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Alcohol, Smoking and Drug Use among Inuit Women of Childbearing Age during Pregnancy and the Risk to Children

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Abstract

Background—Alcohol consumption during pregnancy, a known teratogen often associated with drug use and smoking, is a well-known public health concern.

Aim—This study provides prevalence data for alcohol, smoking, and illicit drug use before, during, and after pregnancy among Inuit. Factors associated with alcohol use are also identified.

Methods—248 Inuit women from Arctic Quebec were interviewed at mid-pregnancy, and at 1 and 11 months postpartum to provide descriptive data on smoking, alcohol, and drug use during pregnancy, and the year before and after pregnancy. Sociodemographic and family characteristics potentially associated with alcohol use were documented.

Results—92% of the women reported smoking and 61% reported drinking during pregnancy. Episodes of binge drinking during pregnancy were reported by 62% of the alcohol users, which corresponds to 38% of pregnant women. 36% of the participants reported using marijuana during pregnancy. Alcohol use and binge drinking during pregnancy were more likely to be reported by women who lived in less crowded houses, had a better knowledge of a second language, drank alcohol more often and in larger amounts prior to pregnancy, and used illicit drugs. Binge drinkers were more likely to be single women and to have had fewer previous pregnancies. Postpartum distress and violence were more likely to be experienced by women who used alcohol during pregnancy. Binge drinking during pregnancy was best predicted by drinking habits before pregnancy, maternal symptoms of depression, the use of illicit drugs during pregnancy and the number of young children living with the mother.

Conclusions—These results confirm that alcohol is a major risk factor to maternal and child health in this population, underscoring the need for culturally relevant and effective prevention programs.

Keywords

alcohol; drug use; pregnancy; Inuit; fetal alcohol spectrum disorder

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Introduction

The introduction of alcohol to indigenous groups in Canada can be traced back to the Hudson Bay region during the seventeenth century when European fur traders used alcohol as gifts and to obtain furs (Brady, 2000; Waldram et al., 1995). Most northern indigenous people drank alcohol only when they visited trading posts, and such events were associated with festive parties where alcohol was generally consumed until the supply was gone (Saggers and Gray, 1998). Alcohol use during this period was not limited to men since indigenous women regularly drank alcohol together with their partners. Furthermore, many women who worked on the trap-lines had a pattern of alcohol use similar to those of men, when at the trading posts (Van Kirk, 1980). While alcohol consumption was initially viewed as a pleasurable activity, many individuals and groups also adopted the use of alcohol as a way to escape the drastic changes in their autonomy, and individually as well as collectively, to cope with negative feelings and experiences brought on by colonization (Saggers and Gray 1998; Tait, 2003). Nowadays, alcohol, smoking and drug use are major public health and social concerns in Canadian aboriginal groups. Explanations for the contemporary high rates of alcohol use among Aboriginal peoples pertain to a wide array of domains, including biology, culture, local community, learned behaviour, psychological distress, and political as well as economic and historical factors (Beauvais, 1998; National Institute on Alcohol Abuse and Alcoholism, 2002). Information on frequency, quantity, and pattern of alcohol consumption for pregnant women and for women of childbearing age is of major importance, as the adverse effects of prenatal exposure to alcohol are now well documented. The effects of *in utero* exposure to alcohol on the fetus are observed with maternal consumption of as few as seven drinks per week during pregnancy on average or with at least one binge drinking episode per week, which corresponds to five standard drinks or more per occasion (Jacobson and Jacobson 1994; Jacobson et al., 1998; Day et al., 1989). Maternal consumption of alcohol during pregnancy can result in fetal alcohol syndrome (FAS), a birth defect characterized by growth deficiencies and a pattern of minor facial dysmorphologies (NIAAA, 2000; Hoyme et al., 2005). Affected individuals typically experience learning, memory, attention, and/or problem solving difficulties, as well as mental health and social problems (May and Gossage, 2001a). Exposed children who lack the dysmorphic characteristics frequently exhibit a whole spectrum of alcohol-related neurodevelopment disorders (ARND), including attention difficulties, cognitive deficit, and decreased IQ (e.g., Burden et al., 2005, Clarren et al., 1987; Jacobson and Jacobson, 1994; Jacobson et al., 2004; Larroque et al., 1995; Streissguth et al., 1989, 1990; Bailey et al., 2004). Prenatal exposure to alcohol is recognized as one of the principal avoidable causes of congenital malformations and developmental delays in industrialized countries, and is considered the leading preventable cause of mental retardation in North America (NIAAA, 2000).

May and Gossage (2001a) estimate a prevalence rate for FAS of 0.5 to 2.0 cases per 1,000 births in the United States during the 1980s and 1990s. Bailey et al. (2004) estimate prevalence levels to be as high as 4.8 occurrences per 1000 births, with many more children exposed at lower levels, approximately 1 in 100 births, that may result in ARND. Based on data from a prospective study conducted in Seattle by Sampson and colleagues (1997), the prevalence of ARND is likely to be three times that of FAS. A very limited number of studies were conducted among US and Canadian aboriginal populations, which are difficult to compare due to differences in the methods used (Burd and Moffatt, 1994; Egeland et al., 1998; Robinson et al., 1987; Williams et al., 1999). For Native Americans, the rates for FAS differ widely between tribes, ranging from 1.6 to 10.7 per 1000 live births (May, 1996).

The prevalence of alcohol consumption during pregnancy, especially when data on frequency and quantity are available, can provide the basis for an estimate of the risk of

potential developmental alcohol effects in children. The few studies conducted in northern Canadian aboriginal communities have shown a high prevalence of alcohol intake during pregnancy. Godel et al. (1992) reported that 34% of women from one Northwest Territories community had consumed alcohol during pregnancy. In another study conducted in this region, Godel et al. (2000) reported that 24% of mothers of school-aged children from grades 1 to 3 binge drank or were frequent alcohol drinkers while pregnant with these children.

Studies conducted among Canadian aboriginal populations have shown that Inuit differ from southern populations in their consumption pattern. They tend to drink relatively rarely, but when they do, a great amount of alcohol is consumed (binge drinking or excessive drinking). The Santé Quebec Inuit Health Survey (SQIHS) conducted among the Inuit communities of Nunavik (Arctic Quebec, Canada) found that 62% of female alcohol users ingested 5 drinks or more when they drank (Jetté, 1994). This prevalence is 5–6 times more than the 11% observed among women from the general Canadian population interviewed in the Canadian Community Health Survey (CCHS) (Chevalier and Lemoine, 1998). Similar high rates of binge drinking among women of childbearing age have been reported in some American Indian tribes (May and Gossage, 2001b), and relatively high proportions of binge drinkers have also been recently reported among Alaska native women (Steele et al., 2008). If continued during pregnancy, such a drinking pattern is especially preoccupying given that it puts the fetus and offspring at greater risk for developing alcohol-related impairments.

In addition to the adverse effects on brain development associated with prenatal exposure, postpartum alcohol abuse is likely to interfere with the establishment of an adequate mother-child relationship and to reduce the mother's availability to respond to the needs of her child (Lier et al., 1995). Moreover, it is recognized that mothers who give birth to a child with FAS or alcohol-related deficits are at high risk for alcohol abuse after delivery and of giving birth to other children with these disorders (May, 1996). Yet, few studies have examined alcohol use during the postnatal period and among mothers with toddlers, and this is true for aboriginal groups as well.

The identification of sociodemographic, psychological, and familial characteristics associated with maternal alcohol use during pregnancy is of interest for prevention and public health and should be conducted within culturally homogenous groups since the correlates of alcohol use are likely to vary depending on the population under study. For example, while lower socio-economic status (SES) and poorer education are usually associated with alcohol consumption during pregnancy among American Indians (Kvigne et al., 1998), two national surveys – the National Population Health Survey (NPHS) (Statistics Canada, 1994) and the National Longitudinal Survey of Children and Youth (NLSCY) (Statistics Canada, 1994–1995) – reported that older women from the general Canadian population, which is mostly composed of Caucasians, and those from higher SES, were more likely to report alcohol use during pregnancy. Similarly, a study conducted among Mexican American women found that alcohol consumption during pregnancy was associated with greater acculturation, defined in terms of greater knowledge of the English language and years of education (Zambrana et al., 1997). Family violence, psychological distress, and sexual abuse have also been identified as factors associated with alcohol and drug use among pregnant women (Horrihan et al., 2000).

Beside alcohol use, maternal smoking during pregnancy is a well-documented determinant of lower birth weight and smaller head circumference (Cornelius and Day, 2000; Jacobson et al., 1994) and has been associated with higher rates of attention and behavior problems among the exposed children, along with slightly diminished intellectual abilities (Weitzman et al., 2002). Qanuipitaa?, a health survey conducted among the Inuit population from

Nunavik in 2004 revealed a very high proportion (72.6%) of regular smokers among Inuit women (Plaziac et al., 2007), which is more than two times higher than the 33% reported among women in Southern Quebec (Bernier and Brochu, 1998). Prenatal exposure to illicit drugs, such as cannabis, stimulants, opiates, hallucinogens, and inhaled solvents, may also have deleterious effects for growth and neurodevelopment (e.g., Fried and Smith, 2001; Jacobson et al., 1996; Lester and Lagasse, 2010; Richardson et al., 2009) but the precise pattern of anomalies related to these substances remains undefined (Roberts and Nanson, 2000). Effects vary and are often difficult to distinguish from poor maternal nutrition and inadequate prenatal care. Cannabis is the illegal drug most used in Canada; 5% of women over 15 years of age reported having used cannabis in the 12 months preceding the NPHS survey (Statistics Canada, 1994). The results from the Qanuippitaa? survey suggest that cannabis is also the most frequently used drug in Nunavik: 46.8% of women over the age of 15 reported using it in the 12 months preceding the survey (Muckle et al., 2007). To our knowledge, prevalence estimates for smoking and use of illicit drugs are not available for pregnant women in specific Canadian aboriginal groups.

To date, descriptive epidemiological data on substance abuse during pregnancy by Canadian Aboriginal women remains sparse and is often averaged across multiple aboriginal groups. The first objective of this study is to provide descriptive data on frequency and amounts of alcohol, cigarettes and illicit drug use during pregnancy among Inuit women from Nunavik. Data on alcohol use during the year prior to pregnancy and during the postpartum year are also provided. The second objective of this paper is, for the first time, to identify socioeconomic, personal and familial correlates of alcohol use during pregnancy. Lastly, the magnitude of the risk of fetal alcohol exposure effects in children in this population is examined.

Materials and methods

Procedures

Pregnant Inuit women from Nunavik were invited to participate in a study focusing on infant health and development. The Nunavik region is located north of the 55th parallel in the province of Quebec (Canada). About 9500 Inuit are scattered along a 2000-km shore line along the Hudson Bay, Hudson Strait, and Ungava Bay, about 1500 km from Montreal and 2000 km from the Great Lakes in the United States. The Nunavik Inuit live in 14 villages, ranging from 160 to 2055 inhabitants per village. From November 1995 to November 2000, a midwife or a nurse in each of the three largest Inuit villages on the Hudson Bay coast provided us with the names of pregnant women shortly after their first prenatal visit. A project research assistant then contacted the potential participant by telephone and invited her to meet at the village's nursing station to learn about the study's objectives and procedures. Women without telephones were contacted by an announcement on the village's radio station. Maternal interviews were conducted at the nursing station at mid-pregnancy and 1 and 11 months postpartum by a research assistant with a master's or doctoral degree in psychology. Interviews were conducted in English, French, or in Inuktitut with the help of a female Inuit interpreter. Alcohol use, smoking, and drug use during pregnancy were documented in the mid-pregnancy interview for the period from conception to the prenatal interview and in the 1-month postnatal interview for the period from the prenatal interview to the delivery. Pre-pregnancy alcohol and drug use was documented in the mid-pregnancy interview. Personal and familial characteristics assessed at the 11-month postpartum interview included psychological distress for the one-week period prior to the interview, suicidal ideation and attempts recently and throughout life, and domestic violence since delivery. A detailed informed consent was obtained from each participant. The research procedures were approved by the Human Subjects committees of Laval University and Wayne State University.

Four hundred and seventeen (417) pregnancies were reported during the study period and 59 potential participants were excluded, for the following reasons: included in the cohort during a previous pregnancy, had a miscarriage during first trimester of pregnancy, or could not be contacted. One hundred and ten (110) of the 417 refused to participate (26.4%). Women who agreed to participate were interviewed during pregnancy ($N = 248$), 1 month ($N = 215$) and 11 months after delivery ($N = 177$). The main reasons for loss of participants during follow-up were: baby adopted (28%) or mother moved to a community not participating in the study (22%), miscarriage and infant mortality (22%), and mother could not be found (18%). Refusal rates after enrolment were 3.6% at postnatal interview and 6.7% at 11-month follow-up.

Instruments

Frequency and quantity of alcohol intake were assessed through structured interviews designed to document number of drinking days, number of standard drinks (beer, wine or liquor) per drinking day, occurrence of binge drinking episodes, and number of standard drinks per binge drinking episode for the pre-pregnancy, pregnancy and postnatal periods. One standard drink corresponds to 0.5 oz of absolute alcohol (AA), which is the equivalent of 350 ml of beer (12 oz), 175 ml of wine (6 oz), or 44 ml of liquor (1.5 oz) (Bowman et al., 1975). Binge drinking was defined as the consumption of at least 5 standard drinks of alcohol (beer, wine or liquor) during one occasion. Questions were adapted from the timeline follow-back maternal interview for alcohol and drug use during pregnancy (Jacobson et al., 1991; Jacobson et al., 2002), which documents the type of alcoholic beverage (beer, wine, liquor, home-made beer, mixed drinks), volume consumed for each beverage, and frequency of consumption. This instrument was modified for use in the Inuit population to facilitate maternal recall and to take into account that alcohol consumption in this population does not necessarily occur on a weekly basis and that amounts ingested are likely to vary considerably between drinking episodes. The participants were asked to identify special events at which they may have consumed larger amounts of alcohol than usual, such as birthdays, holidays, parties, as well as any stressful life events that might have elicited heavier drinking. When binge drinking episodes were not spontaneously reported, participants were asked explicitly about when they had 5 drinks or more during one occasion, as well as average and maximum number of drinks during these occasions.

During the prenatal interview, alcohol consumption was assessed for three time periods: the year prior to the pregnancy, the peri-conceptual period, which corresponds to the 3-week period after the first day of the last menses, and the period from conception to the prenatal interview. The interview conducted 1 month after delivery documented alcohol use for the period from the initial maternal interview to the end of pregnancy. The interview conducted 11 months after delivery documented alcohol use from the delivery to the 11-month interview. The following were tabulated for each drinking period: average ounces of absolute alcohol (AA)¹ per day, frequency of drinking (days per month), average ounces of AA per drinking day, number of episodes with 5 or more drinks, and average and maximum AA per binge drinking episode. Two trained research assistants, one of whom had conducted the maternal interviews, coded maternal responses independently. Disagreements were identified and discussed until a consensus was reached, sometimes with involvement of a more senior coder.

Smoking during pregnancy and during the year following delivery was reported in terms of number of cigarettes smoked per day with questions from the SQIHS (Jetté, 1994) and

¹One standard drink of alcohol corresponds to 0.5 oz of absolute alcohol (AA), which is the equivalent of 350 ml of beer (12 oz), 175 ml of wine (6 oz), or 44 ml of liquor (1.5 oz)

Qanuippitaa? survey (Plaziac et al., 2007). The following illicit drugs were documented in terms of frequency per month or total number of days during the pre-pregnancy, pregnancy, and postnatal periods: marijuana, cocaine (including crack cocaine), solvent sniffing, heroin, mushrooms, phencyclidine (PCP, angel dust), sedatives and amphetamines. Age when cigarettes and each illicit drug were first used was noted, as well as age when discontinued, if relevant.

The following socioeconomic characteristics were assessed by maternal interview: maternal age, education, occupation, socioeconomic status (Hollingshead Index; Hollingshead, 1979), marital status, parity, and village of residency; number of adults and number of children younger than 6 years of age living with the mother; maternal French or English literacy (Peabody Picture Vocabulary Test Index-Revised PPVT-R; Dunn and Dunn, 1981); language used for maternal interviews; and if the baby was given up for adoption.

The Hollingshead Index (1979) is based on the level of educational attainment of mother and father, as well as the degree of social prestige associated with the type of occupation of each parent. If the family received more than 50% of its financial support from another relative, education and occupational prestige of that person were also obtained. In the PPVT-R, the participant chooses from among four pictures presented simultaneously, the one representing the word read aloud by the interviewer. The French version of this test was used for participants whose second language was French, the English version, for those whose second language was English. Because Inuktitut was the native language for virtually all of the mothers, the PPVT-R score is used primarily as an index of acculturation to mainstream Canadian culture.

Psychological distress was assessed from the short version of the “Inventaire de détresse psychologique de Santé Québec” (IDPESQ-14; Préville, 1992). This instrument, which has been used in previous health surveys conducted in Nunavik and in the general population of the province of Quebec, was developed from the Psychiatric Symptoms Index (PSI; Ilfeld, 1976). Its 14 items assess symptoms of depression, anxiety, irritability, and cognitive problems and provide a total score of overall psychological distress. The participant reports the frequency of each symptom experienced during the previous week. The IDPESQ-14 has good internal consistency reliability among the Inuit (Cronbach alpha of 0.88) and a stable factorial structure reproducing the four PSI factors (Jetté, 1994). Two yes/no questions developed by Tousignant et al. (1984) and previously used in the SQIHS were used to document the prevalence of suicidal ideation and suicidal attempts over the postnatal year and during the mother’s lifetime.

Domestic violence was assessed on the Conflict Tactics Scales (CTS; Strauss, 1979). This instrument assesses frequency of use of reasoning, verbal aggression, and physical violence in conflict situations with one’s husband/wife or partner over the previous 12-month period. The items consist of a list of possible responses that each partner can use when a disagreement arises. Each respondent is asked about her behaviours and her partner’s. In the original instrument, three standardized scores were obtained, representing the factorial structure of the instrument: reasoning, verbal aggression, and physical violence. In this study, the four items assessing the reasoning subscale were omitted because many of the mothers found them difficult to understand and did not endorse reasoning as a response during our pilot study. Scores on verbal aggression and physical/lethal violence were computed for the mother, for her partner, and for the couple.

Statistical analyses

All data were analysed using SPSS (SPSS Inc., Chicago, IL) software. Each sociodemographic, psychological, and familial characteristic was compared between women

who drank during pregnancy and those who did not, and between women who binge drank while pregnant and those who did not, using *t*-tests for continuous variables and chi-square tests for discrete and dichotomous variables. In addition to these comparisons, the best predictors of binge drinking during pregnancy were evaluated using forward stepwise logistic regression. Variables that were found to differ between women who binge drank during pregnancy and those who did not ($p \leq 0.05$) were included as potential predictors. When multiple variables reflecting similar constructs satisfied this criterion, only one was included in the model in order to avoid multicollinearity. In these cases, a variable integrating the information of the multiple variables was created when conceptually possible, or the variable that was the most highly associated with binge drinking during pregnancy was selected. Significance criterion was fixed at $p < 0.05$.

Results

Participant characteristics are presented in Table 1. About 14% of participating women were younger than 18 years while pregnant. The participants were poorly educated, only 21% had obtained their high-school diploma, 71% were unemployed at prenatal interview, 23% were primiparous, and 18% already had more than 3 children. About one third were neither married nor living with a partner. 15.3% of women gave their baby up for adoption, usually to a close relative, which occurs relatively frequently among the Inuit when the mother is either very young or not inclined to raise additional children. Inuktitut is the first language of Nunavik Inuit but since most of the participants were fluent in a second language, interviews were mainly conducted in English or French.

Most participants had their first experience of alcohol drinking before the age of 18 years, with 23% before the age of 14 years (Table 2). Almost three-quarters of the participants reported drinking alcohol during the year prior to the pregnancy. The prevalence of alcohol use during pregnancy was 60.5%. The average alcohol intake during pregnancy was only slightly lower than during the year before pregnancy, a decrease from 8 to slightly less than 6 standard drinks per drinking day, but the frequency of alcohol consumption decreased substantially from 1 out of 6 days during the year before pregnancy to 1 out of 25 days during pregnancy. Among alcohol users during pregnancy, 62% reported at least one episode of binge drinking, which corresponds to 38% of the whole sample. This consumption pattern occurred an average of 9 times during pregnancy. The average amount of alcohol intake during these binge episodes was 10 standard drinks. The prevalence of alcohol users and binge drinkers during the postnatal year was similar to that reported for the pregnancy period, as was the average number of standard drinks per drinking day. However, alcohol users and binge drinkers drank more frequently during the postnatal year than during pregnancy.

The number of standard drinks of alcohol per day during pregnancy, as reported by pregnant women, was used to estimate the prevalence of children whose neurobehavioral development is likely to be at risk for in utero exposure to alcohol effects. Although most birth cohort studies reported that alcohol effects are dose-dependent, generally without threshold, the lowest level at which effects are reported during gestation is 0.5 ounces of absolute alcohol per day (Carter et al., 2005; Jacobson et al., 1998; Sampson et al., 1994; Testa et al., 2003), which corresponds to one standard drink. 4.65% of women reported consuming this level of alcohol during their pregnancy. Using this cut-off point as the minimal exposure for observable neurobehavioral effects, we estimated that 47 children per 1000 live births are at risk for possible alcohol effects.

Nine of 10 women smoked during pregnancy, more than half (52%) of whom reported smoking at least 10 cigarettes per day (Table 2). The average age for first time smoking was

12 years, with 17.7% of participants initiating before 10 years of age. Marijuana was by far the most prevalent illicit drug with four of five women reporting marijuana use on at least one occasion prior to the pregnancy. Marijuana continued to be used by more than one-third of the women during pregnancy, who reported smoking it on average of about 2 times/week. A large proportion of the participants had at some point inhaled solvents, mainly glue, gas and nail polish remover, and almost one-quarter had at some point used powdered cocaine. Other drugs, such as crack cocaine, mushrooms, PCP, sedatives and amphetamines were reported by less than 5.6% of the women. Other than marijuana, the illicit drugs documented were rarely used during pregnancy. Marijuana, sniffing solvents, and cocaine were used for the first time at an average age of 16, 14, and 21 years, respectively. Sniffing solvents started before the age of 13 years for 26.2% of women reporting that practice.

T-tests were performed to identify how alcohol users during pregnancy differed from abstainers (Table 3), and how binge drinkers during pregnancy differed from those who did not binge drink (Table 4). Alcohol users during pregnancy were more likely to live in less crowded houses, have better mastery of a second language, and to have used marijuana, cocaine, and inhaled solvents. They were also more likely to use marijuana while pregnant and consumed alcoholic beverages 6–7 times more often on average and in larger amounts during the year preceding pregnancy. Binge drinking during pregnancy was more likely to occur among women who were single, had given birth to fewer children, were living in less crowded houses, and had a better knowledge of a second language. The women who binge drank during pregnancy were also younger when they first drank alcohol, consumed alcohol more often and in greater amounts per occasion during the year prior to their pregnancy, smoked a greater number of cigarettes daily during pregnancy, were more likely to use marijuana often while pregnant, and to have used cocaine and inhaled solvents before pregnancy. Alcohol users during pregnancy, as well as binge drinkers, were more likely to experience psychological distress and depressive symptoms during the postnatal year than abstainers. A lifetime history of suicidal attempt was also more prevalent among women who drank or binge drank during pregnancy compared to those who did not. Moreover, the women who drank alcohol and binge drank during pregnancy used verbal aggression more often during conflicts with their husband or partner during the year following the birth of their child, and binge drinkers reported that their husband or partner more frequently used verbal aggression.

A stepwise logistic regression analysis was performed to identify what variables best predicted maternal binge drinking (yes/no) during pregnancy among the following predictors: maternal marital status, # children < 6 years living with the mother, maternal PPVT score, maternal age at first drink, # standard drinks per drinking day before pregnancy, lifetime use of solvents and/or cocaine, use of illicit drugs during pregnancy, # cigarettes/day during pregnancy, and maternal symptoms of depression. Since 23 cases were missing due to the variables ‘maternal PPVT’ and ‘age at first drink’ and because these variables did not significantly predict binge drinking when other variables were in the model, final analyses did not include these two variables. The test of the full model with all retained predictors was statistically significant, $\chi^2(4, N = 186) = 51.3, p < 0.001$, indicating that the predictors, as a set, reliably distinguish between pregnant women who binge and those who do not. This model accounts for 33.2% of the variance of binge drinking status according to the Nagelkerke R^2 and classifies 89.3% of non-bingers and 46.2% of bingers, for an overall success rate of 74.2%. The Hosmer-Lemeshow statistic suggests that the model does not show a lack of fit ($\chi^2(8) = 14.7, p = 0.07$). Table 5 shows the regression coefficients, Wald statistics, odds ratios, and 95% confidence intervals for odds ratios for each of the final predictors. Overall, greater number of drinks per occasion before pregnancy, higher maternal score of depression at 11-month postnatal interview, maternal use of illicit drugs (marijuana, solvents or cocaine) during pregnancy, and fewer children

aged < 6 years living with the mother best predicted maternal binge drinking during pregnancy (all p 's < 0.05).

Discussion

Comparison of prevalence data obtained in this study with those from the SQIHS (Jetté, 1994) suggests that the proportion of Inuit women using alcohol increased between 1992 and the 1995–2000 period. The proportion of non-pregnant women self-reporting alcohol use in 1992 was 61.3% among women aged 15 to 24 years and 48.7% for those aged 25 to 44 years, compared with more than 70% of women aged 14 to 41 years reporting using alcohol while not pregnant in this study. This comparison should be considered with caution due to differences between the two studies in the interview protocol used to obtain the alcohol data and the Nunavik communities represented in the sample. Nevertheless, the data from this study that was conducted 3–8 years after the SQIHS are consistent with the findings in the latter survey showing higher rates of alcohol use among younger women.

To our knowledge, this is the first study providing prevalence data on alcohol use during pregnancy for the Canadian Inuit population. A large proportion of participants, that is 72.9%, drank during the year preceding pregnancy. Although one-fifth of them stopped consuming alcohol when they became pregnant, there was still 60% of the study participants consuming alcohol while pregnant, and the majority drank large quantities of alcohol when they drank. This prevalence rate is about two times higher than that reported by Godel et al. (1992, 2000) for other Canadian aboriginal groups living in the North. Given the high levels of alcohol reported by the mothers for the pregnancy period, we estimated that as many as 47 per 1000 live births in this population may result in children at risk for alcohol effects. The estimate reported here indicates that alcohol is a key risk factor for impaired child development in this population rather than a prevalence rate per se since we based our estimations on maternal report of alcohol rather than on direct child assessments. The risk to the children may actually be higher since binge drinking is the predominant pattern of alcohol consumption in the studied group: 63% of alcohol users during pregnancy binge drank on 9 occasions on average, and had an average of 10 standard drinks on those occasions. According to Bailey et al. (2004), 7-year-old children exposed to binge drinking are 1.7 times more likely to have IQ score in the mentally retarded range, and 2.5 times more likely to have clinically significant levels of delinquent behaviour.

In this cohort of pregnant women, tobacco use was extremely common, with about 9 women out of 10 reporting smoking during pregnancy. Similar rates were reported among non-pregnant Inuit women in the Qanuippitaa? survey (Plaziac et al., 2007). These data suggest that smoking cessation campaigns have utterly failed to reach Nunavik Inuit women. Prenatal tobacco exposure is a well documented risk factor for numerous negative pregnancy outcomes, especially reduced birth weight, and recent studies suggest that it is likely also to be associated with increased risk of attention deficit and hyperactivity disorder (Braun et al., 2006; Weitzman et al., 2002).

Marijuana is by far the most commonly used illicit drug in Nunavik with 8 out of 10 women self-reporting having used it at some time in their lives. As many as 36% of the women reported using this drug during pregnancy, which is higher than the rates previously reported in non-pregnant women from Nunavik (30%; Jetté, 1994) and southern Canada (5%; Statistics Canada, 1994). Illicit drug use during pregnancy was also a significant predictor of binge drinking during that period.

Surprisingly, alcohol use and binge drinking are associated with higher socioeconomic status (SES) and greater acculturation to national Canadian culture in this sample, as

indicated by less crowded living conditions and greater mastery of English or French. Thus, by contrast to other aboriginal groups, younger women with lower SES do not appear to be the most appropriate target group for prevention in this population. In explaining these associations, we should consider that alcohol sale is prohibited in all Nunavik stores. Alcohol is available through existing bars in only two communities out of 14 and in the remaining communities, it has to be ordered by individuals from larger Southern cities and delivered by plane, which is very expensive; alcohol is also available through the black market, which makes its cost even higher. In this study, two out of the three participating communities had no access to alcohol within the community and 85% of study participants come from those “dry” communities. Consumption may thus be associated with greater access to alcohol, which in turn is likely to be greater with higher SES. An other avenue of explanation might be that living in less crowded households, having fewer children and greater mastery of a non traditional language are characteristics of more acculturated independent women who are likely to be less influenced by conservative and traditional relatives and friends. Those women living in relatively independent circumstances who are more oriented to modern culture might be more likely to feel sufficiently free and unconstrained so as to binge drink. Overall, such associations are very difficult to interpret within the context of our data collection. Other methods belonging to qualitative research would provide additional complementary information.

Not surprisingly, alcohol use in the year prior to the pregnancy is a key characteristic that can be used to identify women at risk of binge drinking while pregnant. Psychological distress, assessed with maternal symptoms of depression after pregnancy, was also associated with alcohol use and binge drinking during pregnancy. It is not clear whether this distress is antecedent or consequent to the use of alcohol. Nevertheless, the maternal distress and domestic violence data indicate that the postpartum period is very difficult for many Inuit women, and access to supportive interventions is needed. Young infants could also gain significant benefits from such interventions, which could help improve the mother's ability to provide more optimal care giving.

One may question how representative the sample is of the Nunavik population of pregnant women since the initial refusal to participate was 26%, the study was conducted in only 3 out of the 14 communities and we cannot estimate the percentage of pregnant women not invited to participate to this study. First of all, we may reasonably agree that more heavily drinkers or alcohol dependent women might be more likely to refuse to participate, which would lead to an underestimation of the prevalence rates reported here. Secondly, we can certainly expect community differences in alcohol use within the 14 Nunavik communities (e.g., in terms of alcohol availability). Since a large majority of our study sample came from communities where alcohol is not sold in stores, we consider that the portrait of the situation described here is somewhat more representative of “dry” Nunavik communities.

In conclusion, given the well-documented negative consequences of prenatal alcohol exposure and the high prevalence of pregnancy drinking in this remote Canadian Inuit sample, drinking in pregnancy is likely to represent one of the greatest risk factors for adverse developmental outcome in this community, particularly with regard to long-term intellectual and behavioral development. Pregnancy smoking and marijuana use are common practices that often co-occur with alcohol use, which may also impact negatively on pregnancy and child outcomes. These data document a need for effective prevention and intervention programs with women of childbearing age, pregnant women together with their partners, and families with affected children. To be effective, these programs must be culturally relevant and involve multiple partners, such as social services, medical, educational and legal systems, and most importantly, must be supported by community leaders. Furthermore, the correlates of alcohol use reported here support the consensus

among researchers that contemporary alcohol use among sub-groups of Aboriginal people in North America is the result of a collective experience that is multi-determined and associated with greater distress and violence.

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Table 1

Characteristics of participants.

	Total N	n (%)	Mean	Median	SD	Range
Marital status (% single)	248	72 (29.0)				
Age	248		24.9	24.4	5.8	14.1–40.7
Education (yr)	248		9.0	9.0	1.7	5.5–14.3
Occupation	248					
No occupation		177 (71.4)				
Unskilled and semiskilled laborers		21 (8.4)				
Skilled laborers		7 (2.8)				
Clerical and sales, technicians		37 (14.9)				
Small business, professionals		6 (2.4)				
Hollingshead Index ¹	246		25.9	25.5	10.1	8.0–50.0
Parity	248		2.1	2.0	1.9	0.0–9.0
Number of adults in house	248		3.5	3.0	1.7	1.0–10.0
Number of children less than 6 yr	246		0.9	1.0	0.9	0.0–4.0
PPVT-R ²	205		68.2	67.0	31.9	11.0–146.0
Language of interview (% Inuktitut)	248	40 (16.1)				
Adoption status (% adopted)	215	33 (15.3)				
Village	248					
Puvirnituk		119 (48.0)				
Inukjuak		92 (37.1)				
Kuujuarapik		37 (14.9)				

¹Hollingshead Index for the mother and her partner or, if she was not self-supporting, for her primary source of support (usually her parents);

²PPVT-R: Peabody Picture Vocabulary Test-Revised.

Table 2

Alcohol consumption, smoking, and drug use

	Total N	N (%)	Mean	Median	SD	Range
ALCOHOL						
Age at first drink	227		15.4	15.0	2.7	8 – 28
Prior to pregnancy (% drinkers)	247	180 (72.9)				
No. of drinking days ¹	179		60.6	24.0	88.8	1.0 – 361.2
No. standard drinks/drinking day ¹	180		8.0	6.4	5.7	0.6 – 32.3
During pregnancy (% drinkers)	215	130 (60.5)				
No. of drinking days ¹	130		9.9	4.0	17.3	1.0 – 131.0
No. standard drinks/drinking day ¹	130		5.9	4.5	5.1	0.4 – 35.2
Binge drinking during pregnancy (% yes)	130	81 (62.3)				
No. of occasions ²	81		9.0	3.0	13.9	1.0 – 73.0
No. standard drinks/binge ²	81		9.7	8.0	5.7	4.8 – 35.2
Highest number of std drinks/binge ²	81		11.1	8.4	8.1	4.8 – 58.8
Binge drinking 1 st trimester (% yes) ²	130	71 (54.6)				
No. of occasions ²	71		7.4	3.0	9.0	1.0 – 43.5
No. standard drinks/binge ²	71		9.9	8.0	5.8	4.8 – 35.2
Highest number of std drinks/binge ²	71		10.8	8.4	6.7	4.8 – 35.2
Year following pregnancy (% drinkers)	174	105 (60.3)				
No. of drinking days ¹	105		24.6	6.0	35.5	.94–180.6
No. standard drinks/drinking day ¹	105		5.8	5.1	3.8	.99 – 25.8
Binge drinking (%)	105	67 (63.8)				
No. of times ²	67		22.8	7.5	31.3	.83 – 180.6
No. standard drinks/drinking day ²	67		8.6	8.0	3.3	4.8 – 25.6
Highest no. standard drinks/binge ²	67		9.7	8.0	4.4	4.8 – 25.6
PREGNANCY SMOKING (%)	248	228 (91.9)				
No. of cigarettes/day ³	228		10.6	10.0	5.6	0.3 – 25.0
DRUGS						

	Total N	N (%)	Mean	Median	SD	Range
Ever						
Marijuana	248	206 (83.1)				
% users						
Solvents	247	153 (61.9)				
% users						
Cocaine	245	56 (22.9)				
% users						
Pregnancy						
Marijuana	215	78 (36.3)				
% users						
Days/month ⁴	78		8.2	4.0	9.4	0.1 – 30.1
Solvents	215	4 (1.9)				
% users						
Days/month ⁴	4		1.5	0.1	2.8	0.1 – 5.8
Cocaine	215	1 (0.5)				
% users						
No. of times ⁴	1		0.1	0.1		0.1 – 0.1

¹ Abstainers excluded;

² Only for binge drinkers;

³ Non smokers excluded;

⁴ For users only.

Table 3

Characteristics of alcohol users during pregnancy.

	Alcohol users								
	Yes				No				
	N	M	SD	%	N	M	SD	%	P
SOCIODEMOGRAPHIC									
Marital status ¹	130			32.3	85			22.4	0.11
Age	130	25.3	5.9		85	24.1	5.7		0.13
Education (yr)	130	9.0	1.7		85	8.8	1.7		0.32
Occupation ²	130			30.8	85			25.9	0.44
Hollingshead ³	129	26.9	9.6		85	24.8	10.2		0.13
Parity	130	2.0	1.7		85	2.2	2.0		0.38
No. of adults in house	130	3.3	1.6		85	3.8	1.8		0.02
No. of children < 6 years	128	0.7	0.8		85	1.2	1.0		0.00
PPVT-R ⁴	125	71.6	32.6		79	62.6	30.3		0.05
Adoption status ⁵	129			15.5	85			15.3	0.97
ALCOHOL									
Age at first drink	126	15.1	2.3		71	15.8	2.9		0.06
Before pregnancy									
Number of drinking days	130	63.7	93.2		85	9.7	25.2		0.00
Number std drinks/drinking day	130	7.8	6.1		85	3.2	5.5		0.00
PREGNANCY SMOKING									
Number of cigarettes/day	130	10.2	6.0		85	8.6	6.0		0.06
DRUGS									
Ever									
Marijuana ⁶	130			88.5	85			76.5	0.02
Solvents ⁶	130			73.8	84			44.0	0.00
Cocaine ⁶	129			28.7	84			9.5	0.00
Pregnancy									

	Alcohol users									
	Yes					No				
	N	M	SD	%	N	M	SD	%	P	
Marijuana ⁶	129			45.7	85			21.2	0.00	
Days/month	129	4.2	8.2		85	1.1	3.4		0.00	
Sniffing ⁷	129			1.6	85			2.4		
Cocaine ⁷	129			0.0	85			1.2		
MATERNAL DISTRESS										
Depression	109	9.0	2.6		80	7.9	2.4		0.00	
Psychologic distress	109	23.4	6.7		80	21.1	5.6		0.01	
Suicidal thoughts ⁸	99			70.7	70			61.4	0.21	
Suicidal attempts ⁸	96			47.9	68			32.4	0.05	
DOMESTIC VIOLENCE										
Resp.	57	24.6	23.3		48	15.6	19.2		0.04	
Physical/lethal	56	3.3	6.0		47	3.3	7.9		0.97	
Partner	57	29.8	32.4		49	21.9	32.1		0.21	
Physical/lethal	56	8.0	17.0		47	6.3	14.3		0.61	

0 = not single, 1 = single;

² 0 = unemployed, 1 = employed;

³ Hollingshead Index for the mother and her partner or, if she was not self-supporting, for her primary source of support;

⁴ PPVT-R: Peabody Vocabulary Test-Revised;

⁵ 0 = not adopted, 1 = adopted;

⁶ 0 = did not use this drug, 1 = used this drug;

⁷ Not enough participants reported using these drugs to conduct T-tests;

⁸ 0 = no, 1 = yes.

Table 4

Characteristics of binge drinkers during pregnancy

	Binge drinkers								
	Yes				No				
	N	M	SD	%	N	M	SD	%	P
SOCIODEMOGRAPHIC									
Marital status ¹	81			40.7	134			20.9	0.00
Age	81	24.9	5.8		134	24.8	5.9		0.85
Education (yr)	81	9.2	1.8		134	8.8	1.7		0.12
Occupation ²	81			30.9	134			27.6	0.61
Hollingshead ³	80	25.8	9.9		134	26.1	9.9		0.83
Parity	81	1.7	1.5		134	2.3	2.0		0.01
Number of adults in house	81	3.3	1.5		134	3.6	1.8		0.16
Number of children < 6 yrs	79	0.6	0.7		134	1.1	1.0		0.00
PPVT-R ⁴	77	73.8	33.3		127	64.6	30.7		0.05
Adoption status ⁵	81			14.8	133			15.8	0.85
ALCOHOL									
Age at first drink	79	14.8	2.3		118	15.7	2.7		0.02
Before pregnancy									
Number of drinking days	81	81.7	102.1		134	18.5	46.5		0.00
Number std drinks/drinking day	81	9.3	6.2		134	4.0	5.5		0.00
PREGNANCY SMOKING									
Number cigarettes/day	81	11.1	5.8		134	8.6	6.0		0.00
DRUGS									
Ever									
Marijuana ⁶	81			87.7	134			81.3	0.23
Solvents ⁷	81			77.8	133			52.6	0.00
Cocaine ⁶	80			31.3	133			15.0	0.01
Pregnancy									

	Binge drinkers									
	Yes					No				
	<i>N</i>	<i>M</i>	<i>SD</i>	%	<i>N</i>	<i>M</i>	<i>SD</i>	%	<i>P</i>	
Marijuana ⁶	81	4.7	8.6	49.4	133	1.9	5.4	27.8	0.00	
Days/month	81	4.7	8.6		133	1.9	5.4		0.01	
Solvents ⁷	81			1.2	133			2.3		
Cocaine ⁷	80			0.0	134			0.7		
MATERNAL DISTRESS										
Depression	67	9.4	2.7		122	8.1	2.4		0.00	
Psychologic distress	67	24.3	6.8		122	21.4	5.8		0.00	
Suicidal thoughts ⁸	62			75.8	107			61.7	0.06	
Suicidal attempts ⁸	61			52.5	103			35.0	0.03	
DOMESTIC VIOLENCE										
Resp. Verbal aggression	35	31.0	24.0		70	15.3	18.8		0.00	
Physical/lethal	34	5.0	7.2		69	2.4	6.6		0.08	
Part. Verbal aggression	35	35.8	30.7		71	21.4	32.3		0.03	
Physical/lethal	34	8.8	16.1		69	6.5	15.7		0.49	

¹ 0 = not single, 1 = single;

² 0 = unemployed, 1 = employed;

³ Hollingshead Index for the mother and her partner or, if she was not self-supporting, for her primary source of support;

⁴ PPVT-R: Peabody Vocabulary Test-Revised;

⁵ 0 = not adopted, 1 = adopted;

⁶ 0 = did not use this drug, 1 = did use this drug;

⁷ Not enough participants reported using these drugs to conduct T-tests;

⁸ 0 = no, 1 = yes.

Table 5

Stepwise logistic regression to predict maternal binge drinking during pregnancy

Variables	β	Wald X ²	Odds Ratio	95% Confidence Interval for Odds Ratio	
				Lower	Upper
# Standard drinks per occasion before pregnancy	0.16	17.06**	1.17	1.09	1.26
Maternal depression	0.16	4.75*	1.17	1.01	1.35
Illicit drugs during pregnancy	0.74	4.27*	2.10	1.04	4.25
# Children < 6 years	-0.45	4.22*	0.64	0.42	0.98
(Constant)	-2.88	16.86**			

**
 $p < 0.001$ *
 $p < 0.05$