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Among Natives and Non-natives: Similarities and Differences**

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ABSTRACT

Objective: Employing probability samples from the Ontario Health Survey Supplement (Ontario Ministry of Health, 1990/91) and a community of Native Ontario reserve residents (Embree, 1993), this study compared and contrasted Natives' and Non-natives' determinants of drug and alcohol use onset. *Method:* Proportional Hazards techniques identified factors associated with the risk and timing of onset of substance use (alcohol and illicit drugs) for both cultural groups, and special attention was paid to the role of family background characteristics as precursors to early alcohol and drug-use onset. *Results:* The multivariate results reveal that, for both Natives and Non-natives alike, and considering both drinking and drug use onset together, age cohort predominates as a risk factor, with youngest groups at greatest risk, and especially in the case of drug use other than alcohol. Males also exhibit consistently higher risks of both alcohol and other substance use, and this is true to a greater extent for Non-natives. For the model of drug use timing, age of alcohol use onset is the second best predictor for Natives, although its effect is still apparent, albeit weaker, in the case of Non-natives. The results concerning age at first regular drinking lend further support to previous findings that alcohol use is a powerful predisposing factor to the use of illicit substances. However, the evident cultural disparity in the predictive power of this measure also suggests that Natives may lag behind the general population with respect to recently observed shifts in the pattern of substance use progression (i.e., away from alcohol use as a necessary precondition to illicit use of other drugs). As for family characteristics, a number of factors emerge as determinants of risk but appear to depend, at least in part, on the cultural group and the substance under consideration: namely, parental substance abuse, paternal history of depression, quality of parental relations, parental occupational background, and sexual abuse during childhood. *Conclusions:* Overall, the findings point to the salience of family background in affecting early onset drinking and drug use, behaviors well-recognized to have potentially adverse mental and physical health consequences, as well as negative social outcomes.

<u>Introduction</u>

A review of literature on substance use patterns reveals a variety of characteristics which may influence the risk of drug and alcohol use onset. Important etiological factors are thought to include various family background characteristics, along with a number of other individual biological, psychological and environmental influences. Concerning characteristics of early family life in particular, parental alcohol or drug problems (Black <u>et al.</u>, 1986; Famularo <u>et al.</u>, 1986; Famularo <u>et al.</u>, 1992; Hernandez, 1992), parental mental problems such as a history of depression, and the quality of the parent-child relationship (Black <u>et al.</u>, 1986; Mian <u>et al.</u>, 1994) appear to figure importantly in the risk of developing problem drinking and other negative behaviors such as illicit drug use. The occurrence of childhood sexual victimization is also understood to result in a vast number of emotional and behavioral problems, including alcohol and other substance abuse (Yellowlees and Kaushik, 1994).

The present research seeks to identify predisposing factors involved in the risk and timing of onset of regular alcohol consumption and other drugs. Special attention is paid to the role of family contextual influences, as a general test of the hypothesis that many individual behaviors, including substance use (and abuse), are learned in the course of early socialization. Although a number of other recent studies have explicitly examined familial factors in this connection (Barnes <u>et al.</u> (1986); Blackson and Tarter (1994); Foxcroft and Lowe (1991); Grichting and Barber (1989); Peterson <u>et al.</u> (1994); Worobec <u>et al.</u> (1990); McKenna and Pickens (1981); Latham and Napier (1992)), few have utilized non-treatment populations and still fewer have considered similarities and differences in substance use patterns between Natives and Non-natives. Moreover, there is a relative paucity of research focusing on the timing of onset as distinct from drug use prevalence or levels when, in fact, it may not be readily assumed that onset and subsequent use patterns (although strongly related) are determined by identical mechanisms. In view of long-standing historical and economic differences and the unique cultural position of Native populations vis-a-vis the larger North American society, it is useful to compare Native and Non-native patterns of substance use; findings from this research on Natives' alcohol and drug use patterns and how such patterns might differ from those

of the general population could help to inform the most successful treatment and prevention strategies for

a group which has suffered heavily from a variety of drug-related health, family and other social problems.

Background

Previous research on substance use onset shows that the age at which individuals begin consuming

either alcohol or drugs strongly predicts more serious negative consequences associated with consumption

later in life. Concerning health consequences, Soderstrom's (1994) study of trauma patients observes that

alcohol abuse, in addition to creating a much higher risk of subsequent traumatic injury than for non-abusing

patients, can exacerbate other conditions such as brain and heart injuries, shock, impaired blood clotting, and

infectious diseases; the degree to which these problems are aggravated is correlated with age of onset and

duration of alcohol use, moreover, as well as with actual volume consumed. Psychiatric health may also be

impaired by abuse of substances (Berman and Atkinson, 1994). Effects of maternal excessive alcohol and

other drug use on the fetus have also been studied extensively (Conry, 1990; Harris et al., 1995; Lamanna,

1982; May, 1991).

Studies also suggest that early onset substance use may be indicative of a variety of other interrelated

problems, such as disrupted family relations and child abuse, that may contribute to maladjustment across

the life course (for example, substance abuse disorder, criminality, and depression) (De Wilde et al., 1994).

Thus, apart from well-documented health consequences, abuse of alcohol and other drugs can have important

negative effects on relationship functioning and stability (Wadsworth et al., 1975), and may be related to

specific negative life events such as separation and serious family arguments (Heikkinen et al., 1995).

Humphrey and Friedman (1986) obtained evidence that the strongest predictors of the extent of

intoxication during the period surrounding the study were early age of onset and the frequency of

intoxication at the onset of drinking. Clapper's (1992) research finds similarly that the age of onset of regular

use of tobacco, marijuana and alcohol is the best predictor for current use levels. Additional research by

Clapper et al. (1995) also indicates that the number of times an individual is intoxicated before his or her sixteenth birthday is the best single indicator of adult alcohol abuse and dependence, with adolescent fighting, arrests, and lack of participation in religious activities also serving as important problem behaviour predictors. These findings pertaining to conduct disorder and early onset alcohol use are supported by Lex et al. (1994) who observe an association between convictions of drunken driving among females, conduct disorders as children, and a younger mean age of onset of alcohol use. Utilizing retrospective data from a large, non-clinical adolescent sample, Windle (1993) found that so-called externalizing childhood problems such as attention deficit/hyperactivity, oppositional behaviour and conduct disorder were associated significantly with both internalizing (i.e., depression) and externalizing (alcohol consumption and delinquent activity) adolescent problem behaviours, as well as with an earlier onset of substance use. Other studies suggest a link between early onset of legal drug use, use of illegal substances, and criminality. Yu and Williford (1994) analyzed data on individuals in prisons, drinking driver programs, alcoholism treatment centres, and on probation. According to the findings, the initiation of alcohol and drug use progresses from legal to illicit drugs with criminality influenced significantly by the patterns of initiation and use. The findings also suggest that early onset of legal drug use increases the risk of illicit drug use; criminality, in turn, is affected by current alcohol and cocaine use. In a Canadian study of female prison-inmates, Biron et al. (1995) investigated drug use and abuse and its relationship to crime while focusing on the age of onset of alcohol and illicit drug use, the nature of the conviction, previous involvement in criminal activities, as well as other variables. The researchers find the subjects to be characterized by an early age of onset of alcohol and drug use which preceded delinquent and criminal behaviour.

Among outpatient alcoholics, Lee and DiClimente (1985) found that early-onset subjects reported significantly greater social role maladaption, more loss of behavioral control when drinking, greater severity of alcohol dependence, more severe alcoholic deterioration, and more frequent psychoperceptual withdrawal symptoms than later-onset alcoholics. Importantly, the early age of onset was a greater predictor of these

destructive patterns than the actual duration of heavy drinking. A further study by Friedman et al. (1996) examines the effects of drug use and abuse on occupational attainment among a longitudinal sample of Black American males. Their results indicate that earlier use of either alcohol or marijuana lead to poorer occupational performance.

Not only does early onset lead to a wide array of specific social and health problems, but patterns of substance use also tend to follow a predictable course among early initiators, from alcohol use to marijuana use to other more dangerous drugs such as cocaine (the so-called 'gateway' theory of drug use patterns). Thus, early onset of alcohol consumption is often seen as a precursor to the use of other, illegal and more dangerous substances. In fact, the sequential use of alcohol and/or cigarettes, marijuana, other illicit drugs, and medically prescribed psychoactive drugs has been established in a number of studies. Yu and Williford (1992), for example, find that alcohol use increases the chance of using cigarettes and marijuana, and that when alcohol and cigarettes are used in combination, there is a significant increase in the risk of the use of marijuana; as well, early onset of alcohol use affects current consumption of alcohol and other drugs, with the impact being greatest when onset occurs at a critical age period between 13 and 16 years. A further study reveals that both the age of onset of use of any particular drug and the frequency of use of a drug at a lower stage of drug use are strong predictors of further progression (Blankfield, 1990). Dinwiddie et al. (1992) note early ages of onset for alcohol use among 'worst-case' non-treatment intravenous drug users in their sample, along with the distinctive pattern of progression observed in many other studies (see also Kandel et al., 1992).

Related research by Golub and Johnson (1994) argues that the timing of the progression pattern itself might be shifting; whereas the typical pattern in the past has been from alcohol use to marijuana use to more serious substances, findings from a sample of serious drug abusers indicate that alcohol use is not a prerequisite for marijuana use, but marijuana use almost always preceded the use of serious substances such as cocaine, crack and heroin. This same research maintains that early onset of substance use is a major

predictor of later drug usage, but that the importance of alcohol as a precursor to marijuana use may have declined due to the relative increase in the prevalence of marijuana use since the 1960's.

Available evidence on Natives' substance use patterns suggests that the age of onset of substance use is strongly correlated with increased use, with more pervasive problems related to use later in life (see Brown et al. (1992-93)). In a study of Native American high school students, Okwumabua and Duryea (1987) find that respondents begin smoking cigarettes and marijuana, drinking, sniffing solvents and using cocaine as early as age ten; moreover, the significant period of risk for initiating drug use appears to be between the ages of 10 and 13, suggesting that the age of onset for substance use is relatively early among Native youth (See also Grobsmith, 1989; Gutierres et al., 1991; Hughes and Dodder, 1984; May, 1982).

Concerning predictors of substance use onset, Blankfield (1990) observes significant age and sex differences in alcohol-related behaviours. This research indicates that younger males are at greatest risk; progression to illicit drugs among males, moreover, appears to be dependent on the prior use of alcohol, whereas for women, the use of either cigarettes or alcohol is sufficient for the progression to marijuana use. Important differences for males and females in the risk and timing of substance use onset have also been noted elsewhere. One recent study, for example, finds that men exhibit higher prevalences of alcohol-related problems, have a lower mean age at onset, and a longer mean duration of alcoholism (Cheng and Chen, 1995). York and Welte (1994) observe a later age of onset of alcohol consumption for females, as well as less frequent alcohol intake and a higher percentage of abstainers.

Biological and demographic factors other than age and sex have also been studied. Wilson et al., 1994) examine the influence of age at menarche on substance use onset and find that young women with earlier puberty report drinking earlier than girls whose puberty is later. Conversely, however, Mezzich et al. (1992) conclude that the age of substance use onset is associated with chronological age, not the age of onset of menarche. In a further study in which the age of onset of alcohol consumption and other psychoactive drugs were investigated from a genetic perspective, researchers (Comings et al., 1994) observed

a significant relationship between the presence of a specific gene and age of onset. Overall, however, the results of this study and others remain inconclusive as to the exact role of certain biological and genetic factors (see, for example, Gelernter et al., 1991). In recent work that focuses on the question of genetic or biological predisposition toward substance abuse versus environmental influences, Vaillant (1994) found that early age of onset of alcohol abuse is correlated with a disturbed family environment, but not with a heredity positive for alcoholism.

From among the various environmental influences, parental substance abuse appears to be one of the most important risk factors in early use onset and excessive consumption. Indeed, family history of alcoholism or other drug abuse has been strongly implicated in a number of studies. Results from a sample of 147 male alcoholics with a parental history of alcoholism and 116 male alcoholics without such a history (Worobec et al., 1990) show that the presence of parental alcoholism, net of other factors, is associated with more severe alcohol dependence and other related difficulties such as an earlier age of onset of alcohol use and current cognitive problems. The study by Miller et al. (1993) of drug and alcohol addicted inpatients also finds a significant family history of alcohol and/or drug dependence. In this treatment group, the rate of familial alcoholism among cocaine addicts approaches 80 percent while the rate of familial drug dependence approaches 40 percent for alcoholics and cocaine addicts. Early onset of substance use is also observed to significantly predict abuse, with the effects of early onset being particularly strong for alcoholic or drug-addicted females (see also Blankfield, 1990). Black et al. (1986) find that adults raised in alcoholic families enjoy significantly less utilization of interpersonal resources as a child; have significantly more family disruptions characterized by a higher divorce rate and premature parental and sibling death; report more emotional and psychological problems in adulthood; experience more physical and sexual abuse as children; and, more frequently become alcoholics and marry alcoholics. Taken together, these findings support theory about substance use and abuse as a behavior learned in the course of early socialization within the family.

Parental substance abuse may also be particularly salient in view of research like that of Windle <u>et al.</u> (1995) which shows that the occurrence of physical or sexual abuse within the context of parental alcoholism may play a significant role in the etiology and continuity of alcohol disorders for both men and women (see also Fox and Gilbert (1994); Bean (1993)). Consistent with these findings from Non-native populations, Lujan <u>et al.</u> (1989) reports that alcohol was present in a significant percentage of the abuse and neglect cases (85 and 63 percent, respectively) in their sample of Native children in a southwestern U.S. state. Lisak and Luster (1994) find that men sexually abused as children report significantly more negative relationships and a greater prevalence of substance abuse compared to the non-abused. A further set of studies on the antecedents of substance abuse find it linked to lack of emotional attachment or commitment to others as well as to self rejection (Textor, 1987; Kaplan <u>et al.</u>, 1988; Walsh, 1995). The study by Yellowlees and Kaushik (1994) found that female psychiatric patients sexually assaulted as children were more likely than their non-abused counterparts to exhibit personality disorders, to be victims more frequently of domestic violence, attempt suicide, and abuse alcohol or tranquillizers. High rates of childhood physical and sexual abuse have also been reported by other researchers among substance-abusing and other clinical populations. Walker <u>et al.</u> (1993) found that patients who had experienced severe lifetime victimization had significantly higher odds of experiencing alcohol abuse, depression, panic disorder, inhibited sexual desire, and a variety of other disorders, than the patients who had experienced less severe sexual trauma or no trauma (see also Goodale and Stoner, 1994; Hussey and Singer, 1993; Swett and Halpert, 1994; Fullerton <u>et al.</u>, 1995). On the basis of existing literature, it appears that factors associated with the early home environment may play an especially important role in influencing patterns of substance use and abuse; nevertheless, it remains to be determined empirically whether these same factors have a similar influence on onset of substance use per se.

Peer risk factors have also been cited as important determinants of the onset and use of alcohol and other drugs. In a study that assesses the impact of a variety of background characteristics on the early onset

of alcohol and drug use among boys 10 to 12 years of age, Blackson and Tarter (1994) correctly classified 83.7 percent of those who had used alcohol and/or drugs by ages 12 to 14 years, using risk factors associated with the subject's perception of family dysfunction, unconventional activities among peers (behavioral problems), and affiliation with peers engaged in delinquent behaviours. Another study linking peer-related influences to early onset of alcohol and drug use is that by Dupre et al. (1995). These researchers find peer pressure to be a major contributing factor to early age of onset of alcohol and other drug use.

The present research examines the extent to which a number of family background characteristics and other factors impact on the risk and timing of substance use onset. Additional influences, such as timing of labor force entry and family formation have also been cited as significant protective factors in timing of substance use onset; but given that such events may also be seen as consequences of onset in some instances, it will be necessary to examine only factors which can be established temporally as causes of substance use onset. For comparative purposes, one sample consists of a random sample of adults collected from a Native Ontario community (Embree, 1993) and the other, a random subsample of the adult population from the 1990-91 Ontario Mental Health Supplement Survey (OHSSUP). Available predictors of drug and alcohol use onset are as follows: Background characteristics pertaining to the family of origin include the experience of sexual abuse during childhood, parental depression during childhood, whether the mother or father had a drinking or drug problem, the perceived closeness of the relationship with parents while growing up, the experience of early parental loss through separation or death, and the occupational attainment of the parent or guardian while the child was growing up. The respondent's age and sex are also considered. Age at the survey data is included as a covariate in order to assess possible cohort differences in the risk of substance use onset. The analysis of drug use timing examines the specific impact of alcohol consumption onset in addition to the other covariates already noted. In order not to confound cause with effect, the necessary assumption made here is that initiation of regular drinking, as discussed above, operates as a 'gateway' or precursor to subsequent use of other substances.[1] As well, we seek to access the similarities and differences

in the risk factors associated with alcohol and drug use onset between Native and Non-native communities.

Method

The data for the Native population are based on a simple random sample gathered by one of the authors (Embree, 1993) of 876 adults ages 19 and over from a Native Ontario community. The overall response rate for the survey was about 72 percent. The questionnaire contains a large number of items pertaining to substance use beliefs and practices, as well as a number of questions about the respondent's family life while growing up. Females account for approximately 70 percent of the sample due to higher non-participation rates among males. Furthermore, about 30 percent of this sample are between ages 19 and 30; 40 percent are between the ages of 31 and 49 whereas the remaining 30 percent are 50 or older. Almost 30 percent of this sample reported sexual victimization during childhood. Forth-three percent reported father's substance abuse and about 14 percent reported father's depression during childhood. By contrast, about 24 percent noted depression by the mother while only 17 percent reported a drug or alcohol problem by the mother. Almost 38 percent of Native respondents report separation from either or both of their parents at an early age, i.e., prior to age 16. Close to 90 percent of Native respondents enjoyed close maternal relations while growing up and about 82 percent experienced close paternal relations. Fifty-one percent identify with a blue-collar parental occupational; about six percent report a professional background, 13 percent, a service sector or small business background, just over three percent, an unemployed background, and 27 percent, farming or other occupations.

Concerning characteristics associated with alcohol and drug use onset and consumption, median survival times (corrected for censoring) for the Native group with respect to alcohol consumption are 17 years and 32 years for drug use. Only about 7.5 percent of this group have never used alcohol by the survey date whereas 60 percent are censored by the survey with respect to drug use. Eight percent began drinking regularly before the age of 13; 36 percent began drinking between the ages of 13 and 16; 22 percent were

between the ages of 17 and 18 at the time of onset, while about 26 percent delayed regular drinking until at

least age 19.[2]

Data for the general population were obtained from the 1990-91 Ontario Mental Health Supplement

Survey (OHSSUP), a stratified, multi-stage area probability sample of the household population ages 15 and

older. Excluded from this group are residents of Native reserves, prison inmates, foreign service personnel

and residents of remote areas. The sample represents 9,128 persons ages 19 and older randomly selected

from the household interview portion of the 1990 Ontario Health Survey (OHS). The final response rate for

the survey was 76.5 percent. The OHSSUP contains detailed information on patterns of alcohol and other

substance use as well as a wide range of demographic and socioeconomic characteristics pertaining to the

respondent's childhood home environment. To yield more meaningful tests of significance, sample weights

were applied to the data and rescaled to equal the actual number of cases in the sample. Further adjustment

for an overall study design effect (DEFF = 2.2)[3] resulted in a sample size of 6,154. Of this number, 3,655

cases were randomly selected for analysis. This subsample was generated in order to yield more similar

sample sizes for the two groups under study while, at the same time, attempting to compensate for the lower

relative prevalence of certain behaviors such as illicit drug use in the general population.

Some basic characteristics of the OHSSUP sample are as follows: Fifty-five percent are female;

twenty-six percent are between 19 and 30 years of age; thirty-two percent are ages 31 to 49 and 39 percent

are 50 or older. Those reporting sexual abuse during childhood account for only 7.5 percent of cases. About

15 versus four percents experienced paternal and maternal substance abuse, respectively. Five percent report

father's depression during childhood whereas about 11 percent had a mother with this problem. Twenty

percent of Non-native respondents report separation from either or both of their parents at an early age, i.e.,

prior to age 16. Eighty-three percent of respondents enjoyed close parental relations during childhood.

Twenty-seven percent came from a blue-collar occupational background; twelve percent from a professional

background, almost nine percent from the service sector or small business, less than one percent from an

unemployed background, and 51 percent from farming or other occupational backgrounds.

Some characteristics of Non-natives' alcohol and drug use patterns are as follows: median survival times (corrected for censoring) are 17 years for alcohol use and 35 for drug use. Only 7.5 percent of this group have never used alcohol by the survey date whereas almost 91 percent are censored with respect to drug use. Given the relatively heavy censoring of drug use, especially in the case of Non-natives, interpretations of 'failure' or 'survival' times, estimated on the basis of uncensored cases, should be treated with caution.[4] Nine percent began drinking regularly before the age of 13; almost 40 percent began drinking between the ages of 13 and 16; twenty-one percent were between the ages of 17 and 18 at the time of onset, while about 24 percent delayed regular drinking until at least age 19.

The dependent variables in the analyses of both the Native and OHSSUP data may be interpreted as survival time in years before experiencing either first regular drinking or drug use.[5] Over this interval, individuals may either survive the event up to the survey time, in which case they are considered censored, or succumb to the event before the date of the survey (uncensored cases).[6] For both samples, the covariates selected for the hazard analyses of alcohol and drug use onset are measured as follows: Age at the survey date is grouped according to the categories '19 to 30', '31 to 49', and '50 or older', with the oldest group serving as the reference; parental occupation during the respondent's childhood is grouped according to 'professional', 'service sector or small business', 'farming or other occupations', 'blue collar' (the reference category), and 'unemployed'. In addition, the model of drug use onset examines the influence of timing of alcohol use onset. With this variable, the relevant categories are 'never drank', started 'before age 13', 'between 13 and 16', 'between 17 and 18', and '19 or older' (the reference group). Among the Native sample, quality of relations with mother and father while growing up are measured separately, with those not enjoying close relations serving as the reference. In the OHSSUP sample, relationship with parents is also a dichotomous variable measuring perceived closeness between parents and child while the respondent was growing up; those not enjoying close relations serve as the reference category. With the OHSSUP measure,

unfortunately, no distinctions can be made between quality of the child's relationships with the mother and the father since the question from this survey referred to parents collectively. Apart from this one discrepancy, the measures employed in the two data sets are operationalized in a very similar or identical manner. Mother's and Father's depression are dichotomous variables, with those not reporting a history serving as the reference group. Sexual abuse is measured at the nominal level according to whether the respondent was ever abused sexually as a child. Those not experiencing abuse of this nature serve as the reference category.[7] Separation status refers to whether the respondent was separated from either of his or her parents prior to age 16. In both samples, those not experiencing a separation serve as the reference group. Sex is measured at the nominal level, with females as the reference category.

The Proportional Hazards model used here (Cox, 1972) combines multiple regression with life table techniques. This technique is appropriate in overcoming the problems of censoring. Right censoring is common in event history analyses and is caused by the incomplete experience of the event studied. For example, in the analyses of drug use onset, only 10 percent of respondents in the OHSSUP sample reported substance use by the date of the survey, whereas about 40 percent in the Native group report drug use prior to the survey date. Life table techniques can handle this censoring or data truncation by combining the experience of those who have undergone the event of interest with those who have not, in the calculation of (corrected) survival probabilities.[8]

To identify trends in drinking and drug use onset, proportions experiencing the events of interest classified by the given demographic and family background characteristics were first estimated. The Proportional Hazards modelling technique (Cox, 1972) was then applied to the data in order to determine the factors which influence the rate at which both Natives and Non-natives experience drinking or drug use onset. With the proportional hazards model, it is also possible to identify individuals with the highest and lowest chances of experiencing drinking or drug use onset by calculating their respective relative risks. The application of this procedure yields estimates of the magnitude and direction of effects on timing of a given

level of the independent variable as well as the relative risk of undergoing the transition of interest associated with a particular demographic or socioeconomic characteristic. Different levels of risk, negative or positive, imply differences in timing, either earlier or later, compared to that for an established reference group. Unlike cross-sectional models which obtain estimates via comparisons of cases having experienced the event of interest with those who have not, event history models like the Proportional Hazards procedure follow cases over time, relating differences in their individual attributes to differences in the length of time spent in the origin state (i.e., the period prior to substance use) before making the transition of interest. The focus is thus on the process of substance use onset as opposed to the more static approach with cross-sectional designs.

For k time-constant variables, Cox's Proportional Hazards model may be written as:

$$\log h(t) = a(t) + b_1 x_1 + b_2 x_2 + \ldots \; b_k x_k$$

where a(t) can be any function of time. Because this function does not have to be specified, the model is often described as partially parametric or semiparametric. It is called the proportional hazards model because for any two individuals at any point in time, the ratio of their hazards is a constant. Formally, for any time t, $h_i(t)/h_j(t) = c$ where i and j refer to distinct individuals and c may depend on explanatory variables but not on time.[9]

Results

Table 1 presents numbers and percentages of Natives and Non-natives experiencing alcohol and drug use onset, classified by the various demographic and family background characteristics. Table 2 gives the relative risks of drinking and drug use onset, respectively, for both Natives and Non-natives.

As noted above, parameter estimates for the covariates reflect negative or positive effects on the timing of the event under study. In unstandardized form, the coefficients mean that a unit change in the level of the covariate involves a given change (either positive or negative) in the hazard,

controlling for other variables in the equation. Exponentiating the coefficients in order to fix the baseline or reference category to one, coefficients less than one work to decelerate the timing of the event or the failure time by a given factor, while coefficients greater than one are interpreted as having an accelerating effect on timing. These antilogged parameter estimates, therefore, yield numerical multipliers of risk per unit difference in the predictor (Singer and Willett, 1991). For dummy variables in particular, the exponentiated coefficient gives the relative hazard for the groups corresponding to values of the dummy variable, controlling for other predictors. Given that the unstandardized coefficients depend on the metric of the variable, it is also be instructive to examine the t-statistics for the null hypothesis that each coefficient is zero. In large to moderate samples, the t-statistics can be interpreted like those in an ordinary multiple regression and represent the ratios of the estimates to their standard errors (Allison, 1984). These give some indication of the magnitude of the effects in the model.[10]

From Table 2, it is apparent that a number of factors are significant in affecting the rate at which both Natives and Non-natives experience substance use onset. Looking first at the results for the analysis of Natives' alcohol use onset, we observe the following: Age cohort has the largest impact on the risk of alcohol use onset, with those in the 19 to 30 age category 2.58 times ($\alpha \leq .001$) more likely to begin drinking than those in the oldest age category; those in the middle category, ages 31 to 49, have an increased risk of almost 80 percent ($\alpha \leq .001$) compared to their elder counterparts. Sex is also an important predictor, with males at 46 percent higher likelihood of initiating regular drinking than females ($\alpha = .01$). From among the family background characteristics, father's substance use problem is associated with a 39 percent increase in risk ($\alpha \leq .01$); quality of maternal relations corresponds with a 33 percent reduction in risk but does not quite achieve statistical significance at the conventional minimum probability level of $\alpha \leq .05$ ($\alpha = .07$). Parental occupation is also important to the risk, with those from a predominantly farming background at 44 percent lower risk than those

from blue-collar backgrounds ($\alpha \leq$ .001). As for the effects of childhood sexual abuse, it is apparent that victimization has a positive impact on the risk: Those reporting abuse are found to be at 54 percent greater risk of early onset alcohol use than their non-abused counterparts (α = .01). The model is statistically significant at $\alpha \leq$ .001 (χ^2 = 136.49, df = 15).

Turning to the OHSSUP results on drinking onset, age cohort exerts the strongest impact on the risk, with those in the youngest age group being at 2.25 times ($\alpha \leq$ .001) the risk of early onset compared to the reference group; in a similar manner, those ages 31 to 49 at the survey date are at 1.39 times ($\alpha \leq$ .001) the risk of those in the reference group. The results for Natives and Non-natives alike show clearly that the risk of initiating regular alcohol use among young people is increasing in a dramatic and linear fashion. Father's drug and/or alcohol problem achieves statistical significance at $\alpha \leq$ .05 and indicates a 14 percent increase in risk over those not experiencing this problem while growing up. The impact of mother's substance use problem is more conspicuous, with those reporting a problem being at 61 percent ($\alpha \leq$ .001) greater risk of early onset compared to the reference group. Father's depression (but not mother's) increases the risk significantly as well, by approximately 30 percent ($\alpha \leq$ .05). Parental occupation proves to be a significant predictor as well: Service sector and small business backgrounds reduce the risk significantly by 19 percent ($\alpha \leq$ .05) compared to blue collar occupations. Unemployment appears to increase the risk substantially (by 28 percent) but not significantly so, possibly due to too few cases. Sex also influences the risk, with males being 66 percent ($\alpha \leq$ .001) more likely to begin drinking. None of the other variables in the model appear to exert a significant effect on timing of alcohol use, including sexual abuse, although the obtained coefficient indicates the expected direction of effect (i.e., 11 percent greater risk for those victimized). Overall, the model is statistically significant at $\alpha \leq$ .001 (χ^2 = 368.00, df = 14).

The models of drug use timing shown in Table 2 also reveal some interesting patterns of results. Considering first the Native sample, as was true for both Natives and Non-natives with respect

to alcohol use, age cohort has a large and significant impact on the timing or drug use onset. The youngest group, ages 19 to 30 at the survey date, are 13 times more likely to begin drug use than members of the oldest cohort, ages 50 and older ($\alpha \leq .001$). The middle age category is also at greater risk, specifically 3.28 times greater, compared to the reference group ($\alpha \leq .01$). Mother's depression comes very close to achieving significance at $\alpha = .07$ and appears to increase the risk by 53 percent. Mother's drug and/or alcohol abuse increases the risk by 81 percent ($\alpha \leq .05$). Quality of paternal relations reduces the risk of drug use by 42 percent ($\alpha \leq .01$); positive maternal relations reduce the risk by 40 percent, but not significantly so. Farming and other occupational background lowers the risk by 37 percent and almost achieves significance at $\alpha = .07$. Unemployment, as well, appears to have the expected positive effect on the risk (55 percent increase), but is not significant. Males are observed to be at 51 percent greater risk than females ($\alpha \leq .05$), whereas the experience of sexual abuse during childhood elevates the risk of drug use by 47 percent ($\alpha \leq .05$). Timing of alcohol use onset exerts a systematic and powerful influence on the risk of drug use, with the earliest group of drinkers (i.e., before age 13) at 10.64 times the risk ($\alpha \leq .001$) of the reference group of late onset drinkers (i.e., ages 19 or older); those in the 13 to 16 age group at six times the risk ($\alpha \leq .001$); and those in the 17 to 18 age category at four times the risk ($\alpha \leq .001$). The model is statistically significant at $\alpha \leq .001$ ($\chi^2 = 286.31$, df = 19).

Turning to the general population results, as with the models of drinking onset for both cultural groups, age cohort has, by far, the largest impact on the risk of drug use onset. In the case of drug use, however, the effect is much more dramatic. For instance, those in the youngest survey-date cohort (ages 19 to 30) are found to be almost 20 times ($\alpha \leq .001$) more likely to begin drug use compared to the reference group consisting of those in the oldest group, ages 50 or older; those in the middle age group (ages 31 to 49) are over six times ($\alpha \leq .001$) more likely to initiate drug use than their older counterparts. According to these results, the risk of drug use onset for both Natives and Non-

natives is clearly increasing over time. Father's drug and/or alcohol problem (but not mother's, although the coefficient is positive as expected) is also influential: Specifically, the risk of initiating drug use is increased by 60 percent ($\alpha \leq .01$) among those with a history of paternal substance abuse. Father's depression (but not mother's) during childhood also has a similar but stronger effect on the risk, elevating it by 100 percent ($\alpha \leq .01$). The experience of sexual abuse during childhood increases the risk by 72 percent ($\alpha \leq .05$). From among the categories of parental occupation, only the service sector and small business group appears to be at significantly different risk of drug use (2.12 times greater) compared to the blue collar category ($\alpha \leq .001$). Possibly, this result for white-collar-type occupations is explained by the fact that use of many kinds of illicit drugs requires greater financial resources than may be enjoyed by those from blue collar backgrounds (note that the coefficient for the professional group is also positive, although the sample size may be too small to enable detection of a significant effect). Positive parental relationships reduces the risk by 30 percent ($\alpha \leq .05$). Males are found to be at 70 percent greater risk of drug use onset than females ($\alpha \leq .001$). Finally, the measure of alcohol use onset employed with the Non-native sample provides further (although less striking) evidence that earlier use of alcohol is associated with the use of other drugs; specifically, those who began drinking prior to age 13 are 88 percent more likely ($\alpha \leq .05$) to use other substances than those waiting until after age 19 (the legal drinking age) to begin drinking. A somewhat more surprising result is that the likelihood of drug use initiation among those who began drinking between ages 17 and 18 is actually somewhat lower (by almost 40 percent) than that of the reference group. While this effect does not quite achieve the accepted significance level, it is nevertheless interesting. One point to bear in mind is that the age of majority has changed at various points over time, with the result that various age thresholds may be relatively more or less critical, depending on the age cohort involved. Moreover, a lower risk of drug use among 17 to 18 year-old first-time alcohol users relative to their older peers could be due to the heightened availability and opportunity of drug and alcohol use

associated with college or university attendance, usually beginning around age 19. In this case, one might expect to observe an elevated risk for the pre-college group as they make their transition to post-secondary school attendance. By contrast, no such effect may be discernable for Natives due to their lower rates of attendance at higher-education institutions. Overall, the model achieves statistical significance at $\alpha \leq .001$, with $\chi^2 = 297.63$, df = 18.

The primary goal of this study has been to further our understanding of the processes of alcohol and other substance use onset and to determine how these mechanisms might differ for Natives and Non-natives. The findings above indicate that a number of features of the early home environment may entail significant protective and risk effects in the timing of substance use onset; the results also reveal some important similarities and differences between Natives and Non-natives in their patterns of alcohol and drug use onset. For both Natives and Non-natives alike, and considering both drinking and drug use onset together, age cohort predominates as a risk factor, with youngest groups at greatest risk, especially in the case of substance use other than alcohol. The observed trends in both drinking and drug use onset therefore appear to involve steadily increasing risks for younger cohorts. As expected, males also tend to exhibit consistently higher risks of both alcohol and other substance use, although the sex differential is apparently stronger among Non-natives. For the model of drug use timing, age of alcohol use onset is the second best predictor for Natives; among Non-natives, its effect is still significant although much less dramatic. Consistent with the 'gateway' theory of drug use progression, age of alcohol consumption onset is found here to be a powerful predisposing factor to Natives' use of illicit or medically-controlled substances. The significance of this apparent cultural difference in the influence of alcohol use timing is a question requiring further investigation, especially in light of the similar prevalence estimates and timing of alcohol use onset for the two groups.

Concerning family background, parental substance abuse affects the risk positively for both

groups, but in no obviously systematic way. In particular, the significance of its influence seems to depend not only on which cultural group and substance is being considered, but also on which parent experienced drinking or drug use problems. In general, however, the findings for these variables support theory about intergenerational transmission of family behaviors as a primary mechanism in the acquisition of drug use behaviors. Paternal history of depression is also important, but only in the case of Non-natives' initiation of drug and alcohol use. Quality of parental relations appears to have a significant protective effect for both cultural groups, but only with respect to drug use onset; the observed patterns of difference between types of substances are possibly due to the more widespread use and greater normative acceptance of alcohol consumption versus other drug use, in both Native and Non-native societies. In the analysis of alcohol use onset, Natives from farming backgrounds have a reduced risk relative to those from blue collar backgrounds whereas a service sector or small business origin predicts a lower relative risk among Non-native respondents. Sexual abuse during childhood also appears to relate positively to the risk of alcohol and drug use, with the exception of Non-native's timing of onset of regular drinking. On balance, the results pertaining to family origin point to the salience of the early family environment in affecting the risk and timing of drug and alcohol use onset. Nevertheless, it is also true that the impact of these various characteristics appears to depend, in part, on which type of substance and which cultural group is under consideration.

Discussion

The above findings need to be interpreted in light of certain methodological limitations that have been identified in previous literature. First, since the data are primarily retrospective, this precludes prospective evaluations of causal relationships between childhood family experiences and onset of alcohol or other drug use. There are also potential measurement problems surrounding

retrospective recall of early life events that may undermine the reliability of assessment: Retrospective accounts of childhood experiences may be limited by recall distortions occurring over time. Related to problems of recall and misreporting of past events is the difficulty in measuring respondents' past attitudes about a variety of issues at various life stages. In cross-sectional surveys with retrospective components such as those studied here, motives and attitudes are typically measured well after the event of interest has taken place. However, even where such associations can be demonstrated, attitudinal measures given in the survey are taken at the survey date, not at the time of the event of interest, namely onset of alcohol and drug use. As is also well understood, reported attitudes can often reflect rationalizations or other types of revisionist explanations for past events or behaviors. Data gathered via a prospective design would be necessary to obtain more accurate and complete information. Other literature, nevertheless, offers strong support for the use of retrospective reports of early childhood events, downplaying the common criticisms of bias and distortion in recall (see, for example, Brewin et al. (1993)).

A further concern relates to the possible influence of 'uncontrolled heterogeneity'. Population heterogeneity refers to the differentiation of a population according to a variety of social, economic or demographic characteristics. Unfortunately, not all of these attributes are readily observable or measurable for the purpose of including all relevant variables in the model. Although the importance of variables like attitudes and motives may be recognized, they cannot be incorporated into the model in any satisfactory way for the reasons indicated above; such unobserved variables are thus referred to as uncontrolled heterogeneity.[11]

In addition to these general methodological concerns, there are a number of other issues involving the comparability of results from the two data sets. It is well known that Natives throughout North America have suffered heavily from social problems such as family violence and child neglect, suicide and drug and alcohol abuse (Durst, 1991; Kirmayer, 1994; Morrissette, 1994; Niezen, 1993).

The observed smaller prevalence estimates in the OHSSUP sample compared to the Native group for drug use onset in particular (10 versus almost 40 percent respectively) suggest that conclusions about patterns of drug use should be drawn tentatively. Sexual abuse and parental substance abuse are also observed to be relatively rare in the general population of Non-natives. Extremely heavy censoring means that probabilities will be calculated on the basis of too few cases. In general, the assumption with event-history analysis that the event of interest is eventually experienced by all is especially problematic in the study of relatively rare behaviors such as drug use. Accordingly, results based on such assumptions must be interpreted with caution.

Recommendations for future research involve addressing many of the issues raised in this investigation, in particular, the potential limitations of retrospective reports, as well as the need to incorporate additional effects into the model. Although the models tested included a fairly comprehensive list of predictors, unobserved heterogeneity is still likely. Other factors which should, ideally, be considered include non-family variables like peer influences (e.g., peers' use of tobacco and alcohol), as well as more refined indicators of parental attitudes towards drug and alcohol use (as opposed to actual behaviors) likely to be fostered within the home environment; other possible indicators include the experience of childhood physical abuse in addition to abuse of a sexual nature. Finally, the modelling of non-recursive processes reflected in the potentially reciprocal relationship between alcohol and drug use onset and various other social and economic variables such as school- and home-leaving, labor force entry, union formation, and childbearing, also warrants further investigation.

A major strength of this study lies in its use of non-treatment samples, in which case the findings may be inferred with greater confidence to non-treatment populations, whether Native or Non-native. The use of non-clinical samples, moreover, has provided us with sufficient cases to examine simultaneously a number of dimensions of variation. Furthermore, despite certain

inconsistencies, the findings from this study point overall to the salience of a number of family background characteristics in affecting the onset of drinking and drug use. This helps to support expectations about the primacy of family environment in shaping certain behaviors and practices, in particular, early use of substances. Nevertheless, the results also suggest some important patterns of differences between Native reserve residents and the larger population; namely, that initiation of regular drinking is a much more important indicator of the onset of use of other substances among Natives than among Non-natives. The timing of substance use progression patterns may indeed be shifting, as suggested by Golub and Johnson (1994), such that alcohol use is no longer a necessary precursor to the use of more serious substances; but Native communities may lag behind the general trends in drug use behaviors exhibited by the larger society, in a manner analogous to the long-standing differentials in patterns of morbidity and mortality between the two populations. As Natives' and Non-natives' patterns of health and illness converge with Natives' achievement of the so-called 'epidemiological transition' (Omran, 1971), the influence of early-onset drinking on the timing of drug use initiation may also decline. Whether this, in turn, implies ultimately a change in the overall risk of drug use onset for future cohorts of Native youth remains to be seen. The evidence obtained here indicates that prevention of early alcohol consumption is more important in combatting drug use onset for Natives than Non-natives. This information would seem to be particularly important in view of the observed large (absolute and relative) proportions initiating drug use in the present sample of Natives (almost 40 percent of Natives compared to only 10 percent of Non-natives). Apart from these differences, the mechanisms do not seem to be remarkably dissimilar for Natives and Non-natives, especially insofar as various parameters of family life are seen to have an important influence on the likelihood of substance use onset. Intervention programs aimed at preventing early onset use of alcohol or other drugs may, therefore, be similarly valid for both groups. Further information about relevant risk and protective factors is essential to the development of effective health programs and

policies, especially in light of strong evidence from this study that, for Natives and Non-natives alike, the risk of alcohol and particularly drug use onset among younger cohorts has increased dramatically over time, relative to the experiences of previous generations.

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Table 1

**Numbers and Percentages of Natives and Non-natives
Initiating Alcohol and Drug Use by Selected
Demographic and Family Background Characteristics**

| | Alcohol Use Onset | | | | Drug Use Onset | | | |
| | Natives | | Non-natives | | Natives | | Non-natives | |
Variable:	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Age Category								
19-30 years	250	96.5	902	95.9	195	74.4	162	19.5
31-49 years	323	94.2	1235	93.9	136	38.6	134	10.1
≥ 50 years	210	85.4	1334	90.1	18	7.2	31	2.0
Sex								
Female	546	90.7	1757	90.0	208	34.2	148	7.1
Male	240	96.4	1554	96.6	144	57.1	179	12.6
Father's Drug Use								
No problem	344	89.1	2769	92.3	121	30.9	237	8.5
Problem	286	97.3	542	98.2	162	54.5	90	18.0
Mother's Drug Use								
No problem	603	92.3	3164	92.9	253	38.3	298	9.6
Problem	123	93.9	147	99.6	69	52.7	29	15.3
Father's Depression								
No problem	446	92.1	3134	92.9	178	36.3	296	9.3
Problem	74	96.1	177	98.6	41	52.6	31	19.2
Mother's Depression								
No problem	476	92.1	2940	92.9	189	36.2	276	9.3
Problem	155	95.1	371	94.9	89	54.6	51	14.1
Quality of Paternal Relations								
Poor Relations	142	94.0	--	--	85	55.6	--	--
Good Relations	653	92.1	--	--	270	37.8	--	--
Quality of Maternal Relations								
Poor Relations	83	90.2	--	--	38	40.9	--	--
Good Relations	712	92.7	--	--	317	40.9	--	--

Table 1 (Continued)

Variable:	Alcohol Use Onset				Drug Use Onset			
	Natives		Non-natives		Natives		Non-natives	
	No.	%	No.	%	No.	%	No.	%
Quality of Parental Relations								
Poor Relations	--	--	583	95.6	--	--	75	12.2
Good Relations	--	--	2726	92.6	--	--	252	9.4
Parental Occupation								
Service Sector	88	90.7	293	95.8	51	51.0	38	12.5
Professional	44	100.0	417	95.6	25	55.6	57	13.2
Farming and Other	181	83.4	1630	91.0	46	21.1	134	7.5
Not Working	26	100.0	20	100.0	10	37.0	2	10.0
Blue collar	388	96.3	914	95.8	193	47.3	92	9.8
Separation before Age 16								
Not separated	487	92.1	2654	93.1	208	38.8	252	9.5
Separated	298	93.1	657	93.4	143	44.4	75	10.9
Sexual Abuse								
Not abused	466	91.2	2862	93.4	193	37.3	283	9.8
Abused	202	97.1	238	96.1	116	55.2	34	15.7
Age of Alcohol Use								
never drank	--	--	--	--	8	12.3	4	2.9
< 13 years	--	--	--	--	62	84.9	65	19.5
13-16 years	--	--	--	--	190	60.9	182	12.2
17-18 years	--	--	--	--	67	34.7	46	6.4
≥ 19 years	--	--	--	--	28	12.4	30	7.4
Sample Size	876		3655		876		3655	
Percent Initiating Substance Use	92.0		94.0		38.5		10.0	

Table 2

**Multivariate Proportional Hazards Analyses (Relative Risks)
of Natives' and Non-natives' Alcohol and Drug Use Onset by Selected
Demographic and Family Background Characteristics**

	Alcohol Use Onset		Drug Use Onset	
	Natives	Non-natives	Natives	Non-natives
Variable:				
Age Category				
19-30 years	2.58***	2.25***	13.05***	19.43***
31-49 years	1.79***	1.39***	3.28**	6.44***
≥ 50 years[a]	1.00	1.00	1.00	1.00
Sex				
Female[a]	1.00	1.00	1.00	1.00
Male	1.46**	1.66***	1.49*	1.70***
Father's Drug Use				
No problem[a]	1.00	1.00	1.00	1.00
Problem	1.39**	1.14*	1.17	1.60**
Mother's Drug Use				
No problem[a]	1.00	1.00	1.00	1.00
Problem	0.98	1.61***	1.81*	1.51
Father's Depression				
No problem[a]	1.00	1.00	1.00	1.00
Problem	1.10	1.30*	0.90	1.99**
Mother's Depression				
No problem[a]	1.00	1.00	1.00	1.00
Problem	0.99	1.11	1.53	1.31
Quality of Paternal Relations				
Poor Relations[a]	1.00	--	1.00	--
Good Relations	0.89	--	0.58**	--
Quality of Maternal Relations				
Poor Relations[a]	1.00	--	1.00	--
Good Relations	0.67	--	0.60	--

Table 2 (Continued)

Variable:	Alcohol Use Onset		Drug Use Onset	
	Natives	**Non-natives**	**Natives**	**Non-natives**
Quality of Parental Relations				
Poor Relations[a]	--	1.00	--	1.00
Good Relations	--	0.98	--	0.70*
Parental Occupation				
Service Sector	0.87	0.81*	0.94	2.12***
Professional	0.87	0.92	1.01	1.39
Farming and Other	0.56***	0.91	0.63	0.88
Not Working	0.74	1.28	1.55	0.93
Blue collar[a]	1.00	1.00	1.00	1.00
Separation before Age 16				
Not separated[a]	1.00	1.00	1.00	1.00
Separated	1.12	0.99	0.97	0.94
Sexual Abuse				
Not abused[a]	1.00	1.00	1.00	1.00
Abused	1.54**	1.11	1.47*	1.72*
Age of Alcohol Use				
never drank	--	--	2.77	0.44
< 13 years	--	--	10.64***	1.88*
13-16 years	--	--	6.07***	1.01
17-18 years	--	--	4.08***	0.63
≥ 19 years[a]	--	--	1.00	1.00
Sample Size	391	3268	397	3241
Percent Censored	7.2	6.4	61.5	90.3
Global χ^2	136.49*** (df=15)	368.00*** (df=14)	286.31*** (df=19)	297.63*** (df=18)

[a] Reference category for the variable.

Note: Final sample sizes based on list-wise deletion of missing cases.

   * $\alpha \leq .05$
  ** $\alpha \leq .01$
 *** $\alpha \leq .001$

End Notes

1. Since peer risk variables such as tobacco and alcohol use are not available from the Native data set and are only measured as of the survey date in the OHSSUP data, they are not included as possible predictors of substance use timing.

2. Some caution is due regarding the accuracy of this sample in view of the high rate of non-participation among Native males in particular. The generalizability of this sample to other Native communities may also be limited by the diverse geographical and cultural experiences of reserve residents. For further information about the survey and sampling procedures, see Embree (1993).

3. DEFF refers to "Design Effect" which reflects the relative magnitude of the standard error of key measures obtained with the given sampling design compared to the standard error obtained with Simple Random Sampling (SRS), which is considered as a standard. Therefore, DEFF values greater than one signify that the sample variance with the given design is larger than would be obtained were SRS sampling employed. This, in turn, indicates lower sampling precision relative to SRS.

4. The necessary assumption (explained further in Note 8) that all individuals eventually experience the event of interest is certainly unrealistic in the case of behaviors such as drug use onset, the result being that survival times are significantly biased upward; nevertheless, these estimates still allow us to make valid comparisons of the relative timing of initiation for Natives and Non-natives. From this evidence, it is apparent that Natives' onset of drug use is earlier (by 3 years) than that of the general population.

5. The drug use onset measure in the Native sample is based on information about the timing of use onset of the following: cannabis, barbiturates with and without a prescription, heroin, speed, cocaine, stimulants with and without a prescription, tranquillizers with and without a prescription, LSD, hallucinogens, and anabolic steroids. In the OHSSUP data, the following items are included: sedatives, tranquillizers, stimulants, analgesics, non-medicinal inhalants, marijuana or hash, cocaine, LSD, PCP or hallucinogens, and heroin.

6. The Native and Non-native data sets alike measure time in discrete units (i.e., years of age) which may result in a large percentage of ties. Since most survival models are based on the mathematical assumption of continuous time (i.e., time measured in small fractional units such as days, weeks or months), a large number of ties may lead to biased regression coefficients (Blossfeld et al., 1989). Relevant research on the question of substance use timing, however, has revealed little difference in the shapes of the hazard functions estimated via discrete versus continuous time methods (see De Wit et al., 1996).

7. Although it is possible to distinguish the relationship of the perpetrator to the victim in both the Native and non-Native data sets, the primary measure of abuse used in the present analyses does not differentiate. Given very small numbers reporting childhood victimization in the general population sample and especially involving a family perpetrator, combined with the major sex imbalance in reported levels (over 80 percent of victims are female), further refinements of the abuse measure proved unfeasible. It may nevertheless be argued reasonably that, in any event, the occurrence of sexual abuse reflects certain general conditions and characteristics of the child's home environment, such as low parental competence or lack of proper child supervision (see, for example, Hernandez, 1992; Mian et al., 1994; Lujan et al., 1989).

8. Two important assumptions, however, must be made by event-history models in overcoming the problem of censoring. First, it is assumed that all cases eventually experience the event of interest, whether by the survey date or at some future time. Second, censoring is assumed to occur randomly over the interval such that censored cases are considered to be at risk of initiating use half way through the interval. A probability of experiencing drug or alcohol use is then calculated for each case at various durations. The denominator of these conditional probabilities includes both censored and uncensored cases who are at risk of substance use onset during the interval. The numerator consists of the actual number of cases experiencing onset. Since the

Proportional Hazards procedure makes full use of all censored cases, individuals who are censored or lost to analysis by the survey date are assumed to experience the same risk of substance use as others at the mid-interval of survival time. It should be apparent that, with the very large proportions censored in the drug use analysis, particularly with the OHSSUP data, the assumption that all individuals eventually experience the event of interest may be problematic. Nevertheless, given clear-cut evidence from the present study for increased incidence of substance use among younger cohorts relative to older ones, this assumption may be less problematic among younger than older age groups.

9.   Estimation is accomplished via partial likelihood estimation which bears many similarities to ordinary maximum likelihood. The method relies on the fact that the likelihood function for data arising from the proportional hazards model can be factored into two parts: One factor containing information only about the coefficients b_1 and b_2; the other factor containing information about b_1, b_2, and the function $a(t)$. Partial likelihood simply discards the second factor and treats the first factor as though it were an ordinary likelihood function. This first factor depends only on the order in which events occur, not on the exact times of occurrence. The resulting estimators are asymptotically unbiased and normally distributed. They are not fully efficient (having minimum sampling variance) because some information is lost by ignoring the exact times of event occurrence. But the loss of efficiency is usually so small that it is not worth worrying about. For further details see Allison (1984) and Kalbfleisch and Prentice (1980).

10.   As in ordinary regression analysis, standardized coefficients can also be computed for purposes of comparing the relative magnitude of the variables' effects on the hazard rate within the same population. However, the standardization of the parameter estimates in the present context is not very useful since the distribution of responses on categories of the independent variables are restricted between zero and one by dummy coding, whereas the dependent variable, the hazard, is analyzed in continuous form. As a result of this categorization, the standard deviations of the independent variables needed to calculate the standardized coefficients are affected. For this reason, the t-statistics associated with each of the parameter estimates are particularly useful for making within-model comparisons of magnitudes of effects. The unstandardized coefficients are also helpful, but mostly in comparing the magnitude of a given variable's effects across the study samples given that, in each case, the scale of the variable will be constant. Overall, it is most convenient to interpret the exponentiated coefficients in order to look at the influence of a given covariate on survival time rather than on the natural logarithm of survival time, as given by the unstandardized coefficients.

11.   Uncontrolled heterogeneity involves two related difficulties for model estimation, namely model misspecification and the tendency over time for the effects of unobserved attributes to persist. In the case of an improperly specified model, the omitted variables may be correlated with those in the analyses, leading to biased parameter estimates. Concerning the second difficulty, the differences among individuals arising from unobserved characteristics tend to remain fairly stable over time. This condition means that existing differences and, thus, the problems of uncontrolled heterogeneity, generally do not diminish over time. These difficulties for model estimation may be especially relevant in the case of attitudes which cannot be captured adequately by the model. One available option is to treat attitudes possibly related to substance use onset as unobservable variables, and to attempt to formally estimate their influence by incorporating a distribution in the analyses of timing of onset. Although efforts have been made to develop statistical models which attempt to control for this possible "unobserved heterogeneity" (for example, Yamaguchi (1986)), the use of such controls is considered controversial and involves untested mathematical assumptions about the distribution of the unmeasured effects (see Vuchinich et al., 1991).