used to heat a traditional dwelling, playing with a decorative oil lantern, children playing with fire-starting materials, and either suspected use of smoking materials or a fire for heat in an abandoned house.

TABLE II**Additional Characteristics of Fires with Aboriginal Fatalities in B.C. Coroner's Reports, 1997-2001**

Characteristics of Fires	Number (%)
Timing of fire:	
In winter or spring (November to April)	12/20 (60%)
Between midnight and 8 AM	17/20 (85%)
Type of housing:	
Private homes	9/20 (45%)
Apartment buildings or duplex housing	4/20 (20%)
Mobile homes	4/20 (20%)
Log homes or traditional dwellings	2/20 (10%)
Abandoned house	1/20 (5%)
Location of fire:	
On-reserve	12/20 (60%)
Location of emergency fire services for on-reserve fires:	
On-reserve	4/12 (33%)
Off-reserve with neighbouring municipalities	4/12 (33%)
Unknown	2/12 (17%)
No access to emergency fire services	2/12 (17%)

Figure 3. Alcohol test results by age category for Aboriginal fire-related deaths in B.C. Coroner's reports, 1997-2001

Characteristics of Fatalities

Twenty-four (24/27, 89%) deaths were caused by smoke inhalation. Nineteen (19/27, 70%) of these deaths were male. The mean age at time of death was 34.2 years (range 2-74 years). Of the five seniors over the age of 65 years who died, two

(2/5, 40%) were living alone at the time of the fire and both had impaired mobility (dependent on the use of a walker or wheelchair).

Toxicological testing for alcohol was performed for 18 deaths (Figure 3). Of these, 13 (13/18, 72% of those tested;

13/27, 48% of all fatalities) tested positive for alcohol above the legal level for driving an automobile of 17 mmol/L (mean 49.2 mmol/L, range 26-81 mmol/L).

Characteristics of Fires

The causes of the fires are listed in Table I. Six fires (6/20, 30%) were cigarette-related (smoking in bed, or ignition of other furnishings); the majority of decedents in these fires tested positive for alcohol. The second most common cause was the use of electric heaters and radiators that were either faulty or were placed too close to flammable materials (3/20, 15%). In this study, two fires were due to cooking oil left unattended on stoves (2/20, 10%).

The presence of smoke alarms was not consistently documented. For the 11 (11/20, 55%) fires where such documentation existed, 7 homes (7/11, 64% of fires with documentation; 7/20, 35% of all fires) had absent or non-functional smoke alarms. Additional characteristics of fires are listed in Table II.

DISCUSSION

It is clear that fire-related mortality among Aboriginal people in British Columbia continues to be a preventable public health concern. Overall, fire-related mortality rates are 9.4 times higher for Status Indians compared to other residents of BC and do not appear to be decreasing. Furthermore, these fire-related deaths are a sentinel for a larger fire-related injury issue, with many non-fatal fires requiring hospitalizations, emergency room visits, or visits to traditional healers.¹³ A recent report estimated that in BC between 1987 and 2000, there were 561 hospitalizations due to burns among Status Indians, representing 5,228 person-days in both acute and reha-

bilitative care (the number of hospitalizations for burns were 3.2 times higher for Status Indians when compared to other residents of the province).¹⁴

This study was not designed to provide an explanation for the higher fire-related mortality rates among Status Indians compared to other residents. Rather, this analysis is intended to describe factors that have been associated with fire-related deaths in the Aboriginal population of BC over the past decade.

The majority of factors identified in this study are supported in the literature for fatal fires in other populations.¹⁵ Risk of dying in fires is higher among males,^{7,16} children less than 5 years of age,^{5,17,18} and seniors greater than 65 years of age.^{5,17,19} Fires are more likely to be fatal if they occur during sleeping hours,¹⁹ during colder months,^{20,21} in mobile homes,^{5,19} or in rental housing.¹⁹ Overheated cooking oil has been reported as a cause of fatal fires in Alberta.⁵ In this study, factors that have not been identified in other studies include abandoned and traditional housing as a setting for fires, and use of propane lanterns due to the lack of community electricity.

Intoxication with alcohol is a well-known risk factor for fire-related mortality.^{17,19} In this study, the proportion of deaths involving alcohol or drug intoxication was similar for both Status Indians and other residents using Vital Statistics data. In data from Coroner's reports, 48% of Aboriginal fire-related deaths showed elevated blood alcohol levels at the time of death (this is a more specific and likely more valid measurement than that obtained from Vital Statistics data based on death certificate documentation). While Coroner's report data on non-Aboriginal residents in BC is not available for comparison, this proportion is similar to what has been reported elsewhere in other populations.²²

The combination of smoking and alcohol intoxication, as demonstrated in this study, is known to be particularly lethal; alcohol intoxication is 2 to 18.5 times more likely among victims in fires caused by smoking materials.²² In this study, the most common cause of fires were lit cigarettes, and smoking is also a known risk for fire-related mortality.^{5,18,19,21} There are no published studies of the effectiveness of

targeting smoking and drinking in preventing fire-related deaths; however, this study further emphasizes the importance of continuing current efforts to reduce smoking behaviours and the misuse of alcohol in Aboriginal communities.

Another frequent cause of fatal fires are heating sources (including wood-fires and electrical heating units in close proximity to flammable substances).^{18,19} Given the prevalence of these heat sources in Aboriginal communities²³ and the findings of this study, perhaps it may be of benefit for fire-prevention programming in Aboriginal communities to include education regarding the safe use and maintenance of electric heaters and wood stoves.²⁴

In our analysis, at least 35% of homes had absent or non-functional smoke alarms, which is similar to other estimates among Aboriginal dwellings in BC.²³ Fires are more likely to be fatal in homes where smoke alarms are absent or non-functional.^{17,19} Education programs and legislation for mandatory smoke alarms have shown some benefit in increasing the prevalence of smoke alarms.²⁵ In British Columbia, building codes have recently changed to request installation of electrically wired smoke alarms in all newly constructed housing. However, housing that predates this change in code would benefit from routine inspections of their existing smoke detectors. Smoke alarm distribution programs have also been evaluated for impact on injury rates and incidence of fires, with conflicting results.^{8,26,27} On long-term follow-up in these studies, approximately half of the distributed smoke alarms remained functional (due to factors including problems with maintenance, and being disabled because of false alarms).²⁸ Smoke alarm distribution programs have the potential to reduce the rates of injuries or fire incidence; in order for such programs to be successful, ensuring correct installation and ongoing maintenance and functionality of the smoke alarms are important.²⁷

There are several limitations of this study that are important to mention. This study involved data from two different sources which used different methods for identification of a death resulting from a fire, and different definitions of ethnicity (i.e., Aboriginal, Status Indian). There are also limitations to these data sources, such

as misclassification of cause of death or ethnicity. As Coroner's reports are public reports of deaths and not data collection tools, data for a number of variables are not systematically coded in all of the records. The small sample size for both fires and fire-related deaths limits the validity of results obtained in the contextual analysis. This study is also unable to comment on factors relevant to fire outcomes such as role of housing quality, or the responsiveness of available emergency medical response services.

In summary, we have identified factors that contributed to fire-related mortality among the Aboriginal people of British Columbia. Further research is needed to support these findings and to explain the higher rates of fire-related deaths among this population. However, this analysis should help to guide injury-prevention programming in Aboriginal communities. The factors that appear most amenable to modification and may have the greatest impact on fire-related mortality include improving the prevalence of functional smoke alarms, increasing the safe use of heating sources such as portable electric heaters, and decreasing smoking behaviours and the misuse of alcohol in Aboriginal communities in British Columbia.

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RÉSUMÉ

Contexte : On sait que les taux de mortalité liés aux incendies en Colombie-Britannique sont plus élevés chez les Autochtones. Nous avons voulu décrire l'épidémiologie et le contexte des décès liés aux incendies dans cette population.

Méthode : Tous les décès enregistrés attribuables aux incendies dans la province ont été trouvés dans les registres d'état civil de la Colombie-Britannique (1991-2001). Les taux de mortalité par âge (TMA) et les taux de mortalité standardisés selon l'âge (TMSA) ont été calculés pour les Indiens inscrits et les autres résidents. À partir des rapports du Bureau des coroners de la Colombie-Britannique (1997-2001), nous avons établi le contexte des décès liés aux incendies chez les Autochtones.

Résultats : Les TMSA globaux liés aux incendies étaient de 0,66 décès p. 10 000 chez les Indiens inscrits et de 0,07 décès p. 10 000 chez les autres résidents. Annuellement, les TMSA des deux populations étaient constants sur la période de l'étude. Les TMA étaient supérieurs dans chaque catégorie d'âge chez les Indiens inscrits; les enfants et les personnes âgées affichaient des taux plus élevés dans les deux populations. Nous avons répertorié 27 accidents mortels (20 incendies) chez les Autochtones lors de l'analyse contextuelle. Nos principales constatations étaient les suivantes : 48 % de l'échantillon total avaient des taux d'alcoolémie élevés; 30 % des incendies avaient été causés par des cigarettes allumées (la majorité des défunts étaient intoxiqués); les installations de chauffage électriques étaient à l'origine de 15 % des incendies; et au moins 34 % des incendies s'étaient produits dans des maisons sans détecteur de fumée ou avec des détecteurs défectueux.

Interprétation : Les décès liés aux incendies chez les Autochtones de la Colombie-Britannique sont un problème de santé publique évitable. Dans cette population, les responsables des programmes de sécurité-incendie et de prévention devraient songer à améliorer la prévalence des détecteurs de fumée en bon état, à promouvoir l'utilisation sans risque des installations de chauffage et à réduire le tabagisme et la consommation d'alcool.

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