FACTORS ASSOCIATED WITH TOBACCO SMOKING STATUS AMONG ABORIGINAL YOUTH PARTICIPANTS AND ATTENDEES OF THE 2002 NORTH AMERICAN INDIGENOUS GAMES

M.Sc. Thesis by Amanda J. Ritchie

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Abstract

Objective: To determine if specified demographic, environmental and attitudinal factors are associated with smoking status among a sample of Aboriginal youth at the 2002 North American Indigenous Games.

Methods: A survey inquiring about tobacco use and factors that have been shown in the literature to be associated with smoking status was implemented. These factors were described, then stratified by games participation to investigate the association between the independent variables and smoking status in bivariate and logistic regression analyses.

Results: There were 570 survey participants between the ages of 12 to 22 (53.5% female) that met the inclusion criteria, of which 32% were current smokers. Age and peer smoking were associated with smoking status among the non-games participants and peer smoking was associated with smoking status among the games participants.

Conclusions: Two environmental factors, one demographic factor and one attitudinal factor were associated with smoking status among these Aboriginal youth.

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In my fifth grade English class, we were asked to present on someone we thought was an important role model. I remember most kids dressed up as hockey players, entertainers and I even remember one boy dressed up as George Washington. My dad suggested I present on Pauline Johnson; a Canadian poet who was born on the Six Nations Reserve in Ontario. Her life was filled with dichotomies. Although her mother was British, her father was a Mohawk Chief. The family were economically comfortable, however after the death of her parents, Pauline wrote and performed her poetry to sustain. After her diagnosis of breast cancer, she continued to work and live for another three years. In 1961 she was commemorated with a Canadian postage stamp. She was the first women, the first Aboriginal person and the first Canadian writer to have this honour. It is now apparent to me why my dad suggested Pauline Johnson as a role model. It is because she is an example of the strength and resiliency that exists within Canadian Aboriginal Peoples. Thanks dad.

Dedication

This work is dedicated to the Aboriginal youth who took time out of a beautiful summer day to share their experiences and feelings with me for the benefit of other youth like themselves.

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CHAPTER ONE: INTRODUCTION

"I think that you guys are doing a good job. We need to know more about our youth to understand them. Then we can help the move in making the right choices. It is very important you guys keep doing it and find out what is important to our youth. So we can have more influence on what they do and help make more positive choice in the harsh world that we live in." (Comment of a survey participant of the AYLS, 2002)

1.1 Background

The first report of the Surgeon General of the United States on smoking and health was written in 1964. Since that time and over the past four decades, additional reports have continued to inform on the harms associated with smoking and ways to reduce the negative public health impacts of this behaviour. Nonetheless, smoking continues to exact a huge toll on the health of the world's population, and efforts to reduce this problem remain a public health priority.

Although smoking rates among Canadians have declined substantially since 1964, tobacco use continues to be an important health problem in this country. According to data from Wave 1 of the 2003 Canadian Tobacco Use Monitoring Survey, the prevalence of tobacco use was highest among the young adult age group (ages 20-24) at 30%, while the prevalence for 15-19 year olds was 18% (CTUMS, 2003).

What is not captured in this general population survey and others like it, are Canadian Aboriginal peoples living on reserve. This is unfortunate since data from other developed countries, such as Australia and the United States, illustrate that marginalized populations (for example their Aboriginal populations) tend to smoke more than non-marginalized populations (Brady, 2002; Bursac et al., 2002). Data on the smoking behaviours of Aboriginal Canadians has been assessed through separate surveys, for

instance the Aboriginal Peoples Survey (APS), the First Nations Youth Inquiry into Tobacco Use (FNYITU) and the First Nations and Inuit Regional Health Survey (FNIRHS). These surveys all support the perception that Aboriginal peoples are smoking more than the over-all Canadian population.

Results from the 1991 APS revealed that 46% of respondents aged 15 and over were daily smokers. Among 15-19 year olds, 54% were current smokers and among the 20-24 year olds 65% were current smokers. This survey also revealed that Inuit youth are more likely to smoke (73% in the 15-24 age group) compared to the Métis or First Nations youth (56% and 59% respectively in the 15-24 age group) (Stephens, 1994).

The FNYITU was conducted in 1995-1996 with 96 on-reserve communities in Canada. This survey documented that 30% of the 10-14 year olds sampled smoked, including 21% who smoked occasionally (Wunska, 1997). In each age group, females had a higher prevalence of smoking compared to males.

The prevalence of tobacco smoking was 62% among respondents aged 20 and older based on the 1996 FNIRHS. Among the 20-24 year old age group, the rate of current smoking was 72% (Reading and Allard, 1999).

A 1997 Angus Reid survey interviewed 18,000 British Columbia residents (Ministry of Health and Ministry Responsible for Seniors, 2000). Whereas 41% of Aboriginal youth aged 12-18 used any form of tobacco, the prevalence was only 16% for the general population of youth in the province.

According to the 1999 School Tobacco Use Survey that was conducted with youth aged 10-17 from the North West Territories, Aboriginal youth smoked more compared to their non-Aboriginal peers. The survey concluded that the Aboriginal group

sampled were about three times more likely to be current smokers compared to the non-Aboriginal group (38% versus 13%), a similar difference that was determined between the British Columbian youth (Northwest Territories Health and Social Services, 2001).

It might be assumed that these high rates of tobacco use in Aboriginal peoples compared to the non-Aboriginal populations are partly a result of traditional tobacco use that has and continues to play a role in ceremonial practices. Many Aboriginal peoples in the Americas have used tobacco for thousands of years for ceremonial, spiritual and medical purposes. After colonization, tobacco became an important trade good. With the Europeans' interest in tobacco as a commercial item, Aboriginal peoples began using tobacco more recreationally and it was incorporated into more common day practices. The Mohawk people of North America began 'eating smoke' after consuming food (Reading, 1996). Today, tobacco is still used for traditional purposes. Tobacco has a strong presence at powwows, being given as a gift to dancers and traditional healers. Even at some meetings or gatherings of Aboriginal importance, smudging may take place (burning a mixture of tobacco and another herb, for example sweet grass or sage to create smoke). The province of Ontario has recognized the traditional use of tobacco in the 1994 Ontario Tobacco Act, by permitting its use in otherwise smoke-free areas (Reading and Allard, 1999).

The association between tobacco's traditional use and cigarette smoking among Aboriginal youth is not presented clearly in the literature. According to the 1991 APS, youth who neither spoke nor understood their Aboriginal language were more likely to have never smoked cigarettes compared to other youth who did (Stephens, 1994). This may suggest that the closer a youth is to its Aboriginal heritage, the greater the likelihood

that they will smoke cigarettes. In focus group discussions about smoking behaviours with American Indian youth however, Kegler et al. (2000a) commented that the topic of traditional use of tobacco never emerged by the participants. Perhaps Aboriginal youth do not consider cigarettes to be related to traditional tobacco use.

A survey conducted by the 'Epidemiology Project through Great Lakes Inter-Tribal Council, Inc.' was reported in the Fall 2001 Newsletter of *The Great Lakes Epicenter*. This work investigated the association between using tobacco for traditional/ceremonial purposes and current smoking status in grade 6 to 8 Aboriginal students. Seventy-six percent of current smokers used tobacco for ceremonial purposes. Of the frequent smokers, 71% used tobacco for ceremonial purposes and of the non-smokers in the sample, 66% used tobacco for traditional purposes. Unfortunately, no sample size was given nor were any statistical tests presented. These findings suggest youth smokers use tobacco in ceremonies more than youth non-smokers. Another interesting finding from this survey was only 22%-27% of those who reported using tobacco for traditional usages, indicated they use "the native tobacco plant". It was not specified what type of tobacco was used the remaining time.

These examples illustrate that cigarettes may not be seen in the same light as traditional tobacco. To demonstrate that there is a dichotomy in perspective on traditional versus recreational tobacco, one can look at the Inuit populations of Canada who have the highest rates of tobacco use while these peoples do not have a history with tobacco in their cultures (Reading, 1996).

1.2 Rationale for the study

To be able to target youth who are likely to smoke and then empowering them not to has tremendous potential. There are several reasons to discourage youth from initiating smoking. The most compelling reason to reduce and/or prevent smoking among youth is, the younger a person begins to smoke, the greater the risk of suffering from the harms of smoking. According to the CDC, even adolescents experience adverse health effects from cigarette use, some of which are: a decrease in physical activity, increased coughing, greater susceptibility to and severity of respiratory illnesses, early development of artery disease, and slower rate of lung growth (US Department of Health and Human Services, 1994). The morbidity and mortality caused by tobacco smoking is devastating and has been thoroughly described in the literature (Doll et al., 1994; US Department of Health and Human Services, 1982).

Youth are susceptible to nicotine dependence (Shadel et al., 2000). Until recently, the time and frequency of tobacco smoking to achieve addiction in youth was not certain, but presumed to take a lengthy amount of time (US Department of Health and Human Services, 1994). An ongoing prospective study being conducted in Montreal is demonstrating that a very low exposure to cigarettes can enable addiction (O'Loughlin et al., 2003). These recent data complement other research that has illustrated the earlier smoking uptake is commenced, the less likely an individual is to successfully quit (Khuder et al., 1999).

The gateway drug hypothesis suggests "Tobacco is often the first drug used by young people who use alcohol and illegal drugs" (US Department of Health and Human Services, 1994). The converse may be true as well: if smoking does not become initiated,

the subsequent non-healthy behaviours, such as marijuana use, may not be attempted either. A recent longitudinal study by Ellickson, et al. (2001) investigated high-risk behaviours in early youth smokers (defined as those who self-reported smoking while in grade 7). Compared to non-smokers, those classified as smokers in grade 7 had the following characteristics by grade 12: they were six times more likely to be daily smokers, six times more likely to be weekly marijuana users, three times more likely to engage in hard drug use and four times more likely to have multiple drug problems. Non-substance related behaviours present in these early smokers by grade 12 were: being about four times more likely to experience early pregnancy or parenthood, between 1.4-2 times more likely to engage in violence, two times more likely to steal or commit a felony, four times more likely to sell drugs, between 1.2–2.5 times more likely to experience school-related problems and five times more likely to drop out of school. In a more recent longitudinal study with a sample of Colombian youth, similar conclusions supported the gateway hypothesis (Siqueira and Brook, 2003). The odds of using marijuana and other drugs were increased two to three fold among the youth who reported cigarette use at baseline.

1.3 Objective, research question and hypotheses

Objective:

The objective of this study is to determine if specified demographic, environmental and attitudinal factors are associated with smoking status among a sample of the participants and attending Aboriginal youth at the 2002 North American Indigenous Games through the analysis of the Aboriginal Youth Lifestyle Survey. This

research will determine if several factors that have been identified in the literature to influence tobacco status among youth are in fact associated with tobacco status among the Aboriginal youth at the games.

To identify factors associated with smoking in a population that has a poorer health status and an unfavourable distribution of many health determinants compared to the general population, due in part to a high prevalence of tobacco use and its health and economic consequences, is of paramount importance. This study may contribute to the identification of important modifiable factors and the translation of that knowledge into the design of intervention programs. This study also hopes to showcase the resilient youth who have competed and fundraised to attend the games and to show that many Aboriginal youth are healthy and well adjusted.

Research Question:

What are some demographic, environmental and attitudinal factors associated with smoking status among participants and other attending Aboriginal youth at the 2002 North American Indigenous Games?

Hypotheses:

It is hypothesized that the directions of association of the factors under investigation will be similar in this sample to what has been shown in the literature.

Factors hypothesized to be negatively associated with smoking status among this sample:

- *Age of smoking initiation*: Youth who report initiating smoking at a younger age will be more likely to be a smoker compared to youth who initiated

smoking at an older age.

- *Games' participation*: Youth who are not athletes in the games will be more likely to be a smoker compared to youth who are athletes in the games.

- *Self-esteem*: Youth with low self-esteem will be more likely to be a smoker compared to youth with high self-esteem.

- *Educational enjoyment*: Youth who do not enjoy their educational experience will be more likely to be a smoker compared to youth who do enjoy it.

- *Computer access*: Youth who do not have access to a computer at home will be more likely to be a smoker compared to youth who do have access at home.

Factors hypothesized to be positively associated with smoking status among this sample:

- *Age*: Older youth will be more likely to be a smoker compared to younger youth.

- *Sex*: Females will be more likely to be a smoker compared to males.

- *Peer smoking*: Youth whose friends smoke cigarettes will be more likely to be a smoker compared to youth whose friends do not smoke cigarettes.

- *Parental smoking*: Youth whose primary care giver smokes cigarettes will be more likely to be a smoker compared to youth whose primary care giver does not smoke cigarettes.

- *Television viewing*: A youth who watches television is more likely to be a smoker; with more watching time a week, the more likely they will be a smoker.

CHAPTER TWO: LITERATURE REVIEW

"This is a cool survey for the Aboriginal youth. And that the North American Indigenous Games for the Aboriginal people is a really good way to meet others and their countries and that the aboriginal youth should stop smoking, stop doing drugs and stop drinking, and start joining any kinds of sports." (Comment of a survey participant of the AYLS, 2002).

The review of the literature that follows is by no means an exhaustive look at the field of tobacco. A brief overview of some of the harms associated with tobacco use is provided. The major reports related to tobacco use in youth, particularly with respect to Aboriginal youth are then summarized. Taking direction from these reports, factors relating to tobacco status in youth that are identifiable in the Aboriginal Youth Lifestyle Survey will be presented. Although other factors are related to smoking behaviour in youth, such as regional smoking policies, those impacts are not discussed here since the survey instrument did not comprise this information.

2.1 Harms of tobacco

In Canada, tobacco smoking is the number one preventable cause of death. According to Makomaski Illing and Kaiserman (2004), the top causes of adult smoking-related deaths are lung cancer, ischemic heart disease and chronic airways obstruction. Many forms of cancer are attributable to smoking (Kuper et al., 2002). Heavy smokers are 25 times more likely to develop lung cancer compared to non-smokers (US Department of Health and Human Services, 1982). In adults, the risk of lung cancer as a result of environmental tobacco smoke (ETS) at home in non-smokers is approximately 24% higher compared to non-smokers who are not exposed to ETS at home (Hackshaw et al., 1997). Smoking is also a contributing cause in the development of other diseases

such as cancer of the bladder, stomach, kidney, pancreas, uterus and cervix (US Department of Health and Human Services, 1989). In addition, cigarette smoking has been associated with reduced fertility, hearing loss and vision problems (Close et al., 1990; Cruickshanks et al., 1998; Klein et al., 1998). Related to the mouth, tobacco smoking changes oral mucosa. This modification is associated with several oral lesions such as smoker's melanosis, gingival recession/tooth abrasion and black hairy tongue (Taybos, 2003). Being a smoker also renders individuals more susceptible to influenza and they are more likely to experience more severe symptoms of the flu when infected compared to non-smokers (Kark et al., 1982). Tobacco smoking and exposure to ETS during pregnancy is a major cause of spontaneous abortions, stillborns and sudden infant death syndrome after birth (Walsh, 1994; Windham et al., 1992). The harms of tobacco smoking also have some immediate health effects. Smoking instantly increases heart rate and blood pressure in people of all ages (Royal College of Physicians of London, 1992).

As well as directly affecting individuals' health, there are also societal consequences of tobacco use. For example, it is established that tobacco use substantially increases costs to health care systems. Estimates from 1991 show that smokers cost Canadians $15 billion, while the tax on the sale of cigarettes only contributed approximately $7.8 billion in taxes (Kaiserman, 1997).

2.2 Summary of major reports/papers related to youth smoking

The 1994 Surgeon General's Report on youth smoking assesses and summarizes the extensive literature on factors that influence the onset of tobacco use among American youth. The major findings of the report were: Most smoking initiation begins before high school graduation; most youth smokers are addicted to nicotine and

experience similar withdrawal symptoms as adults when attempting to quit; tobacco is a gateway drug to other substances; risk factors for youth smoking are having lower levels of school achievement, having fewer skills to resist influences to smoke, having peers who smoke, and having a low self-image; cigarette advertising increases the likelihood of smoking uptake; and, prevention programs should include a community-wide and school-based effort, tobacco tax increases and enforcement of minors' access laws (US Department of Health and Human Services, 1994).

In 1998, the Surgeon General reported on Tobacco Use Among U.S. Racial/Ethnic Minority Groups – African American, American Indians and Alaska Natives, Asian Americans and Pacific Islanders, and Hispanics (US Department of Health and Human Services, 1998). Among these groups, the harmful effects of tobacco are increasing. Where differences arise are on account of different smoking usages between and within the groups. Of the American populations investigated in the report, smoking rates were highest among the American Indians and Alaska Natives (at approximately 40%), followed by African American and Southeast Asian men. Pertaining to American Indians and Alaska Natives youth and young adults, their data on the 18-34 year old age group shows that rates of smoking decreased from the 1970s to 1990-1991 to a prevalence of 36%, and have since increased to 48% by 1994-1995. Between the early and mid 1990s, those without a high school diploma experienced an increase in smoking rates, whereas those with at least a diploma had a decline in prevalence rates. The report identified several factors that may be associated with tobacco use within the ethnic groups: socioeconomic status, cultural characteristics, acculturation, stress, biological elements, targeted advertising, price of tobacco products and varying

capacities of communities to establish and/or maintain effective tobacco control initiatives. Since this literature is limited, the direction of association of these factors with tobacco status could not be determined. With what information is available however, it appears these factors act differently between the American ethnic groups. For instance, the report stated relatively weak tobacco control infrastructure was more specific to American Indian communities. The one variable noted to commonly influence these groups is stress. The high level of stress reported among the groups, contributed to smoking maintenance (US Department of Health and Human Services, 1998).

A report produced by the Indian and Inuit Health Committee of the Canadian Paediatric Society summarized the Canadian findings up to 1999 on tobacco use among Aboriginal children and youth (CPS, 1999). This review identified several factors associated with high rates of smoking in this population: a lack of education, poverty, being of an older age, geographical isolation, living with a smoker, early smoking initiation, peer smoking, a perception that smoking is 'cool', the ease of purchase and brand identification.

2.3 Search strategy

To identify and review the literature on determinants of smoking among youth, the following databases were searched: Medline (OVID) (1966 to May Week 2 2004), PsycINFO (1972 to May 25th 2004), EMBASE (1980 to Week 21 2004), PubMed (using the available online database from the program Reference Manager on November 4th 2003) and ISI's Web Science (using the available online database from the program Reference Manager on November 4th 2003). The terms: 'Aboriginal', 'Native American',

'Indian', 'Tobacco', 'Tobacco Control', 'Smoking Cessation', 'Health Education', 'Adolescent', 'Peer', 'Physical Activity', 'Initiation', 'Television', 'Computer', 'Gender', 'Academic', 'Parental Smoking', and 'Self-Esteem' were used to search the databases. In addition, the bibliographies of relevant reviewed papers were searched through for additional studies. When more than approximately 200 hits were generated per search entry the search term was combined with another term to acquire a more specific list of titles. When the number of hits available from a search term or a combination of terms was below 200, the paper titles were read for possible inclusion. If the title did not provide enough information to decide whether or not the content of the paper was appropriate or not for inclusion, the abstract was read for further clarification. For example, some titles were very short and information regarding the study content could not be deduced from the title alone. Abstracts of papers with unclear titles as well as those of studies that might meet inclusion to the review were read. Furthermore, it was not always clear from the abstract whether or not a study was appropriate. When there was uncertainty as to the appropriateness of the papers, the paper was printed in its entirety for more detailed analysis. These papers and others that were determined to meet the inclusion criteria based on their abstracts were printed for possible inclusion.

Studies considered for inclusion were those that targeted youth participants and included a tobacco smoking outcome. Studies examining only other types of tobacco use, such as smokeless tobacco were not included for review. Since the designation of youth varied by study, the precise age group of interest was noted. The population was not restricted to Aboriginal youth, however studies that had an Aboriginal population were always read for potential inclusion since these studies are not prolific. All study types

were included in the review. As well, there were not specific criteria used to define smoking status (Table 1).

Table 1: Papers generated through the search strategy by search engine

Search engine (in order searched)	# Hits generated	# That met inclusion criteria (and had not been read to date)
Medline	634	236
PsycINFO	315	113
Embase	5786	8
PubMed	5490	75
ISI's Web Science	643	12

2.4 Factors associated with tobacco use in adolescents

Age

Internationally, a number of studies have shown a positive association between age and smoking status. The percentage of smokers in a Swiss sample (n=9,268) was higher among older versus younger respondents (p<0.05) (Bonard et al., 2001). When 'grade' was used as a proxy for age in two American studies, it was significantly associated with current smoking [Lewis et al., 2001 (n=1,207); Kann et al., 1995 (n=16,296)]. Thornton and colleagues (1999) demonstrated with an Australian sample of youth (n=368) that smoking increased with age. Analysis of the Canadian National Longitudinal Survey of Children and Youth revealed, with 1,537 mother-child dyads, that a child's age was a risk factor for smoking initiation across ethnic groups (Griesler et al., 2002). In a Turkish sample of students (n=883), the investigators found that increasing age was associated with higher rates of smoking (Yorulmaz et al., 2002). Escobedo et al. (1993) demonstrated that age is also associated with the frequency of cigarette smoking. As age increased, the rate of use increased and peaked at ages 13 and 14 (n=11,631).

Their work also demonstrated that older students were more likely than others to be heavy regular smokers. In an analysis of the National Indian Adolescent Health Survey that collected information from more than 200 American reservation-based schools (n=7,687), Potthoff et al. (1998) found that tobacco use (the combined use of cigarettes, chewing tobacco and snuff) was associated with age. They found age differences in the covariation of the investigated risk behaviours.

Whereas the previously mentioned studies had found significant relationships between age and smoking behaviour, a study by Nelson et al. (1997) found no significant associations. Their work analysed a sample of Montana Native Americans from grades 9-12 (n=421) and found age was not associated with daily tobacco smoking. The authors suggest smoking behaviours are established earlier than the age range they examined.

Age of smoking initiation

Studies have demonstrated that there is an association between smoking status and age of smoking initiation. The younger a person is when initiating smoking, the more likely they are to be a current smoker as an adult. In a study by Escobedo et al. (1993), the authors calculated age-specific smoking initiation incidence rates and concluded that they increase with age. Specifically, rates peaked at age 13 to 14 and declined after age 16. Their study also found that ever smokers who begun smoking cigarettes at or before the age of 12 were more likely than older ever smokers to be regular smokers. Reading and Allard (1999) illustrated, with retrospective data from the adult sample of the FNIRHS (n=9,870), that Aboriginal youth begin smoking cigarettes as early as age 5 with initiation peaking at age 16. They also observed that when youth did not initiate smoking by the ages 18 or 19, they were unlikely to ever become smokers. Lantz et al. (2000) also

concluded that few people initiated smoking or became regular smokers after adolescence in their review investigating youth tobacco control.

Sex

Research has been conducted investigating the relationship between gender and tobacco use in adolescents. In Vickers et al.'s review of the literature, the authors concluded that gender is associated with smoking initiation (2002). However, the relationship between tobacco use and gender is not always consistent. In Bonard et al. (2001), the percentage of smokers was higher among boys compared to girls ($p<0.05$)($n=9,268$). In an Australian sample of youth, males had a higher smoking rate compared to females (Thornton et al., 1999). Results from a Swedish sample of youth ($n=3,019$) revealed males initiated smoking earlier than females, while females became regular smokers earlier than males (Galanti et al., 2001). Based on information derived from the 1993 Youth Risk Behavior Survey of American Indians in grades 9-12 living on or near Montana reservations ($n=421$), females were more likely than males to be daily cigarette smokers ($p<0.01$) (Nelson et al., 1997). In Canada, analysis of the National Longitudinal Survey of Youth revealed that being female was a significant predictor of smoking initiation in white youth, however not among other ethnic groups (Griesler et al., 2002).

Physical activity involvement

Physical activity has repeatedly been shown in the literature to influence tobacco status in youth (Castrucci et al., 2004; Davis et al., 1997; Escobedo et al. 1993; Pate et al.,

1996; Rainey et al., 1996; Thorlindsson et al., 1990; Baumert et al., 1998; Collingwood et al., 2000). Winnail et al. (1995) reported that high levels of physical activity were associated with decreased use of tobacco in male white teenagers in South Carolina (n=4,800). In a logistic regression analysis adjusted for sex and age performed by Bonard and colleagues, former smokers were more likely to belong to a sport club compared to current smokers, while non-smokers were more likely to belong to a sport club compared to former smokers (2001). In a study of 1,200 Louisiana male high school students, the authors concluded that youth athletes were more likely to smoke less than non-athletes (Davis et al., 1997); however, after controlling for race and grade point average, there were no significant differences in this sample. According to Escobedo et al., students who were not involved in interscholastic sports were more likely than those involved to be heavy regular smokers (1993). After adjusting for age, sex, ethnicity and academic performance in their analysis, the adjusted odds ratios of regular and heavy smoking decreased with increasing number of sports played. After stratifying by gender, Melnick et al. (2001) determined that both female and male high school athletes (n=16,262) were less likely to be regular smokers compared to non-athletes (p<0.001 for both tests). There was also a positive association between increasing level of physical involvement and a decrease in the rates of regular smokers for both genders. Analyses of the U.S. Youth Risk Behavior Survey (n=14,221) revealed that sport participants were less likely compared to non-sport participants to report cigarette smoking (Pate et al., 1996).

Contrary to the conclusions generated by the other studies, data from the Center for Disease Control's (CDC) Cardiovascular Health in Children and Youth (CHIC II),

found no significant differences between current smokers, experimental smokers and non-smokers according to level of physical activity (Lewis et al., 2001).

Peer influence

Peer influences have been shown to play a role in the use of tobacco by youth (Webster et al., 1994; Colborn et al., 1989; Blackford et al., 1994). A longitudinal study investigating predictors of smoking behaviours among fifth to eighth grade students from 96 U.S. schools (n=3,654) found that having a best friend who smoked was the strongest correlate of smoking in the eighth grade (Johnson et al., 2002).

In Jackson's 1997 analysis, she concluded that the perceived uses of tobacco among same-aged peers, as well as best friend's use, are correlated with adolescent smoking (n=1,213). The importance of a friend's opinion about smoking is also associated with smoking behaviour. Youth who believed more than 50% of all adolescents smoked were significantly more likely to be smokers themselves compared to other youth who did not share this belief (n=17,287)(Castrucci et al, 2002). The ability to make friends was investigated by Bonard et al. (2001). They found that although there was no association between former and non-smokers in terms of making new friends easily, former smokers were less likely to make new friends compared to regular smokers.

Parental (primary care giver) smoking

The influence of parental smoking has also been shown in the literature to influence the smoking habits of youth (Murphy and Price, 1988; Jackson, 1997; Jackson

and Henricksen, 1997). One study concluded that interventions aimed at reducing smoking among youth (n=4,149) should include a component towards parental cessation (Distefan et al., 1998). The influence of family relating to the smoking behaviour of Aboriginal youth was investigated only in one known paper (Kegler et al., 2000b). Their qualitative analysis with 144 non-reservation American Indian teens concluded that youth felt having smokers in their homes influenced them to try smoking and that many of the youth obtained their first cigarettes at home. A study by Lewis and colleagues supports this association of exposure to cigarettes at home increasing use in adolescents (2001). In their sample, children who had at least one parent who was a current smoker were significantly more likely to themselves be either a current or experimental smoker (p=0.03).

To assess the association between parental style and the tobacco behaviour of youth, a scale referred to as The Family of Origin Scale was used by O'Byrne and colleagues (n=816)(2002). The scale assesses family intimacy and autonomy, such as the youth's ability to deal openly with issues and to express their personal responsibility. It was determined that parental style, based on the score achieved on the scale, is not a significant risk factor for smoking experimentation in youth (p=0.82), however it was a significant risk factor for smoking initiation (p<0.01). A longitudinal study with 372 baseline non-smoking youth by Sargent and Dalton (2001) concluded that youth who perceived strong parental disapproval of smoking were less likely to have higher smoking index levels at follow-up compared to those who did not perceive strong parental disapproval.

A study by Farkas et al. (n=4,502) has demonstrated that parental cessation also influences youth tobacco behaviour (1999). The authors suggested that, in comparison to parents that were still smoking, adolescents whose parents had quit smoking were almost one-third less likely to be ever-smokers. As well, the adolescents whose parents had quit smoking were twice as likely to quit compared to the adolescents with parents still smoking. Their results also indicated that parental quitting is most effective in reducing smoking initiation in adolescents if it occurs before the children reached the age of 9.

In Griesler and colleagues' analysis of the National Longitudinal Survey of Youth investigating predictors of smoking initiation in Canadian adolescents, they determined that maternal current smoking status was a risk factor across all investigated ethnic groups (2002). Maternal smoking status was also found to be associated with higher rates of smoking from a Turkish sample of students (Yorulmaz et al., 2002).

Maternal smoking was significantly associated with the smoking status of 14-year-old Australian youth drawn from a prospective cohort study. The prevalence of youth smoking was low at 11.7% in this sample (n=5247). The longitudinal study followed women from the birth of their children. Other positive associations with youth smoking from this sample were marital conflict, maternal depression and social disadvantage (Conwell et al., 2003).

Self-esteem

Self-esteem has been described as a favourable or unfavourable attitude toward the self (Rosenberg, 1965). However, the construct can be used to refer to narrower concepts, such as self-confidence, self-efficacy, shyness, anxiety or the perception of

body image. The standard/popular measurement scale to access self-esteem in youth is the Rosenberg scale. This scale includes ten items that are scored using a four-point response that ranges from strongly disagree to strongly agree. Blascovich and Tomaka (1991) have found the Rosenberg scale to be acceptably reliable and valid. Since this measure of self-esteem (and others) is collected through self-report, the biggest limitation to this method is the susceptibility to socially desirable responding, ie. the sample over-reporting high self-esteem. However, Blascovich and Tomaka did state, "an individual who fails to endorse Self-Esteem Scale items at least moderately is probably clinically depressed". This suggests that even the restricted range of self-esteem scores is useful, and it may be extrapolated that a binary response item might also successfully divide those with high self-esteem from those without it.

The body of literature surrounding the influence of self-esteem to youth tobacco status is inconsistent. While Jackson (1997) demonstrated a weaker association between the prevalence of smoking in youth and self-esteem, another study demonstrated that self-esteem is the most important factor in predicting use, especially in white girls (Lewis et al, 2001). A study of Canadian students between grade 6 to 9 (n=8,672) found no association between smoking and self-esteem in males; however, among females, there was a strong association (all p-values < .01) between self-esteem in grade 6 and smoking in later years (Abernathy et al., 1995). Lewis et al. (2001) reached similar conclusions using the CDC CHIC II study. They revealed self-esteem was significantly higher in non-smokers compared to current smokers in females and that there were no significant differences between smokers and non-smokers in the male portion of the sample. Moore et al. (1996) proposed a unique model, based on the Social Deviance Model, that

hypothesized a relationship between self-esteem and cultural or group norms and that this interaction plays a role in substance use in youth. The authors suggest that people conform to the norms of their culture. These 'norms' were assessed through a questionnaire where youth respondents reported their perspective of their culture's norms. Their analysis suggested that respondents' cultural norms may predict a relationship between self-esteem and drug use (n=2,237).

Educational experience/enjoyment

In this study educational experience refers to an adolescent's attitude about school, i.e. how important school is in their lives; is it a positive experience or a negative one. The literature available to address this idea is limited. Instead, the majority of studies investigating school in relation to tobacco use utilize academic status as the independent factor. When youth's grades were assessed as the factor of interest, an association between increased tobacco use with decreased academic performance was found.

Griffin et al. (1999) followed a sample of 743 students through high school to investigate factors associated with heavy smoking in youth. Analysis of the baseline data compiled from grade nine revealed that poor grades in school was a significant risk factor for the outcome of interest. In a similarly designed study (n=365), Hops and colleagues concluded that social and academic behaviours, through observation and teachers' records demonstrated at ages 7-9 predicts substance use of tobacco, alcohol and marijuana by ages 14-15 (1999).

This same conclusion was reached through several cross-sectional studies. A study examining the association between cigarette use and academic stream was

conducted using the Ontario Student Drug Survey (1987) in Canada (Allison, 1992). The author concluded that 'advanced' level students were less likely to smoke cigarettes compared to students in 'basic' and 'general' academic streams (n=2,543). A year later (1993), Escobedo and colleagues reported from their sample of 11,248 American youth respondents that those with low academic performance were less likely than others to be experimental or former smokers. Recently, Yorulmaz et al. (2002) found that high school success was associated with lower rates of smoking in a sample of 883 Turkish students.

LeMaster et al. (2002) examined factors associated with increased and decreased risk for current tobacco use in a sample of American Indian youth. Their sample comprised of 2390 youth (aged 13-20) from ten high schools in Western United States. The authors investigated the influence of several sociological factors derived from the *Voices of Indian Teens Project* (such as stressful life events and community mindedness) on current smoking status. Their logistic regression analysis revealed that academic orientation was a protective factor in tobacco use, while death/loss and other stressful life events were shown to be risk factors for tobacco use.

Television Viewing

The influence of television viewing is another factor that has been associated with tobacco use among adolescents. A study by Gidwani and colleagues (2002) supports a dose-response relationship between television viewing and the initiation of smoking. In their analysis of the National Longitudinal Survey of Children and Youth (n=592), they investigated the relationship between television viewing habits in 1990 and smoking initiation between 1990 and 1992. Youth who reported viewing five or more hours of

television a day were approximately six times more likely to have initiated smoking compared to those who watched less than two hours a day of the same age group. Gidwani et al.'s study did not however, investigate the type of programming the youth watched nor did they investigate several known factors that are associated with tobacco smoking status in youth, such as peer smoking.

The media's influence on youth smoking was considered in Wakefield et al. (2003). Their review of the literature suggests that cigarette promotion through the media predisposes youth to experiment with smoking and reinforces continued use. While television viewing is one means of communicating these messages, another study found that while the portrayal of tobacco in television programming decreased in the 1980's, it increased during the 1990's (Hazan and Glantz, 1995). In a content analysis of tobacco use on Music Television (MTV), it was present in 26% of music videos (Durant et al., 1997).

Computer access

The influence of computer access related to tobacco behaviour in adolescents has not been well identified in the literature. Potentially, it may act as a protective factor by engaging youth in an activity and reducing boredom. Conversely, it may encourage a more sedentary lifestyle and increase behaviours such as tobacco use.

One study successfully utilized a software program as an intervention tool to educate Native American youth (n=368) about the harms of tobacco use and other risk factors for cancer (Schinke et al., 1994).

Other factors associated with youth smoking status

Other factors have been shown in the literature to influence the smoking status of youth. Although the following factors are not examined in this research project, their association with youth smoking will be discussed briefly.

Mental health

An American study by Kerby et al. (2003) investigated the relationship between adolescent tobacco use and anger types in a nationally representative sample of Native population in the sixth, eighth and tenth grades (n=513). The four anger types were determined through cluster analysis. The authors defined current smokers as those who had smoked in the past 30 days (27%). The anger category named 'externalized anger', for instance was created from items such as reacting to anger with physical fights, breaking something or doing drugs when angry. A higher level of externalized anger was associated with tobacco use. Compared to the youth with the other anger types, the youth with the externalized anger types were about 10 times more likely to be current smokers. This study illustrates that adolescent mental behaviours are associated with tobacco smoking status. The direction of this relationship is not known.

To date, there have not been any studies to investigate the relationship between tobacco smoking and depression among Aboriginal youth, however work on other populations is available. Much of this work illustrates a significant association between youth smokers and depression (Fergusson et al., 2003; Pullen et al., 2000). Where the literature is inconsistent is in relation to the direction of causality of these factors. Some longitudinal research (Goodman and Capitman, 2000) has shown that tobacco smoking

precedes depression while others (Fergusson and Woodward, 2002; Patton et al., 1998) demonstrate that depression precedes smoking.

With the association between depression and tobacco smoking in mind, a recent publication by Daniel and colleagues (2004) set fourth to examine this relationship in a population with high rates of tobacco smoking. An adult sample (mean age of 44.1 years old) of a Northwestern First Nation on-reserve community (n=187) was examined for this analysis. The research indicated that smokers perceived that greater depression affect their lives compared to the non-smokers based on the responses of a 4-item Likert-type Brief Screen for Depression survey. The authors suggest that depression in a First Nation context may be an account of social disadvantage and therefore enabling changes that encourage perceived control and social support might be necessary in reducing high smoking rates among this population.

Rural versus urban impacts

Tobacco smoking status among urban and rural Native American youth was investigated through the Independent Evaluation of the California Tobacco Control Program (Unger et al., 2003). The smoking prevalence of rural Native Americans (29%) did not differ significantly from the urban Native American inhabitants (28%). As well, the rural-urban disparity was not larger among the Native Americans compared to other American ethic groups who were also sampled in this population-based statewide survey. The authors note that Native American communities do suffer considerably from other factors, such as high rates of alcoholism and unemployment that have also been identified to influence tobacco use.

Household smoking

The association between parental smoking and adolescent smoking status has been identified earlier in this chapter. The influence of household smoking, such as the smoking influence from other family members with youth smoking status has not been described thus far. Komro et al. (2003) conducted a cross-sectional study with parent-youth dyads within Minnesota (1,343 pairs). While smoking by an adult living in the home was associated with youth smoking (OR=1.99), sibling smoking was also related (OR=8.95). A review on familial and household influences on youth smoking status was recently conducted (Avenevoli and Merikangas, 2003). They concluded that there was more consistency with siblings influencing peer smoking compared to parental influences, although they admit that there are fewer studies investigating the influence of sibling smoking.

Socioeconomic status

The literature shows a consistent association between lower socioeconomic status (SES) with a greater risk of disease among adults (Kaplan and Keil, 1993). To investigate the effect of SES on chronic disease risk behaviours among youth, Lowry and colleagues (1996) utilized data from the Youth Risk Behavior Surveillance System implemented by the Centers for Disease Control and Prevention between 1992 and 1993 (n=10,645). SES was assessed through the number of years of education completed by the most educated parent/caregiver and family income. Tobacco smoking was most prevalent among youth from families in which the parent/caregiver completed less than 4 years of high school and total family income was less than $20,000 per year, and was least prevalent among

youth from families in which the parent/caregiver had completed 4 or more years of college and total family income was $40,000 or more per year. The overall prevalence of tobacco smoking in this sample was 20%. SES and its association with Aboriginal youth smoking status has not been assessed in the published literature.

2.5 Summary of Literature

The literature review has been conducted to understand the direction of association of several factors known to influence the smoking status of youth. It was determined that age is most consistently found to predict smoking status; as youth age, they are more likely to smoke. Similarly, age of smoking initiation is predictive of tobacco use. The earlier one experiments with tobacco, the more likely they are to be a current smoker later on. The literature reveals that gender is associated with tobacco use, however the relationship is not consistent. What was consistent in the literature was with higher levels of physical activity and involvement, youth are less likely to smoke compared to those with less activity and involvement. According to the literature reviewed, peers do influence each other. When friends smoke surround a youth, the youth is more likely to smoke than if their friends did not smoke. Similarly, having a parent or primary care giver who smokes increases the likelihood that a youth will also smoke compared to when a parent/primary caregiver does not smoke. Overall, there appears to be a consistent relationship between youth's self-esteem and tobacco status. When their self-esteem is low, they are more likely to smoke. Findings from the literature revealed that high educational performance is associated with less tobacco smoking when compared to having low educational performance. The study that investigated the

relationship between television viewing and tobacco smoking suggested that initiation is more likely when a youth views more than five hours a day. A relationship between tobacco smoking and computer use was suggested in one study.

Unfortunately the influence of many of these factors has not been investigated with Aboriginal youth. This research gap must be addressed since Aboriginal youth have a high prevalence of tobacco smoking and therefore could potentially gain the most from research in this area. To conclude, literature investigating smoking behaviours related to Aboriginal youth is disproportionately low compared to the present and future health burden on this unique population.

CHAPTER THREE: METHODOLOGY

"This is a great experience for me because I come from a small community. There's great Hospitality!" (Comment of a survey participant of the AYLS, 2002)

3.1 Ethical issues:

In July 2002, project approval was granted from the University of Toronto - Research Services - Ethics Review Office. The consent form constructed for the project outlined potential risks and benefits for participants. Extreme care was taken to ensure that confidentiality was maintained. In this regard, respondents' names do not appear on the survey and parents or guardians were not permitted to examine participants' answers and responses.

3.2 Study design:

The data for this project were collected at one time, however some of the questions do reflect attitudes and events over a period of the participants' lifetime. This opportunistic cross-sectional study was designed to benefit from an event where a large group of Aboriginal youth would be present, the North American Indigenous Games. To assemble a group of over 6,000 Aboriginal youth participants as well as an undefined number of youth spectators (and of no cost to the researcher) would otherwise not be achievable. These youth may not be the most appropriate group to survey about tobacco use considering they would be expected, as a group, to be more health conscientious and motivated compared to the general population of Aboriginal youth. However, as presented above, the body of literature on tobacco use among any Aboriginal youth group

is limited, and any new information would contribute to understanding this important matter.

3.3 Study instrument:

The Aboriginal Youth Lifestyle Survey (AYLS) (Appendix A) is a self-administered survey that was created based partly on questions used in other Canadian national surveys, for potential future comparability. With permission, the majority of the items used in the six-page survey are from portions of the 1998-1999 National Longitudinal Survey for Children and Youth (NLSCY). As well, a few items were used for comparability to the 1997 First Nations and Inuit Regional Health Survey (FNIRHS). Items were chosen based on their relevance to address the study's objective.

The testing instrument was formatted into ten major sections: 'Contact information', 'Friends', 'School', 'About me', 'Activities', 'Smoking', 'Family and household', 'Health', 'Money' and 'Help us to improve this questionnaire! Tell us what you think of it'.

3.4 Data collection:

Setting

The survey was administered at the 2002 North American Indigenous Games (NAIG) in Winnipeg, Manitoba that took place between Sunday July 28th 2002 and Sunday, August 4th 2002. Every two or three years, one city in Canada or the United States hosts the NAIG. The games are a sporting and cultural event for Aboriginal athletes invited to participate from all provinces, states and territories. A total of 6,136

athletes and 1,233 coaches, managers and chaperones were in attendance as well as countless other family members and friends (Appendix B). Participants in the games competed and fundraised to attend.

Participants

The two criteria for inclusion to the study were that survey participants were of Aboriginal ancestry and were between the ages of 12 to 22 years old. This age range was determined based on the age categories set by the NAIG (*Bantam* to *Senior*)[1]. It was decided to include both the participants of the games as well as Aboriginal youth spectators in attendance. This second group, predominantly made up of Aboriginal youth from in and around the Winnipeg area, is a substantial component in itself and might better represent Canadian Aboriginal urban youth.

Recruitment

The heart of the NAIG was in the Cultural Village, a large park-like area in downtown Winnipeg that housed the entertainment, food and beverages, merchandise, first aid and acted as a meeting place for many of the teams before or after events. This is where the project booth was located and where participant recruitment took place (Illustration 1).

The booth operated from noon to 9:00 pm each day. There was at least one facilitator at the booth at all times. As people walked by the booth, the facilitator(s)

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[1] The age specifications in the consent form were determined upon communications with the NAIG organizers. In a telephone conversation, they stated the participants of the Bantam to Senior were between 13 and 21 years old. Athletes were in fact recruited based on their year of birth, therefore some survey respondents had not turned 13 yet and others had already turned 22 by July when the games took place.

Illustration 1 : Project booth

casually explained the purpose of the survey and invited participants who fit the inclusion criteria to participate.

Participants were not randomly selected to participate in the study; instead they were self-selected. As the health and wellness nature of the study was apparent by the description provided by the facilitator(s), those potentially concerned with their health and wellness level or ability, may have been less willing to participate. If this occurred, the study sample may not be generilizable to all Aboriginal Peoples present at the games. Upon agreement to participate, a numbered consent form (Appendix C) was given to the individual to complete. All participants were required to sign the form and those below the age of 19 were required to have their guardian sign as well. When a participant's parent or legal guardian was not present at the games, the adult who had been entrusted to be responsible for the participant while at the games (i.e. team coach or chaperone) was asked to sign the form.

When the signed consent form was handed back to the facilitator, the corresponding numbered survey was then distributed to the respondent for them to fill out. At this time, the respondents were told the facilitator was there to assist them in any way necessary with the interpretation, design of the survey and its various questions. There were appropriate writing stations and facilities (i.e. chairs, pens, pencils and clip boards) available for the youth to sit and fill out the survey at their own pace without a time limit specified (Illustration 2).

Illustration 2: Writing station

Upon completion of the survey, respondents then had the opportunity to choose one of three numbered gift bags. Each bag contained a Frisbee, a hacky sac, or an FM radio, which were all purchased in advance as part of research expenses. These appreciation gifts were shifted around randomly within the bags from one person to the next so that every youth had an equal chance of receiving one of the gifts.

3.5 Analyses:

Data inputting

A codebook was created to aid with and standardize the inputting of data from the surveys collected (Appendix A). The data were entered onto a table in Microsoft Access once all the data were collected. All surveys were inputted whether or not the participant met the inclusion criteria, since those who did not meet the inclusion criteria could be removed later.

Cleaning and vetting the data

Frequencies were run to double-check the data for errors. If an incorrect entry was found, such as a '4' response when the range of responses was only 1-3, the error was corrected after reviewing the original survey.

Defining the study sample

Once the data were cleaned they were imported into SAS System version V8 for analysis. Before analysis took place, all respondents who did not meet the inclusion criteria were removed from the study sample. Since all participants were of Aboriginal descent, only those who either did not provide age information or were too old or too young were excluded from the analysis.

Describing the data

Frequency information was acquired on the survey items of interest (Table 2). To investigate whether the games participants and non-games participants were alike in their responses to the independent variables of interest, these variables were described separately by games participation status.

Table 2: Independent variables for analyses

Variable name	Number of respondents (n)	Survey question	Coding
Age	567	Age	Continuous (12-22 range)
Age of smoking initiation	297	How old were you when you smoked cigarettes for the first time?	Continuous (4-18 range)
Gender	563	Male or Female	Male, Female
Games' participation status	563	Are you an athlete in the Games?	No=1, Yes=2
Peer smoking	562	How many of your close friends smoke cigarettes?	All=1, Most=2, A few=3, None=4
Parental smoking	567	Does your primary care giver smoke cigarettes?	Yes=1, No=2, I don't know=3

Table 2 con't...

Self-esteem	533	A lot of things about me are good	True=1, Sometimes true=2, Sometimes false/Mostly true=3, Mostly false=4, False=5
Educational enjoyment	560	How do you feel about school?	I like school very much=1, I like school quite a bit=2, I like school a bit=3, I don't like school very much=4, I hate school=5
Television viewing	555	On average, about how many hours a day do you watch TV or videos?	I don't watch TV or videos=1, Less than 1 hour a day=2, 1 or 2 hours a day=3, 3 or 4 hours a day=4, 5 or 6 hours a day=5, 7 or more hours a day=6
Computer access	555	Do you have access to a computer at home?	Yes=1, No=2

Upon describing the frequencies of the categorical variables as well as the means, medians and modes of the continuous variables, some variables required recoding. The variables for age of smoking initiation, self-esteem, time spent watching television per day, and parental smoking were recoded in order to combine categories with few responses. The variable for self-esteem was recoded due to a labelling inconsistency in the survey (Table 3). The age of smoking initiation variable was further manipulated into dummy variables for the regression analyses (the different age of initiation groups were coded as dummy variables, with never smokers as a reference category).

Table 3: Coding of new variables

Variable	Was coded as:	New variable coded as:
Age of smoking initiation	4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18	1 = 4, 5, 6, 7 2 = 8, 9, 10 3 = 11, 12, 13, 14 4 = 15, 16, 17, 18 5 = never initiated smoking 6 = missing information

Table 3 con't...

Self-esteem	True=1, Sometimes true=2, Sometimes false/Mostly true=3, Mostly false=4, False=5	1 = High (old 1) 0 =Not high (old 2,3,4,5)
Parental smoking	Yes=1, No=2, I don't know=3	1 = Yes 2 = Not yes
Television viewing	I don't watch TV or videos=1, Less than 1 hour a day=2, 1 or 2 hours a day=3, 3 or 4 hours a day=4, 5 or 6 hours a day=5, 7 or more hours a day=6	1 = ≤2 hours a day (old 1,2,3) 2 = 3 to 4 hours a day (old 4) 3 = ≥ 5 hours (old 5,6)

The binary variable 'smoker' was created as the outcome variable of interest comparing current smokers to non-smokers (participants who either reported never smoking or were former smokers)(Table 4).

Table 4: Frequency and proportion of youth by smoking status

Smoker variable	Frequency	Proportion
Non smoker	362	68%
Current smoker	167	32%

Bivariate analyses

All bivariate analyses were stratified by games participation status. To test the relationship between the independent variables and smoking status, t-tests were performed on the two continuous variables (age and age of smoking initiation) and chi-square tests were performed on the remaining non-continuous variables. The two coded categories "never initiated smoking" and "missing information" were omitted in the t-test analysis comparing age of smoking initiation by smoking status.

Test for trend

The study hypothesis relating to television viewing is two-parted. To address whether more television watching time per week increases the likelihood of being a smoker, the Cochran Armitage test for trend was performed. This test compared the smoking status of the youth at the different levels of viewing time. The null hypothesis for this test is that there is no trend. To determine the significance of the relationship (i.e. whether a positive or a negative or no trend exists), a test statistic is generated. The value of this test statistic (i.e. being less, equal or larger than zero) determines which p-value to read to determine the significance of the relationship.

Logistic regression

Since the dependent variable for this analysis is discrete and binary, logistic regression was used to estimate the probability of being a current smoker according to a set of independent factors. The logistic regression model produces odds ratios and their 95% confidence intervals.

There are several different statistical techniques available to determine the best model. The technique known as backward elimination (or backward regression) is the most appropriate computer-based method to determine an efficient model for logistic regression (Kennedy and Bancroft, 1971).

The data were first stratified by the respondents' games participation status and then the backward elimination procedure was applied. The variables that remained significant at the $p < 0.05$ were kept in the models. Therefore, two models were produced, one for the games participants and one for those who did not participate in the games. For

comparison, the results of the stratified analysis without the backward elimination procedure are also presented.

CHAPTER FOUR: RESULTS

"From reading and going back and looking at the questions I marked, I say that I know a little more about myself!" (Comment of a survey participant of the AYLS, 2002)

4.1 Study sample

During the 8 days of data collection at the NAIG, a total of 590 respondents completed the study survey. Of the 590 surveys returned, 20 participants were excluded from the sample based on their age information (9 had missing information, 11 were too old or too young). Of the 570 respondents who remained, 477 were Canadian, 79 were American and the information could not be deduced from 14 surveys (Figure 1). There were 318 games participants and 245 non-participants (7 unknown). Refusal rates are unavailable owing to the nature of the recruitment.
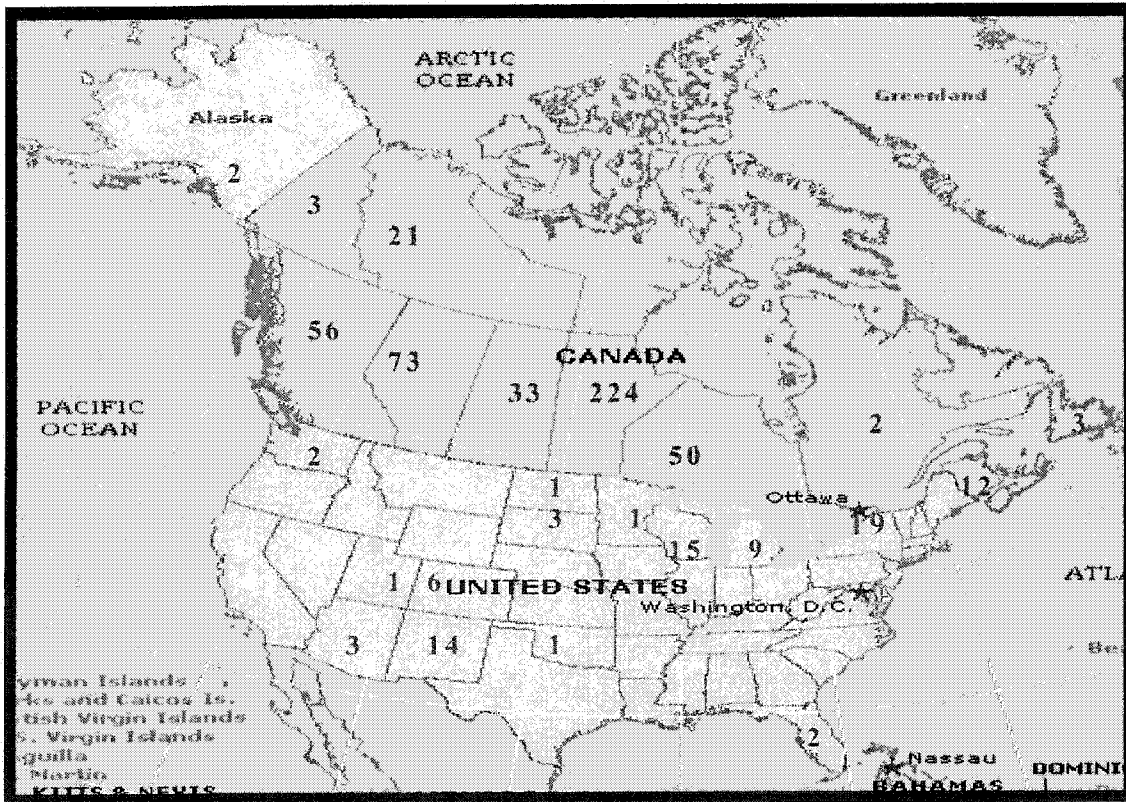
Figure 1: Map of Canada and the United States showing where the survey respondents live

4.2 Descriptive analyses

Smoking status

Smoking status could be assessed for 529 (93%) of respondents. There were 205 youth (39%) who replied that they had never had even a puff of a cigarette. Of those that had tried, 157 (48%) indicated they were not currently smoking and 167 (52%) said they currently smoke cigarettes. Therefore, the prevalence of tobacco smoking in this sample of Aboriginal youth is 32%.

The prevalence of tobacco smoking among the games participants was 22% (65/298). The prevalence of tobacco smoking among the non-games participants was exactly double that of the participants (102/230).

Smoking behaviours

Of those who said they currently smoke, 105 (63%) reported that they smoke daily (at least one cigarette every day for 30 days). Of the non-games participants who reported they were a current smoker, 73% replied they smoked daily. This is a higher proportion compared to the games participants where 50% of the current smokers replied to being a daily smoker.

When asked, "On a day that you smoke, about how many cigarettes do you usually smoke?" the average number of cigarettes smoked in this sample was 7.8 (sd=11.3), the mode was lower at 5 cigarettes a day, the minimum number was 1 (n=14) and the maximum was 120 (n=1) cigarettes per day. When comparing daily smokers (n=103) to non-daily smokers (n=26) and to those who replied they didn't know if they were a daily smoker or not (n=28), daily smokers smoked most (the responses of 10

current smokers were missing). Daily smokers smoked an average of 8.7 cigarettes a day, non-daily smokers smoked an average of 7.7 cigarettes a day (and comprised the outlier who reported smoking 120 cigarettes a day), while those in the "don't know" category smoked an average of 4.3 cigarettes a day. When comparing the responses by games participation status, the non-games participants smoked a higher number of cigarettes per day compared to the games participants (9.2 cigarettes a day compared to 5.3 cigarettes per day).

Current smokers were asked "During the past 12 months, did you ever try to quit smoking cigarettes?" Of the 163 respondents who answered this question, 118 (72%) stated that yes they had tried to quit smoking, 30 (18%) replied no and 15 (9%) replied that they didn't know. The responses by games participation status were similar, 71% of non-games participants had tried to quit smoking cigarettes during the past 12 months compared to 74% of the games participants who currently smoke.

Those who had tried smoking but no longer smoke were asked if they had ever smoked cigarettes daily. Of the 137 respondents, 25 (18%) reported yes they had smoked daily and 20 did not reply. A quarter of the non-games participants who had tried smoking but no longer smoke, reported smoking daily previously (n=12). This compares to 15% of the games participants who no longer smoke (n=13).

Independent variables

<u>Age</u>:

The average age of the sample was 15.7 (sd=2.6) years. The sample median was

15, while the mode was 13 (Figure 2). The non-games participants were older on average

(16.4 years old) compared to the games participants (15.2 years old).
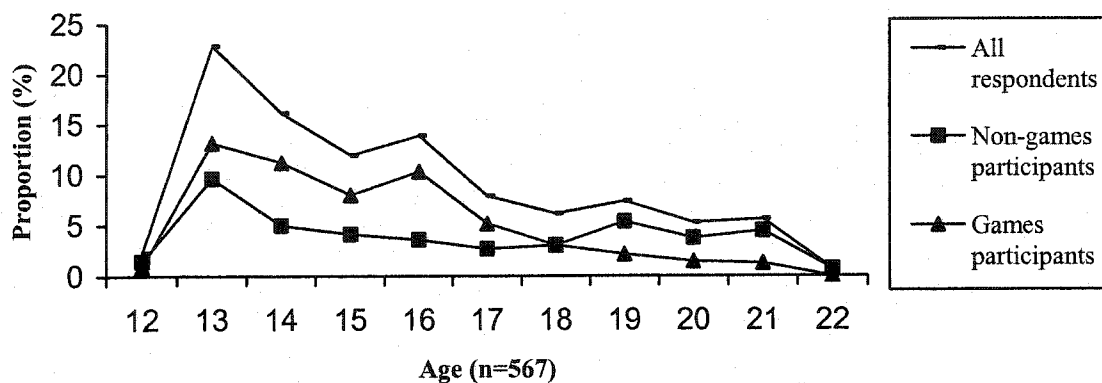
Figure 2: Age of respondents

Age of smoking initiation:

Initiation began at age 4. By the age of 6, about 2% of the ever smokers had

initiated smoking. This doubled by age 8 to 5%, doubled to 10% at age 10 then doubled

again by age 12, when initiation peaked at 20% (n=60) (Figure 3). The age of 12

represents the median, mean and mode for this variable. The patterns of smoking

initiation were different between the games participants and non-games participants.

Smoking initiation of non-games participants increased steadily with age up to age 12,

with the largest increase between ages 11 and 12. Smoking initiation of the games

participants also peaked between ages 11 and 12, however their pattern of initiation was

irregular compared to the non-games participants. It rose and declined between ages 6

and 9, 9 and 11, again between 11 and 13, then tapered off after age 14.
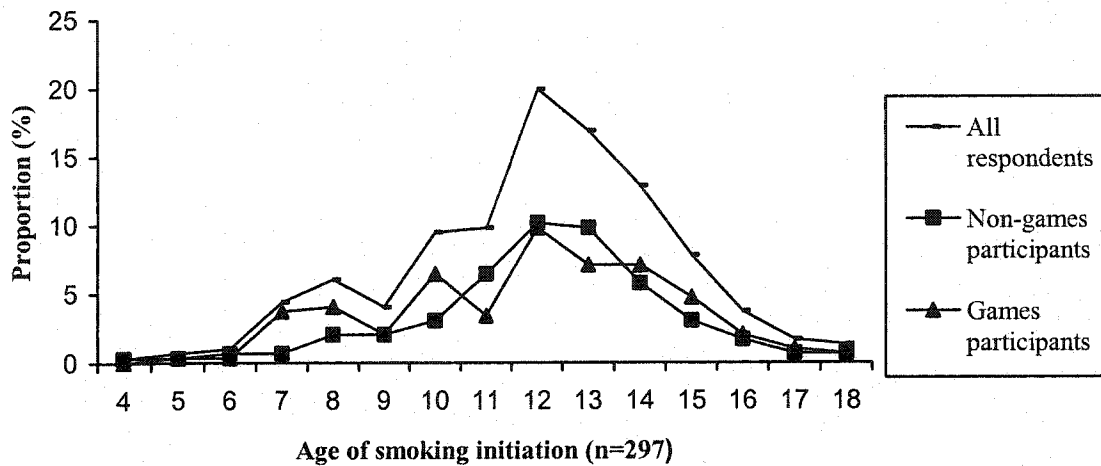
Figure 3: Distribution of smoking initiation by age

Sex:

Fifty-three percent of respondents were female and 46% were male, with information on gender missing for 4 (1%) respondents. The sex distribution among the games participants was 45% female and 55% male, whereas there were double the number of female non-games participants compared to male non-games participants (66% female, 34% male).

Peer smoking:

Overall, 68% of respondents indicated that at least a few of their friends smoke cigarettes (Figure 4). This figure also demonstrates a different distribution of responses between the games participants and the non-games participants. The non-games participants have more friends that either 'all' or 'most' smoke, whereas the games participants have more friends that either 'a few' or 'none' smoke.
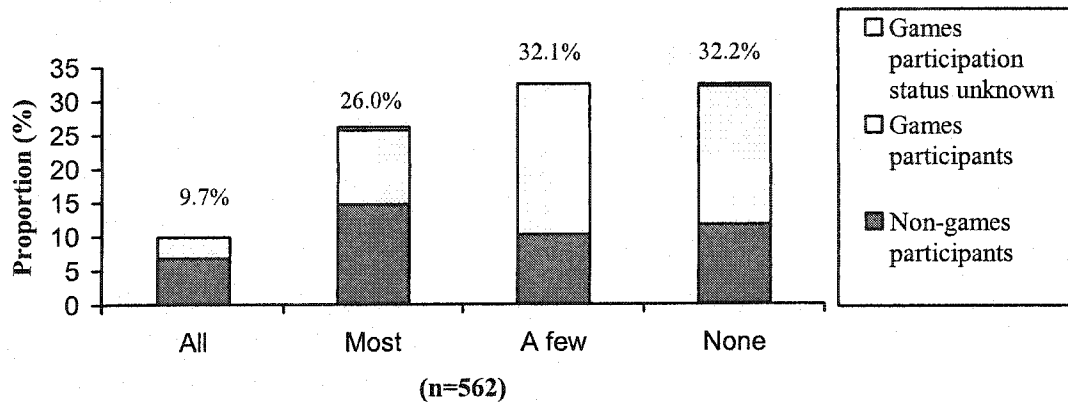
Figure 4: Proportion of close friends who smoke cigarettes

Parental (primary care giver) smoking:

Almost half of the respondents (48%) replied that their mother was their primary care giver. Listed as the second highest primary care giver was "mom and dad" (23%). Listed third was "father" (9%). When combined, these top three responses represent over 80%. The remaining 20% are distributed over a diverse group of other family members, friends and supporters. When asked if their primary care giver smokes cigarettes, 230 (41%) responded yes.

Among the non-game participants, 49% responded their primary care giver smoked and 51% replied not yes. There was a 20% difference between the smoking status of the primary care giver of the games participants. When asked 'does your primary care giver smoke?' 40% replied yes and 60% replied not yes.

Self-esteem:

Self-esteem was high in this sample, with 65% of respondents agreeing with the statement "a lot of things about me are good" (Figure 5). Responses by games participation status were distributed quite evenly. Due to the inconsistency of the

presented responses of this particular survey item (i.e. moving from the highest ranked self-esteem response to the third, to the second, then to the fourth and fifth), this variable was recoded to a binary response, comparing "true" to all the other responses. Although the original responses are described below, the binary variable was utilized in the bivariate and logistic regression analyses.
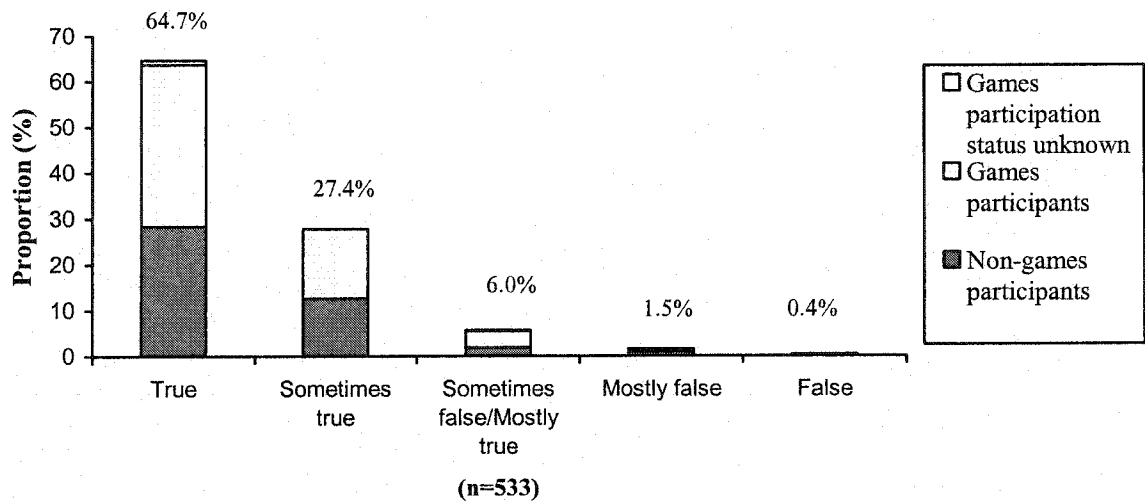
Figure 5: Feelings about the statement "A lot of things about me are good"

Educational enjoyment:

Sixty three percent of respondents said that they at least liked school quite a bit. A further 31% either liked school "a bit" or " not very much", while the remaining 5% reported hating school. When comparing the responses by games participation status, both groups responded the same to the answers 'I like school very much', 'I like school a bit' and 'I don't like school very much'. Six percent more non-games participants responded that they like school quite a bit and three percent more games participants responded that they hated school.

Television viewing:

There were 555 youth who responded to the question, "On average, about how many hours a day do you watch TV or videos?" About 50% of respondents said they spend at least three hours per day watching TV or videos, while 3% said they do not watch at all (Figure 6). The distribution of responses by games participation status were similar, no more than two percent different per category.

There were 521 youth included in the test for trend analysis. The test for trend was not significant (p=0.17); therefore there was a similar distribution of smokers and non-smokers across the three different television-viewing levels described in Table 3.
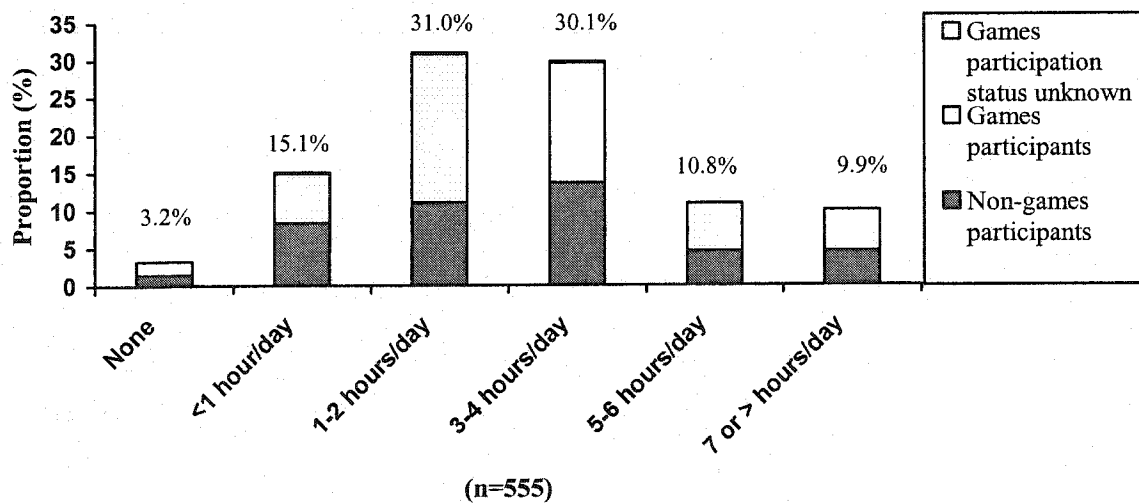
Figure 6: Number of hours spent watching television or videos

Computer access:

Sixty-six percent of respondents (n=369) indicated that they have access to a computer at home; 11 people did not respond to this question. In both of the games participation status groups, 66% said they had access to a computer at home.

4.3 – Bivariate Analyses

Table 5 displays the stratification by games participation status investigating the association between the independent variables and smoking status. Upon stratification by games participation status, compared to non-smokers, smokers were more likely to be older (p<0.01), to report an older age of smoking initiation (p<0.01), to have friends who also smoke cigarettes (p<0.01) and to have their primary care giver be a smoker (p<0.01). Smokers were less likely to report a high level of self-esteem (p<0.01) and to have access to a computer at home (p<0.01). There were no statistically significant differences between smokers and non-smokers according to gender (p=0.49), educational enjoyment (p=0.69) and time spent watching television and video games (p=0.19).

Table 5: Relationship between smoking status and the independent variables, by games participation status

Variables	Non-Games Participants		Games Participants		p-value
	Non-Smokers N (%)	Smokers N (%)	Non-Smokers N (%)	Smokers N (%)	
Age**	128	102	233	65	<.01
12	7 (5%)	0 (0%)	4 (2%)	0 (0%)	
13	38 (30%)	8 (8%)	62 (27%)	6 (9%)	
14	19 (15%)	7 (7%)	50 (22%)	9 (14%)	
15	10 (8%)	13 (13%)	37 (16%)	6 (9%)	
16	12 (9%)	7 (7%)	34 (15%)	19 (29%)	
17	5 (4%)	9 (9%)	17 (7%)	11 (17%)	
18	6 (5%)	10 (10%)	12 (5%)	5 (8%)	
19	12 (9%)	17 (17%)	7 (3%)	4 (6%)	
20	8 (6%)	13 (13%)	5 (2%)	3 (5%)	
21	10 (8%)	15 (15%)	5 (2%)	2 (3%)	
22	1 (1%)	3 (3%)	0 (0%)	0 (0%)	
mean age	15.6	17.7	15.0	16.2	
Age of smoking initiation**	127	101	233	65	<.01
4,5,6,7	2 (2%)	4 (4%)	7 (3%)	6 (9%)	
8,9,10	7 (6%)	13 (13%)	28 (12%)	9 (14%)	
11,12,13,14	34 (27%)	57 (56%)	49 (21%)	26 (40%)	
15,16,17,18	5 (4%)	13 (13%)	12 (5%)	12 (18%)	

Table 5 con't...

Never initiated	75	(59%)	0	(0%)	129	(55%)	0	(0%)	
Missing info.	4	(3%)	14	(14%)	8	(3%)	12	(18%)	
Sex*	128		100		232		65		0.49
Female	83	(65%)	68	(68%)	103	(44%)	31	(48%)	
Male	45	(35%)	32	(32%)	129	(56%)	34	(52%)	
Peer smoking*	125		102		232		65		<.01
All	8	(6%)	26	(25%)	4	(2%)	10	(15%)	
Most	24	(19%)	54	(53%)	29	(13%)	29	(45%)	
A few	36	(29%)	20	(20%)	96	(41%)	23	(35%)	
None	57	(46%)	2	(2%)	103	(44%)	3	(5%)	
Parental smoking*	119		94		218		61		<.01
Yes	47	(40%)	58	(62%)	82	(38%)	33	(54%)	
Not yes	72	(61%)	36	(38%)	136	(62%)	28	(46%)	
Self-esteem*	123		99		220		60		<.01
High	86	(70%)	58	(59%)	151	(69%)	32	(53%)	
Not high	37	(30%)	41	(41%)	69	(31%)	28	(47%)	
Educational enjoyment*	127		100		231		64		0.69
Very much	36	(28%)	35	(35%)	67	(29%)	23	(36%)	
Quite a bit	51	(40%)	31	(31%)	76	(33%)	15	(23%)	
A bit	30	(24%)	24	(24%)	53	(23%)	19	(30%)	
Not very much	6	(5%)	5	(5%)	20	(9%)	3	(5%)	
Hate it	4	(3%)	5	(5%)	15	(6%)	4	(6%)	
Television viewing*	125		100		232		63		0.19
≤ 2 hours a day	64	(51%)	45	(45%)	120	(52%)	29	(46%)	
3-4 hours a day	32	(26%)	36	(36%)	70	(30%)	14	(22%)	
≥ 5 hours a day	29	(23%)	19	(19%)	42	(18%)	20	(32%)	
Computer access*	125		101		232		63		<.01
Access	95	(76%)	58	(57%)	166	(72%)	36	(57%)	
No access	30	(24%)	43	(43%)	66	(28%)	27	(43%)	

*chi-square test
**t-test

4.4 Logistic regression analyses

When all of the independent variables were entered into the backward elimination procedure for the non-games participants' model (n=195), age (p<0.01), peer smoking (p<0.01) and self-esteem (p=0.02) were significant. Upon running the logistic regression

with only those significant variables, the sample size rose to 221 non-games participants.

In Table 6, the odds of being a smoker were increased for the older non-games participants compared to the younger ones [OR=1.21 (1.06-1.37)]. The odds of being a smoker were approximately 6 times higher for youth who reported all of their friends smoked cigarettes compared to those who reported a few of their friends smoked [OR=5.53 (2.00-15.29)]. The odds of being a smoker decreased when most friends smoked compared to a few [OR=3.57 (1.64-7.77)]. Furthermore, the odds of being a smoker were close to 0 when no friends smoked compared to a few [OR=0.08 (0.02-0.35)]. The odds of being a smoker were about two and a half times higher for non-games participating youth with 'not high' self-esteem compared to youth with high self esteem [OR=2.45 (1.17-5.13)].

Table 6: Significant predictors of current smoking, logistic regression using backwards elimination, non-games participants

Variables	Comparison group	Odds ratio (95% C.I.)		Pr > Chi-square
Age		1.21	(1.06-1.37)	<.01
Peer smoking	A few	1.00		<.01
	All	5.53	(2.00-15.29)	
	Most	3.57	(1.64-7.77)	
	None	0.08	(0.02-0.35)	
Self-esteem	High	1.00		0.02
	Not high	2.45	(1.17-5.13)	

Peer smoking (p<0.01) and three of the four age categories for the age of smoking initiation variables [4-7 (p=0.01); 11-14 (p=0.02) and 15-18 (p<0.01)] were significant following the backward elimination procedure in the logistic regression analysis for the games participants (n=258). After removing the non-significant variables, the sample size increased to 297 games participants. In Table 7, the odds of being a smoker for the games

participants were about 11 times higher for youth who reported all their friends smoked compared to those who only had a few friends who smoked [OR=10.95 (2.99-40.08)]. When youth reported that most of their friends smoked compared to those with a few, the odds of being a smoker were about 4 times higher [OR=3.96 (1.91-8.18)]. Among the games participants, the odds of being a smoker were close to 0 when no friends smoked compared to a few [OR=0.16 (0.05-0.56)]. Compared to non-smokers, the odds of being a smoker when smoking initiation began between ages 4 to 7 were about seven times higher [OR=6.89 (1.83-26.02), they were two and a half times higher when initiation began between ages 11 to 14 [OR=2.51 (1.20-5.27)] and were more than four times higher when initiation began between ages 15 to 18 [OR=4.46 (1.59-12.53) among the games participants.

Table 7: Significant predictors of current smoking, logistic regression using backwards elimination, games participants

Variable	Comparison group	Odds ratio (95% C.I.)	Pr > Chi-square
Peer smoking	A few	1.00	<.01
	All	10.95 (2.99-40.08)	
	Most	3.96 (1.91-8.18)	
	None	0.16 (0.05-0.56)	
Age of initiation			
4-7	Never smokers	6.89 (1.83-26.02)	<.01
11-14	Never smokers	2.51 (1.20-5.27)	0.02
15-18	Never smokers	4.46 (1.59-12.53)	<.01

Without using the variable elimination technique and leaving all of the independent variables in the model, the non-games participants yielded the regression results in Table 8 (n=195). In this analysis, the variables age (p=0.05), three of the four age categories for the age of smoking initiation variables [8-10 (p=0.04); 11-14 (p<0.01) and 15-18 (p=0.03)], and peer smoking (p<0.01) were significant. Table 9 displays the

findings of the regression of the games participants without using the variable elimination technique (n=258). In this analysis, three of the four age categories for the age of smoking initiation variables [4-7 (p=0.03); 11-14 (p=0.02) and 15-18 (p=0.02)], and peer smoking (p<0.01) were significant.

On account of the smaller samples sizes and wider confidence intervals produced when not using the variable elimination techniques, the results in Tables 8 and 9 will not be incorporated into the discussion and those of Tables 6 and 7 will.

Table 8: Significant predictors of current smoking, logistic regression without using backwards elimination, non-games participants

Variables	Comparison group	Odds ratio (95% C.I.)	Pr > Chi-square
Age		1.18 (1.00-1.40)	0.05
Age of initiation			
4-7	Never smokers	4.54 (0.41-50.79)	0.22
8-10	Never smokers	4.91 (1.08-22.32)	0.04
11-14	Never smokers	5.58 (2.06-15.10)	<.01
15-18	Never smokers	5.91 (1.24-28.12)	0.03
Sex	Male	1.00	0.92
	Female	0.95 (0.37-2.43)	
Peer smoking	A few	1.00	<.01
	All	5.24 (1.58-17.43)	
	Most	2.70 (1.06-6.83)	
	None	0.14 (0.03-0.71)	
Parental smoking	Not yes	1.00	0.28
	Yes	1.54 (0.70-3.40)	
Self-esteem	High	1.00	0.08
	Not high	2.16 (0.90-5.20)	
Educational enjoyment	Very much	1.00	0.98
	Quite a bit	0.92 (0.33-2.56)	
	A bit	0.75 (0.26-2.22)	
	Don't like	1.18 (0.20-6.86)	
	Hate it	0.70 (0.08-6.23)	

Table 8 con't...

Television viewing	≤ 2 hours	1.00	0.47
	3 to 4 hours	1.72 (0.67-4.41)	
	≥ 5 hours	1.56 (0.50-4.88)	
Computer access	Access	1.00	0.13
	No access	1.99 (0.81-4.92)	

Table 9: Significant predictors of current smoking, logistic regression without using backwards elimination, games participants

Variables	Comparison group	Odds ratio (95% C.I.)	Pr > Chi-square
Age		1.09 (0.89-1.34)	0.40
Age of initiation			
4-7	Never smokers	6.50 (1.16-36.65)	0.03
8-10	Never smokers	1.36 (0.37-4.99)	0.64
11-14	Never smokers	3.17 (1.18-8.55)	0.02
15-18	Never smokers	5.34 (1.36-20.92)	0.02
Sex	Male	1.00	0.99
	Female	1.00 (0.45-2.22)	
Peer smoking	A few	1.00	<.01
	All	11.67 (2.22-61.20)	
	Most	4.11 (1.67-10.11)	
	None	0.13 (0.03-0.64)	
Parental smoking	Not yes	1.00	0.44
	Yes	0.72 (0.32-1.63)	
Self-esteem	High	1.00	0.11
	Not high	1.90 (0.86-4.23)	
Educational enjoyment	Very much	1.00	0.41
	Quite a bit	1.07 (0.39-2.87)	
	A bit	1.78 (0.63-5.03)	
	Don't like	0.22 (0.02-2.10)	
	Hate it	0.72 (0.09-5.68)	
Television viewing	≤ 2 hours	1.00	0.10
	3 to 4 hours	0.62 (0.24-1.59)	
	≥ 5 hours	2.02 (0.77-5.28)	
Computer access	Access	1.00	0.08
	No access	2.07 (0.92-4.65)	

CHAPTER FIVE: DISCUSSION

"I think it was interesting to actually sit here and do a questionnaire that made me think of my health for my family and myself. Thank you!!" (Comment of a survey participant of the AYLS, 2002)

This research project has focussed on a sample of Aboriginal youth from Canada and the United States. The objective of this work was to determine whether a set of factors that have been illustrated in the literature to influence the smoking status of youth in general, are also associated with the smoking status of these Aboriginal youth. This was accomplished through the analysis of items in the 2002 Aboriginal Youth Lifestyle Survey.

5.1 Tobacco smoking status

In the literature reviewed, rates of current smoking among Aboriginal youth varied from 30% among 10-14 year olds based on the results of the 1995-1996 FNYITU, to 73% among Inuit youth between the ages of 15-24 according to the 1991 APS. The prevalence of tobacco smoking among the youth who participated in the 2002 AYLS was 32%. While this rate is at the lower end of the spectrum compared to what has been reported in relation to Aboriginal youth smoking, it is still a higher rate than the general youth population of Canada (aged 15-24) reported in the first wave of results from the 2003 CTUMS, at 24% (CTUMS, 2003).

In the discussion below, some of the factors that have been shown to influence tobacco status in general youth populations will be discussed in terms of their association with smoking status in this Aboriginal youth sample. It must be re-stated that the influence of the factors of interest do not function independently of other factors that are

not investigated in this research project. For instance, First Nations have cultural and spiritual affiliations with tobacco. Having a high presence of tobacco in the home or community provides an environment of acceptance. To date, there have not been any studies that directly investigate traditional tobacco use with smoking status among Aboriginal youth. One study, demonstrated how youth in proximity to tobacco have a higher prevalence of use than youth who are not (Noland et al., 1996). Their research, involving 3,851 non-Aboriginal seventh-grade students in Kentucky, found that the risk of tobacco use was associated to whether the student personally raised tobacco and/or if their parent smoked tobacco. If a student was exposed to both of these factors, this further increased their risk of smoking a smoker. A student who personally raised tobacco and had at least one parent who smoked was 10.2 times more likely to have smoked in the last 7 days than a student from a non-raising household in which neither parent smoked.

5.2 Factors associated with smoking status among Aboriginal youth

Games participation

The Aboriginal Youth Lifestyle Survey was created to collect information from Aboriginal youth at a cultural and sporting event. The North American Indigenous Games are an occasion to celebrate Aboriginal health and wellness. For this reason, information regarding participation status at the games was chosen as a variable to represent physical activity involvement. In order to further explore other measures of physical activity, two of the survey items were combined and categorized into three groups to create a physical activity index (Outside of school, in the last 12 months, how often have you played sports or participated in physical activities without and with a

coach)(Appendix D). Although this variable was significant at a bivariate level, it did not predict smoking status in the final regression model.

The smoking status of the games-participants and the non-games participants mirrored what has been repeatedly showed in the literature; that those involved with sports are less likely to smoke compared to those who are not (Escobedo et al., 1993). In this sample, smoking prevalence was twice as high among non-games participants compared to games participants. Perhaps games participation detracts from boredom. Or perhaps being apart of a team provides an opportunity to be exposed to other youth who have prioritized health more than youth who are not involved with a team. Due to the cross-sectional nature of this research, it cannot be determined if health-conscious youth join teams or if being on a team then encourages a healthier outlook.

Age

It was hypothesized that age would be positively associated with smoking status; older youth would be more likely to smoke compared to the younger youth. The hypothesis was supported in the bivariate analyses and by the logistic regression findings among the non-games participants. Among the games participants, age was not significant in the final model.

The statistical association between youth smoking status and age is common in the literature investigating both Aboriginal and non-Aboriginal youth. The proportion of smokers increased dramatically with age (12% at 10 years to 51% at 14 years) in the analysis of the First Nations Youth Inquiry into Tobacco Use (Wunska, 1997). These study findings may be explained by the older an individual is, the more temporal

opportunity they have to start smoking. This may partly explain the prevalence of tobacco use in this study. As mentioned previously, 32% is quite low compared to what has been reported in other studies investigating smoking in Aboriginal youth. If an individual is more likely to smoke when they are older, having a study sample with an average age of 15.7 may reflect less time and opportunity to initiate smoking. The age discrepancy between the two games participation groups may explain the significance of age in the final model. The average age of the non-games participants was 16.4 while the games participants were younger with an average age of 15.2.

Age of smoking initiation

In the literature reviewed, age of smoking initiation was an important predictor of smoking status among adolescents and thus it was hypothesised that it would be negatively associated with the smoking status of the Aboriginal youth sampled. Specifically, youth who initiate smoking at younger ages will be more likely to maintain smoking compared to those who initiated as older youth. In this sample, the age of initiation variable was statistically associated with smoking status in the bivariate analysis. In the logistic regression analyses, each of the age of smoking initiation age categories were analysed separately compared to never smokers. These variables were not significant in the regression of non-games participants. Among the regression of the games participants however, three of the four age categories were associated with smoking status. As described in the results chapter, the patterns of initiation differ by games participation status. However, when examining the graph by each group, the must noteworthy rise in the proportion of initiation is between ages 11 and 12. At this age,

youth begin senior school (also known as junior high). Perhaps this transition is a heightened vulnerable time period for these youth. Often, youth will move to a new school for grade 7 where they would be exposed to older youth who may smoke. This transition may also give them more access to cigarettes. Aboriginal youth who live on-reserve may be required to transfer to an off-reserve school at this time. This change may produce an even more uncomfortable environment, one where a youth may want to find a hitch to fit in more easily. Tobacco smoking could be seen as a remedy.

The data reveal the same pattern of initiation observed in the 1996 First Nations and Inuit Regional Health Survey. Respondents of the FHIRHS began smoking at age 5, initiation peaked at age 16 and ceased by age 24. Similarly, in the AYLS, smoking initiation began at age 4, peaked at age 12 and did not commence beyond the age of 18. Whereas non-Aboriginal youth do adhere to a similar curve as well, the age of initiation is not reported as early as in Aboriginal youth (Escodedo et al, 1993). The 1999 School Tobacco Use Survey of the Northwest Territories sampled youth between the ages of 10 to 17. Their data show that Aboriginal youth start smoking earlier than the non-Aboriginal youth of the same region. In the 10 to12 year old sample, Aboriginal youth's rates were 8 times those of the non-Aboriginal youth (8% versus 1%), among the 13 to14 year olds, the Aboriginal youth had rates that were 3.7 times those of non-Aboriginal youth (37% versus 10%), and the Aboriginal youth of the oldest category had rates that were 2.8 times those of non-Aboriginal youth (66% versus 24%)(Northwest Territories Health and Social Services, 2001).

Sex

The literature on the influence of gender related to smoking status is not consistent. The results of the First Nations Youth Inquiry into Tobacco Use determined that in each age group, the female respondents had a higher prevalence of smoking compared to the males (Wunska, 1997), therefore, it was hypothesized in this research project that females would be more likely to smoke than males. While the results of this study did concur with those of the FNYITY, (females had a higher smoking prevalence: 35% vs. 28%) gender was not statistically associated with smoking status in the bivariate analysis or in the logistic regressions.

Peer smoking

Peer smoking has consistently been shown in the literature to be associated with smoking status. Therefore, it was hypothesized that peer smoking would be positively associated with smoking status in this study; youth whose friends smoke will be more likely to smoke themselves. This hypothesis was supported by the results in this study.

The strong influence of peer smoking might be what is apparent of 'all respondents' in Figure 4 of the results chapter. In this illustration of smoking initiation by age, a doubling of smoking initiation from age 4 and every two years up to age 12 is observed. This pattern may suggest a strong role of peer influence since the uptake is occurring in clusters. The association of peer smoking and peer influence at the time of age of initiation was not investigated.

The direction of association of peer influence is difficult to determine: are friends who smoke sought out because they already smoke or do two non-smoking friends decide

together to experiment with smoking? Whatever the case may be, peers do influence each other. With the urban and rural Native American youth sampled in Unger and colleagues' work (2003), friends' smoking [OR=6.84 (4.65-10.05)], perceived positive consequences [OR=2.06 (1.49-2.86)] and perceived negative consequences [OR=0.42 (0.26-0.69)] were the only factors associated with smoking status.

Parental smoking

Parental/primary care giver smoking was hypothesized to be positively associated with smoking status in this study; youth whose primary care giver smokes would be more likely to smoke themselves compared to having a primary care giver who didn't smoke. When parental smoking is stratified by games' participation, there is a significant difference between the games participation groups (p<0.01). However, in the multivariable, parental smoking was not significant.

In a review by Avenevoli and Merikangas (2003), they found that when significant parental smoking effects are found, these effects are generally small in magnitude. They also remarked that the effect of parental smoking on youth smoking is often eliminated completely when other variables are included in models. They further noted that there is inconsistent support for a dose-response association between parental smoking and youth smoking; youth are not at greater risk for smoking when both parents smoke compared to when one of their parents smokes. This finding could not have been tested with the data from the AYLS.

Self-esteem

As the literature indicates that youth with lower levels of self-esteem are more likely to smoke compared to youth with higher levels of self-esteem, it was hypothesized that self-esteem would be negatively associated with smoking status in this sample as well. The results of the bivariate test and the regression of the non-games participants did support this prediction, however the logistic regression of the games participants did not.

Both games participants and non-games participants reported the same amount of high self-esteem (65%). The differences in reported self-esteem rose within the two groups when comparing smokers to non-smokers. More non-smokers reported high self-esteem compared to smokers.

In a 2003 review, Baumeister and colleagues found that self-esteem had little association with health behaviour. High self-esteem did not appear to prevent children from drinking, taking drugs or smoking. In fact, they suggested that high self-esteem tends to foster experimentation of these behaviours. This might explain why the overall prevalence of tobacco smoking in this sample is high despite an overall high level of self-esteem.

Educational enjoyment

It was hypothesized that youth who do not enjoy their educational experience would be more likely to smoke compared to those who do. However, educational experience was not associated with smoking status among the games participants or the non-games participants. It was postulated that having a negative attitude about school would be considered deviant therefore may appeal to youth smokers more than to non-

smokers, since cigarette smoking has been shown to be considered a deviant behaviour (Andrews and Duncan, 1997). Perhaps smoking cigarettes does not carry the same deviant connotation among Aboriginal youth since smoking prevalence is higher than among non-Aboriginal youth.

Television viewing

On account of the dose-response relationship found to be associated with smoking initiation in Gidwani et al.'s Canadian analysis of the National Longitudinal Survey of Children and Youth (2002), it was hypothesized that television viewing would be positively associated with smoking status in this predominantly Canadian sample. However, this relationship was not shown to be significant in either the bivariate or logistics regression analyses. Furthermore, the trend analysis was not significant.

It was postulated that youth who spent a large quantity of time watching television would be missing out on activities that help guard against smoking, such as physical activity. However, 21% of both the games participants and non-games participants watched ≥ 5 hours a day of television or video games.

In the AYLS, the mean number of hours spent watching television per day was 3-4 hours. However, in Gidwani et al.'s sample, the mean reported time spent watching television per day was 4.8 hours, more than was reported in the AYLS sample.

Computer access

Computer access was hypothesized to be negatively associated with smoking status; youth who do not have access to a computer at home would be more likely to

smoke compared to youth who did. Although the bivariate analysis comparing computer access between the two smoking status groups was significantly different, when the variable was tested in the logistic regression models, it was not statistically significant. In this sample fewer smokers had access to a computer at home compared to the non-smokers, whereas 68% of both the games participants and the non-games participants had access to a computer at home.

The literature suggests that access to a computer at home is an indicator of socio-economic status. In the United States, those with a higher income were more likely to have a computer at home (US Department of Commerce Economics and Statistics Administration, 2001). In the analysis of the AYLS, one survey respondent took the time and effort to write in the margin of their response that their family would like a computer but did not have enough money for one. Therefore, for at least this one individual, not having a computer was related to their family's socio-economic status and not necessarily to their desire to have one. Pending this argument is supported in future research, then the findings from this study would indicate that the SES of youth is associated with smoking status. Perhaps the next step to strengthen this argument would be to determine the number of computers at home per person and/or whether the computer(s) had Internet capabilities. Investigating SES more directly with a standard SES measure, such as parental and/or household income level, could be beneficial for comparisons to other populations.

5.3 Study strengths

The available literature on the health status of Aboriginal youth is firstly limited and secondly does not often portray the healthier and resilient youth who are showcased

in this study. The games' participants competed and fundraised to attend a high calibre international sporting event. Although Aboriginal youth experience poorer health compared to other youth, most Aboriginal youth are healthy. Therefore, the North American Indigenous Games was chosen to access a healthier representation of Aboriginal youth.

This cross-sectional survey has the potential of developing into a longitudinal study since contact information was acquired from the participants (ethics approval would be required for this additional study component). With longitudinal data, causality related to the factors of interest may be determined.

The survey included participants representing individuals from 24 different provinces, states and territories. Although this sample does not reflect all Aboriginal youth from these regions, a fuller representation would not have been achievable without much greater resources in funding and personnel since the population is made up of thousands of communities throughout North America.

5.4 Study limitations

Ideally, to best determine what factors are associated with smoking status among Aboriginal youth, one would conduct a longitudinal cohort study to acquire data on the causal influences on tobacco use. One would follow a large representative group of Aboriginal children through their youth into adulthood to learn which factors protect them against smoking initiation and which risk factors contribute to its uptake. Collecting data over time would enable the researcher to analyze the change these influences have as the sample aged and their relationship to the outcome of interest. Although this study

would produce strong findings, it is not feasible for a number of reasons, not the least of which is the difficulty in accessing the many isolated Aboriginal communities in Canada and the United States.

Limitations have been introduced to this study via the population sampled. Those who participated in the North America Indigenous Games (56% of the study sample) are not an accurate representation of the Aboriginal youth of North America, consequently external generalizability of the study findings must be interpreted with this in mind. These youth are probably much more health conscious, for instance the smoking rate among this survey sub-group was 22%, much lower than what has been reported in the literature among Aboriginal youth and lower than the overall prevalence of this study sample. The other sub-group of this study sample are those who were not athletes in the games. These games attendees were either relatives or friends of the athletes, visitors from out of town, or most likely residents of the Winnipeg or surrounding area. These non-games participants may be more representative of urban Aboriginal youth compared to the participants.

Although all games participants and non-games participants present at the NAIG had an equal opportunity of taking the survey, characteristics of those who did not write the survey were not measured; therefore one cannot assume that those who did respond to the survey were like those who did not. What is known about those who did not participate in the AYLS is that some of them were games participants and others were not. In addition, because of the non-intrusive manner in which survey respondents were acquired, a response rate could not be calculated.

A further limitation of this study is the contextual scope of the outcome. There are other factors related to tobacco status such as policy and historical influences that are not easily encompassed by a cross-sectional design and were not considered here. Therefore the interpretation of the study findings should consider this variable bias; not all variables that predict tobacco status have been included in this analysis.

Each participant responded to the same structured survey, however there is no way to know how questions were interpreted. With participants varying in age by ten years, and undoubtedly by formal education, the range of comprehension may be wide. Whereas all survey respondents were Aboriginal youth, another concern is the cultural heterogeneity and geographical diversity of the participants. While the scope of participants is a strength of the survey, differences in interpretation of the survey items and differences on the interpretation of the concept of health may vary due to these differences.

Validity may be a concern due to the closed-ended questions of the survey. Although the survey was pre-tested with several youth within the age criteria of the study, none of those youth were of Aboriginal descent. Despite this potential limitation, having variable comparability to the 1998-1999 NLSCY may, in future analysis, may be useful in making the direct comparisons that are needed between Aboriginal and non-Aboriginal youth.

5.5 Implications for policy and practice

Several chronic diseases, such as diabetes, cancer and cardiovascular diseases, are increasing in Aboriginal populations in North America (Young, 1994). What is common

in the discussion of these illnesses is the risk factor tobacco use. The implications of preventing the uptake of smoking are therefore paramount in preventing chronic diseases.

This study suggests that four factors are associated with smoking status in either or both of the Aboriginal youth games participants or non-games participants. It also reveals that several factors that influence tobacco smoking in a general youth population are not statistically associated with tobacco smoking among this sample of Aboriginal youth. The influences of age and self-esteem appear to be associated with the non-games participants in the same manner as they influence non-Aboriginal youth. Age of smoking initiation occurred at an earlier age than what has been reported in non-Aboriginal youth. This finding would support implementing tobacco control efforts in as early as kindergarten (Reading and Allard, 1999).

As the variable for peer smoking produced the highest odds ratio, an effective tobacco control program for Aboriginal youth should incorporate this finding by, for instance, placing a lot of emphasis on resisting peer pressure. Being a participant in the games was associated with less smoking among these youth. Perhaps a tobacco control program or a health and wellness program could incorporate aspects of this involvement, such as playing a sport, fundraising and/or experiencing a community/identity with other Aboriginal youth.

5.6 Implications for research

This study suggests areas for future research. The youth of this project lived in several regions of North America, however the influence of urban versus rural environments was not measured. As these environments have been shown in the literature

to influence other health outcomes (Newbold, 1998), perhaps its association with smoking status among Aboriginal youth could be investigated. These findings may suggest a need for regionally specific tobacco control programs. As well, the relationship between tobacco and different Aboriginal Peoples varies, therefore it would be important to investigate its use between a Métis community and an Inuit community. A longitudinal study could investigate whether or not Aboriginal youth who move from a rural to urban setting experience acculturation in a similar manner as new immigrant youth do; smoking prevalence among foreign-born youth is high compared to Anglo youth in Toronto, Ontario, Canada (Yang, 1998).

The present study illustrated that participation in the North American Indigenous Games was associated with lower smoking rates compared to those not involved in the games; while level of physical activity was not significant. This begs the question, does involvement in the North American Indigenous Games itself protect against smoking in Aboriginal youth or is physical activity level hidden or contributing to this relationship as the literature suggests.

Upon the completion of this study, the author would like to request more calls for research and more research funds in this tobacco and population health domain. Specifically, research investigating the association of Aboriginal youth smoking with: involvement with different activities (i.e. involvement in school clubs, non-school related groups or clubs, or sporting teams); different levels of physical activity (i.e. elite athletes, regular physically active youth, weekend warriors and the physically inactive); the smoking status of siblings (and other household members, such as grandparents); SES at the family and community levels; and youth mental health (in the area of depression

where there is currently no published work and/or perhaps in relation to attention-deficit/hyperactivity disorder which is a mental health condition that has been reported to significantly precede the onset of daily smoking among youth (Rohde et al., 2004)).

5.7 Conclusion

The present study examined factors that are associated with the smoking status of other youth populations and investigated whether or not they influence Aboriginal youth as well. The environmental factor peer smoking was associated with smoking status among the games participants and the non-games participants. The demographic factor age was associated with the smoking status among the non-games participants while age of smoking initiation was associated with the smoking status among the games participants. The attitudinal factor self-esteem was associated with the smoking status of the non-games participants. The remaining demographic and environmental factors were not associated with smoking status among these Aboriginal youth.

The findings of this study will contribute to the limited body of literature on tobacco smoking among Aboriginal youth. It may also foster more research in this important area of tobacco control.

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Appendix A: Aboriginal Youth Lifestyle Survey (and Codebook)

Section A: Contact Information (Reference Number)   #____

A1) Address:_____(Raw information)_____
                    Street   City/Town/Reserve/Reservation

_____
                State/Province   Zip/Postal Code

A2) Age:___(Age)_____   Male or Female___(male or female)___

A3) Date of Birth:____(dd/mm/year)_____

A4) What is your Aboriginal ancestry?__(Raw information)_____

A5) How many times have you been to the North American Indigenous Games?

     ?   One time (1)
     ?   More than one time
     →   If more than one time, how many times_____(2+)_____

A6) Are you an athlete in the Games?

     ?   No (1)
     ?   Yes (2)
     →   If you are an athlete in the Games, what event are you participating in this year?_____A6a - (1-Volleyball; 2-Archery; 3-Basketball; 4-Taekwon Do; 5-Soccer; 6- Softball; 7-Athletics; 8-Golf; 9-Badminton; 10-Canoeing; 11-Swimming; 12-Baseball; 13-Boxing; 14-Rifle;15-Cross Country; 16-LaCross; 17-Wrestling)

Section B: Friends

B1) Please answer the following statements about your friends and/or others your age.

	True	Mostly true	Sometimes true/ Sometimes false	Mostly false	False
a) I have many friends	1	2	3	4	5
b) I get along easily with others my age	1	2	3	4	5
c) Others my age want to be my friend	1	2	3	4	5
d) Most other people my age like me	1	2	3	4	5

B2) How many of your close friends do the following:

	All	Most	A Few	None
a) smoke cigarettes?	1	2	3	4
b) drink alcohol?	1	2	3	4
c) have tried marijuana?	1	2	3	4
d) have tried drugs other than marijuana?	1	2	3	4

Section C: School

C1) How do you feel about school?

1	I like school very much
2	I like school quite a bit
3	I like school a bit
4	I don't like school very much
5	I hate school

C2) How important is it for you to do the following in school:

	Very important	Somewhat important	Not very important	Not important at all
a) make friends?	1	2	3	4
b) get good grades?	1	2	3	4
c) participate in extra-curricular activities	1	2	3	4
d) show up for class on time?	1	2	3	4
e) learn new things?	1	2	3	4
f) express your opinion in class?	1	2	3	4
g) take part in student council or other similar groups?	1	2	3	4

C3) How do you like the following subjects:

	I like it a lot	I don't like it very much	I hate it	I don't take it
a) Math	1	2	3	4
b) Science	1	2	3	4
c) English	1	2	3	4
d) French	1	2	3	4
e) History	1	2	3	4
f) Gym/Physical Education	1	2	3	4
g) Fine Arts (arts, music, drama)	1	2	3	4
h) Spanish	1	2	3	4
i) an Aboriginal language (which Aboriginal language?(C3ii - Raw info.)	1	2	3	4

Section D: About me

D1) Choose the answer that best describes how you feel.

	True	Sometimes true	Sometimes false/Mostly true	Mostly false	False
a) In general, I like the way I am.	1	2	3	4	5
b) Overall I have a lot to be proud of.	1	2	3	4	5
c) A lot of things about me are good.	1	2	3	4	5
d) When I do something, I do it well	1	2	3	4	5
e) I like the way I look	1	2	3	4	5

Section E: Activities

E1) How physically active are you compared to other youth your own age and gender?

?	1	Much More Active
?	2	More Active
?	3	Same
?	4	Less Active
?	5	Don't Know

E2) **Outside of School**, in the last 12 months, how often have you....

	4 or more times a week	1 to 3 times a week	Less than once a week	Never
a) played sports or participated in physical activities WITHOUT a coach or an instructor (e.g. biking, skateboarding, etc.)?	1	2	3	4
b) played sports WITH a coach or instructor (swimming lessons, baseball, hockey, etc.)?	1	2	3	4
c) taken part in dance, gymnastics, karate or other groups or lessons (organized outside of school)?	1	2	3	4
d) taken part in art, drama or music groups, clubs or lessons (again outside of school)?	1	2	3	4
e) taken part in clubs or groups such as Guides or Scouts, 4-H club, community, church or other religious groups?	1	2	3	4
f) had a hobby or craft (drawing, model building, etc.)?	1	2	3	4

E3) Excluding for school or for work, how often do you...

	Daily	Weekly	Monthly	Several times a year	Never
a) use a public library?	1	2	3	4	5
b) write letters, poetry, stories, journals, etc.?	1	2	3	4	5
c) read newspapers or magazines?	1	2	3	4	5
d) read books?	1	2	3	4	5

E4) On average, about how many hours a day do you watch TV or videos?

1	I don't watch TV or videos
2	Less than 1 hour a day
3	1 or 2 hours a day
4	3 or 4 hours a day
5	5 or 6 hours a day
6	7 or more hours a day

E5) Do you have access to a computer at home?

1	Yes
2	No

Section F: Smoking

F1) Have you ever tried cigarette smoking, even just a few puffs?

1	Yes		**Go to question F2 (next question)**
2	No		If no.....

If you have never tried cigarettes, please rank the reasons, from 1 to 6 (1 being the most important reason and 6 being the least important reason)why you NEVER tried smoking cigarettes:

F1a (1-6)__ *personal choice*
F1b (1-6)__ *parental or family influence*
F1c (1-6)__ *want to stay healthy*
F1d (1-6)__ *uncool*
F1e (1-6)__ *do not want to spend money on cigarettes*
F1f (1-6)__ *smoking is not important to my friends* |**Go to Section G**

F2) How old were you when you smoked cigarettes for the first time?
I was __(Raw information)__years old.

F3) Do you still smoke cigarettes?

Yes (1)
If yes.....
a) *If you still smoke cigarettes, please rank the reasons, from 1 to 6 (1 being the most important reason and 6 being the least important reason)why you STILL smoke cigarettes:*
F3Aa (1-6)__ *personal choice*
F3Ab (1-6)__ *parental or family influences*
F3Ac (1-6)__ *don't care about staying healthy*
F3Ad (1-6)__ *to be cool or cooler*
F3Ae (1-6)__ *the cost is not important*
F3Af (1-6)__ *smoking is important to my friends*

b) Have you ever smoked cigarettes daily, that is, at least one cigarette every day for 30 days?
1 Yes
2 No
3 I don't know

c) On a day that you smoke, about how many cigarettes do you usually smoke?
__(Raw information)____number of cigarettes

d) During the past 12 months, did you ever try to quit smoking cigarettes?
1 Yes
2 No
3 I don't know
Go to Section G

No (2)
If no.....
e) *If you no longer smoke cigarettes, please rank the reasons, from 1 to 6 (1 being the most important reason and 6 being the least important reason) why you CURRENTLY DO NOT smoke cigarettes:*
F3Ea (1-6)__ *personal choice*
F3Eb (1-6)__ *parental or family influences*
F3Ec (1-6)__ *want to stay healthy*
F3Ed (1-6)__ *uncool*
F3Ee (1-6)__ *do not want to spend money on cigarettes*
F3Ef (1-6)__ *smoking is not important to my friends*

f) Have you ever smoked cigarettes daily, that is, at least one cigarette every day for   30 days?

   1 Yes
   2 No
   3 I don't know **Go to Section G**

Section G: Family and Household

G1) Who is your primary care giver (e.g. *who looks after you the most*.....your mother, father, grandparent, aunt, uncle, brother, sister or others)? ___(1-Mother; 2-Father; 3-Brother; 4- Sister; 5-Grandmother; 6-Grandfather; 7-Aunt; 8-Uncle; 9-Foster Parents; 10-Cousin; 11-Other; 12-Themselves; 13-Girlfriend/Boyfriend; 14-Mom and Dad; 15-Step-Mom; 16-Step-Dad; 17-Grandparent; 18-People at Home for Pregnant Teens; 19-Jesus Christ; 20-Roomate; 21-Friends; 22-Sister's Boyfriend's Grandmother; 23-Guardian)___

G2) Does *that person* (your primary care giver) smoke cigarettes?

   1 Yes
   2 No
   3 I don't know

G3) How many people live in your household?
  _(Raw)__people live in my household

G4) How many people, including yourself, are below the age of 21 in your household?
  _(Raw)__are below the age of 21 in my household.

G5) How many people in your household, not including yourself, smoke daily?
  _(Raw)__people in the household smoke daily.

Section H: Health

H1) In general, would you say your health is...

   1 excellent?
   2 very good?
   3 good?
   4 fair?
   5 poor?

H2) How many times a week do you eat breakfast?

   1 Never
   2 1 or 2 times a week
   3 3 or 4 times a week
   4 Every day

H3) Which of the following are you trying to do?

   1 Lose weight
   2 Gain weight
   3 Stay the same weight
   4 I'm not trying to do anything about my weight

Section I: Money

I1) How do you usually spend your money?
(You can mark more than one answer.)

   I1a - yes or no Meals, snacks or junk food
   I1b - yes or no Clothes, shoes

I1c - yes or no	Cigarettes
I1d - yes or no	Alcohol or drugs
I1e - yes or no	Other things for myself (make-up, CD's, lottery tickets, magazines, etc.)
I1f - yes or no	Going out (movies, arcades, parties, etc.)
I1g - yes or no	Activities or equipment (school supplies or school trips, music or sports lessons, computer supplies, etc.)
I1h - yes or no	Gifts for family and friends
I1i - yes or no	Family expenses (groceries, etc.)
I1j - yes or no	Savings
I1k - yes or no	Other. Specify:_(Raw information)_____

Section J:Help us to improve this questionnaire! Tell us what you think of it.

J1) Overall, how easy did you find the questionnaire to read and understand?

    1   Not at all easy
    2   Not very easy
    3   Fairly easy
    4   Very easy

J2) What about the length of the questionnaire?

    1   Much too long
    2   A bit too long
    3   About right
    4   Too short

J3) Do you have other comments?
_____(Raw information)

_____
_____
_____
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_____

Thank you very much for helping us!

Appendix B: Canadian and American participants: including athletes, coaches, managers and chaperones

Canada - 5056
British Columbia 599
Alberta 874
Saskatchewan 900
Manitoba 1117
Ontario 879
Québec 157
Nova Scotia 200
Prince Edward Island 30
NorthWest Territories 192
Nunavut 5
Yukon 103

United States - 2313
Washington 112
Oregon 18
Colorado 165
New Mexico 120
North Dakota 298
South Dakota 117
Iowa 113
Florida 256
Wisconsin 314
Michigan 165
Connecticut 68
Maine 31
New York 499
Mississippi 37

Appendix C: Informed Consent Form
#___

CONSENT FORM

Purpose: The purpose of this project is to gain information on non-traditional tobacco related behaviours in North American Aboriginal youth.

Procedure: If you are between the ages of 13 and 21, we would like you to volunteer for our project. Information will be collected about you, your friends and family. This information will be used to learn about your influences and health related attitude. We will require this form to be signed by you. *If you are below the age of 19, we require your guardian to also sign this form. Guardians should not read the answers of the participants.*

We will need about 10 minutes of your time to participate. You may refuse to answer any questions or drop-out at any time.

Confidentiality: All information you provide will be kept strictly confidential. No names or other identifying information will be included in any reports or summaries we produce when we are finished this project.

Risks/Benefits: There are no direct benefits or risks to you for participating in the project, except that you may appreciate being given the opportunity to express your views regarding the project, and will help us to complete out work.

I have read the information above and I agree to participate in the project. I know that I am free to drop out at any time without any penalty. I may contact Amanda Ritchie at (amanda.ritchie@utoronto.ca) or at the Institute of Aboriginal People's Health at (416) 946-5634 at any time if I have any questions.

Participant's Name:_____

Participant's Signature:_____

Date:_____

For participants below the age of 19, your guardian's signature is also required. If your guardian is not at the Games, the person who is in charge of you while you are at the Games must sign.

Guardian's Name:_____

Guardian's Signature:_____

Date:_____

Appendix D: Description of physical activity index

Table 10: Frequency information from the two activity related survey questions

Response categories	Points	Activity per week without a coach n (%)	Activity per week with a coach n (%)
4 or more times a week	4	227 (41%)	201 (37%)
1-3 times a week [delete extra space in this row]	3	227 (41%)	174 (31%)
Less than once a week	2	74 (13%)	89 (16%)
Never	1	27 (5%)	89 (16%)
# of respondents		555	553

The responses of these two survey questions were combined to create a physical activity index ranging from 2 to 8. Someone who replied that they participate in activities without a coach 4 or more times a week and less than once a week with a coach would receive a score of 6 out of a possible 8.

This index was than categorized into three activity levels: High (score of 6-8), medium (score of 3-5) and low (score of 2).

Table 11: Bivariate analysis of smoking status by activity level

Activity level	Non-smokers (%)	Smokers (%)
High	82 (23%)	20 (12%)
Medium	226 (64%)	94 (57%)
Low	44 (13%)	50 (30%)
# of respondents	352	164

The chi-square test of this relationship is significant at the 1% level.