

# Daily Smoking in Saskatoon: The Independent Effect of Income and Cultural Status

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## ABSTRACT

**Objective:** Smoking prevalence in the Saskatoon Health Region (SHR) went from 23.9% in 2003 to 23.3% in 2005 to 26.2% in 2007. The prevalence of smoking within the SHR Aboriginal population is substantially higher than the rest of the population. The purpose of the current study was to determine the independent effects of Aboriginal cultural status and income status on daily smoking status.

**Methods:** Data from three cycles of the Canadian Community Health Survey (2001, 2003, 2005) were merged with identical data collected by the SHR in 2007. All four cycles were random telephone survey samples.

**Results:** 5948 participants (81.1% response rate) completed the survey. After cross-tabulation, Aboriginal cultural status and income were strongly associated with daily smoking status. Using logistic regression, the odds of daily smoking for residents of Aboriginal cultural status was reduced substantially from the initial odds of 3.43 to 2.26 after adjusting for income alone, and reduced further to 1.57 after full multivariate adjustment.

**Conclusion:** Given the association between smoking status and income status, future policies to reduce smoking prevalence should include generic policies to reduce income disparity as well as targeted strategies to improve the social conditions of Aboriginal people.

**Key words:** Ethnology; social class; income; smoking

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

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In Canada, it is not difficult to find a government agency reporting that Aboriginal cultural status is associated with smoking. For example, the Health Canada website reports that 57% of Aboriginal adults are current smokers, which is twice the rate of the Canadian national average.<sup>1</sup> Statistics Canada reports that 51.4% of the off-reserve Aboriginal population are smokers, which is 1.9 times higher than the non-Aboriginal population.<sup>2</sup> More importantly, Statistics Canada reports that smoking rates among Aboriginal people are not decreasing.<sup>2</sup>

In the Saskatoon Health Region (SHR), Saskatchewan, daily smoking prevalence was 23.9% in 2003 and 23.3% in 2005 but then increased to 26.2% in 2007, despite a population health promotion plan to reduce tobacco use.<sup>3-6</sup> In comparison, smoking prevalence in Canada remained relatively constant from 22.9% in 2003 to 21.7% in 2005 to 21.9% in 2007.<sup>3-5</sup> The prevalence of smoking within the SHR Aboriginal population is substantially higher than in the rest of the population. This leads to the question: are differences in the prevalence of daily smoking in SHR really due to cultural status or are they due to other factors like socio-economic status?

In response, the authors were able to find only one study that reviewed the association of Aboriginal cultural status with smoking after adjustment for socio-economic status. The US Surgeon General's Report indicates that after adjustment for the confounding of education, the difference in the prevalence of smoking between American Indians and Caucasians was not significant.<sup>7</sup> Another report from the United States found that the odds of smoking are not higher for minority African Americans in comparison to Caucasians after adjustment for socio-economic status.<sup>8</sup>

The purpose of the current study was to determine the independent effects of Aboriginal cultural status and income status on daily smoking status in the Saskatoon Health Region.

## METHODS

The Canadian Community Health Survey (CCHS) is administered by Statistics Canada with the central objective of collecting health-related data at the level of health regions.<sup>9</sup> The sample size for each health region is chosen to represent a sample large enough to provide valid and reliable information for a health region within any given cycle.<sup>9</sup>

The CCHS consists of cross-sectional surveys in 2000/01, 2003 and 2005. Data that were collected by Statistics Canada on all three cycles of the CCHS were merged with identical questions asked in February of 2007 by the Saskatoon Health Region (SHR). All four cycles were random digit dialing telephone survey samples with computer-assisted interviewing. The target population included approximately 98% of the SHR. Aboriginal people sampled were off reserve. Missing data were excluded from the analysis. Although the methodology of the CCHS has been documented in detail previously, there are no publications citing validity or reliability.<sup>9</sup>

The outcome in the study was current daily smoking status based on those who reported smoking cigarettes every day at the present time.

The baseline variables included: 1) cultural status (Caucasian, Aboriginal or Other); 2) socio-economic status, consisting of a fam-

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ily income: 0-\$25,000, \$25,001-\$75,000 and above \$75,000, b) neighbourhood income: six contiguous low-income neighbourhoods<sup>10</sup> and rest of Saskatoon, and c) individual education: less than high school graduate, high school graduate and post-secondary graduate; 3) demographics (age and gender); 4) self-report health (excellent, very good, good, below average, poor); 5) mental health (lifetime suicide ideation); 6) life stress measured by current amount of stress in daily life; 7) behaviours, consisting of a) physical inactivity (composite index including activities, frequency, duration and intensity), b) having more than five drinks of alcohol at one time at least once per week in the past twelve months; 8) body mass index over 30; and 9) consultations with a family physician or with a mental health worker (social worker, counsellor or psychologist) in the past year. Only results with statistical significance are presented.

The main cross-tabulations to be computed were between the demographics of income and cultural status with the outcome of daily smoking status. A logistic regression model was built to describe the relationship between the outcome of a) daily smoking status and b) non-daily smoking status and all covariates. A hierarchical well-formulated front-wise modeling approach was used instead of a computer-generated stepwise algorithm.<sup>11</sup> Stepwise models were built that start with cultural status and then progressively include socio-economic status (family income and neighbourhood income, then education), then demographics and so on (entered in same order listed in previous paragraph). In the final model, the unadjusted effect of each covariate was determined and then entered one step at a time based on changes in the -2 log likelihood and the Wald test.<sup>12</sup> The variables were tested independently in a hierarchical fashion but are presented in blocks in the table for clarity. The final regression model included factors with beta values for which the p-values were less than 0.05.<sup>12</sup> Confounding was tested by comparing the estimated coefficient of the outcome variable from models containing and not containing the covariates.<sup>12</sup> Interaction was assessed with product terms.<sup>12</sup> R<sup>2</sup> was used to determine the proportion of variance in the outcome variable explained by the knowledge of the explanatory variables but not as a measure of the appropriateness of the final model.<sup>12</sup> Goodness-of-fit of the final model was assessed by the Hosmer-Lemeshow statistical test.<sup>12</sup> The final results were presented as adjusted odds ratios with 95% confidence intervals.<sup>12</sup> All analyses were performed with an SPSS 15.0 software package.

Ethics approval was obtained from the University of Saskatchewan Behavioural Research Ethics Board. The research was conducted in partnership with the Saskatoon Tribal Council and the principles of OCAP were followed.

**RESULTS**

Over four cycles in 2001, 2003, 2005 and 2007, 7,332 residents of SHR were asked to complete a health survey with 6,127 agreeing to participate (83.6%) and complete data available on 5,948 participants (81.1%). By individual cycle, the sample sizes were 1,174, 1,082, 1,177 and 2,515. Overall, the mean age was 46.3 (SD 20.3). Females represented 55.2% of the sample and Caucasians represented 82.9% of the sample (N = 4,930) while Aboriginal people represented 10.4% of the sample (N = 619). In comparison to 2001 census data for SHR, the sample had a statistically significant difference in age (22.0% of the sample was over the age of 65 in com-

**Table 1.** Cross-tabulations for All Independent Variables by Daily Smoking Status among Adults in Saskatoon

Independent Variables	Daily Smoker (%) (n=1215)	Sig.
Cultural Status		
Aboriginal	44.0	<0.000
Caucasian	18.6	
Family Income		
\$0-25,000	29.5	<0.000
\$25,001-75,000	20.0	
>\$75,000	13.6	
Neighbourhood Income		
6 low-income neighbourhoods	44.1	<0.000
Rest of Saskatoon	18.5	
Education		
<Secondary graduate	23.9	<0.000
Secondary graduate	25.8	
University	17.1	
Age (years)		
12-19	11.1	<0.000
20-29	24.4	
30-39	23.8	
40-49	28.8	
50-59	24.4	
≥60	12.6	
Sex		
Males	19.9	0.227
Females	20.7	
Self-report Health		
Excellent / very good	18.0	<0.000
Good / fair / poor	23.4	
Suicide		
Has considered	38.8	<0.000
Has not considered	18.5	
Life Stress		
Not at all / not very / a bit of	20.2	<0.000
Quite a bit/extreme	24.8	
Number of Drinks Once/Week in a Year		
<5	20.9	<0.000
≥5	43.6	

parison to 13.2% of census) but not in gender or cultural status. The only variable to have a statistically significant difference between the individual cycles was physical activity rates (higher in cycle four).

At the descriptive level, the variables of Aboriginal cultural status, family income, and neighbourhood income were all strongly associated with daily smoking status. For example, 44.0% of Aboriginal residents were daily smokers in comparison to 18.6% of Caucasians. As well, 44.1% of residents living within low-income neighbourhoods smoked daily in comparison to 18.5% of other city residents and 29.5% of low-income earners smoked daily in comparison to 13.6% of high-income earners. The other variables with significance included educational status, age, self-report health, life stress, suicide ideation and excessive alcohol consumption (Table 1).

A hierarchical model-building strategy is presented by blocks in Table 2. At the first stage of model building, the crude odds ratio for Aboriginal cultural status reduced from 3.43 to 2.26 when adjusted for family income and neighbourhood income (a 117% reduction in odds). The introduction of educational status into the model had limited influence (2.26 to 2.20). Age had an impact on the association between Aboriginal cultural status and daily smoking status (OR reduced from 2.20 to 1.76). The odds of Aboriginal people smoking daily reduced to 1.55 after adjusting for suicide ideation and extreme life stress. The odds of Aboriginal people smoking daily actually increased from 1.55 to 1.57 after adjusting for excessive alcohol consumption. After full multivariate adjustment, Aboriginal cultural status had a much more limited association with daily smoking status (OR=1.59; 95% CI 1.16-2.17) than its unadjusted association (OR= 3.43; 95% CI 2.84-4.13).

**Table 2.** Stepwise Model Building for Daily Smoking among Adults in Saskatoon Health Region

Independent Variables	Crude OR Model 0	95% CI	Adj. OR Model 1	95% CI	Adj. OR Model 2	95% CI	Adj. OR Model 3	95% CI	Adj. OR Model 4	95% CI	Adj. OR Model 5	95% CI
Aboriginal Cultural Status	3.43	2.84-4.13	2.26	1.76-2.90	2.20	1.71-2.84	1.76	1.36-2.30	1.55	1.14-2.10	1.57	1.15-2.15
Family Income												
\$0-25,000	2.66	2.13-3.31	1.80	1.39-2.34	1.69	1.30-2.21	2.12	1.59-2.83	2.13	1.52-3.01	2.30	1.61-3.29
\$25,001-75,000	1.59	1.28-1.97	1.44	1.13-1.82	1.38	1.08-1.75	1.62	1.26-2.08	1.68	1.26-2.25	1.83	1.35-2.49
6 Low-income Neighbourhoods	3.60	2.80-4.63	2.33	1.67-3.25	2.41	1.72-3.37	2.31	1.63-3.28	2.47	1.60-3.82	2.39	1.51-3.78
Education												
<Secondary graduate	1.52	1.30-1.77			1.20	0.96-1.50	1.87	1.46-2.41	1.82	1.35-2.45	1.83	1.34-2.50
	1.68	1.44-1.96			1.37	1.12-1.68	1.43	1.15-1.77	1.38	1.08-1.76	1.39	1.08-1.78
Age (years)												
12-19	0.86	0.63-1.17					0.52	0.31-0.85	0.60	0.27-1.34	0.64	0.28-1.45
20-29	2.23	1.80-2.77					2.06	1.54-2.77	1.66	1.18-2.34	1.50	1.05-2.15
30-39	2.16	1.75-2.68					2.36	1.76-3.17	1.98	1.40-2.79	1.84	1.28-2.65
40-49	2.79	2.27-3.43					3.29	2.47-4.37	2.83	2.04-3.93	2.69	1.90-3.82
50-59	2.24	1.79-2.78					2.64	1.96-3.56	2.28	1.63-3.19		1.44-2.93
Has considered suicide	2.78	2.30-3.37							1.59	1.20-2.11	1.51	1.27-2.03
Extreme life stress	1.30	1.12-1.51							1.24	0.97-1.58	1.31	1.02-1.69
5 drinks once per week in a year	2.92	2.32-3.68									2.60	1.79-3.76

n = 5948; missing = 39 cases

Reference category for dependent variable – Daily smoker

Reference category for independent variables: Caucasian cultural status; Family income >\$75,000; Rest of Saskatoon; University graduate education; Age ≥60;

Has not considered suicide; No extreme life stress; <5 drinks once per week in a year

Independent variables (Block 0) = Crude ORs for the independent variables tested independently

Independent variables (Block 1) = Cultural status + Family income + Neighbourhood income

Independent variables (Block 2) = Block 1 + Education

Independent variables (Block 3) = Block 2 + Age

Independent variables (Block 4) = Block 3 + Suicide ideation + Life stress

Independent variables (Block 5) = Block 4 + Alcohol use (FINAL MODEL)

Family income, neighbourhood income and age were all confounders to the relationship between Aboriginal cultural status and daily smoking status. There was no interaction in the final regression model. Other significant covariates associated with daily smoking status included educational status, suicide ideation, extreme life stress and excessive alcohol use. Increased or decreased utilization of physicians or mental health services was not associated with daily smoking status. The  $R^2$  for the final model was 0.166, suggesting reasonable explanation of the proportion of variance in the outcome variable explained by the knowledge of the explanatory covariates. The goodness-of-fit test result (0.821) suggests that the final model is appropriate and that the predicted values are accurate representations of the observed values in an absolute sense. The estimated slope coefficients and standard errors presented are small, therefore co-linearity is not suspected.

## CONCLUSIONS

There are very few studies that review the association of Aboriginal cultural status with smoking after multivariate adjustment for variables like socio-economic status. The results from the American Surgeon General's Report indicates that after adjustment for the confounding of education, odds of smoking between American Indians and Caucasians were not statistically significant (OR=1.20; 95% CI 0.95-1.51).<sup>7</sup> The results of our study indicate that the initial odds of daily smoking for residents of Aboriginal cultural status was 3.43, but reduced substantially to 2.26 after adjustment for income alone (117% reduction in odds) and 1.57 after full multivariate adjustment. It is important to note, however, that Aboriginal cultural status was still independently associated with daily smoking status after multivariate adjustment. This might represent true cultural differences in usage, the macro social effects of being of Aboriginal cultural status acting as an intermediary (i.e., the impact of discrimination) or mediating effects (i.e., fewer resources available to those most in distress).

Income, neighbourhood income and education have been found previously to be associated with smoking prevalence.<sup>7,8,13-18</sup> Mental health (i.e., suicide ideation, life stress and excessive alcohol intake) have also been demonstrated previously to be associated with smoking status, although mental health can also be seen as an intermediary between behaviour and outcome.<sup>19-21</sup>

A limitation of the study design is that it is cross-sectional and can therefore only imply association and not causation. Second, the questions asked in the CCHS limit the review of all potential covariates associated with daily smoking (i.e., psychosocial motives, self esteem, social influences and social networks<sup>22</sup>). Third, the data on Aboriginal residents are limited to the off-reserve population. Fourth, there appears to be a sampling bias by age within the study; which is adjusted for in the analysis.

There are important policy implications to discuss. A fundamental assumption of anti-smoking campaigns is that individuals will enact behavioural change when they are given knowledge.<sup>14</sup> Recent declines in smoking prevalence, however, have been more rapid in individuals with higher socio-economic status (SES) than those of lower SES.<sup>14,23</sup> As such, future strategies will need to address SES.<sup>14,22,23</sup> Second, Aboriginal cultural status is currently associated with poverty and impoverished social conditions and therefore acts as a pathway to daily smoking status.<sup>22</sup> As such, targeted strategies will also be required specifically for Aboriginal people to improve their life situation.<sup>22</sup>

Smoking prevalence in the Saskatoon Health Region (SHR) went from 23.3% in 2005 to 26.2% in 2007. Future directions to reduce smoking prevalence should include policies to reduce socio-economic disparity as helpful adjuncts to other individual and population-based strategies.

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## RÉSUMÉ

**Objectif :** La prévalence du tabagisme dans la région sanitaire de Saskatoon (RSS) a reculé de 23,9 % en 2003 à 23,3 % en 2005, puis augmenté à 26,2 % en 2007. La prévalence du tabagisme dans la population autochtone de la RSS est considérablement plus élevée que dans le reste de la population. Notre étude visait à déterminer les effets indépendants du statut culturel autochtone et du revenu sur l'usage quotidien du tabac.

**Méthode :** Nous avons fusionné les données de trois cycles de l'Enquête sur la santé dans les collectivités canadiennes (2001, 2003, 2005) avec des données identiques recueillies par la RSS en 2007. Les quatre cycles utilisaient des échantillons aléatoires d'enquêtes téléphoniques.

**Résultats :** 5 948 participants ont répondu aux enquêtes (taux de réponse de 81,1 %). Une tabulation en croix a mis au jour de fortes corrélations entre le statut culturel autochtone et le revenu et l'usage quotidien du tabac. L'analyse de régression logistique a toutefois considérablement réduit la probabilité pour les résidents de statut culturel autochtone d'être des fumeurs quotidiens : cette probabilité est passée de 3,43 (initialement) à 2,26 après rajustement selon le revenu, et à 1,57 après rajustement multivarié.

**Conclusion :** Étant donné l'association entre l'usage du tabac et le revenu, les futures politiques de réduction de la prévalence du tabagisme devraient inclure des politiques générales pour réduire l'écart dans les revenus, ainsi que des stratégies ciblées pour améliorer les conditions sociales des Autochtones.

**Mots clés :** ethnologie; classe sociale; revenu; tabagisme